NorthConnect
Interconnector Converter Station
and
High Voltage Alternating Current Cable Route

Environmental Statement
Volume 2
Main Document
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Contents

NORTHCONNECT
CONNECTING RENEWABLES

Chapter 1

Introduction

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1 Introduction

NorthConnect is a commercial Joint Venture (JV) established to develop, build, own and operate a 1400 megawatt (MW) High Voltage Direct Current (HVDC) ‘interconnector’. The interconnector will provide an electricity transmission link between Scotland and Norway. The interconnector will allow electricity to be transmitted in either direction across the North Sea.

This document is the Environmental Statement (ES) for the Interconnector Converter Station and High Voltage Alternating Current (HVAC) cable route connection of the NorthConnect electricity transmission project in the UK.

The purpose of this ES is to support the planning application by describing the proposed project, documenting the assessment of its likely significant effects on the environment, and detailing the mitigation measures proposed to minimise adverse significant effects.

The Environmental Statement is split into four volumes as follows:

1. Non-Technical Summary;
2. Main Text;
3. Appendixes; and
4. Drawings.

1.1 NorthConnect

NorthConnect is a JV company established in order to develop, build, own and operate an ‘interconnector’ between Norway and Scotland. The interconnector will allow trading of renewable power in either direction between the Norwegian and UK grids. The interconnector will allow Norway, through its hydro capacity, to act as a form of reserve generation capacity for Scottish wind power, while also allowing export of excess Scottish energy to Norway, which could then be exported onwards to neighbouring European countries.

The partners of the JV comprise four owner companies: Vattenfall, Agder Energi, E-CO and Lyse, as illustrated in Figure 1.1.1.

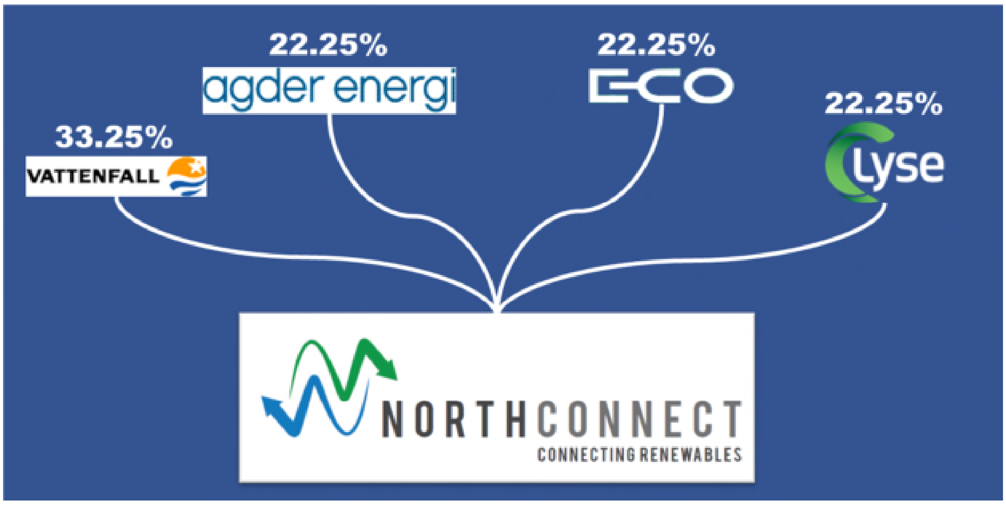

Figure 1.1.1: NorthConnect Joint Venture Partners

1.2 Project Background

The aim of the NorthConnect project is to install the HVDC cable connection between Norway and Scotland by 2022.

In the UK, electricity is normally generated, transmitted, distributed and consumed as AC. However, DC technology allows electricity to be transmitted from point to point in much larger volumes, over greater distances with fewer transmission losses in buried cables compared to an equivalent AC system. DC systems are therefore often used for high capacity interconnector projects such as NorthConnect.

The interconnector will have a capacity of 1400MW; it will be 650km in length and is intended to facilitate the trading of energy with Norway and continental Europe. The interconnector will be routed from Simadalen in Norway, across the North Sea and will make Scottish landfall at Longhaven, Peterhead.

The key components of the project are:

- Onshore HVAC buried cabling from substations to converter stations;
- Onshore interconnector converter stations located near Peterhead, Aberdeenshire and Simadalen, Norway along with associated infrastructure;
- Onshore HVDC buried cabling from landfall to converter stations; and
- Subsea HVDC interconnector between the UK and Norway.

These components are shown Figure 1.2.1, with further details provided in Chapter **Error! Reference source not found.**.

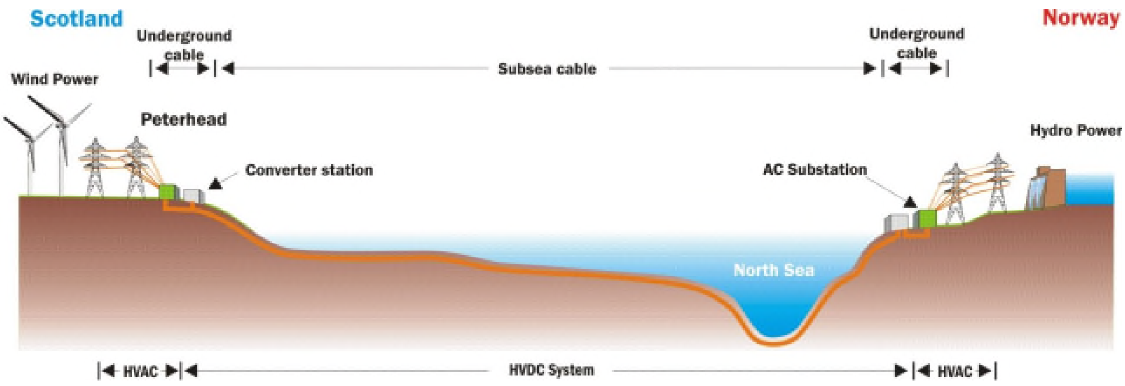

Figure 1.2.1: Scheme Components

By utilising differences in the Norwegian and UK electricity markets' prices and importing / exporting energy to follow these differences, sufficient revenue can be raised for the construction and operation of the interconnector.

1.3 Environmental Statement Project Coverage

This ES covers the following parts of the project:

- The Interconnector Converter Station including services, auxiliary buildings and parking, to be situated at Fourfields south of Peterhead, Aberdeenshire ;
- Onshore buried AC cables from the Converter Station to the boundary of Scottish Hydro Electric Transmission Ltd's (SHETL) land where the substation connection will be made;
- The access road to the converter station;
- Some temporary construction requirements; and
- Associated landscaping.

1.4 The Location

A grid connection agreement is already in place with the National Grid to connect to the Planned New Peterhead substation (Grid Reference: NK121 429), hence the landing point and converter station ideally need to be as close to this substation as is feasible.

A site selection optioneering study (Henderson, 2014) has been completed taking account of a range of technical, social and environmental factors, and considering a number of potential sites. It has identified an area which has been named 'Fourfields' as the preferred site for the Converter Station, and for the preferred HVAC cable routings to follow field boundaries to the sub-station.

1.4.1 Converter Station – Fourfields

The Fourfields site is approximately 2.6km south of the outskirts of Peterhead; 4.5km south of Peterhead town centre; and 1km southwest of the village of Boddam, (Drawing 3019).

The Fourfields site was so named as it is made up of four fields, the corners of which meet at NK119 412 (Drawing 3019). The Fourfields site covers an area of approximately 20Ha.

The Fourfields site is located to the south of Lendrum Terrace and Highfield, east of the Den of Boddam, Sandfordhill and Denhead and west of Stirling Hill and the Quarry.

The proposal is to position the converter station primarily within the north east field, although it will extend into the other three fields, the remainder of the site will be appropriately landscaped, to minimise the landscape and visual impact of the building (Drawing 3022).

1.4.2 HVAC Cable Route

The proposed route for the HVAC cable route is along the northern edge of the Fourfields site, past Highfield, into the fields on the west side of the Highfield access track. The cables would then run due north, parallel to the access track, and then along the west side of the unnamed road past Denend, with the cable then passing under the road somewhere between Denend and Hjaltland. It would finally continue to follow northward, on the east side of the unnamed road, before cutting east, to connect into a proposed 400kV extension to the Peterhead Substation (Drawing 3019). Note that the proposed substation extension is planned by another party, and is not included within the Environmental Statement, or the NorthConnect project.

1.4.3 Access Road

The access to the site will be via the existing quarry access road to the east of the site, which is owned by Breedon Aggregates. There is a need to resurface the road, including widening the junction with the A90 (Drawing 3009).

1.4.4 Temporary Construction and Laydown Area

Temporary construction and laydown facilities will be required. This will be located within the Fourfields site (Drawing 3012).

1.5 Consenting

1.5.1 Introduction

In order for the project to be constructed and operated, there are various consenting and licensing requirements that need to be in place. In the case of this particular project the interconnector converter station, HVAC cabling and auxiliary buildings and services will require consent from Aberdeenshire Council for Planning Permission under the Town and Country Planning (Scotland) Act 1997, as amended by the Planning etc. (Scotland) Act 2006.

The HVDC cable will require Planning Permission from Aberdeenshire Council for the stretch above Mean Low Water Spring (MLWS) and a Marine Licence for the section below the Mean High Water Spring (MHWS) from Marine Scotland. These cannot be applied for until subsea surveys have been completed. A programme constraint for the project connected with the Norwegian Energy Act, is preventing the project from undertaking subsea surveys at the present time. Hence the HVDC Cable consenting process for the project will not commence until later this year. A separate ES will be produced for this and as such the HVDC cable is not considered here. This phased approach has been discussed and agreed with Aberdeenshire Council, Marine Scotland and the Scottish Government.

1.5.2 EIA Regulations

The Town and Country (Environmental Impact Assessment) (Scotland) Regulations 2011 (EIA Regulations) implement the European EIA directive 85/337/EEC (EIA Directive), as amended by Directive 97/11/EC. Schedule 1 of the EIA Regulations lists project types and threshold criteria for defined development where there is a statutory requirement for an EIA to be completed. Schedule 2 of the Regulations lists the types of development where EIA ‘may’ be required and sets out applicable thresholds and criteria for which the need or otherwise can be determined. Although the converter station and onshore cabling requirements do not clearly fall within EIA development under Schedule 2 of the Regulations, the most relevant classification may be interpreted as Category 10 of the Schedule 2 (Infrastructure Projects). This classification applies to other development not falling wholly within any single class of development described in Categories 1 to 9. For Category 10, the threshold relates to the area of the site exceeding 0.5 hectares (Ha). Schedule 2 also makes reference to the consideration of ‘sensitive sites’ and ‘cumulative effects’.

In October 2012 a Scoping Report requesting a screening opinion was submitted to Aberdeenshire Council for an alternative location. Aberdeenshire Council confirmed that an Environmental Statement would be required and it is presumed that this is the case for the new location for the converter station in Fourfields.

1.5.3 Pre-Application Consultation (PAC)

The NorthConnect interconnector converter station is categorised as a major development under The Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009, as it falls under item 9. Other Development in the Schedule and the area of the site exceeds 2Ha. As a major development NorthConnect is required to enter into pre-application consultations (PAC) under The Town and Country Planning (Development management Procedure (Scotland) Regulations 2013. The formal notice of the intent to submit an application for consent was submitted in December 2014, more than 12 weeks in advance of the planning application submission.

The consultation process is discussed in more detail in Chapter 4.

1.5.4 Planning Policy

The context for NorthConnect lies in international and national policy on climate change and energy generation. This is distilled into national, regional and local planning through policies on sustainability and energy, where policies exist.

The development planning system in Scotland, which provides the framework for considering planning applications, is made up of three main documents:

- The National Planning Framework (NPF);
- Strategic Development Plans (SDPs); and
- Local Development Plans (LDPs).

Other guidance on a specific planning topic may be prepared and become part of the development plan; this is called supplementary guidance.

The National Planning Framework (NPF) is a requirement of the Planning (Scotland) Act 2006 and sets out the strategy for long-term development within Scotland. The third NPF (NPF3), was published in 2014 (Scottish Ministers, 2014), and sets out the strategy for development over the next 20 to 30 years.

All Scottish Planning Policy (SPP) (Scottish Government, 2014a) has been consolidated into one overall policy document and the most up to date version of the document has been published recently setting out national planning policies which reflect Scottish Ministers’ priorities for operation of the planning system and for the development and use of land.

The Scottish Government provides advice and technical planning information in the form of Planning Advice Notes (PANs).

The relevant development plan applicable to the determination of the application for consent consists of the Aberdeen City and Shire Strategic Development Plan, published in March 2014 [1] and the Aberdeenshire Local Development Plan 2012 [2]. The appropriate supplementary guidance documents will be utilised to assist with topic specific assessments.

Planning policy is covered in more detail in Chapter 5.

Chapter 2

Project Description

Contents

2 Project Description

2.1 Introduction

This chapter describes the NorthConnect project proposals concentrating on the elements which are relevant to the UK planning process. The chapter covers the needs case for the project, the project components, anticipated activities during construction, operation and decommissioning, and presents a consideration of alternatives to the proposals.

2.2 Background

2.2.1 UK Electricity Transmission and Generation System

The UK power system consists of a mix of different electricity sources. At present, thermal production capacity (burning fossil fuels) dominates, but the share of wind power production is set to increase rapidly in the future. The UK is expecting to lose a third of its generation capacity within the next 10 years as existing nuclear reactors and high-emission coal and gas plants are decommissioned. The potential for greater pumped storage hydro power is limited in the UK and most of the suitable sites have already been developed. The marine energy sector is still in the developmental stage and, as such, wind energy will be the major renewable source for the foreseeable future.

Adjusting power production according to consumption using standby thermal plant or similar is costly and fluctuating consumption/supply leads to fluctuating prices. In periods with low consumption and high wind power production there will be low prices. In periods with high consumption and low wind there will be a need to activate thermal units with high marginal costs, therefore, wholesale prices will be considerably higher. Providing alternative methods of balancing this system, and so stabilising prices, will be a key factor in the success of the UK's move to a low carbon power system.

Within the UK, the National Electricity Transmission System (NETS) is operated by National Grid Electricity Transmission plc (NGET), who have responsibility for operating a transmission system which provides people with a safe and reliable energy supply. Generated electricity is fed into the transmission system and distributed around the UK as required. Currently, electricity cannot be stored efficiently and so it is only generated when required.

Although NGET are system operators within the UK, the Scottish transmission system is owned by Scottish Power Energy Networks (SPEN) and Scottish and Southern Energy (SSE), of which SHETL are responsible for transmission. Any generators/suppliers requiring grid connections in Scotland are awarded grid connection points by NGET in collaboration with SPEN or SHETL.

The 2012 Electricity Networks Strategy Group (ENSG) Report (ENSG, 2012) sets out an updated view of how the UK electricity transmission system needs to be reinforced to help meet the renewables targets for 2020. With changes in generation to more renewable sources, and the consequential change in the location of generation capacity to areas with good renewable resources, major network changes are required.

In Scotland, there has been a dramatic increase over the last decade, in the amount of renewable energy development and connection requirements to the electricity transmission system. This has resulted in planned and on-going large scale improvements to the infrastructure, in order to expand upon the system's electricity transmission capacity. These improvements have included the strengthening of the existing transmission infrastructure (e.g. Dounreay to Beauly) and installation of new sections of overhead line and underground cabling (e.g. Beauly to Denny). In addition, subsea cables are required to strengthen the system including the Western Subsea HVDC project (linking Scotland to England), Caithness-Moray HVDC, Kintyre-Hunterston HVAC, and also links from the Western Isles, Orkney and Shetland to the UK mainland grid.

The move to more renewable energy sources has a significant impact on the grid layout, and the nature of generation that needs to feed into this system.

2.2.2 Norwegian Electricity Generation and Transmission System

The Norwegian power market is dominated by hydro power (more than 90%). A large proportion of the hydro capacity is associated with reservoirs, providing flexibility by being able to store energy, or hold back electricity production, until it is required. This large degree of flexible production enables suppliers to quickly and cheaply follow the demand, both in the short (hourly) and medium (seasonal) terms. However, reservoir capacity is finite, meaning that reservoir levels, hydro generation and this flexibility are strongly influenced by rainfall. Currently, Norway is typically a net importer of electricity in dry years and net exporter in wet years. In the future, Norway is predicted to become a surplus energy area at most times of the year and in most years.

The Norwegian power system is well connected with the other Scandinavian power systems both physically and as a trading market. From this connection, the Norwegian grid is able to access northern European grids and markets. The neighbouring countries have a considerably lower share of hydropower and therefore are less flexible. Extensive renewables projects, which will provide a power surplus, are planned for the future in Scandinavian countries.

Norway has an open electricity market, integrated with the other Nordic countries. Export and import is routine over the direct power links to Sweden, Denmark and the Netherlands. The market is handled by NASDAQ OMX Commodities Europe and Nord Pool Spot.

Hydroelectric plants are very flexible with the ability to reduce or increase generation rates over very short time periods. They can therefore adapt well to variations in demand and hence in price (peak demand periods attract higher prices). On a normal day, when the price is low during night time, Norway normally imports power, to allow it to recharge reservoirs in pumped storage hydro schemes, and exports during daytime when the price is higher. In recent years, Norway has suffered from low rainfall, which has also coincided with down-time in Swedish and Finnish nuclear production, and therefore some restriction of supply, which has led to volatility in electricity prices.

2.3 Needs Case

As long ago as 2002, the European Council set European Union Member States a target of having electricity interconnections equivalent to at least 10% of their (installed production) capacity by 2005. Thirteen years on, Great Britain is only half way to meeting this target. In May 2014, as part of its work on European energy security, the European Commission proposed an interconnection target of 15% for 2030. This was adopted by the European Council in its 23 October 2014 conclusions on the European Union's 2030 Climate and Energy Policy Framework (European Commission, 2014).

The European Union (EU) has set the target that 20% of Europe's energy requirements will be met by renewable sources by 2020. The Scottish Government aims to exceed this target and is looking to achieve 100% of the demand within Scotland (gross consumption) for electricity being met from renewable sources by 2020. The Scottish Government has set an interim target of 50% by 2015 and as per their most recent figures 44.4% was achieved in 2013 with an estimated growth of a further 4.3% by Q3 of 2014 (Scottish Government, 2015), hence Scotland is on track to meet the 2015 and 2020 targets. Further to this Scotland continues to be a net exporter of electricity, exporting a record 28% of generation in 2013 (Scottish Government, 2014).

As a result of these targets, the electricity generation portfolio will move from the traditionally predictable energy generation provided by coal / gas fired power stations and hydro, towards an increasing proportion from renewable sources (primarily wind in the UK). As a consequence, the predictability in generation capacity will reduce. Investment in greater renewable capacity will therefore lead to a rise in demand for reserve generation capacity to supply the grid during periods when the wind farms cannot meet demand.

The Scottish Government (2013a) published the Electricity Generation Policy Statement 2013 (EGPS). This examines the way in which Scotland generates electricity, considers the changes which will be necessary to meet the targets which the Scottish Government has established, and reflects both views from industry and other stakeholders regarding developments in UK and EU electricity policy. It looks at the sources from which that electricity is produced, the amount of electricity which we use to meet our own needs and the technological and infrastructural advances and requirements which Scotland will require over the coming decade and beyond. The EGPS states:

'Scotland's renewables potential is such that, should the relevant technologies be developed successfully, it could deliver up to £46bn of investment and be much more than enough to

meet domestic demand for electricity. The remainder could be exported to the rest of the UK and continental Europe to assist other countries in meeting their binding renewable electricity targets' (Scottish Government 2013).

Significant new investment will be needed both in electricity generation capacity and in the associated transmission infrastructure. The transmission infrastructure will need to be improved to both deliver electricity across Scotland, and to access the other markets which offer electricity generated from renewable sources.

Moving to an increased dependency on renewable electricity sources presents Scotland with a number of challenges. Wind farm productivity is dependent on when the wind blows and the wind speed, while demand for electricity varies with time of day and the time of year. In order to secure supply, especially during peak demand, the electricity transmission grid needs to be able to access power sources quickly. Thermal power generation sources (fossil fuels), mostly gas and diesel, have traditionally been used because of their ability to respond to these changes in demand quickly. The renewable option to meet future security of supply requirements may be to increase access to hydro generation because it has the same fast response time as thermal power to meet peaks in electricity demand.

Scotland and Norway are two fundamentally different power systems. Power generation in Scotland comprises a mix of thermal, nuclear and hydro generation with an increasing proportion of wind power. Norway is dominated by hydro generation which accounts for more than 90% of electricity production.

The NorthConnect project proposes to provide a link between the electricity grids of Scotland and Norway. By linking wind and hydro generation resources between the two countries, NorthConnect will strengthen the security of power supply for consumers in both Scotland and Norway and will support the achievement of Scottish, Scandinavian and European renewable energy targets.

There are four key drivers associated with the NorthConnect project:

- **Security of Supply*:*** Linking the Scottish and Norwegian networks will support energy security in both regions, compensating for fluctuations when future Scottish energy demand is met by a higher proportion of wind energy. The link will also compensate for low Norwegian precipitation and low hydro storage levels, enhancing the electricity transmission infrastructure for both countries;
- **Green Battery*:*** Wind power is subject to fluctuations in production. These fluctuations make a 'Green Battery' energy storage approach attractive to ensure renewable power is available for consumers when the wind is not blowing. About half of Europe's reservoir capacity lies in Norway which also has good potential for energy storage, to provide on demand renewable electricity and the long term realisation of a low carbon electricity supply for Europe;

* **Reduced Price Fluctuations*:*** The project will stabilise electricity prices in the UK and Norwegian markets by leading to increased power exchange and competition in European energy markets; and
* **Risks not Borne by Consumers*:*** NorthConnect is an international joint venture with strong owners who have the financial capacity to realise the project. If power is not traded via the interconnector, consumers do not pay and the owners will lose on their investment.

In addition, NorthConnect will address three key cycles of power supply and demand between the two countries:

* Daily fluctuations for storage of night-time renewable generation and supplementing day-time peak demand;
* Seasonal variations with wetter winters, drier summers and possible icing up of Norwegian hydro in some years; and
* The wind – hydro relationship which can help to balance generation and demand at any time dependent upon weather conditions.

In parallel with this there is emerging international cooperation in the European energy sector and the clear political goal of linking the European power systems closer together. NorthConnect will be a means to connect the two complementary and hitherto disconnected power systems of Scotland and Norway. It will provide reserve capacity to help balance the grid and will allow wider trading across Europe.

There are additional benefits to the transmission system also. According to National Grid's assessment of Benefits of Interconnectors to Great Britain's Transmission System 2014 (National Grid, 2014), additional ancillary services that interconnectors will provide to the UK grid and consumers are:

* **Frequency response and reserve*:*** The ability to address real-time frequency imbalances which demand and generation impose on the grid system;

* **Black Start capability*:*** The capability to be started quickly in a grid blackout situation in a coordinated and controllable way which enables the national grid to be brought back on line;

* **Reactive Power Reserve*:*** Allows voltage control across the localised grid network due to the type of technology used for the HVDC link; and

* **Boundary Capability & Constraint Management*:*** In certain market conditions the ability to relieve constraints on the Scottish grid by exporting power to the Nordic region.

The Department of Energy and Climate Change (DECC) UK have undertaken studies which show that up to 4gigawatt (GW) of interconnection (NorthConnect's capacity is 1.4GW) with the hydro-focussed areas of Europe would be beneficial for consumer and provide an economic boost of up to £2.5bn (DECC, 2013). NorthConnect also have conducted a socio-economic welfare study (Redpoint Energy & Thema, 2013) showing a benefit of at least

£130m per year split roughly equally between Norwegian and UK consumers. More detail on which is provided n Chapter 17: Local Community and Economy.

2.4 Strategic Alternatives Assessment

As part of the EIA process, there is a requirement to outline the main alternatives studied in terms of development siting and design, along with providing an indication of the main reasons for the choices, taking account of the environmental effects (EIA Regulations, Schedule 4, Clause 2). To meet with these requirements, NorthConnect completed a detailed site selection and route option process, (Pre-FEED Report Strategicc Options Appraisal for Landing Point UK /2011.06.02) particularly focussing on the alternatives in relation to location of the Converter Station site, location of the landfall and routing of the onshore cables and subsea cables. A second options assessment process was undertaken (NorthConnect, 2014b) covering the specific locations for the Converter Station, landfall point and onshore cable routing.

As part of the consideration of alternatives in Norway, although not part of this EIA process, two alternative landfall and Converter Station sites were considered with Simadalen being the preferred option.

2.4.1 UK Landfall Selection and Subsea DC Cable Routing

A preliminary study was undertaken for this project looking at the key aspects that will affect the design and viability of the scheme. A key objective of the study was to identify potential landfall options within the UK and assess these to identify a preferred option. Options were assessed against the following:

- Sub-sea and overland route requirements;
- Environmental assessment including permitting aspects;
- Technical implications of both grid connections and system configuration;
- Cost and economic appraisal;
- Option risk and particularly UK north / south revenue, tariff and underwriting risks; and
- Outline programming durations for development and construction.

This assessment first identified the preferred landfall zones adjacent to a suitable grid connection point and then undertook a review of the local options with regard to a specific landing point within the selected zones.

From an initial list of 25 potential options a screening study was undertaken that identified five potential options that were targets of more detailed appraisal. These five options were:

- Peterhead in Aberdeenshire
- Cockenzie on the Forth Estuary
- Hawthorn Pit in County Durham
- Creyke Beck on Humberside

- A variation on Creyke Beck for routeing via the planned Round 3 Dogger Bank offshore wind farms

The locations are shown in Figure 2.4.1.

Figure 2.4.1: Straight line routes for landing point UK options

To undertake the assessment to select the preferred option, a weighting and scoring system was applied to each of the assessment factors. A workshop approach was taken to deploy this methodology and went through a process of assessing each option. Details of the assessment process and scoring are present in the NorthConnect Strategic Options Appraisal report [9] and are summarised in Table 2.4.1.

Table 2.4.1: Summary of the Results from the Regional Review

Results		Peterhead	Cockenzie	Hawthorn Pit	Creyke Beck	Creyke Beck (Via Dogger)
Total Normalised, Weighted Score		54.4	48.4	48	46	45.6
Total Normalised, Weighted Score Available		66	66	66	66	66
Grand Total (%)		82%	73%	73%	70%	69%
Overall Rank		1	2	3	4	5
Category Results						
Routeing	Weighted Score	8	10	6	4	4
	Rank	2	1	3	4	4
Environmental	Weighted Score	12	8.4	8.4	7.2	6
	Rank	1	2	2	4	5
Technical	Weighted Score	9.6	9.6	9.6	12	12
	Rank	3	3	3	1	1
Cost	Weighted Score	12	9.6	9.6	7.2	9.6
	Rank	1	2	2	5	2
Risk	Weighted Score	4.8	6	9.6	10.8	10.8
	Rank	5	4	3	1	1
Programme	Weighted Score	8	4.8	4.8	4.8	3.2
	Rank	1	2	2	2	5

The output from this assessment showed the Peterhead region as clearly the preferred option. Peterhead was ranked first from a cost, economic, environmental and programme perspective. It was therefore been taken forward as the preferred option for more detailed landfall and route corridor assessment within this zone.

Following the outcome of this assessment, a Grid Connection Application was made by NorthConnect for a connection point to the National Grid at Peterhead, and after receipt of a connection offer further assessment was undertaken to identify landfall points in the general area of the substation, which is located on to the south west of the port at Peterhead approximately 1km from the outskirts of the town.

2.4.2 Converter Station Location

A number of sites were considered in the Peterhead area by NorthConnect for the Converter Station site, including to the north of the current substation, but this was already selected as East Coast HVDC's preferred option and so was not available. A site was then looked at immediately south of the substation, on land owned by SSE who at the time were part of the NorthConnect JV. However, the site would have given rise to significant landscape and visual impacts, so when SSE exited the JV, an alternative site was sought.

It was recognised that due to the size of the building that sighting was key to minimising landscape and visual effects. In addition the converter station site needed to be within a reasonable distance to the sea and the sub-station, ideally with good access and services nearby.

Three possible converter station sites were identified, Denend, North Collielaw and Fourfields, centred on grid references NK116 420, NK097 434, and NK119 412 respectively. Initial studies were undertaken to inform the site selection decision making process, including:

- Extended Phase 1 Habitat Assessment (Atmos Consulting, 2014a);
- Topographical Surveys;

- Geology, Hydrogeology and Contaminated Land Desk Study (ERS, 2013);
- Archaeological and Cultural Heritage Desk Study;
- Initial Landscape and Visual Assessment including: Zone of Theoretical Visibility (ZTV) modelling (Atmos Consulting Ltd, 2013)
- Review of Transport Routes for Construction; and
- Landownership Boundaries.

The approximate location of the three sites is shown on Figure 2.4.2. The North Collielaw site was large and, as such, the converter station could have been located in a number of places on the site.

As part of the assessment of these converter station locations, a workshop was held to inform the decision making process and to ensure that option comparison benefited from a range of inputs and technical disciplines. During the workshop a series of attributes were defined under the following headings:

- Health and Safety
- Environmental Impact
- Technical
- Socio-economic
- Commercial

Attributes were scored and weighted out of 5 with 1 being the worst performing/less important and 5 being the best/most important respectively. The scoring definitions and the assignment of weighting are provided in the NorthConnect Optioneering report (NorthConnect, 2014b). Below are the scoring results for all the options considered:

- Denend: weighted score of 146 out of a possible 255
- North Collielaw: weighted score of 164 out of 255.
- Fourfields: weighted score of 189 out of 255.

Denend scored badly due to the large effect it would have on the landscape, and the associated archaeological setting impacts on the Den of Boddam flint mine.

The North Collielaw site scored lower due to its distance from the sea, the substation and the A90, so there would have been a need for significant road improvements and installation of services. Both the HVDC and HVAC cable routes would have been significant lengths with many landowners involved in the routing process. The site was flat and open and as such the Converter Station would have been visible over a wide area.

Fourfields was identified as the preferred site at the workshop, due to it having good access, favourable topography allowing the building to be screened from most viewpoints and the low likelihood of significant environmental effects.

Figure 2.4.2: Converter Station and HVDC Routing Options

2.4.3 HVAC Cable Routing

The routing of the HVAC Cable from Fourfields to the Substation, took into account the following principles:

- Where practicable, it should avoid archaeological features including the need to cross the nineteenth century railway built to convey convicts from Peterhead prison to the quarries (See Chapter 9: Archaeology);
- Road crossings should be minimised;
- Infrastructure crossings should be minimised;
- Where possible field boundaries should be followed;
- The number of landowners affected by the wayleave should be minimised;
- Where practicable valuable ecological assets should be avoided;
- The route should avoid disturbance to residential properties where possible; and
- The route should not be excessively long.

Hence the proposed cable route is from the north west field of Fourfields, heading north in the field parallel to the Highfield access road, and thereby keeping the route away from the residential properties of Lendrum Terrace and the historic railway line. The route northwards then follows the field boundaries running parallel to the minor road from Lendrum Terrace. It stays on the west side of the road to avoid water vole habitats on the stream banks on the east side of the road (see Chapter 7). It then crosses the road before the forest and the property Hjaltland, to avoid the need for tree felling.

2.4.4 Converter Station Access Road

It was identified that a new access route might be constructed from the A90 south of Fourfields; however this will give rise to more environmental impacts and potential cost than the use of an existing route. Hence the focus has been on considering the existing routes.

There are 3 existing routes to the Fourfields site;

- From the corner of the minor road west of Lendrum Terrace to the north west corner of Fourfields, which facilitates access to Highfield and the Den of Boddam;
- From the west end of Lendrum Terrace to the north east corner of Fourfields; and
- The main Stirling Hill Quarry access road from the A90 to the east side of Fourfields.

During construction there will be a number of large vehicle movements which could not be accommodated by the existing minor road from the A90 to Lendrum Terrace; nor by the minor road that runs down the west of the substation; without significant upgrades. The quarry access road only requires minor upgrading including resurfacing and some junction modifications, in order to make it suitable for construction traffic. In addition the use of the quarry access road will avoid the disturbance of residential properties; hence the quarry access road has been adopted as the preferred option.

2.5 Project Components

The interconnector uses HVDC technology because Direct Current (DC) is subject to less transmission loss than Alternating Current (AC), and it is not technologically viable to transmit large amounts of AC power over such long distances via subsea cables. The converter stations are required to allow AC electricity to be converted to DC for exporting via subsea cables, and for the imported power to be converted from DC back to AC, so that it can be utilised by the national grid system. The interconnector has a design life of 60 years.

A description of the main components associated with the planning application is provided in this section. It should be noted that the development will be subject to a design and build contract and, as such, a detailed design has not yet been completed. For example, aspects of the electrical design are dependent on the selection of the electrical supplier for the contract, as the main companies in the HVDC field have their own proprietary technology, and the differences in the components, control methodologies and electrical topologies give rise to variations in the layouts of the converter stations.

Hence, the outline design of the main elements of the converter station have been developed by the NorthConnect team to facilitate the planning process. When required, a 'Rochdale Envelope' approach has been taken to use the largest possible length, width, height or layout which may come from any of the potential suppliers. This then leaves open the possibility that some elements may reduce in size once a main contractor has been selected and their design submitted. However, the intent of the Rochdale Envelope approach is to not materially change the design from that being described here.

2.5.1 Interconnector Converter Station Site

2.5.1.1 Design & Access Statement

It has been agreed with the consenting authority that a separate Design & Access Statement is not required to accompany the planning application, providing that the following areas are addressed within this Environmental Statement:

- The design development process for the project is described in Chapter 3, outlining the design philosophy and approach, and explaining how the design has developed to a form which fits in and respects the character and amenity of the area; and
- Issues of access for disabled people are addressed in this Project Description Chapter 2. These can be found addressed in:
  - Section 2.4.2 Interconnector Converter Station Building; and
  - Section 2.4.5 The Remainder of Fourfields.

2.5.1.2 Layout & Positioning

The converter station site will cover an area of 3.4 hectares (Ha) and will be surrounded by a security fence. However, the area of the permanent works, which includes the final landscape formations, will be 11.2 Ha, and the total area within the Planning red-line boundary, including access road, temporary site areas and the HVAC cable construction corridor, is 28.54 Ha.

The project has undergone a security assessment with the Home Office and the DECC to determine its designation within the 'critical national infrastructure' framework. NorthConnect have been advised that the site will be treated similarly to a large National Grid substation and so, for consenting purposes, the fencing specification has assumed a worst case Category 1 – 'Enhanced' Fence System from the National Grid Technical Specification (NGTS 2.22 Perimeter Security Fencing for Substations and Other Operational Compounds). This is a 3.0m high palisade fence to BS 1722-12:2006 with an electric pulse system on the internal face which extends a further 1.0m above the palisade. The security fence will be located inside and lower than the landscaping mounds at all sides of the site. No overnight security lighting is required.

The converter station site will sit on a large, levelled 'platform' area which is partially excavated into the slope of the ground and surrounding landscaping mounds will be utilised to shield the site visually on all four sides (see Chapter 10). The exact positioning, orientation and height of the platform has been subject to an iterative, multi-disciplinary design process to try to meet and optimise the following principal constraints:

- Landscape and visual impact mitigation;
- Excavation volumes and their impact on transport movements;
- Noise from electrical equipment and noise mitigation of the screening mounds;
- Maximum building or landscaping mound heights not encroaching on the MoD's Buchan Ness Radar safeguarding surface;
- Groundwater levels and possible pollution impacts.

This resulted in a final selection of a platform level of 63m Above Ordinance Datum (AOD). The proposed layout of the converter station on the platform is shown in Drawing 3022 and its various elements are described in the following sections.

2.5.1.3 Electrical Components

The site will house the components identified in Table 2.5.1. Included also for reference are example photographs of similar components to those which will be installed at the Fourfields Converter Station site.

Table 2.5.1: Items on the Converter Station Site

Item	Dimensions			Description	Function
	Length (m)	Width (m)	Height (m)		
Interconnector Converter Station Boundary	210	170.5	N/A	The boundary of the site will be fenced. The site area will be approximately 3.4Ha.	To prevent unauthorised access for security and safety reasons.
The Converter Station Building	190	58	26.6	Steel framed clad building with a curving, planted sedum roof.	To protect the converters and associated equipment from the elements.
Control Building	45	15	12	Connected to the Converter Station Building, this will include office and welfare facilities.	Contains electronics cubicles for protection, control, monitoring and telecommunications related to the converter station and associated cables. It also houses the pumps for the cooling system.
Auxiliary	20	15	12	Connected to the Converter Station Building, this houses spare parts required for the operation and maintenance of the station.	To house the operational spare parts for the station.
Coolers	36	12	2	Adjacent to the Converter Station Building, these are coolers that provide cooling to the electrical equipment in the converter hall by dissipating the heat using fans.	To provide cooling to the electrical equipment in the converter halls. The cooling circuit contains ethylene glycol anti-freeze to prevent freezing in winter if the equipment is out of service (see Figure 2.5.6)
Air Handling Units AHU's (6No.)	12	3	2	Adjacent to the Converter Station Building, these are air handling units used to circulate air and draw in fresh air for the converter building and inductor hall.	To provide circulation and filtered fresh air to the inside of the converter halls and inductor hall to maintain operational temperature, humidity and a clean environment. Also to maintain the inside of the building at a slightly positive pressure to prevent dust ingress (see Figure 2.5.5)

Item	Dimensions			Description	Function
Fire Pump House	8	4	4	Building away from the converter station housing pumps.	To provide onsite fire suppression capabilities (see Figure 2.5.7).
Water Tank (2 No.)	10	3	2	Two above ground tanks capacity approximately 120m^3.	To provide a supply of water in event of a fire.
Water Tank (1 No.)	4 (Dia.)		4	One circular tank capacity approximately 50m^3.	To provide a supply of water if automatic foam system is installed for Transformer fire suppression.
Gas Insulated Switch Gear (GIS) Building	35	15	16	Located separately from the converter station building, this will also be a steel framed and clad building.	To house the switchgear which is required to provide disconnection in the event of faults, to isolate the equipment from healthy systems and to provide safety isolation and earthing to allow access by maintenance personnel (see Figure 2.5.1).
Super Grid Transformers (SGT) (3No. + 1 spare)	22.5	19	8	The 3 transformers and a spare are large steel tanks which also include mineral oil used for insulation and cooling. The oil is then cooled to ambient air temperature, using radiators with fans. They are installed inside concrete bunds which are capable of containing 110% of the oil and have concrete barriers between each unit. To minimise noise impacts it is likely that these will need to be fully enclosed.	Provide a change in AC voltage level between the converters working at the voltage on the DC cables to Norway and the transmission voltage needed by the National Grid. They also provide galvanic isolation between these two systems (see Figure 2.5.4).
Parking	20	6	N/A	Parking for 7 vehicles including 1 disabled space.	Parking for operatives, maintenance workers and visitors.
Roads	c.1000	5 to 12	N/A	Access road running around both the converter station building and the main SGT / GIS area.	To provide appropriate access for operations and maintenance.

Item	Dimensions			Description	Function
Filter Areas (2No.)	30	30	Various	Consists of an outdoor area of electrical equipment. The area consists of capacitors, inductors, resistors, bushings, insulators, CTs, busbars and conductors that are connected to the AC electrical system.	To dissipate electrical harmonics that the converter may generate to ground (see Figure 2.5.2).
Auxiliary Transformers	4	4	4	The two transformers are large steel tanks which also include mineral oil used for insulation and cooling. The oil is then cooled to ambient air temperature, using radiators potentially with fans. They are installed inside concrete bunds which are capable of containing 110% of the oil.	Provide a change in the AC voltage level between the local 33 or 11kV distribution network and the low voltage required to operate equipment at the converter station. They also provide galvanic isolation between the two systems. (see Figure 2.5.3)

Figure 2.5.1: GIS building, associated GIB and Building Internals

Figure 2.5.2: Filter Area

Figure 2.5.3: Auxiliary Transformer

Figure 2.5.4: Super Grid Transformers

Figure 2.5.5: Air Handling Units (AHU)

Figure 2.5.6: Coolers

Figure 2.5.7: Transformer Automatic Foam System

2.5.1.4 Services

For its ongoing operations, the interconnector converter station will require service connections as described below. Local connections are available to each of these and pre-development applications have been lodged with the various utility companies based on the information known at this outline design stage. However, detailed development of these connections will need to be progressed by the utilities in parallel with NorthConnect's detailed design and build phase of the converter station. As such, these are outwith the current planning application and separate consent will be sought at the appropriate time by the utility companies, either by application or through their permitted development processes.

Water

The converter station has cooling systems which require water and, although these operate as a closed system, they require a supply for initial filling and for topping up during operation.

Fire suppression systems similarly require initial filling of water storage tanks and subsequent topping up.

Finally, the station control building will include a small office and messing facilities for at least 5 people, with a kitchen, sinks, showers and toilets which requires a reliable supply of water.

Sewerage

The facility will not be seeking a public sewer service connection (see Drainage below).

Telecommunications

The interconnector design will include a fibre-optic control cable installed with the main HVDC cables between the Norwegian and Scottish converter stations. However, the station will also require a connection to public networks for external telephone and data communications from the offices and control room.

Power

During normal operations, the converter station will draw its power for ancillary operating equipment (pumps, fans, AHU's, etc.) and service power (heating, lighting, etc.) from a service connection to the local 11kV or 33kV distribution network. In outline, the nature of the supply required will be two 3-phase circuits of 1000kVA capacity each. If National Grid ask for the interconnector to have black-start capability in the event of grid blackout, this will require an appropriately sized back-up generator to provide the necessary start-up power. This generator, if required, will replace one of the above two circuits and one of the Auxiliary Transformers in Table 2.5.1. The generator will replace the position of the Auxiliary Transformer on the layout plan and will have at least 24 hours fuel (approximately 5000 litres).

2.5.1.5 Drainage

Surface Water Drainage

The principles of sustainable urban drainage systems (SUDS) will be adopted for the site. All SUDS elements will be designed in accordance with the SUDS Manual (CIRIA C967, 2007).

Due to the southern part of the site platform being cut into rock and the northern portion having relatively shallow groundwater in relation to the platform level (approximately 2m down), soakaways for drainage will not be feasible on the whole. However, construction by over-excavation and then compaction of crushed rock to build up the platform base and sub-base layers, will create a moderate depth of permeable medium below the whole site. A proportion of trench soakaway or permeable hardstanding areas will be examined as detailed design progresses. In the meantime, the proposals below with associated volumes and pipe sizes will assume the worst case of no soakage capability for planning purposes.

A site drainage plan is shown on Drawing 3028. The largest proportion of impermeable area on the site is accounted for by the main converter building roof. This will be a planted sedum roof providing both attenuation storage and one level of treatment.

Other impermeable areas on the site (roads and hardstandings) will generally be drained via filter drains in order to achieve one level of treatment. Run-off from the filter areas will be pre-treated by an oil and water separator. Run-off from the transformer and oil-filled equipment areas will be routed through a holding tank, with the contents of the tank pumped forward periodically for treatment in the filter drains, thus leaving the tank empty in the event of a major oil spill. The pump will be equipped with oil detection cut off system

The site drainage will be collected and routed to the north east corner of the site, the prevailing direction of the surrounding landform slopes. Pipe diameters will range from 150mm to 600mm across the site.

At the north-east corner, inside the landscape bund, further attenuation storage of approximately 300m^3 will be provided by a modular crate system. Outflow from the crate system will be limited to greenfield run-off rates by means of a hydro-brake flow control device. The maximum outflow during 1-year and 30-year return period events will be 27 l/s and 58 l/s respectively. An overflow will be provided for events with return periods in excess of 30 years.

Outflow from the crate system will be conveyed to a swale located outside the landscape bunds. This will provide a second level of treatment to the attenuated flows and will be at least 30m long in order to maximise the water quality benefits.

The swale will discharge to the drainage ditch at the north-east corner of the site. The overflow from the crate system will discharge separately to the same burn. A licence will be sought from the Scottish Environment Protection Agency (SEPA) for this discharge through The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (Scottish Ministers, 2011), referred to as a 'CAR' licence.

Foul Drainage

The control building will have mess and toilet facilities for the use of up to 5 people. As septic tank and soakaway options are not feasible on the site, a small package treatment plant (e.g. BioDisc® or similar) will be used, with discharge of treated effluent to the drainage ditch. This will be included in the CAR licence to be sought once the detailed design has been confirmed.

2.5.2 Interconnector Converter Station Building

2.5.2.1 Building Description

The main building on the site will be the converter station building housing the converter valve equipment which changes the power from AC to DC and vice versa. The principal components of this building are set out and described in Table 2.5.2.

The 'Rochdale Envelope' approach, discussed at the beginning of this section, is applicable to the converter building. This houses the specialist HVDC equipment, which is only available from a limited number of suppliers across the globe. Discussion has taken place with the potential suppliers of the equipment and this has informed the outline design. The scale of the converter station is such that it can accommodate any of the potential suppliers equipment, but there is a potential that the building will reduce in size in one or more directions during the design and build process.

The building will be built as a Faraday cage to conduct any radiated or induced current to earth and limit effects outside the building to acceptable levels (see Chapter 16 for discussion). This is achieved by cladding with aluminium or steel sheeting or wire mesh, bonded together at intervals. The cladding covers walls and roof and will be coated for protection. It is also bonded to steel mesh in the floor and to measures taken at door apertures. Any windows will include a bonded mesh and any pipework or ducting is also bonded to the Faraday cage as it passes through the walls. There will be some electrical connections into the halls for lighting and other services, and also fibre-optic cables for control purposes, but this will run through bonded conduits of sufficient length to limit radiation. Doors are bonded to the frames and hence to the cage.

Colin Armstrong Architects have designed a curved, planted (sedum) roof for the building to give it a natural effect, as this was deemed desirable during the public consultation process (see Chapter 4). In addition it incorporates local red granite at lower levels and translucent panels at the top for aesthetic reasons (see Chapter 10).

Table 2.5.2: Converter Station Building Components

Item	Dimensions			Description	Function
	Length (m)	Width (m)	Height (m)		
Converter (Valve) Halls (2No.)	75	58	20 *	Within the converter station building, there will be 2 converter valve halls, each approximately 75 x 58m, containing the main converter valve equipment	Convert AC into DC electricity. Made up of several hundred indoor modules consisting of semiconductor switches (very large transistors), capacitors and control circuits. They generate heat and are cooled by water with ethylene glycol anti-freeze. Antifreeze is required to prevent freezing in winter if the transistors are required to be out of service for maintenance.
Inductor Hall	40	58	23 *	Also within the converter station building, the Inductor Hall is likely to fill the central section measuring 40 x 58m, the Inductors are coiled wires forming an electrical inductor.	To limit fault currents and provide impedances to allow control of both power and AC voltage. They generate heat which is removed by air ventilation systems.

**** Minimum internal clearance height of halls***

2.5.2.2 Access for Disabled People

The majority of the converter building and other areas of the converter station site will become an operationally live electrical and mechanical engineering installation. As such it will have some standard constraints on access stemming from safety related maintenance methodologies, such as mobile platforms used at height and confined space entry to chambers, etc. Having said that, the interests of safe operation and maintenance also mean that level flooring, pathways and ramps will be designed in all indoor and outdoor operational areas so that vehicles, personnel and mobile gantry-arms and trolleys can be easily moved around the site.

The main area where operational personnel will gather and non-operational personnel may be visiting the site, is the control room building which will include wheel chair access. The car park for the site including disabled parking will be located across the main access road from this building. In addition to the control room and offices, the control building will also contain the operations welfare with domestic facilities such as toilets, showers and a mess room. Wheelchair access will be provided to all these areas, including a lift to access the upper floor.

As the control building includes offices, with the potential for public access, it will be designed to meet building regulations, including access and fire codes. The rest of the site will conform to the appropriate fire safety regulations.

2.5.3 HVAC Cable

Two 400kV AC cable circuits comprising six underground cables (3 cables per circuit) will connect the Interconnector Converter Station to the planned new National Grid substation operated by SHETL west of the A90 and north of the existing substation. The AC cables will be buried in two separate trenches, three cables in each (see Figure 2.5.8), with each trench measuring 1.5m deep and 1.5m wide, and separated by a temporary 7m wide haul road. The cable maybe ducted in certain sections, for example under roads. NorthConnect are only responsible for consenting the HVAC cables up to the boundary of SHETL land at the proposed substation connection location.

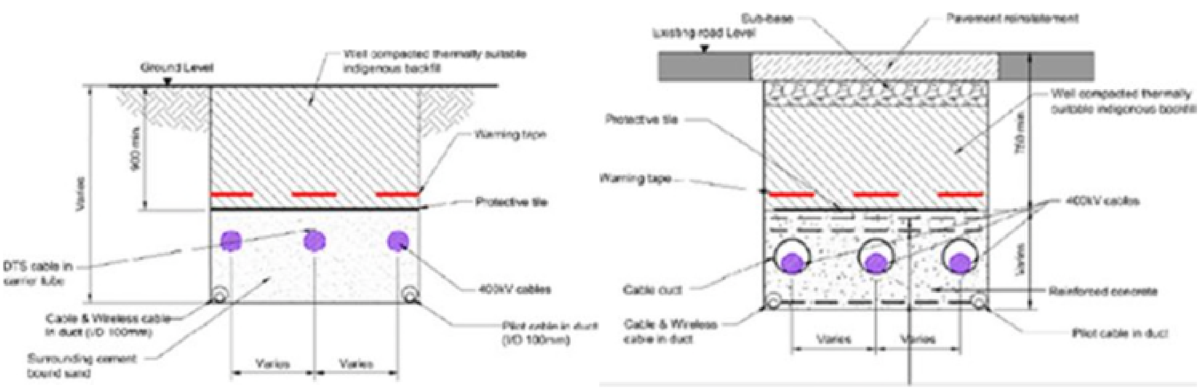

Figure 2.5.8: Cable Trench Cross Sections (with and without ducts)

During construction, the cable corridor will comprise a haul road, safety area, soil storage area, topsoil storage area, drainage ditch and boundary fencing. The total construction corridor width required will be approximately 45m wide, although this can be narrowed over short lengths where constraints may be encountered. The cable corridor will be reinstated once construction is complete, to allow activities such as farming to continue as before.

Currently a 50m wide corridor has been identified within the red line as the cable route. This is to allow for micro-siting of the cable at the detailed design stage. The micrositing will take into account:

- Results of pre-construction ecological surveys;
- Cable bend radii and temporary lay-down;
- Accessibility for construction plant;
- Positioning and orientation of connection chambers and above ground joint box; (see figures, 2.5.9 and 2.5.10)
- Approach angles to locations of road and other service crossings;
- Temporary haul roads, locations for temporary topsoil and trench spoil storage during construction, and drainage;
- Tree sterilisation zones of approximately 10 metres; and finally
- The direction and point of entry to the SHETL substation.

Figure 2.5.9: Above Ground Joint Box

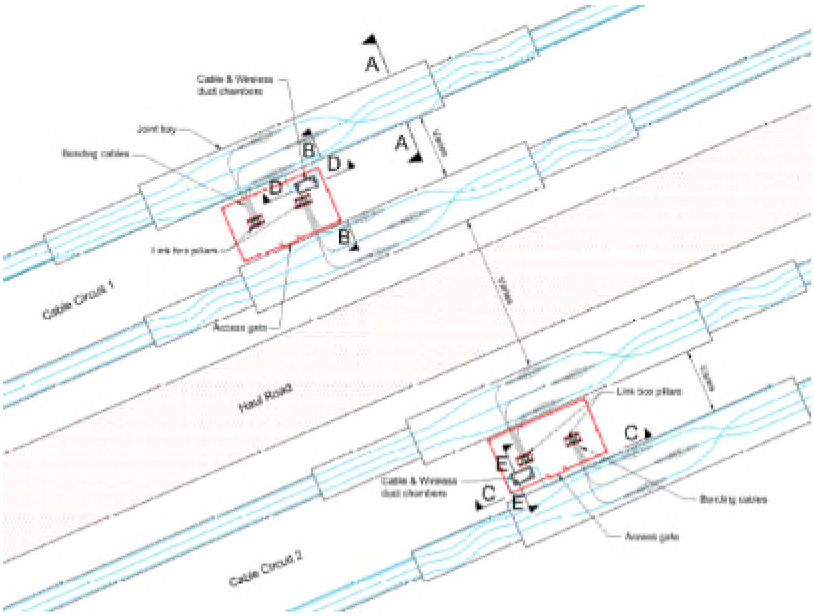

Figure 2.5.10: Typical Cable Joint Bay

2.5.4 Converter Station Access Road

To facilitate the construction of the converter station, an access road is required capable of taking delivery of all the construction materials including aggregates, concrete, structural steel work, cladding and the various electrical components, including the four large transformers. The same route will be also be utilised for operations, maintenance and decommissioning of the station.

NorthConnect are in the process of seeking to finalise agreement with Breedon Aggregates in regard to gaining access to the Fourfields site through the quarry's access road.

Further analysis and details of road access and vehicle movements is given in Chapter 15 Traffic and Transport. In summary, the works requirements associated with the road access will involve:

- Upgrading of the private quarry access road with re-surfacing, widening for passing bays and curves on certain sections and possibly strengthening;
- Strengthening of the existing culvert at the entrance to the Fourfields site;
- Some widening of the junction bellmouth with the A90 to accommodate the turning of the transformer transports, the extent of which is shown in Figure 2.5.11; and
- Temporary movement of some street furniture on the A90 through Stirling Village to facilitate passage of the transformer transports.

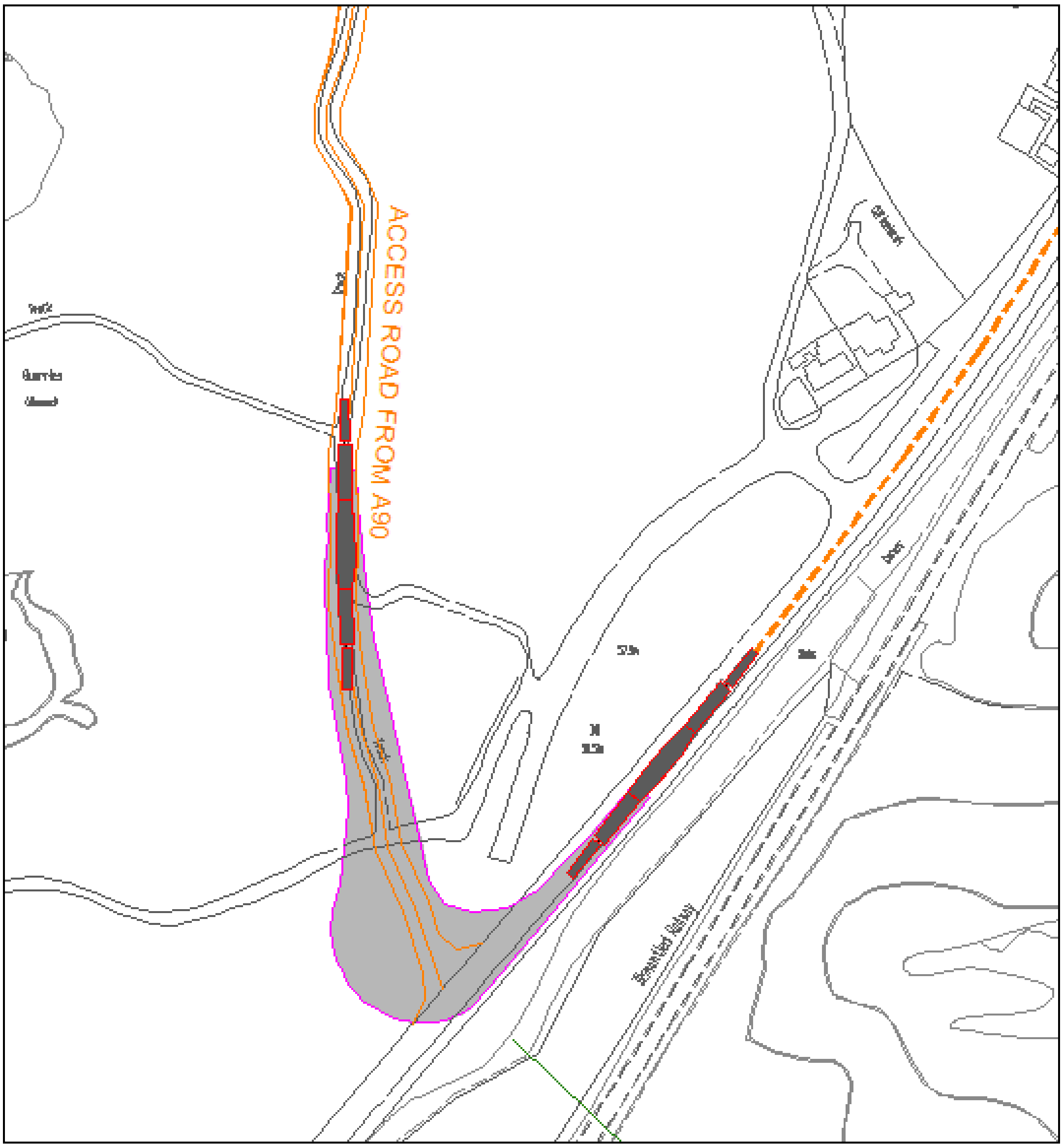

Figure 2.5.11: A90 Junction Widening Outline

2.5.5 The Remainder of Fourfields

The proposal is to position the converter station primarily within the north east field, although it will also extend slightly into the north west and south east fields. The remainder of the site would then be appropriately landscaped, to minimise the landscape and visual impact of the building (Drawing 3022). Full details of the landscape and planting design are provided in Chapter 10.

The construction of the Converter Station Site will require part of the existing path that bisects the site West to East to be removed. The intention is to construct new paths as shown in Drawing 3022. Paths will be 1.5m wide constructed with low maintenance in mind utilising aggregates. A route is provided from the west to the east across the site in addition to a link to the north west corner of Fourfields and a new path running parallel to the western edge of the northwest field. A sheltered seating area will be included on the western edge of Fourfields just to the north of the dividing wall. This will be primarily of drystone construction utilising where practicable stone from the walls that need to be dismantled to make way for the converter station site. The shelter will be 5-10m in diameter, and no more than 1.5m high, enough to provide shelter without becoming a dominant feature in the landscape. The design will be adapted from the Dry Stone Walling Associations (DSWA) design: Butts for Shooting, Shelter and Watching (DSWA, 2005) similar to that shown in Figure 2.5.12, however the opening will be wider to allow wheel chair access.

Figure 2.5.12: Example of Shelter Design Type

Three interpretation boards would be installed indicative locations for these are shown in Drawing 3022. More information with regard to the boards is included in Chapters 9: Archaeology and 17: Local Community and Economy.

The main portion of the two southern fields will probably revert in ownership back to Boddam Estates, who shall use them for agriculture and to retain access to their fields in the vicinity of the Hill of Boddam viewpoint.

2.5.6 Temporary Construction Requirements

During the construction process, site offices, staff welfare facilities, parking storage and laydown areas will be required, separate but adjacent to the converter station footprint. During construction a maximum of 200 people may be working on the site, so an additional area will be required to facilitate construction. The welfare facilities will be provided with containment tanks for effluent which will be periodically tankered off site for treatment and discharge at an appropriate sewerage treatment facility. Measures will be taken to minimise waste volumes, such as waterless urinals and grey-water toilets, and to encourage recycling of packaging, etc. in the mess facilities.

The Fourfields site and area within the red line boundary provides space that could be utilised as temporary construction and laydown facilities (see Drawing 3012). The south east of the Fourfields being the most obvious as it is closest to the access and construction works. The rest of the area to the west side of Fourfields will need to be used for the temporary stockpiling of topsoil and other earth mounds and plant movements during the earthworks phase.

2.6 Project Location

A grid connection agreement is already in place with the National Grid to connect to the Planned New Peterhead substation (Grid Reference: NK120 430).

2.6.1 Converter Station – Fourfields

The Fourfields site is approximately 2.6km south of the outskirts of Peterhead, 4.5km south of Peterhead town centre, and 1km southwest of the village of Boddam (Drawing 3019).

The Fourfields site was so named as it is made up of four fields, the corners of which meet at NK119 412 (Drawing 3019). The converter station site itself will cover an area of 3.4Ha within the security fence line, although landscaping areas as part of the overall proposals will extend beyond.

The Fourfields site is located to the south of Lendrum Terrace and Highfield, east of the Den of Boddam, Sandfordhill and Denhead and west of the Hill of Boddam and Stirling Hill Quarry.

2.6.2 HVAC Cable Route

The proposed route for the HVAC cable route is along the northern edge of the Fourfields site, past Highfield and into the fields on the west side of the Highfield access road. The cables then run due north, parallel to the access track, and along the west side of the unnamed road past Denend, with the cable then passing under the road between Denend and Hjaltland. From here it will continue northward, on the east side of the unnamed road, before turning east to connect into the proposed 400kV extension to the Planned New Peterhead Substation (Drawing 3019). As discussed in Section 2.4.3 micrositing will be completed at the detailed design stage.

2.6.3 Access Road

The quarry road runs northwest from the A90 for approximately 700m along the western edge of the quarry and east boundary of the Fourfields site as shown in Drawing 3009. The last section of this road north into the quarry will not be used by the NorthConnect project for routine access, as an upgraded access into the Fourfields site will be created at the corner where the quarry road first meets the Fourfields eastern boundary.

2.6.4 Temporary Construction and Laydown Area

As discussed above, the Fourfields site provides space that could be utilised as temporary construction and laydown facilities. The south east of the Fourfields being the most obvious as it is closest to the access and construction works (Drawing 3012).

2.7 Timescales

2.7.1 Project Programme

Figure 2.7.1 shows the outline programme for the whole NorthConnect project.

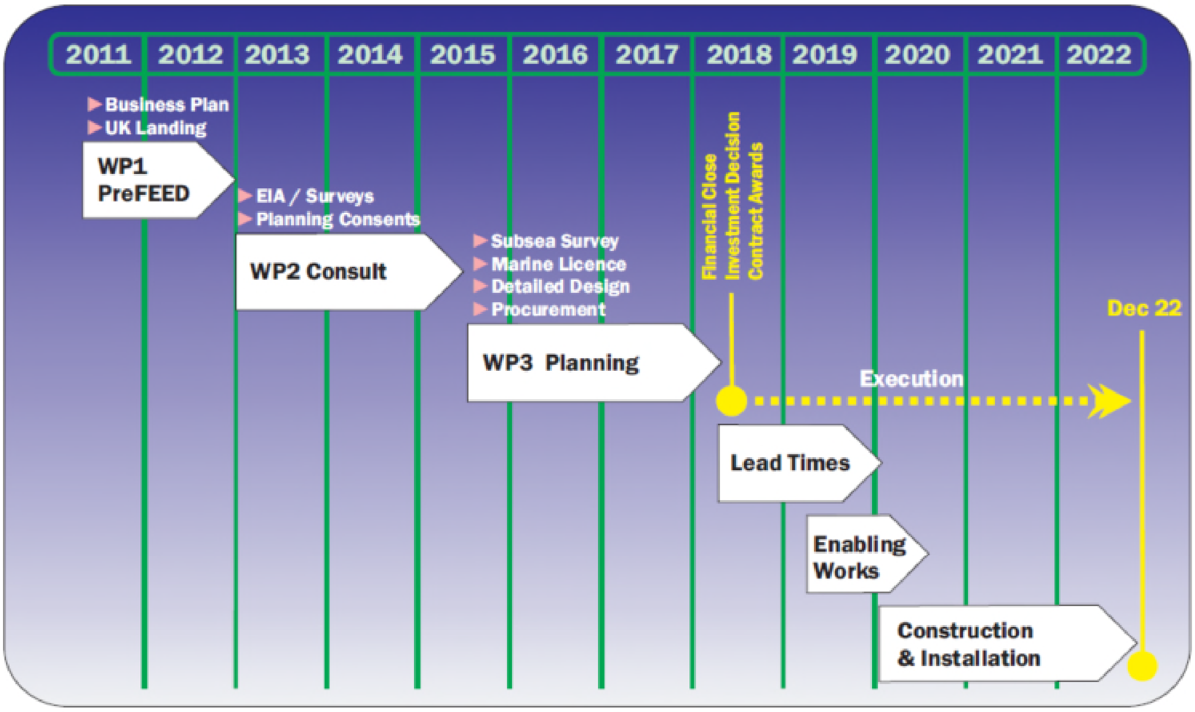

Figure 2.7.1: Project Programme

It can be seen that the project is currently seeking to ensure the onshore (HVAC Cable and Converter Station) consent for the UK by the middle of 2015. A programme constraint for the project connected with the Norwegian Energy Act, is preventing the project from undertaking subsea surveys at the present time, hence the offshore (HVDC Cable) consents for the project will not commence until later in 2015. This phased approach has been discussed and agreed with Scottish Government and the consenting authorities (Aberdeenshire Council and Marine Scotland).

2.7.2 Construction Programme

Figure 2.7.2 shows the anticipated outline programme for the construction of the Fourfields Converter Station site and the HVAC cable installation.

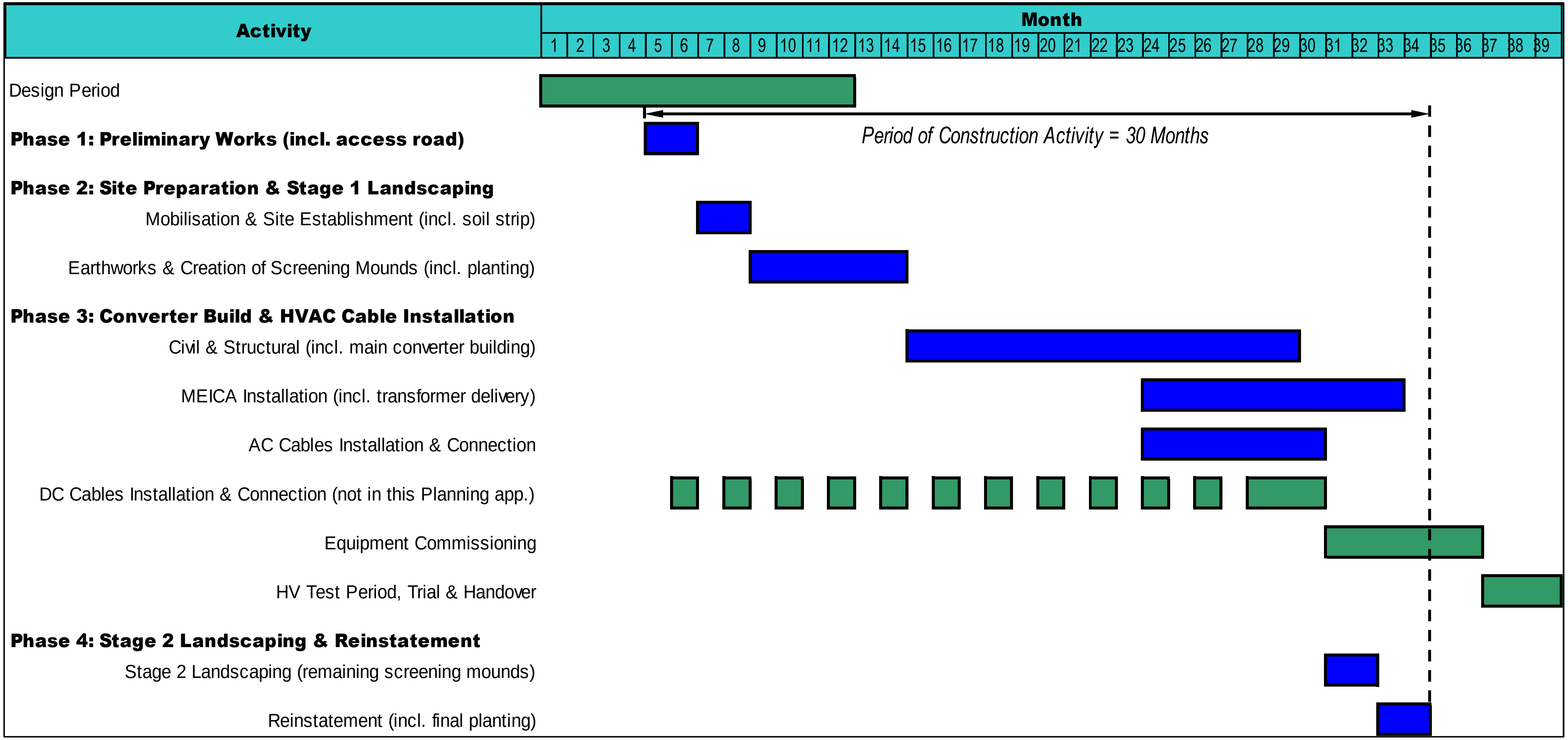

Figure 2.7.2: Construction Programme

The detailed programme will be developed by the main delivery contractor(s) for the project when appointed. This is likely to be a separate contract for firstly preparatory wider area and enabling works, involving such things as road improvements and earthworks to construct initial screening mounds and the basic converter station 'platform'. Following that the main HVDC delivery contract will encompass the rest of the converter station civil, structural and electrical construction, installation and commissioning, in addition to the HVAC cable installation.

As further design and then procurement of the design and build contracts is still to be undertaken, the programme has been estimated here for consenting purposes. The enabling works duration is anticipated to take approximately 1 year and the main HVDC delivery contract approximately 2 years. If we discount the commissioning and testing period, the period of actual construction works taking place between both contracts is estimated at approximately 30 months out of the 3 year total duration.

2.8 Construction, Operation and Decommissioning

In this section a detailed description of the tasks to be carried out in order to install, operate and decommission the NorthConnect Interconnector project is presented.

2.8.1 Construction

For the Converter Station site, a suitable construction platform will need to be created covering an area of 3.6 Ha (3.4 Ha within the site security fence). It is intended that this will be achieved through a balanced cut and fill operation, thereby minimising the need for import or export of materials. In addition, the excavated rock may be suitable for crushing and grading for use as sub-base or base course material for hardstanding areas, blinding base course for foundations or even aggregate for concrete batching.

The area proposed for the Converter Station site is sloping gently from southwest to northeast between approximately 63m to 82m above sea level. The level for the proposed Converter Station site is going to be 63m above sea level, cutting it into the landscape, with the excess fill to be used to create landscaping mounds around the periphery of the site, full details of which are given below in 2.8.1.2.

It is estimated around 331,000 m^3 of material will be excavated, made up of 211,000 m^3 of rock and 85,000 m^3 of glacial till and 35,000 m^3 of topsoil.

It is anticipated that the construction works will involve the following stages:

2.8.1.1 Phase 1: Preliminary Works

In advance of the main enabling works mobilisation, further intrusive site investigation and pre-construction surveys will be required to refine the site design during the design phase of the main contractor(s) Design & Build contracts.

Advanced landscaping, planting and fencing may take place as appropriate; to create temporary screens and access related mitigations in preparation for the main enabling works. This will include creating perimeter paths and closing off those crossing the site. The drystone walls that need to be removed will be dismantled and the stone utilised to upgrade or create new walls around the perimeter of Fourfields.

Also at this stage, wider area enabling works will also take place such as road junction improvements, changes to any services required by the utilities, and development (upgrading) of the main site access road through the quarry.

2.8.1.2 Phase 2: Site Preparation & Stage 1 Landscaping

Mobilisation & Site Establishment

The first stage of the site establishment will involve vegetation clearance and establishment of all temporary facilities including site offices and welfare, lay down and storage areas, car-parking and temporary drainage, power, communications and water supplies, and erection of security fencing, hoarding and signage. This will involve stripping and stockpiling of topsoil from certain areas for later landscaping use, and placement of Type 1 aggregate in vehicle and pedestrian areas of the construction site layout.

Earthworks & Stage 1 Landscaping

Topsoil will be stripped from the platform area, and also from the area beneath the northern and eastern permanent screening mounds, and stockpiled for future topsoil installation of landscaped areas. The underlying glacial till (a stiff, sandy-clay soil) will then also be stripped from across the platform area, down to foundation level, or in the case of the south of the site to rockhead, as rock will be encountered above foundation level. Some of this glacial till will be used to build up the permanent landscaping mounds on the north and east of the site, in order that they can be topsoiled and planted at the earliest opportunity to provide screening of the construction works from the critical viewpoints in the Highfield and Lendrum Terrace directions.

The drainage balancing crate structure with swales on the outlet will also be constructed at this point, to be able to be used as part of the run-off and sediment control measures required for the site during construction. Similar, cable ducts will be installed underneath the landscaping mound on the north and north west corner of the site to facilitate the later pulling of the AC and DC cables respectively. Other ducting may also be required for smaller service cabling. This will be dependent upon the detailed design and liaison with utilities' design of the connections, there will be adequate preparatory ducting laid at this stage.

The screening mounds will be constructed using fill excavated from the beginning of the main 'cut and fill' operations required to form a level platform across the whole converter station site footprint. To create a level platform at a height of 63m AOD the platform at the north east corner will be more or less at the existing ground level. It will then 'cut' into the glacial till towards the centre of the platform as the existing ground rises, and finally into rock towards the south west corner, reaching a maximum depth of about 14m below the existing ground level.

Rock cutting will be carried out by either hard-ripping in less competent rock, or by blasting where the rock increases in hardness and competence towards the south west corner of the site area.

Across the rock excavation area of the platform, overcut to below platform depth will be necessary in places, to allow for foundations, drainage arrangements and other underground infrastructure to be installed. Detail of this will be developed through the detailed design process.

The ‘fill’ operations also have yet to be geotechnically designed, as they will vary across the site dependent on the detailed building and equipment designs and their various load bearing foundation requirements. In outline, however, the base of any fill areas will be formed using the excavated rock, requiring crushing and grading of any harder rock, which will be placed in layers using compaction plant (e.g. sheeps-foot rollers). Across equipment areas, this will incorporate a membrane to prevent plant growth but, in landscaped or other grassed areas of the site, varying depths of the stockpiled glacial till and then topsoil will be built up on top of the crushed rock. The remaining permanent screening mounds around the south and west perimeter will also be built up in this way.

2.8.1.3 Phase 3: Converter Build & HVAC Cable Installation

Civil, electrical and balance of plant design, construction and installation of the converter station and all its ancillary infrastructure will be the responsibility of the main HVDC delivery contractor appointed to build the NorthConnect interconnector. As such, the precise methodology, programming and construction sequence of the works will be developed by the contractor during their detailed design phase of the contract. It will involve the following basic components; however, all of these activities will overlap to a greater or lesser degree, or be phased differently across different areas of the site, in order for the contractor to plan the most efficient delivery of the project.

Civil & Structural

- Construction of building foundations, equipment plinths, cable trenches, earth grid, ducting and other balance of plant infrastructure, retaining walls, drainage infrastructure and any below ground structures;
- Building Unit Development: Construction of all building units including erection of steel frames and cladding. The main converter building is obviously the largest and will be the longest lead structure within the programme, but several other smaller buildings are required either adjoining or separate from the converter building; and
- Service Connections & Building Services: connections required to water, communications and electricity networks, and building services fit-out for heating, lighting, air-conditioning and other power requirements; Civil Finishing Works: Construction of the permanent surfaced access road ready for equipment delivery, internal roads, car parking and connection of drainage arrangements.

Mechanical, Electrical, Instrumentation, Control & Automation (MEICA)

- MEICA Installation: Delivery and installation of all high voltage AC and DC electrical equipment for the Converter Station including converter valves, inductors, filters, the large AC transformers, cooling systems, ancillary equipment and all balance of plant and control equipment;

- Main Cable Termination: See below for separate description of AC cable installation which is part of this consent scope, but both AC and DC cables will be laid into the converter station site and terminated at the GIS building and converter building respectively; and
- Commissioning: Following completion of all equipment installation works, there will be a significant period of testing and commissioning before the interconnector is brought on-line and achieves first energy transmission.

During the construction period a range of vehicles will be accessing the site including heavy good vehicles such as flatbed trucks delivering plant and equipment, concrete and aggregates lorries, specialist equipment such as heavy lift cranes as well as smaller cars and vans associated with construction staff movement. The delivery of large components of the project (transformers and large/bulk construction materials) by sea into Peterhead will be brought south down the A90, to the improved quarry junction and taken the short distance to the site, minimising the impact on public highways. Further details on transport requirements are provided in Chapter 15: Traffic and Transport.

<u>HVAC Cable Installation</u>

A 50m red-line corridor has currently been defined to allow for micrositing during detailed design, however, for the installation a construction corridor of up to 45m will be created to facilitate access along the route for excavation of cable and drainage trenches, storage of topsoil and soil from the trenches, delivery of materials and transport of personnel, excavation and cable installation plant and equipment. The 45m width can be narrowed at certain locations to deal with physical ‘pinch points’ on the route (road crossings, etc.) In these locations the route can be narrowed by moving the topsoil and trenching spoil to either other locations on the route.

Livestock fences will firstly be installed along the corridor. Topsoil will be stripped and stockpiled along the corridor edge. Excavated subsoil will also be stockpiled within the construction corridor (separate to the topsoil) and the subsoil and topsoil used for backfilling and restoration. The soil heap may need to be temporarily stabilised by use of a geotextile, to prevent erosion or side-slope collapse. Gaps will be left between the stockpiles so as not to impede the flow of surface water, and ideally the stockpiles will be located on the higher ground within the construction corridor to facilitate good drainage.

A significant part of the cable installation will involve the construction of a temporary haul road, as this will reduce the number of construction vehicles on the road network and provide the access required along the route for the installation of the circuit. The haul road, which would include passing-by bays where necessary, would act as the main artery of the construction works. This would enable construction traffic movements and construction works to be carried out simultaneously.

The haul road will be accessed primarily from the Fourfields site and at the points where the route crosses the roads, only. The volume of construction traffic associated with the cable installation means that the haul road will need to be approximately 7m wide to allow for two way traffic.

Three track crossings and a crossing of the unnamed road behind the substation are required for the cable installation. These will be carried out in open cut trenches and the road will require the seeking of a Traffic Order for a two week closure with appropriate traffic management.

Similarly there are two burn crossings and a number of other small field's drains / ditches. Cable burial will be deepened at these locations to ensure adequate clearance depending on ground conditions between the bed of the watercourse and the top of the cable. These will also be carried out in open cut, but will require the installation of either mini-piling or box shuttering to partially coffer dam the watercourse and temporarily culvert flow as the excavation works across. Appropriate sediment control and pollution prevention measures will be planned for these operations (see Chapter 11: Water Quality).

In addition, there are two major pipeline crossings (the main gas and water feeds to Peterhead Power Station) and also working below overhead lines will be involved in the construction of the AC cable route. The gas pipeline from St Fergus to Peterhead is classified as a 'Hazardous Installation' under their regulatory model (HSE, 2013). As such, the pipeline (asset 7098) has a consultation and land use planning zoning as shown in Table 2.8.1, and the HSE are a statutory consultee to the planning process. NorthConnect liaison with the asset owner (SSE Generation) and Operator (National Grid Transco) is already ongoing and appropriate health and safety management arrangements will be put in place. For the pipeline crossings, intrusive surveys will be undertaken by arrangement, with representatives of all parties present, through pre-agreed methodologies and with emergency contingency measures planned. Then prior to the construction itself, the parties will develop an asset crossing agreement containing appropriate financial indemnities and similar planned methodologies and health, safety, environmental and quality management arrangements. These will be developed as detailed design progresses.

Table 2.8.1: Pipeline Land Use Planning Zones

HSE Ref No.	Pipeline Name	New Land Use Planning Zones		
		Inner Zone	Middle Zone	Outer Zone
7098	St Fergus to Peterhead Power Station Pipeline	9m	9m	125m

Limitations on the maximum length of cable that can be delivered mean that maximum deliverable cable lengths are likely to be in the range of 850m – 1000m. The drum size would be in the order of 2.5 - 3m wide and 4.5m in diameter.
For the cable system, the route length is approximately 1.7 km, so at least one joint bay per circuit is required. However, the route is not straight, hence there may be a need for an additional join to manage the bends in the route. This will be confirmed at the detailed design stage; hence in alignment with the Rochdale Envelope approach it has been assumed that two joint bays per circuit, i.e. four in total will be required. The individual sections of cable would be jointed together on site in the joint bays (see Figure 2.5.10).

400kV joint bays would be expected to be approximately 10-20m long and approximately 3m to 5m in width for each group of three cables once the joint is made the joint bay is buried underground.

At the joint bay location, above ground link box pillar would be installed. Subject to manufacturer's specification, link box pillars are typically 0.6m x 1.0m x 1.5m. If required, the link box pillars would be enclosed inside a timber post and rail fence, and they will usually be designed to be located at field margins or boundaries next to the road. At this point it is assumed that four above ground box pillar installations will be required.

Following cable installation, the original soil utilised to infill the cable trenches and the corridor will be restored back to its original condition.

2.8.1.4 Phase 4: Stage 2 Landscaping & Reinstatement

This final phase will actually take place in parallel to some of the testing and commissioning activities described above, but essentially, as soon as the main 'heavy' construction phase is complete and spatial logistical constraints will allow, then the main contractor will begin to reinstate the peripheral areas around the platform area.

This will include completion of the remaining designed screening mounds around the western and southern perimeters of the site, and downsizing and eventually permanent removal of site offices and all temporary facilities. Land and cable trench reinstatement will also take place over this stage, with finishing landscape works including: topsoil reinstatement, planting schemes, final paths and features.

2.8.2 Operation

It is anticipated that the Converter Station will be operated remotely, and that on-site operational requirements will be limited. Safety and maintenance activities will be undertaken on a regular basis, so it is likely that a small maintenance team will be permanently based on site. This will comprise up to five personnel working shift patterns, with probably a maximum of three on site at any one time.

Permanent vehicular access to the Converter Station will be required for the above inspection and maintenance of equipment. Vehicles accessing the site will be mostly cars and vans, however, larger vehicles may require access should the need for major equipment replacement arise (see Chapter 15: Traffic and Transport).

The onshore cables do not generally require significant operational maintenance once successfully installed and commissioned. The cables will be monitored remotely for condition and function. Works are only likely to be required should physical damage be caused (for example, by excavators undertaking other works). Measures are taken to prevent this by installing protective cable tiles above the cable installation and cable tape above the protective tiles that identifies the burial of a HV cable underneath.

In the unlikely event that a cable is damaged, repairs will have to be undertaken by uncovering the cables and replacing the damaged cable with a new section jointed at either end.

2.8.3 Decommissioning

As the anticipated life of this project is at least 60 years, the final use of the Converter Station site cannot be defined at this stage. However, it is likely that the site will either, be reused for other purposes by the transmission owner with renovation / adaptation undertaken to facilitate ongoing use (the site platform and possibly some of the buildings retained) and the site developed for an alternative industrial / commercial use or, alternatively, the site may be decommissioned and restored.

In this final option the Converter Station will be decommissioned, stripped of machinery and equipment, the building dismantled and foundations removed. The site would then be reinstated back to agricultural or other non-industrial uses.

The HVAC cabling is likely to be cut off and sealed at appropriate points and left in the ground. Should, at the time of decommissioning, removal and recycling of the cable be economically viable then the construction operation would effectively be reversed. A working corridor would be established, a trench dug above the cable and the cable removed and the trench backfilled and restored to its former use.

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Chapter 3

Methodology

Contents

3 Methodology

3.1 Introduction

This chapter lays out the approach and methodology that has been applied throughout the EIA process. It also discusses how the project has been developed to this point.

3.2 Overview of Approach and Methodology

One of the main purposes of the EIA process is to influence and improve design through iteration. Environmental impacts have been considered throughout the project, from the site selection stage and through the initial design stages of the project (Chapter 2). Where possible, environmental considerations have been incorporated within the design. The building design and landscaping have been heavily influenced by the landscape, visual and potential noise issues associated with the development.

An environmental specialist has been involved throughout the process and, where necessary, appropriate topic experts have been brought in to inform the design process. The project design therefore has avoided and minimised impacts wherever possible and, as such, there are embedded ‘primary mitigation measures’ to avoid or reduce negative effects. These have been incorporated within the assessment of effects.

In addition, standard construction practices, such as those outlined in Pollution Prevention Guidance notes, are assumed to be applied in the assessment process and are captured within the Schedule of Mitigation.

This section sets out the process undertaken in order to provide, a methodical and robust assessment of environmental impacts that is used across all chapters of the Environmental Statement, and meets legislative requirements.

3.3 Development Statement

A standalone design statement has not been produced for the project, as design has been an integrated process with the environmental statement production. However, for transparency and to demonstrate compliance with Policy 8 and Supplementary Planning Guidance (SG) LSD 2: Layout, Siting and Design of New Development within the Local Development Plan, an overview of how the elements normally addressed within a design statement have been provided in this section.

The five stage process outlined in PAN 68 (Scottish Government, 2003) has been followed, an overview of which is provided here. In addition, the Questions posed in Planning Advice: Number 6/2012 have been utilised to inform the process. Table 3.2.1 details the questions and answers from a NorthConnect viewpoint. Note that not all questions are relevant to a project of this type and, as such, they have not been included.

Table 3.2.1: Design Statement Questions

Question	Answer
A(i)Response to Climate Change: 1. How has wind-chill been reduced within the development? 2. How does the building(s) orientation maximise passive solar gain? 3. How do the key elements and features of the buildings' or structures' design respond to the climate?	The mounding around the building will protect the building and staff when outside from the full force of the wind. The components inside the building will generate heat and will require cooling, hence the building has been designed to minimise solar gain. The number of external components have been reduced from the original plan, due to the corrosive effects of the sea air. External components will be appropriately specified to deal with the corrosive coastal environment.
A(ii) Respect for its setting: its response to the existing landscape, townscape and neighbouring features. 4. How does the design respond to the local landscape? 5. How does the design respond to valuable characteristics in the surrounding townscape? 6. How does the build design relate to existing neighbouring features, such as public open spaces and landmarks?	The building is designed to be naturalistic and merges into the landscape, utilising the curved sedum roof and landscaping mounds. The design incorporates paths, planting and landscaping in keeping with the current recreational land use. Chapter 10 provides a full assessment of landscape and visual effects.
B(i) Embodied energy and reuse of construction materials: 1. How does the design maximise the use of durable and renewable materials, and how will the general energy cost implications of getting the materials to the site be as low as it can be? 2. How has end of life recycling been considered?	As discussed in Chapter 14: Resources, the site has been designed to ensure a cut and fill balance to minimise material requirements. Chapter 14 also details the construction materials and how items such as building steelwork can be recycled at the end of life.
B(ii) Compactness of built form: 1. How does the building design and /or road layout optimise the density of the site?	There needs to be appropriate space around components to allow for both electrical clearances and maintenance works to be undertaken. This has been accommodated for, but at the same time ensuring the footprint of the area is kept as small as practicable.
B(iii) Appropriateness of materials: How do the finishes, textures and colours of the materials relate to each other and the surroundings?	A sedum roof has been utilised to tie the building into the surrounding landscape. Red granite has been specified for the lower building walls as this is a local material and reflects the local area. The top of the building is translucent to minimise the visual obtrusiveness of the building. Photomontages show that the three in combination are very effective.
C(i) Basic functions: 2. How does the design provide a reasonable level of privacy and amenity? 5. How does the design provide easy and safe routes to walk and cycle …?	Security fencing has been included (see Chapter 2: Project Description) for the specification. In addition, safety fencing has been incorporated at the top of the landscaping mounds to prevent falls from height down steep slopes. Paths have been incorporated into the design which link to the existing core paths and rights of way.
C(ii) Support Systems 1. How will the energy needed to run the building over its life-cycle be minimised? 2. How renewable are the energy sources provided? 3. How has light pollution been minimised? 4. How has the recycling of water been maximised? 5. Is the drainage system proposed the most	The minimisation of energy requirements will be developed through the detailed design process. Solar power was considered, however, it was not compatible with the sedum roof. Full details of the projects contribution in terms of renewables are provided in Chapter 12. Lighting levels will be minimised to that required for safe access and working, the specifics of which will be developed through the detailed

Question	Answer
sustainable for the site? 6. How efficiently will waste be managed in terms of the principles of “reduce, re-use, recycle and recover”?	design phase. Overnight security lighting is not required. The building has a low water requirement, which limits options to recycle water. The inclusion of a sedum roof and SUDS system are recognised best practise for management of surface water. Chapter 14: Resources details the approach to waste including the implementation of the waste hierarchy.
C(iii) Connectivity: 1. How will pedestrian movements be given priority over vehicles? Is there a clearly defined transport hierarchy? 2. How will the environmental impact of providing adequate parking space be minimised?	Chapter 15: Traffic and Transport specifically considers pedestrian vehicle interactions. There will be only a handful of workers on site once operational, adequate parking has been incorporated to manage visitors and maintenance activities. Areas inside the security fence will not be accessible by members of the public, unless as official Visitors.
C(iv) Flexibility: 1. How effectively will access be provided for those who are permanent or occasionally less mobile.	All public paths have been designed to be wheelchair accessible. There is wheel chair access to the control building from the disabled parking area and a lift is provided.
D(i) Balance of community:	Landscaping including paths, shelter and interpretation board has taken account of the community’s desire for a mixed land use.
D(ii) Sense of place:	As detailed in the PACC Report (NorthConnect, 2015) the community were involved in the design process, to ensure it included elements that met with their desires.
D(iii) Aesthetics: 1. How do the key elements, features and associated infrastructure of the buildings contribute to the unity of the design and the sense of place? 2. How do the key elements, features and associated infrastructure of the buildings contribute to the rhythm of the design and its setting?	As discussed in Chapter 10: Landscape and Visual, the buildings, landscaping and planting have been designed to work together with the existing landscape elements to blend in with the natural environment, as far as possible. The curves and sedum roof are key to this.
D(iv) Visual Appeal: 2. How does the scale of the building or structure sit appropriately within its location? How does the style of the design suit the location?	The site was chosen due to its capacity to accommodate a building of the scale required. The design has been specifically develop to be naturalistic and blend into the location.

3.3.1 Stage 1: Site and Area Appraisal

As discussed in Chapter 2: Project Description, a site selection process was undertaken to identify a site suitable for the converter station. This included a number of factors taken account of in an optioneering study and, as such, an appraisal of the site and the surrounding area were carried out very early in the design process. Site visits were carried out as part of this process.

3.3.2 Stage 2: Identifying Design Principles

Principles and constraints were identified as discussed in Chapter 2: Project Description. These included engineering, environmental and aesthetic elements.

3.3.3 Stage 3: Analysis

An internal multidisciplinary workshop was held to collate information and understand the main points and elements to be taken forward into the design stage.

3.3.4 Stage 4: Developing the Design Concept

Some initial design styles were developed and a public questionnaire and aesthetics workshop were utilised to gain stakeholder input to the preferred design concepts. This included blending into the landscape and having a natural theme including curves and a planted roof.

3.3.5 Stage 5: The Design Solution

The design solution took into account the particular requirements, engineering and environmental constraints and the aesthetic design concept. The processes was iterative. A proposed design was presented at a community information day, feedback from which has since been incorporated into the design. The PACC Report (NorthConnect, 2015) provides more detail on the public involvement through the design process.

3.4 Scoping

A scoping report was submitted to Aberdeenshire Council in June 2014. A response to this was received in August 2014. Table 4.1 of the scoping report is reproduced below (Table 3.4.1). Items scoped out (grey) have not been assessed through the ES process, and those in purple and blue have been subjected to a full assessment as laid out in Section 3.3. The remainder have been scoped in for transparency purposes only and, although they will be discussed in the ES, they may not be subject to a full assessment as laid out in Section 3.3, as it is not required due to the insignificance of the effects.

Table 3.4.1: Summary of Topics Scoped in and Out

Topic	Construction of Converter Station	Cable Laying	Operations & Maintenance	Decommissioning
Noise & Vibration				
Ecology				
Archaeology & Cultural Heritage				
Landscape & Visual				
Water Quality				
Air Quality				
Land Quality				
Resource Usage				
Traffic & Access				
Electric & Magnetic Fields				
Local Community & Economics				

Key

	No Effect/Not Applicable – Scoped Out
	Negligible Effect – Scoped Out
	Negligible Effect – Scoped In for transparency reason.
	Potential Effect – Scoped In
	Potential Significant Effect – Scoped In

3.5 Assessment Methodology

3.5.1 Assessment Criteria

The assessment criteria being applied to this EIA are detailed within this section. For each of the environmental topics being assessed, the appropriate professional guidelines for EIA have been applied and followed as considered necessary, along with any other relevant guidance documents and best practice techniques. As a result, where the standard assessment criteria and terminology set out below are not followed for a specific environmental topic, this will be identified within the relevant environmental chapter of the ES, along with specific information on the preferred assessment criteria that have been applied.

The environmental assessment is conducted in two stages. The first stage characterises the nature of the impacts (positive or negative) and the second determines the level of significance of the effects. An effect results from the consequences of a change (or impact) acting on a resource / receptor. The precise nature of the effect will depend on the interaction between the degree of impact (e.g. extent, duration, magnitude, permanence etc.) and the sensitivity, value or number of the resources / receptor in each case.

3.5.2 Impacts and Effects

Schedule 3, Clause 3 of the EIA Regulations (Scottish Ministers, 2011a) states that:

'The potential significant effects of development must be considered in relation to criteria set out under paragraphs 1 and 2 above , and having regard in particular to—

(a) The extent of the impact (geographical area and size of the affected population);
(b) The trans frontier nature of the impact;
(c) The magnitude and complexity of the impact;
(d) The probability of the impact;
(e) The duration, frequency and reversibility of the impact.'

Schedule 4, Part 1, Clause 4 states that:

'A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development.'

Further, Schedule 4 Part 1 Clause 5 goes on to state that there should be:

'A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.'

As illustrated above, the EIA Regulations Scottish Ministers (2011a) make reference to both environmental 'impact' and 'effect'. The Regulations do not provide a definition of this terminology, but rather, they are used interchangeably. For consistency throughout this ES, a difference is defined and the following terminology will be adopted for the purposes of impact assessments:

- **'Impact'**: the way in which an environmental resource / receptor is changed by the project proposals. The phrase **'potential impact'** will be used to describe any impacts which may arise as a result of the project and the **'magnitude of impact'** will be determined for each resource / receptor as part of the process (further detail below).

- **'Effect'**: the consequence of the change to (or impact upon) an environmental resource / receptor.

Taking into consideration the 'sensitivity of a resource / receptor' and the 'magnitude of impact', the overall effect is determined, along with its significance.

The assessment identifies the origins of environmental impacts, positive (beneficial) and negative (adverse), from the project and predicts their effects on resources or receptors. A resource is any environmental component affected by an impact (e.g. items of environmental capital such as habitats, aquifers, landscape, views and community facilities). A receptor is any environmental or other defined feature (e.g. human beings) that is sensitive to or has the potential to be affected by an impact.

Assessment of whether the effect of the proposed project on any particular resource or receptor was made by suitably qualified and experienced practitioners. Where possible, quantitative analysis was undertaken to support the impact assessments. Where the subject does not lend itself to quantitative analysis, qualitative analysis based on the relevant literature and similar studies is undertaken to provide a robust assessment. This will be determined for each environmental topic depending on the nature of the receptor.

Each potential impact will be assessed in terms of their sensitivity or value (e.g. nature conservation value, landscape value or amenity value), followed by an assessment of the magnitude of the impact, and determination of whether or not significant effects result. For any significant effects then identified, appropriate mitigation measures will be identified. Taking into consideration the mitigation proposed, the residual effect will then be determined for each significant effect.

3.5.3 Sensitivity / Value of Resource / Receptors

Using a set of criteria and terminology defined within each technical chapter, a sensitivity value will be assigned to a particular environmental resource or receptor. This is often categorised in accordance with EIA guidance documents for each environmental topic.

The categories used to describe value / sensitivity will be defined within the 'Assessment Methodology' section of the individual chapters.

3.5.4 Magnitude of Impact

Once a sensitivity or value has been assigned to each environmental resource or receptor, the magnitude of the impact will be identified. The magnitude of impact terminology and criteria applied are defined within each environmental chapter.

Impacts are identified as either permanent (e.g. lasting the length of the period the development is in place for, such as loss of habitat due to the construction of a new converter station) or temporary (e.g. restricted to the construction period only, such as noise emissions from construction plant). A permanent impact is considered to be irreversible and from which recovery is not possible within a reasonable timescale, or for which there is no reasonable chance of action being taken to reverse. A temporary impact is reversible and from which spontaneous recovery is possible, or for which effective mitigation is both possible and an enforceable commitment has been made (IEEM, 2006).

Temporary impacts can be further sub-divided if necessary in accordance with the following guideline, although definitions of this terminology is highly dependent on other factors depending upon the environmental topic being assessed (e.g. lifecycle of flora and fauna species):

- Short-term – less than 1 year in duration;
- Medium-term – between one to three years in duration; and
- Long-term – more than three years in duration.

As well as direct impacts (resulting from the project itself), impacts can also be indirect or cumulative. There can also be impact interactions when other projects are taken into consideration. Where this terminology is used within any assessment, the definitions for these are outlined below (as taken from 'Guidelines for the assessment of indirect and cumulative impacts as well as impact interactions' (European Commission, 1999)):

- Indirect - impacts on the environment, which are not a direct result of the project, often produced away from or as a result of a complex pathway. Sometimes referred to as second or third level impacts, or secondary impacts;
- Cumulative - impacts that result from incremental changes caused by other past, present or reasonably foreseeable future actions together with the project; and
- Impact interactions - the interactions between impacts whether between the impacts of just one project or between the impacts of other projects in the areas.

3.5.5 Determination of Significant Effects

Taking both the sensitivity / value of the resource / receptor and the magnitude of impact into consideration, a determination of whether or not there are significant effects is made. Table 3.5.1 show's how the two elements can be combined to give an overall significance category. Topic specific tables are provided in each chapter.

Table 3.5.1: Categorising Significance of Effects.

Magnitude of Impact	Sensitivity/Value of Receptor			
	High	**Medium**	**Low**	**Negligible**
Major/Large/High	Major	Moderate	Minor	Negligible
Moderate/Medium	Moderate	Moderate	Minor	Negligible
Minor/Small/Low	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

The categories provide a threshold to determine whether or not significant effects may result from the proposals. A typical categorisation is shown in Table 3.5.2.

Table3.5.2: Categorisation and Definition of Effects

Category	Definition
Negligible	No detectable change to the environment resulting in no significant effect.
Minor	A detectable, but non-material change to the environment resulting in no significant effect.
Moderate	A material, but non-fundamental change to the environment, resulting in a possible significant effect.
Major	A fundamental change to the environment, resulting in a significant effect.
Beneficial	Positive change to the environment, resulting in a possible significant effect.

For the purposes of this particular ES, a significant effect is identified as moderate in level or higher (Table 3.5.1 & Table 3.5.2) and is considered to be a 'likely significant effect' in terms of EIA. For these significant effects, mitigation is identified in order to prevent, reduce, or offset the significant adverse effect. Effects determined as minor or lower are considered to have no likely significant effect. Where there impact can be reduced by the application of best practice irrespective of its significance this is identified. This will assist to reduce all effects, whether they are significant in EIA terms or not.

3.5.6 Approach to Mitigation

Secondary mitigation measures will be assessed for any significant adverse effects that are identified. This mitigation will then be taken into consideration and a determination will be made whether residual significant effects remain (i.e. after mitigation).

Significant adverse effects identified on the environment will be mitigated as far as practicable. Embedded design mitigation for significant adverse effects will be incorporated into the design of the project as a matter of course. Further mitigation measures will then be developed, as required, taking into account current Government guidance, precedents from similar projects, effectiveness and feasibility of solutions, and incremental costs. Mitigation may only reduce the severity of adverse effects and may not always eliminate them. Residual effects are those that remain after mitigation has taken place, these are assessed in the same way as detailed above. The discussion in each topic chapter provides further information and identifies mitigation measures that are proposed.

In order to ensure that mitigation requirements are fully understood and that each mitigation commitment is captured and transcribed into contract documentation, a Schedule of Mitigation has been drafted (Chapter 19). A Construction Environmental Management Document will be utilised to manage the mitigation through the construction process aligned to the process laid out by The Highland Council (2010). An Environmental Management System (EMS) will be utilised to manage the operational impacts.

Chapter 4

Consultation

NORTHCONNECT
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Contents

4 Consultations

4.1 Introduction

This chapter presents an outline of the EIA consultation process that has been undertaken in relation to the development proposals. NorthConnect has engaged with key stakeholders at an early stage and then throughout the EIA process in order to inform this ES and ensure that the development proposed is acceptable in terms of design and environmental effects.

The onshore aspects of the NorthConnect project are classed as 'major development' and, as such, fall under The Town and Country Planning (Development Management Procedure (Scotland) Regulations 2013 (Scottish Ministers, 2013). Hence there is a requirement to submit a Pre-Application with Communities Consultation (PACC) Report (NorthConnect, 2015). The PACC Report details the community consultation engagement including the community input to the building aesthetics, landscaping and surrounding land use, the output from which has been incorporated within the EIA. As such, this information has not been repeated within this ES.

This chapter concentrates on the consultation with statutory and non-statutory consultees with specific regard to ES topics.

4.2 EIA Scoping Consultation

In June 2014 an EIA Scoping Report (NorthConnect, 2014a) was submitted to Aberdeenshire Council with a request for a formal Scoping Opinion under the EIA Regulations. Aberdeen Council sent the report to, and requested additional scoping opinion from, Historic Scotland (HS), Defence Infrastructure Organisation (Ministry of Defence), Scottish Natural Heritage (SNH), Planning Division of the Scottish Government, Scottish Water and Scottish Environment Protection Agency.

A Scoping Opinion was received from Aberdeenshire Council (AbC) on the 4th August 2014. It is acknowledged that the scope and extent of the scoping report is generally acceptable and covers the main issues. Specific comments to address and incorporate in the EIA process were provided and these have been reproduced in Table 4.2.1.

Table 4.2.1 also details how NorthConnect have addressed these comments during the EIA process.

Table 4.2.1: Scoping Comments and Responses

Chapter		Scoping Responses	NorthConnect Steps to Address
6	**Noise**	AbC: The most significant factor in terms of off-site impact from this development is the potential for nuisance resulting from noise and vibration during the period of construction and operation. It is important therefore that the environmental impact assessment (EIA) takes account of this and in particular identifies what measures can be put in place to minimise these impacts particularly during evening/night time hours and at weekends. Confirmation is also being sought as to the intended working hours. This will be significant particularly in regard to evening and weekend working. The EIA should identify all noise sources, particularly plant and equipment, where it will be utilised and in what manner. Operational noise levels should be confirmed and well as what practical measure can be used to limit noise. The hours during which such equipment would expect to be used should also be confirmed. It is also recommended that a background noise survey be carried out at the nearest noise sensitive receptors to help determine whether operational noise will be likely to give rise to statutory nuisance. It is anticipated that the drilling and blasting of rock may be part of this development. Again the manner in which this work will be undertaken should be identified and confirmation given that the effects of vibration will be routinely monitored by the operator/contractor. It is anticipated that residents may claim damage to their property particularly as a result of blasting operations and the operator/contractor should take account of how they will address such complaints. Depending on the proposed hours of operation it may be necessary to consider planning conditions aimed at controlling times when particular noisy operations.	Baseline noise measurements were taken at sensitive noise receptors in the vicinity of the development and utilised within the impact assessment detailed in Chapter 6: Noise and Vibration. The majority of construction activities will be carried out in the daytime. Especially in the event of noisy activities such as blasting. Evening working will be by exception, for example, delivery of large components that require the road to be closed. A section 61 application will be made to ensure agreements are in place with the council with regard to specific construction activities and the times they can be carried out. Operations will be 24hours a day 365 days a year but as discussed in Chapter 6 the noise levels are being minimised at source through the design process and mitigation including landscape mounds are employed to ensure they are no significant effects occur. Typical noise levels for components that will be included within the site have been utilised in the assessment process.

Chapter		Scoping Responses	NorthConnect Steps to Address
7 8	**Ecology & Ornithology**	SNH: The scoping report lists protected areas within 2 km of the proposed development boundary. They agree that a 2 km radius is generally appropriate for consideration of protected areas, given the nature of the proposed works. The following protected areas are noted in the report as being within 2 km of the proposal: 1. Buchan Ness to Collieston Coast Special Protection Area (SPA). 2. Buchan Ness to Collieston Coast Special Area of Conservation (SAC). 3. Bullers of Buchan Coast Site of Special Scientific Interest (SSSI). They advise that the proposal will have no impacts on the (SPA), (SAC) & (SSSI).	These areas have been considered as part of the ecological and ornithological assessment, no effects were identified.
7	**Ecology**	AbC: The Environment Team are satisfied with the range of ecological surveys that it is proposed to scope into the EIA. It is noted that otter have not been mentioned but the water vole survey work is still to be carried out so assume any evidence, or otherwise, of otter will be picked up as part of that survey.	Water Vole and Otters were specifically investigated as part of the ecological surveys - see Appendix G.2.
7 & 8	**Ecology & Ornithology**	SNH: The scoping report does not make clear the full list of protected species which will be covered in terms of survey work (completed and proposed) to inform an assessment of impacts arising from the proposal. Survey methodologies followed/to be used are not detailed for all interests though we note that methodologies are to follow relevant guidance from appropriate bodies. SNH: note that mention is made in the ecology and nature conservation section of the following species: amphibians and reptiles, badgers, bats, birds, otters, water voles. They agree that it is appropriate to consider the impact of the proposal on all of these species and advise that sufficient survey work is carried out to enable full assessments of potential impacts.	Surveys were completed for badgers, otters, water voles, breeding and wintering birds. Full details of the methodologies utilised are provided in Chapter 7 Ecology and *8Ornithology. The extended phase 1 assessment identified a potential for reptiles in the dry stone walls, hence, it was conservatively assumed they were present. The extended phase 1 survey did not identify the need for additional amphibian or bat surveys to be completed for the purpose of assessment. Note: pre-construction surveys will be carried out for otter, water vole and badger. An ECoW will be present on site throughout the construction works to ensure good working practices with regards to ecology are adhered to (see Chapter 19 Schedule of Mitigation).

Chapter		Scoping Responses	NorthConnect Steps to Address
7	**Ecology**	SNH: note that an extended phase 1 habitat survey has been undertaken. They advise that in addition to this, detailed surveying (to NVC standard) should be carried out of any areas where habitats and/or species of natural heritage interest are identified. Any rare or nationally scarce higher and/or lower plant species within the survey area should be identified and any necessary mitigation described. Similarly, the presence of invasive non-native species (INNS) should be noted and any necessary mitigation described.	No areas of rare or nationally scarce plant species were identified for assessment. Hence, no NVC surveys were completed. INNS presence was noted, but is not expected to impact the project due to its location. Where semi-natural habitats are present they are generally of poor quality and widespread for this area. Works will only affect highly modified habitats.
7 & 8	**Ecology & Ornithology**	SNH: In general, SNH agree with the potential impacts of the proposal on ecological interests, as set out in the scoping report. They support the inclusion of a schedule of mitigation forming part of the Environmental Statement (ES) as this will be a key document to ensure that impacts on ecological interests are minimised and legal obligations to protected species are met. They agree that there are opportunities for positive benefits to local ecology arising from the proposal, notably through habitat creation and landscaping. Long-term sympathetic management of the site will be required to maximise any benefits in this respect.	Chapters 7: Ecology and 8: Ornithology identify mitigation measures, these are incorporated into the Schedule of Mitigation in Chapter 19. The landscaping and its long-term management are detailed in Chapter 10: Landscape and Visual.
9	**Archaeology and Cultural Heritage**	HS: recommends application of a Zone of Theoretical Visibility (ZTV) analysis; which should provide a basis for assessing the potential impacts on the setting of surrounding assets. It is noted that the ZTV provided at this stage indicates that potential impacts on the setting of the above assets are unlikely; however given the proximity of the assets, particularly of Boddam Den, flint mining complex, HS would wish to see an assessment of these sites included in any ES produced.	ZTV's were utilised in Chapter 9:Archaeology to identify assets to assess impacts on. The Boddam Den Flint Mining Complex was assessed within the chapter, including effects on setting.
9	**Archaeology and Cultural Heritage**	HS: would expect any ES produced to contain a full appreciation of the historic environment assets potentially affected and the likely impacts on their site and setting. Where significant impacts are predicted, the conclusions of the assessment should be supported by appropriate visualisations. It is noted that the scoping report indicates that potential inclusion of interpretation will be utilised to minimise impacts on setting. It is not considered that provision of interpretation is adequate mitigation for significant impacts on the setting of designated assets; this is generally considered to be a compensatory measure rather than a means of avoiding or reducing an impact.	A full assessment of the historic environment has been included in Chapter 9. Photos have been utilised to illustrate the view points from various receptors. Photomontages from west of the Den of Boddam (viewpoint 3) are included with Chapter 10. Although the interpretation boards are included within the mitigation section of the chapter, no 'credit' with regard to mitigation effects has been made.

Chapter		Scoping Responses	NorthConnect Steps to Address
9	**Archaeology and Cultural Heritage**	AbC: Having reviewed the documentation, and in particular Section 3.6 'Archaeology and Cultural Heritage', Archaeology can confirm that the recommendations contained within Section 3.6.3 regarding the proposed Environmental Impact Assessment are acceptable and that there are no additional comments or recommendations to make at this stage.	Noted.
10	**Landscape and Visual**	SNH are generally in agreement with the scope of and approach to assessing the landscape and visual impacts of the proposal, as set out in the scoping report. They note that the zone of theoretical visibility map (ZVT) included in scoping report takes account of screening effects of existing buildings and trees. Aberdeenshire Council may consider it appropriate to request that the ES also includes a "bare ground" ZTV illustrating visibility without screening effects of buildings and trees as these may not be permanent features in the landscape.	A bare ground ZTV has been completed as part of Chapter 10.
11	**Water Quality**	SEPA: Watercourse Engineering - Any alterations to watercourses / drainage channels / waterbodies should be identified and mitigation measures highlighted and assessed for their environmental impacts. In order to meet the objectives of The Water Framework Directive, developments should be designed to leave the water environment in its natural state with engineering activities such as culverts, bridges, watercourse diversions, bank modifications or dams avoided wherever possible. Where there is the undergrounding of cabling, and this involves the crossing of any watercourses / waterbodies, such works may require separate authorisation from SEPA under CAR.	Chapter 11 identified the surface water features in the area. There is a need to upgrade an existing culvert at the entrance to the site. In addition, the cable route will cross to minor streams both of which will be reinstated after works have been completed. Appropriate mitigation measures have been identified in Chapters 11 and incorporated into the Schedule of Mitigation, Chapter 19. The requirements for CAR authorisations are noted and will be applied for at the appropriate time.
12	**Air Quality**	AbC: The EIA should address the measures to be taken to control dust emissions from the construction works particular from vehicles and haul roads. This should include plans for regular mechanical sweeping and dampening of lay down areas and haul road.	Noted and included within the mitigation section of Chapter 12, and also incorporated into the Schedule of Mitigation, Chapter 19.
13	**Land Quality**	SEPA: Hydrogeological Setting - This should cover the local geology for the development site, the groundwater and surface water resources at and adjacent to the site. Any local private water supplies (PWSs) and their sources should be identified, the effects of development assessed, and any mitigation measures proposed.	Chapter 13 described the hydrogeological setting of the site, and assesses effects.

Chapter		Scoping Responses	NorthConnect Steps to Address
14	**Resources**	SEPA: Waste Management - Any ES should include details for the handling, and removal of soil, overburden and rock from the site (where not being reused on site). Storage and reuse proposals should include mitigation measures to reduce the risk of pollution to surface and groundwater, and incorporate best practice guidelines including procedures and guidance provided by SEPA. Should surplus soils, overburden and or rock be generated in this project, we would expect the applicant to provide details as to how and where they would propose to dispose of the surplus materials.	As discussed in Chapter 14 Resources, it should be possible to obtain a cut and fill balance and therefore there is no intent to dispose of soil, overburden or rock from the site. Appropriate storage of material will be employed and is included within Chapter 19: Schedule of Mitigation.
15	**Traffic and Transport**	AbC: It is noted that all deliveries and personnel travelling to the site from the North or South will utilise the A90, and that the A982 into Peterhead and passing the harbour will also be utilised to transport materials which are delivered by sea, and potentially personnel from the town. These routes are major A-class roads and should be capable of handling any additional traffic during construction. The effects of the development in the longer term will be very limited for the road network. Therefore Roads have no additional comment on the Scoping enquiry, although they would draw your attention to the fact that the A90 is a Trunk Road and, as such, is the maintenance responsibility of Transport Scotland and not Aberdeenshire Council. Any implications for the A90 should therefore be commented on by Transport Scotland as Trunk Roads Authority.	Noted and NorthConnect have been in discussion with Bear Scotland, Transport Scotland's contractors. Please see the PACC Report (NorthConnect, 2015).
17	**Local Community and Economy**	SNH: They note that the scoping report acknowledges potential impacts on recreational users of the area, for example with respect to noise and landscape and visual impacts. They agree that this is appropriate and that the ES should include an assessment of these impacts.	Particular regard has been paid to recreational users of the area, associated with the Stirling Hill path network, full details of which are provided in Chapter 17. In addition specific impacts on path users have been considered in other topic chapters.
17	**Local Community and Economy**	AbC: There are several core paths and rights of way on or adjacent to this site as well as paths developed by the local community. The developer will have to consider the impact of this proposal on any recreational interests in the area and identify any mitigation that may be necessary, including the diversion of paths if required.	Particular regard has been paid to recreational users of the area, associated with the Stirling Hill path network, full details of which are provided in Chapter 17. Where existing paths need to be removed, new alternative routes have been provided, the development of which has included input from the local community as discussed in the PACC report (NorthConnect, 2015)

Chapter		Scoping Responses	NorthConnect Steps to Address
19	**Schedule of Mitigation**	SEPA: A Project Environmental Management Plan (PEMP) will be required for such a project in consultation with Aberdeenshire Council, SEPA and SNH. This document should set out the requirements for protecting the environment and promoting sustainability for all elements and all stages of the project. Aspects of the development which should be covered by the PEMP should be identified in an ES.	As discussed in Chapter 3: Methodology, the intent is to follow Guidance Note – Construction Environmental Management Process for Large Scale Projects (Highland Council, 2010). As such, a CEMD will be produced for the construction stage. An EMS will then be put in place when the plant becomes operational. The specific items listed by SEPA have been incorporated where appropriate within topic specific mitigation measures. Chapter 19 provides the initial stage of the CEMD Process. It details the Schedule of Mitigation, which pulls together the mitigation measures from all the topic specific chapters to allow them to be taken forward with the project. The CEMD will be developed through the detailed design process into the construction phase to ensure that it is a relevant and useful document.

4.3 Ongoing Consultation

Throughout the EIA process there have been discussions with various Aberdeenshire Council departments and statutory consultees. Consultation methods have included email, phone calls and face to face meetings.

4.4 Non-Statutory Consultees

In addition to the statutory consultees, a number of non-statutory consultee discussion have been undertaken, a full list of which is included within the PACC Report (NorthConnect, 2015). Only discussion with a particular regard to the EIA process are covered here.

4.4.1 Ministry of Defence (MoD)

The RAF Buchan Ness Radar Station is immediately to the south west of the Fourfields site and it was recognised that, if the Interconnector Converter Station interfered with the radars, then this would be a potential 'showstopper'. Engagement with the Defence Infrastructure Organisation (DIO) safeguarding team in Solihull was begun during the site selection phase of the project in February 2014.

Information on the NorthConnect project was provided to them and, in the first instance, DIO confirmed that, as long as the project was clear of the radar by an appropriate height, then there would be no issues. The concept design specifically building location, platform level and landscaping have all taken account of the radar clearance constraint. The design submitted to planning has recently been sent back to the MoD, both the DIO and the local Station Commander, for comment and they have stated that, "They have no objection to the consent design proposals".

Communications with the MoD will continue throughout the detailed design and construction stages to ensure no conflicts occur.

4.5 Summary

NorthConnect have engaged with statutory and non-statutory consultees through the development of the project to date. Their views and guidance has been taken into account, both in the design process and the production of this environmental statement. NorthConnect have also developed and implemented a public consultation stategy and produced a PACC report to support the planning application.

NorthConnect acknowledge the benefit of good communications with all stakeholders and will develop a communications plan for the next stages of the project, to build upon the work carried out to date.

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Chapter 5

Planning Policy and Context

Contents

5 Planning Policy and Context

5.1 Introduction

This section highlights and provides a summary of national, regional and local planning policies that will apply to the determination of the planning permission application. These policies have informed the assessment of potential environmental impacts undertaken, in respect of the proposed development.

The application will be assessed under the Town and Country Planning (Scotland) Act 1997 (Scottish Parliament, 1997), as amended by the Planning etc. (Scotland) Act 2006 (Scottish Parliament, 2006).

5.2 Planning Policy

This section sets out the planning policy context relating to the elements of the proposed development which include: buried HVAC cabling; the interconnector converter station; potential road improvements for access purposes; and temporary construction requirements. The relevant national, regional and local policy framework is discussed, along with other relevant material considerations.

5.2.1 National Planning Framework

Scotland's Third National Planning Framework (NPF3) (Scottish Ministers, 2014) sets out the Scottish Government's development vision for Scotland. The NPF3, published in June 2014, guides Scotland's spatial development to 2030 by identifying national developments and other strategically important development opportunities in Scotland, and setting out strategic development priorities to support the Scottish Government's central purpose of promoting sustainable economic growth.

NPF3's Section 3 - A Low Carbon Place identifies a number of key themes which align to the NorthConnect project drivers as shown in Table 5.2.1.

Table 5.2.1: NorthConnect Drivers compared to NPF3 Themes

NorthConnect Driver	NPF3 – Quote
Security of Supply	Maintaining security of supplies and addressing fuel poverty remain key objectives.
Move to a Low Carbon Future	Our ambition is to achieve at least an 80% reduction in greenhouse gas emissions by 2050.
Reduced Price Fluctuation	Maintaining security of supplies and addressing fuel poverty remain key objectives.

The NPF3 spatial strategy shows where there will be opportunities for investment in the low carbon economy and highlights Peterhead as one of the hubs. Within Section 3 'A low carbon place' the Scottish Government specifically mentions international interconnectors in relation to Peterhead:

'....The area may also be the landfall for an international North Sea interconnector and could be a focus for onshore connections to support offshore renewable energy. These can support wider aspirations for growth, including the Energetica corridor where energy-driven opportunities are being used to focus investment and promote a place-based approach to development.'

A number of key National Developments are identified in NPF3 as needed to help deliver the Scottish Government spatial strategy. 'An Enhanced High Voltage Energy Transmission Network' is needed to facilitate renewable electricity development and its export. In NPF3, the National Developments listed in Annex A includes:

'4. High Voltage Electricity Transmission Network:

d. new and/or upgraded offshore electricity transmission cabling of or exceeding 132 kilovolts'

In short, the development of the NorthConnect project would assist Scottish Government to meet their strategic ambitions.

5.2.2 Scottish Planning Policy

The Scottish Planning Policy (SPP) (Scottish Ministers 2014a) sits alongside the NPF3 in the Scottish Government's planning policy series. The SPP sets out the Scottish Ministers' priorities for operation of the planning system, with regard to how nationally important land use planning matters should be addressed across the country. It is intended that the document be used in the preparation and development of plans, the design of development from concept to delivery, and the determination of planning applications.

Within the SPP are a number of key principals which are relevant to the NorthConnect project, all of which have been considered at the planning stage and are fulfilled in the design. These aspects are summarised in Table 5.2.2.

Table 5.2.2: NorthConnect project rational and SPP principals.

SPP Principals	North Connect
Promote business and industrial development that increases economic activity while safeguarding the natural and built environments as national assets.	As detailed in Chapter 17: Local Community and Economics,NorthConnect has a significant associated socio-economic benefit. The design process has safeguarded the surrounding environment.
Enable positive change in the historic environment which is informed by clear understanding of the importance of the heritage assets affected and ensure their future use. Change should be sensitively managed to avoid or minimise adverse impacts on the fabric and setting of the asset, and ensure that its special characteristics are protected, conserved or enhanced.	As discussed in Chapter 9:Archaeology, the project has been developed taking account of the historical assets in the vicinity. The project has mitigated against adverse impacts and is promoting understanding of the assets through the inclusion of interpretation boards.
Support the development of a wide range of electricity generation from renewable energy technologies, including the expansion of renewable energy generation capacity.	Increasing electricity interconnectivity allows a greater renewable energy contribution to the energy mix. Facilitating increased harnessing of Scotland's renewable energy

SPP Principals	North Connect
	resources See Chapters 2: project Description and 12:Air Quality.
Policies and decisions should be guided by the principle of supporting climate change mitigation and adaptation	The NorthConnect project will facilitate significant carbon savings, hence supporting climate change mitigation, see Chapter 12.
Facilitate positive change while maintaining and enhancing distinctive landscape character.	The building and landscaping design as discussed in Chapter 10 has taken into account the landscape character to ensure the development's impacts are minimised as far as practicable.

The SPP recognises the importance of planning decisions on both Scotland's social and economic futures, in that:

'…By locating the right development in the right place, planning can provide opportunities for people to make sustainable choices and improve their quality of life.'

and,

'…By allocating sites and creating places that are attractive to growing economic sectors, and enabling the delivery of the necessary infrastructure, planning can help provide the confidence required to secure private sector investment, thus supporting innovation, creating employment and benefiting related business.'

Peterhead has been identified by NPF3 as the right place to develop a subsea interconnector landfall. Furthermore, the design and rationale of the project aligns well to all relevant principals of the SPP. As such, the guidance within the SPP suggests that the North Connect project will provide significant socio-economic benefits, to both the local area and Scotland as a whole.

5.2.3 Planning Advice Notes

Planning Advisory Notes (PANs) are published by the Scottish Government and supplement the planning policy documents. PANs provide point in time guidance and technical information, including best practice, on certain policy areas. As such, relevant PANs need to be considered both during a projects design, and as part of the planning considerations. The PANs relevant to the NorthConnect development include:

- PAN 1/2011: Planning and Noise (Scottish Government, 2011b)
- PAN 1/2013: Environmental Impact Assessment (Scottish Government, 2013b)
- PAN 2/2011: Planning and Archaeology (Scottish Government, 2011a)
- PAN 3/2010: Community Engagement (Scottish Government, 2010b)
- PAN 51/2006: Planning, Environmental Protection and Regulation (Scottish Government, 2006a)
- PAN 60/2008: Planning for Natural Heritage(Scottish Government, 2008)
- PAN 61/2001: Planning and Sustainable Urban Drainage (Scottish Government, 2001)

- PAN 68: Design Statements (Scottish Government, 2003)

5.2.4 Electricity Generation Policy Statement

The Electricity Generation Policy Statement (EGPS) (Scottish Government 2013c) examines the way in which Scotland generates electricity, and considers the changes which will be necessary to meet Scottish Government renewable energy targets. In particular, it looks at the sources from which electricity is produced, the amount of electricity required to meet Scotland's needs, and the technological and infrastructural advances which Scotland will require over the coming decade and beyond. The EGPS states that Scotland's generation mix should deliver:

'…a secure source of electricity supply, at an affordable cost to consumers; which can be largely decarbonised by 2030 and which achieves the greatest possible economic benefit and competitive advantage for Scotland'.

The EGPS highlights the Scottish Governments target of:

'…delivering the equivalent of at least 100% of gross electricity consumption from renewables by 2020 as part of a wider, balanced electricity mix'.

In order to do this, it is stated that Scotland will be:

'Seeking increased interconnection and transmission upgrades capable of supporting projected growth in renewable capacity'

This confirms the importance of interconnectors:

'Our vision is to connect, transport and export Scotland's full energy potential. Scotland can and must play its part in developing onshore and offshore grid connections to the rest of the UK and to European partners – to put in place the key building blocks to export energy from Scotland to national electricity grids in the UK and Europe.'

5.2.5 Local Development Plan

5.2.5.1 Introduction

Under Section 25 of the Town and Country Planning (Scotland) Act 1997 (as amended) (Scottish Parliament, 1997), the onshore components of the NorthConnect project will be determined against the policies contained within the local development plans, unless material considerations indicate otherwise. The development plan for the area comprises:

- Aberdeen City and Shire Strategic Development Plan.
- Aberdeenshire Local Development Plan.

5.2.5.2 Aberdeen City and Shire Strategic Development Plan

The Aberdeen City and Shire Strategic Development Plan (Aberdeen City and Shire Strategic Development Planning Authority, 2014), approved in March 2014 is a joint plan prepared by Aberdeen City Council and Aberdeenshire Council, which sets a clear direction for the future development of the North

East. The plan recognises the importance of improving links and connections, and providing opportunities for high quality sustainable growth. The Plan covers the whole of Aberdeen City and Shire except those areas within the Cairngorms National Park.

The plan aims to identify the challenges that Aberdeen City and Shire will face looking forward through the next 20 years. This is to allow the region to adapt to these challenges, in order to create its vision for the future. The plan's vision for a successful and sustainable future is:

'Aberdeen City and Shire will be an even more attractive, prosperous and sustainable European city region and an excellent place to live, visit and do business'.

In order to achieve the vision, the main aims of the plan are to:

'provide a strong framework for investment decisions which help to grow and diversify the regional economy, supported by promoting the need to use resources more efficiently and effectively'

and

'take on the urgent challenges of sustainable development and climate change'.

The plan recognises the influence of climate change and sustainability on its own design:

'We have developed a spatial strategy which promotes development in places that meet the needs of business and, at the same time, are sustainable and take on the challenges of climate change.'

As part of the plan's spatial strategy, four strategic growth areas are identified as the main focus of development in the area up to 2035. One of these four areas is Aberdeen-Peterhead and, within this section, Peterhead is specifically cited as an area of key importance in the energy future due to its suitability for interconnectors:

'…the potential to be an important hub in transmitting renewable energy both within the UK and more widely as part of a European network. Its coastal location and existing connections make it an attractive choice for subsea cables and their onshore infrastructure'.

The plan goes on to set out a number of key objectives which must be fulfilled in order to achieve the aims of the plan and ultimately realise the overriding vision. Three of these objectives are at the heart of the rationale behind the NorthConnect Project:

- Economic Growth:
  'To provide opportunities which encourage economic development and create new employment in a range of areas that are both appropriate for and attractive to the needs of different industries, while at the same time improving the essential strategic infrastructure necessary to allow the economy to grow over the long term.'

- Sustainable development and climate change:
  'To be a city region which takes the lead in reducing the amount of carbon dioxide released into the air, adapts to the effects of climate change and limits the amount of non-renewable resources it uses'.
- Quality of the environment:
  'To make sure new development maintains and improves the region's important built, natural and cultural assets'.

The NorthConnect Project fulfils both the aims of the Strategic Development Plan and, in addition, the Spatial Strategy supports subsea energy cables and the associated onshore infrastructure. The project also satisfies three of the key objectives and, as such, will help Aberdeen City and Shire achieve their vision for the future.

5.2.5.3 Aberdeenshire Local Development Plan

The Aberdeenshire Local Development Plan (LDP) (Aberdeenshire Council, 2012a) and associated supplementary planning guidance(Aberdeenshire Council, 2012b) was adopted in June 2012 and sets out an ambitious framework and a clear vision for the future development of the North East over the next 20 years. The LDP is founded on the principle of supporting and encouraging sustainable development. In addition to policies relating to economic growth, sustainable communities, designated sites and housing, the plan seeks to take on the challenges of sustainable development and climate change. The LDP has introduced policies and proposals to:

- Reduce greenhouse gases from development in the area;
- Reduce the need to, and encourage active, travel;
- Protect and improve natural, built and cultural heritage;
- Avoid risks associated with flooding and other major risks; and
- Encourage the sensitive development of renewable energy resources.

The Fourfields site is within the regeneration priority area on the Buchan proposal map, and it is on the western edge of the area safeguarded for mineral extract. It is noted however, that the proposal maps indicate general locations for proposals to expand the Quarry are to the east of the existing quarry, and not west into the Fourfields site. Hence, no conflict with regard to the safeguarding mineral extraction area is predicted.

The LDP contains a number of policies applicable to NorthConnect including:

- Policy 1 – Business Development outlines Aberdeenshire Council's support for business development and sustainable economic growth, with particular emphasis on the Energetica corridor;
- Policy 8 – Layout, siting and design of new development sets out advice on how new development proposals will be assessed, using a process that includes public consultation and appropriate standards for design, open space, accessibility, safety, sustainability, and the provision of associated services;
- Policy 11 – Natural heritage seeks to improve and protect designed nature conservation sites and the wider biodiversity and geodiversity of the area;

- Policy 12 – Landscape conservation promotes the protection, management and planning of the landscape;
- Policy 13 – Protecting, improving and conserving the historic environment supports the protection, improvement and conservation of the historic environment, and there will be a presumption against development that would have a negative effect on the quality of these historic assets; and
- Policy 14 – Safeguarding of Resources and Areas of Search supports protecting the water environment, important mineral deposits, prime agricultural land, open space, trees and woodlands.

5.2.6 Other Material Considerations

5.2.6.1 Aberdeen City and Shire Structure Plan

The Aberdeen City and Shire Structure Plan (Aberdeen City and Shire, 2009) has been effectively replaced by the Strategic Development Plan detailed in section 5.2.5.2 as a result of the revisions of the Scottish planning system under the Planning etc. (Scotland) Act 2006 (Scottish Parliament, 2006).

The Structure Plan is also a joint document prepared by Aberdeen City Council and Aberdeenshire Council, which provides a strategic statement and clear direction about the future use of land for the region. The plan covers the geographical areas of Aberdeen City and Aberdeenshire, excluding the Cairngorms National Park. The structure and scope of the document is similar to that of the Strategic Plan and its vision, aims and objectives have been transposed into the strategy document.

5.2.6.2 Energetica Placemaking Supplementary Planning Guidance

The Energetica Placemaking Supplementary Planning Guidance (SPG) was published in 2011 by Aberdeen City and Shire Economic Future, a public/private partnership led by Aberdeen City Council, Aberdeenshire Council and Scottish Enterprise (Aberdeen City Council, 2012).

The proposed NorthConnect project is located within the Energetica Framework Area. The SPG states:

'Within this framework area, as defined on the attached map, development must make a contribution to the quality of life, environmental performance and economic development targets'.

The SPG sets out a number of criteria that developments in the Energetica Framework area have to meet, including the need for an Energetica Compliance Statement. In order to demonstrate compliance with the Energetica Placemaking SPG, all proposed developments in the corridor must have an accompanying Energetica Compliance Statement.

5.2.6.3 Peterhead Southern Gateway Environmental Improvement Masterplan

The Peterhead Southern Gateway Environmental Improvement Masterplan was commissioned by Energetica and published in May 2012 (Energetica, 2012). The Masterplan recommends in section 8 that:

'any future development proposals for the proposed converters at Peterhead power station conform with the principles of the Peterhead Southern Gateway Landscape Masterplan and Design Guide'.

This has been considered as part of the Landscape and Visual Impact Assessment included in Chapter 10.

5.2.6.4 South Peterhead Development Framework

A Development Framework for South Peterhead is being progressed by Aberdeenshire Council, Aberdeen City & Shire Strategic Development Planning Authority and Scottish Enterprise, and is to be published as Supplementary Guidance. This framework is at an early stage in the plan-making process, however, it is noted that consultation has commenced with stakeholders and a Stakeholder Summary Report has been prepared by CBRE (2012). This report states:

'the aim of the Development Framework is to successfully plan for unique new investments in the economy and accommodate the growth of established business in Peterhead'.

The NorthConnect project has been acknowledged within the Stakeholder Summary Report as a possible HVDC project for the area.

The Draft Development Framework was initially programmed for publication in Spring 2013 with a view to adopting it as planning guidance in Summer 2013 but, as of March 2015, neither the draft development framework nor the supplementary guidance have yet been published.

5.3 Summary

This chapter has introduced the key planning policies that apply to applications for planning permission with respect to the NorthConnect project. These policies have informed the design and the assessment of the project as outlined in the technical chapters.

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Chapter 6

Noise and Vibration

Contents

6 Noise & Vibration

6.1 Introduction

The noise assessment considers the construction and operational noise impact of the proposed development. Noise monitoring has been undertaken at locations representative of nearby noise sensitive receptors (NSRs) to establish the baseline conditions. Predictions of the construction noise and operational noise of the site and associated activities have been made. The evaluation of the significance of the predicted noise has been undertaken in accordance with the relevant policy and guidance. The noise assessment work has been completed by Golder Associates (UK) Limited.

The vibration assessment is restricted to the construction phase only, as that is when activities (e.g. blasting) that may give rise to vibration impacts will be carried out. The vibration assessment has been informed by the detailed assessment work completed by Vibrock Limited which has been included in full as Appendix A.4.

6.2 Sources of Information

The topographical map and site layout data was utilised in the noise modelling. The predictions for operational noise are based on sound power data sourced from knowledge of similar projects and items of equipment. The sound power data for the construction noise prediction has been sourced primarily from Annex C of *BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (British Standards Institute, 2009). An anticipated schedule of works on which to base the predictions has been developed to provide an indicative basis for the assessment. Information on the predicted HGV movements is taken from Chapter 14: Traffic and Transport.

A detailed assessment of vibration associated with the planned blasting operations has been completed by Vibrock, a copy of which is provided in Appendix A.4. The output from this has been utilised to complete an assessment of effect significance within this Chapter.

6.3 Noise and Vibration Assessment Methodology

6.3.1 Relevant Standards and Guidance - Noise

The EIA Scoping Opinion from Aberdeenshire Council did not identify any deviation from the methods of assessment for operational and construction noise outlined in the EIA Scoping Report:

"It is proposed that a construction noise assessment will be carried out in alignment with BS5228-1:2009(as amended): Code of practice for noise and vibration control on construction and open sites.

The assessment of whether or not operational noise is likely to give rise to complaints will be assessed in line with BS 4142:1997: Method for rating industrial noise affecting mixed residential and industrial areas"

The methods of assessment in the stated British Standards are outlined in the following sub-sections. *BS 4142: 2014 Methods for rating and assessing industrial and commercial sound* (British Standards Institute, 2014) has since superseded *BS 4142:1997: Method for rating industrial noise affecting mixed residential and industrial areas* (British Standards Institute, 1997a) and has therefore been adopted for the assessment.

6.3.1.1 BS 5228-1: 2009 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

Annex E.3.3 of BS 5228-1:2009 provides a method for the evaluation of the significance of construction noise effects:

'Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB L_{Aeq}, Period, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

These evaluative criteria are generally applicable to the following resources:

- *residential housing;*
- *hotels and hostels;*
- *buildings in religious use;*
- *buildings in educational use;*
- *buildings in health and/or community use.'*

The time periods are defined as:

- Daytime – Weekdays 07:00 to 19:00 and Saturdays 07:00 to 13:00;
- Evening and weekends – Weekdays 19:00 to 23:00, Saturdays 13:00 to 23:00 and Sunday 07:00 to 23:00; and
- Night-time – 23:00 to 07:00.

This method has been adopted to evaluate the significance of the predicted noise due to the construction works as it applies to all noise–sensitive residential receptors and public open space. Only the weekday daytime period has been assessed as that is when the noisier activities will be carried out. Work during evening and weekends will be restricted to ensure noise levels at the nearest receptors are below 55dB (Decibels).

The noise levels at each NSR have been predicted for each phase of the construction process. If the predicted noise level is above 65 dB $L_{Aeq,\ daytime}$, the total noise has been compared to pre-construction ambient noise. If the total noise exceeds the pre-construction ambient noise level by 5 dB or more, the noise impact is considered to be significant (British Standards Institute, 2009).

6.3.1.2 BS 4142: 2014 Methods for rating and assessing industrial and commercial sound

British Standard (BS) 4142: 2014 provides a method for evaluating significance of new industrial sound sources on existing residential dwellings. BS 4142: 2014 refers to acoustic emissions as 'sound' and delineates noise as specifically being unwanted sound. It states:

'Noise is related to a human response and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive.'

Within this chapter the term 'sound' has been used exclusively in relation to BS 4142:2014. Elsewhere 'noise' has been used to describe acoustic emissions. In the context of this chapter they have the same meaning.

The method provided in BS 4142:2014 is a comparison of a derived Rating sound level with the typical Background sound level, which is absent of the new industrial sound source. The Specific sound level, from which the Rating sound level is derived, is the sound level produced by the sound source at the assessment location, i.e. the noise sensitive receptor. The Rating sound level is assessed in terms of the $L_{Aeq,T}$, where 'T' is a reference period of:

- 1 hour during daytime, weekend and evening hours (07:00 hrs to 23:00 hrs); and
- 15 minutes during night-time hours (23:00 to 07:00 hrs).

The difference between the Background sound level and the Rating sound level is used to indicate the significance of the impact of the new sound source. The standard states:

1) *Typically, the greater this difference, the greater the magnitude of the impact.*
2) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
3) *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
4) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
5) *Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.'*

The operational noise levels at each NSR have been predicted and significance of these has been evaluated for the daytime and night-time periods following the method outlined above. The noise levels at locations representative of NSRs have been measured in the baseline survey. The mode L_{A90} value of the contiguous 5 minute periods measured has been adopted as the typical Background Sound Level for the assessment (British Standards Institute, 2014).

6.3.1.3 BS7455-1:2003 Description and Measurement of Environmental Noise

British Standard (BS) 7445-1: 2003: Description and measurement of environmental noise (British Standard Institute, 2009). Guide to Quantities and Procedures provides guidelines for baseline environmental noise monitoring.

It states that:

> *'To minimise the influence of reflections, make the measurements at least 3.5 m from any reflecting surface other than the ground. The preferred measurement height is 1.2 m to 1.5 m above the ground.'*

6.3.2 Noise Baseline - Monitoring Method

Monitoring was undertaken in line with the method outlined in BS 4142: 2014. Monitoring was undertaken in accordance with guidance outlined in BS 7445-1: 2003. Measurements were taken following this method, and taking precautions outlined in BS 4142: 2014 to avoid interference from wind, heavy rain, and electrical interference.

6.3.2.1 Instrumentation

Instrumentation used during the survey is detailed in Table 6.3.1. Sound level meters (SLMs) were tripod mounted to a height of 1.5 m above ground level (AGL).

Table 6.3.1: Instrumentation

Instrument	Make/Model	Serial No.	Calibration due date	Set up
Sound Level Meter	Norsonic Nor131	1313177	August 2015	Frequency weighting – A Time weighting – Fast Tripod mounted
	Norsonic Nor140	1402742	March 2015	Frequency weighting – A Time weighting – Fast 1/3 octave band data recorded Tripod mounted
Calibrator	Norsonic type 1251	31525	February 2015	n/a
Calibrator	Norsonic type 1251	33002	February 2015	n/a

The SLMs were calibrated in the field, prior to, and following monitoring. The calibrator emits a reference tone of 114.0 dB at 1 kHz(KiloHertz), which is recorded by the SLM and any deviations from this level were noted. No deviations greater than 0.2 dB in calibration were recorded before, during or after the survey.

6.3.2.2 Monitoring Locations

The Noise Monitoring Point (NMP) locations are listed in Table 6.3.2 and Drawing 3017 shows these locations on a map.

Table 6.3.2: Noise Monitoring Locations

Monitoring Location	Description	Grid Reference
NMP 1	Converter Site	NK 1195 4127
NMP 2	Highfield	NK 1173 4159
NMP 3	Lendrum Terrace	NK 1206 4181
NMP 4	Hill of Boddam Viewpoint	NK 1227 4095
NMP 5	Gateside Access Road	NK 1187 4235
NMP 6	Longhaven Mains	NK 1155 4048
NMP 7	Stirlinghill	NK 1284 4189

6.3.3 Noise Prediction Method

Using DataKustik CadnaA 3D acoustic modelling software, a model of the proposed converter site at Fourfields was produced. This has been used for construction noise and operational noise predictions.

The topographical height contour data used in the model was provided by NorthConnect. This data included the proposed mounding surrounding the site. For the construction noise prediction, the mound was excluded from the phases of works where it would not exist, i.e. Phase 1 and 2. For these phases the topography of the area as it currently exists was used.

To account for ground absorption, the converter site was modelled as hard, acoustically reflective ground (an absorption coefficient of 0) to represent the site hard-standing. The remaining areas were modelled as mixed ground conditions (an absorption coefficient of 0.5). This is a worst case scenario, as the site is surrounded by open fields with small clusters of residential areas. Buildings have not been included in the model, again as a worst case. Air conditions of 10ºC and 70% humidity were used for air absorption calculations.

The NSRsSPL considered in the predictions are listed in Table 6.3.3 and Drawing 3017 shows these locations on a map. The noise modelling revealed that original list of NSRs from the EIA scoping report was required to be expanded upon, due to the screening effect of the landscaping mounds. The inclusion of some receptors was only relevant for construction noise due to their location near to the proposed HVAC cable route.

The height of the NSRs which are residential has been assumed to be 4.0 m above local ground level. The height of 4.0 m represents the worst case, a first floor bedroom window. The height of the NSR which is public open space has been assumed to be 1.5 m above local ground level to represent the average height of a person.

Table 6.3.3: NSR locations used in predictions

Description	Grid Reference	Height (rel.) m
Residential Receptor		
Highfield	NK 1177 4158	4
Lendrum Terrace 1	NK 1211 4181	4
Lendrum Terrace 2	NK 1216 4178	4
Lendrum Terrace 3	NK 1231 4168	4
The Croft	NK 1248 4169	4
Hjaltland	NK 1184 4229	4
Longhaven Mains	NK 1158 4049	4
Stirlinghill	NK 1290 4156	4
Gateside*	NK 1202 4238	4
Denend Croft*	NK 1172 4251	4
Public Open Space Receptor		
Hill of Boddam Viewpoint*	NK 1227 4095	1.5

*Considered for construction noise only

6.3.3.1 Construction Noise

Predictions of construction noise levels were undertaken in accordance with the method set out in BS5228-1:2009 using CadnaA. Predictions have been made only for the daytime period, Weekdays 07:00 to 19:00, as works will be primarily focused within this period.

The activities undertaken and the corresponding noise output will vary as the project progresses. The construction activities have therefore been broken into four sub-categories and assessment of the noise effect of each activity undertaken separately. For the purposes of the study the assumed activities are:

- Phase 1 – Preliminary works (including access road improvements) ;
- Phase 2 – Site preparation, soil strip, earthworks, stage 1 landscaping and platform;
- Phase 3 – Converter build and HVAC cable installation ; and
- Phase 4 – Stage 2 landscaping and reinstatement.

Items of plant have been selected to represent anticipated activities for that task (or range of tasks). Noise data for each item of plant selected have been obtained from the sound level data tables in BS5228-1:2009 Annex C. These along with the plant items in operation in each phase are included in Appendix A.1. Apart from HGV(Heavy Goods Vehicle). Items of plant have been intentionally selected with worst-case noise levels and have been assumed to be operating continuously with a 100% on-time. Consequently, the noise level predictions are those that could not be exceeded in practice and represent a worst case.

The plant item noise sources have been modelled as area sources containing a moving point source at 1 m above local ground level. The area sources cover the working areas. The working areas used for Phases 2, 3 and 4 in the model are those shown in Drawing 3019. For Phase 1 the working area is the 'Access Road from A90' as shown in Drawing 3009.

The numbers of predicted HGV movements per hour used in the model are presented in Table 6.3.4. The values for each phase are taken from Table 14.5.2 in Chapter 14: Traffic and Transport. The HGV movements have been modelled as line sources at a height of 1 m above local ground level and only those movements once off the road network have been considered. A speed of 10 km/h while on site and a 12 hour working day has been assumed. The HGV route used in the model is the 'Access Road from A90' as shown in Drawing 3009.

Table 6.3.4: HGV movements

Construction Phase	Duration of phase (weeks)	HGV Movements	
		Total	Per hour
Phase 1	3	180	1
Phase 2	32	40	0.1*
Phase 3	60	2,650	0.74
Phase 4	28	112	0.1*

***minimum model input value**

6.3.3.2 Operational Noise

Predictions of operational noise levels were undertaken in accordance with the method set out in ISO 9613-2:1996 (International Standards Organisation, 1996). The predicted noise levels represent both the daytime and night-time periods, as it is assumed the operational noise will not vary over time.

To locate the noise sources, the proposed site layout provided by NorthConnect was used, including height data relative to ground level. All noise sources were modelled as point sources. This approach is considered appropriate due to the distance of the nearest NSR relative to the size of the plant items. The point sources were assigned sound power levels based on the data provided by the electrical engineering consultants working on the project. The converter station building will be designed to ensure that noise emissions from it will be below 50dB at 10 m from the building façade, and as such will not be a contributing factor to the noise levels at the nearest receptors; hence it has been excluded from the noise model. A summary of the sound power levels is included in Appendix A.2.

A drawing of the site layout used is shown in Drawing 3019. It should be noted that the project is still to identify an equipment supplier and to go through the detailed design phase. As such all information utilised is the best available at this point, however it is not 'actual' levels. It is known that some models of the type of plant items likely to be used in the converter station emit a tonal component. As there is uncertainty over the final choice of plant items, the noise model has considered scenarios with (worst case) and without a tonal component.

The following project design noise attenuation measures were included in the model:

- The landscape mounding (see Chapter 10);
- The Supergrid Transformers (SGTs) fully enclosed with the enclosure spaced about 100 mm from the transformer tank, and in addition have blast walls and a barrier surrounding them at 10 m height; and
- The Coolers surrounded by a barrier of 6 m height

The location of the barriers is shown on Drawing 3144. These were modelled as rigid and reflective.

6.3.3.3 Decommissioning

Due to the potential for major changes in the activities undertaken in the surrounding area and hence baseline noise levels and the lack of detail on decommissioning techniques, it is not practicable to undertake an assessment of decommissioning noise. It is anticipated that decommissioning noise levels will be similar to those predicted for construction activities. It is also anticipated that noise receptors will have changed by this time, hence the noise impact has been not been considered in this assessment. Vibration Assessment Methodology

6.3.4 Vibration Baseline

Vibrock Limited were employed to undertake an assessment of the blasting activities carried out at Stirlinghill Quarry, to inform the design of the proposed converter station. This included vibration measurements of an actual blast and regression modelling (Vibrock, 2014).

6.3.5 Vibration Receptors

As with noise assessment, receptors sensitive to vibration need to be identified. Blasting activities will only be carried out on the Fourfields site as such there is no need to identify receptors in the vicinity of the HVAC cable route. The four receptors identified were:

- Highfield;
- Lendrum Terrace;
- RAF Buchan Ness; and
- Telecommunications Mast to the south east of Fourfields.

6.3.6 Evaluation of Receptors

Vibration sensitive receptors have been identified, and split into two sensitivity categories as detailed in Table 6.4.1.

Table 6.4.1: Vibration Receptor Sensitivity

Sensitivity	Criteria
High	Residential buildings.
Low	Non-residential buildings, including offices and workshops.

6.3.7 Magnitude of Impact

The magnitude of the impacts are defined in Table 6.4.2, they are defined in terms of Peak Particle Velocity (PPV) measured in millimeters per second (mms^{-1}) for more information on how they are defined please see Appendix A.4.

Table 6.4.2: Magnitude of Potential Impact

Magnitude of Impact	Predicted Peak Particle Velocity Vibration Levels (mms-1)
	Blasting Operations
Very High	>10.0 at a 95% confidence level
High	>6.0 to 10.0 at a 95% confidence level
Medium	>3.0 to ≤6.0 at a 95% confidence level
Low	>1.5 to ≤3.0 at a 95% confidence level
Negligible	≤1.5 at a 95% confidence level

6.3.8 Significance Evaluation

The evaluation of significance uses the matrix provided in Table 6.4.3.

Table 6.4.3: Significance of Potential Effects

Magnitude of Impact	Sensitivity	
	High	Low
Very High	Major	Moderate
High	Moderate	Minor
Medium	Minor	Minor
Low	Minor	Negligible
Negligible	Negligible	Negligible

Key

Orange	Significant Effect
Light blue	Non-Significant Effect

6.4 Noise Baseline Information

6.4.1 Results of Noise Monitoring

A summary of the results of the daytime and night-time monitoring at each NMP are shown and discussed in the following section. Any observations made which may have potentially affected measurements during monitoring are noted. Monitoring was undertaken for one hour periods during the daytime, and for 3 x 5 minute periods during the night at all locations. The weather conditions during the survey are presented in Table 6.4.1.

Table 6.4.1: Weather Conditions

Monitoring Period	Cloud Cover	Wind	Temperature	Precipitation / Humidity	Ground Conditions
Daytime	Clear	Still	8°C	Dry with some very light rain later	Dry then Damp
Night	Clear	Still	7°C	Dry	Damp

6.4.2 Summary of Noise Monitoring Results

A summary of the noise monitoring results at each NMP are presented in Table 6.4.2 and the full results with observations are included in Appendix A.3.

Table 6.4.2: Summary of noise monitoring results

Date	Start Time	Duration hh:mm	dB $L_{Aeq, duration}$	dB $L_{A90, 5 min}$ Mode
NMP 1 Converter Site				
25/11/2014	12:05	01:00	52.8	42
25/11/2014	23:48	00:15	32.7	26
NMP 2 Highfield				
25/11/2014	13:50	01:00	43.4	41
25/11/2014	23:30	00:15	36.6	23
NMP 3 Lendrum Terrace				
25/11/2014	10:55	01:00	54.2	43
25/11/2014	23:00	00:15	44.1	27
NMP 4 Hill of Boddam Viewpoint				
25/11/2014	10:55	01:00	54.0	41
26/11/2014	00:31	00:15	39.5	30
NMP 5 Gateside Access Road				
25/11/2014	12:15	01:00	54.2	45
25/11/2014	23:06	00:15	33.9	30
NMP 6 Longhaven Mains				
25/11/2014	13:50	01:00	45.0	36
26/11/2014	00:35	00:15	47.2	28*
NMP 7 Stirlinghill				
25/11/2014	13:50	01:00	65.8	52
26/11/2014	00:57	00:15	52.8	30

***Mean value used as all rounded integer measurement values were unique**

The noise levels in the area surrounding the proposed site are generally very low, especially during the night-time period. The measured night-time background levels are all equal to or below 30 dBL_{A90}. During the day-time the noise levels are higher due to traffic on the A90, which is the dominant source of noise. The proximity of each receptor to the A90 and any screening by terrain or buildings, defines the noise level.

6.5 Vibration Baseline Information

Stirlinghill Quarry immediately to the east of Fourfields is operated by Breedon Aggregates Ltd. They undertake drilling and blasting operations approximately six times each year.

The blast face heights are up to 15 metres high and the anticipated maximum instantaneous explosive charge is around 145kg, although blast design will vary from blast to blast. The closest the quarry blasts will be to the Fourfields Converter Station is approximately 190 metres.

Monitoring from various points has allowed Vibrock to plot a regression graph and thereby calculate likely vibration levels at different levels from the blast point. It is possible for velocity vibration levels in the region of $19mms^{-1}$ to be experienced at the east side of the converter station site. This is well below the $50mms^{-1}$ levels guidance BS 7385-2:1993 (British Standards, 1993) suggesting it is acceptable for industrial buildings; however, it may not be ideal for the sensitive electrical components associated with the converter station. Acceleration levels at the edge of the Fourfields site associated with the quarry blasts have been calculated to be 1.01g (Vibrock, 2014).

6.6 Noise Impact Assessment

6.6.1 Construction

The significance of the predicted construction work noise level at each NSR has been evaluated following the example in BS 5228-1:2009 (British Standards Institute, 2009) Annex E 3.3 and as outlined previously in Section 6.3.1.1. The predicted noise levels at each receptor are shown in Table 6.6.1. At most receptors, the predicted construction noise level does not exceed the cut-off value of 65 dB $L_{Aeq,\ daytime}$. Assuming the worst case scenario, the cut-off value is exceeded at Highfield for Phase 2. At Highfield and Hjaltland the cut-off value is exceeded only for the HVAC Cable section of Phase 3. These values are highlighted in Table 6.5.2 for clarity.

Table 6.6.1: Predicted Construction Noise Levels, dB $L_{Aeq, daytime}$

NSR	Phase 1	Phase 2	Phase 3			Phase 4
			Total	Site Works	HVAC Cable Works	
Highfield	55.7	70.5	69.7	56.8	69.5	56.9
Lendrum Terrace 1	51.2	62.6	58.4	53.2	56.8	44.7
Lendrum Terrace 2	53.3	63.0	58.3	54.0	56.2	45.9
Lendrum Terrace 3	55.9	63.0	58.1	55.4	54.8	47.1
The Croft	51.1	57.3	55.8	52.4	53.0	44.8
Hjaltland	46.5	56.6	74.7	47.3	74.7	41.7
Longhaven Mains	40.8	47.4	45.8	45.4	35.9	36.4
Stirlinghill	39.7	37.9	43.4	42.3	37.0	27.5
Gateside	46.5	56.3	63.6	46.9	63.5	38.5
Denend Croft	44.6	55.2	62.7	45.5	62.7	40.3
Hill of Boddam Viewpoint	58.1	64.9	58.4	58.0	48.4	52.7

The predicted total noise levels (pre-construction ambient plus construction) at the NSRs where construction noise only is predicted to exceed 65 dB $L_{Aeq, daytime}$ are presented in Table 6.7.2. Note, they are the same as the predicted construction noise levels, as the construction noise is a much higher proportion of the total noise than the existing background.

Table 6.6.2: Predicted Total Noise Levels, dB $L_{Aeq, daytime}$

NSR	Pre-Construction Ambient Noise	Predicted Total Noise					
		Phase 1	Phase 2	Phase 3			Phase 4
				Total	Site Works	HVAC Cable	
Highfield	43.4	-	70.5	69.7	-	69.5	-
Hjaltland	54.2	-	-	74.7	-	74.7	-

The excess of the predicted total noise level over the pre-construction ambient noise level is shown in Table 6.6.3. At Highfield, for Phase 2 and at Highfield and Hjaltland for the HVAC Cable section of Phase 3, there is an excess of more than 5 dB. The effect of the predicted construction noise levels at these properties during these phases is significant. At Hjaltland, the total duration of the noise impact is expected not to exceed 8 weeks, and this is likely to comprise several shorter periods.

Table 6.6.3: Excess of Predicted Total Noise over the Pre-Construction Ambient Noise Level, dB

NSR	Phase 1	Phase 2	Phase 3			Phase 4
			Total	Site Works	HVAC Cable	
Highfield	-	27.1	26.3	-	26.1	-
Hjaltland	-	-	20.5	-	20.5	-

6.6.2 Operations

The predicted operational noise at each NSR is presented in Table 6.6.4. A noise contour plot of the predicted operational noise levels is presented in Drawing 3144. The highest noise level is predicted at Lendrum Terrace 3 followed by Highfield.

Table 6.6.4: Predicted Operational Noise Levels, dB $L_{Aeq, period}$

NSR	Daytime	Night-time
Highfield	25.0	25.0
Lendrum Terrace 1	23.7	23.7
Lendrum Terrace 2	24.1	24.1
Lendrum Terrace 3	25.6	25.6
The Croft	20.6	20.6
Hjaltland	17.6	17.6
Longhaven Mains	11.8	11.8
Stirlinghill	6.4	6.4

The predicted operational noise levels due to each group of equipment are presented in Table 6.7.5. The most significant group of equipment is Filter Bank 2.

Table 6.6.5: Predicted Operational Noise Levels – All sources, dB $L_{Aeq, period}$

Name	Total	Filter Bank 2	Filter Bank 1	SGTs	Coolers	Other Sources
Lendrum Terrace 3	25.0	24.0	14.7	12.5	9.6	8.8
Highfield	23.7	19.9	13.9	19.8	7.6	10.5
Lendrum Terrace 2	24.1	20.2	14.4	20.1	7.0	12.3
Lendrum Terrace 1	25.6	23.1	16.0	19.5	4.0	13.3
The Croft	20.6	16.9	12.4	16.1	0.8	8.2
Hjaltland	17.6	11.9	9.6	13.0	10.8	-
Longhaven Mains	11.8	6.4	6.4	6.7	1.4	-
Stirlinghill	6.4	-	4.0	-	-	-

The data has been not been available to determine if any correction for tonality is required by following the objective methods in Annex C and D of BS 4142:2014 (British Standard Institute, 2014). This needs frequency spectrum data of 1/3 octave or greater. Also, as the component suppliers and exact components have not been identified, a subjective assessment of their tonality has not been possible, therefore Rating Sound Levels with and without the

6 dB tonality correction have been included in the evaluation. The results of the evaluation are presented in Table 6.6.6.

Considering the worst case with a tonality correction of +6 dB, the Rating sound level at Highfield is 8 dB above the Background sound level, therefore a significant adverse impact is predicted to occur. At Lendrum Terrace 3, an adverse impact is predicted to occur as the Rating sound level is 5 dB above the Background sound level. Lendrum Terrace 1 and Lendrum Terrace 2 receptors have a Rating sound level 3 dB over the Background sound level, therefore a slight adverse impact is likely to occur.

Considering the case without a correction for tonality, the maximum predicted exceedance is 2 dB at Highfield. At all other properties, no exceedance is predicted. For this scenario therefore, a significant impact is expected not to occur.

Table 6.6.6: BS 4142:2014 Evaluation results, continuous operation

NSR	Period	Specific Sound Level, dB $L_{Aeq, day/night}$	Rating Sound Level, dB		Back ground Sound Level, dB L_{A90}	Excess, dB	
			No Tonality Corr.	+6 dB Tonality Correction		No Tonality Correction	+6 dB Tonality Correction
Highfield	Day	25	25	31	41	-	-
	Night	25	25	31	23	2	8
Lendrum Terrace 1	Day	24	24	30	43	-	-
	Night	24	24	30	27	-	3
Lendrum Terrace 2	Day	24	24	30	43	-	-
	Night	24	24	30	27	-	3
Lendrum Terrace 3	Day	26	26	32	43	-	-
	Night	26	26	32	27	-	5
The Croft	Day	21	21	27	43	-	-
	Night	21	21	27	27	-	-
Hjaltland	Day	17	18	24	45	-	-
	Night	17	18	24	30	-	-
Longhaven Mains	Day	12	12	18	36	-	-
	Night	12	12	18	28	-	-
Stirlinghill	Day	6	6	12	52	-	-
	Night	6	6	12	30	-	-

6.6.3 Decommissioning

As it is not clear what for decommissioning will take, it is not practical to predict the type of equipment and machinery to be utilised. In addition advances in technology over the next 60 years may also lead to less noisy machinery being available. It is likely that if the site were to be reinstated then noise levels will be equivalent to or lower than construction levels. A full assessment of noise impacts associated with the decommissioning of the site should be carried out prior to works commencing.

6.7 Vibration Impact Assessment

6.7.1 Evaluating Sensitivity of Receptors

Table 6.8.1 provides the sensitivity evaluation for each of the vibration receptors.

Table 6.8.1: Evaluation Vibration Receptor Sensitivity

Receptor	Location (Grid Reference)	Sensitivity
Highfield	NK118 416	High – residential
Lendrum Terrace	NK121 417	High - residential
RAF Buchan Ness	NK114 410	Low – industrial
Telecommunications Mast	NK124 412	Low - industrial

6.7.2 Construction

It is expected that a triangular area in the south west corner of the Fourfields site will need to be blasted to fragment the rock for excavation purposes. This is to obtain the required platform height for the Converter Station. The rock depths expected to be removed within the triangle vary from 3m in low lying areas up to 14m in the high south west corner. The maximum explosive charge weight that would typically be used to remove this amount of rock was utilised to calculate the vibration levels (Appendix A.4 Table 6). Full details of the calculation methods employed are provided in Appendix A.4 (Vibrock, 2015).

The resultant vibration levels at the various receptors are shown in Table 6.8.2.

Table 6.8.2: Calculated Vibration Levels for Maximum Explosive Weights

Location	Vibration Level Peak Particle Velocity (mms^{-1})							
	NE Corner		SE Corner		Centre		SW Corner	
	Mean	Max'm	Mean	Max'm	Mean	Max'm	Mean	Max'm
Highfield	> 3.0	> 6.0	0.2	0.4	>3.0	> 6.0	>3.0	>6.0
Lendrum Terrace	1.1	2.1	0.2	0.3	1.4	2.9	1.8	3.7
RAF Buchan Ness	0.7	1.3	0.1	0.2	1.4	2.9	2.8	5.7
Telecom's Mast	0.6	1.2	0.3	0.6	1.5	3.0	2.1	4.3

Vibration impact magnitude for Highfield is identified as high resulting in an effect significance of moderate and overall a significant effect in EIA terms.

Construction vibration impact magnitude on Lendrum Terrace ranges from low to medium resulting in a minor effect significance which is not significant in EIA terms.

RAF Buchan Ness and the Telecommunication Mast are both subject to medium magnitude impacts from vibration resulting in a minor effect significance which is not significant in EIA terms.

6.7.3 Operations

No operations likely to give rise to vibration will be carried out during operation of the Interconnector. Blasting from the quarry could impact upon the sensitive electrical components on the converter station site. As discussed in Section 6.6 this has been assessed and the information will be feed into the detailed design process. The design will ensure that the converter station operations are not affected by quarry blasting activities. Hence no detailed assessment of effects is required.

6.7.4 Decommissioning

No operations likely to give rise to vibration are likely to be required during decommissioning. If any were proposed for use they should be assessed prior to being implemented when full information is available.

6.8 Mitigation Measures

6.8.1 Construction Noise

Once the actual construction plant has been identified by the construction contractors, the noise modelling will be reassessed to ensure noise levels at receptors are kept below the BS522-1:2009 (British Standard Institute, 2009) levels where practicable. A Section 61 Application under the Control of Pollution Act 1974 will be made prior to construction commencing. Local residents will be kept informed of planned activities throughout the project lifetime. Good construction practice will be implemented to ensure noise levels do not exceed the adopted noise limits, including:

- Selection of types of plant items to reduce noise levels;
- Scheduling of works and simultaneous activities to ensure that noise levels do not exceed the noise limits;
- Regular maintenance of plant, equipment and vehicles; and
- Plant and vehicle engines to be switched off when not in use.

6.8.2 Construction Vibration

The assessment of effects used the maximum explosive charge weight likely to be required to remove various depths of rock. Alternative techniques can be employed which will significantly reduce the weight of explosive and resulting vibration effects.

One method of achieving such a reduction is to deck the explosives within the borehole. This technique splits the column of explosives in two, separated by inert material. If blasting is required at closer distances than that where double decking would be a successful strategy, other charge reduction methods would have to be employed. These could be more complex decking strategies or changes to the blast geometry and / or the use of smaller diameter boreholes.

It is therefore proposed that the blasting design takes into account the receptors and limits the peak particle velocity of the blast to below $6mms^{-1}$, at any inhabited property. Blasting will only be carried out during daylight hours, and local residents will be informed prior to blasting being undertaken.

6.8.3 Operational Noise

During the detailed design of the project, the appointed contractor will revise the noise model and predictions using the source noise terms of the confirmed equipment. Any appropriate tonality allowance will be incorporated. If combined noise levels (i.e. ambient plus construction noise levels) are predicted to be significant (greater than 5dB above ambient) then additional acoustic attenuation measures will be incorporated into the design.

6.9 Residual Effects

6.9.1 Construction Noise

Taking account of mitigation factors, noise levels at Highfield and Hjaltland are predicted to exceed 65dB during the day for some of the construction works, and as such the residual effect is significant for these receptors. Construction noise levels at all other receptors are predicted to be not significant.

6.9.2 Construction Vibration

Assuming that blasts designed such that vibration levels at inhabited properties are below $6mms^{-1}$, then the impact magnitude on Highfield will reduce to medium resulting in a minor effect significance which is not significant in EIA terms.

6.9.3 Operational Noise

Through the detailed design process, operational noise levels will be designed to meet the required noise limits, therefore the residual noise impacts are predicted not to be significant.

6.10 Cumulative Effect

6.10.1 Scope

As discussed in Chapter 18, there is a need to consider the potential cumulative effects of noise arising from the NorthConnect project in combination with the HVDC Cable installation works. Vibration effects associated with the proposed extension to Stirling Hill Quarry also need to be considered in combination.

6.10.2 HVDC Cable

6.10.2.1 Construction

The cables will run close to each other from the Converter Station to the north-west corner of Fourfields at which point the HVDC cable route heads south and the HVAC cable route heads north. Hence for the majority of the routes there is a significant spatial separation which will mean that cumulative noise effects on any given receptor do not occur.
When the routes converge, the civils work will be coordinated and due to space constraints and health and safety implications, the amount of equipment will be restricted to that utilised for the HVAC cabling.

Predicted noise levels at Highfield are therefore expected to be similar to those predicted for HVAC cable laying activities. Similarly, construction noise levels at properties south of the converter site are expected to be no higher than those reported for HVAC cable laying works elsewhere.

6.10.2.2 Operations

Once in place the buried HVDC cables will not give rise to any noise as such no noise effects are predicted.

6.10.2.3 Decommissioning

It is likely that the cables will be left in situ at the point of decommissioning and, as such, there will be no cumulative noise effects. If the decision is taken to remove the cables then it is likely that the same equipment will be utilised for both the HVDC and HVAC cables hence there should not be an overall increase in noise levels.

6.10.3 Stirlinghill Quarry Extension

6.10.3.1 Construction

Cumulative effects could only occur if both the Quarry and NorthConnect are blasting at exactly the same time. The quarry only blast six times a year, hence there is a very low probability that both would be blasting at the same time. However, to ensure this, good communications with the quarry operators will be in place throughout the construction works. This will be facilitated by the Safety Committee which will include a number of stakeholders and consider issues such as noise, vibration and transport safety, see Chapter 19: Schedule of Mitigation.

6.10.3.2 Operation

There will be no blasting or other sources of vibration associated with the operations of the Fourfields site, as such potential effects of the Quarry extension on NorthConnect and not in combination with it have been considered.

The quarry extension is further from the Converter Station than the existing quarry works as such the assessment carried out by Vibrock Limited will be appropriate for inclusion within the detailed design of the converter station as discussed in Section 6.8.2.

6.10.3.3 Decommissioning

As discussed in Section 6.8.3 it is highly unlikely that techniques giving rise to vibration will be utilised during decommissioning however it is employed, hence there will be no cumulative effects. Furthermore it is not known whether or not the Quarry will still be operating in 60 years' time.

6.11 Summary

The noise impact from the proposed NorthConnect Interconnector Converter Station and HVAC connection to the substation has been assessed, for both the construction and operational phases of the development.

A baseline noise survey of existing daytime and night-time noise levels at the nearest sensitive receptors has been carried out. Predicted maximum construction noise levels indicate that significant adverse noise impacts are expected to occur at Highfield and Hjaltland.

Worst-case predicted operational night-time noise levels have the potential to be significant at Highfield. Good design will reduce the noise effects to non-significant.

If the worst case is taken with regard to explosive volumes utilised in blasting then vibration levels at Highfield are significant. This can be mitigated by utilising a different blast design to minimise explosives required and keep the PPV below $6mms^{-1}$ at all residential properties, thereby avoiding significant effects from vibration. A summary of effects is provided in Table 6.12.1.

Table 6.11.1: Summary of Noise Effects

Receptor	Receptor Type	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Construction Noise							
Highfield	Single Residential Property	Exceeds Cut off Values during Phase 2 & 3.	Significant	Good plant maintenance.	Exceeds Cut off Values during Phase 2 & 3.	Significant	Significant
Lendrum Terrace 1	Cluster of residential properties	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
Lendrum Terrace 2	Cluster of residential properties	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
Lendrum Terrace 3	Cluster of residential properties	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
The Croft	Cluster of residential properties	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
Hjaltland	Single residential property	Exceeds Cut off Values during HVAC (8 weeks)	Significant	Good plant maintenance.	Exceeds Cut off Values during HVAC (8 weeks)	Significant	Significant
Longhaven Mains	Single residential property	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
Stirlinghill	Cluster of residential properties	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant

Receptor	Receptor Type	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Gateside	Single residential property	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
Denend Croft	Single residential property	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
Hill of Boddam Viewpoint	Recreational location	Below cut off values.	Not significant	Good plant maintenance.	Not significant	Not significant	Not significant
Construction Vibration							
Highfield	Residential/ High	High	Moderate	Limit the peak particle velocity of the blast to below $6mms^{-1}$, at inhabited properties.	Medium	Minor	Not significant
Lendrum Terrace	Residential/ High	Low- Medium	Minor		Low- Medium	Minor	Not significant
RAF Buchan Ness	Industrial/ Low	Medium	Minor		Low - Medium	Minor	Not significant
Telecom's Mast	Industrial/ Low	Medium	Minor		Low -Medium	Minor	Not significant
Operations Noise							
Highfield	Single Residential Property	Night time > 5dB above background with Tonality Correction	Significant	Good design, equipment selected to minimise tonality.	Near Background	Not significant	Not significant
Lendrum Terrace 1	Cluster of residential properties	Night time 3dB above background with tonality correction.	Not significant	Good design, equipment selected to minimise tonality.	Near/ Below Background	Not significant	Not significant
Lendrum Terrace 2	Cluster of residential properties	Night time 3dB above background with tonality correction.	Not significant	Good design, equipment selected to minimise tonality.	Near/ Below Background	Not significant	Not significant

Receptor	Receptor Type	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Lendrum Terrace 3	Cluster of residential properties	Night-time > 5dB above background with Tonality Correction	Significant	Good design, equipment selected to minimise tonality.	Near/ Below Background	Not significant	Not significant
The Croft	Cluster of residential properties	Below background	Not significant	Good design.	Below background	Not significant	Not significant
Hjaltland	Single residential property	Below background	Not significant	Good design.	Not significant	Not significant	Not significant
Longhaven Mains	Single residential property	Below background	Not significant	Good design.	Not significant	Not significant	Not significant
Stirlinghill	Cluster of residential properties	Below background	Not significant	Good design.	Not significant	Not significant	Not significant
Gateside	Single residential property	Below background	Not significant	Good design.	Not significant	Not significant	Not significant
Denend Croft	Single residential property	Below background	Not significant	Good design.	Not significant	Not significant	Not significant
Hill of Boddam Viewpoint	Recreational location	Below background	Not significant	Good design.	Not significant	Not significant	Not significant
				Key		Significant effect	

Chapter 7

Ecology

7 Contents

7 Ecology

7.1 Introduction

This chapter presents the results of an Ecological Impact Assessment (EcIA) of the NorthConnect project. The purpose of this EcIA is to describe the potential effects of the development on the non-avian nature conservation interest of the Site and its immediate environs, assess their significance and identify appropriate mitigation and good practice methods to protect the nature conservation interests. Chapter 8 presents the EcIA for avian features of the Site.

For the purpose of this EcIA, the Site is a detailed in Drawing 3019 and includes the red line application boundary for the AC Cable Route from the planned new substation just to the North of the existing Peterhead Substation at (grid reference NK120 430) to the Converter Station located at 'Fourfields' grid reference NK119 412), the converter station building, required ancillary works and the access road.

The survey areas for ecological components extend beyond the Site boundary to include an ecologically relevant buffer. The survey area for habitats is detailed in Drawing 3134 and for protected mammals in Drawing 3135. The rationale for the survey areas is discussed in Section 7.3.4.

This chapter is supported by two Appendices:

- B1: Extended Phase 1 Target Notes (Atmos Consulting, 2014)
- B2: Protected Mammal Survey (Tracks Ecology, 2014)

This EcIA presents baseline information, anticipated impacts from both construction and operation, mitigation and residual impacts, as well as taking into account associated cumulative and potential decommissioning impacts.

7.2 Sources of Information

7.2.1 Planning Framework

7.2.1.1 National

Biodiversity features within the vision of NPF3 as '*natural and resilient place*' with a key action within the NPF3 to '*implement the Scottish Biodiversity Strategy, including completing the suite of protected places and improving their connectivity through a national ecological network centred on these sites'*.

SPP sits alongside NPF3 and sets out how the NPF3 visions should be delivered on the ground. As a statement of Ministers' priorities, it carries significant weight in the preparation of development plans and is a material consideration in planning decisions.

Biodiversity and the natural environment are central to the SPP. The principle polices of the SPP: Sustainability; and Placemaking, both feature the natural environment as a consideration.

The primary Subject Policy paying regard to the natural environment is 'A Natural, Resilient Place' with benefits for biodiversity sought from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats. Recognition to the duty by all public bodies under the Nature Conservation (Scotland) Act 2004, to further the conservation of biodiversity, is reflected in the SPP.

It is acknowledged within the Policy – Valuing the Natural Environment that:

'Planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment […] Planning authorities should apply the precautionary principle where the impacts of a proposed development on nationally or internationally significant landscape or natural heritage resources are uncertain but there is sound evidence indicating that significant irreversible damage could occur'.

It is also stated within the same Policy that:

'If there is any likelihood that significant irreversible damage could occur, modifications to the proposal to eliminate the risk of such damage should be considered'.

It is also acknowledged that protected species are an important consideration in assessing planning applications:

'If there is evidence to suggest that a protected species is present on site or may be affected by a proposed development, steps must be taken to establish their presence. The level of protection afforded by legislation must be factored into the planning and design of the development and any impacts must be fully considered prior to the determination of the application'.

The 2020 Challenge for Scotland's Biodiversity aims to promote and enhance Scotland's nature, and to better connect people with the natural world through developing a national ecological network over time. The 2020 Challenge is a supplement to the Scottish Biodiversity Strategy (2004) and together comprise the Scottish Biodiversity Strategy.

7.2.1.2 Local

Aberdeenshire Council specifically acknowledge the need to protect the natural environment within their Local Development Plan (Aberdeenshire Council, 2012). The two dedicated Supplementary Guidance (SG) Policies on Natural Heritage (SGNH) within the Plan are:

- SG Natural Environment 1: Protection of nature conservation sites (SGNE1); and
- SG Natural Environment 2: Protection of the wider biodiversity and geodiversity (SGNE2).

Aberdeenshire Council states within SGNE1 that:

'We will not approve new development where it may have an adverse effect on a nature conservation site designated for its biodiversity or geodiversity importance, except in the following circumstances'.

A. In the case of an internationally important site, where a Habitat Regulations Assessment has concluded that:

1) the development will not adversely affect the integrity of the site; OR

2) it has been demonstrated that:

i) there are imperative reasons of overriding public interest for permitting the development, including reasons of a social, environmental or economic nature; AND

ii) there is no satisfactory alternative site or solution; AND

iii) suitable compensation measures will be implemented.

B. In the case of a site of national importance, where a thorough assessment of the site has demonstrated that:-

1) any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social, environmental or economic benefits of national importance; AND

2) the objectives of the designation and the overall integrity of the area will not be compromised; AND

3) any impact will be suitably mitigated.

C. In the case of any other recognised nature conservation site, wetlands or Ancient, Long Established or Semi-Natural Woodlands, where a thorough assessment of the site has demonstrated that:

1) the proposal's public benefits at a local level clearly outweigh the nature conservation value of the site; AND

2) any impact will be suitably mitigated.'

Aberdeenshire Council state in SGNE2 that:

A. We will only approve development, subject to other policies, if the applicant has also:

1) identified measures that will be taken to enhance biodiversity and geodiversity in proportion to the potential opportunities available and the scale of the development in line with good practice (this should include habitat creation and management, and the restoration of habitats and wildlife networks, where possible, incorporating existing habitats);

2) included an ecological management plan, where required; AND

3) demonstrated that due regard has been given to the extent of organic and organic-rich soils on sites, to limit loss of soil carbon and the potential contribution of soil disturbance to greenhouse gas emissions.

B. We will not approve development that would be detrimental to the maintenance of the population of a European Protected Species at a favourable conservation status in its natural range. In the case of development that is likely to have an adverse effect on a European Protected Species, we will only approve it, where a thorough assessment of the site has demonstrated that:

1) the development is required for preserving public health or public safety or for other imperative reasons of overriding public interest, including those of a social or economic nature; AND

2) there is no satisfactory alternative site or solution; AND

3) any impact will be suitably mitigated.

C. We will not approve development that would be likely to have an adverse effect on a species protected under the Wildlife and Countryside Act 1981 unless the development is required for preserving public health or public safety. For development affecting a species of bird protected under the 1981 Act there must also be no other satisfactory solution. In the case of development that is likely to have a significant adverse impact on habitats listed in

Annex 1 of the Habitats Directive, on semi-natural habitats or species of importance to biodiversity, or on areas of importance to geodiversity, we will only approve it, where a thorough assessment of the site has demonstrated that:

> *1) its public benefits at a local level clearly outweigh the value of the habitat for biodiversity conservation or of the site for geodiversity; AND*
> *2) the development will be sited and designed to minimise adverse impacts on its environmental quality, ecological status or viability; AND*
> *3) there will be no fragmentation of habitats as a result of the development; AND*
> *4) any impact will be suitably mitigated.*

Where the impacts of a development on an international or national natural heritage resource are uncertain, but there are good scientific grounds that significant irreversible damage could occur, the precautionary principle will apply. The applicant should modify the development to eliminate the risk of irreversible damage.'

The Aberdeenshire Council Supplementary Guidance on Safeguarding of Resources and Areas of Search (SGSR) (Aberdeenshire Council, 2012) includes SGSR 3: Protection and conservation of trees and woodland states:

We will only approve development that would cause the loss of or serious damage to trees or woodlands, which are either covered by an existing or proposed Tree Preservation Order, or are of significant ecological, historical, recreational or shelter value, subject to other policies, if:

> *1) it would achieve significant and clearly defined public benefits that outweigh any potential loss; AND*
> *2) when required, an evaluation of the biodiversity and amenity value of the woodland and habitat, including current and future benefits of the existing woodland, has been undertaken; AND*
> *3) the minimum damage occurs to existing trees and woodland as a result of the development, and there is no unnecessary fragmentation of existing or potential woodland networks; AND*
> *4) the impact of the removal of any trees and the effect on the character or aamenity of the area is mitigated by appropriate compensatory planting to an agreed standard.*

The Council will support the creation and protection of sensitively designed and managed forests and woodlands, in line with the Forest & Woodland Strategy and in accordance with the landscape character supplementary guidance.

7.2.2 Legislative Framework

7.2.2.1 Habitats Directive

The European Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, also referred to as the 'Habitats Directive'. The primary aim of the Habitats Directive is to maintain biodiversity within the Member States and is transposed into Scottish law by a combination of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland), commonly known and the 'Habitat Regulations' together with the Habitats Regulations 2010 (in relation to reserved matters).

The Habitats Regulations identify a number of habitats or species whose conservation interest requires the designation of Special Areas of Conservation (SAC) and in combination with the designation of Special

Protection Areas (SPAs) under the Birds Directive, form the Natura 2000 network of protected sites.

In addition the Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. These species are commonly termed European Protected Species (EPS).

7.2.2.2 Wildlife & Countryside Act 1981

The Wildlife & Countryside Act 1981 (WCA) (as amended in Scotland) was originally conceived to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Birds Directive in Great Britain. It has been extensively amended since it came first into force.

Schedule 5 of the WCA provides special protection to selected animal species other than birds, through section 9(4) of the Act, against damage to "*any structure or place which [any wild animal included in the schedule] uses for shelter and protection*", and against disturbance whilst in such places.

The WCA contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9. It also provides a mechanism making the above offences legal through the granting of licenses by the appropriate authorities.

Important amendments to the WCA have been introduced in Scotland including the Nature Conservation (Scotland) Act 2004 (in Scotland). Part 3 and Schedule 6 of this Act make amendments to the WCA, strengthening the legal protection for threatened species. The Nature Conservation (Scotland) Act 2004 (in Scotland) is also the instrument under which Sites of Special Scientific Interest (SSSI) are protected in Scotland.

The Wildlife and Natural Environment (Scotland) Act 2011 provided a new licensing element to the WCA within Scotland, specifically for certain non-avian protected species 'for any other social, economic or environmental purpose'. This licensing purpose is qualified by two constraints; "*that undertaking the conduct authorised by the licence will give rise to, or contribute towards the achievement of, a significant social, economic or environmental benefit; and that there is no other satisfactory solution*".

7.2.2.3 Protection of Badgers Act 1992

Badgers *Meles meles* and their setts are protected by the Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004 making it an offence, amongst other actions, to willfully kill, injure, take or attempt to kill a badger, or, by intentionally or recklessly causing or allowing disturbance or obstruction of a badger sett. In common with other legislation, it is possible to carryout actions that would otherwise be illegal under a licence.

7.2.2.4 Water Framework Directive

The Water Framework Directive (WFD) became law in Scotland during 2003 through the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act) which sets out the arrangements for the protection of the water environment in Scotland. The Freshwater for Fish Directive (FFD) was revoked in 2013 under the (WFD) however the ecological designations for salmonids did not alter.

7.2.3 Ecology Guidance

All baseline survey methodologies were undertaken in accordance with current survey guidelines and were agreed to be sufficient by Aberdeenshire Council and Scottish Natural Heritage (SNH).

Baseline surveys follow nationally-recognised best practice guidelines (Institute of Environmental Assessment, 1995) and the ecological impact assessment takes into account the recognised ‘Guidelines for Ecological Impact Assessment in the United Kingdom’ (Institute of Ecology and Environmental Management, 2012).

Phase 1 habitat surveying was undertaken as described in the Handbook for Phase 1 Habitat Survey – a technique for Environmental Audit (Joint Nature Conservation Committee, 2010). Further species specific guidance was also followed and is referenced in the relevant sections.

7.3 Assessment Methodology

7.3.1 Overview

The EIA methodology adopted within this assessment is based on standard best practice as detailed in Chapter 3 and has been agreed with Aberdeenshire Council through a Scoping Request.

7.3.2 Desk Study

A desk study and literature search was undertaken to inform the characterisation of the existing baseline conditions. Baseline data on the nature conservation interest of the Site and its surroundings, including information on designated nature conservation sites and protected species records were sought from the following sources:

- SNH interactive map facility at Sitelink (Scottish Natural Heritage, 2014);
- National Biodiversity Network (NBN) Gateway’s information service (Centre for Ecology and Hydrology & Joint Nature Conservation Committee, 2014);
- The Scottish Biodiversity List (SBL) is a list of animals, plants and habitats considered to be of principal importance for biodiversity conservation in Scotland; the List was first published in 2005 in compliance with Section 2(4) of The Nature Conservation (Scotland) Act 2004 and has been updated several times;

- The UK Biodiversity Action Plan (UK BAP) and North East Scotland Local Biodiversity Action Plan (LBAP) have been published in response to the Convention on Biological Diversity (CBD) (United Nations, 1992). The LBAP is currently under review and is altering the structure of the plan to an ecosystem approach.
- North East Scotland Biological Records Centre (NESBReC) provided information regarding statutory designations and notable and protected species; ecological records were requested for a buffer of 5km for bat interest and 2km for all other protected or notable species; and
- Large-scale 1:10,000 Ordnance Survey (OS) maps in conjunction with colour 1:25,000 OS map (to determine the presence of ponds and other features of nature conservation interest).
- Aerial photography for the Site was examined using imagery in the public domain at www.bingmaps.com and www.maps.google.co.uk.

7.3.3 Field Surveys

To provide detailed contemporary information on the Site and to determine baselines accurately to inform the EIA following field surveys were carried out following current survey guidelines and agreed to be sufficient by Aberdeenshire Council and SNH via Scoping.

- Extended Phase 1 habitat survey (Atmos Consulting, 2014); and
- Otter, Water Vole & Badger Survey (Tracks Ecology, 2014).

7.3.3.1 Extended Phase 1 Habitat Survey

Phase 1 Habitat Survey is a standardised method of recording habitat types and characteristic vegetation, as set out in the Handbook for Phase 1 Habitat Survey – a technique for Environmental Audit (Joint Nature Conservation Committee, 2010). Due to the design iteration process, the majority of the AC Cable Route was surveyed between 23rd and 25th September 2013, with surveys updated and extended to include the Fourfields location during 16th and 17th April 2014. The ecologists provided by Atmos Consulting were suitably qualified and surveys were conducted under suitable weather conditions during the optimal time of year.

The area surveyed during the Extended Phase 1 is detailed in Drawing 3134 and is hereafter referred as the ‘Phase 1 Survey Area’. The Phase 1 Survey Area encompasses all proposed infrastructure together with appropriate buffers following landscape features where relevant.

This survey method was extended by evaluating the habitats in accordance with the habitats listed in the SNIFFER document Water Framework Directive (WFD) 95 - A Functional Wetland Typology for Scotland (Scotland and Northern Ireland Forum for Environmental Research, 2009), and through the recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance.

Whilst not a full protected species or botanical survey, the extended Phase 1 method enables a suitably experienced ecologist to obtain sufficient understanding of the ecology of a site that it is possible either:

- To confirm the conservation significance of the Phase 1 Survey Area and assess the potential for impacts on habitats/species likely to represent a material consideration in planning terms; or
- To ascertain that further surveys of some aspect(s) of the site's ecology will be required before such confirmation can be made.

The habitat and protected species details recorded during the extended Phase 1 survey are presented within this EcIA with target notes detailed in Appendix B.1.

7.3.3.2 Protected Mammal Survey

The Phase 1 Habitat Survey recommended that further field surveys targeting otter *Lutra lutra*, water vole *Arvicola terrestris* and badger should be undertaken in order to facilitate a comprehensive assessment of the potential impact of the proposal upon those species.

Identified as necessary during the extended Phase 1 survey, further surveys targeting a number of protected mammal species were undertaken during September 2014.

The protected mammal survey areas were dependent on the species and are displayed on Drawing 3135. For otter and water vole the survey area included all watercourses and waterbodies within a buffer of 200m to the proposed infrastructure and for badger all land within a buffer of 100m to the infrastructure.

At the time of the surveys the final application boundary was not known. As a result a section of the proposed access route from the A90 was not included within the survey along with a small section of the northern AC cable route. As the access route presently supports the haulage access track for the quarry and no additional land take is anticipated this does not represent a significant limitation. The section of the HVAC cable route not surveyed was included within a survey by RSK in 2013 (RSK Environment Ltd, 2013) they detailed the area as being dominated by improved grassland. Pre-construction surveys will be undertaken to safeguard against any breach in wildlife legislation with respect to protected terrestrial species within these areas.

7.3.3.2.1 Otter

The otter survey was undertaken on 29th September 2014 broadly in accordance with the approach detailed in "Otters and Development" guidance document (Scottish Natural Heritage, 2010) and Ecology of the European Otter (Chanin, 2003). The survey concentrated on all watercourses within 200m of proposed infrastructure and included a thorough check for otter resting places (holts and couches) and was undertaken by a Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM) suitably qualified and experienced ecologist supplied by Tracks Ecology. Full details of the methodology are presented in Appendix B.2.

7.3.3.2.2 Water Vole

The methodology employed during the survey followed that of an adapted version of the Water Vole Conservation Handbook (Strachan, 2011) with additional reference to field sign guidance provided by Using Field Signs to Identify Water Voles (Kemp, 2009) and The Handbook of British Mammals Corbet and Southern 1977).

The water vole survey was undertaken concurrently with the otter survey on 29th September 2014 by a MCIEEM suitably qualified and experienced ecologist supplied by Tracks Ecology. The survey again focussed on watercourses within 200m of proposed infrastructure. Full details of the methodology are presented in Appendix B.2.

7.3.3.2.3 Badger

The survey for badger was also undertaken on 29th September and covered all accessible areas within 100m of proposed site infrastructure. The badger survey comprised a search for setts and other signs of badger activity, e.g. latrines, dung pits, pathways, snagged hair and signs of foraging.

Badger surveys are generally best undertaken when vegetation is at a minimum during winter months to maximise chances of identifying sett structures. However, the dominance of agricultural habitats and European gorse *Ulex europaeus,* an evergreen species, undertaking the survey during September is not considered a significant limitation. Full details of the methodology are presented in Appendix B.2.

7.3.4 Impact Assessment Methodology

The assessment of the significance of predicted impacts on ecological receptors is based on both the 'value' of a receptor and the nature and magnitude of the impact that the development will have on it. Effects on biodiversity may be direct (e.g. the loss of species or habitats), or indirect (e.g. effects due to noise, dust or disturbance), on receptors located within or out with the respective survey area. This EcIA has, in principle, followed the assessment methodology outlined in Chapter 3 with the specific ecological assessment methods and criteria detailed below.

7.3.4.1 Evaluation of Ecological Receptors

The evaluation methodology has been adapted from the Guidelines for Ecological Impact Assessment in the United Kingdom (Institute of Ecology and Environmental Management, 2012). A key consideration in assessing the effects of any development on flora and fauna is to define the areas of habitat and the species that need to be considered. This required the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by biophysical changes caused by project activities, however remote from the respective survey area.

The approach that has been undertaken throughout this EcIA is to identify 'valued ecological receptors' i.e. species and habitats that are both valued in some way and could be affected by the proposed development and separately, to consider legally protected species. Both species populations and habitats have been valued using a broad geographical basis with full details in Table 7.3.1

The approach taken in this assessment is that a species population or habitat area that is considered to be of Regional or greater importance in biodiversity conservation terms is considered to be a valued ecological receptor. Therefore, if a species population or habitat area is considered to be of High Local value or less, the proposed development is not anticipated to have an effect that would be of importance to the decision maker in terms of the EIA Regulations. Exceptions are made if the species population or habitat area has been identified as having a high social or economic value or if the species or habitat is legally protected.

Table 7.3.1: Nature conservation receptor evaluation criteria.

Value	Criteria
International	• An internationally important site (SAC) or a site proposed for, or considered worthy of designation; • A regularly occurring substantial population of internationally important species (listed on Annex IV of the Habitats Directive).
National	• A nationally designated site, SSSI, or a site proposed for, or considered worthy of such designation; • A viable area of habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; or • A regularly occurring substantial population of a nationally important species, e.g. listed on Schedule 5 & 8 of the 1981 Wildlife and Countryside Act.
Regional	• Areas of internationally or nationally important habitats which are degraded but are considered readily restored; • Viable areas of priority habitat or viable populations identified in the UKBAP or smaller areas/populations which are essential to maintain the viability of a larger area/population as a whole; • Regionally important population/assemblage of an EPS, Schedule 1 and/or 5 species. • Regionally important assemblages of other species or habitats.
High Local	• Ancient semi-natural woodland, Local Nature Reserves (LNRs) and Local Nature Conservation Sites (LNCS); • Locally important population/assemblage of an EPS, Schedule 1 and/or 5 species; or • Sites containing viable breeding populations of species known to be county rarities (e.g. included in the LBAP) or supplying critical elements of their habitat requirements.
Moderate Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the local context (within 2km radius from the site) and may benefit from mitigation as a good practice measure.
Low Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the immediate environs of the site and may benefit from mitigation as a good practice measure.
Negligible	• Common and widespread or modified habitats or species.
Negative	• Invasive, alien species often scheduled under Section 14, Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

It should be noted that the approach of this assessment is to consider the value of the Site for the species under consideration, rather than the nature conservation importance of the species itself, although this is a factor in the evaluation process with the level of use of the Site (number of individuals using the site and nature and level of use) taken into consideration. An assessment is then made of the value of the Site to that species, based upon a combination of data sources, professional judgment and knowledge of the Site and wider area.

7.3.4.2 Legal Protection of Species

There is a need to identify all legally protected species that could be affected by the proposed development to ensure that the development is in compliance with all relevant nature conservation legislation. It is, therefore, appropriate to take into full consideration the legal protection of a species within the evaluation process. For example full account of the Protection of Badgers Act is taken into consideration, notwithstanding the species protection on animal welfare grounds.

7.3.4.3 Nature and Magnitude of Impact

Impacts can be: permanent or temporary; direct or indirect; adverse or beneficial; reversible or irreversible; and may also have a cumulative function with other activities out with the assessed development. These factors are taken into consideration in the context of the sensitivity of the valued ecological receptor and the range of potential effects. To identify whether impacts are significant or not it is important to undertake the assessment in terms of the integrity (coherence of the ecological structure and function) and conservation status (ability of the receptor to maintain its distribution and/or extent/size) of the receptor.

Table 7.3.2 provides an overview of the range of impact magnitudes referred to within this assessment. In addition impacts may also be positive in nature.

Table 7.3.2: Definition of Magnitude of Impact

Magnitude	Description
Negligible / None	Very slight change from the baseline conditions. Changes barely detectable, approximating to the 'no-change' situation. Any effects likely to be reversible within 12 months and not affect the conservation status or integrity of the receptor.
Low	Minor shift away from baseline conditions. Effects will be detectable but unlikely to be of a scale or duration to have a significant effect on the conservation status or integrity of the receptor in the short term (1-5 years). Overall baseline character of site will not alter substantially.
Medium	Clear effect on the conservation status or integrity of the receptor in the short to medium term (6-15 years), although this is likely to be reversible or replaceable in the long-term (15 years plus).
High	Total loss of, or major alteration to conservation status or integrity of a receptor with situation likely to be irreversible, even in the long term. Fundamental alteration to the character and composition of the Site.

7.3.4.4 Significance of Effects

The significance of an effect is a product of the value of the ecological receptor and the magnitude of the impact on it, moderated by professional judgment. Table 7.3.3 illustrates a matrix based on these two parameters which is used for guidance in the assessment of significance. In terms of the EIA Regulations, only effects which are 'moderate' or 'major' are considered significant, the others constituting an non-significant effect. The level of effect has been assessed as either major, moderate, minor or negligible, or beneficial in accordance with the definitions provided in Chapter 3: Methodology.

Table 7.3.3: Significance of Effects Matrix

Magnitude of Impact	Sensitivity				
	International	**National**	**Regional**	**Moderate Local/ High Local**	**Low Local /Negligible**
High	Major	Major	Moderate	Moderate	Minor/ Negligible
Medium	Major	Moderate	Moderate	Minor	Minor / Negligible
Low	Moderate	Minor	Minor	Minor	Minor / Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

7.4 Baseline Information

7.4.1 Designated Sites

This section relates to sites designated in full or part for non-avian nature conservation interest. No designated sites are located within the Development envelope. A number of designated sites, both statutory and non-statutory are present within 2km of the Site (Drawing 3133).

7.4.1.1 Statutory Designated Sites

Two statutory designated sites of nature conservation interest are within 2km of the proposed development, Buchan Ness to Collieston SAC and the constituent Bullers of Buchan Coast SSSI. The boundaries of these sites in relation to the Site are illustrated in Drawing 3133.

7.4.1.1.1 Buchan Ness to Collieston SAC

Buchan Ness to Collieston SAC is located approximately 550m to the east. The qualifying interest of this SAC is the Annex 1 habitat Vegetated sea cliffs of the Atlantic and Baltic Coast. The sea cliffs support a wide range of semi-natural plant communities including: maritime heath; acid peatland; and brackish flushes, which are now rare on the coast of north-east Scotland and this section of coastline has some of the best remaining examples. There is an abundance of local species such as Scot's lovage *Ligusticum scoticum* and roseroot *Sedum rosea* and other species which are more typical of southern Britain such as carline thistle *Carlina vulgaris* and cowslip *Primula veris,* which are associated with dry, calcareous grasslands.

SNH confirmed through the Scoping Opinion response from Aberdeenshire Council (2014c) that the proposal will have no impacts on this SAC. This is as a result of the scale and nature of the development and the lack of ecological connectivity from the Site to the designated site. Hence this designated site is not considered further within the EcIA.

7.4.1.1.2 Bullers of Buchan Coast SSSI

This SSSI a constituent of the Buchan Ness to Collieston SAC comprises sea cliffs and inshore stacks which are of special geological and biological interest. Similarly to the SAC, the sea cliffs support a wide range of maritime plant communities with good examples of coastal dwarf-shrub heath and brackish flushes. In addition, the SSSI supports important breeding seabird colonies.

SNH again confirmed through the Scoping Opinion response from Aberdeenshire Council (2014c) that the proposal will have no impacts on this SSSI. This is as a result of the scale and nature of the development and the lack of ecological connectivity from the Site to the designated site. Hence this designated site is not considered further within the EcIA.

7.4.2 Non-Statutory Designated Sites

Within Aberdeenshire, Sites of Interest to Natural Science (SINS) have in the past been used to identify areas of regional value for nature conservation. SINS were identified following a Study of Environmentally Sensitive Areas (SESA's) carried out in 1977. It is now widely recognised that the SINS system is out of date and is under review. As such it is expected that Local Nature Conservation Sites (LNCSs) will replace SINS and sites will be identified in the Aberdeenshire Local Development Plan 2016, which will also contain policies for their protection. Through consultation with Aberdeenshire Council and NESBReC this EcIA has identified the new LNCS sites as receptors and excluded the outdated SESA and SINS from assessment.

The vast majority of the proposed development is located within the Skelmuir Hill, Stirling Hill, Duwick LNCS (No.89). This non-statutory designation is for the Preglacial Buchan Gravels Formation, which is rich in flints, blankets the ridge of Stirling Hill, Hill of Dudwick and Skelmiur Hill. The Den of Boddam glacial meltwater channel is also cited. As these are not biological designations, the site is not considered further within this assessment.

7.4.3 Other Sites and Inventory Habitats

The Scottish Wildlife Trust (SWT) Longhaven Cliffs Reserve is within the boundaries of the designated sites Buchan Ness to Collieston SAC and Bullers of Buchan Coast SSSI. The Reserve is located 550m to the southeast of the ‘Fourfields’ site. It is considered to be important for breeding seabird colonies, along with special habitats such as maritime heath and salt marsh with plants such as devil’s-bit scabious *Succisa pratensis* and grass-of-Parnassus *Parnassia palustris*.

It is assessed that, as no impacts are anticipated on the SAC or SSSI, as confirmed by SNH, this SWT reserve is no longer included within the EcIA.

There are no areas of ancient woodland within 2km of the Phase 1 Survey Area.

7.4.4 Habitats and Flora

The findings of the extended Phase 1 habitat survey were mapped and can be seen in Drawing 3134. The habitats present within the Phase 1 Survey Area as defined in Section 7.3.4.1 are described below. No habitats of significant ecological value were identified to be affected by the proposed development and, as a result, no focussed NVC surveys were required to confirm conservation status of habitats.

7.4.4.1 Dominant Habitats

Improved Grassland

This is the dominant habitat in the AC Cable Route part of the Phase 1 Survey Area. This habitat was dominated by perennial rye-grass-*Lolium perenne* with daisy-*Bellis perennis*, meadow buttercup-*Rannunculus acris*, creeping thistle-*Cirsium arvense* and white clover-*Trifolium repens*. The sward was short and heavily grazed (TN18).

Cultivated/ disturbed land – arable

Arable land is the habitat comprising the majority of the ‘Fourfields’ site, with the fields separated by stone walls, and with very restricted field margins. The arable fields located within the AC Cable Route were generally bordered by post and wire fencing with occasional scrub and hedgerows also present around field boundaries.

Neutral grassland - semi-improved

Located at a number of locations across the Phase 1 Survey Area this habitat was dominated by grasses such as cock’s-foot-*Dactylis glomerata*, crested dog’s-tail-*Cynosurus cristatus* and sweet vernal-grass-*Anthoxanthum odoratum*, along with tall herbs such as common nettle-*Urtica dioica*, foxglove-*Digitalis purpurea*, ribwort plantain-*Plantago lanceolata*, creeping thistle, spear thistle-*Cirsium vulgare*, common ragwort-*Senecio jacobaea* and cow parsley-*Anthriscus sylvestris*.

7.4.4.2 Other Habitats

Other tall herb and fern – ruderal

This habitat comprised a small area around the farm buildings at Denend, where it was dominated by rosebay willowherb-*Chamerion angustifolium*, broad-leaved dock-*Rumex obtusifolius*, spear thistle and common nettle. Along the edge of the southern field (TN3) and the banks of the small burn the habitat had more varied vegetation.

Acid dry dwarf shrub heath

This habitat was found around the top of the disused quarry to the south of the 'Fourfields' site and on the slopes down to Denhead Dam. It was dominated by heather-*Calluna vulgaris* which was short, no more than 30cm high (TN25). There were few other species present, occasional crowberry-*Empetrum nigrum* with the moss-*Pleurozium schreberi* dominating the understorey. Although dominated by ericoids, it is not of sufficient quality to qualify under the Annex 1 and UK BAP habitat heathland definition. However, lowland heathlands are present as priority species on the Scottish Biodiversity List.

Broadleaved plantation woodland

There is an area of broadleaved trees along the northern boundary of the Highfield property, mostly willow species *Salix sp.* and hawthorn *Crataegus monogyna*. Another area of broadleaved plantation bordered the northeast corner of the 'Fourfields' site, these were young trees 2-3m high with a mix of ash-*Fraxinus excelsior*, alder-*Alnus glutinosa*, rowan-*Sorbus aucuparia* and elder-*Sambucus nigra*.

The third broadleaved plantation was to the east of the Peterhead sub-station, on the banking of the entrance road. It comprises a small area with planted young (5m) broadleaved trees, alder and sycamore-*Acer pseudoplatanus*.

Buildings

The buildings within the Phase 1 Survey Area included the agricultural barns and farmhouse at Denend, the residential house and outbuildings at Highfield, the ruined cottage at Denhead, a barn near to the Hill of Boddam, the farmhouse at Gateside and the cottages at Millbank. In addition there were remnants of stone buildings at Whinbush with a small stone barn located opposite Whinbush.

The cottages at Millbank and Gateside were occupied and in a good state of repair, mostly constructed of stone with slate roofs. The farmhouse at Denend was derelict and of similar construction to the agricultural barns, which were of stone walls and slate tile roofs. The farmhouse had a number of potential access points for wildlife, particularly bats, through missing windows and missing tiles from the roof.

There was no access to Highfield so it was not possible to determine exactly how many or in what state of repair the buildings were, however, the main residence is inhabited and hence assumed to be in a good state of repair. At Denhead there was one derelict cottage which was stone built with a slate roof. It was in a poor state of repair most of the windows had no glass, there was no door and slates were missing from the roof. This would potentially provide access for bats and barn owls to roost. The barn near Hill of Boddam was in a similar state of repair and constructed of stone walls and slate roof (TN24). There were two outbuildings, again of stone construction, one with a tile roof the other with a corrugated composite roof. It was not possible to access these buildings, but is assumed that they would also be suitable for roosting bats and potentially barn owls (see Chapter 8: Ornithology).

The remains of stone buildings at Whinbush supported no roof structures, with stone walls not exceeding 2m in height and open to the elements. These were unlikely to provide any significant roosting opportunities. The small stone agricultural barn on the opposite side of the road at Whinbush retained a weather proof interior and provided some suitability for use of bats with open flight paths to within the building.

Coniferous woodland – plantation

Four small blocks of coniferous plantation woodland are scattered across the Phase 1 Survey Area, bordering Highfield and Lendrum Terrace. Only a group of mature coniferous bordering the south edge of the Highfield property were regarded as having a moderate ecological value, although these trees were isolated and overall scattered.

On the southern edge of the coniferous woodland to the south of Highfield a small expanse of Japanese knotweed-*Fallopia japonica* is present. This species is an invasive non-native plant and is listed on Schedule 9 of the Wildlife and Countryside Act 1981.

Marsh/marshy grassland

There were four minor areas of marshy grassland within the Phase 1 Survey Area:

- One located in the corner of the semi-improved field east of the farm at Denend, on the banks of the burn flowing east from Denend (TN14);
- One to the northern boundary of the sub-station; and
- The remaining two located along the disused railway track and near to the quarry settling ponds. This habitat was dominated by either soft rush or compact rush-*Juncus conglomeratus* with occasional Yorkshire fog-*Holcus lanatus*.

Mixed plantation woodland

There were two areas of this habitat within the Phase 1 Survey Area: one just east of the farm cottage at Denend; and one to the east of the Peterhead sub-station. The area next to the cottage at Denend was dominated by mature Sitka spruce-*Picea sitchensis* with some sycamore, with individual ash and goat willow-*Salix caprea*. The area to the east of the sub-station was comprised of Sitka spruce, alder and sycamore.

Quarry

There was a large working quarry within the Phase 1 Survey Area with vertical cliff faces of about 40-50m mostly bare of vegetation. Although there were places which may be suitable for small mammals or bats to shelter it is unlikely that any would be present due to the ongoing disturbance of the working quarry.

There was an area of former quarrying to the west of the Highfield property (100m west of the AC Cable Route) which was colonised by dense European gorse scrub restricting safe access. A further disused quarry was located approximately 100m south of the Fourfields location (TN28). This area was colonised by predominantly heathland vegetation with exposed rock.

Scrub - dense/ continuous and scattered

The main areas of this habitat were found along the banks of the dismantled railway, on the banks of the small unnamed burn that runs from the Den of Boddam in a north easterly direction, and a large area of dense scrub around the disused quarries west of Highfield. This habitat was dominated by European gorse and, particularly where the gorse was very dense, there was no vegetation under it. Extensive signs of rabbit *Oryctolagus cuniculus* (burrows and droppings) was present throughout the habitat, particularly where it bordered grassland.

One area of scrub which was dominated by grey willow carr *Salix cinerea* was located in the flood basin around the small unnamed burn. This habitat was situated in the valley bottom and prone to flooding. Wet woodland is identified as a habitat which is potentially dependent on groundwater but this area of willow carr was assessed to depend on surface drainage rather than groundwater.

Running water

There is a small unnamed burn running from the Den of Boddam in a north easterly direction, which crosses the proposed AC Cable Route in the vicinity of Denend (TN2, TN16). The watercourse appeared to become culverted for a significant portion of its course to the northeast of the A90 trunk road, and outwith the Phase 1 Survey Area. The burn is 0.5-1m wide with a bottom substrate of pebbles and gravel and, at the time of survey in 2014, there was very little water (0.1 – 0.2m) in the bottom which was barely flowing. The banks were quite steep at 70-90° and covered in scrub and tall ruderal vegetation, with plants such as European gorse, broom-*Cytrisus scoparius*, meadowsweet-*Filipendula ulmaria*, raspberry-*Rubus idaeus*, hogweed-*Heracleum sphondylium* and common nettle.

Along the boundary which borders Hjaltland is a drain which will also cross the proposed AC Cable Route, and that drains into the aforementioned small burn. Again this was 0.5-1m wide and 1m deep and wet in places but not flowing. Banks were 60-90° and overgrown with improved grasses, common nettle, soft rush and hogweed. Another small drain flows into the unnamed burn upstream of Denend, at the time of the survey this drain supported open water in places but was not flowing with banks creating a channel 1m wide and 2m deep with steep 70-90° soil banks, mostly overgrown with soft rush and grasses such as Yorkshire fog and cock's-foot.

A small drainage ditch runs along the eastern and northern edge of the Converter Station site (TN21). The drain is approximately 0.5m wide with banks 80-90° and the bottom substrate of gravel, silt and pebbles.

Further information on watercourses is presented in Chapter 11 – Water Quality.

Standing water

There are a number of areas of standing water in the Phase 1 Survey Area. The largest is Braeside Trout Fishery located on the Highfield property, approximately 50m to the north of the 'Fourfields' site. It is approximately 120m x 60m with gently sloping banks covered in semi-improved neutral grassland.

On the north west boundary of the active granite quarry are four settling ponds (TN20), and one pond below these where water has accumulated in a hollow, which appears to be offline from the water treatment system. These are of varying sizes between 5-12m wide and 3-10m long. The banks are steep, of soil and rock, covered in grasses such as cock's-foot, Yorkshire fog, broad-leaved dock with ribwort plantain, European gorse and soft rush. The small pond is approximately 5m x 3m and is completely overgrown with curly waterweed-*Lagarosphion major*, which is an invasive non-native plant and is listed on Schedule 9 of the Wildlife and Countryside Act 1981.

There is another small pond near to Hill of Boddam (TN23), approximately 10m to the east of the edge of the 'Fourfields' site, which was 30m x 5m with banks up to 3m high and steeply sloping, covered in semi-improved grassland with occasional willows.

Further information on waterbodies is presented in Chapter 10 – Water Quality.

Boundary Features – stone walls

Between the arable fields of 'Fourfields' there are dry stone walls which could provide shelter and hibernacula for small mammals and reptiles. Very limited field margins are present within these fields with arable land use extending to within 2m of the dry stone walls.

7.4.5 Protected Species of Fauna

7.4.5.1 Otter

Data records retrieved from NBN gateway during the desk study exercise revealed presence of otter within the 10km grid square NK14, within the River Ugie catchment to the north of Peterhead.

The short distance between the proposed development area and the coast (550m) and the presence of the unnamed burn that runs north easterly between Denend Dam, past the dwelling of Denend and ends at Sandford Bay, along with a number of agricultural drains and waterbodies make the Phase 1 Survey Area likely to be within range of both coastal and inland otter territories. The main unnamed burn is highly modified and has been culverted between the A90 and the coast (a distance of approximately 750m) and is, therefore, unlikely to act as a commuting route.

The extended Phase 1 survey identified otter sprainting at two locations (TN27 and 31). The former was located on the edge of a bog pool 30m to the southeast of the 'Fourfields' site and the latter on the coastal path adjacent to the dismantled railway, approximately 580m to the south of the 'Fourfields' site (Drawing 3134).

The otter survey of all drains and watercourses within 200m of the proposed development identified a potential holt. It was located in the unnamed watercourse approximately 50m upstream of the road culvert at Denend as shown in Appendix B.2. The burrow was on the edge of the stream (potentially being submerged in high flows) and was sheltered by dense gorse scrub with an entrance of approximately 20cm in diameter and roughly circular. No field signs to categorically confirm use by otter or any other animal were present, but the structure and location of the burrow was consistent with that of otter.

In addition, a single weathered spraint was located on a rock close to pond situated 225m to the southeast of the 'Fourfields' site, just out with the Phase 1 Survey Area (TN27). No other signs of use by otter were identified during the otter survey, although the dense scrub and areas of restricted access may support such signs.

7.4.5.2 Bats

As a result of the Extended Phase 1 habitat survey it was determined that the main consideration in terms of bats was the buildings associated with Denend Farm, Denhead, Whinbush and Highfield. These buildings offered numerous opportunities for roosting bats or were inaccessible for assessment. In addition, the disused quarries could potentially offer some roosting potential. Across the Phase 1 Survey Area the buildings, gardens, scattered trees, scrub and woodland edges offer sheltered habitats for foraging bats.

The unnamed burn running north easterly past Denend and the associated marshy grassland and scrub habitats offered the most suitable habitat for foraging and commuting bats, but remained sub-optimal due to the lack of sheltered environments. The Braeside Trout Fishery pond may also offer some suitability as foraging habitat.

The agricultural landscape with improved grassland and arable fields which was widespread within the Phase 1 Survey Area offered somewhat limited resources for bats, although dependent on crop regimes some seasonal foraging resources may exist.

7.4.5.3 Aquatic Ecology

The aquatic habitats characteristics within the Phase 1 Survey Area are detailed in Section 7.4.4 (Running Water) which identifies that the watercourses are highly modified, with extensive culverts present and ongoing pressures from surrounding land use. Furthermore, the watercourses within the Phase 1 Survey Area are not identified as important for salmonids (FFD/WFD). As a result it is assessed that fish access to the Phase 1 Survey Area is very limited and the conservation value of the aquatic ecology within the Phase 1 Survey Area also restricted. Due to the agricultural pressures on these watercourses, it is assessed that the invertebrate fauna supported will be dominated by common and widespread species with limited ecological value.

7.4.5.4 Water vole

No evidence of any water vole activity was found during the Phase 1 habitat survey. However, it was assessed that the aquatic and associated habitats offered suitable habitat for water voles.

During the protected mammal survey, extensive evidence of water vole presence was found along the unnamed burn downstream of the road crossing near Denend (Appendix B.2). The water vole colony did not extend west to the other side of the road where the habitat is far less suitable due to extent of gorse scrub. Despite over ten latrines being identified along the 250m stretch of burn, no burrows were identified. This is probably due to the dense vegetation and steep sided banks making searches difficult. All other watercourses did not support evidence of water vole being present at the time of survey.

7.4.5.5 Badger

During the extended Phase 1 survey evidence of badgers was identified at two locations, a latrine at a disused quarry situated on the hill above Longhaven Mains and a latrine at the edge of the valley mire located 310m to the south of the ‘Fourfields’ site. No confirmed setts were identified although a number of areas offered potential for sett construction including the disused quarry where the first latrine was found, and the banks to the south of the Denend farmhouse which showed signs of a potential relict sett, now long abandoned.

During the survey taken in September 2014, limited evidence to suggest that badger were present within the Badger Survey Area was identified. Only a single field sign confirming the presence was recorded in the form of snagged hair on barbed wire fence to the south of Denend, approximately 120m away from the proposed AC cable corridor (Appendix B.2). No evidence of setts or latrines were identified from within the Badger Survey Area.

The agricultural nature of the Phase 1 Survey Area and surrounding landscape offers highly suitable habitat for badgers, and the presence in places of dense gorse cover could have obscured signs of setts being present. It is therefore likely that badgers use the Phase 1 Survey Area on a frequent basis for foraging.

7.4.5.6 Amphibians and Reptiles

No sightings of reptiles occurred during the extended Phase 1 survey and only one common frog-*Rana temporaria,* was observed close to a boggy pool situated 20m to the south of the 'Fourfields' site (TN26). Records from NESBReC showed that common toad-*Bufo bufo* and common lizard-*Zootoca vivipara* have been recorded in the area (outwith the Site boundary) and it is assessed that these species are likely to be present at low density across suitable habitats within the Phase 1 Survey Area.

Agricultural landscapes and the associated disturbance from farm machinery (arable) and livestock (pasture) offers limited suitable habitat. Nonetheless reptiles including adder-*Vipera berus* and common lizard are present throughout this region, and it is possible that small numbers of reptiles may be present within undisturbed areas, possibly in the dry heath around the disused quarry and along dry stone walls which also offer potential hibernation habitat.

Great crested newts-*Triturus cristatus* have extremely limited distribution in this part of Scotland, with the nearest population in excess of 100km's away (NBN Gateway). The ponds within the Phase 1 Survey Area are generally unsuitable for great crested newts, with agricultural ponds being highly disturbed by livestock, former quarry ponds supporting no aquatic vegetation and the lagoons supporting predominantly highly silted water. As a result, the possibility of this European Protected Species (EPS) being present within the Phase 1 Survey Area is assessed as being negligible.

7.4.5.7 Other considerations on Fauna

No invertebrate species of conservation concern (Scottish Biodiversity List, LBAP, UKBAP, Red Data List) were identified within data searches or through consultations.

Species including Scottish wildcat-*Felis silvestris*, pine marten-*Martes martes* and red squirrel-*Sciurus vulgaris* were assessed to be absent from the Phase 1 Survey Area due to lack of suitable habitat and generally outside the species range. As a result, these species were not assessed as part of this EcIA.

No other non-avian species of conservation concern were identified as potentially being present from desktop studies or field surveys.

7.4.6 Valuation of Key Receptors

This section evaluates the nature conservation interest of the Phase 1 Survey Area for its habitats and for the species it supports in terms of its relative importance in a geographical context. The value for each receptor is presented in Table 7.4.1, in which receptors requiring legal consideration are identified with an asterisk [*].

Table 7.4.1: Evaluation of Nature Conservation Interest

Ecological Receptor	Conservation Importance	Evaluation Rationale	Site Ecological Receptor Value
Designated Sites for Nature Conservation			
Buchan Ness to Collieston SAC	International	Assessed as not having any impacts due to lack of ecological connectivity and scale and nature of development. Confirmed by SNH through scoping.	Negligible - excluded from further assessment
Bullers of Buchan Coast SSSI	National	Assessed as not having any impacts due to lack of ecological connectivity and scale and nature of development. Confirmed by SNH through scoping.	Negligible - excluded from further assessment
Other Sites and Inventory Habitats			
Longhaven Cliffs Reserve	High Local	Reserve is located within SAC and as such is also assessed as not having any impacts due to lack of ecological connectivity and scale and nature of development.	Negligible - excluded from further assessment
Habitats / Flora – Dominant Habitats			
Improved Grassland	Negligible	The habitat is very common both locally and nationally. This habitat is ecologically unremarkable.	Negligible - excluded from further assessment
Cultivated / disturbed land - arable	Local	Although Arable Field Margins is a UK BAP Priority Habitat, no significant field margins are present within the Phase 1 Survey Area and the arable habitats are highly managed through modern agricultural techniques. The wider landscape is dominated by this habitat which does offer some limited valuable habitat for a wildlife such as hibernation and commuting habitat for reptiles.	Low Local
Neutral grassland - semi-improved	Regional	The areas of semi-improved neutral grassland can support a number of invertebrate and small mammal species which can enrich the local biodiversity. This feature is common and widespread at a local and regional level and supports an unremarkable array of floral species. The habitat is recognised within the LBAP.	Low Local
Habitats / Flora – Other Habitats			

Ecological Receptor	Conservation Importance	Evaluation Rationale	Site Ecological Receptor Value
Other tall herb and fern - ruderal	Negligible	The limited and isolated distribution of this habitat within the Phase 1 Survey Area determined that it only showed a negligible ecological value.	Negligible - excluded from further assessment
Acid dry dwarf shrub heath	National	It is affiliated to the UK BAP 'Lowland Heathland', but the two patches within the Phase 1 Survey Area are of poor quality, isolated and their extent within the Phase 1 Survey Area is relatively small.	Moderate Local
Broadleaved woodland – plantation and semi-natural	National	Although woodland habitats are of value this area is considered to be of rather limited ecological value due to its isolation and poor species diversity.	Low Local
Buildings	Negligible	Assessment of the impacts on bat roosting habitat is assessed separately. Buildings are not considered further in this ecological assessment in the context of habitats.	Negligible - excluded from further assessment
Coniferous woodland – plantation	Local	Four small blocks of coniferous plantation woodland across Phase 1 Survey Area, bordering Highfield and Lendrum Terrace. This habitat is considered to be of limited ecological value although the habitat is relatively limited in the wider environs so may offer some value as shelter for wildlife.	Low Local
Marsh/marshy grassland	Local	The habitat is present due to surface water movements and is related to farm management practices. Botanically the habitat is relatively unremarkable although it may provide some habitat for a variety of invertebrates. The habitat within the Phase 1 Survey Area is often poached by cattle.	Low Local
Mixed woodland - plantation	National	Mixed plantation is present in small, often isolated, compartments within the Phase 1 Survey Area. Although affiliated with the UK BAP priority habitat 'Lowland Mixed Deciduous Woodland', this habitat is considered to be of rather limited ecological value due to its isolation, young age and small size.	Low Local

Ecological Receptor	Conservation Importance	Evaluation Rationale	Site Ecological Receptor Value
Quarry	Local	As a habitat the quarry offered no significant ecological value, however there is potential for the cliffs to provide shelter for a range of species. The majority of these areas remain active quarry sites and therefore their value is highly restricted.	Low Local
Scrub - dense/ continuous and scattered	Negligible	Scrub dominated by European gorse is not notable in biodiversity terms, although it provides shelter and foraging habitat for a number of species (e.g. birds, invertebrates and mammals).	Negligible - excluded from further assessment
Running water	Regional	Rivers are listed as a UK BAP Priority habitat. Although all of the watercourses within the Phase 1 Survey Area are minor and have been modified and impacted upon by agricultural activities. The presence of otter (probable) and water vole (confirmed) linked to the watercourses make them valuable from an ecological perspective.	High Local
Standing water	Local	Standing open water is a Priority UK BAP habitat (Ponds). A number of ponds are located within the Phase 1 Survey Area. These areas have some but limited ecological value, notably for common amphibians and invertebrates, but are not key features.	Low Local
Boundary Features (stone walls, hedgerows)	Local	Hedgerows and Field Margins are UK BAP Priority habitat and feature within the LBAP. Stone walls provide suitable habitat for reptiles and offer connectivity but offer little other ecological value.	Low Local
Fauna			
Otter	International	Otters are a UK BAP priority species and receive full legal protection as an EPS. Otters are found throughout most of Scotland, the species is considered relatively widespread and common and the Scottish population represents 90% of the total British population (Scottish Natural Heritage, 2010). Otter spraints and a potential holt site have been identified in the burn close to Denend.	High Local*

Ecological Receptor	Conservation Importance	Evaluation Rationale	Site Ecological Receptor Value
Bat	International	All bat species receive full legal protection as an EPS, via inclusion on Schedule 2 of the Conservation (Natural Habitats & c.) Regulations 1994. The potential for bats within and around the Phase 1 Survey Area was assessed as high due to presence of scattered buildings, disused quarries, scrub sections, marshy grassland and woodland edge habitat that could provide roosting habitat, flight lines and feeding/foraging opportunities.	Low Local*
Aquatic Ecology	International	Limited potential for supporting fish populations and is not designated as salmonid waters. Ongoing pressures from land use activities combined with the highly modified channels results in limited conservation value. Supports water vole and other common and widespread species.	Low Local
Water vole	National	Small population present on a short section of an unnamed burn. Water vole are distributed throughout much of north east Scotland.	High Local*
Amphibians and Reptiles	National	All UK native amphibian and reptile species receive full legal protection under the Wildlife and Countryside Act 1981 (as amended). The naturally occurring species in Scotland are listed in the Scottish Biodiversity List and the UK BAP. Only one young frog was seen close to a pool within the Phase 1 Survey Area. Reptiles including adder and common lizard are present throughout this region and it is possible that small numbers of reptiles may be present within undisturbed areas.	Low Local*
Badger	National	Badgers are identified as being present on at least an infrequent basis across the Badger Survey Area, with a number of habitats likely to provide foraging resources. No evidence of active setts was identified although the dense scrub and areas of restricted access may support such.	Low Local*

* Receptors requiring legal consideration.

7.5 Impact Assessment

The impacts of the development on the non-avian ecological receptors which have been assessed as having some ecological value are assessed in terms of their impact magnitude and significance. Where impacts are negligible, no further assessment is undertaken.

7.5.1 Nature of Potential Impacts

A number of potential impacts (in the absence of secondary mitigation) have been identified in connection with both the construction and operation phases of the development, and these may be direct or indirect impacts:

- Permanent loss of habitat and species present within the construction footprint of the development (primarily the Converter Station) and associated infrastructure;
- Temporary loss of habitats and species within the construction footprint of the AC Cable Route, due to excavation of cabling trenches, installation of haul roads/drainage ditches, storage of soil heaps, construction laydown areas and site compound facilities;
- Disturbance to species protected under European and National legislation;
- Direct physical damage inflicted to protected species as a consequence of construction works, resulting in injury or death;
- Pollution and degradations of watercourses/water quality due to construction disturbance, pollution and run-off;
- Fragmentation of habitats and severance of ecological corridors during construction; and
- Indirect temporary impacts on adjacent habitats (and the species that use them) for example through noise, light and visual disturbance.

7.5.2 Construction stage

7.5.2.1 Habitats and Flora

The assessment of impacts derived from the proposed development of the Converter Station building and ancillary infrastructures, AC cable installation and temporary construction elements upon the local habitats is carried out below. The project design has made all reasonable attempts to avoid significant impacts to sensitive habitats and unavoidable impacts are minimised wherever possible through embedded ‘primary mitigation measures’, which have been incorporated within the assessment of effects

Dominant Habitats

<u>Cultivated/ disturbed land – arable</u>

The development will lead to the permanent loss of arable land, specifically an area of 11.2Ha which will be occupied by the Converter Station building, the ancillary elements and landscaping mounds. Arable land along the AC cable corridor will be temporarily disturbed and reinstated once the construction is complete.

The value of this receptor has been assessed as low local as it is common and widespread habitat both local and nationally and undergoes regular modifications. The habitat loss will also result in some minor fragmentation of habitat but this is considered to be a negligible impact. The permanent loss of arable land in the 'Fourfields' site will be regarded as an impact of high magnitude since the features and attributes of the land will be permanently modified. However, the resulting effect will be minor and not significant. The temporary loss of arable land along the AC Cable Route and within the 'Fourfields' site will be regarded as a low magnitude impact, as the land will be reinstated to its original state once the works are finished, so the resulting effect will be considered minor and not significant.

Overall the anticipated impacts on the arable habitat is assessed to be of minor significance and not significant in terms of this EcIA.

Neutral grassland - semi-improved

This habitat is common and widespread within the Phase 1 Survey Area and wider environs, however, only two small sections (close to Denend and on the western edge of Peterhead substation) of this habitat will be affected by the temporary habitat loss associated with the installation of the AC cable. Any fragmentation will be extremely localised and short in duration, with habitat reinstatement following the construction works.

The magnitude of the impact is therefore considered to be low, resulting in an overall negligible effect and not significant in terms of this EcIA.

Other Habitats

Acid dry dwarf shrub heath

It is not expected that the proposed development will result in any direct impact (permanent or temporary habitat loss) on this habitat. The potential for indirect impacts from dust deposition is also expected to be, at worst, minimal due to the distance of the proposed works from the habitat.

The magnitude of the impacts on this habitat is assessed as negligible and the resulting effect significance is Negligible and not significant in terms of this EcIA.

Broadleaved plantation woodland

It is not expected that either the broadleaved plantation area to the north of Highfield, or the one to the east of the Peterhead sub-station, will be directly or indirectly affected by the proposed development, as the two areas are at a considerable distance from any proposed works.

Therefore, the magnitude of the impacts on this habitat is assessed as negligible and the resulting effect significance is negligible and not significant in terms of this EcIA.

Coniferous woodland – plantation

It is not expected that any loss of coniferous woodland will occur during the proposed construction works, with the Converter Station and AC Cable Route avoiding all areas of coniferous woodland.

Therefore, the magnitude of the impacts on this habitat is assessed as negligible and the resulting effect significance is negligible and not significant in terms of this EcIA.

Marsh/marshy grassland

Two areas of marshy grassland habitat (adjacent to the unnamed watercourse and along the northern boundary of the Peterhead sub-station) will be affected temporarily during the installation of the AC cable. The impacts will include temporary loss of habitat over a small area (0.05ha) which will be reinstated on completion of the cable installation.

The marshy grassland has been assessed not to be linked to groundwater resources and is significantly affected by ongoing agricultural activities. The impact magnitude, therefore, can be regarded as low resulting in an effect significance of negligible and not significant in terms of this EcIA.

Mixed plantation woodland

Due to sensitive design it is not expected that any loss of mixed plantation woodland will occur during the proposed construction works with the AC Cable Route designed to avoid areas of woodland.

The magnitude of the impacts on this habitat is assessed as negligible and the resulting effect significance is negligible and not significant in terms of this EcIA.

Quarry

No loss of quarry habitat is expected as a consequence of the proposed development. The potential impact will therefore be considered of negligible magnitude and the resulting effect will be Negligible and not significant in terms of this EcIA.

Running water

The route of the AC cable will cross both the unnamed burn that runs north easterly between the Dam at Denhead and Sandford Bay within the vicinity of Denend, and agricultural drains in the vicinity of Hjaltland. At these locations the AC Cable Route will be buried beneath the bed of the burn and ditch resulting in no permanent disruption. At the location of the crossing of the watercourse and the ditches, cable burial will be deepened to ensure adequate clearance depending on ground conditions between the bed of the watercourse and the top of the cable. Installation will be carried out using open cut trenching with installation of coffer dams to temporarily culvert flow of water through excavations. Appropriate sediment control and pollution prevention measures will be planned for these operations and no significant fragmentation of the watercourse or ditch is expected as a result of the temporary impacts. Furthermore it is not considered that the watercourse or ditch represent important habitat for fish, especially migratory fish.

Full reinstatement of the channel/ditch will be completed immediately after the works. The temporary loss and disturbance to habitat will result in a low magnitude impact.

Working within or adjacent to watercourses increases the risk of impacts on the water environment occurring from pollution incidents. While the effects of the development on the water quality features will be further assessed within Chapter 11: Water Quality, the impact derived from water quality variations on ecological receptors can be considered as having a low magnitude since the working areas will be isolated from the watercourses' main streams, which will limit the risk of sediments or accidental spills from entering the watercourses while working within the channel. The increased risk of pollution incidents occurring results in a low magnitude impact.

A further agricultural drain will be impacted upon due to the need to strengthen and potentially extend an existing culvert to allow the development of the access track from the existing quarry access road to the location of the Converter Station. This location is downstream of the pond in the south east of the Phase 1 Survey Area and will result in minimal impacts from the extension of the existing culvert.

Further impacts on water quality of the agricultural drain east of the Converter Station may result from the earthworks associated with the building construction. Unmitigated clearance and movements of significant volumes of topsoil and subsurface soil/rock could result in sediment input to the ditch network, especially under extreme rainfall events.

Potential impacts to mammals, including water vole and otter, which are likely to use the watercourses and ditches is discussed separately under the individual animal assessments.

Overall the anticipated impact magnitude on running water is expected to be low and the resulting effect significance is minor and not significant in terms of this EcIA.

Standing Water

It is not expected that there will any direct impacts on standing water bodies as a consequence of the proposed development. The Braeside Trout Fishery pond located within the Highfield property is located approximately 50m from the northern edge of the Converter Station location and is not hydrologically linked with the works area.

The five settling ponds within the active quarry continue to be utilised by the quarry for the management of the outwash from the processing plant and again, not hydrologically linked to the works area.

The small pond to the east of the Converter Station location is not expected to be impacted due to it being located in excess of 100m upstream from the area of proposed works, and on the distal side of a drain. The former quarry ponds are also in excess of 100m from any proposed works and are not hydrologically linked to the works areas.

The ecological value assigned to the standing water features within the Phase 1 Survey Area is low local as the ponds are mostly of small extension and dependant on human activities (recreational, quarry management, farmland practices).

It is possible that some of these ponds could receive surface flows of water contaminated with pollutants and/or sediments. However, best practice methodology in terms of managing on site run-off and chemical management will be employed (see Chapter 11: Water Quality).

Potential impacts to mammals, including water vole and otter, which are likely to use the watercourses and ditches is discussed separately under the individual animal assessments.

Overall the anticipated impact magnitude on standing water is expected to be low and the resulting effect significance is Minor and not significant in terms of this EcIA.

Boundary Features – stone walls

Between the arable fields of 'Fourfields' there are dry stone walls which will need to be dismantled and relocated in order to accommodate the proposed Converter Station and associated infrastructure. In total a length of 680m of stone walls will be lost.

Although of limited ecological value in themselves, it is recognised that these walls may support reptiles and amphibians, especially during the hibernating period. In the absence of secondary mitigation there will be significant loss, fragmentation and isolation of these features resulting in a high impact magnitude resulting in a Minor effect significance although not significant in terms of this EcIA. However, it should be recognised that reptiles and amphibians are afforded some protection against killing and injury.

Invasive Species

As detailed, Japanese knotweed and curly waterweed are both present within the Phase 1 Survey Area. However, neither of the areas will be affected directly or indirectly by the proposed works.

7.5.2.2 Protected Species

Otter

Although the potential holt has, at this stage, not been subject to further assessments to confirm its activity, the design process has taken the location into account on the assumption that the holt is occupied at the time of the works. As a result, the holt remains out with the planning application boundary and will allow a no works buffer to the holt location of 40m with the cable located as close to the public road as possible at this location.

Potential impact routes on otter therefore include the following:

- Temporary fragmentation of commuter routes – disturbance free routes along watercourse in easterly direction will be temporarily interrupted during works on short section of cable traversing the watercourse;
- Visual disturbance – avoidance of disturbed areas by otters may alter their spatial use of the surrounding landscape including disruption to commuting and foraging patterns;
- Noise disturbance – this may also be a result of proposed works and potentially impact otters in a similar fashion to visual disturbances;
- Water quality impacts – if these were to occur (from chemical or sediment inputs) they could impact on otter prey and therefore on the foraging success of otter;
- Water flow – potential changes in water flow due to installation of temporary coffer dams (and culverts) which may alter the suitability of the potential holt for use by otter depending on the morphology of the underground structure;
- Changes in otter use – it is possible that as otter are present changes in their use of landscape could occur prior to works commencing. A new holt for instance could result in the impact assessments changing significantly; and
- Accidental killing/injury – construction works could result in the accidental killing or injury of otters should they become trapped within excavations, plant or stored materials if precautions are not taken.

In the absence of secondary mitigation measures, these impacts are collectively assessed to result in a medium magnitude impact and the resulting effect significance is minor and not significant in terms of this EcIA. However, it should be recognised that otter is a European Protected Species and afforded full protection under the Habitats Regulations. As such, if disturbance to otter is anticipated, there may be the need for a derogation licence to be applied for prior to works commencing.

Bats

No buildings, mature trees or other potential roosting habitat will be affected as part of the proposed development works. Permanent habitat loss (3.6ha) associated with the Converter Station is restricted to arable fields and field boundaries which are open in nature and unlikely to provide valuable foraging resources for bats. Temporary habitat loss associated with the AC Cable Route does not permanently sever any potentially important commuting routes (e.g. significant hedgerows) and the habitat loss is both small in area and temporary in nature.

Works within the watercourses and ditches (both along the AC route and access track to the Converter Station) may result in temporary indirect disturbance in flight lines due to the presence of construction plant, lighting and alterations to habitats, but these potential impacts will be short in duration and extent.

In the absence of secondary mitigation measures, these impacts are collectively assessed to result in a low magnitude impact and the resulting effect significance is minor and not significant in terms of this EcIA.

However, it should be recognised that bats are European Protected Species and afforded full protection under the Habitats Regulations. As such, if disturbance to bats is anticipated, there may be the need for a derogation licence to be applied for prior to works commencing although this is assessed to be highly unlikely due to the suitability of the habitat for foraging/commuting bats and the lack of impact on potential roosting features.

Aquatic Ecology

The watercourses are presently disturbed from agricultural activities and are assessed as having limited conservation value other than the associated potential presence of otter and confirmed presence of water vole. The proposed works will include temporary disturbance of the unnamed watercourse and an agricultural drain at the locations of AC Cable Route crossings. At both locations the flow of water will be temporarily managed through the use of coffer dams and culverts. These dams and culverts will maintain natural flow regime and will be left in place for as short a period as possible. Prior to removal of the dams and culvert the channel bed will be restored to its former profile and original substrate will be relocated into the channel. This will result in a very limited impact on the aquatic ecology of the watercourse and ditch.

Overall the anticipated impact magnitude on aquatic ecology is expected to be low and the resulting effect significance is Minor and not significant in terms of this EcIA.

Water vole

Water voles were present along a stretch of the unnamed burn to the east of the public road and this has been taken into consideration during the design process. As a result, no direct impacts on the section of watercourse supporting water voles is anticipated. The AC Cable Route will be installed on the distal side (west) of the public road as it traverses the watercourse. The watercourse on the west of the road supported no evidence of water voles and was suboptimal habitat due to extensive gorse scrub and reduced levels of tall herb and grassland.

No significant increase in habitat fragmentation will occur as works are linear in nature and cross perpendicular to the watercourse, resulting in a very small footprint across the sub-optimal and presently unoccupied water vole habitat to the west of the public road.

Some potential impact routes on water vole do exist and include:

- Water quality impacts – if these were to occur (from chemical or sediment inputs) they could impact on water vole foraging resources although with the majority of water vole food located on the terrestrial habitats this is unlikely;
- Water flow – potential changes in water flow due to installation of temporary coffer dams (and culverts) which may alter the suitability of the habitat for water vole especially if water levels downstream (within the occupied regions) are lowered significantly as this reduces their predator avoidance capabilities; and
- Changes in water vole use – water voles often change their distribution year to year and it is possible that the existing population distribution could expand or relocate to include additional areas.

In the absence of secondary mitigation measures these impacts are collectively assessed to result in a low magnitude impact and the resulting effect significance is minor and not significant in terms of this EcIA. However, it should be recognised that water vole is listed on Appendix 5 of the WCA and afforded partial protection. As such, if direct disturbance to water vole burrows is anticipated, there may be the need for a derogation licence to be applied for prior to works commencing.

Amphibians and Reptiles

Common amphibian species and associated suitable habitats were recorded on site including ponds and marshy grassland. The design of the development has attempted to avoid these habitats as much as is possible with no permanent loss of optimal amphibian habitat occurring. Temporary disturbance of areas of marshy grassland will be reduced, as far as is practicable, with subsequent reinstatement further reducing impacts on amphibians. Impacts on water quality within ponds and watercourses is also anticipated to be negligible.

With respect to reptiles, the only highly suitable habitat to be affected are the sections of stone wall. Approximately 680m of these walls will need to be removed to allow the construction of the Converter Station. The stone walls provide both hibernation habitat and act as corridors for movement through the wider landscape. Although the stone walls are located within sub-optimal habitat for reptile species, such as common lizard, the wider environs provide good quality habitat (e.g. heath and scattered scrub), and therefore hibernating reptiles from an area extending beyond the Phase 1 Survey Area may be present within the stone walls during the winter months.

In the absence of secondary mitigation measures, these impacts are collectively assessed to result in a medium magnitude impact on amphibian and reptiles, with a resulting Minor effect significance and not significant in terms of this EcIA. However, it should be recognised that reptiles, such as common lizard, are afforded partial protection under the WCA.

Badger

No setts will be affected by the proposed development. The Converter Station will result in 3.6Ha of suitable foraging habitats (arable) being lost permanently with further temporary loss along the AC Cable Route. The landscape supports extensive agricultural habitats for foraging and it is unlikely that the loss of these areas will have a significant impact on local social groups. There is the possibility that badgers may become trapped in excavations, plant or stored materials if precautions are not taken.

In the absence of secondary mitigation measures, these impacts are assessed to result in a low magnitude impact on badgers, with a resulting minor effect significance and not significant in terms of this EcIA. However, it should be recognised that badgers and their setts are afforded a level of protection under the Badger Protection Act.

7.5.3 Operation / Maintenance

Once the Converter Station is operational, there will be minimal disturbance and/or impact on the ecological receptors identified above. The AC Cable Route and temporary construction sites will undergo reinstatement and landscaping works as part of wider landscape enhancement plan, which is assessed to provide an overall positive impact. These landscape plans are presented in detail in Chapter 10 but will include the following components:

- Creation of 1.8Ha of native mixed woodland planted on the landscaping mounds of the Converter Station with a species mix of 34 native woodland species;
- Creation of 7.2Ha of native coastal meadow with a locally relevant mix of approximately 20 native flowering herbs and five grass species;
- Creation of approximately 1.2Ha of 'green roof' using sedum matting (Converter Station Building, Control Building and GIS Building);
- 4.8Ha of current arable land will become grazing pastures; and
- 420m of new native hedgerow along the south and eastern boundaries consisting of hawthorn, blackthorn-*Prunus spinosa* and dog rose *Rosa canina*.

These components will be subject to ongoing management to ensure that the desired outcome of a 'natural' looking woodland and meadow habitat is obtained and maintained in the long term.

In the context of the Site, the addition of these habitats will provide a net gain in biodiversity, increasing the floral and structural diversity which in turn will provide habitat for birds, mammals and invertebrates. Although the sedum roof will not be accessible to non-flying animals, it will provide some benefit to invertebrates and in turn birds and potentially bats.

7.5.4 Decommissioning

The lifespan of the development is at least 60 years and it is anticipated that the site could be retained and used for an alternative commercial purpose with only minor alterations, or the building demolished and the site reused for an alternative purpose.

However, if the development becomes redundant then the decommissioning is likely to involve the complete removal of the Converter Station building and contents, hardstanding and associated infrastructure. The necessity of reprofiling of the landscape to return to pre-development levels and land use would be assessed taking into consideration the habitats that will have become established.

The removal of the AC cable will be dependent on the commercial viability of the process. If non-viable then the terminals will be made safe and the cable left in situ. If removed then a working corridor would be established, a trench dug above the cable and the cable removed and the trench backfilled and restored to its former use.

Effects on ecological receptors during decommissioning are likely to be similar in nature to those identified during the construction phase based on the anticipated ecological receptors and, as a result, it is unlikely that any significant impacts following current EcIA guidelines would result.

A reassessment of environmental effects would need to be undertaken prior to decommissioning to validate these anticipated effects due to the passage of time and transitory nature of species and regeneration / establishment of vegetation over time.

7.6 Mitigation Measures

This section outlines the proposed mitigation strategy for the development. Mitigation measures are aimed to prevent or reduce any likely significant effects on the ecological receptors identified. In line with EcIA guidance, mitigation measures are required for impacts identified as being of minor significance or greater in EcIA terms. Potential impacts of the development on valued ecological receptors have been minimised through careful site design, resulting in no significant effects being identified. As detailed in Chapter 3: Methodology, standard construction practices, such as Pollution Prevention Guidance are assumed to be applied. However, where the overall EcIA significance is less than minor, mitigation may not be required but some habitats and species are still subject to mitigation to ensure high environmental working standards and legal compliance.

7.6.1 Invasive Species

As part of the Construction Environment Management Document (CEMD) the two locations supporting invasive non-native species will be identified on relevant constraints drawings. If works are located within 50m of either location, then the areas containing the invasive species will be clearly marked to prevent any disturbance. If these areas are to be disturbed, then a suitably experienced professional should be consulted with respect to the most appropriate method of managing the invasive species.

7.6.2 Protected Species

7.6.2.1 Otter

A pre-construction survey, to identify if the present use of the Otter Survey Area has altered, will be conducted prior to work commencing. This will focus on all watercourses within 200m of the proposed infrastructure and should be completed within 6-8 weeks of the start of construction. It is planned that the use of the potential holt will be further assessed with the deployment of a camera trap in proximity (but not disturbing) the holt.

A buffer of 40m to the potential holt will be clearly marked, although this will be reviewed dependent on the level of activity identified during the period of camera trapping. Micrositing to increase the distance of the works from the holt will also be used where practicable.

Dependent on the results of the pre-construction surveys, an assessment of the likelihood of disturbance to otter will be undertaken and the need for a derogation licence under the Conservation (Natural Habitats &c.) Regulations 1994 as amended in Scotland will be assessed and discussed with SNH.

Any pipes or other such materials shall be stored upright, or have covers fitted to the ends to prevent entrapment, and all excavations shall be covered and/or provisions (ramps) made to allow mammals, should they fall in, to escape by themselves.

In the unlikely event that a previously undiscovered large mammal burrow is identified, then works will stop within 30m of the burrow and the ECoW or suitably qualified ecologist consulted.

Trenching under the watercourses and associated use of coffer dams and culverts shall be undertaken following best practice techniques (SEPA, 2009), with duration and extent of disturbance minimised and habitat reinstatement undertaken at the earliest opportunity.

Artificial lighting along watercourses should be minimised wherever possible and directed to only the areas where it is required.

All relevant staff will be made aware of the considerations with respect to otter through tool box talks.

7.6.2.2 Bats

Many of the measures proposed to safeguard otter will assist in reducing potential impacts for local bat populations. In particular, reduction in the extent of artificial lighting for construction works during hours of darkness and minimising the duration and extent of works, will reduce the potential for negative impacts. The potential for unnecessary light spill associated with the ongoing operation of the Converter Station will be reduced by the presence of the landscape screening mounds. Furthermore, the exterior of the building will not be lit by bright security style lighting during night time hours, with lighting utilised only where required for safe working conditions.

7.6.2.3 Aquatic Ecology

As detailed above, trenching under the watercourses and associated use of coffer dams and culverts shall be undertaken following best practice techniques (SEPA, 2009), with duration and extent of disturbance minimised and habitat reinstatement undertaken at the earliest opportunity.

At location of works adjacent to, and within, watercourses, extreme care must be taken to prevent pollution of watercourses either from chemicals or sediment. The site wide CEMD will include location specific components for the sensitive water crossings.

7.6.2.4 Water vole

A pre-construction survey to identify if the present use of the Water Vole Survey Area has altered will be conducted prior to work commencing. This will focus on all watercourses within 200m of the proposed infrastructure and should be completed within 6-8 weeks of the start of construction, taking into account the seasonal constraints of the survey methodology.

To reduce the likelihood of the water vole colony extending to the western side of the public road and the location of the proposed cable crossing, the existing dense scrub should be retained for as long as possible, as this habitat reduces the suitability of the location to support water voles. Immediately prior to works, the required working corridor will be carefully cleared of vegetation under supervision from the ECoW. Once scrub vegetation has been cleared, the area should be maintained at a very short sward to reduce the suitability for water vole and discourage colonisation.

Any pipes or other such materials shall be stored upright, or have covers fitted to the ends to prevent entrapment, and all excavations shall be covered and/or provisions (ramps) made to allow mammals, should they fall in to escape by themselves.

In the unlikely event that a previously undiscovered water vole burrows are identified, works will stop within 10m of the burrow and the ECoW or suitably qualified ecologist consulted.

As detailed above, trenching under the watercourses and associated use of coffer dams and culverts shall be undertaken following best practice techniques (SEPA, 2009), with duration and extent of disturbance minimised and habitat reinstatement undertaken at the earliest opportunity.

All relevant staff will be made aware of the considerations with respect to water vole through tool box talks. If at any point the potential for significant disturbance to water voles and/or destruction of burrows cannot be ruled out, then a derogation licence under the WCA may be required.

7.6.2.5 Badger

A pre-construction survey to identify if the present use of the Badger Survey Area has altered will be conducted prior to work commencing. This will focus on all areas within 100m of the proposed infrastructure and should be completed within 6-8 weeks of the start of construction, taking into account the seasonal constraints of the survey methodology. Dependent on the results, there may be the need for a badger protection plan to be incorporated into the CEMD.

In the unlikely event that a previously undiscovered large mammal burrow is identified, works will stop within 30m of the burrow and the ECoW or suitably qualified ecologist consulted.

Any pipes or other such materials shall be stored upright, or have covers fitted to the ends to prevent entrapment, and all excavations shall be covered and/or provisions (ramps) made to allow mammals, should they fall in, to escape by themselves.

7.6.2.6 Amphibians and Reptiles

The sections of stone walls to be removed (totalling 680m) will be undertaken out with the reptile and amphibian hibernation period (October to March – weather dependent) to prevent disturbance at the most sensitive time of year. The walls will be dismantled under controlled conditions (where possible by hand) supervised by a suitably experience ECoW.

It is likely that any reptiles found within the walls will disperse away from the disturbance (if undertaken during warm weather conditions). If dormant or immobile individuals are located then these will be relocated by hand to a suitable receptor location in close proximity, but outwith the area of disturbance. It is unlikely that any licensing requirements will be required, although dependent on the findings dialogue with SNH may be required.

To partially mitigate for the loss of 680m of stone walls, 320m will be reinstated on the northern edge of the Fourfields site, and remaining stones will be utilised to rebuild other sections of existing walls around the site.

7.6.2.7 Habitats

No habitat specific mitigation in addition to that outlined in Section 7.6.1 (Generic Mitigation & Best Practice Methodology) is recommended. The protection of the aquatic habitats will be outlined within the CEMD and will focus primarily on reducing the extent and duration of disturbance, and preventing pollution from chemicals and sediment.

7.7 Residual Effects

Proposed mitigation strategies during the construction and operational phases reduce the potential impacts on a number of receptors and residual impacts are all identified as being minor or negligible, with the overall EcIA significance identified as not significant.

7.8 Cumulative Effects

Two local developments are relevant with respect to potential cumulative impacts on non-avian ecological receptors.

The first development is the additional components of the wider NorthConnect project including the proposed new Peterhead substation and the interconnector HVDC cable which is proposed to extend south east from the Converter Station to the coast at Long Haven. The cable route will pass predominantly through agricultural habitats before reaching the more semi-natural habitats located east of the A90 along the cliff tops within the Buchan Ness to Collieston Coast SAC and the Bullers of Buchan Coast SSSI.

The second development involves Breedon Aggregates proposal to extend the Stirlinghill quarry into an area of approximately 3.7Ha to the east of the current quarry. This quarry is located immediately to the east of the Converter Station. From surveys undertaken in 2014 the site was identified to be botanically diverse with good examples of lowland heathland and lowland acid grassland, which are habitats listed within the Scottish Biodiversity List. Very few mammals were assessed to be using the site, although a single building close to the development site could support roosting bats.

Although both of these projects will result in some disturbance to the local semi-natural and agricultural habitats, the magnitude of impact is unlikely to result in a significant cumulative impact for receptors present within the application boundary, as all of these are identified to be of high local value at best. Furthermore, the schemes are unlikely to impact heavily on protected mammals, with no evidence of mammals at the proposed quarry extension site and the HVDC cable route, resulting in minimal disturbance. It is possible that further impacts on otter and water vole occur if places of shelter are identified to be present within the HVDC cable route, but these will require mitigation proposals to avoid breach of relevant European and UK wildlife legislation, thus ensuring disturbance is minimised.

It is possible that the interconnector HVDC will have impacts on the coastal habitats and protected areas (both statutory and non-statutory), but with respect to this project, as no impacts are identified on these receptors, cumulative impacts are not relevant.

7.9 Summary

The key habitats and species within the respective survey area were identified during the completion of baseline surveys: Extended Phase 1 habitat survey; and Otter, Water Vole and Badger Survey. No significant effects on ecological receptors have been identified resulting from the development. Several best practice measures have been identified along with a number of species specific mitigation approaches in order to reduce ecological effect as far as possible. Table 7.9.1 provides a summary of the potential impacts, their levels of significance before and after mitigation, along with a summary of mitigation.

Table 7.9.1: Summary of potential ecological effects

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Impact Magnitude/ Effect Significance	Assessment of Residual Effects
Construction							
Cultivated/disturbed land – arable - Permanent habitat loss - Temporary habitat loss - Fragmentation	Low Local	High	Minor	- Minimise area of land take - Reinstatement of temporary loss areas. - Reduce impacts of fragmentation	High	Minor	Not Significant
Neutral grassland - semi-improved - Temporary habitat loss - Localised short term fragmentation	Low Local	Low	Negligible	- Reinstatement of temporary loss areas.	Low	Negligible	Not Significant
Acid dry dwarf shrub heath - Indirect impacts from dust deposition	Moderate Local	Negligible	Negligible	- No specific mitigation	Negligible	Negligible	Not Significant
Broadleaved woodland – plantation and semi-natural	Low Local	Negligible	Negligible	- No specific mitigation	Negligible	Negligible	Not Significant
Coniferous woodland – plantation	Low Local	Negligible	Negligible	- No specific mitigation	Negligible	Negligible	Not Significant
Marsh/marshy grassland - Temporary habitat loss - Localised short term fragmentation	Low Local	Low	Negligible	- Minimise area of disturbance - Reinstatement of temporary loss areas.	Low	Negligible	Not Significant

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Impact Magnitude/ Effect Significance	Assessment of Residual Effects
Mixed woodland - plantation	Low Local	Negligible	Negligible	- No specific mitigation	Negligible	Negligible	Not Significant
Quarry	Low Local	Negligible	Negligible	- No specific mitigation	Negligible	Negligible	Not Significant
Running water - Temporary habitat loss - Disturbance to flow regimes - Additional culverting - Increased risk of pollution	High Local	Low	Minor	- Use of dams and flume - CEMD - Minimise area of disturbance - Reinstatement of temporary loss areas.	Low	Minor	Not Significant
Standing water - No direct impacts - Increased risk of pollution	Low Local	Low	Minor	- Construction Environmental Management Plan	Negligible	Negligible	Not Significant
Boundary Features (stone walls, hedgerows) - Permanent habitat loss - Temporary habitat disturbance - Fragmentation	Low Local	High	Minor	- Appropriate timing of works - Ecological Clerk of Works - Habitat relocation - Maintenance of overall connectivity	Minor	Minor	Not significant
Invasive non-native species - Potential for disturbance and spread of species across construction site and beyond.	Negative*	Low	Minor	- Inclusion within CEMD and constraints drawings - Clear marking of areas - Appropriate management if areas will undergo disturbance	Low	Minor	Not Significant

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Impact Magnitude/ Effect Significance	Assessment of Residual Effects
Otter - Visual disturbance - Temporary fragmentation of commuter routes - Noise disturbance - Water quality impacts - Flow regime alterations - Changes in otter use - Accidental killing/injury	High Local*	Medium	Minor	- Pre-construction surveys - Maintenance of 40m buffer - CEMD - Use of dams and culvert - Minimise area and duration of disturbance - Reinstatement of temporary loss areas - Good working practice - Assess need for EPS licence	Low	Minor	Not significant
Bat - Permanent habitat loss - Temporary habitat disturbance - Fragmentation Flight path disturbance	Low Local*	Low	Minor	- Minimise area of disturbance - Reinstatement of temporary loss areas. - Good working practice - Minimise use of artificial lighting	Low	Minor	Not significant
Aquatic Ecology - Temporary habitat loss - Disturbance to flow regimes - Additional culverting - Increased risk of pollution	Low Local	Low	Minor	- Use of dams and flume - CEMD - Minimise area of disturbance - Reinstatement of temporary loss areas.	Low	Minor	Not significant

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Impact Magnitude/ Effect Significance	Assessment of Residual Effects
Water vole - Water quality impacts - Flow regime alterations - Changes in water vole use	High Local*	Low	Minor	- Pre-construction surveys - Maintenance of buffer if required - CEMD - Use of dams and flume - Minimise area of disturbance - Reinstatement of temporary loss areas. - Good working practice - Assess need for WCA licence	Low	Minor	Not significant
Amphibians and Reptiles - Permanent habitat loss (470m of stone wall) - Temporary habitat disturbance (210m of stone wall) - Fragmentation	Low Local*	Medium	Minor	- Appropriate timing of works - Ecological Clerk of Works with translocation of reptiles to suitable receptor site if required. - Habitat relocation - Reinstatement of 210m of stone walls	Low	Minor	Not significant
Badger - Loss of foraging habitat - Fragmentation - Risk of killing/injury	Low Local*	Low	Minor	- Pre-construction surveys - Good working practice	Low	Minor	Not significant

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Impact Magnitude/ Effect Significance	Assessment of Residual Effects
Operations							
Mixed woodland – plantation - Habitat creation and management	Low Local	Positive	Beneficial	- Creation and ongoing management of 1.8Ha of mixed woodland	N/A	N/A	N/A
Neutral grassland - semi-improved - Habitat creation and management	Low Local	Positive	Beneficial	- Creation and ongoing management of 7.2Ha of coastal meadow	N/A	N/A	N/A
Native hedgerow - Habitat creation and management	Low Local	Positive	Beneficial	- Creation of 420m of native hedgerow	N/A	N/A	N/A

*** Receptors requiring legal consideration.**

Chapter 8

Ornithology

Contents

8 Ornithology

8.1 Introduction

This chapter describes the avian Ecological Impact Assessment (EcIA) of the proposed NorthConnect development. The Ornithological receptors considered in this chapter are described and evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 5: Planning Policy). The receptors of sufficient value that impacts upon them could be significant have been identified and subject to detailed impact assessment. Much of the ecological mitigation is inherent in the design (e.g. avoidance of sensitive habitats) and therefore the potential impacts of the development are assessed including the 'designed in' primary mitigation. Further mitigation is then proposed and finally, the residual impacts and their significance are assessed.

This chapter considers all stages of the development, namely construction, operation and decommissioning.

8.2 Sources of Information

While legislation does not set out the methodologies for the completion of an environmental assessment with respect to birds, there is legislation which assists in the identification of sensitive bird species, whose presence on a site should be given greater consideration during assessment. In addition, UK and European legislation also allows sites to be designated for ornithological interests.

8.2.1 European or International Legislation

The primary European legislation relating to bird interests is the Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version), commonly referred to as the Birds Directive (European Commission, 2010). This provides a framework for the management and conservation for wild birds throughout the EU.

The Birds Directive allows for the classification of Special Protection Areas (SPAs) for rare or vulnerable species listed on Annex 1 of the Directive, or for where there are regular concentrations of migratory, particularly wetland, species (Article 4). Since 1994 all SPAs in combination with Special Areas of Conservation (SACs) comprise the UK contribution to the Natura 2000 ecological network of protected sites.

As such, species listed on Annex 1 are considered sensitive species for the purposes of this assessment.

In addition to European legislation, there are also international agreements on the protection of birds. The most relevant here is the Ramsar Convention on Wetlands, an international agreement signed in 1971 in Ramsar, Iran, to protect wetland birds. The Convention has subsequently been extended to focus on the protection of wetland habitats, as well as wetland birds. The UK is a contracting party of the

Convention and has designated a number of wetland sites in the UK as Ramsar sites. All Scottish Ramsar sites form part of the Natura 2000 network, and many are also recognised as Sites of Special Scientific Interest (SSSI). Although there is no specific legal framework that safeguards Scottish Ramsar sites, they benefit from the measures required to protect and enhance the Natura sites and SSSIs which overlap them.

8.2.2 National Legislation

The primary legislation transferring the Birds Directive into UK law is the Wildlife and Countryside Act 1981, as amended (UK Parliament, 1981) and the Nature Conservation (Scotland) Act 2004. Under these acts, all wild birds are protected under UK law and may not be taken, injured or killed without a licence at any time (with exceptions). Additionally, nests are also protected from damage or destruction while in use and eggs may not be taken or destroyed without a licence. For certain species - listed on Schedule 1 – special protection is provided and it is an offence to disturb those species at their nest while it is in use.

As such, species listed on Schedule 1 of the WCA are considered sensitive species for the purposes of this assessment. In certain circumstances, where no significant effect is found as a result of the assessment, but the works would have the potential to disturb Schedule 1 species at their nest, this would be considered a significant effect, in order to ensure the works are legally compliant with the WCA, and to allow mitigation to be identified to protect the nests of Schedule 1 species from potential disturbance. This is noted in the text.

8.2.3 Other Guidance

In addition to the legislation identified above, there are two other reviews that should be considered when carrying out impact assessment for ornithology.

There are national and local Biodiversity Action Plans (BAPs) which list species which have been identified as threatened, and for which action plans have been developed to aid recovery. Any species listed on a national BAP are given special consideration. Species listed on the local BAP (LBAP) are also identified.

Birds of Conservation Concern (BoCC; Eaton *et al,* 2009) comprises a regular review carried out to assess the status of bird species in the UK, and identify those for which populations or range are declining. All bird species are classified into one of three groupings:

- **Red** – species which are globally threatened, or which have suffered a historical population decline in the UK, or which have undergone a severe population decline or a severe range decline;
- **Amber** – species of conservation concern across Europe, or which have undergone a historical population decline but are now recovering, or have undergone a moderate decline in breeding or non-breeding population or range, or are a rare breeder or have a restricted range or are internationally important; and
- **Green** – species which do not fall into the previous two categories.

8.3 Assessment Methodology

8.3.1 Desktop Study

8.3.1.1 Designated Sites

Designated sites were searched for using the Defra MAGIC website (Defra, 2015) and SNH's SiteLink service (SNH, 2015). An area with a radius of 15km from the Converter Station site was selected to take account of the distance which wintering geese may fly between roost and feeding sites.

8.3.1.2 Data Sources

For other data, NESBReC was consulted and the 'The Breeding Birds of North-east Scotland' (Francis & Cook, 2011) was used to identify species which may be breeding in the vicinity of the proposed development.

In addition, the NBN gateway was also reviewed in order to provide a high level over view of species that have been recorded within the development site and therefore likely to be encountered throughout field surveys.

8.3.2 Field Surveys

Three discrete surveys were undertaken in 2014 and 2015, by Atmos Consulting Ltd and Agroecosystems Ltd. The dates and the survey methodology are given in Table 8.3.1 and the rest of this section.

Table 8.3.1 Summary of Field Survey Work

Survey Date	Survey Description	Survey company
27th and 28th February 2014	Wintering Bird survey (two visits to cover the full area)	Atmos Consulting Ltd
27th June 2014	Breeding bird Survey	Agroecosystems Ltd
30th June 2014	Breeding bird Survey	Agroecosystems Ltd
7th July 2014	Breeding Bird Survey	Agroecosystems Ltd
29th January 2015	Wintering Bird Survey	Atmos Consulting Ltd
28th February 2015	Wintering Bird survey	Atmos Consulting Ltd
5th March 2015	Wintering Bird Survey	Atmos Consulting Ltd

8.3.2.1 Atmos Wintering Bird Survey Methodology

The wintering bird survey visit followed an adapted, scaled-down Common Birds Census (CBC) methodology. This involved following a route through the area while ensuring that, wherever possible, each part of the survey area was viewed and visited to within 50m. The route was walked slowly using periodic scanning with binoculars, with the identity and activity of all birds seen recorded. As many hedgerows as practically possible were walked during the survey visits. Target species selected for the survey included species listed in Annex 1 of the Birds Directive, Schedule 1 of the Wildlife and Countryside Act 1981 and red species from the Birds of Conservation Concern.

All birds detected on the surveys were recorded on large-scale maps of the area using standard British Trust of Ornithology (BTO) species codes and activity symbols (BTO, 2015).

8.3.2.2 Agroecosytems Ltd 2014 Breeding Bird Survey Methodology

The methodology followed that of Gilbert et al (1998). Standard methodology is to undertake three visits within the breeding season, between mid-April and early July, however, the three surveys were not spread across the whole season, due to a late start to the work.

The surveys were carried out by walking slowly across the whole site to ensure all parts of the site were covered to within 100m, watching and listening for birds and their activity (i.e. songs, territorial displays, nesting behaviour, alarm calls and feeding young) as signs of breeding. The route took in all features considered key habitat for birds.

All birds detected on the surveys were recorded on large-scale maps of the area using standard BTO species codes and activity symbols (BTO, 2015). The outside margins of the conifer plantation within the site were recorded. The development does not encroach into the conifer plantations and is unlikely to a have a significant effect on species deeper within the plantation.

The maps from the three visits were combined, using the principles of the CBC methodology (Bibby et al. 2000). No night time surveys were carried out during 2014 therefore the presence of owl species cannot be assessed beyond the presence of a single Barn owl pellet.

8.3.3 Impact Assessment Methodology

Although the IEEM Guidelines (2006) do not advocate the use of a matrix, the three stages of impact assessment are the same, namely:

- Valuation of ecological receptors: assessment of the nature conservation value of each receptor (e.g. designated site, habitat or species);
- Determining impact magnitude: description of the nature and scale of the predicted impacts, quantified if possible; and
- Identification of the impact significance.

The IEEM Guidelines (2006) employ ecological principles to determine significance, defining a significant impact, in ecological terms as *'an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area'*. This assessment has been undertaken with these ecological principles in mind while being aligned to the methodology laid out in Chapter 3: Methodology.

8.3.3.1 Evaluation of Ecological Receptor

Determination of value of ecological features relies heavily on professional judgement, use of available guidance and information, and expert opinion. The IEEM Guidelines (2006) recommend that the value or potential value of each ecological resource or feature is described in terms of its geographic frame of reference, but do not attempt to provide definitions of value for habitats and species. The reason for this is that such definitions cannot take into account all the factors that influence value and there are difficulties in applying the same criteria consistently across the UK. Table 8.3.2 provides helpful examples of the way in which ecological features are valued.

Table 8.3.2: Conservation value of receptors

Conservation Value	Criteria
International	Internationally designated or proposed sites such as Ramsar sites, SPAs, SACs and Biosphere Reserves. Or otherwise meeting criteria for international designation. Sites supporting populations of internationally important species. Populations of birds meeting the threshold for international importance (1% of the relevant international breeding/wintering population).
National	Nationally designated sites such as SSSIs or non-designated sites meeting SSSI selection criteria, National Nature Reserves (NNRs. Those containing viable areas of any key habitats identified in the UK (BAP). Sites supporting viable breeding populations of Red Data Book species (excluding scarce species) or supplying critical elements of their habitat requirements. Populations of birds comprising at least 1% of the UK breeding/wintering population (where data are available). Significant populations of birds for which Biodiversity Action Plans (BAP) or Species Action Plan (SAP) are available, or are red-listed on BoCC.
Regional	Sites containing viable areas of threatened habitats of importance within a regional context, comfortably exceeding Sites of Important Nature Conservation (SINC) criteria but not meeting SSSI selection criteria. Sites supporting viable breeding populations of Nationally Scarce species or those included in the Regional BAP (if present) on account of their rarity or supplying critical elements of their habitat requirements. Populations of birds comprising at least 1% of the relevant county breeding/wintering population (where data are available).
High Local	Sites meeting the criteria for a county area designation (such as SINC), which may include amenity and educational criteria in urban areas. Ancient semi-natural woodland. Designed Local Nature Reserves (LNRs). Sites containing viable breeding populations of species known to be county rarities (e.g. included in the county BAP) or supplying critical elements of their habitat requirements.
Moderate Local	Undesignated sites, features or species considered to appreciably enrich the habitat resource with the context of the Parish (i.e. approximately 10 km radius from the site).
Low Local	Undesignated sites, features or species considered to appreciably enrich the habitat resource within the immediate environs of the site (e.g. a species-rich hedgerow).
Negligible	Low grade and widespread habitats or species.
Negative	Invasive, alien species often scheduled under Section 14, Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

It should be noted that in some cases it is possible for a feature to be of relatively low value in nature conservation terms, yet subject to legal protection. An example might include the majority of common wild bird species (all of which are subject to some protection).

The IEEM Guidelines recommend that a threshold of value for the ecological features is defined, above which any impact upon them could be considered significant and therefore require more detailed assessment. Features to be subject to more detailed assessment should be both of sufficient value that impacts upon them may be significant, and potentially vulnerable to significant impacts arising from the development. This approach is consistent with the EIA Regulations, which only require investigation of likely significant effects.

In this assessment, impacts are assessed in detail only for ornithological receptors that are of sufficient value that an impact upon them could be considered significant in terms of the EIA Regulations, or which are subject to legal protection. For the purposes of this assessment, the threshold level of value of a receptor below which it is considered that an impact would not be considered significant, has been set at low local. Therefore, impacts are assessed in detail only for receptors of at least local value or subject to some form of legal protection.

8.3.3.2 Magnitude of Impact

For the valued receptors, the nature of any impacts on them is considered with reference to:

- Extent;
- Duration (short-term, long-term, temporary or permanent);
- Whether impacts are direct or indirect;
- Reversibility;
- Timing/frequency; and
- The potential for cumulative effects with other developments.

These factors together contribute to the overall magnitude of impact. Wherever possible, the magnitude of the impact is quantified and then professional judgement is used to assign the effects on the receptors to one of four classes of magnitude described in Table 8.3.3.

Table 8.3.3: Definition of Magnitude of Impact

Magnitude	Description
Negligible	A short term but reversible effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group that is within the normal range of annual variation.
Low	A short term but reversible effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group that is within the range of variation normally experienced between years.
Medium	A permanent or long term effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group. If adverse, this is unlikely to threaten its sustainability; if beneficial; this is likely to be sustainable but is unlikely to enhance its conservation status.
High	A permanent or long term effect on the extent/size or integrity of a site, habitat, species assemblage/community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.

8.3.3.3 Impact Significance

The significance of effect is derived from the value of the receptor and the magnitude of the impact. Professional judgement is used when assigning value and magnitude, particularly when considering effects on conservation status and integrity, and is therefore critical in determining significance. Table 8.3.4 illustrates four categories of significance: Major, Moderate, Minor and None. Impacts can be adverse or beneficial. The categories of Major and Moderate significance are considered significant in terms of the EIA.

Table 8.3.4: Significance of Effects Matrix

Magnitude of Impact	**Value**				
	International	**National**	**Regional**	**Moderate Local/ High Local**	**Low Local /Negligible**
High	Major	Major	Moderate	Moderate	Minor/ Negligible
Medium	Major	Moderate	Moderate	Minor	Minor / Negligible
Low	Moderate	Minor	Minor	Minor	Minor / Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

Indication is given of the level of certainty of the predictions to reflect both the uncertainty in whether or not an impact will occur and also in the level of confidence in the prediction of significance. The categories of certainty applied in this assessment are as recommended in the IEEM Guidelines:

- Certain/near-certain;
- Probable;
- Unlikely; or
- Extremely unlikely.

The significance of the impacts of the proposed development are assessed before and after mitigation and enhancement. The assessment of significance of the residual impacts will be considered against legislation, policy and development control when determining the application of the corridor during that one season.

8.4 Baseline Information

8.4.1 Designated Sites

Designated sites in the vicinity of the proposed developed are described below and are shown in Drawing 3133.

Buchan Ness to Collieston Coast SPA stretches 25 km from north to south, with the Bullers of Buchan Coast SSSI within the SPA. The Buchan Ness to Collieston Coast SPA and SSSI is located approximately 550m east and south of Fourfields.

8.4.1.1 Buchan Ness to Collieston Coast (including marine extension) SPA

Buchan Ness to Collieston Coast SPA qualifies under Article 4.2 by regularly supporting in excess of 20,000 individual seabirds. It regularly supports 95,000 seabirds including nationally important populations of the species listed in Table 8.4.1. The entire coastal area of the Site lies within this SPA.

Table 8.4.1 Buchan Ness to Collieston Coast (including marine extension) SPA qualifying interest

Feature	Details	Condition
Seabird assemblage, Breeding	Regularly supports 95,000 seabirds	Unfavourable No change
Fulmar Fulmarus glacialis, Breeding	1,765 pairs, 0.3% of the GB population	Unfavourable Declining
Guillemot Uria aalge, Breeding	8,640 pairs, 1.2% of GB population	Favourable Declining
Herring gull Larus argentatus, breeding	4,292 pairs, 2.7% of the GB population	Unfavourable No change
Kittiwake Rissa tridactyla, Breeding	30,452 pairs, 6.2% of the GB population	Unfavourable No change

8.4.1.2 Bullers of Buchan Coast SSSI

The notified features of the SSSI have similar components to that of the SPA (Table 8.4.2) with the addition of maritime cliff and coastal geomorphology interest.

Table 8.4.2: SSSI Notified features

Feature Category	Feature
Birds - aggregations of breeding birds	Guillemot, breeding
Birds - aggregations of breeding birds	Kittiwake, breeding
Birds - aggregations of breeding birds	Shag – Phalacrocorax aristotelis, breeding
Birds - aggregations of breeding birds	Seabird colony, breeding
Geomorphology	Coastal Geomorphology of Scotland
Supralittoral rock (Coast)	Maritime cliff

A desk based data search was carried out to identify species that were likely to be recorded on the site during field work, allowing the appropriate survey methodology to be selected. The results of this search are in Table 8.4.3

Table 8.4.3: Sensitive species which may be present around the proposed development site[1]

Species	Scientific Name	Schedule 1	UKBAP	BoCC (red listed only)	Comments
Northern Lapwing	Vanellus vanellus		X	X	Habitat present is highly suitable for this species
Eurasian Curlew	Numenius arquata		X		
Herring Gull	Larus argentatus		X	X	
Barn Owl	Tyto alba	X			May be present in trees or buildings close to the site
Sky Lark	Alauda arvensis		X	X	Habitat present is highly suitable for this species
Common Starling	Sturnus vulgaris		X	X	Habitat present provides good foraging for this species
Song Thrush	Turdus philomelos		X	X	
Hedge Accentor	Prunella modularis		X		
House Sparrow	Passer domesticus		X	X	Some habitat present is suitable for this species
Eurasian House Sparrow	Passer montanus		X	X	Habitat present is suitable for this species
Common Linnet	Carduelis cannabina		X	X	Habitat present is suitable for this species
Corn Bunting	Emberizia calandra		X	X	Habitat present is suitable for this species
Yellowhammer	Emberiza citronella		X	X	Habitat present is suitable for this species

[1] Data is provided to 10 km^2 resolution within the atlas for species protection

8.4.2 Other Sites and Inventory Habitats

The Scottish Wildlife Trust (SWT) Longhaven Cliffs Reserve is within the boundaries of the designated sites Buchan Ness to Collieston SAC and Bullers of Buchan Coast SSSI. The Reserve is located 550m to the southeast of the 'Fourfields' site. It is considered to be important for breeding seabird colonies, along with special habitats such as maritime heath and salt marsh with plants such as devil's-bit scabious-*Succisa pratensis* and grass-of-Parnassus-*Parnassia palustris*.

It is assessed that as no impacts are anticipated on the SAC or SSSI, as confirmed by SNH, hence this SWT reserve is no longer included within the EcIA.

8.5 Field Survey Results

The following summarises the results of the three field surveys that were undertaken in 2014 and 2015.

8.5.1 Breeding Bird Survey

The total number of pairs are recorded as ‘confirmed’ (C), ‘probably’ (Pr) or ‘possibly’ (Po) breeding in the survey area in Table 8.5.1 and shown graphically in Drawings 3137, 3138, 3146 and 3147.

A total of 50 species were noted within the site across the 3 visits, of which 27 have been assessed as of confirmed or probable breeding status, and a further 5 of possible breeding status, thus a total of 32 species with some breeding likelihood.

Of these, some species were difficult to assess for numbers due to lack of access into buildings and/or the lateness of season. These include those species using the site for foraging, such as Swallow - *hirundo rustica*, House martin - *delichon urbica*, Sand martin - *riparia riparia* and the occasional Swift over arable and pasture fields which are likely to be breeding adjacent to the site as well as Magpie, therefore these have not been determined. In addition colonies of certain species (Herring gull, Common gull and House sparrow) recorded in and around trees and buildings, were also not counted in individual numbers. Other species noted as present are very likely to be breeding in adjacent habitat (Blue tit, Coal tit, Great tit within the plantation, or Raven on adjacent rocky outcrops, etc). Of these 50 species, 39 are resident and the remainder summer breeders/visitors only.

The locations of species of conservation concern are plotted and can be found in the Drawing 3136. Signs of one Annex 1 (EU Birds Directive) species was noted (Peregrine falcon - falco peregrinus) but these were not considered as breeding. Also two Schedule 1 (Wildlife & Countryside Act 1982) species (Peregrine falcon and Barn owl) were noted, with no or limited breeding evidence.

Nine BoCC Red listed species were observed, all of which were considered to be breeding (4 Confirmed, 3 Probable and 2 Possible). 18 BoCC Amber listed species were observed, 1 of which was considered to be breeding.

Table 8.5.1: Breeding bird survey results

Species	Code	Status	Pairs C	Pairs Pr	Pairs Po	Present
Barn owl (Tyto alba)	BO	A				✓
Blackbird (Turdus merula)	BB	G			4	
Blue tit (Cyanistes caeruleus)	BT	G				✓
Bullfinch (Pyrrhula pyrrhula)	BF	A			1	
Buzzard (Buteo buteo)	BZ	G	1			✓
Carrion Crow (Corvus corone)	C	G		2		✓
Chaffinch (Fringilla coelebs)	CH	G		3	2	
Coal tit (Parus ater)	CT	G				✓
Collared dove (Streptopelia decaocto)	CD	G				✓
Common gull (Larus canus)	CG	A		1 col		
Curlew (Numenius arquata)	CU	A			1	
Dunnock (Prunella modularis)	D	A		5	6	
Goldfinch (Carduelis carduelis)	GF	G		3	5	
Great tit (Parus major)	GT	G				✓
Greenfinch (Carduelis chloris)	GN	G			1	
Grey heron (Ardea cinerea)	GH	G				✓
Herring gull (Larus argentatus)	HG	G		1 col		
House martin (Delichon urbica)	HM	A		✓		✓
House sparrow (Passer domesticus)	HS	R	3 cols			
Jackdaw (Corvus monedula)	JD	G		1 col	2	
Kestrel (Falco tinnunculus)	K	A				✓
Lapwing (Vanellus vanellus)	L	R	1			
Lesser redpoll (Carduelis flammea)	LR	R		1	2	
Linnet (Carduelis cannabina)	LI	R	3	8	11	
Long-tailed Tit (Aegithalos caudatus)	LT	G				✓
Magpie (Pica Pica)	MG	G				✓
Mallard (Anas platyrhincos)	MA	A	2			
Meadow Pipit (Anthus pratensis)	MP	A		25-40		
Mistle thrush (Turdus viscivotus)	MT	A				✓
Mute swan (Cygnus olor)	MS	G	1			
Pied Wagtail (Motacilla alba)	PW	G			2	
Oystercatcher (Haematopus ostralegus)	OY	A		3		
Raven (Corvus corax)	RN	G				✓
Reed bunting (Emberiza schoeniclus)	RB	A	3	3		
Robin (Erithacus rubecula)	R	G		1		✓
Rock dove (Columba livia)	DV	G				✓
Sand martin (Riparia riparia)	SM	A				✓
Sedge warbler (Acrocephalus schoenobaenus)	SW	G	3	3		
Skylark (Alauda arvensis)	S	R		7	6	
Song thrush (Turdus philomelos)	ST	R			2	
Starling (Sturnus vulgaris)	SG	R		✓		✓
Swallow (Hirundo rustica)	SL	A		✓		✓

Species	Code	Status	Pairs C	Pairs Pr	Pairs Po	Present
Swift (Apus apus)	SI	A				✓
Tree sparrow (Passer montanus)	TS	R			1?	✓
Willow warbler (Phylloscopus trochilus)	WW	G		3	1	
Wheatear (Oenanthe oenanthe)	W	A			1	
Whitethroat (Sylvia communis)	WH	A	1		1	
Wood pigeon (Columba palumbus)	WP	G				✓
Wren (Troglodytes troglodytes)	WR	G		10	9	
Yellowhammer (Emberiza citronella)	Y	R	2	15	18	

In addition some evidence of Peregrine falcon was present to the south side of the site in the form of possible 3 prey items (2 rock dove and 1 jackdaw) which were highly likely to be Peregrine kills, but this could not be confirmed.

Mallard: Two breeding pairs (one male and two females with broods) were noted at the dam at the west side of the survey area.

Tree sparrow: Several birds were observed close to the House sparrow colony on the track leading north adjacent to the Stirlinghill Quarry ponds on the first visit. It is highly likely that this species was under-recorded on this survey due to breeding early in the season. It is possible that several pairs nest here, with their territories possibly on the margins of the survey area.

Bullfinch: The species was not confirmed as breeding but two individuals were identified as possible breeders (one pair). A male and female were seen on separate visits at the western part of the survey area around an area of willow scrub.

Skylark: A total of 13 breeding Skylark territories were identified across the survey area.

Meadow Pipit: This species was abundant across the survey area in both arable fields and grass pastures. Due to the lateness in the season it was not easy to identify territorial display. Total counts between 73 and 109 were made across the 3 visits with an estimated 25-40 probable breeding pairs within the site.

Dunnock: The species was relatively common across the survey area with 5 pairs assessed as probable and 6 pairs as possible breeders. The scrub habitat and hedgerows are valuable for this species.

Whitethroat: The species was found in two key places associated with roadside hedgerows and gorse scrub, with both considered breeding territories due to territorial displays or carrying food. It is possible this species was under-recorded.

Linnet: Linnets were abundant across the site, with particular presence noted in arable fields/margins and gorse scrub. Any assessment of breeding pairs was especially difficult to determine for this species given the semi-colonial breeding behaviour, the lateness of the season (where territorial display was diminishing and feeding and fledging of young was high) and the highly mobile, sociable feeding behaviour. The presence of small flocks of Linnets crossing the survey area made it difficult to separate between the birds holding breeding territory within the survey area and those breeding further afield but foraging within the site. Birds breeding within the site will also forage extensively back and forth across arable fields.

Reed Bunting: The species was found in 6 sites across the survey area in marginal, damp rushy or scrub areas. All site records were assessed as confirmed or probable breeding pairs.

Yellowhammer: Of Red List species, Yellowhammer was the most abundant breeding bird across the survey area, with birds widespread across arable, field margins, hedgerows and gorse scrub. Between 17 and 35 breeding territories were identified across the survey area, of which 17 were considered confirmed or probable, and 18 as possible.

8.5.2 Wintering Bird Survey

8.5.2.1 2014 Wintering Bird Survey

The area surrounding the proposed Converter Station supported wintering passerines of Yellowhammer, Skylark and Linnet. The fish pond west of Highfield and the proposed building location supported a pair of Mallard, a pair of Mute Swans and a single male Goldeneye. Two Oystercatcher, possibly a pair, were recorded flying over the Fourfields area to the south of Highfield. The secondary species recorded during the survey were Buzzard and Grey Heron.

The quarries east of the proposed building location were surveyed for signs of peregrine, but no evidence was identified and no wintering individuals were observed.

8.5.2.2 2015 HVAC Cable Route: Sub-station to Fourfields

The HVAC Cable route was dominated by passerines, including the red listed: Skylark (maximum count 11), Starling (maximum count 65), Tree Sparrow (maximum count 27), Linnet (maximum count 45) and Yellow Hammer (maximum count 55). Numbers of these species varied between visits, which would reflect winter flocks breaking up and birds beginning to return to breeding areas, but also the displacement of birds from areas where stubbles had been ploughed in. The stubbles within section one remained throughout the survey period. Pink-footed geese were recorded once, a group of 63, in this area, during visit 3, feeding on the field just to the west of the minor road, south of Denend, before being disturbed and flying south west. A large number of Herring Gull were present around the existing Peterhead Sub-station, with a maximum count of 220. These birds were exhibiting territorial behaviour so it is likely at least some were setting up territories on the roof of the building, although many were likely to be loafing birds including those originating from the SPA. A maximum of 2 Snipe - *gallinago gallinago* were flushed in an area of rushes in the field to the west of the substation. Birds on the lochan east of Highfields were restricted to common wintering species such as Goldeneye, of which a maximum of 8 were recorded during visit 1. Full details of the birds recorded are provided in Table 8.5.2.

Table 8.5.2: HVAC Cable Route Wintering Bird Records

Species	Code	Status	2014	Visit 1	Visit 2	Visit 3
Blackbird (*Turdus merula*)	BB	G		2	3	6
Buzzard (*Buteo buteo*)	BZ	G		1	0	0
Carrion Crow (*Corvus corone*)	C	G		2	2	4
Collared dove (*Streptopelia decaocto*)	CD	G		2	4	2
Chaffinch (*Fringilla coelebs*)	CH	G		0	7	5
Coot (Fringilla coelebs	CO	G		0	0	2
Coal tit (*Parus ater*)	CT	G		0	5	0
Goldcrest (Regulus regulus	GC	G		0	4	1
Goldeneye (Bucephala clangula)	GN	A		8	8	3
Goldfinch (*Carduelis carduelis*)	GF	G		5	3	0
Greenfinch (*Carduelis chloris*)	GN	G		0	2	0
Grey Heron (Ardea cinerea)	H	G		2	0	0
Herring Gull (Larus argntatus argenteus)	HG	G		4	220	176
Jackdaw (*Corvus monedula*)	JD	G		200	197	12
Linnet (*Carduelis cannabina*)	LI	R	✓	45	0	22
Little Grebe (*Tachybaptus rufficolis*)	LG	A		0	1	1
Magpie (*Pica Pica*)	MG	G		5	14	6
Mallard (*Anas platyrhincos*)	MA	A		0	5	1
Moorhen (*Gallinula chloropus*)	MH	G		1	2	0
Mute swan (*Cygnus olor*)	S.	G	✓			
Oystercatcher (*Haematopus ostralegus*)	OY	A		0	0	4
Pink footed Goose (Anser brachyrhynchus	PG	A		0	0	63
Pheasant (Phasianus colchicus)	PH	n/a		1	0	0
Robin (Erithacus rubecula)	R	G		5	2	0
Reed Bunting (Emberiza schoeniclus)	RB	A		2	32	6
Rook (Corvus frugilegus)	RO	G		100	10	0
Skylark (Alauda arvensis)	S	R	✓	0	11	11
Starling (*Sturnus vulgaris vulgaris*)	SG	R		65	0	37
Snipe (*Gallinago Gallinago*)	SN	A		0	2	1
Song Thrush (*Turdus philomelos clarkei*)	ST	R		0	3	2
Tree sparrow (*Passer montanus*)	TS	R		0	27	24
Woodpiegeon (*Columba palumbus*)	WP	G		0	5	3
Wren (*Troglodytes torglodytes*)	WR	G		0	0	2
Yellowhammer (*Emberiza citronella*)	Y.	R	✓	42	55	24

8.5.2.3 Fourfields

The area surrounding the proposed Converter Station building again supported a similar array of species to the fields to the north. The species composition altered significantly when the stubbles were ploughed in between visit 1 and 2. During the first visit 54 Skylark, 4 Tree Sparrow, 5 Twite - *cardeulis flavirostris*, 21 Yellowhammer and a single Corn Bunting were all seen, with numbers much lower or the species absent completely during the other visits. Other red-listed species in the Fourfields, included Grey Partridge - *perdix perdix*, were recorded during visit 1, with 12 counted. This species moved off after visit 1, once the stubbles had been ploughed.

The quarries east of the proposed building location were surveyed for signs of Peregrine, but no evidence was identified and no individuals were observed. Table 8.5.3 provides the detailed records of the wintering birds.

Table 8.5.3: Fourfield Wintering Bird Records

Species	Code	Status	Visit 1	Visit 2	Visit 3
Blackbird (*Turdus merula*)	B	**G**	9	2	3
Carrion Crow (*Corvus corone*)	C.	**G**	2	0	0
Corn bunting (*Emberiza calandra*)	CB	**R**	1	0	0
Dunnock (*Prunella modularis occidentalis*)	D.	**A**	1	0	0
Goldcrest (*Regulus regulus*)	GC	**G**	0	1	0
Hooded crow (*Corvus cornix*)	HC	**G**	1	0	0
Herring gull (*Larus argentatus argenteus*)	HG	**R**	0	34	0
House sparrow (*Passer domesticus*)	HS	**R**	0	0	4
Jackdaw (*Corvus monedula*)	JD	**G**	10	0	0
Magpie (*Pica pica*)	MG	**G**	2	0	0
Meadow pipit (*Anthus pratensis*)	MP	**A**	10	0	0
Grey partridge (*Perdix perdix*)	P.	**R**	12	0	0
Pheasant (*Phasianus colchius*)	PH	**n/a**	0	2	0
Robin (*Erithacus rubecula*)	R.	**G**	3	0	0
Reed bunting (*Emberiza schoeniclus*)	RB	**A**	1	0	0
Rook (*Corvus frugilegus*)	RO	**G**	0	16	0
Skylark (*Alauda arvensis*)	S.	**R**	54	10	11
Stock dove (*Columba oenas*)	SD	**A**	0	0	1
Starling (*Sturnus vulgaris vulgaris*)	SG	**R**	0	0	4
Tree sparrow (*Passer montanus*)	TS	**R**	4	0	0
Twite (*Cardeulis flavirostris*)	TW	**R**	5	0	0
Wren (*Troglodytes troglodytes*)	WR	**G**	1	2	0
Yellowhammer (*Emberiza citronella*)	Y.	**R**	21	6	2

8.5.3 Survey Limitations

It should be noted that there are some limitations to the surveys which have been considered during the production of this chapter and in the impact assessment. The most significant of this is the breeding bird survey undertaken in June 2014 as these dates are outwith the recognised survey period and, as a result, there is a potential to have missed early breeding pairs or pairs whose breeding attempts failed early in the season.

For species such as Corn Bunting that were recorded during the wintering survey and, as the proposed development area contains habitat suitable for their breeding, a precautionary approach has been taken and it has been assumed that those species do breed within the proposed development. As a result, these species will be taken forward for detailed assessment within section 8.6 on the assumption that there is potential for breeding within the proposed development site.

8.6 Impact Assessment

Species that were found to utilise the site but were not recorded as breeding in it (but are considered to breed in close proximity to the site) such as Swallow, House Martin, Sand Martin, Swift and Magpie, have not been taken forward for detailed assessment. It is also considered that the habitat loss as a result of construction activities would not constitute a significant loss of habitat within the local region.

Table 8.6.1 describes those species taken forward for detailed assessment. For simplicity, species have been classified into breeding species and wintering species. Potential impacts to these assemblages will then be described in detail below. As there were no Annex 1 or Schedule 1 species recorded as breeding during field work for any of the surveys, only red list species (on the BoCC) will be taken forward for further assessment, as they are considered to be of high local value as described in Table 8.3.2.

Although evidence of Peregrine activity (i.e. two kill sites) were found during the 2014 breeding bird survey, no observations of raptors were made during the course of any of the three field surveys. In addition, no nests were encountered during field survey or are (at the time of writing) known to be present within 1 km of the development through desk based searches. Peregrine will therefore not be taken forward for detailed assessment.

A flock of 63 pink footed geese were recorded during one survey visit of the wintering bird surveys. It is considered likely that small flocks of geese are only occasional visitors to the fields on the HVAC Cable route and, as a result, are not taken forward for detailed assessment.

Table 8.6.1: Summary of Species Taken Forward for Detailed Assessment

Species	Breeding	Wintering
House Sparrow	X	
Lapwing	X	
Lesser redpoll	X	
Linnet	X	
Skylark	X	
Song thrush	X	
Starling	X	
Tree sparrow	X	
Yellow hammer	X	
Corn bunting		X
Grey partridge		X
Herring gull		X
House sparrow		X

Species	Breeding	Wintering
Yellowhammer		X
Starling		X
Song thrush		X
Skylark		X
Tree sparrow		X
Twite		X

8.6.1 Construction

8.6.1.1 Construction Impacts Breeding Birds

Nine species recorded during the breeding bird survey and 10 species recorded during the wintering bird survey have been taken forward for detailed assessment. As it is considered that construction impacts are likely to impact the breeding assemblage at the development site in much the same way they are considered together.

The construction impacts for the proposed development at Fourfields are considered to comprise of the following:

- Permanent Land take of 3.6 Ha;
- Temporary land take during cable installation;
- Increased disturbance through higher numbers of plant and machinery movements; and
- Noise impacts associated with the increased construction activity, including rock blasting.

The above activities are assessed below in relation to both species group (breeding and wintering) and taken forward for detailed assessment.

It should be noted that only noise impacts which arise as a result of construction works on site have been considered. Blasting activities at the local quarry have been excluded from consideration as the project has confirmed that site blasting activities will be timed so as not to coincide with the quarry activities. Therefore, only construction site blasting has been considered.

The construction of the Converter Station at Fourfields will involve the permanent loss of 3.6 Ha of pasture and arable land, this area is not particularly large in habitat terms. Given the planting to be undertaken on completion of the construction works, the diversity of trees and shrubs will be returned and increased, which will again be utilised by breeding birds as it is likely that the fresh soil and newly planted trees will maintain insect abundance. It is therefore considered that the impacts to breeding birds from habitat loss will be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

The installation of the cable route will involve temporary disturbance of the construction corridor (approximately 45m wide and 1.7km long) and construction activities undertaken during the breeding bird season are likely to displace any breeding birds. However, due to its very temporary nature, the impact is considered to be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

Associated with the loss of habitat there is a potential to disturb Schedule 1 species at their nest as discussed in Section 8.2.2. This would be considered a significant effect and appropriate mitigation is require to ensure the works are legally compliant with the WCA.

The breeding bird species which utilise the site will have some level of habituation to disturbance through frequent dog walkers and farming activities. As the frequency and scale and volume of activity increases throughout construction, it is likely that this will have some temporary disturbance effects to breeding birds. This disturbance will be very temporary in nature and will be limited to the construction phase only. It is further concluded that the extent of this disturbance will be limited to the converter station site on completion of the landscaping mounds. It is therefore considered that the impact significance will be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

Noise as a result of blasting or construction works are also considered to be temporary in nature. Once the landscaping mounds have been installed, they will reduce the distance at which the sound will carry beyond the converter station site. As a result the temporary disturbance to breeding birds is considered to be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

8.6.1.2 Construction Impacts Wintering Birds

The site is utilised by wintering birds for foraging on the stubbles that are found within the footprint of the proposed development site. Construction impacts to wintering birds are considered to be very similar to those of breeding birds with the permanent loss of 3.6 Ha of land and temporary disturbance impacts as a result of construction activities if carried out in the winter.

In terms of the permanent loss of the converter station land, this is habitat which occurs relatively frequently within the local region and, as a result it is considered that the magnitude of impact to wintering birds will be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

The installation of the cable route will involve temporary disturbance of the construction corridor (approximately 45m in width) and is likely to displace any wintering birds during construction. However, due to its temporary nature the impact is considered to be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

Wintering species which utilise the site will have some level of habituation through frequent dog walkers and farming activities, however, as the frequency and scale and volume of activity increases throughout construction, it is likely that this will have some temporary disturbance effects to breeding birds. This disturbance will be temporary in nature and will be limited to the construction phase only. It is further concluded that the extent of this disturbance will be limited to the converter station area on completion of the landscaping mound. It is therefore considered that the impact significance will be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

Noise as a result of blasting or construction works are considered to also be temporary in nature, particularly once the landscaping mounds have been installed, as this will reduce the distance at which the sound will carry beyond the development site. As a result, the temporary disturbance to wintering birds is considered to be minor (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

8.6.2 Operational

8.6.2.1 Operational Impacts on Breeding Birds

Throughout the operational life of the development there may be some routine maintenance visits, however, these are expected to be limited in their frequency and duration. As a result, it is considered that the impacts of these maintenance or routine visits will not increase disturbance beyond the levels already tolerated by the bird assemblage as a result of the frequent dog walking. Operational noise has also been assessed and; it is likely that this will be limited at source. Operational impacts to breeding birds are therefore considered to be negligible (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

The AC Cable Route and temporary construction sites will be subject to reinstatement and enhancement works during the operational phase. This is assessed as having an overall positive impact. These landscape plans will include the following components (full details are provided within Chapter 10):

- Creation of 1.8Ha of native mixed woodland planted on the landscaping mounds of the Converter Station with a species mix of 34 native woodland species;
- Creation of 7.2Ha of native coastal meadow with a locally relevant mix of approximately 20 native flowering herbs and five grass species;
- Creation of approximately 1.2Ha of ‘green roof’ using sedum matting (Converter Station Building, Control Building and Coolers);
- 4.8Ha of current arable land will become grazing pastures; and
- 420m of new native hedgerow along the south and eastern boundaries consisting of hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa* and dog rose *Rosa canina*.

These components will be managed so as to achieve a ‘natural’ looking woodland and meadow habitat. It is a project commitment that this will be maintained in the long term.

In the context of the site the addition of these habitats will provide a net gain in biodiversity, increasing the floral and structural diversity which in turn will provide habitat to support both breeding and wintering birds, particular passerines.

8.6.2.2 Operational Impacts wintering birds

The nature of the potential impacts (both negative and positive) to wintering birds can be considered to be similar to those affecting breeding birds. As a result the impacts to wintering birds are considered to be negligible (*certainty: near certain*). The impacts are therefore not considered to be significant within the bounds of this EcIA.

8.6.3 Decommissioning

The nature of the potential impacts of decommissioning activities if the site is to be reinstated is likely to be similar to those occurring during the construction phase. There will be no additional land take as a result of decommissioning activities and works will be less extensive, for example no blasting will be required. In addition, the duration of any disturbance is predicted to be shorter than it would be during the construction phase. Therefore, as a worst case scenario, the magnitude of all impacts are assumed to be similar to those experienced during the construction phase.

8.6.4 Cumulative

This section considers two local developments with potential cumulative impacts upon avian ecological receptors.

The first of these is the associated development of the wider Northconnect project; comprising of the interconnect converter station and the interconnector HVDC cable. This proposed development extends in a south easterly aspect from the Converter Station to the coast at Long Haven. The cable route will pass predominantly through agricultural habitats towards the coast This section will be installed into trenches in the same way as the HVAC cables. Before it reaches the cliffs, the construction technique will change to directional drilling. The cable route will be directionally drilled below the cliffs which are within the Buchan Ness to Collieston Coast SAC and the Bullers of Buchan Coast SPA and SSSI.

The second development involves the extension to the east of the Stirlinghill quarry by approximately 3.7 Ha taking the quarry works further from the Converter Station. The quarry has been searched for both breeding and wintering birds and it is considered, due to blasting activities that the quarry is not currently used by nesting birds, demonstrated by the lack of records in each of the survey periods.

Given the nature of construction activities for the two NorthConnect projects, it is considered probable that there will be some disturbance of avian receptors through the construction period. It is further considered that impacts associated with the HVDC cable trenching will not be dissimilar to those described within in this chapter for the agricultural sections of the development. The cumulative impacts of these are considered, without prejudice not to be significant should appropriate mitigation measures, such as those described within this EcIA, be employed.

For the directional drilling activities within and immediately adjacent to the costal habitats and the designated sites, it is considered that there will be no cumulative impacts to consider as a result of this development. This is due to the range avian receptors being predominantly seabird as opposed to those affected by the Converter Station construction that are predominately farmland passerines. Hence, the expected impacts will be different. A full assessment of impacts on seabirds will be completed as part of the HVDC EIA process.

8.7 Mitigation Measures

Prior to the commencement of works, in the appropriate survey season and under suitable weather conditions, NorthConnect would commission a suitably experienced Ecologist(s) to carry out a final check for the presence of protected species and to advise on final mitigation requirements. These would then be agreed with the appointed contractor and captured in the Construction Environmental Management Document (CEMD). The implementation of which will be monitored by the Environmental Clerk of Works as described in Chapter 19: Schedule of Mitigation.

To ensure that birds' nests are fully protected, vegetation clearance should only occur outside the bird breeding season (April – August inclusive). This prevents them being damaged and/or destroyed if the vegetation is removed. If it is necessary to remove vegetation during the breeding season, then the vegetation should be searched by a suitably qualified ecologist before removal. Any active nests should be marked out with an appropriate buffer zone to prevent accidental damage.

It is considered unlikely, due to the habitat present, that there would be any Schedule 1 species breeding within the vicinity of the site. Barn Owl may be present in buildings in the vicinity of the converter station site. Any unoccupied buildings within 200m of this site will be assessed, and if necessary and possible, checked before pre-construction works commence. If any breeding Barn Owls are present, then exclusion zones will be used to manage disturbance to ensure compliance with the WCA.

8.8 Residual Effects

With mitigation, the effect of habitat loss on breeding birds is considered minor and not significant.

As a result of the mitigation identified, there are no outstanding residual significant adverse effects on ornithological receptors.

8.9 Summary

Table 8.9.1 summarises the impacts assessed for ornithological receptors, the mitigation measures identified to control them and the potential for residual significant adverse effects.

In total, three impacts from NorthConnect were identified to have the potential for significant effects upon ornithological receptors. Measures were identified to protect Barn Owls, a Schedule 1 species which could potentially be nesting in the vicinity of the construction works. Of the other impacts, appropriate mitigation has been identified and no significant residual effects are predicted.

Table 8.9.1 Summary of Ornithological Effects

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Potential Effect Significance	Significance of Effect	Residual Impact Magnitude	Residual Significance Of Effect	Assessment of Residual Effects
Construction							
Temporary habitat loss (disturbance to nesting birds).	Moderate/ Local	Negligible	Minor (but assessed as significant impact due to WCA compliance)	Restrictions on vegetation removal; See Section 8.8	Negligible	Minor	Not significant
Permanent habitat loss	Moderate/ Local	Low	Minor	No specific mitigation required	Low	Minor	Not significant
Screening planting	Moderate/ Local	Positive	Beneficial	No specific mitigation required	Positive	Beneficial	Not significant
Disturbance of birds at the Converter Station Site.	Moderate/ Local	Negligible	Minor/ Negligible	No specific mitigation required	Negligible	Minor/ Negligible	Not significant
Disturbance to Barn Owl.	National	Negligible	Minor (but assessed as significant impact WCA compliance)	Pre-construction surveys to determine presence. See Section 8.8	Negligible	Minor	Not significant
Operation							
Operational noise disturbance from converter station (all receptors)	Moderate Local	Negligible	Minor/ Negligible	No specific mitigation required	Negligible	Minor/ Negligible	Not significant
Disturbance by frequent access by people and vehicles.	Moderate Local	Negligible	Minor/ Negligible	No specific mitigation required	Negligible	Minor/ Negligible	Not significant
Decommissioning –Impacts anticipated to be similar to similar those for construction.							

Key	Significant effects

NORTHCONNECT
CONNECTING RENEWABLES

Chapter 9

Archaeology

Contents

9 Archaeology

9.1 Introduction

This chapter of the ES presents the findings of the Cultural Heritage and Archaeology assessment carried out. It is the purpose of this chapter to determine the character and extent of the Cultural Heritage and Archaeology resource within, and intervisible with the Project. The impact of the Project on this resource is considered and, where appropriate, this chapter presents a mitigation strategy to avoid or reduce predicted effects.

This assessment has been undertaken by Rathmell Archaeology Limited (Rathmell), informed by consultation with Aberdeenshire Council and Historic Scotland (HS). The assessment focuses on both the immediate area of the proposed construction activities and external Cultural Heritage and Archaeology receptors within the wider landscape.

9.1.1 Scope of Assessment

This assessment considers the predicted impacts and effects on the Cultural Heritage and Archaeological environment from the construction and operation of the Project. The specific objective of this historic environment assessment was to:

- Identify the historic environment baseline within the Archaeology Study Area;
- Identify notable historic environment sites intervisible with the project;
- Consider the potential and predicted effects of the Project on the Cultural Heritage and Archaeology resource; and
- Propose measures, where appropriate, to mitigate any predicted adverse effects.

9.1.2 Archaeological Study Area

The Archaeological Study Area is an open arable landscape with rolling topography and no substantial high areas apart from Stirling Hill on the eastern edge. The Study Area comprises the application site boundary (Development Area) as defined on Drawing 3101 including Fourfields, the HVAC Cable Route, and access tracks plus a buffer of 500m was applied to this site boundary to ensure that sites in close proximity were considered within this assessment.

9.2 Sources of Information

The UK and Scottish Governments have passed legislation for the conservation and protection of the historic environment; this legislation has generated a range of relevant designations.

Sites without statutory protection are curated within the planning process by the planning authority. Scottish Planning Policy deals with all aspects of the historic environment with a view to its protection, conservation and enhancement. Historic Scotland has also issued guidance that is a material consideration through their Managing Change in the Historic Environment series. For archaeological sites PAN 2/2011 Planning & Archaeology (Scottish

Government, 2011a) indicates that the principle of preservation in-situ where possible, and by record if loss cannot be avoided.

The Scottish Government in 2011 expressed their policy towards the management of change in the historic environment through their Scottish Historic Environment Policy. Of note in this context:

"The protection of the historic environment is not about preventing change. Ministers believe that change in this dynamic environment should be managed intelligently and with understanding, to achieve the best outcome for the historic environment and for the people of Scotland. Such decisions often have to recognise economic realities. Scottish Historic Environment Policy, July 2011 (Historic Scotland, 2011)."

The local planning authority, Aberdeenshire Council, delivers the Development Plan through a Local Development.

Aberdeenshire Council: Aberdeenshire Local Development Plan 2012 (Aberdeenshire Council, 2012a) through a series of specific policies identifies the approach that should be taken to the historic environment. All the policies lie nested below Policy 13 Protecting, Improving and conserving the historic environment that identifies that:

"Aberdeenshire Council supports the protection, improvement and conservation of the historic environment. There will be a presumption against development that would have a negative effect on the quality of these historic assets. Different parts of the historic environment require to be subject to specific guidance and controls to make sure that we maintain and improve their value

There are four separately published supplementary guidance:

SG Historic Environment 1: Listed Buildings

(a) We will protect all "listed buildings" contained in the statutory list of Buildings of Special Architectural or Historic Interest for Aberdeenshire, and we will encourage their protection, maintenance, enhancement, active use and conservation.

(b) We will refuse planning permission and/or listed building consent for any works, including demolition, which would have a detrimental effect on their character, integrity or setting.

(c) We will only approve alterations or extensions to listed buildings or new development within their curtilage, subject to other policies, if:

- *They are of the highest quality, and respect the original structure in terms of setting, scale, design and materials.*
- *The proposed development is essential to securing the best viable use of the listed building without undermining its architectural or historic character, or its setting.*

SG Historic Environment 2: Conservation Areas

(a) We will refuse planning permission and/or conservation area consent for any development, including change of use or demolition, which would have a detrimental effect on the special character or setting of a conservation area.

(b) We will only approve new development wholly or partly within a conservation area, subject to other policies, if:

- *all details are provided under cover of an application for full planning permission;*

- *the design is of the highest quality, and respects and enhances the architectural, historic and visual qualities that give rise to the designation;*
- *Any trees that contribute to the conservation areas setting and character are retained.*

SG Historic Environment 3: Historic gardens and designed landscapes

(a) We will only approve development that would have an adverse effect on the character, structure or setting of a designated historic garden or designed landscape, subject to other policies, if:

- the objectives of designation and the overall integrity and character of the designated area will not be compromised; OR
- any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by long term strategic social or economic benefits of over-riding public importance, for which no other alternative site is available.

(b)In either case, mitigation and appropriate measures must be taken to conserve and enhance the essential characteristics, aesthetics, archaeological, historical value and setting of the garden or the designed landscape.

SG Historic Environment 4: Archaeological sites and monuments

(a) We will only approve development that would have an adverse effect on a scheduled ancient monument or on any other archaeological site, including battlefields, of either national or local importance, or on their setting, subject to other policies, if:

- *there are imperative reasons of overriding public interest, including those of a social or economic nature;*
- *there is no alternative site for the development;*
- *Where there is doubt, the applicant has provided further information, at their expense, on the nature and location of the archaeological feature(s) involved, prior to determination of the planning application.*

(b)In any such case, the applicant must at their own expense:

- *take satisfactory steps to mitigate adverse development impacts;*
- *when the preservation of the site in its original location is not possible, arrange for the full excavation and recording of the site in advance of development.*

9.3 Assessment Methodology

9.3.1 Baseline Data Collection

This assessment was conducted in accordance with the Institute for Archaeologists Code of Conduct and appropriate Standards.

The Study Area was the subject of a desk-based study and walkover survey, the latter carried out on the 25th November 2014. All sites identified by the desk-based study and the reconnaissance survey were recorded and assessed for potential direct or indirect impacts.

For the desk-based study up-to-date information was obtained on the locations of known historic environment sites including those with statutory protection and non-statutory designations within the Study Area. The primary sources for this information were the AC Sites & Monuments Record and Canmore, a Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) resource.

Ordnance Survey (OS) maps and earlier historic maps were examined to provide information on the land-use history for the area. A bibliographic search was undertaken using standard and accessible sources. The aerial photograph collection of the RCAHMS was also consulted as were other relevant archives.

Data was also collected on Nationally Significant Heritage Sites (World Heritage Sites, Scheduled Monuments, Inventory Gardens and Designed Landscapes, Inventory Battlefields, Listed Buildings (Category A) and Non-Statutory Register Sites) within 5km of the Project. This dataset was then overlain on the ZTV maps, and notable sites falling within the theoretical zones of intervisiblity (see Chapter 10: Landscape and Visual) were assessed for potential indirect visual impacts (in keeping with Managing Change in the Historic Environment volume setting).

9.3.2 Approach to Appraisal

This appraisal considers the predicted impacts and effects on the Cultural Heritage and Archaeology from the construction and operation of the Project. For all identified assets, the characterisation process will be to establish the nature; form and extent of the asset incorporating an assessment of its date, integrity, level of preservation and importance (see Table 9.3.1 for value of designated assets).

Table 9.3.1: Relevant historic environment designations

Designation	Explanation	Value	Responsibility
World Heritage Sites	Described by UNESCO as exceptional places of '*outstanding universal value'*	International	Historic Scotland and Planning Authority
Scheduled Monuments	Ancient monuments protected for archaeological interest under *Ancient Monuments and Archaeological Areas Act 1979*	National	Historic Scotland
Listed Buildings	Buildings of special architectural or historic interest protected under the *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*. Classified into (non-statutory) categories A, B and C(S) in decreasing order of importance.	National, Regional and Local	Historic Scotland and Planning Authority
Conservation Areas	Areas of special architectural or historic interest can be designated as Conservation Areas, under the *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*.	Local	Planning Authority
Inventory Gardens and Designed Landscapes	Gardens and designed landscapes of national importance are included on the inventory giving them protection through the planning system	National	Historic Scotland

Inventory of Battlefields	Battlefields of national importance are included on the inventory giving them protection through the planning system	National	Historic Scotland

9.3.3 The Significance of Potential Impacts

The criteria published in *Scottish Planning Policy*, *Scottish Historic Environment Policy* have been used to determine the importance / sensitivity of historic environment assets. The main thresholds of importance / sensitivity are recognised as International, National, Regional, Local and Other. The importance of designated assets is detailed in Table 9.3.2; undesignated assets are assessed against the published criteria. Typically these assets will fall within Regional or Local importance, but where there is no substantive significance then they may be assessed as being of other importance / sensitivity.

The type of effects and impacts from the development on Cultural Heritage and Archaeology resources are divided into the following categories:

- **Direct:** where there will be a physical, typically irreversible, effect on an asset. Direct effects may be caused by a range of activities associated with the construction and operation of proposed development. Construction activities may include ground-disturbing excavations for foundations, access roads, installation of services, etc. In addition other disturbance from processes, such as vehicle movement and soil bunding, may produce irreversible effects upon historic environment assets; and
- **Indirect:** where the asset may be affected as a consequence of the development occurring in a manner that may be either irreversible or temporary. Indirect effects may relate to the new development reducing views to or from historic environment assets with important landscape settings; from increased noise or vibration, or the initiation of processes such as erosive scour from windblown dust; or from increased fragmentation of the historic landscape and the loss of connection between its component parts. Such effects may occur during the construction phase of the development and persist through the operational phase.

Potential effects, direct and indirect, have been considered in terms of their longevity, reversibility and nature, which allowed the magnitude of impact to be determined. Magnitudes of impact are assessed in the categories major, moderate, minor and negligible, and are described in Table 9.3.2.

Table 9.3.2: Criteria for classifying Magnitude of Impact

Magnitude of Impact	Criteria
Major	Fundamental change to the specific environmental conditions assessed resulting in temporary or permanent change to the character or setting.

Moderate	Detectable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change and partial alteration of character or setting.
Minor	Detectable but minor change to the specific environmental conditions assessed and does not affect the condition of the receptor materially.
Negligible	No perceptible change to the specific environmental conditions assessed.

The assessment of significance of predicted effects and impacts was undertaken using two key criteria: importance / sensitivity of the asset and the magnitude of the anticipated effect. Table 9.3.3 combines these criteria to provide an assessment of the level of significance of effect. All adverse direct and indirect impacts resulting in Moderate or Major effects are considered to be significant in terms of the EIA Regulations.

The determination of the magnitude of change for direct impacts has been driven by the available information on the character of the Project in terms of the proposed physical elements and reasonable inference as to the anticipated process of construction (see Chapter 2: Project Description).

Table 9.3.3: Matrix for assessing significance of effect

	Value			
Magnitude of Impact	**International and National**	**Regional**	**Local**	**Low**
Major	Major	Moderate	Minor	Negligible
Moderate	Moderate	Moderate	Minor	Negligible
Minor	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect
	Non-Significant Effect

For indirect impacts, the ZTV completed by Atmos Consulting (see Chapter 10: Landscape and Visual) has been used to identify intervisible ground and hence those Cultural Heritage and Archaeology sites where the setting has the potential to be impacted. The magnitude of this change has been judged following national guidelines (see Section 9.3.2) supported where appropriate by site inspection and wireframes or photomontages.

9.3.4 Identification and Assessment of Mitigation

Where direct effects are identified that have not been designed out, mitigation will be proposed where there is both a magnitude of change greater than negligible and a reasonable potential for the enhancement of our comprehension of the Cultural Heritage and Archaeological Environment. Mitigation will be framed to be in keeping with planning guidance, the Development Plan, the policies of the Institute for Archaeologists and relevant best practice.

For indirect effects that are identified that have not been designed out there is no credible potential to further mitigate the impact.

9.3.5 Assessment of Residual Impacts

The resource being considered, the Cultural Heritage and Archaeology, by its nature is a static and non-renewable resource. Hence the original assessment of the Project for direct and indirect permanent impacts will remain sound post-mitigation and hence this assessment will be sustained as the residual impact.

Where mitigation has been detailed, typically for construction related direct effects, this mitigation usually orientates to the recovery, interpretation and dissemination of knowledge about the compromised Cultural Heritage and Archaeology sites. Some of this knowledge may be embodied in physical object (artefacts) that are retained. While the mitigation has ensured that the potential knowledge inherent within those compromised sites has been realised and retained, compliant with the principles of the Development Plan, this does not fundamentally alter the loss of a non-renewable resource

9.3.6 Limitations of the Assessment

The absence of large scale and systematic archaeological fieldwork within the Study Area has a consequence on the comprehensiveness and comparability of the archaeological record for any individual piece of ground. The archaeological record is effectively a composite of antiquarian and archaeological interest through time (whether stimulated by academic or commercial drivers) and as such is piecemeal, fragmentary and partial (both spatially and temporally). This process of compilation will inevitably perpetuate information gaps and erroneous information that cannot be confidently identified.

The studies to compile the baseline information will have resolved many of the information gaps. However, there is always the potential for additional, unidentified sites to be present.

The sites identified as intervisible by this assessment, based upon the ZTV, should be treated as a ‘worst case’ and it is likely that in reality a lesser number of receptors would be wholly or partly intervisible with the Project (for ZTV images see Chapter 10: Landscape and Visual).

9.4 Baseline Information

9.4.1 Cultural Heritage and Archaeological baseline

Presented within this section is a narrative description of the known Cultural Heritage and Archaeological baseline conditions within the Archaeology Study Area. Where sites are within the Archaeology Study Area they are identified with a site number (e.g. S4), a detailed listing of Cultural Heritage and Archaeology data relating to them is presented in Table 9.4.1 and their location is shown on Drawing 3102.

The desk-based assessment identified twenty-three Cultural Heritage and Archaeology assets within the Archaeology Study Area (Drawing 3102). Within the Development Area there is one Cultural Heritage and Archaeological asset (S12).

This is the site of a former farmstead depicted on the 6-inch 1st and 2nd edition Ordnance Surveys (1872 & 1901) that depicts two rectangular buildings with a small enclosure on the southern side. Its current condition is a substantial grass covered mound. The most notable Cultural Heritage and Archaeological asset within the Archaeology Study Area is located to the west of the Archaeology Study Area and is the Scheduled Monument of; Boddam Den, flint mining complex (S1) (Canmore ID: 21303, AMR Index: 6137).

The majority of the identified sites; nineteen in total (S3-S7 & S10-S23) are all associated with agricultural activity in the form of farmsteads. One site, (S9) represents the quarry site of Stirling Hill that is first depicted as a quarry on Alexander Gibb's Map of the North eastern districts of Aberdeenshire (1858). Within the area of (S9) there are a number of individual Cultural Heritage and Archaeological assets identified and recorded on the Royal Commission on the Ancient and Historical Monuments of Scotland known historic environment assets (RCAHMS: Canmore). As the route of the access road is to use preceding tracks and therefore will not impact on the recorded assets, for the purposes of the assessment (S9) covers the whole quarry and associated individual Cultural Heritage and Archaeological assets.

There are two further sites; (S2) and (S8). Site (S2) (HER ID: NK14SW0061) is the nineteenth century railway built to convey convicts from Peterhead prison to the quarries over a length of 2 ½ miles. The railway was fully equipped to a trunk line, with a complete signalling and communication system. Site (S8) (Canmore ID: 81603, HER ID: Designated Assets.

The assessment identified no specific assets within the Development Area that were protected for their archaeological, cultural or historical merit under any historic environment designation including the Ancient Monuments and Archaeological Areas Act 1979. Though, Boddam Den, flint mining complex (S1), a Scheduled Monument, lies within the Archaeology Study Area.

Table 9.4.1: Cultural Heritage and Archaeology Sites within the Archaeology Study Area

Site	Name	UID & Designation	NGR Ref:	Description
S1	Den of Boddam (Flint mining complex)	Canmore ID: 21303 AMR Index: 6137 HER ID: NK14SW0003	NK 11470 41350	The remains of a chalk flint deposit, the major source of flint in Scotland, occurs, mainly above the 91m contour, on the ridge of high ground which runs westward for about 10 miles (13.4km), from the coast between Invernettle (NK 12 44) and Stirling Hill (NK 12 41) to the west of Skelmuir Hill (NJ 98 41) and Hill of Dudwick (NJ 97 37). The flint, yellow in colour, occurs in the form of gravel, pebbles, nodules and boulders. Over 300 'flint pits' (the largest measuring about 7m across by 2m deep) and comparable with those on Skelmuir Hill are plainly visible lying in an irregular line near the top of both edges of a ravine about three-quarters of a mile long. Though the ground has not been cultivated, the edges of the pits are very broken. In one place numerous flakes, fragments and some anvils were found just below the peat.
S2	Den of Boddam	HER ID: NK14SW0061	Centred on: NK 1226 4289	Remains of the embankments which mark the course of the old railway line built between the quarries at Stirling Hill and the breakwater. An elaborate little railway was built to convey convicts from Peterhead prison to the quarries. The total length of the line was only 2.5; miles, but the whole works were of very elaborate construction. The line contained some large engineering works including a massive granite viaduct of several spans, a steel girder bridge across the road, two masonry over bridges and several cuttings and embankments.
S3	Gateside	HER ID: NK14SW0092	NK 1185 4232	Site of a now destroyed croft which is shown on the 1st and 2nd edition OS map. On the 1st edition map it is shown as a rectangular building within a shield shaped enclosure. Also within the enclosure is a smaller building. By the 2nd edition map only the rectangular building is shown.
S4	Gateside	HER ID: NK14SW0091	NK 1201 4238	Former farmstead now used as a residence. On the 1st edition OS map it is shown as a U-shaped steading, with the opening to the south, an extension from the eastern wing and horse-mill attached to the north face. There is a rectangular garden enclosure to the south and a possible pond beyond that. By the 2nd edition OS map the possible pond and the horse-mill have been removed. Most of the building has been removed at the time of vertical aerial photographs taken in 1978, which show the former farmstead surrounded by a caravan park. The 2006 map shows that the eastern extension remains in use and a portion of the former steading is shown as disused.
S5	Denend	HER ID: NK14SW0023	NK 1166 4209	The disused farmstead of Denend is depicted on the OS map of 1867 as a roughly U-shaped steading with open court to the SE. Another range extends north from the northern corner. By 1888 this range has gone and another smaller building lies to the SW. The southern range of the court has been shortened. Today the farmstead has a number of later additions to the north and west.
S6	Whinbush	Canmore ID: 21282 HER ID: NK14SW0027	NK 1186 4182	The OS 1st edition 1867 map shows an L-plan and a Z-plan building, each with a small attached rectangular enclosure. By the time of the OS 2nd edition 1888 map the eastern wing of the Z-plan building had been removed leaving an L-plan. The second building has also been altered at its north end; the enclosure formerly on its west side is no longer shown. A new small rectangular building has been added to the south on the opposite side of the

Site	Name	UID & Designation	NGR Ref:	Description
				track. All of the buildings are depicted as disused on current OS maps.
S7	Whinbush	HER ID: NK14SW0028	NK 1170 4178	Remains of a building, depicted on the 2nd edition OS map.
S8	Stirling Hill	Canmore ID: 81603 HER ID: NK14SW0021	NK 1120 4085	Radar site, established during World War II. After the war it was developed as part of the overhaul and improvement of the UK's air defences under codename ROTOR. At the beginning of that period it was a Ground Control Intercept Station, but in 1952 construction began on a standard underground 'R3' type operations block; it became operational in August 1953. It is still in use by the MOD. There was also a Royal Observer Post operated here during WWII.
S9	Stirling Hill	Canmore ID: 305259 HER ID: NK14SW0072	NK 1249 4125	The remains of Stirling Hill quarries lie c.2 miles south of Peterhead. Although in use by 1867 the construction of a large breakwater was begun by the Admiralty across Peterhead Bay to convert it into an all-weather harbour in 1884. The granite used in the concrete was excavated form the quarries at Stirling Hill by convict labour from Peterhead Prison. A small railway (NK14SW0061) was constructed to convey the convicts to and from the quarry and the granite to the breakwater. A number of smithies are visible on the OS maps 1867 and 1888 but only the remains of a few survive now. Site visit September 2014 recorded a number of surviving features including at least three magazines, with granite walls and concrete roofs; and a smithy. Two cottages next to the road at NK127411 may have been for quarry workers. Within the convict fenced area are foundations for a crane and an open fronted building, possibly for masons' bankers.
S10	Sandford Hill	Canmore ID: 143817 HER ID: NK14SW0030	NK 1158 4155	Site of a farmstead. The OS 1st edition 1867 map shows a long range with a smaller rectangular building to the south. Part of the eastern end of the range appears to have been removed by the time of the OS 2nd edition 1888 map, which also shows an enclosure attached on its south side. Current OS maps show that both buildings have since been removed, although a new dwelling has been built to the north.
S11	Sandford Hill	Canmore ID: 143817 HER ID: NK14SW0029	NK 1164 4155	Remains of a building. An L-shaped building with a small attached enclosure to its west, and two small enclosures to its east, are depicted on the OS map of 1867. By the 1888 edition only the L-shaped building with an attached enclosure to its NW is depicted. This ruined building is situated on a moderate N-facing slope in agricultural ground at an altitude of about 80m OD.
S12	Sandford Hill	HER ID: NK14SW0069	NK 1171 4117	Site of a farmstead depicted on OS 1st and 2nd edition OS maps, which show two rectangular buildings with a small enclosure to the S.
S13	Hill of Boddam	HER ID: NK14SW0032	NK 1219 4105	A small farmstead is depicted on the OS map of 1867 as a long range with a small extension to the west at its southern end. To the west is a house with attached garden enclosure. By the 1888 edition the small extension has gone but the rest remains as it is today, although the garden enclosure is no longer evident.
S14	Denhead	Canmore ID: 143818 HER ID: NK14SW0031	NK 1145 4122	Remains of three buildings. They are depicted on the OS maps of 1867 and 1888.
S15	The Den	HER ID:	NK 1137	A single building with attached enclosure to the south is

Site	Name	UID & Designation	NGR Ref:	Description
		NK14SW0026	4163	depicted on the OS map of 1867. By 1888 only the building is depicted. Today the building with small alterations stands within an enclosure.
S16	Denend (Denend Croft)	HER ID: NK14SW0054	NK 1169 4248	An L-shaped small farmstead and enclosure and two other buildings to the north are depicted on the 1st edition OS map of 1867. By the 1888 edition these had been removed and have been replaced by a new L-shaped building and rectangular building with attached enclosure immediately to the east. These remain in use.
S17	Buckie	HER ID: NK13SW0055	NK 1140 4266	Site of a now destroyed well, several buildings and an associated trackway.
S18	Burnside	HER ID: NK14SW0078	NK 1234 4273	Site of farmstead. On the 1st edition OS map it is shown as four buildings, two of which are long, rectangular and parallel. In-between is a sub-rectangular enclosure and on the north of the northern building is an attached horse-mill. The remaining buildings are to the west, the southern of which is attached to a triangular enclosure. By the 2nd edition map only the northern of the western buildings and the remnants of the enclosures are shown. Now destroyed.
S19	Denside Sandfordhill	Canmore ID: 156551	NK 1137 4163	A farmstead, comprising one roofed long building and one unroofed building is depicted on the 1st edition of the OS 6-inch map (Aberdeenshire 1872, sheet xxxii), but it is not shown on the current edition of the OS 1:10000 map (1990).
S20	Denside Sandfordhill	NA	NA	Small square building on depicted on the OS 1st edition 6-inch map (Aberdeenshire 1872, sheet xxxii). Not depicted on the OS 2nd edition 6-inch map (Aberdeenshire 1872, sheet xxxii) or current mapping.
S21	Denside	HER ID: NK14SW0025	NK 1130 4170	Two buildings with an attached enclosure are depicted on the 2nd edition OS map of 1888 but not on the earlier 1867 edition. They are still in use today.
S22	Denside	HER ID: NK14SW0024	NK 1126 4178	Site of two small buildings with an attached enclosure which are depicted at this location on the 1st edition OS map. By the 2nd edition map, only one small building with a small enclosure to its east is depicted. Today a small farmstead of six buildings now stands here.
S23	NA	NA	NA	A small square building with a surrounding wall located to the northwest of the quarry with an enclosure on its east side and open with a well depicted to the south. This is not on the 6-inch 2nd edition Ordnance Survey (1901) or on current mapping.

9.4.2 Previous Historic Environment Studies

To date, there have been no recorded programmes of archaeological survey and excavation within the Development Area. There have however, been a number of targeted archaeological survey and excavations undertaken in the area of the Scheduled Monument (S1) (see Table 9.4.2). All have been carried out as part of programmes of academic research.

Table 9.4.2: Previous archaeological studies

Event No.	Details	Year	Reference
E1	Exploratory excavations took place in areas where extensive surface indications of flint extraction survive in the form of hollows. The excavations confirmed the presence of substantial pits (over 2.5m deep) dug through glacial till into the underlying Buchan Ridge Gravel, and showed that pits continued beyond the Den slopes into cultivated ground. Spoil heaps from the extraction pits seal well-preserved buried soils. It was the Buchan Ridge Gravel which is the source of the large cobbles (up	1991	Saville. A

	to 170mm across) of grey flint being exploited. The extraction area was densely littered with the residue of primary processing of these cobbles in the form of cores, flakes, and the quartzitic cobbles used as anvils.		
E2	A second season of research excavation took place, centred on a formerly cultivated plot above the west side of the Den. An area of c159 sq m immediately south of the modern ditch section examined in 1991 was machine-stripped, then cleaned by hand. The excavation focused on a close-set group of extraction pits on the south edge of the area. Archaeological and geological samples were taken from elsewhere in the Den provided information on distribution and variability. It was estimated that flint may have been extracted over as much as 4ha (10 acres), with pits being dug wherever the Buchan Ridge Gravel was close to the surface. No evidence for the manufacture of finished implements on site; virtually all the struck flint recovered is primary processing debris, often with a strong bipolar aspect, resulting from the technique of knapping on anvils.	1992	Saville. A
E3	A detailed survey of the flint mines in the Den of Boddam was conducted over a period of a week. The full extent of the flint mines was mapped at a scale of 1:2500, while a sample of the pits on the slope below the area excavated by Alan Saville were drawn at a scale of 1:500.	1993	Saville. A & RCAHMS
E4	A third season of research excavation examined an area of c. 130 sq. m. immediately southwest of the 1992 excavation. Machine-stripping revealed the presence of seven extraction pits, two of which were wholly within the cleared area and work was concentrated on these. Excavation has made it clear that the pits were originally bell-shaped, being much narrower at the surface when first dug. The present shapes result from collapse of the unstable upper edges which had been undercut when the lower flint-rich deposits were extracted.	1993	Saville. A
E5	Field walking was carried out in two fields to the north of excavations at the Den of Boddam (NK14SW0003) and the field to the northwest. Large quantities of debitage were observed across the eastern, downslope, fields to the north, but concentration of material decreased to the west and little was found west of the track. The distribution probably reflects the presence of extraction pits under the surface and thus of the presence of accessible Buchan Ridge Gravel. The debitage also showed a change in colour across this distribution, from grey in the area of the excavation to red- and yellow-brown on the fields to the north, relating to a change in the nature of the Gravel. Radiocarbon dates obtained from samples of the buried soil and from initial peat formation have indicated a late Neolithic (late 3rd millennium uncal BC) bracket for the flint extraction at Boddam.	1993	Saville. A

Traces of the exploitation of flint by prehistoric peoples are very rare. Several complex pits and working hollows have survived on the Buchan Ridge Gravels south-west of Peterhead and date to the third millennium BC. Flint is generally only found in Scotland as small pebbles on coastal beaches, apart from one area south-west of Peterhead in Aberdeenshire, known as the Buchan Ridge Gravel.

The Buchan Ridge Gravel is the remains of a fossil beach with deposited flint cobbles formed several million years ago and discovered and exploited by early farmers. They dug pits through the overlying soil and glacial clay to reach the flint cobbles.

With sponsorship from the National Museums of Scotland and Grampian Regional Council and supervised by Alan Saville, exploratory excavations took place in May-June 1991 where extensive surface indications of flint extraction survived. The excavations confirmed the presence of substantial pits dug through glacial till into the underlying Buchan Ridge Gravel, and showed that pits continued beyond the Den slopes into cultivated ground.

As a result a second season of research excavation took place in July-August 1992 and a third season of excavation in June-July 1993. In between the second and third season of excavation a detailed survey of the flint mines was conducted over a period of a week in May 1993 by the Royal Commission that surveyed the full extent of the flint mines at a scale of 1:2500.As part of the third season of excavation, field-walking on the northwest side of the Den produced further clear evidence for the limits of extraction beyond where the pits are visible.

Radiocarbon dates obtained from samples of the buried soil and gathered during the excavations provided a late Neolithic (late 3rd millennium uncalibrated BC) bracket for the flint extraction at Boddam.

9.4.3 Historic Development including Historic Mapping

The earliest name given to Peterhead is Keith Inch which it retained until 1593 when it obtained a charter as a burgh. The Archaeology Study Area lies within the parish of Peterhead with Peter-Ugie, Petri Promontorium and Petri Polis also other derivatives that are found on associated charters (Donald, 1834-45: 344 Moss, 1791-99: 385). The estate of the Earls of Marischall included the parish of Peterhead and had one of their residences at Boddam Castle (Canmore ID: 21292, AMR Index: 3252).

Both the Old (1791-99) and New (1834-45) Statistical Accounts provide a detailed insight into the economic and social state of the parish. With particular reference to the topographic feature of Stirling Hill that forms the southern extent of Peterhead Parish and has an abundance of fine granite. Moss (1791-99: 558) refers to this abundance and quality of the granite having been used for numerous buildings in Peterhead while Donald (1834-45: 331) highlights it being taken down to the Isle of Sheppey in Kent to be used in the construction of the naval dockyards at Sheerness.

The flint mining complex at the ‘Den of Boddam’ (Canmore ID: 21303, AMR Index: 6137) and its associated pits are mentioned in both the Statistical Accounts (Donald 1834-45, Moss 1791-99: 385). However, they are concluded to be the hiding areas for people when they were attacked by Viking raids along the coast.

Along with the Statistical Accounts that provide a factual insight into the historic changes of both the Study and Development Area. Another avenue to achieving an understanding of the nature and extent of the heritage assets within the Development Area and its immediate environs is an assessment of the historic land use, in particular relating to agriculture and extractive industries. A detailed examination of the map evidence is important in this respect, particularly when trying to evaluate the intensity of the land use. It can also establish whether or not the documentary sources can be used as a reliable means of assessing anthropic impact from the late 18th century onwards.

The earliest mappings depicting the area of Boddam are Robert Gordon's *Aberdeen, Banff, Murrey to Inverness: [and] Fra the North Water to Ross* (1640) and Joan Blaeu's *Description of the two shyres Aberdene and Banf, with such contreys and provinces as are Comprehended un* (1654), itself a re-depiction of Gordon's survey. Both surveys label Boddam (spelt 'Boddom') and the larger settlement of Peterhead to the north with the inland area in which the Archaeology Study Area is located as hills (not shown).

It is not until Roy's *Military Survey of Scotland* (1747-52) (Figure 9.4.1) that the location of the converter station at Fourfields can be potentially located. Roy depicts Boddam (spelt 'Boddom') and what appears to be a rectangular enclosure divided into two areas possibly representing a walled garden associated with the building located on its northern edge. Regarding the Archaeology Study Area, Roy depicts Stirling Hill; 'Sterling Brae' which is located in close proximity and to the east of Fourfields.

Figure 9.4.1: Extract from Roy's *Military Map of Scotland* (1747-52)

Roy (1747-52) (Figure 9.4.1) also depicts two settlements/clachans both formed by four buildings sited on the eastern and western sides of a cultivated area of land with higher topography to the north. This higher topography to the north fits the present day landscape and the location of the Fourfields site. A further settlement, labelled 'Denain' is depicted to the east of a small burn, both of which are depicted on the current Ordnance Survey with the settlement possibly representing 'Denend' which is located to the east of Fourfields.

As mentioned, another topographic feature is the small burn running southwest-northeast and still depicted on the current Ordnance Survey to the northwest of Fourfields and flowing into a small reservoir to the south at the Den of Boddam (S1) (Canmore: 21303, Schedule Index: 6137). Roy (1747-52) (Figure 9.4.1) also depicts a road aligned north-south having its starting point at Aberdeen and continuing north until it reached Fraserburgh. From the farmstead labelled 'Whinbush' (S6) on current mapping this forms a minor road still in use and runs parallel to the Northern Section of the HVAC cable route. The road is still visible and can be traced as a track way running up to 'Whinbush' (S6) on current mapping and along the western edge of Fourfields (Drawing 3102).

John Thomson's *Northern Part of Aberdeen and Banff Shires. Southern Part* (1832) (Figure 9.4.2) continues to depict the north-south aligned road from Roy's survey (1747-52) (Figure 9.4.1) and also a new road running along the coast; the present day A90, and curves to the northwest where it joins up with the road depicted by Roy. Thomson's (1832) (Figure 9.4.2) survey is the first to label Boddam Castle (still spelt 'Boddom') and labelled as a 'ruin'. The clachans that were possibly located near to the Archaeology Study Area are still depicted but only as one building respectively with the settlement at Denend ('Dunain' on Roy's survey) is not labelled.

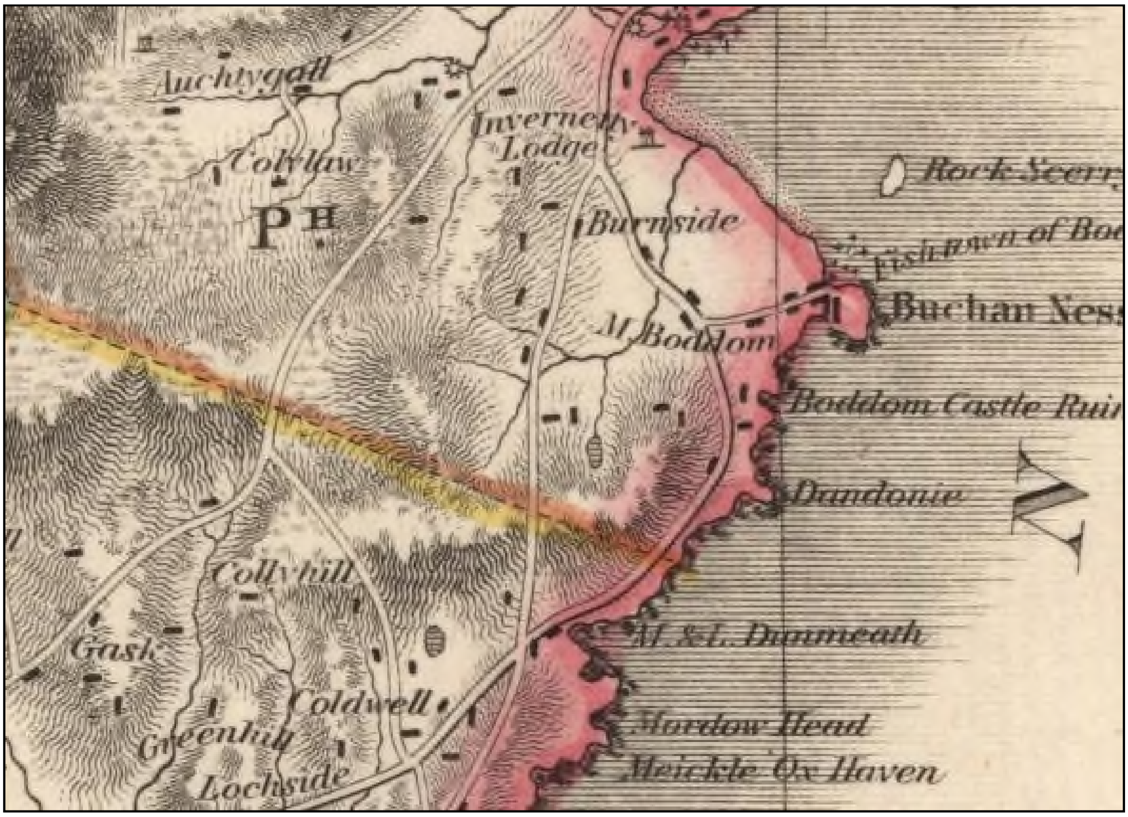

Figure 9.4.2: Extract from Thomson's *Northern Part of Aberdeen and Banff Shires. Southern Part* (1832)

By the time of Alexander Gibb's *Map of the North eastern districts of Aberdeenshire* (1858) (Figure 9.4.3) the clachans/settlements are not depicted and a small road aligned northeast-southwest has been constructed that joins Roy's (1747-52) (Figure 9.4.1) road and what is now the A90. This small road is still depicted on current mapping leading east from 'Whinbush'. This is also the first survey when 'Stirling Hill Quarries' are labelled. The burn that is first depicted by Roy (1747-52) is labelled for the first time as 'Burn of Sandfordhill' with 'Denend'; it's present spelling used, labelled as three buildings on the western side of Roy's road.

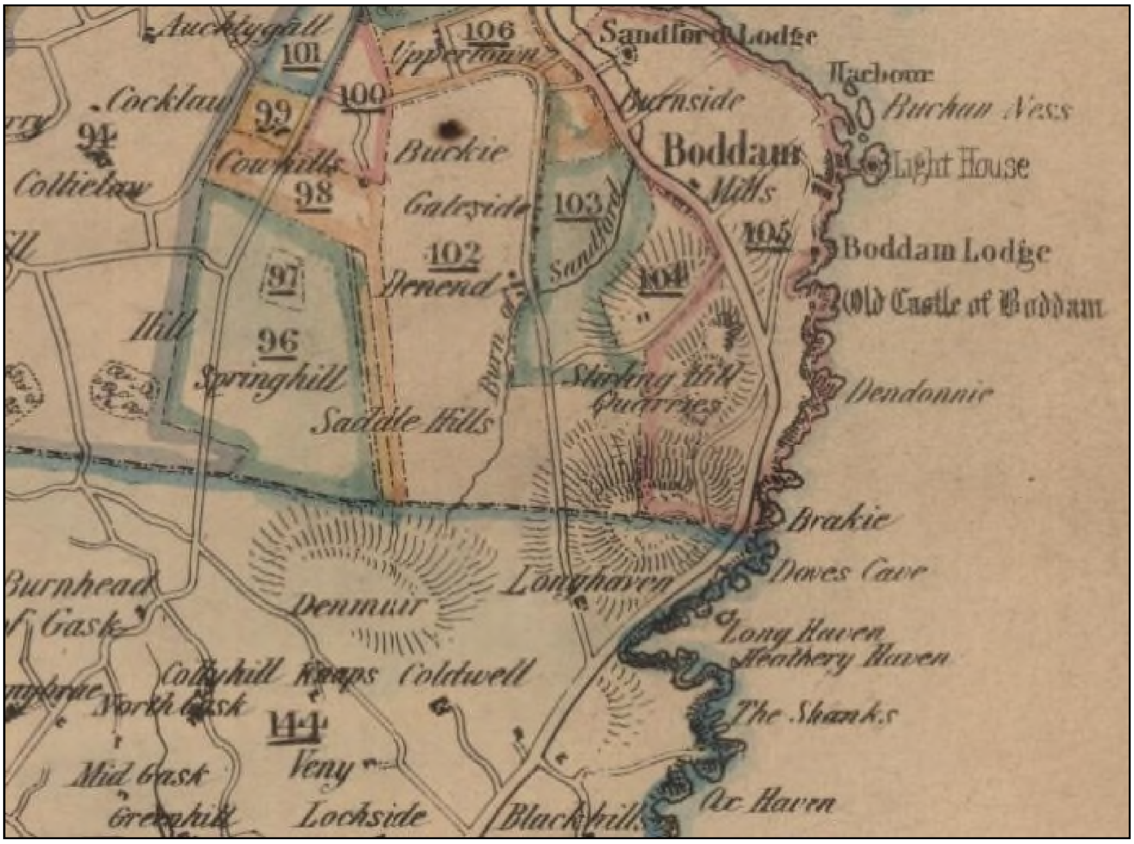

Figure 9.4.3: Extract from Gibb's *Map of the North eastern districts of Aberdeenshire* (1858)

With the *6-inch 1st edition Ordnance Survey* (1872) (Figure 9.4.4) the landscape has become enclosed and resembles the current layout of the landscape with the Fourfields site clearly distinguishable as a large square formed of four individual smaller square fields. Depicted within the Development Area of Fourfields are two wells along the edge of the northwest quadrant and the farmstead 'Sandfordhill' (S12) (HER ID: NK14SW0069) formed by two rectangular buildings and a small enclosure to the south and located in the southwest quadrant.

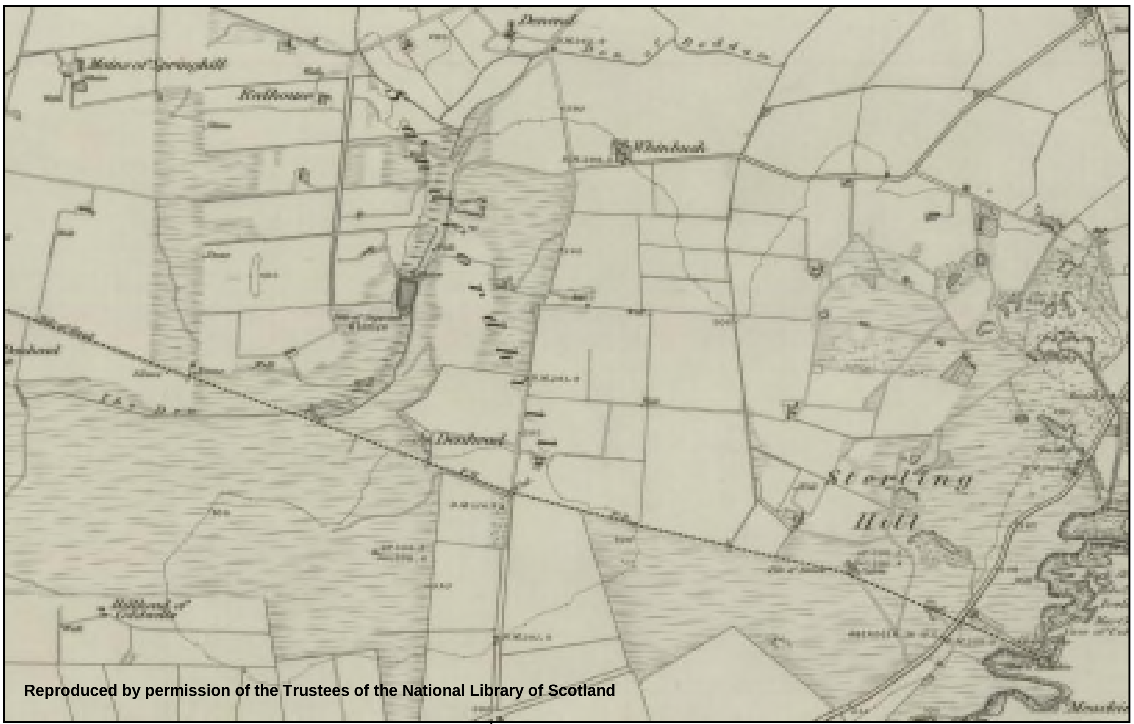

Figure 9.4.4: Extract from the *6-inch 1st edition Ordnance Survey* (1872) showing the Fourfields site centrally located

This is the first time that the farmstead at ‘Whinbush’ (S6) (HER ID: NK14SW0027) is depicted with the road running eastwards on Gibb’s (1858) (Figure 9.4.3) survey still depicted and joining the current A90. The north-south road depicted by Roy (1747-52) (Figure 9.4.1) is still traceable; however, its form is more akin to a track without a metalled surface (Figure 9.4.4). Surrounding Fourfields are a number of farmsteads all located within the Archaeology Study Area. Along the eastern side in the southeast corner there is a two building farmstead, Hill of Boddam (S13) (HER ID: NK14SW0032) with a long rectangular range with a small extension at its southern end while to the west is a house with an attached garden enclosure (Figure 9.4.4). A well is also depicted and located to the north. Located half-way up the eastern side is another farmstead of three buildings enclosed by a curvilinear wall (Figure 9.4.4). This is not depicted on the current mapping.

To the northeast there are another two farms with the closest to Fourfields formed by three buildings; two are large rectangular ranges and there are two associated enclosures, the further east farmstead is sited on the southern side of the minor east running road and formed of one larger rectangular range, a small square building within an enclosing wall (Figure 9.4.4). Neither of the farmsteads are on current mapping. Further to the east and north of Stirling Hill (labelled ‘Sterling Hill’) the landscape is crossed by a number of tracks, open quarry areas (S9) (HER ID: NK 14SW0072) and seven farmsteads (Figure 9.4.4).

Along the northern edge of Fourfields there is an ‘L-shaped’ range with an enclosure located on its western side (Figure 9.4.4), a track leading to the west and joining the road depicted by Roy (1747-52) (Figure 9.4.1) and a small square building joined to the outside northern edge of the northwest quadrant (S11) (HER ID: NK14SW0030). On current mapping both buildings have since been removed, although a new dwelling has been built to the north. A small rectangular range and three associated enclosures on the north and east sides are depicted in an area of unimproved land (S10) (Canmore ID: 143817, HER ID: NK14SW0029) with a quarry depicted to the north on the east edge of Sandfordhill Burn. Labelled as disused on current mapping with the farmstead not depicted but recorded as a ruined building situated on a moderate north facing slope in agricultural ground (S10) (Figure 9.4.4).

The present day reservoir at the southern end of Sandfordhill is depicted as a body of water (Figure 9.4.4), although significantly smaller than that depicted on current mapping. Labelled at the southern end of the reservoir is the 'site of supposed circles', however, nothing is recorded in any historical records. Within this area on the eastern side of the reservoir is the scheduled site of Den of Boddam, flint mining complex (Canmore ID: 21303, AMR Index: 6137).

Further to the west and within the 500m buffer of the Archaeology Study Area are seven further farmsteads, the furthest south is labelled 'Denhead' (S14) (Canmore ID: 143818, HER ID: NK14SW0031) and formed of a large rectangular range with three smaller associated buildings and an enclosure to the south (Figure 9.4.4). To the northwest is a small rectangular building with a small enclosure on its south side (S15) (HER ID: NK14SW0026), on current mapping the building is still present within an enclosure.

The other four farmsteads are sited to the north. The first (S19) is formed of a rectangular range with a smaller rectangular unroofed building to the southwest (Canmore ID: 156557). To the north of (S19) is a small square building (S20) depicted on the *6-inch 1st edition Ordnance Survey* (1872) (Figure 9.4.4). Neither site is depicted on the *6-inch 2nd edition Ordnance Survey* (1901) (Figure 9.4.5) or current mapping.

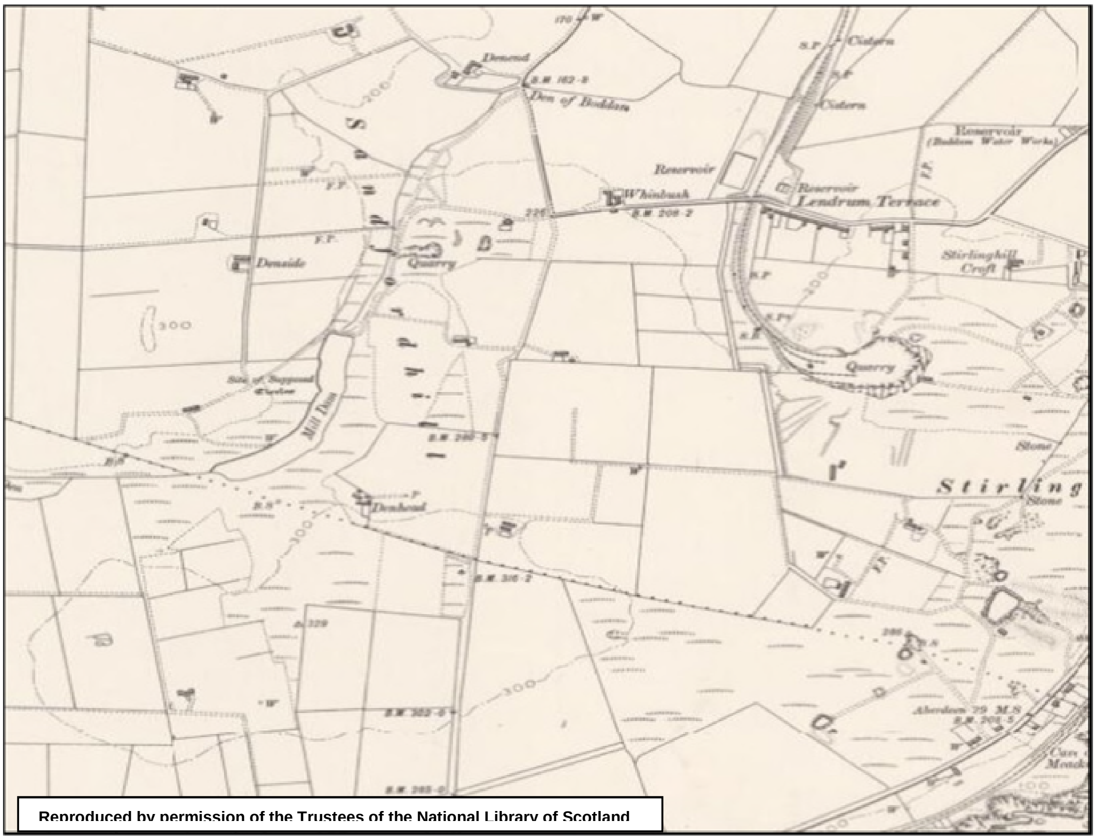

Figure 9.4.5: Extract from the *6-inch 2nd edition Ordnance Survey* (1901) showing the Fourfields site centrally located.

Of the final three farmsteads (S21) and (S22) are to the northwest of (S19) with (S23) to the northeast. On the *6-inch 1st edition Ordnance Survey* (1872) (Figure 9.4.4) (S22) (HER ID: NK14SW0025) is located further to the west away from the track and formed by two buildings with an enclosure sited to the east. By the time of the *6-inch 2nd edition Ordnance Survey* (1901) (Figure 9.4.5) the farm has moved to its present location to further to the west. Site (S22) (HER ID: NK14SW0024) is located just to the north of (S21) and formed by two small buildings with an attached enclosure. Presently this a small farmstead of six buildings.

Site (S23) is a small square building with a surrounding wall located to the northwest of the quarry with an enclosure on its east side and open with a well depicted to the south (Figure 9.4.4). This is not on the *6-inch 2nd edition Ordnance Survey* (1901) (Figure 9.4.5) or on current mapping.

Within the north section of the Archaeology Study Area along the route of the HVAC cable there are a number of farmsteads. Sited on the western edge of the road depicted by Roy (1747-52) (Figure 9.4.1) is a small ‘L-shaped’ range with a smaller square building with a surrounding wall (S3) (NK14SW0092) with ‘Gateside’ to the east (Figure 9.4.4). This is also the first depiction of ‘Gateside’ (S4) (HER ID: NK14SW0091) and it forms a substantial range with the west side forming a ‘U-shape’ with a courtyard to the south and the adjoining east side of the range forming an ‘L-shape’. Sited to the south is an area of formal and tree lined garden (Figure 9.4.4).

The location of the present substation is to the north of 'Gateside', with the connection of the HVAC cable proposed to be to the south of the substation. On the *6-inch 1st edition Ordnance Survey* (1872) (Figure 9.4.4) there are two farmsteads labelled 'Denend'; one (S5) (NK14SW0023) is located to the northwest of 'Whinbush' (S6) the other located to the east (S5) of 'Gateside'. The 'Denend' (S5) northwest of 'Whinbush' is formed of four rectangular buildings, a well and a small square enclosure to the south. The second 'Denend' (S16); labelled as 'Denend Croft' on current mapping, has a more formal layout of three rectangular buildings, two of which are aligned east-west and are relatively substantial with two enclosures sited in the south of the area (Figure 9.4.4). Both farmsteads are still depicted on current mapping.

The farmstead of 'Buckie' (S17) (NK14SW0055) is depicted within a well organised layout with an 'L-shaped' range and a rectangular, east-west range with a total of four associated buildings within the grounds and a garden area distinguishable by its rectangular shape and trees lining the lower eastern side (Figure 9.4.4). The site of the well, several buildings and an associated track way is now destroyed. The current 'Buckie Farm' is located just to the north and depicted on current mapping as a large 'C-shaped' range.

'Burnside' (S17) (NK14SW0078) is depicted on both Tomson's (1832) (Figure 9.4.2) and Gibb's (1858) (Figure 9.4.3) surveys and forms another well organised farmstead with two substantial rectangular east-west aligned buildings and two small square buildings located to the northwest, all are sited within an enclosing wall. The farmstead is not depicted on current mapping.

With the *6-inch 2nd edition Ordnance Survey* (1901) (Figure 9.4.5) the most significant change to the landscape within the Archaeology Study Area is the construction of the north-south route of the Den of Boddam railway (HER ID: NK14SW0061) that transported convicts from Peterhead prison to the quarries at Stirling Hill. This is also the first time that 'Stirling Hill' is labelled with its current spelling. The size of the reservoir at the 'Den of Boddam' is labelled as 'Mill Dam' and significantly larger with an extension to the south and forms its present shape and form that is on current mapping. To the east of 'Whinbush' is 'Lendrum Terrace' that is formed by seven buildings, two of which form rectangular buildings associated with terraced housing. Previously this area was open fields on the *1st edition Ordnance Survey* (1872) (Figure 9.4.4).

The route of the access road leaves the east side of Fourfields heading in an easterly direction and changing direction to head south and join the A90. The route passes through the area and uses previous tracks from the period when the area was associated with Stirling Hill Quarries (S9) (HER ID: SK14NW0072).

9.4.4 Aerial Photographs

For an insight into the character of the Development Area as it has evolved through recent years, reference to aerial photography is an important element.

Aerial photographs and recent satellite-derived imagery shows the full extent of Stirling Hill and the site of Fourfields and surrounding landscape as open arable fields. This also demonstrates that there are no unexpected crop marks within the Archaeology Study Area that may survive and be affected by the Development.

Figure 9.4.6: Aerial photo showing the Den of Boddam surrounding the reservoir. RCAHMS Aerial Photography Digital Oblique aerial view centred on the reservoir and the remains of the flint mines, taken from the NNE. DP011672 Copyright RCAHMS.

9.4.5 Significant monuments in the larger landscape

The assessment reviewed the significant designated assets within 2.5km of the Converter Station building. This identified some fifty-eight sites meeting these criteria; these were broken down into one Category A Listed Building, six Category B Listed Building one of which was a Scheduled Monument, and fifty-one Category C Listed Buildings.

The vast majority of these sites, some fifty-three Listed Buildings, are located with the urban core of Boddam. These buildings by their character and design have been conceived to reference one another, the urban streetscape and (for Boddam) the eastern coastal margin of the town. As such their setting does not reference or orientate to the rural, inland fringe of Boddam. When considering their relationship explicitly with the Fourfields area, the intervening higher topography of Stirling Hill blocks views towards the proposed location of the Converter Station. Hence it is not credible that these Listed Buildings are at risk of a noticeable setting impact from the Project.

For three sites; Sandford Lodge Walled Garden and Sandford Lodge located to the north and Buchaness Cottage located to the east which are sited outside of the urban core of Boddam, ZTV presented in Chapter 10 Landscape Visual Impact Assessment demonstrates that there will be no visibility of the Converter Station. As a result these are not considered further in terms of visual impact.

Two sites from the fifty-eight, due to their designation and location were considered as having the potential to receive a visual setting effect and were considered in greater detail. These two site were the Scheduled Monument and Category B Listed Building; Boddam Castle (Canmore ID: 21292, AMR Index: 3252) and one Category A Listed Building; Buchaness Lighthouse (HB No: 16367).

The remains of the fifteenth-sixteenth century Boddam Castle (Canmore ID: 21292, AMR Index: 3252) is sited on a level promontory between two deep vertical sided sea inlets and consists the remains of a curtain wall, c.33.0m in height, a round arched doorway and square window above, surmounted by a low gable, and one or two smaller arches as well as the complete foundation.

Surviving as irregular rubble walls within rough grazing, the promontory character of the site is evident in defining the form of the setting of the Castle. The modern coastal road into Boddam with its linear belt of modern residential buildings has visually separated the promontory, and the castle, from the agricultural hinterland further west. Rather the promontory relates to the cliff line and sharp inlets to shape the setting for the castle.

The Category A Listed Building Buchaness Lighthouse (HB No: 16367) was built in 1827, by engineer Robert Stevenson on a small island, connected to the shore by a 3-span concrete bridge to the mainland. It consists of a tall tower with lantern 130ft (39.6m) above sea level, painted in red and white stripes, with a walkway supported on corbels with arched openings. There are two blocks of ancillary buildings and the tower itself rises from a circular one-storey base.

By its fundamental character, the lighthouse has panoramic views across the North Sea seascape to the east of Boddam. The institutional character of the complex of buildings, standing on the small island, is exaggerated by the managed grass and boundary walls onto the foreshore. The views of the neighbouring coast are dominated by either the granite cliffs of the coastal town of Boddam to the immediate west. The rolling Aberdeenshire hills, including Stirling Hill, are ancillary and minor in creating the setting in comparison to the cliffs and seascape that dominate the setting for this site.

9.5 Impact Assessment

9.5.1 Ascribing Sensitivity to Archaeological Assets

Ascribing sensitivity to the sites identified within the Archaeology Study Area has followed the criteria detailed in Table 9.3.1. The ascription was based on the known origin and potential importance of these sites as identified by the baseline studies.

The designated site, Den of Boddam flint mining complex is recognised to be of National importance which would have a High level of sensitivity. This level of sensitivity is commensurate with the designation in which it holds.

The majority of the identified sites; nineteen in total (S3-S7 & S10-S23) are all associated with nineteenth century agricultural activity and would be ascribed a low level of sensitivity. The remaining site of (S2), (S8) and (S9) are all of local importance and therefore given a local level of sensitivity.

With all ascription of sensitivity, the base for judgement is the current knowledge base. While for this assessment the baseline studies present a sound understanding, there remains the potential that any subsequent archaeological intrusive works may uncover unanticipated information about these sites. In particular, there is the potential for nineteenth century rural sites to re-use the locations of earlier sites, obscuring any surface traces of such earlier activity. Hence sensitivity of individual sites may change with our understanding

9.5.2 Potential Direct Impacts of the Proposed Development

The proposed development will not have any direct or destructive impact on any archaeological or cultural heritage remains within the Archaeology Study Area during construction of operation.

There are no archaeological or cultural heritage assets within the Development Area and associated build elements (HVAC cable route and Access road) that will have any adverse direct impacts upon them.

In addition to the effects detailed above, there is a potential for currently unknown buried archaeological features within the development site that could be disturbed by the development. The potential for the presence of such features has been assessed as low given the character of the Development Area.

Although presently unquantified the close proximity of the Den of Boddam (S1) to the core site of the Project has the potential for unknown archaeological features to be present and would be at risk from direct adverse impacts.

9.5.3 Potential Indirect Impacts of the Proposed Development

In considering the potential of indirect impacts of the proposed development, all aspects of the construction and operation of the proposed development have been considered.

In terms of setting impacts, within the Archaeology Study Area there is one nationally important Cultural Heritage and Archaeology asset which will receive an impact on its setting. This is the prehistoric monument previously described: the Den of Boddam flint mining complex (S1).

In this particular instance, the nature of the existing land form is such that a substantial portion of the site is located on sloping topography which has higher ground on both sides of the Den and therefore blocks views out from the site (Figures 9.5.1 & 9.5.2).

Figure 9.5.1: View to the east and Development Area from the base of the west side of the Den of Boddam

Figure 9.5.2: View to the east and Development Area halfway up the west side of the Den of Boddam

The primary concern for any indirect setting impacts is the view looking east onto the Development Area as the footpath descends into the Den of Boddam and any effect that this may have.

The modest nature of this setting intrusion is well illustrated by photomontages in Chapter 10: Landscape and Visual, Viewpoint 3, which shows the view east from the footpath west of the Den of Boddam Drawing. 3116. The viewpoint is positioned to the west of the western boundary of (S1).

The viewpoint reflects the visibility of the top of the convertor station for visitors to the monument as they approach from the west and north. The majority of the area covered by the Scheduled Monument has no inter-visibility with the convertor station.

As illustrated by the photomontage Chapter 10: Landscape and Visual the form and design of the roof structure will suppress the nature of the intrusion into the setting in the approach from the west and north. Photomontages reflect a worst case scenario setting impact of the development with regards to the indirect effects on the setting of the nationally important heritage asset; the Den of Boddam flint mining complex (S1).

As a consequence of this, the potential visual impact has been minimised. In summary, it is considered that the setting impact will be of minor magnitude, resulting in a minor effect, which is not significant in terms of the EIA regulations (Table 9.5.1).

Table 9.5.1: Significance of indirect effects on sites within the Archaeology Study Area

Site No	Name	Type	Sensitivity	Magnitude of impact	Significance of effect
S1	Den of Boddam flint mining complex	Flint Mines	National	Minor	Minor

The Project will create indirect setting effects on the other Cultural Heritage and Archaeology sites in the Archaeology Study Area. However, due to their local to low level of sensitivity this impact is considered not to be significant. The most severe example of this is Sandford Hill (S12) where the introduction of the new built form in the immediate agricultural landscape will cause a detectable change in the character of the setting. The magnitude of impact on the setting of (S12) would be major. However, the low sensitivity of this site means that the effect would be minor, which is not significant.

The proposed route for the HVAC cable route is along the northern edge of the Fourfields site and into the fields on the west side of the Highfield access road. The route will then run due north, parallel to the access track (Figure 9.5.3), and then along the west side of the unnamed road past Denend, with the cable then passing under the road.

Figure 9.5.3: The HVAC Cable route will run down the edge of the field to the left of the track shown here.

It would finally continue to follow northward, on the east side of the unnamed road, before cutting east to the existing substation (Figure 9.5.4).

Figure 9.5.4: Demonstrating far north end of the HVAC Cable route where it turns east to join the existing substation.

Any visual effect caused by the excavation will be temporary and will not have any long term setting impacts on any Cultural Heritage or Archaeological sites.

In the wider landscape the character of two sites were considered with care to enable the assessment for indirect setting impacts. These were the Scheduled Monument of Boddam Castle (Canmore ID: 21292, AMR Index: 3252) and the Category A Listed Building; Buchaness Lighthouse (HB No: 16367). For both sites their settings are dominated by the seascape and shoreline of this coast, with strong associations into the town of Boddam that isolate these monuments from wider views or relationships with the more distant, inland landscape.

Both sites are located on the coast with views blocked into the interior by the higher topographic feature of Stirling Hill (Figures 9.5.5 & 9.5.6).

Figure 9.5.5: View looking southwest from Buchaness Lighthouse with Stirling Hill visible blocking views onto the Development Area

Figure 9.5.6: View looking from west from Boddam Castle with Stirling Hill visible blocking views onto the Development Area

The location of the proposed development is also sited within low topography with all views out to the east and coast blocked by Stirling Hill (Figure 9.5.7).

Figure 9.5.7: View from within the Development Area and the proposed location of the converter station demonstrating the topographical feature of Stirling Hill blocking views out to the east.

Hence, neither will receive any indirect setting impacts onto the proposed location the Converter Station.

9.6 Mitigation Measures

The design of the converter station and associated build elements has taken account Cultural Heritage and Archaeology assets within the Development Area and broader Archaeology Study Area.

There are no known, discrete Cultural Heritage and Archaeology assets identified that will receive an adverse impact that warrant mitigation. However, there is the potential for currently unknown archaeological sites within the Development Area. This potential requires further archaeological works in order to resolve this.

A staged programme of archaeological works will be undertaken in support of the Project. The character of the works is:

- The intrusive evaluation of the Converter Station site, including surrounding laydown areas and site compound area;
- The results from the evaluation would determine the appropriateness of additional stages of archaeological work that could encompass:
- Formal excavation of identified at risk archaeological sites;
- Monitoring of ground breaking works (in accordance with PAN 02/2011); and
- Post-excavation analysis and reporting of the significant features recorded and of the samples, records or finds recovered.

All archaeological works would seek to identify significant archaeology and facilitate its competent excavation. Recovered samples, materials and records would be subject to an agreed programme of post-excavation analyses and subsequent reporting, including publication where appropriate. Every opportunity will be taken to disseminate the findings both amongst academic audiences and within the local community.

To increase public awareness of the Cultural Heritage and Archaeology of the area it is proposed that Interpretation boards be located in the southwest field near S12 Sandfordhill (see Drawing 3102) and another in the northwest corner of the Fourfields site focusing on S1 Den of Boddam.

Currently there is nothing that explains what S1 Den of Boddam is. The provision of an interpretation board would be a very positive measure to raise awareness in the importance and significance of the site to the study of prehistoric industrial activity.

Currently S12 Sandfordhill is a large grass covered mound. The siting of an interpretation board at the site would provide information of what the site formerly was. Added detail could also highlight the 18th century track way that runs along the western edge of the Fourfields site and further enhance a wider appreciation in the differing Cultural Heritage and Archaeology assets that exist within the immediate area. Sympathetic landscaping of the site will help to reduce impacts on setting.

9.7 Residual Effects

The Historic Environment is a static and non-renewable resource. Hence the original assessment of the Project for direct and indirect permanent effects (see Section: 9.5*)* will remain sound post-mitigation for known component and hence sustained as the residual impact. The risk associated with finding unknown assets during construction are reduced by the mitigation.

9.8 Cumulative Effects

Cumulative effects on the Cultural Heritage and Archaeology environment derive from setting effects caused by this Development when considered in conjunction with other developments that occurred in the past or are likely to occur in the foreseeable future.

The introduction of the Project is not anticipated to generate new significant cumulative effects on the setting of (S1) when the influence of the Development is considered.

9.9 Summary

A programme of assessment and survey was conducted to consider the potential impacts on the Cultural Heritage and Archaeological assets from the proposed development at Fourfields, a summary of the findings are provided in Table 9.9.1.

9.9.1 Statement of Significance

There is one site that will have an effect on the setting of a notable Cultural Heritage and Archaeology site within the surrounding landscape of the Archaeology Study Area. Den of Boddam, flint mining complex (S1) will receive a Minor effect on its setting from the presence of the converter station to the east. The cause of the effect is the intrusion of the top of the converter station into the views from the approach of the monument from the west and north. While the setting of this monument may experience 'Minor' change, the effect is not significant in terms of EIA regulations.

Although presently unquantified the close proximity of the Den of Boddam (S1) to the core site of the Project has the potential for unknown archaeological features to be present and would be at risk from direct adverse impacts.

Within the Development Area there is one Cultural Heritage and Archaeological asset (S12). This is the site of a former farmstead depicted on the 6-inch 1st and 2nd editions Ordnance Survey (1872 & 1901) that depict two rectangular buildings with a small enclosure on the southern side. This is not depicted on current mapping and the present condition is a large grass covered mound. In the Archaeology Study Area there a further twenty-three Cultural Heritage and Archaeological sites. None of these sites will suffer from any direct adverse impacts from the development.

There are no known, discrete Cultural Heritage and Archaeological assets identified that will receive an adverse impact that warrant mitigation. However, there is the potential for currently unknown archaeological sites within the Development Area. This potential requires further archaeological works in order to resolve this.

A staged programme of archaeological works will be undertaken in support of the Project. The character of the works is the intrusive evaluation of the Convertor Station site, including surrounding laydown areas and site compound area.

The Development will be compliant with the Development Plan and Planning Guidance by not generating any new significant effects.

Table 9.9.1: Summary of Cultural Heritage and Archaeology Effects

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Construction							
Visual effects of works on local cultural and archaeological heritage sites.	Low-National	Temporary – Minor	Minor	Not Required	Temporary – Minor	Minor	Not Significant
Disturbance of unknown buried archaeological artefacts.	Local - National	Moderate	Moderate	A staged programme of archaeological works.	Negligible – Low	Negligible - Minor	Not Significant
Operational							
Effect on Setting of Den of Boddam flint mining complex	National	Minor	Minor	Sympathetic Landscaping	Moderate	Minor	Not Significant
Change in Character of Sandford Hill	Local	Major	Minor	Sympathetic Landscaping	Major	Minor	Not Significant
				Key		Significant effect	

Chapter 10

Landscape and Visual Impact

Contents

10 Landscape and Visual

10.1 Introduction

This Chapter considers the effects of the proposed Converter Station and associated earthworks and HVAC cable route on the landscape and visual resources of the site and the surrounding Study Area during construction and operation.

The landscape and visual impact assessment (LVIA) is based on a Study Area of 5 km radius from the Converter Station and is shown on Drawing 3105.

The cumulative landscape and visual impact assessment (CLVIA) focusses upon buildings and structures within the Study Area that have valid planning applications, but have not yet been constructed, and are likely to give rise to significant cumulative effects in combination with the Converter Station.

Topics covered within this chapter include:

- Relevant planning guidance;
- Methodology used in the assessment of landscape and visual effects;
- Summary of the consultation process;
- Baseline description of the landscape and visual resource of the Study Area, based on the results of desk study, fieldwork and consultations;
- Description of the design and mitigation strategy detailing how the design has evolved to minimise effects on the landscape and visual resources;
- Assessment of potential effects: the ways in which the landscape and visual resources of the site and Study Area may be affected by the Converter Station;
- Assessment of residual effects following secondary mitigation; and
- Statement of significance.

The Chapter is supported by and should be read in conjunction with Appendix C, which describes in detail the baseline conditions and assessment of potential effects at each of the eight agreed viewpoints.

10.2 Sources of Information

10.2.1 Statutory Planning Policy and Supplementary Guidance

Aberdeenshire Council adopted the Aberdeenshire Local Development Plan (ALDP) (Aberdeenshire Council, 2012a) and associated supplementary guidance on 1 June 2012 (Aberdeenshire Council, 2012b). Policy 12: Landscape Conservation recognises that the landscapes of Aberdeenshire are valuable assets and aims to promote protection, management and planning of all landscapes, in order that the overall quality of the landscape can be improved or maintained.

SG Landscape 1: Landscape Character provides a policy context for achieving this. The supplementary guidance requires all development to be appropriate to the landscape character of the area and avoid adverse impacts on key features or the overall composition and quality of landscape character.

SG Landscape 2: Valued Views identifies rural views which are valued by the community at large and require a degree of protection from development. Appendix 1 Valued Views lists the 42 views within Aberdeenshire that require protection. There are two of these views that could potentially be affected by the Converter Station. These are:

6) The view across Peterhead Bay from South Road; and
9) The views towards Mormond Hill.

10.2.2 Non-statutory Planning Advice

Aberdeenshire Council has also published Landscape Planning Advice for Small Scale Development.

This non-statutory planning advice provides guidance on the key characteristics of landscape character areas. It provides specific advice for development and how to fit this into the landscape. Although the advice is aimed at small scale development such as single houses, small groups of houses, agricultural buildings and small scale commercial developments, consideration of the key characteristics and qualities of a character area are important, regardless of development scale.

10.2.3 Other Planning Advice

Aberdeen City and Aberdeenshire Councils, in association with Aberdeen City and Shire Economic Futures (ACSEF), Scottish Enterprise, and other stakeholders, support the "Energetica Framework", as promoted by the National Planning Framework 2 (Aberdeen City Council, 2012).

Supplementary Guidance Business 5: Development in the Energetica Framework Area states that development must make a contribution to the quality of life, environmental performance and economic development targets, including "*…a commitment to the provision of high quality landscaping which contributes to a unified sense of place within the framework area*". The site lies within Energetica Framework Area 1, illustrated within the Supplementary Guidance.

Energetica has produced detailed non-statutory siting and design advice for development within the Peterhead Southern Gateway area between Stirling Hill and Invernettie, which borders the Fourfields site to the east (TGP Landscape Architects, (2011). This guidance has been taken into account in the siting and design of the Converter Station, including proposed mitigation measures.

10.3 Assessment Methodology

The LVIA and CLVIA follow the approach set out in the Guidelines for Landscape and Visual Impact Assessment (GLVIA) (Landscape Institute and Institute of Environmental Assessment 2013) and other current good practice and policy guidance.

In accordance with paragraph 7.13 of the GLVIA, the LVIA considers the potential effects of the Converter Station on the existing landscape and visual resources, against a baseline that includes existing built development and that under construction. The CLVIA considers the potential changes arising from the addition of the Converter Station, in relation to a baseline that includes developments with valid planning applications, as well as consented and existing built development.

The assessment involved a combination of desk study, computer analysis, field work and interpretation using professional judgement. The site and surrounding area have been extensively visited to gain a clear understanding of the landscape and the likely effects of the Converter Station. Fieldwork was undertaken during periods of clear visibility between December 2013 and February 2015.

10.3.1 The Study Area and Viewpoint Selection

The Study Area extends to 5 km from the building envelope (see Drawing 3105). Preliminary fieldwork and desk study confirmed that visibility of the Converter Station would be restricted beyond this distance and significant landscape and visual effects would be very unlikely.

Maps showing the zone of theoretical visibility (ZTV), created by computer manipulation of a digital terrain model, indicate areas from which the Converter Station may theoretically be seen and enable the Study Area to be focused upon those locations that are most likely to be significantly affected.

The ZTVs, illustrated in Drawings 3106-8, were prepared by Atmos Consulting following best practice guidance (Scottish Natural Heritage 2014). It is important to bear the following points in mind when interpreting these visibility maps:

- They do not take the orientation of the viewer into account, for example when travelling in a vehicle;
- Visibility maps do not convey the likely nature or magnitude of visual effects of the Converter Station, which can only be determined by further assessment; and
- The visibility shown on the ZTV maps is more extensive than would actually be visible on the ground, but where the ZTVs indicate no visibility, the Converter Station would not be seen.

As recommended in paragraph 6.20 of the GLVIA, the viewpoints used for this assessment were selected according to the following criteria:

- Publicly accessible;
- Reasonably high potential number of viewers or being of particular significance to the viewer(s) affected;
- Range of viewing directions, distances (i.e. short, medium and long distance views) and elevations;
- Range of viewing experiences (for example static views, views from settlements and views from points along routes);

- Range of view types, (e.g. Panoramas, glimpses); and
- Locations with potential cumulative views of the Converter Station, in addition to other built development.

Not all of these criteria necessarily apply to all viewpoints. The viewpoints included in Table 10.3.1 have been selected to offer the clearest view within the vicinity of the chosen point. Viewpoints have been excluded where the Converter Station would not be visible.

The viewpoint selection has been confirmed through site visits and consultation with Aberdeenshire Council. The eight agreed viewpoints are listed in Table 10.3.1 and shown on Drawing 3105.

Table 10.3.1: Agreed Viewpoints

Ref	Name	NGR	Distance*	Receptors
1	Stirling Hill summit viewpoint area	NK 1227 4093	0.38	path users
2	Lendrum Terrace – Stirling Hill Access Network	NK 1209 4181	0.39	residents, path users, road users
3	Footpath west of Sandfordhill reservoir	NK 1131 4150	0.62	residents, path users
4	Elevated sculpture at the entrance to the Power Station	NK 1260 4260	1.32	visitors
5	A90 – substation entrance	NK 1236 4267	1.28	residents, path users, road users
6	Minor road south of Newton	NK 1195 4300	1.56	residents, road users
7	Minor road south of Newfield	NK 1050 4275	1.94	residents, road users
8	A982 north of Invernettie roundabout	NK 1192 4412	2.67	path users, road users

* Distance in km from building envelope

10.3.2 Landscape Receptors

Landscape receptors within the Study Area that could be affected by the Converter Station include:

- Landscape elements and features such as landform, trees, field boundaries, tracks, watercourses, etc.;
- Landscape character types (LCTs);
- Areas of recognised landscape value; and
- Other recreational, natural or cultural heritage interests that contribute to landscape character.

The landscape baseline identifies the elements and features of the landscape that may be directly affected by the Converter Station, as well as the aesthetic and perceptual aspects of landscape resources within the Study Area which the Converter Station could affect.

LCTs identified from the published landscape character assessments within the Study Area were reviewed and the key characteristics and sensitivities verified by site visits.

10.3.3 Visual Receptors

Visual receptors are defined as those individuals or groups of people within the Study Area who may be affected by the Converter Station. The main groups of visual receptors in this case are considered to be:

- Residents at home;
- Walkers and recreational users;
- Tourists or visitors; and
- People travelling through the area via road or rail.

The visual baseline identifies the parts of the Study Area from which the Converter Station may be visible and the way in which different receptors may experience views of it.

10.3.4 Assessment of Predicted Effects

The assessment of potential landscape and visual effects focuses on an assessment of the effects on the landscape and visual resources arising at each of the selected viewpoints. Together with fieldwork and desk-based analysis, the detailed viewpoint assessment informed the general assessment of effects within the Study Area. The desk work referred to a range of maps, photographs, the ZTV analysis and computer-generated wireline diagrams and photomontages, produced by Atmos Consulting. The method used to create the ZTVs, photographs, wireline diagrams and photomontages follows good practice guidance (Scottish Natural Heritage 2014).

Existing and predicted views from each of the viewpoints were assessed in order to identify, predict and evaluate the potential effects arising from the Converter Station. Wherever possible, identified effects are quantified and the prediction of magnitude and assessment of significance of the landscape and visual effects is based on pre-defined criteria in order to provide greater consistency. Note that these criteria are not used as prescriptive tools, and the methodology and analysis of potential effects at any particular location allows for the exercise of professional judgement. In practice, all factors need to be considered in combination and applied using careful judgement, particularly in terms of the relative weight given to each. In some instances, one criterion may be considered to have a determining effect.

The criteria used in this assessment have been based upon paragraph 3.26 of the GLVIA, which recommends that factors affecting the sensitivity of the receptor (susceptibility and value) and those affecting the magnitude of the effect (size, extent, duration and reversibility) are each assessed separately. These terms are described below. Throughout the assessment, landscape and visual effects are also considered separately. The description of effects takes account of changing seasonal conditions and the effects of on-going changes to the landscape over time, such as the predicted growth of vegetation or felling of trees.

10.3.5 Duration and Reversibility of Effects

Operational effects of the Converter Station would be permanent and non-reversible. It is estimated that the preliminary works would last approximately two months, construction of the platform and first stage landscaping a further 8 months and the main construction phase approximately 20 months, as described within Chapter 2: Project Description. The preliminary works and platform excavation / landscaping are referred to as “enabling works”. Effects due to construction would therefore be short to medium term and reversible.

10.3.6 Significance of Effects

The EIA Regulations (Scottish Government 2011) require that the significance of each effect is identified. The degree of significance of effects on landscape resources and visual receptors is determined from a combined evaluation of the sensitivity of the receptor and the magnitude of the effect.

Table 10.3.2: Determining Significance of Effects

	Sensitivity		
Magnitude of effect	**High**	**Medium**	**Low**
Very large	substantial	major	mod-major
Large	major	mod-major	moderate
Medium	mod-major	moderate	mod-minor
Small	moderate	mod-minor	minor
Negligible	mod-minor	minor	negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

Table 10.3.2 shows how the significance of the landscape effect increases from negligible to substantial with increasing landscape receptor sensitivity and with greater magnitude of effect. The most substantial effects would occur where a receptor of highest sensitivity is affected by an effect of very large magnitude. Conversely, negligible effects would arise where a receptor of lowest sensitivity is affected by an effect of negligible magnitude. Between these two extremes the significance of effect would vary continuously and the significance of any one effect is determined by professional judgement, taking into account all the relevant factors.

Table 10.3.2 includes additional levels of significance in comparison to Table 3.2.1, as this reflects the diversity of magnitude and sensitivity commonly found in landscape and visual impact assessment.

The assessment of significance of the landscape and visual effects is based on pre-defined criteria. Tables 10.3.3 to 10.3.7 provide a framework that helps to ensure consistency and transparency in the decision-making process, but are not used as prescriptive tools, allowing for the exercise of professional judgement in determining sensitivity, magnitude and significance. Magnitude of effect is equivalent to magnitude of impact as defined in Chapter 3: Assessment Methodology.

The assessment of general effects and the detailed viewpoint assessments (Appendix C) provide further details of how the significance of effects has been determined in each case. Where overall effects are predicted to be mod-major, major or substantial, these are considered to be significant in terms of EIA regulations.

10.3.7 Positive and Negative Effects

Negative effects result in a direct loss of physical resources, weaken key characteristics or result in a reduction in visual amenity. Positive effects occur where the Converter Station replaces physical resources, strengthens the landscape characteristics or improves the visual amenity. Effects may also be neutral, where there is no net effect on the landscape or visual resources.

Changes to rural landscapes that involve the construction of man-made objects of a large-scale generally have a negative effect on the landscape character, although this effect can be mitigated by the contribution to the landscape that a development may make in its own right, usually by virtue of good design, even if it is in contrast to the existing character.

Changes to views and visual amenity can be more subjective, in that people may like or dislike what they see, or may be used to seeing similar developments and therefore more ambivalent about them. Whether the visual effect is perceived as positive or negative depends upon individual preferences, the context in which a person experiences the view, and upon their attitude towards development in general. Although some people may be more neutral or ambivalent in their opinions about the proposed changes in views, this assessment adopts a precautionary approach and assumes that all visual effects are negative.

10.3.8 Direct and Indirect Effects

Direct landscape effects result directly from the Converter Station itself, such as the loss of field boundaries. Indirect effects are consequential changes resulting from the Converter Station, such as changes to the character of adjacent landscapes.

10.3.9 Landscape Effects

Landscape effects arise from changes to the physical components of the landscape, its character and how this is experienced. The significance of landscape effects is assessed by considering the sensitivity of the landscape receptors and the magnitude of the landscape effect.

10.3.10 Sensitivity of Landscape Receptors

The GLVIA indicates that landscape receptors need to be assessed firstly in terms of their sensitivity, combining judgements of their susceptibility to the type of proposal and the value attached to the landscape.

10.3.10.1 Landscape Susceptibility

Aberdeenshire Council has published guidance on the sensitivity of LCTs to development (Aberdeenshire Council 2012). Whilst strategic landscape studies provide useful background information, they do not provide a substitute for detailed assessment of receptors in relation to a specific proposal. Best practice guidance – Topic paper 6 (Scottish Natural Heritage and Countryside Agency 2004, page 3) states that:

"*Sensitivity is related…to landscape character and how vulnerable this is to change…Landscapes which are highly sensitive are at risk of having their key characteristics fundamentally altered by development, leading to a change to a different landscape character i.e. one with a different set of key characteristics. Sensitivity is assessed by considering the physical characteristics and the perceptual characteristics of landscapes in the light of particular forms of development*."

These aspects of sensitivity distinguish one LCT from another, but it is important to recognise that sensitivity can also vary across a particular LCT. This LVIA includes an assessment of factors affecting the susceptibility of the landscape to the changes brought about by the Converter Station, in order to identify any variation at the local scale. Table 10.3.3 sets out attributes of landscape character that have been considered in assessing susceptibility, adapted from best practice guidance (Perth & Kinross Council, July 2010).

Table 10.3.3: Landscape Susceptibility to Large Scale Development

Susceptibility	Lower	Higher
Scale	Large-scale	Intimate or small-scale
Enclosure	Open or exposed	Enclosed or confined, sheltered.
Landform	Flat, smooth, regular, gently undulating, or flowing landform.	Dramatic, steep, rugged, or complex landform with prominent peaks or ridges.
Diversity	Simple or uniform, e.g. moorland or forest plantations.	Complex or diverse, variety of land cover.
Land cover pattern and line	Sweeping lines or indistinct or irregular patterns.	Strong and regular linear features, geometric or rectilinear patterns, or planned landscapes.
Settlement and infrastructure	Frequent masts, pylons, industrial elements, modern buildings, infrastructure, settlements or main roads.	No obvious modern settlement, buildings, infrastructure or main roads.
Perception of landscape change	Modern or clearly dynamic showing obvious land use changes.	Little or no land use changes, or with obvious historical continuity.
Tranquillity	Busy, with evidence of human activity, noise or regular movement.	Remote or tranquil with strong sense of stillness or solitude.
Settings and skylines	Low lying areas that do not tend to feature in views from populated areas or main	Areas with topographic features that define the setting, backdrop, outlook or

Susceptibility	Lower	Higher
	transport routes.	skyline of populated areas or main transport routes.

10.3.10.2 Landscape Value

The assessment considers the following factors, in order to identify how the relative landscape value may vary at the local scale. The factors set out in Table 10.3.4 are adapted from paragraphs 5.28-5.31 of the GLVIA and other guidance (Scottish Natural Heritage and Countryside Agency 2004 Figure 1b).

Table 10.3.4: Landscape Value

Factors affecting Landscape Value	
Condition/intactness	The degree to which the landscape is unified or intact.
Scenic quality	The extent to which the landscape appeals, primarily to the visual senses.
Perceptual aspects	The degree to which the landscape is recognised for perceptual qualities, such as its sense of remoteness.
Rarity	The presence of unusual elements or features in the landscape or the presence of an unusual LCT.
Representativeness	The degree to which the landscape contains important examples of elements or features, or is of a particular character that is considered important.
Conservation interests	Cultural or natural heritage interests that add to the value of the landscape and/or are of value in themselves.
Recreational value	Evidence of recreational activity where experience of the landscape is important, such as recognised scenic routes.
Associations	Recognised cultural or historical associations that contribute to perceptions of the natural beauty of the landscape.

10.3.11 Magnitude of Landscape Effects

Each effect on landscape receptors is also assessed in terms of its size or scale, the geographical extent of the area influenced and its duration and reversibility.

10.3.11.1 Size or Scale of Effect

This is judged using the factors set out in Table 10.3.5.

Table 10.3.5: Size or Scale of Landscape Effect

Class	Criteria
Very large	Highly obvious change, affecting the majority of the key characteristics and defining the experience of the landscape.
Large	Obvious change, affecting many key characteristics and the experience of the landscape.
Medium	Noticeable but not obvious change, affecting some key characteristics and the experience of the landscape.
Small	Minor change, affecting some characteristics and the experience of the landscape slightly.
Negligible	Little perceptible change.

10.3.11.2 Geographical Extent of Effect

The geographical area over which the landscape effects would be experienced (local or restricted to the site) is also taken into account. This is distinct from the scale of the change. For example, a small change to the landscape over a large geographical area could be comparable to a very large change affecting a much more localised area.

10.3.12 Significance of Landscape Effects

The assessment of significance is based on professional judgement, considering both the sensitivity of the receptor and the predicted magnitude of effect resulting from the Converter Station, as described above.

Major loss of landscape features or characteristics across an extensive area that are important to the integrity of a nationally valued landscape are likely to be of greatest significance. Short-term effects on landscape features or characteristics over a restricted part of a landscape of lower value are likely to be of least significance.

10.3.13 Visual Effects

Visual effects result from the changes in the content or character of views and visual amenity, due to changes in the landscape. The assessment of visual effects takes account of both the sensitivity of the visual receptors (individuals or groups of people) and the magnitude of the change on their views and visual amenity.

10.3.14 Sensitivity of Visual Receptors

The sensitivity of each visual receptor is assessed in terms of susceptibility to change in views or visual amenity as well as the value attached to particular views.

10.3.14.1 Susceptibility to Change

People generally have different responses to views and visual amenity depending on the context (e.g. location, time of day, degree of exposure), and their purpose for being in a particular place (e.g. whether for recreation, travelling through the area, residence or employment). Susceptibility to change is therefore a function of:

- The occupation or activity of people experiencing the view or visual amenity; and
- The extent to which their attention or interest may be focused on the landscape around them.

Table 10.3.6 illustrates some examples of the relative susceptibility of some of the key visual receptors within the Study Area. Note that different individuals or groups of people at one location may have different levels of susceptibility.

Table 10.3.6: Examples of Susceptibility to Change in Views or Visual Amenity

High	Medium	Low
Residents within dwellings or curtilage.	People at their place of work, where views are an important part of the setting, such as a	People at their place of work whose attention is likely to be focused on their work or

High	Medium	Low
	countryside ranger.	activity, not on their surroundings.
Users of recognised national trails, whose attention or interest are likely to be focused on the landscape or on particular views.		People engaged in active outdoor sports or recreation and less likely to focus on the view.
Road and rail users where appreciation of the landscape is an important part of the experience, such as recognised scenic routes.	Road and rail users likely to be travelling for other purposes than just the view, such as commuter routes.	
Visitors to heritage assets or to other attractions, such as recognised beauty spots, where views of the surroundings are an important part of the experience.		

10.3.14.2 Value attached to particular views

Judgments are also be made about the value attached to views, based on the following considerations:

- Recognised value – such as views from heritage assets or designated landscapes;
- Inclusion in guidebooks or on tourist maps, the facilities provided for visitors or references to the view in literature or art; and
- The relative number of people who are likely to experience the view.

People that are more susceptible to change at viewpoints of recognised value are more likely to be significantly affected by any given change.

10.3.15 Magnitude of Visual Effect

The magnitude of the visual effect resulting from the Converter Station is evaluated in terms of size or scale, geographical extent, duration and reversibility.

10.3.15.1 Size or Scale of Effect

This is based on the interpretation of a combination of a range of factors, described in Table 10.3.7. Some of these are largely quantifiable and include:

- Distance and direction of the viewpoint from the Converter Station;
- Extent of the Converter Station visible from the viewpoint;
- Scale of the change in the view, including the proportion of the field of view occupied by the Converter Station;
- Degree of contrast with the existing landscape elements and characteristics in terms of background, form, pattern, scale, movement, colour, texture, mass, line or height;

- The relative amount of time during which the effect would be experienced and whether views would be full, partial or glimpses; and
- Orientation of receptors in relation to the Converter Station, e.g. whether views are oblique or direct.

Table 10.3.7: Size or scale of visual effect

Class	Description	Appearance in field of vision
Very large	Dominant	Commanding, controlling the view. Creation/removal of a dominant visual focus. Highly uncharacteristic elements or pattern introduced. Most of the view affected.
Large	Prominent	Major change to the view, striking, sharp, unmistakeable, easily seen. Creation/removal of major visual focus. Uncharacteristic elements or pattern introduced. Large proportion of the view affected.
Medium	Conspicuous	Noticeable change to the view, distinct, clearly visible, well defined. Creation or removal of a visual focus that may compete. Some elements of the Converter Station fit the existing pattern. Some of the view affected.
Small	Apparent	Minor change to the view but still evident. Little change to focus of the view. Fits intrinsic visual composition. Little of the view affected.
Negligible	Inconspicuous	No real change to perception of the view. Weak, not legible, hardly discernible.

10.3.15.2 Geographical Extent

The extent over which the changes would be visible is also taken into account within the assessment.

10.3.16 Significance of Visual Effects

The degree of significance of effects on visual receptors is determined from a combined evaluation of the sensitivity of the visual receptor and the magnitude of the visual effect.

Effects are more likely to be significant on people who are particularly sensitive to changes in views and visual amenity, when experienced at recognised and important viewpoints, or from recognised scenic routes. Large scale changes which introduce new, discordant or intrusive elements into the view are also more likely to be significant than small changes or changes involving features already present within the view.

10.3.17 Cumulative Effects

Cumulative effects of the Converter Station are described in Section 10.19.

Cumulative effects arise from changes brought about by one development in conjunction with those of another. These can include:

- Other examples of the same type of development;
- Other types of development, including those that may arise as an indirect consequence of the Converter Station; and
- Associated or ancillary development that may require its own planning consent.

The approach used to determine cumulative effects draws from guidance on cumulative impact assessment within the GLVIA. The cumulative assessment includes those developments most likely to be seen in combination with the Converter Station. All large scale developments within 5 km of the Converter Station that are constructed, that have planning consent, or are the subject of undetermined applications are illustrated on Drawing 3031.

The assessment also considers sequential cumulative effects. These effects occur when moving from one area to another, for instance when travelling along a road, when two or more developments are visible at the same, or at different times, in sequence.

10.3.18 Magnitude of Cumulative Effect

Cumulative landscape and visual effects result from changes to the baseline landscape or visual resources, as a result of the Converter Station in the context of other developments.

The emphasis of this cumulative assessment is on the additional changes that the Converter Station may bring to the cumulative situation. The assessment draws conclusions about whether the addition of the Converter Station would cause the landscape to become characterised by large scale developments.

The magnitude of cumulative effect arising from the Converter Station takes account of the following largely quantifiable parameters:

- The number of existing developments and large buildings visible;
- The distance of the Converter Station, its horizontal and vertical scale and position relative to other developments;
- The direction and pattern of existing development and large buildings; and
- The landscape setting, context and degree of separation of existing and planned developments.

10.3.19 Significance of Cumulative Effect

The significance of the cumulative effect is assessed in relation to the sensitivity of the receptor and the predicted magnitude of effect.

The most significant cumulative landscape effects would change landscape character to such an extent as to have a major effect on its key characteristics, or transform it to a different landscape type, where the project 'tips the balance' through its additional effect.

Higher levels of significance may also arise due to:

- Developments that are close to the proposal and are clearly visible together in views from the selected viewpoints; and/or
- Developments that have a high degree of combined visibility with the Converter Station from different parts of the Study Area.

The most significant cumulative visual effects would arise where the Converter Station results in a large degree of change, affecting a sensitive or important receptor, such as people visiting a popular scenic viewpoint.

10.4 Consultation and Scope of the LVIA

The Scoping Report (NorthConnect, June 2014) identifies the need for an assessment of landscape and visual effects as part of an Environmental Statement (ES) to accompany the planning application. Responses to the Scoping Report and other consultations undertaken as part of this assessment are summarised in Table 10.4.1. All comments referring to the viewpoints have been taken into account in the viewpoint selection (Table 10.3.1) and are detailed below.

Table 10.4.1: Consultation Responses

Consultee	Issues and Concerns raised	Response/Action Taken
Scottish Natural Heritage (SNH) Letter dated 15th July 2014	Suggest the ES also includes a bare ground ZTV illustrating visibility without screening effects of buildings and trees as these may not be permanent features in the landscape.	Bare ground ZTV also considered within the assessment.
	The potential impacts on recreational users of the area, for example with respect to noise and landscape and visual impacts should be included within the assessment.	Effects on recreational users have been considered within the assessment.
	The LVIA should explore fully any impacts arising from in-combination and cumulative effects. SNH agrees with the list of other projects given in the scoping report.	The CLVIA has taken these other proposals into account – see section 10.19.
Aberdeenshire Council Environmental Planner (Landscape) Memo dated 9 Sep 2014	Viewpoints should be superimposed on the ZTV.	These have been included.
	The selection of viewpoints is appropriate, as long as unobstructed views can be obtained.	The eight agreed viewpoints have been included in the assessment. All provide unobstructed views towards the site; some have been adjusted slightly to ensure that this is the case.
	The siting and design of the building	The LVIA process has influenced

Consultee	Issues and Concerns raised	Response/Action Taken
	should form part of the LVIA process. Mitigation measures should include the design of the building and its surroundings, following the principles set out in the Energetica Peterhead Southern Gateway Environmental Improvement Masterplan.	the siting and design of the Converter Station. All proposed mitigation measures have taken the Energetica guidance into account.
	The CLVIA should take account of large scale proposals in the general area of south Peterhead.	The CLVIA has taken these other proposals into account – see Section 10.19.

Table 3.5 of the Scoping Report (NorthConnect 2014) identifies eight representative viewpoints for detailed assessment. The eight viewpoints were agreed by Aberdeenshire Council. The visibility of the Converter Station from each was checked by field visits and the position of some adjusted slightly to allow unobstructed views towards the site. The finalised viewpoints are listed in Table 10.3.1.

10.5 Mitigation Measures to Reduce Predicted Negative Effects

As discussed in Chapter 3, one of the main purposes of the EIA process is to influence and improve design, through iteration. As part of the assessment of landscape and visual effects, it is also necessary to consider what mitigation measures might be possible in order to avoid or reduce any potentially significant negative effects. Mitigation measures include:

- Primary measures – modifications to avoid or reduce negative effects that become mainstream components of the project design, such as screening mounds. They also include standard construction practices, including details of restoration measures; and
- Secondary measures – designed to address any adverse effects remaining after the first two types of primary mitigation have been incorporated into the scheme, such as recommendations for potential landscape enhancement measures, including tree planting.

Primary mitigation measures, developed through the iterative design process, have been incorporated into the design as it developed, and this LVIA considers the final scheme, taking into account the embedded primary mitigation measures. The consequence of any secondary mitigation measures on the potential effects of the finalised scheme is also considered within the LVIA, in order to determine the residual effects following mitigation. These are set out in Section 10.18.

10.6 Baseline Description

The purpose of the baseline study is to record the existing landscape and visual resources against which the effects of the Converter Station can be judged. Note that all distances given are from the building envelope. The assessment includes all landscape and visual receptors within the 5 km Study Area.

10.7 Existing Landscape Resources

10.7.1 Designated Landscapes

There are no ‘Gardens and Designed Landscapes’ or designated landscapes within the Study Area. Prior to the adoption of the ALDP, part of the coastal area to the south of the site was identified as an Area of Landscape Significance.

10.7.2 Landscape Character: Site and Immediate Surroundings

The Fourfields site lies to the south of Lendrum Terrace, north-east of RAF Buchan Ness, east of the Den of Boddam and immediately to the west of StirlingHill Quarry. It consists of four gently sloping medium sized rectangular fields, enclosed by post and wire fences with stone dykes, many of which are remnant. It is currently in arable use, with some hedgerow planting along the boundaries and has an open and relatively exposed character. Recent hedgerow planting within and around the site has been of variable success, with fewer survivors towards the more exposed southern edge. Wider, more mature broadleaved belts around the more sheltered northeast corner of the site show some reasonable growth, especially to the north of the site.

The site lies within a natural bowl, enclosed on three sides by a ridge of higher land, which includes the active quarry to the east, improved pasture and some gorse dominated scrub and heathland to the south and west. To the north the landform slopes towards Sandford Bay and there are longer views in this direction towards Peterhead and the coast, although these views are curtailed by tree belts around Braeside Trout Fishery and along the southern boundary of Lendrum Terrace. The Fourfields site falls gently from the southwest corner towards the northeast, flattening towards the northeast.

StirlingHill marks the transition between the gently undulating, open regular fields of arable and improved pasture to the west and the coastal landscape to the east, where exposure, poorer soils and rock outcrops limit tree growth and agricultural use.

The sight and sound of activity at StirlingHill quarry, sound of traffic on the A90 and views of Ministry of Defence installations at RAF Buchan Ness, Peterhead Power Station and the nearby substation, power transmission lines, several masts and some large industrial buildings to the north currently detract from the rural character of the site.

Existing Core Paths follow the eastern, southern and western boundaries of the site, whilst that to the west is also a Right of Way (see Chapter 17: Local Community and Economy). Another path crosses the site from east to west. These form part of the StirlingHill Access Network, supported by the Boddam Community Association, connecting Boddam with Sandfordhill and passing by the viewpoint feature on the Hill of Boddam and several derelict granite powder stores that reflect the history of quarrying in the area.

10.7.3 Landscape Character: the Study Area

SNH carried out the Banff and Buchan Landscape Character Assessment (Cobham Resource Consultants, 1997) as part of the national programme of landscape character assessment. Aberdeenshire Council produced non-statutory guidance for small scale development, based upon the same LCTs that were identified in the 1997 study (Aberdeenshire Council, 2012).

In addition to the area around Peterhead, which is classified as *Urban*, two LCTs lie within the Study Area: the *Eastern Coastal Agricultural Plain* and *Cliffs of the North and South-East Coasts*. Table 10.7.1 describes the key characteristics of the two LCTs, taken from the 2012 guidance. These LCTs are illustrated on Drawing 3104.

The Fourfields site lies on the boundary of the two LCTs, but reflects the characteristics of Eastern Coastal Agricultural Plain more strongly, being gently undulating, cultivated arable land with medium to large size open rectilinear fields, scattered farmsteads and little woodland.

Table 10.7.1: Landscape Character Types within 5 km

Ref	LCT	Key Characteristics taken from the 2012 Guidance
BB1	Cliffs of the North and South-East Coasts	• The persistent influence of the sea dominates. • Despite the physical restrictions of this narrow rocky coastline, the overall impression is of an open, large-scale landscape, the wide expanses of sea and sky merging into one at the uninterrupted horizon line. • Lack of landscape diversity. • High headlands give way to sheer cliffs, pitted by waves and shattering into jagged reefs. • Cliff edged headlands are frequently fissured and bitten into by narrow inlets and more rarely hugging sheltered sandy bays such as Cruden and Sandend. • South of Peterhead the sea has gnawed the pink granite into a ragged coastline of highly sculpted and fractured cliffs, broken reefs and dramatic features such as the Bullers of Buchan blowhole. • Short creeping grasses and occasional wind pruned gorse bushes on cliff faces. • Trees and woodland are very limited which adds to the windswept nature of the cliffs. • Frequent settlement along the coastline. • Settlements vary from large fishing ports of Fraserburgh and Peterhead to small fishing villages of Crovie and Pennan which are crammed at the base of cliffs and are colourful in comparison with planned inland villages. • Ruined castles and mansion houses such as those at Slains, Pitsligo and Dundarg, stud the grassy headlands. • High nature conservation and geological interest, in particular the large number of coastal breeding birds. • This character area is of increased landscape sensitivity and prior to the adoption of the ALDP part of the coastal area was identified as an Area of Landscape Significance.

Ref	LCT	Key Characteristics taken from the 2012 Guidance
BB7	Eastern Coastal Agricultural Plain	• Broad sweep of gently undulating land bordering the eastern coast of Banff and Buchan. • Generally open and windswept with constant views of the sea. • The area is predominantly in agricultural use, cultivated wherever possible to the outermost boundaries of the land, despite being exposed and windblown. • Large and open fields with post and wire fencing. • Uniform, gently undulating topography has allowed a random network of farmsteads to be scattered across the landscape. • Villages such as Hatton, Longside and New Leeds are a legacy from the 19th century. • Sparsely wooded with medium sized conifer plantations scattered across the area. • Mosses are a feature dotted throughout the area and are often signalled by forest plantations. • Broad-leaved trees are restricted to occasional shelterbelts and groups around farmsteads, or as more substantial fringes on the outskirts of villages. • There is a diverse range of landscapes, from higher and hillier land to the west, through open agricultural plains which typify the farmland of the District, to the wooded estates which line the South Ugie Water.

10.7.4 Landscape Sensitivity

The overall landscape susceptibility and value of each LCT is derived from the relevant landscape assessment studies and other local authority guidance, as described above in Section 10.3. An assessment of factors affecting landscape susceptibility and value was also carried out at each of the viewpoints to provide an indication of how these vary at the local level (see detailed viewpoint assessments in Appendix C).

10.7.4.1 BB1 Cliffs of the North and South-East Coasts

- This is a large scale, open landscape with a lack of diversity. Within the Study Area, frequent settlement and infrastructure and the busy A90 reduce susceptibility, although the dramatic topography increases it. Overall landscape susceptibility is assessed as medium.
- Panoramic coastal views and distinctive coastal landform contribute to the landscape quality of this landscape. Within the Study Area, eroded field boundaries, traffic noise, Peterhead Power Station, Stirling Hill Quarry, Boddam settlement expansion, masts and views of MOD facilities, pylons and industrial buildings to the west detract. Recreational, cultural and natural heritage assets contribute to the landscape value, which is assessed as med-high overall.

10.7.4.2 BB7 Eastern Coastal Agricultural Plain

- This is a med-large scale, open, undulating, slightly varied, relatively low-lying landscape with some land use change, settlement and infrastructure, especially towards the east. The field pattern is more evident to the west. Overall landscape susceptibility is assessed as medium.

- The landscape has a strongly rural character, especially towards the west, and is relatively tranquil. Detractors include pylons and industrial buildings, the substation, masts and RAF infrastructure, eroded field boundaries, outskirts of Peterhead and views of Peterhead Power Station. Away from the coast there is little evidence of recreational use or cultural heritage features and the landscape is intensively farmed. Overall landscape value is assessed as medium.

10.8 Existing Visual Receptors

10.8.1 Residential Dwellings and Settlements

The settlement pattern of the Study Area is characterised by coastal towns, small clusters of houses, dispersed farmsteads and individual dwellings.

Within 1 km of the Converter Station there are three small clusters of dwellings and several dispersed dwellings. The closest of the clusters is at Lendrum Terrace, consisting of approximately 15 dwellings, the nearest of which lies some 400 m to the east of viewpoint 2. Further east, there are approximately ten dwellings in the vicinity of Admiralty Cottages and seven along the A90 at Stirlinghill. There are a further 16 dispersed dwellings within 1 km, although four of these are currently derelict, mostly to the west of the site. The closest dwelling is Highfield, which lies 190 m to the northwest of the Converter Station.

Between 1 and 2 km from the Converter Station, the settlements of Stirling and Boddam lie to the northeast and there are also small clusters of dwellings at Denend and Newton to the north, some of which are derelict.

Invernettie and the southern parts of Peterhead lie to the north of the site, between 2 and 5 km from the Converter Station.

These settlements are shown on Drawing 3105.

10.8.2 Key Transport Routes

The A90 is the closest main road, passing within 0.6 km to the southeast of the Converter Station. It follows the coast northwards as far as Invernettie, where it by-passes Peterhead to the west. The A982 takes the route of the former coast road north from Invernettie through the town of Peterhead, reconnecting with the A90 near Inverugie. The A950 heads west from Peterhead Bay towards Mintlaw, intersecting the A90 at the Invernettie roundabout.

The B9108 is the only secondary road within the Study Area, connecting Boddam with the A90. In addition, a number of other minor roads and tracks serve dispersed dwellings and farmsteads. The closest minor road connects Stirling Village and Lendrum Terrace with Den of Boddam and Newton, passing within 400 m to the north of the Converter Station. A brown tourist sign directs visitors to the flint mines at Den of Boddam from the A90.

These routes are shown on Drawing 3105.

10.8.3 Recreational Routes

The Aberdeenshire Coastal Path forms part of the North Sea Trail, a European initiative to create a series of footpaths around the North Sea Coasts of Norway, Sweden, Denmark, Germany, the Netherlands and the United Kingdom. It comes within 700 m of the Converter Station, as it follows the A90 to the southeast of the site.

The StirlingHill Access Network is an initiative supported by Boddam and District Community Association to improve Core paths around the StirlingHill. These paths surround the Fourfields site. The undesignated path that currently crosses the site from east to west would require to be diverted to allow construction of the Converter Station.

Recreational routes are illustrated in Chapter 17: Local Community and Economics.

10.8.4 Recreational and Tourist Attractions

Key recreational or tourist attractions within the 5 km Study Area include the Lighthouse at Buchan Ness, Boddam Castle and the Den of Boddam Flint Mines. These are illustrated on Drawing 3103.

10.9 The Converter Station

The Converter Station includes the following components, which are described in Chapter 2:

- Onshore Converter Station, including the converter building, associated infrastructure and earthworks; and
- Onshore AC cable route from Converter Station to planned new Peterhead substation.

Within the converter station site, a level development platform of approximately 3.6 Ha will be created by a cut and fill operation designed to avoid the need to export any waste material off-site. This platform will be contained within a 3 m high security fence. In addition to the Converter Station, a number of other ancillary structures will be located alongside and connected to the main building. An access road and car parking will be provided within this fence.

The route for the HVAC cable is described in Chapter 2. The cable is routed away from dwellings and buried along its entire length.

10.9.1 Embedded Mitigation

The site selection and design process are described in full within Chapter 2. The design of the Converter Station has evolved as part of an iterative process that aims to provide an optimal design in environmental terms, but also takes into account technical and economic factors. A number of mitigation measures have been introduced into the design in order to minimise the likely landscape and visual effects. These embedded primary mitigation measures are as follows.

10.9.1.1 Design Strategy

The design strategy for the key elements of the Converter Station has taken into account the following objectives:

- To identify a location where the Converter Station could relate best to the landscape character of the site and its surroundings;
- To locate the Converter Station where it would be least visible from key receptors;
- To create a design that responds to the landscape character of the site;
- To create a design that takes account of the relevant national, regional and local policy and guidance; and
- To respond to the various constraints identified, including responses from statutory consultees (see Table 10.4.1) and from public consultations (see PACC Report (NorthConnect, 2015).

10.9.1.2 Site Specific Design Measures

The design process has taken into account the position of the Converter Station in relationship to the landform as well as key receptors. The location of the Converter Station within the lower, north-eastern part of the site has minimised its visibility, particularly from the north and from the more populated parts of the Study Area. The height of the Converter Station above the surrounding landform has been minimised by reducing the level of the building platform.

Excavated material will be used to create screening mounds adjacent to the Converter Station, to further reduce its visibility and also help to integrate the building into the landscape. These mounds will have a maximum outer slope of 1 in 3 and a naturalistic profile to reflect that of the natural, undulating topography that is evident nearby, as advocated by the Energetica Masterplan. The curving form of the converter building will reflect the profile of the mounds and the planted roof will also help to integrate the building within the landscape.

Computer generated representations of the evolving layout from key viewpoints were reviewed at several stages throughout the iterative design process.

The Converter Station would most often be seen against the sky, particularly from the lower-lying parts of the Study Area. In order to minimise the contrast against the sky, the upper sides of the building would be clad in translucent panels. This would have the effect of reducing the distance over which it would be visible, especially in dull weather or low light conditions.

The landscape and visual effects of the main site access will be minimised by the proposed use of the existing Stirling Hill Quarry access track, which would require only minor upgrading, including resurfacing, junction modifications and replacement of an existing culvert at the eastern boundary of the site.

The screening mounds to the north and east would be created as part of the enabling works in advance of the main construction phase, using materials excavated from the Converter Station platform. This would help to screen activity on site during the subsequent construction period, from the critical viewpoints to the north and north east. The Fourfields site is sufficiently large to allow reuse of excavated materials on site, so minimising the visual effects of traffic movements on residents, whilst allowing naturalistic mounds to be created that reflect the local landscape character.

The temporary construction and laydown area is likely to be located in the southeast part of the Fourfields site. Proposed screening mounds in this area would require to be formed towards the end of the construction period. Visibility of the Converter Station from areas to the southeast of the site would be minimal (as illustrated by the ZTVs, Drawings 3106-8), although there would be visual effects for users of the adjacent footpaths.

The south-eastern part of the Fourfields site would be fenced and used by Boddam Estates for grazing livestock, but the remainder would be managed as meadow. A stone shelter would be provided as part of the mitigation works, which have been designed to reflect the preferences of those who use the area at present, identified during the public consultation exercise (NorthConnect, 2015). These proposals are shown on the Layout Plan, Drawing 3022.

The final design has thus sought to balance the technical requirements of the applicant with the environmental considerations, including those highlighted by consultees. The potential effects of the Converter Station, including the embedded mitigation are considered in sections 10.12-10.17.

10.9.2 Secondary Mitigation

Secondary mitigation works include new and relocated dry stone dykes and hedgerow planting, intended to reinforce the existing field pattern. The north and eastern mounds would be planted with a woodland tree mix, in line with recommendations in the Energetica Masterplan, but also including tree and shrub species that are growing well on the site already. This woodland planting would be located within the more sheltered part of the site and would provide additional screening over time, building upon existing tree belts that run along the north and eastern edges of the site. The remainder of the screening mounds would be sown with a coastal meadow mix, which would help to integrate the undulating landforms within the surrounding landscape.

10.9.2.1 Woodland Planting

The proposed woodland planting has the following objectives:

- To ensure adequate screening of the Converter Station from nearby residential properties and adjacent footpaths;
- To ensure sufficient numbers of trees and a sufficient variety of species are present so that if one area of planting or one species fails that the remaining number of trees would be adequate to screen the Converter Station;
- To provide a naturalistic planting design that mitigates the landscape effects of the Converter Station and provides a degree of landscape integration;

- To reflect the form and scale of woodland belts within the local landscape of the Eastern Coastal Agricultural Plain; and
- To reflect the planting mixes provided within the Energetica guidance, but also reflects the success of hedgerow and woodland species used in recent planting adjacent to the Fourfields site.

Proposed planting is considered as secondary mitigation, taken into account in the assessment of the residual landscape and visual effects (see Section 10.18) and illustrated on the Layout Plan, Drawing 3022.

10.9.2.2 Existing Vegetation

The landscape of the Study Area is predominantly agricultural and subject to cold, exposed coastal winds. There are few areas of woodland cover and these are mostly in the form of shelter belts associated with farms. Some hedgerows remain as field boundaries, but these are generally neglected. New planting has been introduced principally for screening around Peterhead Power Station and Substation and Upperton Industrial Estate, whilst some recent hedgerow planting within and adjacent to the Fourfields site has been of variable success.

10.9.2.3 Guidance within Energetica Masterplan

The Energetica Masterplan retains and augments existing hedges and woodland areas, and introduces new planting to improve the biodiversity and shelter of the area, providing a framework for future development without impacting dramatically on the distinct open coastal landscape character.

It advises that all new developments should have a minimum boundary width of 10 m structure planting to provide a framework to the development and shelter. The 10 m boundary can incorporate existing planting. Structure planting should consist of native woodland and shrub transplants, 40-60 cm high at 1 per m^2 with feathered trees at 1 per $5m^2$, protected with rabbit and wind proof fencing and deer proof fencing where planting is adjacent to open country or coastal strips. Plant species should consist of native woodland mixes suitable as first and second line of defence in maritime conditions.

10.9.2.4 Proposed Planting within Fourfields site

Tree and shrub planting would be restricted to the north and eastern fringes of the site. There are several reasons for this:

- The results of the public consultation indicate a desire for the majority of the site to be kept open;
- The proposed planting would build upon existing tree and shrub belts located along the north and eastern boundaries;
- Recent tree and hedge planting is generally more successful towards the north of the site, which is more sheltered from coastal winds;
- Tree and shrub planting located here would provide the most effective screen from nearby dwellings, footpath and road users; and

- The form and scale of the planting proposed reflects that of nearby tree belts, helping to minimise effects on the predominantly open landscape character.

Table 10.9.1 identifies proposed woodland tree and shrub species and estimated growth rates at years 1, 5, 10 and 15. Photomontages of the Converter Station from each viewpoint (Drawings 3109-3132) illustrate estimated tree growth ten years after planting.

10.9.2.5 Woodland Planting

The proposed woodland mix builds upon that recommended by the Energetica Masterplan, but also includes native species such as aspen (*Populus tremula*) and Wych elm (*Ulmus glabra*) , which are known to do well on exposed sites and are also tolerant of the dry conditions that might be expected on earth mounds. Scots pine (*Pinus sylvestris*) is included, in order to provide an evergreen component.

Whilst the Energetica Masterplan advocates the inclusion of 1.8-2.0 m high feathered trees within the mix, smaller trees have been shown to establish more quickly, particularly on exposed sites such as Fourfields (Simon J Hodge, 1995) and it is proposed that 40-60 cm plants are used throughout at a density of 1 plant/m^2.

10.9.2.6 Woodland Shrub Edge Mix

The woodland shrub edge mix is similar to that proposed by the Energetica Masterplan, but also includes gorse, which thrives locally and would increase the evergreen component. All would be planted at a density of 3 plants/m^2.

The planted area would be enclosed within a 2.0 m high rabbit-proofed deer fence. In addition, all plants would be protected with tree and shrub shelters with suitable stakes and ties.

All species selected are native to Scotland, generally tolerant of exposed sites and could therefore be expected to grow successfully at the site. Prior to finalising the planting scheme and selecting the most appropriate species, soil testing of the planting areas should be undertaken and any deficiencies rectified.

The estimated growth rates shown in Table 10.9.1 would not be uniform, with some species growing rapidly in the first five to ten years and slowing down thereafter, and some species growing at a steady rate. The heights of species listed are therefore indicative and a conservative estimate of the likely growth rates that could be achieved, taking the exposed nature of the site into account.

Edges of woodland areas would be scalloped in order to maximise the woodland edge and increase wildlife value. Rides would be incorporated into the belts for the same reason. Native honeysuckle (*Lonicera periclymenum*) would be planted within woodland margins to enhance wildlife benefits.

Table 10.9.1: Woodland Planting: Species and Estimated Growth Rates

%	Species	Growth rate	Mature height	Tolerant dry soils	Shade tolerant	Salt tolerant	Tolerant exposure	Estimated height (m) at given year			
								1	**5**	**10**	**15**
Woodland mix											
10	Alder (*Alnus glutinosa*)	F	6-15 m	no	yes	no	yes	0.6	2.4	4.7	7.0
10	Ash (*Fraxinus excelsior)*	M-F	> 15 m	no	no	yes	yes	0.6	2.1	4.0	5.9
10	Aspen (*Populus tremula)*	F	6-15 m	no	no	yes	yes	0.6	2.4	4.7	7.0
10	Birch, Downy *(Betula pubescens)*	F	6-15 m	yes	no	no	yes	0.6	2.4	4.7	7.0
10	Birch, Silver (*Betula pendula*)	F	6-15 m	yes	no	no	yes	0.6	2.4	4.7	7.0
5	Cherry, Bird (*Prunus padus)*	M	6-15 m	no	no	no	yes	0.6	1.8	3.3	4.8
5	Elm, Wych (*Ulmus glabra)*	M	15 m +	no	yes	yes	yes	0.6	1.8	3.3	4.8
10	Hawthorn (*Crataegus monogyna*)	M	0.5-5 m	yes	no	yes	yes	0.6	1.8	3.3	4.8
5	Oak (*Quercus robur*)	S	> 15 m	no	yes	yes	yes	0.6	1.2	2.0	3.0
10	Pine, Scots (*Pinus sylvestris*)	M	> 15 m	yes	no	no	yes	0.6	1.8	3.3	4.8

%	Species	Growth rate	Mature height	Tolerant dry soils	Shade tolerant	Salt tolerant	Tolerant exposure	Estimated height (m) at given year			
								1	**5**	**10**	**15**
10	Rowan (*Sorbus aucuparia*)	F	6-15 m	yes	no	yes	yes	0.6	2.4	4.7	7.0
5	Whitebeam (Sorbus aria)	M	6-15 m	yes	yes	yes	yes	0.6	1.8	3.3	4.8
Woodland edge											
15	Blackthorn (*Prunus spinosa*)	F	0.5-5 m	yes	no	yes	yes	0.6	2.4	4.7	7.0
10	Elder (*Sambucus nigra*)	F	6-15 m	yes	yes	yes	yes	0.6	2.4	4.7	7.0
15	Gorse (*Ulex europaeus*)	M	0.5-5 m	yes	no	no	no	0.6	1.8	3.3	4.8
10	Hazel (*Corylus avellana)*	F	6-15 m	no	yes	no	no	0.6	2.4	4.7	7.0
10	Osier (*Salix viminalis*)	F	6-15 m	no	no	yes	yes	0.6	2.4	4.7	7.0
10	Rose, Briar (*Rosa rubiginosa*)	M	0.5-5 m	yes	no	no	yes	0.6	1.8	3.3	4.0
10	Rose, Burnet (*Rosa spinosissima*)	M	0.5-5 m	yes	no	yes	yes	0.6	1.8	3.3	4.0
10	Rose, Dog (*Rosa canina*)	M	0.5-5 m	yes	yes	no	yes	0.6	1.8	3.3	4.0
10	Willow, Grey (*Salix cinerea*)	F	6-15 m	no	no	yes	yes	0.6	2.4	4.7	7.0

10.9.2.7 Hedgerow planting

Recently planted hedgerows along the southern boundary would be extended along the southern and eastern boundaries to meet the proposed site access. Mixed thorn species (*Crataegus monogyna* and *Prunus spinosa*) elder - *Sambucus niger* and dog rose - *Rosa canina* would be planted at 10 plants/m in staggered rows, as recommended by the Energetica Masterplan. Plants would be protected by tree shelters and enclosed within 1 m high rabbit-proofed post and wire fences.

10.9.2.8 Maintenance of Tree and Shrub Planting

Factors affecting plant establishment include soil preparation and drainage, vermin control, wind protection and also reducing competition from weeds. Maintenance of the planting over the course of five years after planting would be essential to ensure its long term success. Maintenance would include beating up (the removal and replacement of failed plants), checking rabbit/deer fencing, vermin control, checking and securing stakes and ties, checking tree shrub and hedge shelters and weed control (keeping 1 m^2 area around each plant weed-free using herbicide). All existing belts along the north and eastern periphery of the site and hedgerow planting along the south and western boundary would be similarly maintained.

10.9.2.9 Proposed Meadow Areas

All unplanted areas, including mounds, woodland rides and remaining meadow areas would be weed-killed and subsequently sown with a suitable coastal meadow mix containing native wild flowers and grasses, as advised by the Energetica Masterplan.

The nutrient status of the former arable land is likely to be high and this will be reduced by regular cutting and removal of arisings (TCE Wells, Ruth Cox and Alan Frost, 1989). This operation will be carried out several times in the first year following sowing during the growing season (April to October), reducing to once or possibly twice annually by year five. The success of meadow species would be monitored as part of ongoing landscape maintenance operations, potentially with some input from the local community.

10.9.2.10 Grazing Land

The area to the south of the proposed path would be fenced and managed by Boddam Estates.

10.9.2.11 Crib Wall Areas

Areas of crib wall would be planted with native ivy (*Hedera helix*) and honeysuckle (*Lonicera periclymenum*) to provide useful habitat and reduce the visual effect of the structures, where these are visible from adjacent areas.

10.10 Assessment of Potential Effects

10.10.1 Development Phases

The Converter Station would comprise two distinct phases:

- A temporary construction phase, including initial enabling works; and
- The operational phase.

These phases are described in full in Chapter 2.

10.10.2 Zones of Theoretical Visibility

These ZTVs use different colours to indicate the likely horizontal subtended angle of the operational Converter Station where it is theoretically visible. This gives an indication of the likely horizontal extent that the building envelope would occupy, which generally reduces with distance.

10.10.2.1 Bare Ground ZTV

Drawing 3106 illustrates the predicted bare ground theoretical visibility and shows the maximum theoretical visibility of the Converter Station. This ZTV takes no account of any screening provided by buildings, vegetation or minor landforms, such as the existing bunds to the north of Stirling Hill Quarry, that are not contained in the digital terrain model (DTM) and which would reduce visibility in practice.

Within 1 km of the building envelope, the effect of the encircling ridge can be seen limiting the theoretical visibility of the buildings to the west, south and east of the site. There would be no visibility of the buildings from Sandfordhill Reservoir, although there is some limited theoretical visibility from the top of the valley sides within the Den of Boddam. Theoretical visibility extends to part of RAF Buchan Ness to the south, to dwellings at Sandfordhill to the west and Denend and Lendrum Terrace to the north. There would be no views from the A90 corridor within 1 km.

Within 1-2 km, theoretical visibility is restricted to the northern part of this zone. To the west, this is intermittent, including agricultural land and several dispersed dwellings along minor roads south of Newfield. To the north, theoretical visibility is more continuous, including dwellings at Newton, part of the A90 north of Stirling village, part of the B9108 and adjacent areas of Boddam.

A similar pattern of intermittent theoretical visibility extends across the 2-5 km zone, including a swathe of higher land to the south of Hill of Longhaven, another to the south and east of Hill of Cocklaw and a swathe extending from Invernettie, including the Reform Tower, parts of the Whitehill, Meethill and Middle Grange areas of Peterhead, a short section of the A982 and a longer section of the A90 as it by passes the town. Further east, Salthouse Head to the south and Keith Inch to the north of Peterhead Bay have theoretical visibility, but none of the Marina or the foreshore between would have any views of the Converter Station. Theoretical visibility also extends seaward in an arc of varying distance from the coast but all over 2 km from the Converter Station.

10.10.2.2 Screened ZTV

Drawing 3107 illustrates the predicted theoretical visibility, taking into account the screening effect provided by buildings and woodland blocks (shaded green on the plan) that are included within the Ordnance Survey Vectormap District dataset. The analysis takes a worst case approach, assuming all buildings are one and a half storeys and woodland plantations are 8 m or less in height. Within 2 km of the Converter Station, the height of woodland plantations has been refined by field survey.

Although the screened ZTV does give a better indication of the likely visibility, it does not take into account the screening effect of smaller tree belts, scrub, hedgerows and garden vegetation or minor landforms, such as the existing bunds to the north of Stirling Hill Quarry, that are not contained in the dataset or DTM and which would reduce visibility in practice. Consequently this ZTV overestimates actual visibility of the Converter Station in practice.

Within 1 km the pattern of theoretical visibility is similar to the bare ground ZTV (Drawing 3106), reflecting the open nature of the site and immediate surroundings. The effect of the dwellings along Lendrum Terrace is evident in reducing visibility to the north, but tree belts along the southern property boundary of these dwellings and earth bunds adjacent to Stirling Hill Quarry are not included in the dataset and would provide additional screening in practice.

Within 1-2 km, theoretical visibility is reduced by the screening effects of some woodland blocks to the north of the site and by buildings to the northeast. This would prevent any visibility of the Converter Station from parts of Newton, along sections of the A90, from almost all of the B9108 and much of Boddam.

Within 2-5 km, theoretical visibility to the west of the site remains similar to the bare ground ZTV, reduced very slightly by woodland blocks and several dispersed farm buildings and dwellings. This screening is more noticeable to the north of the Hill of Longhaven. Further north the effects of buildings on the southern outskirts of Peterhead noticeably reduce theoretical visibility within the town and along the A90. Theoretical visibility within Whitehill and along the A982 would be sporadic and there would be no views from the Meethill and Middle Grange areas of Peterhead. Further east, Salthouse Head to the south and Keith Inch to the north of Peterhead Bay have limited theoretical visibility, but none of the Marina or the foreshore between would have any views of the Converter Station. Theoretical visibility also extends seaward in an arc of varying distance from the coast but all over 2 km from the Converter Station.

10.10.2.3 Screened ZTV including proposed mounding

Drawing 3108 takes account of the same screening that is included in Drawing 3107, but also includes the effect of the proposed mounding around the Converter Station.

Within 1 km of the building envelope the mounding has most effect to the west and south of the site, reducing theoretical visibility from the eastern sides of

Sandfordhill reservoir and from the heathland west of Hill of Boddam. There would be no views of the buildings due south of the Converter Station.

Within 1-2 km, theoretical visibility to the north and east remain similar to the screened ZTV, but to the west the extent of theoretical visibility is reduced, most noticeably around Wellsforest. To the northwest the extent of theoretical visibility remains similar, but the horizontal angle subtended by the Converter Station is less.

Within 2-5 km, the extent of theoretical visibility remains largely similar to the screened ZTV except to the south of Hill of Longhaven, where there would be no views from Hillhead of Gask. To the west and northwest, the extent of theoretical visibility remains similar, but the horizontal angle subtended by the Converter Station is less.

Table 10.10.1: Theoretical Visibility shown on ZTVs

ZTV	Total Area of Theoretical Visibility (km^2)			
	0-1 km	**1-2 km**	**2-5 km**	**0-5 km**
Bare Ground	1.7 (45%)	2.6 (25%)	21.6 (32%)	25.8 (32%)
Screened	1.6 (44%)	2.1 (21%)	18.4 (27%)	22.2 (27%)
Screened with Proposed Mounds	1.4 (36%)	1.9 (18%)	17.5 (26%)	20.7 (25%)
Total Area within Zone	3.8 (100%)	10.0 (100%)	67.7 (100%)	81.5 (100%)

Table 10.10.1 summarises the extent of theoretical visibility (in km^2) of the Converter Station at different distances from the site. It shows how the effects of woodland plantations, buildings and the proposed mounds reduce the extent of visibility of the Converter Station. Note that these figures do not take the screening effect of smaller tree belts, scrub, hedgerows and garden vegetation or minor landforms, such as the existing bunds to the north of Stirling Hill Quarry, that are not contained in the dataset or DTM and which would reduce visibility in practice.

10.11 Detailed Viewpoint Assessments

Table 10.11.1 below summarises the detailed assessments at each of the eight viewpoints. Please also refer to Appendix C which contains the full text of the detailed assessments and to the assessment of landscape effects described below.

The assessment of significance of landscape effects is informed by the magnitude of landscape effect identified at the viewpoints, but also takes into account the extent and nature of the predicted effect on the receptor as a whole. Table 10.11.1 identifies the magnitude of the landscape effect at each viewpoint, but conclusions about the significance of landscape effects are contained within the general assessment of landscape effects, which follows.

The detailed viewpoint assessments also inform the determination of effects during construction and the residual effects, following secondary mitigation, which are described in Sections 10.12 and 10.18 respectively.

Visual representations (photos and photomontages) of the operational Converter Station from each of the viewpoints are provided in Drawings 3109-3132.

Table 10.11.1: Summary of Predicted Effects at Viewpoints during Operation

			Landscape				Visual				
VP	**Location**	**Distance***	**Receptors**	**Susceptibility**	**Value**	**Magnitude**	**Receptors**	**Susceptibility**	**Value**	**Magnitude**	**Significance**
1	Hill of Boddam viewpoint	0.38	BB1	medium	med-high	med-large	path users	high	med-high	med-large	**mod-major**
2	Lendrum Terrace – Stirling Hill Access Network	0.39	BB1 BB7	medium	medium	med-large	residents	high	medium	med-large	**mod-major**
							path users	med-high	med-high	med-large	**mod-major**
							road users	medium	medium	medium	moderate
3	Footpath west of Sandfordhill reservoir	0.62	BB7	medium	med-high	small	residents	high	medium	small	moderate
							path users	high	med-high	small	moderate
4	Elevated sculpture at entrance to Power Station	1.32	BB1	low-med	medium	small-med	visitors	high	med-high	small-med	moderate
5	A90 – substation entrance	1.28	BB1	low-med	low-med	small-med	residents	high	medium	small-med	moderate
							path users	high	med-high	small-med	moderate
							road	med-	med-	small	mod-minor

			Landscape				Visual				
VP	Location	Distance*	Receptors	Susceptibility	Value	Magnitude	Receptors	Susceptibility	Value	Magnitude	Significance
							users	high	high		
6	Minor road south of Newton	1.56	BB7	medium	medium	small-med	residents	high	medium	small-med	moderate
							road users	medium	medium	small-med	moderate
7	Minor road south of Newfield	1.94	BB7	medium	medium	small	residents	high	medium	small	mod-minor
							road users	medium	medium	small-neg	minor
8	A92 north of Invernettie roundabout	2.67	Urban	low	low-med	small-neg	path users	high	med-high	small	moderate
							road users	med-high	med-high	small	mod-minor

* Distance in km from building envelope

10.12 Assessment of Potential Temporary Construction Effects

It is estimated that the initial enabling works would last approximately 10 months and the main construction phase approximately 20 months. During this time, the following activities and elements have the potential to cause an effect on the landscape resources and visual receptors within the Study Area:

- Construction of the access track and watercourse crossing;
- Earthmoving to form screening mounds;
- Temporary construction compound and lay down area, approximately 1.5 ha;
- Excavations, including platform (approximately 3.6 ha), building foundations and cable trenches;
- HVAC cable excavations (approximately 1.7 km), construction of temporary haul route and watercourse crossings;
- Building materials delivery and installation;
- Construction of buildings;
- HVDC equipment delivery and installation; and
- Removal of temporary site compound and accommodation, forming remaining earth mounds and reinstatement of disturbed areas.

10.13 Landscape Effects during Construction

10.13.1 Effects on Physical landscape Resources

Activities that would have an effect on the landscape elements and features of the site during the construction phase include track construction, excavations, earthmoving and construction of the buildings.

The total area within the Planning red-line boundary, including access road, temporary site areas and the AC cable construction corridor is 28.54 Ha. The Converter Station site would cover an area of 3.6 Ha and the area of the permanent works, which includes the proposed earth mounds, would be 11.2 Ha. The temporary construction compound and laydown area would occupy approximately 1.5 Ha.

Although much of the Fourfields site would be disturbed at some point during the enabling and construction periods, progressive reinstatement would limit the magnitude of effect of the earthmoving on the physical landscape resources. It is proposed that earth mounds to the north, west and east of the Converter Station platform would be formed where practicable during the enabling works. The remainder of the excavated spoil would be stored in temporary heaps within the lay down area, located in the south-eastern field and the permanent mounds here formed towards the end of the construction phase. Topsoil would be kept separate from subsoil and excavated rock during all stages of the works.

Other landscape elements that would be removed during the construction phase include some 680 m of stone dyke, 335 m of path (which bisects the site from east to west) and 360 m of recently planted hedgerow (which bisects the site from north to south), but no mature trees would need to be disturbed. The majority of the existing path network, including all core paths and rights of way, would remain in use for the majority of the construction period.

Several new and reinstated existing dry stone dykes are proposed as part of the landscape works, amounting to 1680 m around the site and 201 m within. A new path is proposed, some 710 m long, crossing the site diagonally from northwest to southeast and 420 m of new hedgerows proposed along the south and eastern boundaries. Improvements to existing hedges are also proposed as part of the landscape works. Many of the proposals, shown on Drawing 3022, would be carried out as part of the early stages of construction, so limiting the effects of construction on the landscape resources of the site whilst reinforcing the field boundary pattern. The remains of a farm steading, located in the southwest field would be fenced and left undisturbed.

The construction of the proposed HVAC cable, associated haul road, drainage ditch, storage areas and fencing would result in disturbance within a corridor approximately 45 m wide and 1.7 km length. No trees or stone dykes would need to be removed and, given reinstatement of all working areas, most effects on the landscape resources would be temporary.

The landscape features of the site are typical of farmed arable coastal farmland, but some are valued locally and are assessed as medium sensitivity overall. Taking into account the extent of disturbance and the progressive reinstatement of disturbed areas as early as possible, the construction of the Converter Station is predicted to have a med-large magnitude of landscape effect, giving rise to a short to medium term temporary mod-major (significant) effect on the landscape elements and features of the site.

10.13.2 Effects on Landscape Character

During the construction period, the extent of visibility within the wider landscape of activity on the Converter Station site would be similar to that of the operational buildings, once screening mounds have been formed during the enabling works. The erection of the converter building is likely to be the most visible element of the work, as this would form the highest structure.

10.13.2.1 BB1 Cliffs of the North and South-East Coasts

Visibility of construction activity from this LCT is likely to be minimal, given the screening effects of the ridge that encloses the site to the east. The effect of trees and buildings would further reduce actual visibility. The sensitivity of this LCT is assessed as med-high. Although med-large landscape effects are predicted at viewpoint 1, which lies 0.38 km from the Converter Station, taking into account the restricted extent of any visibility in practice, the magnitude of landscape effect during the construction period is predicted to be small. Overall effects on this LCT are assessed as **mod-minor** (not significant), short to medium term.

10.13.2.2 BB7 Eastern Coastal Agricultural Plain

This is a large LCT that extends across Banff and Buchan from Cullen in the east to south of Balmedie in the southwest. It is assessed as having medium overall sensitivity within the Study Area. Ground level activity would be largely screened from view, once the proposed mounds have been formed during the enabling works, but construction of the upper parts of the buildings would be visible. The bare ground ZTV (Drawing 3106) shows theoretical visibility within this LCT extending to the west and north of the site. Field survey confirms that, in practice, buildings and woodlands would reduce this, especially to the south of Hill of Longhaven and the proposed screening mounds would reduce visibility to the west. Viewpoint assessments predict a magnitude of landscape effect during operation of med-large at 0.39 km, reducing to small-med at 1.32 km and small at 1.94 km (see Appendix C).

Effects during construction would be similarly visible. Taking into account the likely extent of visibility in practice, the small proportion of the LCT within 5 km affected (approximately 16%), the large extent of the LCT, the predicted magnitude of effect at distances over 1 km and the strengthening of the field pattern by the additional stone walls and hedges proposed, the magnitude of effect on the LCT as a whole during construction is predicted to be small, giving rise to a mod-minor (not significant) short to medium term effect.

10.14 Visual effects during Construction

10.14.1 Dwellings and Settlements

Note that the following assessment of potential visibility has been determined by survey from public roads and open land, without access to the private curtilage of individual dwellings and so does not constitute a formal residential amenity survey. It has been informed by the ZTV and by representative visualisations from the key viewpoints. In some instances, it has been difficult to ascertain potential visibility, where buildings may appear amongst trees for example, and a precautionary approach has had to be adopted. Aerial photographs have also been used to supplement the findings from fieldwork where necessary.

Individual dwellings have been identified from fieldwork, aerial photographs and Ordnance Survey mapping. The theoretical visibility of settlements is shown on the ZTVs, Drawings 3106-8.

Residential receptors are assessed as med-high sensitivity.

10.14.1.1 Dwellings within 1 km

The proposed mounds would be formed during the enabling works and would screen ground level construction activity from the majority of nearby dwellings. The bare ground ZTV (Drawing 3106) indicates that within 1 km, residents of approximately 21 dwellings may have views of some above ground construction activity. This includes some dwellings along Lendrum Terrace where views are likely to be restricted by existing conifer belts and the earth bunds next to the quarry, neither of which are taken into account within the ZTVs.

The detailed assessment at viewpoints indicates that med-large visual effects are possible during operation within 0.39 km of the building envelope, reducing to small-med at 1.32 km. Effects during construction would be similar, giving rise to short to medium term temporary mod-major (significant) visual effects for residents of dwellings with views of the construction activity and within close proximity of the site. This is likely to include Highfield and some of the 15 dwellings along Lendrum Terrace.

10.14.1.2 Small Settlements 1-2 km

The bare ground ZTV (Drawing 3106) indicates that only one dwelling within Stirling Village has theoretical visibility of the Converter Station, but that there may be views from much of Boddam. In practice, only dwellings facing south onto the Recreation Ground would have visibility. Elsewhere in Boddam, non-residential buildings to the east of the A90 would screen construction activity from view. The dwellings with views lie approximately 1.2-1.5 km from the site and, at this distance, the detailed viewpoint assessments indicate that the magnitude of visual effect is likely to be small-med or less. This would give rise to a moderate (not significant) short to medium term visual effect at most for residents of approximately 30 dwellings with views of construction activity.

Woodland plantations to the south would screen any views of the construction activity from dwellings at Denend, but one dwelling at Newton would have open views of the construction activity. The detailed assessment at viewpoint 6 (Minor Road south of Newton) predicts a small-med magnitude of effect, giving rise to a moderate (not significant) short to medium term visual effect.

10.14.1.3 Settlements over 2 km

The bare ground ZTV (Drawing 3106) indicates that Invernettie and the southern parts of Peterhead, parts of Meethill and Middle Grange have theoretical visibility of the Converter Station. In practice, industrial estates in the vicinity of Invernettie and parkland trees at Coplandhill are likely to screen any views of construction activity from dwellings to the north and no visual effects are predicted.

10.14.2 Key Transport Routes

10.14.2.1 A90

The bare ground ZTV (Drawing 3106) shows theoretical visibility of the Converter Station from much of the A90 between Stirling and Invernettie roundabout and from some of the bypass to the west of Peterhead. In practice, buildings and woodland blocks would restrict visibility of construction activity from parts of the section between Stirling Village and Invernettie. Open views would be possible from a section of approximately 210 m north of the B9108, another 120 m in the vicinity of viewpoint 5, a section of 100 m south of Newton and another 180 m south of Invernettie. West of Invernettie roundabout, roadside embankments and industrial buildings prevent any views towards the site from the bypass in practice. In all, road users heading south would have intermittent views of construction activity for approximately 610 m between Invernettie roundabout and Stirling Village at distances of between 1.2 km and 2.5 km from the site.

Detailed viewpoint assessments along the A90 indicate that the magnitude of effect is likely to be small-med or small, depending upon the distance from the site and the angle of view. Road users on the A90 are assessed as having med-high sensitivity. Taking into account the small proportion of the route affected, the predominantly oblique angle of view and the predicted reduction in magnitude of effect with increasing distance, a small magnitude of visual effect is predicted, giving rise to a mod-minor (not significant) short to medium term visual effect for road users.

10.14.2.2 A982

Road users heading south would have views of construction activity from a 350 m section of road as they approach Invernettie roundabout. Buildings, parkland trees and landform would screen views from all other parts of the road. The detailed assessment at viewpoint 8 (A982 north of Invernettie roundabout) predicts a small magnitude of change for road users at 2.67 km from the site. Road users on the A982 are assessed as having med-high sensitivity. Taking into account the small proportion of the route affected this is predicted to give rise to a minor (not significant) short to medium visual effect for road users due to construction activity.

10.14.2.3 B9108

Road users on the B9108 are assessed as having medium sensitivity. Although the bare ground ZTV (Drawing 3106) indicates theoretical visibility along a 500 m section of this road, trees and dwellings within Boddam and non-residential buildings next to the A90 would prevent any views of construction activity in practice. No visual effects are predicted for road users.

10.14.2.4 Minor Road from Stirling Village to Newton

This is the closest minor road to the site. The bare ground ZTV (Drawing 3106) indicates theoretical visibility along a 0.75 km section of this road, to the north of the site. In practice, views of construction activity would be restricted by trees and dwellings along Lendrum Terrace, but there would be more open views for road users to the west of viewpoint 2 (Lendrum Terrace) along a 380 m section of road and between 400-500 m from the site and also from a 1.1 km section to the south of Newton.

This road is used mostly for local access and is assessed as medium sensitivity. The detailed assessment at viewpoint 2 predicts a medium magnitude of effect, given the oblique nature of views at this point but views would be more direct for road users travelling south from Newton, where the magnitude of effect is predicted to be small-med. Taking into account the extent of the road with visibility of construction activity, the overall magnitude of effect is predicted to be medium, giving rise to a moderate (not significant) short to medium term visual effect for road users due to construction activity.

10.14.3 Recreational Routes

10.14.3.1 Aberdeenshire Coastal Path

Theoretical visibility from this route is very similar to that of the A90. Path users along this route are judged as having med-high to high sensitivity. Detailed viewpoint assessments along the A90 predict a small-med magnitude of effect for path users at 1.3 km from the site, reducing to small at 2.67 km. Taking into account the small proportion of the route affected, a moderate (not significant) short to medium term visual effect is predicted for path users due to construction activity.

10.14.3.2 Stirling Hill Access Network

Construction activity would be visible at close range from the Core Paths that surround the Fourfields site and would also require the removal of the unclassified path that bisects the site from east to west. Proposed mounds, formed during the enabling works, would provide screening for path users between Lendrum Terrace and the proposed site access and also from sections of the Right of Way to the south of Highfield. The remaining parts of the network, along the southwest, south and southeastern boundaries of Fourfields and on the west-facing slopes of Hill of Boddam, including viewpoint 1, would have visibility of construction activity. The detailed assessment at viewpoint 1 (Hill of Boddam viewpoint) predicts a med-large magnitude of visual effect for path users, 380 m from the site. Effects would greater from paths closer to the construction site, construction compound and lay down area, although temporary soil storage would reduce the extent of visibility.

Path users are judged as having med-high to high sensitivity. Where visible from adjacent paths, construction activity is predicted to result in a large magnitude of effect, giving rise to a major (significant) short to medium term visual effect for path users. Effects would be smaller from the slopes of the Hill of Boddam, where a mod-major (significant) short to medium term visual effect is predicted for path users.

10.14.4 Recreational and Tourist Attractions

The bare ground ZTV (Drawing 3106) indicates that there would be no theoretical visibility from the Lighthouse at Buchan Ness, Boddam Castle or the Den of Boddam Flint Mines and these are therefore not considered further.

10.15 Assessment of Potential Operational Effects

The operational elements with the potential to affect the landscape and visual amenity of the Study Area include the Converter Station and ancillary structures, fencing, access road and earthworks. The access road would be retained throughout the operational stage to provide car parking and access for maintenance of the Converter Station.

The assessment of the potential landscape and visual effects during the operational phase takes account of the embedded, primary mitigation measures described above.

10.16 Landscape Effects during Operation

10.16.1 Physical Landscape Resources

No loss of any landscape elements or features is predicted during the operational phase. No landscape effects are predicted therefore.

10.16.2 Landscape Character

Table 10.16.1 summarises the overall theoretical visibility of the LCTs within the Study Area, as illustrated by the ZTVs, Drawings 3106-8.

Table 10.16.1: LCTs within 5 km - Theoretical Visibility

	Area in km^2		
	BB1*	**BB7***	**Urban**
Total area of LCT within Banff and Buchan	9.8	307.4	6.7
Total area of LCT within 5 km	6.6	33.3	4.5
Theoretical visibility within 5 km			
Bare Ground theoretical visibility (Drawing 3106)	1.6 (25%)	8.8 (27%)	2.7 (59%)
Screened theoretical visibility (Drawing 3107)	1.2 (19%)	7.6 (23%)	0.9 (21%)
Screened theoretical visibility including proposed mounds (Drawing 3108)	1.1 (16%)	6.5 (20%)	0.8 (19%)

* Code as indicated on Drawing 3104

10.16.2.1 BB1 Cliffs of the North and South-East Coasts

Visibility of the Converter Station from this LCT is likely to be minimal, given the screening effects of the ridge that encloses the site to the east. The effect of trees and buildings would further reduce actual visibility. The sensitivity of this LCT is assessed as med-high. Although med-large landscape effects are predicted at viewpoint 1, taking into account the restricted extent of any visibility in practice, the magnitude of landscape effect during the operational period is predicted to be small. Overall effects on this LCT are assessed as mod-minor (not significant) permanent landscape effect.

10.16.2.2 BB7 Eastern Coastal Agricultural Plain

This large LCT is assessed as having medium overall sensitivity within the Study Area. The bare ground ZTV (Drawing 3106) shows theoretical visibility within this LCT extending to the west and north of the site. Field survey confirms that, in practice, buildings and woodlands would reduce this, especially to the south of Hill of Longhaven and the proposed screening mounds would reduce visibility to the west. Viewpoint assessments predict a magnitude of landscape effect of med-large at 0.39 km, reducing to small-med at 1.32 km and small at 1.94 km (see Appendix C). Taking into account the likely extent of visibility in practice, the small proportion of the LCT within 5 km affected (approximately 16%), the large extent of the LCT (307.4 km^2), the magnitude of effect on the LCT as a whole is predicted to be small, giving rise to a mod-minor (not significant) permanent landscape effect.

10.17 Visual Effects during Operation

10.17.1 Dwellings and Settlements

Note that the following assessment of potential visibility has been determined by survey from public roads and open land, without access to the private curtilage of individual dwellings and so does not constitute a formal residential amenity survey. It has been informed by the ZTV and by representative visualisations from the key viewpoints. In some instances, it has been difficult to ascertain potential visibility, where buildings may appear amongst trees for example, and a precautionary approach has had to be adopted. Aerial photographs have also been used to supplement the findings from fieldwork where necessary.

Individual dwellings have been identified from fieldwork, aerial photographs and Ordnance Survey mapping. The theoretical visibility of settlements is shown on the ZTVs, Drawings 3106-8.

Residential receptors are assessed as med-high sensitivity.

10.17.1.1 Dwellings within 1 km

Within 1 km, residents of approximately 21 dwellings may have views of the Converter Station. This includes some dwellings along Lendrum Terrace where views are likely to be restricted by existing conifer belts and the earth bunds next to the quarry, neither of which are taken into account within the ZTVs. The detailed assessment at viewpoints indicates that med-large visual effects are possible within 0.39 km of the building envelope, reducing to small-med at 1.32 km. These would give rise to mod-major (significant) permanent visual effects for residents of dwellings with views of the Converter Station and within close proximity of the site. This is likely to include Highfield and some of the 15 dwellings along Lendrum Terrace.

10.17.1.2 Small Settlements 1-2 km

The bare ground ZTV (Drawing 3106) indicates that only one dwelling within Stirling Village has theoretical visibility, but that there may be views from much of Boddam. In practice, only dwellings facing south onto the Recreation Ground would have visibility, and from elsewhere in Boddam, non-residential buildings in the vicinity of RAF Buchan would screen the Converter Station from view. Dwellings in Boddam with views lie approximately 1.5 km from the site, although those in Stirling Village are 1.1 km away. Detailed assessments at nearby viewpoints indicate that the magnitude of visual effect is likely to be small-med or less. This would give rise to a moderate (not significant) visual effect at most for residents of approximately 30 dwellings.

Woodland plantations to the south would screen any views from dwellings at Denend, but one dwelling at Newton would have open views of the Converter Station. The detailed assessment at viewpoint 6 (Minor Road south of Newton) predicts a small-med magnitude, giving rise to a moderate (not significant) visual effect.

10.17.1.3 Settlements over 2 km

The bare ground ZTV (Drawing 3106) indicates that Invernettie and the southern parts of Peterhead, parts of Meethill and Middle Grange have theoretical visibility of the Converter Station. In practice, industrial estates in the vicinity of Invernettie and parkland trees at Coplandhill are likely to screen any views of the Converter Station from dwellings further north and no visual effects are predicted.

10.17.2 Key Transport Routes

10.17.2.1 A90

The bare ground ZTV (Drawing 3106) shows theoretical visibility of the Converter Station from much of the A90 between Stirling Village and Invernettie roundabout and from some of the bypass to the west of Peterhead. In practice, buildings and woodland blocks would restrict visibility from parts of the section between Stirling Village and Invernettie. Open views would be possible from a section of approximately 210 m north of the B9108, although a new amenity tree belt planted along the southern road edge would provide some screening during the operational period. There would also be views from a 120 m section in the vicinity of viewpoint 5, from another 100 m to the south of Newton and another 180 m section south of Invernettie. West of Invernettie roundabout roadside embankments and industrial buildings prevent any views towards the Converter Station from the bypass in practice. In all, road users heading south would have intermittent views for approximately 610 m between Invernettie roundabout and Stirling Village at distances of between 1.2 km and 2.5 km from the site.

Detailed viewpoint assessments along the A90 indicate that the magnitude of effect is likely to be small-med or small, depending upon the distance from the site and the angle of view. Road users on A90 are assessed as having med-high sensitivity. Taking into account the small proportion of the route affected, the predominantly oblique angle of view and the predicted reduction in magnitude of effect with increasing distance, a mod-minor (not significant) permanent visual effect is predicted for road users.

10.17.2.2 A982

Road users heading south would have views of the Converter Station from a 350 m section of road as they approach Invernettie roundabout. Buildings, parkland trees and landform would screen views from all other sections of the road. The detailed assessment at viewpoint 8 (A982 north of Invernettie roundabout) predicts a small magnitude of change for road users at 2.67 km from the site. Road users on A982 are assessed as having med-high sensitivity. Taking into account the small proportion of the route affected this is predicted to give rise to a minor (not significant) permanent visual effect for road users.

10.17.2.3 B9108

Although the bare ground ZTV (Drawing 3106) indicates theoretical visibility along a 500 m section of this road, trees and dwellings within Boddam and non-residential buildings next to the A90 would prevent any views of the Converter Station in practice. No visual effects are predicted for road users.

10.17.2.4 Minor Road from Stirling Village to Newton

This is the closest minor road to the site. The bare ground ZTV (Drawing 3106) indicates theoretical visibility along a 0.75 km section of this road, to the north of the site. In practice, views would be restricted by trees and dwellings along Lendrum Terrace, but there would be more open views for road users to the west of viewpoint 2 (Lendrum Terrace) along a 380 m section of road which lies between 400-500 m from the Converter Station, and from a 1.1 km section to the south of Newton.

This road is used mostly for local access and is assessed as medium sensitivity. The detailed assessment at viewpoint 2 predicts a medium magnitude of effect, given the oblique nature of views at this point but views would be more direct for road users travelling south from Newton, where the magnitude of effect is predicted to be small-med. Taking into account the extent of the road with visibility of the Converter Station, the overall magnitude of effect is predicted to be medium, giving rise to a moderate (not significant) permanent visual effect for road users.

10.17.3 Recreational Routes

10.17.3.1 Aberdeenshire Coastal Path

Theoretical visibility from this route is very similar to that of the A90. Path users along this route are judged as having med-high to high sensitivity. Detailed viewpoint assessments along the A90 predict a small-med magnitude of effect for path users at 1.3 km from the site, reducing to small at 2.67 km. Taking into account the small proportion of the route affected, a small magnitude of effect is predicted on the route as a whole, giving rise to a moderate (not significant) permanent visual effect for path users.

10.17.3.2 Stirling Hill Access Network

The Converter Station would be visible from the west-facing slopes of Hill of Boddam, including viewpoint 1, and from the Core Path along the east of the site boundary, where it meets the permanent site access. Elsewhere, the proposed mounds are likely to screen views of the Converter Station.

Path users are judged as having med-high to high sensitivity. The detailed assessment at viewpoint 1 (Hill of Boddam viewpoint) predicts a med-large magnitude of visual effect for path users, 380 m from the site but effects would be greater where the Core Path passes the permanent site entrance. This would give rise to mod-major (significant) permanent visual effects for path users on the slopes of the Hill of Boddam and a localised major (significant) effect at the permanent site entrance.

10.17.4 Recreational and Tourist Attractions

The bare ground ZTV (Drawing 3106) indicates that there would be no theoretical visibility from the Lighthouse at Buchan Ness, Boddam Castle or the Den of Boddam Flint Mines and these are therefore not considered further.

10.18 Residual Effects Following Secondary Mitigation

Tree, shrub and climber planting on the north and east mounds is proposed, in order to mitigate significant operational landscape and visual effects. The effects of woodland planting are illustrated on the photomontages from each viewpoint, ten years following planting (Drawings 3109-3132) and described within Appendix C. These also show the growth of climbers planted on the crib walling on the inner faces of the proposed mounds.

10.18.1 Residual Effects at Viewpoints

Significant operational effects have been identified at viewpoint 1 and 2.

10.18.1.1 Viewpoint 1

This viewpoint lies to the southeast of the Converter Station. From here, tree and shrub growth would screen the lower parts of the proposed buildings. By year 10 the lower parts of the converter building and much of the GIS building would be hidden from view, as shown in Drawing 3111. By year 15 this planting is likely to screen the GIS building and much of the granite cladding of the converter building. Although the planting would help to reduce the amount of the Converter Station visible and so reduce the magnitude of visual effect slightly, the reduction is not predicted to give rise to a lower class of magnitude of visual effect for path users.

The tree planting would help to integrate the proposed buildings within the landscape, also reflecting the scale and extent of existing woodland plantations at Denend. Consequently, the proposed planting is predicted to reduce the magnitude of landscape effect to medium at this viewpoint by year 10.

10.18.1.2 Viewpoint 2

This viewpoint lies to the north of the Converter Station, from where woodland planting on the north and east mounds would be visible either side of the existing quarry bund. The proposed woodland planting would appear to extend the existing tree belts, helping to integrate the building within this undulating landscape. The effect of tree and shrub growth would be to screen the lower parts of the proposed buildings. By year 10 the lower parts of the converter building and much of the GIS building would be hidden from view, as shown in Drawing 3114. By year 15 much of the granite cladding of the converter building would be concealed and only the translucent cladding and sedum roof visible. Climbers would reduce the visual contrast of the crib walling over time and could be expected to cover this completely by year 15.

Although the proposed woodland planting would help to reduce the amount of the Converter Station visible and so reduce the magnitude of visual effect slightly, the reduction is not predicted to give rise to a lower class of magnitude of visual effect for road users. The planting is likely to screen more of the Converter Station from the adjacent footpath, which lies slightly lower than the viewpoint. For residents, the tree planting is also likely to screen more of the Converter Station, especially from the one and a half storey dwellings located at the lower end of Lendrum Terrace. The magnitude of visual effect for path users and some residents is predicted to be reduced slightly (from med-large to medium), but would nonetheless give rise to a mod-major (significant) permanent residual visual effect.

The woodland planting would help to integrate the proposed buildings within the landscape, appearing to extend the existing tree belts to the east of the Braeside Trout Fishery. Consequently, the proposed planting is predicted to reduce the magnitude of landscape effect at this viewpoint to medium by year 15.

10.18.2 General Residual Effects

Significant potential operational effects have been identified on the following receptors:

10.18.2.1 Dwellings within 1 km

Mod-major (significant) potential visual effects are predicted for residents of Highfield and some of the 15 dwellings along Lendrum Terrace. By year 15 the tree planting is likely to screen a greater proportion of the Converter Station, especially when viewed from one and a half storey dwellings located towards the lower end of Lendrum Terrace. Although this would reduce the magnitude of visual effect (from med-large to medium) for some residents, this is nonetheless predicted to give rise to a mod-major (significant) permanent residual visual effect.

10.18.2.2 Stirling Hill Access Network

Mod-major (significant) potential visual effects are predicted for path users on the slopes of the Hill of Boddam and a localised major (significant) effect is predicted at the permanent site entrance. Woodland planting is not predicted to give rise to a lower class of magnitude at viewpoint 1, but would partially screen views of the permanent site entrance, reducing the magnitude of visual effect from large to medium and giving rise to a localised mod-major (significant) permanent residual visual effect for path users.

10.19 Cumulative Landscape and Visual Effects

10.19.1 Scope of Assessment

Best practice guidance places emphasis on the need to identify the key cumulative effects which are likely to influence decision making, rather than an assessment of every potential cumulative effect (Scottish Natural Heritage 2012, paragraph 66). Paragraph 7.14 of the GLVIA also advises that: "*schemes at pre-planning or scoping are not generally considered in the assessment of cumulative effects because firm information on which to base the assessment is not available and because of uncertainty about what will actually occur, that is, it is not 'reasonably foreseeable*".

Accordingly, this cumulative landscape and visual impact assessment (CLVIA) focusses upon developments where sufficient information is in the public domain to enable assessment and which are most likely to give rise to significant cumulative effects, in combination with the Converter Station.

Cumulative landscape and visual effects may arise from the changes to the baseline landscape or visual resources as a result of the proposed Converter Station in the context of other developments within the surrounding area, as discussed in Chapter 18. The emphasis of the CLVIA is on the additional changes the Converter Station may bring to the cumulative situation of other developments and not the combined effect of all the developments potentially visible. It draws conclusions about the cumulative effects on the basis of submitted planning documents, fieldwork and the Converter Station ZTVs and visualisations.

Initial desk and site-based assessment confirmed that the cumulative assessment should include the following large scale developments:

Table 10.19.1: Developments Included in CLVIA

Planning Ref	Description	Status
	Landfall of NorthConnect subsea interconnector NorthConnect DC cable route from landfall to converter station.	Pre-planning
APP/2014/1437	New 400kV electricity substation (including 4 no. buildings housing switchgear and transformers) and associated infrastructure.	Planned
APP/2011/0058	Upperton Industrial Estate Peterhead AB42 3GL. Creation of Energetica Industry Park Comprising of Class 4 (Business) Class 5 (General Industrial) and Class 6	Planned

Planning Ref	Description	Status
	(Storage or Distribution) uses with Associated Access and Landscaping.	
ENQ/2014/2784	Peterhead Carbon Capture and Storage	Not submitted

10.19.2 Effects during Construction

The NorthConnect HVDC Cable would be installed at the same time as the Interconnector Converter Station and HVAC cable and could potentially lead to short-term cumulative effects. Although the precise route has not been determined, it is likely that it would follow the western boundary of Fourfields then head south towards Long Haven Bay. The bare ground ZTV (Drawing 3106) indicates that theoretical visibility of the Converter Station is restricted to within 400 m to the south of the buildings. The extent of visibility would be further reduced once the southern mounds have been formed. Depending upon the timing of the formation of the mounds, footpath users may experience a small-med magnitude of effect, giving rise to a moderate (not significant) short-term cumulative visual effect. No other cumulative landscape or visual effects are predicted.

Given the uncertainty concerning the timing of approval and subsequent construction of other proposed developments listed in Table 10.19.1, assessment of these effects cannot be predicted with any confidence. The following comments concerning the cumulative effects of the Converter Station during construction should therefore be considered with this uncertainty in mind.

There is potential for significant short to medium term cumulative landscape and visual effects if the construction phases of the projects listed in Table 10.19.1 occur simultaneously. These effects could include localised effects on landscape character arising from lay down areas and construction compounds, as well as general construction activity, including noise. Visual effects on path and road users, visitors and residents are also likely, especially where construction of concurrent projects is visible within the same 90 degree view, or where a receptor is effectively surrounded by construction activity.

These construction effects could be mitigated by adequate consultation and liaison to ensure that combined effects of concurrent projects are minimised during construction.

10.19.3 Effects during Operation

10.19.3.1 New 400kV Electricity Substation

Other than the NorthConnect HVDC cable, the proposed 400kV substation is the closest of the planned developments. The new substation building would be located adjacent and to the north of the existing substation, approximately 1.4 km from the Converter Station.

The bare ground ZTV (Figure 3.4.1) within the ES of the proposed 400kV substation indicates a similar pattern of theoretical visibility to that of the Converter Station. The associated transmission towers would be more widely visible, especially from Peterhead and the A90 (Figure 3.4.2). The Converter Station would generally be visible within the same 90 degree view, except near Lendrum Terrace where the two developments would be visible successively.

NorthConnect viewpoints 2, 4, 6 and 8 correspond with those used within the ES of the proposed 400kV substation. From the visualisations within the submitted ES, it is evident that the proposed substation would appear as an extension to the existing buildings, with a consequent increase in the number of transmission towers nearby.

Landscape

The proposed 400kV substation would be located within a landscape already affected by industrial buildings and infrastructure, and would reinforce the industrial character of the open farmland to the south of Peterhead. The effect of introducing the Converter Station into this scenario would remain the same as identified within the non-cumulative assessment. The Converter Station would bring the influence of large scale industrial buildings further south towards a landscape that has a more rural character, although the Stirling Hill Quarry affects this at present. The landscape effect of the Converter Station would be reduced by the naturalistic ground shaping, which would help to integrate the buildings into the surrounding landscape and no additional landscape effects are predicted as a result of the addition of the proposed 400kV substation to the baseline.

Visual

The proposed 400kV substation and transmission towers would increase the complexity of the existing infrastructure, so forming a more noticeable focus and adding to the visual clutter, especially in close proximity. The effect of introducing the Converter Station into this scenario would remain the same as identified within the non-cumulative assessment. It would form a new focus when viewed from close by, but would generally appear low on the skyline, well integrated with the adjacent mounds and the skyline beyond. The translucent cladding and planted roof would help to reduce the visual contrast of the converter building. No additional visual effects are predicted as a result of the addition of the proposed 400kV substation to the baseline.

10.19.3.2 Creation of Energetica Industry Park

The proposed Energetica Industry Park would lie southwest of Invernettie roundabout (NorthConnect viewpoint 8) some 2 km to the north of the Converter Station and within an area characterised by industrial development, fly tipping and made-up ground. Views of the site are restricted by embankments of the disused 19th century railway to the east, by the Score Energy facility at Wellbank to the west and by existing buildings at Upperton Industrial Estate to the north. Combined visibility with the Converter Station is therefore most likely from the area to the south of the proposed Energetica Industry Park and west of the A90, where there is least screening from buildings and landform.

From these areas the proposed Energetica Industry Park would be experienced within the context of the industrialised fringe of Peterhead, viewed between the industrial buildings at Wellbank and Upperton. The Converter Station would most often be seen in combination with the proposed Energetica Industry Park from the area between the two developments, where views would be largely successive.

Landscape

Although the creation of the proposed Energetica Industry Park would have an effect on the immediate surrounds, it would not affect the addition of the relatively distant Converter Station to this baseline, which would remain the same as that identified within the non-cumulative assessment.

Visual

From most areas with combined visibility, the proposed Energetica Industry Park would tend to merge with the surrounding industrial buildings and infrastructure and the visual effect of the comparatively distant Converter Station would remain the same as that identified within the non-cumulative assessment.

10.19.3.3 NorthConnect HVDC Cable

The proposed cable would be installed below ground and no cumulative landscape or visual effects are predicted during operation.

10.19.3.4 Peterhead Carbon Capture and Storage (CCS) Project

New equipment and modifications to existing equipment at the Peterhead power station are required to enable the carbon capture process to be integrated into the existing facility. These additions and modifications would be confined to the land within the footprint of the existing power station site.

Landscape

The proposed CCS project would be located within a landscape already affected by buildings and infrastructure associated with the power station, which lies some 1.75 km northeast of the Converter Station. The effect of introducing the Converter Station into this scenario would remain the same as identified within the non-cumulative assessment and no additional landscape effects are predicted as a result of the addition of the proposed CCS project to the baseline.

Visual

The proposed CCS project would increase the complexity of the existing power station, so adding to the visual clutter, especially in close proximity. The effect of introducing the Converter Station into this scenario would remain the same as identified within the non-cumulative assessment and no additional visual effects are predicted as a result of the addition of the proposed CCS project to the baseline.

10.20 Summary

Table 10.20.1 summarises the landscape and visual effects, both potential and residual following secondary mitigation, during the short to medium term construction phase and the permanent operational phase.

Table 10.20.1: Summary of Landscape and Visual Effects

Nature of Impact	Receptor Sensitivity	Magnitude of Effect	Significance of Effect	Secondary Mitigation	Residual Magnitude of Effect	Residual Significance of Effect	Assessment of Residual Effects
Construction - Landscape							
Landscape elements and features of the site	medium	med-large	mod-major	none	med-large	mod-major	short to medium term significant
BB1 Cliffs of the North and South-East Coasts LCT	med-high	small	mod-minor	none	small-neg	mod-minor	short to medium term not significant
BB7 Eastern Coastal Agricultural Plain LCT	medium	small	mod-minor	none	small	mod-minor	short to medium term not significant
Construction - Visual							
Dwellings within 1 km	med-high	medium and med-large	mod-major	none	medium and med-large	mod-major	short to medium term significant
Small settlements within 1-2 km	med-high	small-med	moderate	none	small-med	moderate	short to medium term not significant
Settlements over 2 km	med-high	none	none	none	none	none	none
A90, A982	med-high	small	mod-minor	none	small	mod-minor	short to medium term not significant
B9108	medium	none	none	none	none	none	none
Minor road Stirling Village to Newton	medium	medium	moderate	none	medium	moderate	short to medium term not significant
Aberdeenshire Coastal Path	med-high to high	small	moderate	none	small	moderate	short to medium term not significant
Stirling Hill Access Network	med-high to high	med-large and large	mod-major and major	none	med-large and large	mod-major and major	short to medium term significant
Operation - Landscape							
Landscape elements and features of the site	medium	none	none	none	none	none	none
BB1 Cliffs of the North and South-East Coasts LCT	med-high	small	mod-minor	none	small-neg	mod-minor	permanent not significant
BB7 Eastern Coastal	medium	small	mod-minor	none	small	mod-minor	permanent not

Nature of Impact	Receptor Sensitivity	Magnitude of Effect	Significance of Effect	Secondary Mitigation	Residual Magnitude of Effect	Residual Significance of Effect	Assessment of Residual Effects
Agricultural Plain LCT							significant
Operation - Visual							
Dwellings within 1 km	med-high	medium and med-large	mod-major	growth of woodland planting	medium	mod-major	permanent significant
Small settlements within 1-2 km	med-high	small-med	moderate	none	small-med	moderate	permanent not significant
Settlements over 2 km	med-high	none	none	none	none	none	none
A90, A982	med-high	small	mod-minor	none	small	mod-minor	permanent not significant
B9108	medium	none	none	none	none	none	none
Minor road Stirling Village to Newton	medium	medium	moderate	none	medium	moderate	permanent not significant
Aberdeenshire Coastal Path	med-high to high	small	moderate	none	small	moderate	permanent not significant
Stirling Hill Access Network	med-high to high	med-large to large	mod-major to major	growth of woodland planting	medium to med-large	mod-major	permanent significant
Construction Cumulative Visual							
Stirling Hill Access Network	med-high to high	small-med	moderate	none	small-med	moderate	short to medium term not significant
				Key		Significant effect	

Chapter 11

Water Quality

Contents

11 Water Quality

11.1 Introduction

This chapter covers surface water and cross references the land quality chapter where hydrogeology is assessed. A background description of the existing hydrological conditions of the area is provided here, and an assessment of the potential effects that the construction, operation and decommissioning activities could have on water quality is provided. Mitigation measures to minimise effects are identified.

11.2 Sources of Information

11.2.1 Planning Framework

11.2.1.1 National

The basic premises for Managing Flood Risk and Drainage in the Scottish Planning Policy (SPP) (Scottish Ministers, 2014a) are that:

'…the planning system should prevent development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere.'

'Infrastructure and buildings should generally be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5% (1:200 years).' (Medium to High Risk – annual probability of coastal or watercourse flooding is greater than 0.5% (1:200 years)).'

'Surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking account of rain falling on the site and run-off from adjacent areas.'

In addition the SPP regarding Valuing the Natural Environment states that:

'The planning system should promote protection and improvement of the water environment, including rivers, lochs, estuaries, wetlands, coastal waters and groundwater, in a sustainable and co-ordinated way'.

11.2.1.2 Local

It is stated in Supplementary Guidance No. 8: Flooding and Erosion, as part of Policy 8 (Layout, Siting and Design of new development) of Aberdeenshire Local Development Plan (Aberdeenshire Council, 2012b), that:

'The current policy approach involves a presumption against development on any land that is at risk from flooding (such as a functional flood plain), is required for long term managed retreat from areas at risk of flood, or is at risk from erosion. Exceptions may be permitted where it can be demonstrated through an appropriate technical assessment that there is neither a medium or high risk of flooding, or it is in a location where adequate existing flood prevention measures are in place.'

Also the local planning policy Safeguarding 1: Protection and conservation of the water environment, contained within the Aberdeenshire Local Development Plan, is deemed as relevant to the current development. The aims of the policy include:

'to support the implementation of the European Commission's Water Framework Directive (European Parliament and Council, 2000); to contribute to the Scotland District River Basin Plan (Scottish Environment Protection Agency, 2009d); to promote the enhancement of the water environment and the creation of good quality riparian habitat; and to provide protection to Aberdeenshire's aquatic environment from new development that could result in unacceptable ecological impacts'.

11.2.2 Regulatory Framework

11.2.2.1 The Water Framework Directive/ Water Environment and Water Service (Scotland) Act 2003

The EU Water Framework Directive (WFD) (European Parliament and Council, 2000) established a comprehensive legal framework for the protection, improvement and sustainable use of all water bodies across Europe. The remit of the WFD extends to all rivers, canals, lochs, estuaries, wetlands, coastal waters and groundwater.

The WFD was transposed into Scottish Law through the Water Environment and Water Services (WEWS) (Scotland) Act 2003 (Scottish Parliament, 2003). The core objective of the WEWS Act is to protect and improve Scotland's water environment. This includes preventing deterioration in status of water bodies and, where possible, restoring surface waters and groundwater damaged by pollution, water abstraction, dams and engineering activities to 'Good Status' by 2015.

In order to meet these objectives, the WEWS Act introduced a new process known as 'River Basin Management Planning' (Scottish Environment Protection Agency, 2009d) to protect, monitor and improve the water environment in a sustainable way, and provided for The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (Scottish Ministers, 2011b) to control the adverse impacts of all activities likely to have an impact on the water environment. SEPA is the competent authority for managing both the planning and regulatory frameworks.

11.2.2.2 The EU Floods Directive/ Flood Risk Management Act (Scotland) 2009

The Flood Risk Management (Scotland) Act 2009 (Scottish Parliament, 2009) transposes the EU Floods Directive (European Parliament and Council, 2007) into Scottish law, and creates a new and more sustainable approach to assessing and managing flood risk management across Scotland.

This states that the flooding risk to a development must be assessed and mitigated if necessary. Furthermore the downstream effects must also be considered, including increased flooding risks due to increased discharges arising from a development.

11.2.2.3 The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR) (Scottish Ministers, 2011b) are intended to control activities which have the potential to cause pollution to the water environment. Such activities are controlled at three different levels depending on the potential risks and these are:

- General Binding Rules (GBRs) – cover low risk activities for which there is no need to contact SEPA. However, a person undertaking an activity controlled by the GBRs must abide by any rule in the regulations which is applicable to the activity;
- Registration – also covers low risk activities, but those which may cause a cumulative risk to the water environment. Such activities must be registered with SEPA, who may impose conditions but only so far as to describe the activity; and
- Licensing – for higher risk activities which require site specific rules, or where constraints on an activity are required. Such activities will be regulated through a CAR license which must be sought through SEPA.

Several aspects of the NorthConnect project may be covered under the CAR Regulations, these include:

- Surface water drainage and associated discharge, both during the construction and operational phase, will fall under the GBRs and potentially licensing;
- Dewatering of excavations will fall under the abstraction GBRs; or
- Cable river crossing and associated bridge works are engineering works and will either be registered or require simple licenses.

It is an offence to conduct an activity controlled under the CAR regulations, without the appropriate license or registration being in place, or to contravene the GBRs.

11.2.2.4 The Control of Pollution Act 1974.

Part 2 of the Control of Pollution Act (UK Parliament, 1974) defines a number of offences relating to water pollution. Specifically section 30F states that:

'A person contravenes this section if he causes or knowingly permits any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters.'

As such, any deliberate or reckless release of a pollutant into the water environment is an offence under the act and is liable to prosecution.

11.2.3 Guidance

11.2.3.1 Pollution Prevention Guidelines

A range of Pollution Protection Guidelines (PPGs) have been produced by SEPA along with the UK's other environmental protection agencies, and provide a comprehensive set of guidance on environmental management across a range of areas. The relevant PPGs to this chapter are:

- PPG1: Understanding Your Environmental Responsibilities, Good Environmental Practices (SEPA, 2013);
- PPG2: Above Ground Oil Storage Tanks (SEPA, 2011);
- PPG5: Works and Maintenance in or Near Water (SEPA, 2007);
- PPG6: Working at Construction and Demolition Sites (SEPA, 2010);
- PPG7: Safe Operation of Refuelling Facilities(SEPA,2011);
- PPG8: Safe Storage and Disposal of Oil (SEPA,2004); and
- PPG21: Pollution Incident Planning Response (SEPA, 2014).

11.3 Assessment Methodology

This assessment has been undertaken primarily using a qualitative approach based on analysis of baseline data and statutory or general guidance, combined with professional judgment. The assessment follows the methodology provided within Chapter 3: Methodology.

11.3.1 Baseline

The baseline assessment has included a desk based information search, augmented by site visits to ‘ground truth’ the information.

11.3.2 Impact Assessment

11.3.2.1 Evaluation of Receptors

The value of the receptor under consideration is defined in accordance with the criteria set out in Table 11.3.1.

Table 11.3.1: Definitions of hydrological receptor value

Value	Criteria
High	Regional or national scale receptor with at least medium quality and rarity and limited potential for substitution. Local scale receptor with a high quality and rarity and limited potential for substitution.
Medium	Regional or national scale receptor with a low quality and rarity and potential for substitution. Local scale receptor with a medium quality and rarity and limited potential for substitution.
Low	Local scale receptor with a low quality and rarity and potential for substitution.
Negligible	Site scale receptor with a low quality and rarity and potential for substitution.

11.3.2.2 Magnitude of Impact

The magnitude of impact are set out within Table 11.3.2. Definitions are provided for a range of hydrological elements.

Table 11.3.2: Definition of impact magnitude

Magnitude	Hydrological Definition

of Impact	Site Runoff Regime	Surface Water Quality	Riverine Flow Regime	Riverine Morphology
Large	Change (>50%) in proportion of site rainfall immediately running off, changing the flood risk or erosion of channels	Change in water quality, which could change river status with respect to WFD* for more than one month	Change in flows >5% resulting in a measurable change in dilution capacity	Change in erosion and deposition, with conservation interests put at risk
Medium	Change (10-50%) in proportion of site rainfall immediately running off, changing the flood risk or erosion of channels	Change in water quality, which could change river status with respect to WFD* for less than one month	Change in flows between 2-5% resulting in a measurable change in dilution capacity	Some change in deposition and erosion regimes
Small	Small change (<10%) in proportion of site rainfall immediately running off, but no change in flood risk or channel erosion	Measurable short-term change in water quality but no change with respect to WFD* status	Measurable change in flow of up to 2%	Slight change in bed morphology and sedimentation pattern, minor erosion
* WFD – Water Framework Directive. Classifications are reviewed every 5 years, but water quality is assessed based on the potential to have changed WFD status.				

11.3.2.3 Significance of Effect

The significance of effect is derived from the matrix set out in Table 11.3.3.

Table 11.3.3: Significance of Effects Matrix

Magnitude of Impact	Value			
	High	**Medium**	**Low**	**Negligible**
Large	Major	Moderate	Minor	Minor
Medium	Moderate	Moderate	Minor	Negligible
Small	Minor	Minor	Negligible	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

11.4 Baseline Information

11.4.1 Surface Hydrology

There are no watercourses within the vicinity of the converter station site and the AC cable route that are classified by SEPA for their status. There are, however, as shown in Drawing 3008, a number of bodies of water and streams in the vicinity of the Fourfields site.

Braeside Trout Fishery is situated 40m north of the Fourfields site. It is not currently operated as a fishery. As discussed in Chapter 13, there is no hydraulic continuity between the Fourfields area and the fishery.

Field ditches runs along the eastern and northern edge of the Fourfields site, with the eastern ditch culverted to provide access into the Fourfields. They join in the northeast corner, passing through a culvert before reappearing above ground and heading north. The watercourse then passes under the road to the west of Lendrum Terrace before joining up with the burn which runs in a north easterly direction from the dam in the Den of Boddam. As discussed in Chapter 7: Ecology, the field ditches have low ecological value due to their steep sides.

There is a small pool to the east of Fourfields, and several ponds further eastwards resulting from disused quarries, along with five small pools to the North of Fourfields associated with quarry tailings settlement. There is no hydraulic link identified between the pools and the converter station site.

In addition to the burn from the dam at Den of Boddam, there is another small water course which crosses the cable route just south of Hjaltland. At times when the site has been visited, there has been no flowing water present. The water course in dry weather is more of a wet section running along a field line. This small water course joins with the burn from the dam at Den of Boddam prior to it joining with the field ditches which run north from Fourfields.

11.4.2 Surface Water Quality

The water quality of Scotland's rivers is classified by SEPA, who have developed a classification scheme for surface waters following the requirements of the WFD, to support the river basin management planning process. This classification scheme assesses the quality of the aquatic ecosystems within rivers, lochs, estuaries and coastal waters, and the extent to which they have been adversely affected by human activity.

This new scheme assesses the condition of each river, loch, estuary and coastal water and assigns it a 'status' from high, good, moderate and poor to bad. If a water body is classified as 'high' or 'good' status, then it has a healthy ecology which deviates only slightly from natural conditions. The water body is an important natural heritage asset and can support a wide range of uses such as recreation, fishing and drinking water supply. If a water body is classified as 'moderate', 'poor' or 'bad', then the ecology is adversely affected, and the range of uses which can be supported is reduced.

Watercourses can also be ‘unclassified’ if they have not been formally assessed.

The Den of Boddam watercourse is unclassified by SEPA in the River Basin Management Plan due to its limited catchment and minor nature. None of the other water features in the vicinity have been classified.

11.4.3 Flooding

There has been no evidence of flooding of the drainage ditches adjacent to Fourfields on any site visit, however, the SEPA Floodmap shows them as having a medium likelihood of flooding, which is defined as having a 0.5% probability of occurring in any given year (often expressed as a 1-in-200 year event).

The converter station and AC cable route fall within the Potentially Vulnerable Area PVA 06/08 Buchan Coastal as showed on SEPA’s Local Plan Districts and Potentially Vulnerable Areas - North East (SEPA, 2009c.)

11.5 Impact Assessment

11.5.1 Ascribing Sensitivity to Hydrological Receptors

The potential hydrological receptors have been identified as watercourses and waterbodies which can be considered to receive any surface or groundwater from, or which might be physically affected by, the Converter Station site or the AC cable route (e.g. surface water runoff). A list of these potential receptors is provided in Table 11.5.1.

The quarry ponds and Braeside Trout Fishery have not been included as they as there are no hydraulic links between them and the NorthConnect development area.

Table 11.5.1: Potential Hydrological Receptors

Name	Location	Sensitivity	Comments
Burn running Northeast from the dam at Den of Boddam.	Follows field boundaries to the northwest of the Converter Station site crossing the HVAC Cable route at south of Denend.	Low	Chapter 7: Ecology identified mammals utilising this watercourse.
Unnamed water course south of Hjaltland	Runs eastward, south of Hjaltland before joining into the burn running from the Den of Boddam.	Negligible	Very small feature.
Unnamed ditches to the north and east of converter station.	Run along the eastern and northern edge of the Fourfields site.	Negligible	Drainage channel with no ecological value.

11.5.2 Nature of Potential Impacts

Impacts on water quality will be through either direct physical disturbance of a watercourse or pollution events. These could occur through all stages of the project.

11.5.3 Construction

There are three points during construction where physical disturbance of a watercourse will occur. During Phase 1 the access to the Fourfields site will be upgraded. This will include the need to upgrade the existing culvert at the east of the site in the drainage ditch. The new culvert will widen the access and hence be longer than the existing culvert. In addition it will be stronger to allow heavy loads to be delivered to the site.

The works will be carried out under a simple CAR license as it is likely to be longer than 2m. The water will be diverted during the works however there is still a potential to impact water quality, primarily by increases in suspended solids due to disturbance of the ground around the works. The impacts will be temporary and recoverable. Overall the impact magnitude is assessed as small giving rise to a negligible impact.

The cable route crosses the burn running northeast from the Den of Boddam just south of Denend, and the unnamed stream which runs past Hjaltland. In both cases the water will be diverted to allow the cables to be installed. There is, however, a potential to increase suspended solids loading due to disturbance of the surrounding land. The impacts will be temporary and recoverable. Overall the impact magnitude is assessed as small giving rise to a negligible impact.

The construction of the cable route will require trenches to be dug and material stored for use as backfill once cables have been installed. During this time, the top and subsoil stored can act as a source of both silt laden water in wet weather, and dust in dry weather. Impacts associated with dust are discussed in Chapter 12: Air Quality. In wet weather, water running over the stock piles will collect silt and become silt laden, hence the drainage of the stored materials will need to be appropriately considered. If silt laden water were to reach one of the water courses on the cable route then it would reduce the water quality. Silt can discolour water courses and can impact the photosynthesis of flora present, increase suspended solid loadings and solids can ‘drop out’ of suspension covering the stream beds.

Although the trenches could be open for more than a month, it is assumed that appropriate drainage and settlement is in place. Hence, impacts would be associated with problems that would be recognised and addressed, and such impacts will not last as long as a month. Impact magnitude is therefore medium giving rise to a significance effect of minor, which is not significant in EIA terms.

The earthworks associated with the converter station construction site are substantial and, as per the HVAC cable route, will provide a source of silt which could give rise to silt laden water. A Sustainable Urban Drainage

System (SUDS) will be installed early in Phase 2, however, up until that point temporary drainage measures will be required including the collection and settling of silt laden water as described in Chapter 17: Resources. There is still, however, a risk that silt laden water enters the drainage channels to the north and east of the converter station.   If this were to occur, the impact magnitude would be medium with negligible effect significance, which is not significant in EIA terms.

As discussed in Chapter 13: Land Quality, there is a potential on the east side of the Fourfields site, for construction excavations to extend below groundwater levels. Given the respective levels and proximity, it is possible that there is hydraulic continuity between the drainage ditches and groundwater in this area. There is therefore a potential the water from the ditch will seep into the excavations, this will be collected (abstracted) by temporary and permanent site drainage under CAR GBR15, settled, and then discharged back into the watercourse under CAR license. The discharge point will be at the north of the Fourfields site, hence, any impact on water flows will be over a limited section of the ditch and the flows will be minimal (estimated less than 0.5 l/s).   The area affected is a drainage ditch, not a river and, as such, the riverine flow criteria in Table 11.3.2 are not entirely applicable. However, due to the negligible value of the ditch, even a large impact would have a minor overall effect significance and hence be deemed not significant.

During construction there will be a need to discharge surface water arisings. The discharges will be to the drainage ditch at the north end of the site. Once installed during Phase 2, the drainage will be via the SUDS system and, up until that point, temporary drainage arrangements will be in place. In both instances a license to discharge will be required under CAR.

As identified in Chapter 14:Resources, there will be fuel, oils and chemicals stored on site which, if released, could be harmful to the environment. It is assumed that they will be appropriately stored as, however, there is still a risk of loss of containment. The harm caused will be determined by the material involved and the volume reaching the water environment. Considering that volumes in excess of 5m^3 of fuel will be stored on site, impact magnitudes could be large, but the resulting effect significance would be minor in the case of the drainage ditches around Fourfields due to their small size and negligible sensitivity. If a pollution incident was to occur on the cable route and reach the stream from the Den of Boddam, however, then the impact would have a moderate effect significance, which is significant in EIA terms.

11.5.4 Operation

A description of the operational drainage is provided in Chapter 2: Project Description, and is shown in Drawing 3028. The surface water drainage has been designed in accordance with The SUDS Manual (CIRIA, 2007). This will ensure that surface water discharges are limited to ‘Greenfield Run-Off’ rates by means of a hydro-brake flow control devise (Allen Gordon, 2015). The foul and surface water drainage systems discharges will be licenced under CAR. Impacts on water quality will be negligible.

As identified in Chapter 14: Resources, there will be significant quantities of fuels, oils and chemicals stored on the site, and it is assumed that they will be appropriately stored and bunded as discussed in Chapter 14. In addition, the drainage system has been designed with appropriate controls to prevent oils being discharged from the site to a water course. Hence, there is a very low likelihood if pollution occurring and, as such, the impact magnitude is deemed to be small with a resultant effect significance of negligible, which is not significant in EIA terms.

11.5.5 Decommissioning

If the site is to be reinstated at the point of decommissioning, the issues identified for construction associated with silt laden water and pollution will apply.

11.5.6 Flood Risk

The small watercourse located to the east of the converter station (running along the boundary of the quarry) is currently identified as medium risk on the SEPA Flood Map.

As part of an initial Flood Risk Screening exercise, a visual inspection of the site has been undertaken together with contact being made with both Aberdeenshire Council and local SEPA officials to obtain information on historic flood events. The short upstream extent of the ditch and limited inflow potential indicates that the potential to provide significant flood risk is limited, and this has been borne out by no reported floods at this location. It is thought that inclusion of this area on the Flood Map may be erroneous or misleading.

On the basis of the above, progressing to a Flood Scoping stage is not appropriate for this location.

11.6 Mitigation Measures

Mitigation measures identified in this section relate specifically to the protection of water quality. They do not address material or waste storage as this is covered in Chapter 14: Resources.

11.6.1 Construction

The culvert and cable installation techniques will be developed with guidance from the ECoW to ensure appropriate steps are taken to prevent pollution and silt issues arising during the works. Particular regard will be made to PPG5 (SEPA, 2007) and the GBR's.

A Drainage Management Plan will be developed prior to the construction phases starting. The plan will identify how site runoff will be minimised and managed during site preparation and construction of the Converter Station site and HVAC cable route. Content of this document will provide details such as drainage ditches, cross drains and controls measures against potential spillages or silt laden runoff. Settlement methods or filtration will be provided to prevent silt laden waters discharging directly into watercourses.

In accordance with Engineering in the Water Environment: Good Practice Guide Temporary Construction Methods (SEPA, 2009a), the three following principles will be followed:

- Divert clean water away from exposed soils and working areas;
- Minimise erosion of exposed soils; and
- Prevent contaminated water from entering watercourses untreated.

Careful scheme design will also be supplemented by environmental measures as described in SEPA's PPG's and special requirements, including the following:

- Installation of cut-off drains around the working areas to intercept uncontaminated surface runoff and divert it around the works (Divert);
- Scheduling construction activities to minimise the area and period of time that soil will be exposed, particularly during winter periods (Minimise);
- Minimising the stockpiling of materials and locating essential stockpiles as far away as possible from watercourses (Minimise);
- Re-vegetation of working areas as soon as possible after construction (Minimise);
- Silt traps used to capture suspended solids generated during construction, supplemented by other measures where necessary (Prevent); and
- Drainage control to ensure runoff does not exceed the greenfield runoff rates (Prevent).

A spill response plan will be put in place, supported by appropriately sized and equipped spill kits and training. Appropriately scaled measures will be developed taking account of materials, volumes of materials and site specific issues such as layout.

The development of specific measures will take into account the PPG's discussed in Section 11.2.3.1, as part of the CEMD.

11.6.2 Operations

A spill response plan for operations will be developed and incorporated into the EMS. Appropriate spill kits will be in place and all staff will be trained in their use.

11.6.3 Decommissioning

Appropriate mitigation will be identified at the point of decommissioning and is likely to be similar to the mitigation used during construction.

11.7 Residual Effects

The mitigation identified will reduce the magnitude of most impacts as detailed in Table 11.9.1. The appropriate control of materials discussed in Chapter 14: Resources and appropriate spill response procedures will reduce the risk and potential impact of spills. With regard to the pollution events during the HVAC cable installation, the impact magnitude will be reduced to small with an overall effect of negligible, which is not significant in EIA terms.

11.8 Cumulative Effects

No cumulative effects have been identified.

11.9 Summary

An assessment of the potential impacts and significance of effects upon water quality has been undertaken and summarised on Table 11.9.1. The findings of this assessment conclude that there will be no significant effects upon these resources and receptors as a result of the Converter Station site and AC cable route.

Standard industry requirements and best practice guidance has been identified and, if implemented, will ensure that environmental effects are reduced further and the risk of pollution is minimised as far as possible.

Table 11.9.1: Summary of potential impacts

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Construction							
Culvert Installation water quality impacts	Negligible	Small	Negligible	PPG5	Small	Negligible	Not Significant
HVAC Stream Crossing Den of Boddam Stream	Low	Small	Negligible	PPG5	Small	Negligible	Not Significant
HVAC Stream Crossing Hjaltland water course	Negligible	Small	Negligible	PPG5	Small	Negligible	Not Significant
HVAC Cable Route Silt Laden Water Pollution	Low	Medium	Minor	Drainage Management Plan	Small	Negligible	Not Significant
Converter Station Silt Laden Water Pollution	Negligible	Medium	Negligible	Drainage Management Plan	Small	Negligible	Not Significant
Reduced Waterflow in drainage ditch due to excavations	Negligible	Large	Minor	Drainage Management Plan	Large	Minor	Not Significant
Pollution Incident during Converter Station Construction	Negligible	Large	Minor	Spill Response Plan	Small	Negligible	Not Significant
Pollution Incident during HVAC Cable Installation	Low	Large	Moderate	Spill Response Plan	Small	Negligible	Not Significant
Operation							
Discharge impacts on water quality	Negligible	Small	Negligible		Small	Negligible	Not Significant
Pollution Incident	Negligible	Small	Negligible	Spill Response Plan	Negligible	Low	Not Significant

Key	Significant effect

Chapter 12

Air Quality

Contents

12 Air Quality

12.1 Introduction

In this Chapter the potential effects on air quality are discussed and assessed. Mitigation measures required to minimise impacts are identified and residual effects assessed. The focus is on dust associated with construction and decommissioning, and also the overall Carbon Dioxide (CO_2) savings of the project is addressed.

12.2 Sources of Information

12.2.1 Regulatory Framework

12.2.1.1 International

The Directive 2008/50/EC on ambient air quality and cleaner air (European Parliament and Council, 2008), aims to reduce harmful effects on health and the environment by defining and establishing ambient air quality objectives. It lays down measures for assessment, information collation and sharing, maintaining and improving air quality, and promotes member state cooperation to assist with its aim.

Directive 2008/50/EC sets out specific monitoring requirements and targets for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM10 and PM2,5), lead, benzene and carbon monoxide as well as ozone.

Similarly, Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (European Parliament and Council, 2004a), aims to minimise effects on human health associated with these substances in air. It lays out target values for each of the substances.

12.2.1.2 National

Air Quality Standards (Scotland) Regulations 2010 enacts the two European directives into Scottish Law. It identifies the circumstances under which Air Quality Plans have to be drawn up for zones, in order to achieve the appropriate limits and target values.

As discussed in Chapter 2, Section 2.2: Project Need, there are both International and National policy drivers to reduce Carbon emissions, this is reflected down through the planning policy framework as discussed in Chapter 5: Planning Policy.

The Climate Change (Scotland) Act 2009 (Scottish Parliament, 2009a) sets a target of reducing greenhouse gas emissions by at least 80% by 2050, with an interim target of reducing emissions by at least 42% by 2020.

12.2.1.3 Local

Since the Local Air Quality Management (LAQM) review and assessment process was introduced by the Environment Act 1995 (United Kingdom Parliament, 1995) and associated regulations, local authorities across Scotland have been required to review and assess the air quality within their geographical areas. The process is designed to identify any exceedances of the Scotland Air Quality Strategy Objectives, and to enable any local authority that identifies such an exceedance to develop and implement a plan to improve air quality within the area.

Under section 83(1) of the Environment Act 1995, Local Authorities have a duty to designate any relevant areas where the air quality objectives are not being (or are unlikely to be) met as Air Quality Management Areas (AQMAs), and follow the declaration with an Air Quality Action Plan to improve air quality in that area.

Aberdeenshire Council carry out a yearly review of monitoring data and emission sources within the Council area, in which the information is compared with National Air Quality Objectives (NAQS), and their last published report was in 2013 (Aberdeenshire Council, 2013). Additionally, a triennial Air Quality Updating and Screening Assessment is undertaken, the last having been published in 2012 (Aberdeenshire Council, 2012d).

In the last yearly report published in 2013, Nitrogen Dioxide ($NO_{2)}$ concentrations were monitored at 8 sites, 4 of which were located in Peterhead, and it was predicted that concentrations of NO_2 in these locations were not likely to exceed the objectives. It must be noted that Aberdeenshire Council does not carry out any monitoring in respect of any of the other pollutants included in the Air Quality Standards (Scotland) Regulations 2010, since the concentration of those pollutants has traditionally been negligible and there is no reason to believe otherwise at present.

12.2.2 Air Quality Guidance

The following documents published by the Institute of Air Quality Management (IAQM) have been utilised in the production of this chapter:

- Assessment of dust from demolition and construction (IAQM, 2014)
- Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (IAQM, 2012).

12.3 Assessment Methodology

12.3.1 Baseline

A desk study was undertaken to inform the characterisation of the existing baseline conditions. The Air Quality in Scotland website provides a centralised source of air quality information for Scotland. Data and maps on Local Air Quality Management parameters, and Air Quality Management Areas, are provided (Ricardo-AEA, 2015).

As mentioned in Section 12.2.1.2, Aberdeenshire Council have 8 monitoring sites at 4 different settlements at which NO_2 concentrations are monitored. These provide the information on the levels of this pollutant for comparison against the (NAQS). Four of those stations are located in Peterhead, their details are summarised in Table12.3.1.

Table 12.3.1: Details of NO_2 Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	Relevant Exposure	Distance to kerb of nearest road
Peterhead 1	Kerbside	E 413594 N 846066	NO_2	Yes (2m)	< 5m
Peterhead 2	Kerbside	E 413209 N 846356	NO_2	Yes (2m)	< 5m
Peterhead 3	Kerbside	E 412716 N 846734	NO_2	Yes (2m)	< 5m
Peterhead 4	Kerbside	E 412758 N 846144	NO_2	Yes (2m)	< 5m

12.3.2 Impact Assessment Methodology

The air quality impact associated with the project, which could have a significant negative effect, is particulate and dust emissions during construction and decommissioning works. PM10 is particulate matter of particles with a diameter of 10 micrometers or less. Dust is the particulate matter whose diameter is larger than 10 micrometers. Suspended particulate matter is known to affect breathing and respiratory systems, damage lung tissue, as well as being linked to cancer. The elderly, children, and people with chronic lung disease, asthma, or influenza, are especially sensitive to the effects of particulate matter.

In practical terms, the sources of dust and PM10's as well as the mitigation measures utilised to control them are the same. As such, the term dust will be utilised within this chapter to cover both dust and PM10 effects.

The impact assessment methodology utilised is based on the IAQM Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014). It should be noted that the methodology, unlike that described in Chapter 3, does not take into account standard construction practices, such as those outlined in Pollution Prevention Guidance notes, in the initial assessment.

The NorthConnect project has the potential to contribute towards a reduction in CO_2 emissions. CO_2 is the primary greenhouse gas emitted through human activities. Global climate change is the most obvious consequence of the increasing levels of CO_2, and some of the effects associated with this phenomenon are rising sea levels and structural changes to ecosystems amongst others. The use of the standard methodology detailed in Chapter 3 for assessing the significance of effects is not appropriate in this case. As an alternative, CO_2 calculations have been carried out to quantify the carbon cost of construction and demolition. This is offset against the potential CO_2 savings predicted by European Network of Transmission System Operators for Electricity (ENTSO-E), to provide an understanding of the overall effect of the project.

12.3.2.1 Evaluation of Receptors

The sensitivity of various receptors to air pollution is determined by a number of factors including:

- Duration spent within the area, i.e. transient or constant presence;
- Sensitivity of receptor i.e. the very old or young or certain plant species; and
- Distance from the source.

Table 12.3.2 takes into account a range of factors based on the IAQM Guidance (2014) to define sensitivity of air quality receptors.

Table 12.3.2: Air Quality Sensitivity

Sensitivity	Criteria
High	Hospitals, Care homes, Schools within 100m of source. >10 residences within 20m of source. >10 residences within 50m of source Areas of high level amenity where people will spend long periods of time e.g. museum. Long term carparks Internationally designated sites where the qualifying feature may be sensitive to air pollution within 50m. Nationally designated sites where the qualifying feature may be sensitive to air pollution (SSSI) within 20m. Red Data list species within 50m.
Medium	>10 residences within 50m of source 2-10 residences within 20m of source Non-residential properties were people are present for long periods of time e.g. offices within 20m. Areas of amenity value where people may linger e.g. parks. Medium term carparks. Nationally designated sites where the qualifying feature may be sensitive to air pollution (SSSI) within 50m.
Low	1 residence within 20m of source >10 residences within 100m of source Transient exposure groups, people moving through an area i.e. footpaths. Short term carparks Non-residential properties were people are present for long periods of time e.g. offices within 50m. Locally designated sites where the qualifying feature may be sensitive to air pollution.

12.3.2.2 Magnitude of Impact

The definitions of impact magnitude for various dust emitting operations that may occur on a construction site provided in the IAQM Guidance (IAQM, 2014) will be utilised as outlined in Table 12.3.3.

Table 12.3.3: Magnitude of Potential Impact

Dust Emission Classes for Demolition Activities	
Large	Total building volume >50,000m^3, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20m above ground level
Medium	Total building volume 20,000m^3 – 50,000m^3, potentially dusty construction material, demolition activities 10-20m above ground level
Small	Total building volume <20,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months
Dust Emissions Classes for Earthworks Activities	
Large	Total site area >10,000m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonne.
Medium	Total site area 2,500m^2 – 10,000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000tonne – 100,000tonne.
Small	Total site area <2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000tonne, earthworks during wetter months
Dust Emissions Classes for Construction Activities	
Large	Total building volume >100,000m^3, piling, on site concrete batching; sandblasting
Medium	Total building volume 25,000m^3 – 100,000m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching
Small	Total building volume <25,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Dust Emissions Classes for Trackout	
Large	>100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m
Medium	25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m
Small / Medium	<25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m

12.3.2.3 Significance Evaluation

The significance of effects will be determined as per Table 12.3.4, taking account of receptor sensitivity and impact magnitude.

Table 12.3.4: Categorising Significance of Effects

Magnitude of Impact	Sensitivity		
	High	**Medium**	**Low**
Large	Major	Moderate	Minor
Medium	Moderate	Moderate	Minor
Small	Minor	Minor	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

12.3.3 Mitigation Identification

Appropriate mitigation is identified for the management of dust, taking into account IAQM Guidance (2104) and Pollution Prevention Guidelines. Monitoring is also proposed in line with IAQM's Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (IAQM, 2012).

12.3.4 Residual Effects

Residual effects are assessed by reassessing the impact magnitude taking account of the mitigation and then re-categorising the significance of the effect.

12.4 Baseline Information

This section describes the baseline local air quality conditions within the area of influence of the converter station and AC cable. The Fourfields site and the majority of the AC Cable route is currently farmland and, as such, is assumed to have a relatively high air quality.

According to the Air Quality in Scotland database and website, there are no Air Quality Management Areas in Aberdeenshire Council Area. The closest AQMAs are located in Aberdeen 30 miles to the South.

Nitrogen dioxide measurements are taken in four locations in Peterhead. The last results published by Aberdeenshire Council in 2013, includes data to 2012 (Aberdeenshire Council, 2103). The emissions data covering the period from 2008 to 2012 is included in Table 12.4.1. None of the annual mean concentrations at any of the stations exceeded the National Air Quality Objective for Nitrogen dioxide, set at 40 $\mu g/m^3$. The highest annual mean concentration being recorded on the kerbside at Queen Street 29.3$\mu g/m^3$ in 2012.

Table 12.4.1: Results of NO_2 Diffusion Tubes (2008 to 2012) at Peterhead

Site ID	Location	Annual mean concentration $\mu g/m^3$				
		2008	2009	2010	2011	2012
Peterhead 1	Broad St	20.0	25.0	21.7	23.3	22.1
Peterhead 2	Queen St	25.4	29.0	26.5	28.7	29.3
Peterhead 3	Hay Crescent	21.1	23.7	22.6	24.3	25.5
Peterhead 4	Kirk St	21.4	24.7	27.0	25.9	22.4

Other air pollutants are below concentration levels that would give local concern, hence the lack of routine monitoring data available.

The presence of the Breedon Aggregates quarry adjacent to the Fourfields site to the Northeast may give rise to dust emissions, particularly during peak times of activity or under unfavourable weather conditions. This is appropriately managed and controlled by them under their permits and licenses to operate the site.

It is proposed that directional particulate monitoring is carried out on the Fourfields site, prior to construction commencing, to gain relevant baseline data for comparison purposes through the construction phase.

12.5 Identification and Evaluation of Receptors

As per Table12.3.2, single properties need to be within 20m of the site and groups of 2-10 properties within 50m of the site for them to become a receptor. The closest occupied properties to the site boundary are Highfields, Hjaltland and Gateside. As shown in Figures 12.5.1 and12.5.2, all of these single residencies are more than 20m from the redline boundary of the NorthConnect site. There are no groups of multiple properties with 100m of the site.

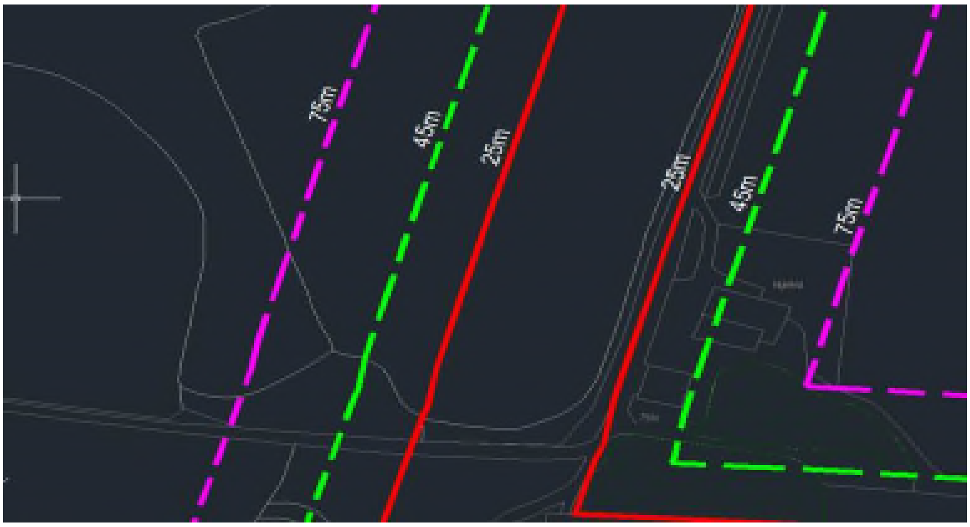

Figure 12.5.1: Highfields in relation to NorthConnect Boundary

Figure 12.5.2: Hjaltland and Gateside in relation to the NorthConnect Boundary

As discussed in Chapter 7 and shown in Drawing 3133, the nearest designated site to the redline boundary is the Buchan Ness to Collieston Coast SPA and the Bullers of Buchan Coast SSSI. Neither of these are within

50m of the redline boundary. In addition, no red list species have been found within the vicinity of the site.

The remaining receptors are the paths, which give access to the public close to the construction site, and crossing the access road within the red line boundary. In addition, there is the quarry and farmland surrounding the site. All of these receptors would be classed as Low sensitivity as per the definitions of receptor sensitivity defined in Table 12.3.2.

12.6 Impact Assessment

12.6.1 Construction

12.6.1.1 Dust

Construction of the converter station platform and surrounding landscaping will require earthworks to be carried out over an area in the region of 11.2Ha, moving 331,000m^3 of material, and constructing mounds in excess of 8m in height.   This is well in excess of 10,000m^2 (1Ha) and 100,000m^3 of materials utilised in Table 12.3.3 to define a large magnitude of impact. Utilising Table 12.3.4 it would suggest that the overall potential effect significance is minor. However, as the site is an order of magnitude higher than the definitions utilised in the IAQM Guidance (IAQM, 2014), professional judgement would suggest that this should be increased to moderate giving an overall significant effect, with no mitigation employed.

The cable construction corridor covers an area of in the region of 7.65Ha, but the two cable trenches will require 6,000m^3 of topsoil to be stripped and 5000m^3 of glacial till to be removed. The cable earthworks has a total volume greater than 10,000m^3 therefore has a large impact magnitude and give rise to minor effect significance without any mitigation. The cable laying earthworks are not significant in EIA terms with regard to dust, without mitigation. However, as a matter of good practise mitigation will be employed.

The Converter Station building is more than double the 100,000m^3 threshold on building size for construction detailed in Table 12.3.3 and, as such, a large impact magnitude will be expected without mitigation. The resultant effect significance is minor and not significant in EIA terms. Unlike the earthworks, there is no need to upgrade this impact, as a large contribution to the volume of the building is the converter buildings height. The converter building utilises steel frame and cladding construction methods, which do not give rise to significant sources of dust, and hence do not warrant upgrading.

As discussed in Chapter 15, a peak of 80 HGV movements a day (40 trips) are expected during construction. The quarry access road is paved so the trackout will be on the quarry access road and not the public highway. The length of unpaved road will be within the Fourfield site. The exact length and location will be determined by where the HGV needs to go on the site, and status and phase of the site construction. However, a length in the region of 50-100m could be required. This is equivalent to a medium impact magnitude in terms of dust trackout, resulting in a minor effect without mitigation and which is not significant in EIA terms. Mitigation will however be employed as identified in Section 12.7.

Vehicle access to the cable route will be from the Fourfields site, however, there will be a need to cross two minor roads. The impacts will be small resulting in negligible effect significance, but appropriate mitigation will still be identified.

12.6.1.2 Carbon Dioxide

The fabrication of cement, steel, and other materials used on site and their transport will have an associated carbon cost. In addition, the transport of construction workers, and the use of site machinery, will give rise to carbon emissions. Table 12.6.1 provides an estimate of the CO_2 equivalent (CO_2e) cost of construction.

Table 12.6.1: Construction CO_2 Equivalent (CO_2e)

Source/material	Quantity	Assumption	Conversion Factor	CO_2e (Tonnes)
Concrete	10,000m^3	Density of 2.4tonnes/m^3	0.159Tonnes of CO_2e per Tonne (Hammond et al, 2006)	3816.0
Road Tarmac for Converter Station	5400m^2 of roads	300mm thick Density of 2tonnes/m^3	50kg of $CO2_e$ per Tonne (Tarmac, 2009)	162.0
Resurfacing Tarmac for Access Road	3845m^2 of road	100mm thick Density of 2tonnes/m^3	50kg of $CO2_e$ per Tonne (Tarmac, 2009)	38.5
Steel Rebar	1,250tonnes	1.25tonnes/m^3 of reinforced concrete volume	1.37 Tonnes of CO_2e per Tonne (Hammond et al, 2006)	1712.5
Building Primary Steel (Hot Rolled)	1450tonne	Estimate based on concept design	1.37 Tonnes of CO_2e per Tonne (Hammond et al, 2006)	1986.5
Purlins and sheeting rails (Cold Formed Steel)	230tonnes	Estimate based on concept design	1.100 Tonnes of CO_2e per Tonne (New Steel Construction, 2010)	253.0
HGV Movements	2982	25 miles per movement (average) Assume 10mpg	11.8307kg of CO_2e per gallon of diesel (DECC, 2015)	88.2
Vans	5308	25 miles per movement (average) Diesel Vans	0.403822kg of CO_2e per mile (DECC, 2015)	5.4
Site Machinery	Variable through construction.	25500 hours of operation 5 gallon of diesel and hour (average)	11.8307kg of CO_2e per gallon of diesel (DECC, 2015)	1508.4
Private Cars from Peterhead	18808 movements	8 miles per movement	0.31202KgCO_2e per mile (DECC, 2015)	46.9
Private Cars from South	28214 movements	35 miles per movement	0.31202KgCO_2e per mile (DECC, 2015)	308.0
			Total	9925.4

12.6.2 Operation

12.6.2.1 Dust

During construction there should be no dust sources on the site and, as such, no effects are predicted.

12.6.2.2 Carbon Dioxide

The converter station will use electricity as part of operations and the control building's office and welfare facilities will utilise small quantities of electricity during operations. This cannot as yet be quantified but, other than for black start (as defined in Chapter 2), the amounts should be relatively small.

Although NorthConnect does not produce electricity, it does facilitate the increase of renewables into the energy mix, by coupling the variable renewable energy sources such as wind, wave and tidal in the UK, to the more controllable hydropower resource of Norway. A larger proportion of renewable energy sources in the energy supply mix will reduce demand on conventional power such as oil, gas and coal and hence contribute to reducing CO_2 emissions.

The ENTSO-E's 10 Year Network Development Plan (ENTSO-E, 2014) considers four scenario visions for future energy generation mixes. Table 12.6.2 summarises the four Visions and where they predict energy markets will be by 2030. The measurement of energy utilised in Tera Watt hours (TWh), where Tera is one million multiplied by one million.

Table 12.6.2: Summary of ENTSO-E Scenario Visions for 2030

Vision Scenario	Total Cross Boarder Exchange (TWh)	Total Demand (TWh)	Renewable Energy Penetration	CO_2 Reductions from 1990
1:Slow Progress	660	3160	41%	42%
2: Money Rules	757	3712	40%	36%
3: Green Transition	605	4167	49%	62%
4: Green Revolution	734	4327	60%	78%

Visions 2 and 4 require greater integration of electricity markets, i.e. more interconnectors. Visions 3 and 4 assume more renewable energy is exploited.

ENTSO-E reviewed NorthConnect along with a range of other projects to assess the role the NorthConnect Interconnector could play under the four vision scenarios. Table 12.6.3 shows the amount of additional Renewable Energy Systems (RES) that could be brought on line due to NorthConnect and the associated CO_2 savings per year (measured in 1000's of Tonnes - kT), and assuming a 60 year project lifetime over the full project (measured in Millions of Tonnes - MT). Due to uncertainty in the calculations the results are provided as ranges.

Table 12.6.3: ENTSO-E's NorthConnect Predictions

Vision Scenario	RES Integration (TWh)	CO_2 Savings (kT/year)	CO_2 Lifetime Savings (MT)
1.Slow Progress	1 - 1.2	360 - 440	21.6-26.4
2.Money Rules	0.9 – 1.1	190 - 240	11.4 – 14.4
3.Green Transition	2.7 -3.3	1700 - 2000	102 -120
4.Green Revolution	2.1-2.6	1500 - 1800	90-108

As ENTSO-E's various visions show energy markets could give rise to a very wide range of scenarios in terms of CO_2 savings. Even the most pessimistic options show that NorthConnect could facilitate the saving of 11.4Million Tonnes of CO_2 in its lifetime, which vastly outweighs the carbon cost of construction.

12.6.3 Decommissioning

12.6.3.1 Dust

The buildings are much greater than 50,000m^3, although they are primarily steel structures with cladding. The floor slabs, however, if they were to be broken up, would be a significant source of dust. Hence, building demolition is assumed to give rise to a large impact magnitude, resulting in a minor significance of effect without mitigation.

It is not known what the final use of the Fourfields site will be at the point of decommissioning, therefore the landscaping and associated earthworks cannot be predicted. However, it does have the potential to be as significant as the construction earthworks and give rise to any significant effect in EIA terms, without mitigation.

12.6.3.2 Carbon Dioxide

The carbon cost of decommissioning will primarily be associated with fuel for vehicle movements. If it is assumed that movements are the same as construction, then the total CO_2 cost will be around 2000Tonnes of CO_2e. The recycling of materials such as steel and aggregates would further reduce the lifecycle carbon cost of the buildings.

12.7 Mitigation Measures

A Dust Management Plan (DMP) will be developed and included within the Construction Environmental Management Document. This will detail both the monitoring and mitigation strategies. The detail of the DMP will take account of best practise included within IAQM Guidance (2014) and Pollution Prevention Guidance (PPG) 6: Working at Construction and Demolition Sites (Scottish Environment Protection Agency, 2010).

Mitigation measures proposed for construction earthworks include:

- Appropriate planning to minimise the number of times material is moved and the time material is stored and ground left bare;
- Due to the volume of materials being removed from the excavation area and cable trench, it is not possible to cover stored material. Instead they will be

kept moist to avoid dust arising's until placed. Mobile water bowsers or equivalent will be utilised in dry weather conditions to damp down potential dust sources and, where possible, they will utilise runoff water (grey water) gathered on the site; and
- As soon as landscaping mounds have been formed, they will be seeded/planted, to bind the soils so they are no longer a source of dust.

Mitigation measures for construction will include but not be limited to:
- Materials stored on site will be minimised where practicable, by utilising a just in time delivery system;
- Aggregates will be stored in dedicated areas and not allowed to dry out, unless this is required for a particular process, in which case appropriate additional control measures such as covers will be used;
- Bulk cement and other fine powder materials if required will be delivered in enclosed tankers and stored in silos with suitable emission control systems, to prevent escape of material and overfilling during delivery;
- Smaller supplies of fine powder materials in bags will be sealed after use and stored appropriately to prevent dust;
- If any rock is to be processed/crushed on site, then appropriate dust mitigation will be employed including dampening;
- Any cutting, grinding or sawing equipment utilised will be used with a suitable dust suppression technique such as water sprays or localised extraction; and
- Good housekeeping across the site.

Mitigation measures to avoid trackout from the converter station site and road crossings on the HVAC cable route will include:
- Water-assisted dust sweeper(s) will be utilised on the access and local roads to remove, as necessary, any material tracked out of the site;
- Vehicles entering and leaving sites will be covered to prevent escape of materials during transport;
- Installed hard surfaced haul routes will be regularly damped down by mobile water bowsers as required and regularly cleaned;
- A wheel washing system with rumble grids to dislodge accumulated dust and mud prior to leaving the site, will be considered and installed if necessary; and
- Private cars routes will be established to avoid the need to drive through construction areas.

Mitigation measures for decommissioning will be identified at the time and be appropriate for the activities planned, however, it is likely to include similar techniques to that utilised during construction earthworks and construction.

A full monitoring plan will be developed taking account of the IAQM Guidance (IAQM, 2012) as part of the DMP, and it will include:
- Directional dust deposit gauges will be installed at least 2 weeks prior to construction works starting to gain an understanding of background dust levels;
- Directional dust deposit gauges will be utilised throughout the construction period, the frequency of change will be proportionate to the risk associated with onsite activities;

- Monitoring results will be reviewed to ensure that mitigation employed is effective and, if not, improvements made;
- At least four directional dust deposit gauges will be installed on the boundaries of Fourfields site and one on the cable route, although this may be moved along the route as works progress; and
- Dust Audits will be undertaken by the Environmental Clerk of Works (ECoW). A checklist will be utilised to ensure all issues are covered and recorded. The audit will include: material storage status; use of dust covers by delivery vehicles; inspection of the access road and local roads; and looking for signs of surface soiling on surfaces around site. Dust audits will be carried out more frequently in periods of dry weather and when high risk materials (cement powder) are on site or high risk activities such as rock crushing are being carried out.

Standard energy saving techniques will be employed throughout operations, from using low energy lighting systems to switching computers off when not in use, in order to minimise the overall CO_2 cost of operations.

Construction site workers will be encouraged to car share or use organised company transport (minibuses) to reach site, thereby reducing private vehicle mileage and associated CO_2 emissions.

12.8 Residual Effects

12.8.1 Construction Dust

With the appropriate mitigations, dust impact magnitude will be reduced from all sources. For the converter station earthworks, the magnitude will reduce to small to medium, resulting in a negligible to minor effect significance, which is not significant.

All other impact magnitudes will be reduced to small and, as such, the effect significance will be negligible and not significant in EIA terms.

12.8.2 Decommissioning Dust

Assuming similar techniques identified for construction are utilised for the earthworks during decommissioning, then impact magnitudes will be reduced in the same manner, reducing too small to medium. The effect magnitude will be negligible to minor and not significant in EIA terms.

By implementing appropriate techniques for demotion dust impact magnitude will reduce to small, giving rise to a negligible effect significance which is not significant in EIA terms.

12.8.3 Lifecycle CO2

The CO_2 cost of construction, operation and decommissioning will be 11925 Tonnes however this is off-set by role the project plays in allowing more renewable energy to come online replacing CO_2 emitting electricity sources, estimated to be between 11.4Million and 120Million Tonnes. This is a significant positive effect.

12.9 Cumulative Effects

The only project that could give rise to cumulative effects on dust, as discussed in Chapter 18, is the NorthConnect HVDC cable which will be installed at the same time as the Converter Station is being constructed and the HVAC cable installed. It will be subject to the same mitigation as the HVAC cable route laying and, as such, neither project should give rise to significant effects individually or cumulatively. Hence, there are no significant cumulative effects predicted.

For NorthConnect to operate and for the CO_2 savings to be realised, it will require the NorthConnect HVDC Cable connection to Norway to also be installed and a connection into the National Grid. The connection to the grid is via the new planned 400kV Substation at Peterhead, hence, the projects in effect work in combination to facilitate the CO_2 savings.

12.10 Summary

The construction earthworks and construction of the converter station have the potential to give risk to significant dust effects if not mitigated. However, standard construction best practise can be utilised to mitigate dust impacts to a not significant level as summarised in Table 12.9.1.

The NorthConnect Converter Station and HVAC Cable in combination with the NorthConnect HVDC Cable and the Planned New Substation in Peterhead has the potential to contribute greatly to the reduction of CO_2 emissions by facilitating the inclusion of more renewable power sources into the energy mix. This is a significant positive effect.

There are no significant negative cumulative effects identified.

Table 12.9.1 Summary of Air Quality Effects

Nature of Impact	Receptors Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Construction							
Dust - Converter Station Earthworks	Low	Large	Minor- Moderate	DPM Implemented.	Small to Medium	Negligible to Minor	Not Significant
Dust - Cable Route Earth Works	Low	Large	Minor	DPM Implemented.	Small	Negligible	Not Significant
Dust - Converter Station Construction	Low	Large	Minor	DPM Implemented.	Small	Negligible	Not Significant
Dust – Trackout	Low	Small	Negligible	DPM Implemented.	Small	Negligible	Not Significant
Decommissioning							
Dust – Demolition	Low	Large	Minor	PPG6 and IAQM Guidance (2014) followed.	Small	Negligible	Not Significant
Dust - Earthworks	Low	Large	Minor-Moderate	PPG6 and IAQM Guidance (2014) followed.	Small to Medium	Negligible to Minor	Not Significant
Lifetime							
CO_2 Savings				Minimise energy usage.			Positive Significant
				Key		Significant effect	

Chapter 13

Land Quality

Contents

13 Land Quality

13.1 Introduction

The chapter provides a background baseline description of the existing geology and soils features of the area, covered by the projected interconnector converter station and AC cable route. It then assesses the key issues raised in regard to the effects associated with construction, operation and decommissioning activities, which could affect impact land quality.

13.1.1 Planning Framework

13.1.1.1 National

The (NPF3) (Scottish Ministers, 2014a) sets as one of the four key priorities for the Scottish Government the protection and promoting of Scotlands key environmental resources, whilst supporting their sustainable use. The Scottish Planning Policy (Scottish Ministers 2014b) identifies two principles guiding policies and decisions relating to land quality. These are:

- Having regard to the principles for sustainable land use set out in the Land Use Strategy;
- Avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality.

It is stated in the Scottish Planning Policy (Scottish Ministers, 2014b 'Valuing the Natural Environment') that:

'The planning system should seek to protect soils from damage such as erosion or compaction' and that 'Local nature conservation sites designated for their geodiversity should be selected for their value for scientific study and education, their historical significance and cultural and aesthetic value, and for their potential to promote public awareness and enjoyment'.

13.1.1.2 Local

Under the Aberdeenshire Local Development Plan (Aberdeenshire Council, 2012a) Policy 11 relating to 'Natural Heritage', and paragraph 2 regarding 'Protection of the wider biodiversity and geodiversity', it is stated that the Council will only approve developments if it is demonstrated that:

'…due regard has been given to the extent of organic and organic-rich soils on sites, to limit loss of soil carbon and the potential contribution of soil disturbance to greenhouse gas emissions'.

In the Policy 8 of the aforementioned Plan, 'Layout, siting and design of new development', particular requirements are imposed on new developments on land that is contaminated or suspected of contamination.

Additionally, the Scottish Executive has issued advice to planning authorities on the development of contaminated land, in the form of Planning Advice Note 33 Scottish Executive, 2000.

13.1.2 Guidance

The following sources of information were utilised:

- Scottish Natural Heritage (SNH) on its Environmental Assessment Handbook
- Scottish Geodiversity Forum
- Sitelink website
- The Macaulay Institute for Soil Research (now the James Hutton Institute), *"Land Capability for Agriculture (LCA) in Scotland"*, Aberdeen, 1981
- ERS: *"North Collielaw & Denend, Peterhead, Desk Study"*, REP01-REV02, November 2013
- Technip Offshore Wind Ltd: *"NorthConnect Landfall Option Study"*, TOWL-1076-RT-ENG-001, December 2013
- British Standards Institute: BS 10175 *"Code of Practice for the Investigation of Potentially Contaminated Sites"*, BSI, 2001.
- ESDAT, *"Soil Remediation Circular 2009"* (Dutch Standards), 2009.
- Horner, P.C., *"Planning & Construction for Earthworks Projects"*, 1988.
- BS EN 1997-1:2004: Eurocode 7: Geotechnical Design. British Standards Institution.
- BS EN ISO 14688-1:2002: Geotechnical Investigation and Testing — Identification and Classification of Soil (Part 1: Identification and description). British Standards Institution.
- BS 5930: 1999 +A2 2010: Code of Practice for Site Investigation. British Standards Institution.
- BS 1377-1:1990: Methods of Test for Soils for Civil Engineering Purposes. British Standards Institution.
- Mott Macdonald, 28- Jul-14, Rev A Soil Resistivity Measurement Specification. Mott Macdonald
- IEEE Std 81-1983: Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System, IEEE 1983.
- NorthConnect Stage 1&2 Ground Investigation Report, R.Blanchfield, December 2014

13.2 Assessment Methodology

13.2.1 Baseline Data Collection

Detailed Stage 1 and Stage 2 Ground Investigation (GI) (Blanchfield, 2014) studies have been undertaken in line with methodologies set out in the above listed references, namely: BS EN 1997-1 Geotechnical Design; BS EN ISO 14688 Geotechnical Investigation and Testing (Soil Classification); BS 5930 Code of Practice for Site Investigation; and BS 1377-1 Methods of Test for Soils for Civil Engineering Purposes.

The GI included trial pits and borehole which were logged and samples taken for laboratory analysis as described in the following sections.

13.2.1.1 Trial Pits

As part of the Stage 1 GI categorisation process, on 12th March 2014, three trial pits were dug across the Fourfields site using the back-actor of a JCB-3CX excavator. Soil was removed in layers by the excavator driver, under instruction of the geotechnical engineer, so that the relevant observations and measurements could be made at various depths, and at any visible changes in ground characteristics. The physical soil characteristics were documented from site observation, and several samples taken and sent for analysis in order to gain detailed understanding of physical and chemical characteristics. The findings are discussed in the Baseline Information section. The depth of the pits was extended until either solid rock was encountered, or until groundwater infiltration and side-wall stability rendered further excavation impossible. The location of the pits is shown in Drawing 3026 and a summary of their locations is as follows:

<u>Trial Pit 1 (TP01) (E412054:N841468):</u> Located at the north east corner of the proposed converter station footprint. At 61.92 mAOD, it is at the lowest point of the current ground surface profile within the proposed site area, and also close to the current surface water features of the field ditches / drains and the Braeside Trout Fishery on the neighbouring land.

<u>Trial Pit 2 (TP02) (E411924:N841273):</u> Located at the south west corner of the proposed converter station footprint. At 74.24 mAOD, it is at the highest point of the current ground surface profile within the proposed site area.

<u>Trial Pit 3 (TP03) (E411800:N841485):</u> Located at the north west corner of the Fourfields area, a few hundred metres west of the proposed converter station location, but on the proposed AC cable tracks down into the site. At 76.40 mAOD, it is up the hill to the west of the proposed site area.

As part of the Stage 2 GI categorisation process, on 7th October 2014, four further trial pits were dug along the AC cable route to the substation. These trial pits and testing were for the purpose of determining the ground's physical properties and basic soil classification for cable installation. The methodology was the same as described above for the Stage 1 pits. Their locations are shown in Drawing 3026 and summarised as follows:

<u>Trial Pit 4 (TP04) (E411752:N841685):</u> Located at the western side of the Highfield access track, to the north of where the cable route exits Fourfields, and at 74.09 mAOD still on the crest of the hill to the north west of Fourfields.

<u>Trial Pit 5 (TP05) (E411748:N841908):</u> Located further north at the western side of the unnamed road, halfway down the hill (60.94 mAOD) towards the unnamed burn which runs north-easterly from the Den of Boddam Dam past the derelict Denend Farm.

Trial Pit 6 (TP06) (E411823:N842219): Located to the western side of the unclassified road to the north of Denend Farm at 50.63 mAOD.

Trial Pit 7 (TP07) (E411734:N842095): Located in the north east corner of the field where the cable route will cross the unnamed road into the field south of the substation location at 53.96 mAOD.

13.2.1.2 Boreholes

The Stage 2 GI included the drilling of three boreholes on the Fourfields site. The principally aim was to establishing rock depth and groundwater characteristics over the northern portion of the converter site, but also to gain further information on soil and rock characteristics. One borehole was inserted on the AC cable route. The borehole locations are also shown in Drawing 3026.

Borehole 1 (BH01) (E412061:N841458): Located in the north-east corner of the Fourfields site at a ground elevation of 62.18 mAOD. Due to heavy rain and standing water in that corner of the field, it had to be sited approximately 15m in from the fence-line.

Borehole 2 (BH02) (E411969:N841483): Located at 64.72 mAOD ground elevation, adjacent to the northern boundary of the Fourfields site at the approximate mid-point of the northern edge of the proposed converter station platform area and close to the small field drain which runs down to the north-east corner of the Fourfields.

Borehole 3 (BH03) (E412094:N841338): Located at 65.54 mAOD ground elevation, adjacent to the eastern boundary at the approximate mid-point of the long edge of the converter station platform area and close to the small field drain / ditch which runs along the eastern boundary of the Fourfields.

Borehole 4 (BH04) (E411766:N842128): Located on the AC cable route at 55.35 mAOD ground elevation, at the western side of the unnamed road between the derelict Denend farm and the property known as Hjaltland.

The boreholes were sunk by cable percussive methods to refusal at rock head level. The use of a window sample rig was discounted due to the requirement for high quality undisturbed samples, the potential for refusal on obstructions at depths shallower than rock head and also to facilitate a better quality installation with sufficient well pack for permeability testing.

Competent bedrock was then proven in each borehole by coring at least 2m of rock by use of a tracked rotary drill. A conventional double tube core barrel was employed for the maximum recovery of rock core in conjunction with a fluid flushing medium. Core samples were packed carefully and placed within core boxes labelled to indicate the depth below ground surface of each core run. Each box was labelled with the site name, contract number, borehole number and depth of core runs.

Upon completion, each borehole was lined with a 50mm High-density polyethylene (HDPE) (piezometer) pipe for future monitoring of groundwater level. This comprises a geosock and 2-5mm washed gravel over the slotted section of the pipe, which allows groundwater from lower levels to enter the pipe whilst keeping it clear from blockages. It also then comprises cement bentonite grout around the plain section at the top of the pipe, which seals it from infiltration by standing or percolating surface water in the upper reaches of the soil. Each installation was capped with a bolted metal upstand to prevent debris entering and marked with a large, coloured stake so that agricultural vehicles are aware of their locations.

Figure 13.1.1 – Borehole Groundwater Installation (Piezometer)

13.2.1.3 Logging, Sampling & In-Situ Testing

In all trial pits and boreholes, the stratigraphy and depths in metres below ground level (mbgl) of ground and groundwater conditions were logged on standard Log sheets. An initial soil description was also recorded of each soil type, including the observed density description. Properties were to be later confirmed and refined by further laboratory testing of disturbed and undisturbed samples. The following samples and measurements were undertaken where possible at each trial pit or borehole sample depth:

For physical soil characteristics or index properties:

- Disturbed 10kg bulk bag samples
- Disturbed 1kg tub samples
- Undisturbed block samples in Stage 1 trial pits
- Undisturbed U100 samples from borehole cores

- Standard penetration test (SPT's)

For various chemical (contamination) soil testing in Stage 1 trial pits:

- 1kg glass jar samples
- 60g glass pot samples

At boreholes, permeability tests were carried out within the installations by an engineer with a submersible pump, dipmeter and water bowser to determine permeability of the drift strata. Rising and falling head tests were used within a completed installation to give an understanding of the permeability of the materials surrounding the response zone. A rising head test was carried out by pumping water from the borehole and measuring the rate of flow back through the response zone, and a falling head test is carried out by adding water to a borehole and measuring the rate of flow into the response zone.

Resistivity testing was also carried out across the Fourfields site over the proposed converter station footprint. This testing is to determine the electrical conductivity properties of the soil, in order that adequate earthing can be designed for electrical equipment, and also for the building, which is designed as a Faraday Cage to minimise magnetic field interference outside the building skin. Locations of the centre of each test are shown on the location plan in Drawing 3030. The tests were carried out in accordance with the Institute of Electrical and Electronics Engineers (IEEE Standard No.81) (IEEE 1983) guidance, as specified by NorthConnect's HVDC electrical consultant (Mott Macdonald 2014).

13.2.1.4 Laboratory Testing

The samples taken were transported to certificated soil testing laboratories, where the following tests were undertaken to UKAS accredited standards and BS 10175 (2001):

Physical Testing / Index Properties:

- Soil classification. Description to BS 5930 (British Standards Institute, 1999) / Eurocode 7 (1997) (British Standards Institute, 1997) standard;
- Particle size distribution;
- Moisture content;
- Dry and bulk density;
- Liquid and plastic limits;
- Particle density;
- Compaction tests;
- Consolidation tests;
- Undrained shear strength of cohesive soils; and
- Uniaxial compression and point load strength of rock.

Contamination Testing Suites:

- Metals;
- Inorganics;
- Aromatic compounds;
- Polycyclic aromatic hydrocarbons (PAH);

- Chlorinated hydrocarbons; and
- Pesticides.

The contamination tests each measured either the *Detected Concentration* level of a particular chemical or compound, or defaulted to a deminimus *Traceability Limit*, i.e. the lowest concentration at which a contaminant can be detected by the testing equipment.

Any detected concentrations were then compared to the Dutch Standards (2009), which is the European accepted standard for the measurement of soil contaminant concentrations. The Dutch Standards list two values for the concentration of each chemical or compound and these are:

- Target Value: representing the anticipated, average background concentration expected to be found naturally occurring in soils; and
- Intervention Value: representing the concentration above which isolation or remediation of the soil should be considered because it poses a significant risk of impairment to human, plant or animal health.

13.2.2 Impact Assessment Methodology

This assessment has been undertaken primarily using a qualitative assessment based on analysis of baseline data, statutory and general guidance, combined with professional judgment. The assessment follows the methodology provided within Chapter 3 (Assessment Methodology) with the significance of effect being determined through a combination of sensitivity / value of a receptor and the magnitude of impact. The sensitivity / value of the receptor under consideration are defined in accordance with the criteria set out in Table 13.3.1, while the magnitude of impact criteria is set out within Table 13.3.2. The significance of effect then follows the matrix set out in Table 13.3.3.

The Macaulay Institute for Soil Research maps show the LCA in Scotland (Macaulay Institute for Soil Research, 1981). The LCA classification is used to rank land on the basis of its potential productivity and cropping flexibility. This is determined by the extent to which the physical characteristics of the land (soil, climate and relief) impose long term restrictions on its use. The LCA is a seven class system. Class 1 represents land that has the highest potential flexibility of use whereas Class 7 land is of very limited agricultural value. These categories have been used in the characterisation of the different receptors sensitivity in Table 13.3.1.

Table 13.3.1: Environmental Value of Geology, Soils and Land Use Receptor

Value	Criteria	Example
Very high	Very high importance and rarity, international scale and very limited potential for substitution.	• SSSIs with geological / geomorphological qualifying interest. • Soils with a very high likelihood of readily transmitting contaminants to nearby sensitive receptors or over a large distance (e.g. granular deposits in saturated zone or in continuity with river systems etc.) H1 soils as defined by the Environment Agency groundwater vulnerability classification system. • Agricultural land use / soil quality of LCA Class 1, 2, and 3.1 (prime agricultural land).
High	High importance and rarity, national scale, and limited potential for substitution.	• Regionally Important Geological and geomorphological Sites (RIGS). • Local Geodiversity Sites (LGS). • Soil sensitivity to pollution: soils with a moderately high potential to transmit contaminants to other receptors or over a significant distance (e.g. mixed cohesive and granular deposits of alluvium). H2/H3 soils as defined by the Environment Agency groundwater vulnerability classification system. • Agricultural land use / soil quality of LCA class 3.2, 4.1 and 4.2 (moderate).
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.	• Soils with an intermediate potential to transmit contaminants (e.g. Glacial Clays with occasional sand bands). Soils of intermediate (I1 or I2) leaching potential as defined by the Environment Agency groundwater vulnerability classification system. • Sites of Interest to Natural Science (SINS: also referred to as SESA (Study of Environmentally Sensitive Areas)). • Local Nature Conservation Sites (LNCS) • Agricultural land use / soil quality of LCA Class 5.1, 5.2 and 5.3 (poor).
Low (or Lower)	Low or medium importance and rarity, local scale.	• Soils with a low potential to transmit contaminants (e.g. competent clay). Soils of low (L) leaching potential as defined by the Environment Agency groundwater vulnerability classification system. • Agricultural land use/soil quality of LCA Class 6.1, 6.2, 6.3 and 7 (very poor).
Negligible	Very low importance and rarity, local scale.	• Land not agricultural – e.g. hardstanding cover.

Table 13.3.2: Magnitude of Impacts and Descriptors

Magnitude of Impact	Criteria	Example
Major	• Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). • Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).	• Change in soil quality or ground gas regime for a large area (>20ha) of land, sufficient to alter land use (e.g. remediation of 20Ha of industrial land sufficient to enable mixed residential / commercial use). • Permanent loss of any area of agricultural land (LCA Class 1, 2 and 3.1). • Generation of large volumes of non-inert waste materials for disposal off-site to landfill.
Medium	• Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). • Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).	• Change in soil quality or ground gas regime for a moderate area of land (<20ha) to a degree sufficient to alter land use in localised portions of the site or to a degree requiring a change in management / mitigation measures for site use
Low	• Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). • Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).	• Measurable but relatively small scale rock volume removed. • Measurable but relatively small scale change in an area of contaminated land or ground gas regime, but insufficient to alter end land use. • Comparatively small area of SINS / SESA sites affected. • Permanent loss of any area of agricultural land (LCA Class 3.2, 4.1 or 4.2).
Negligible	• Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). • Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).	• Very limited mass of contamination mobilised – just detectable. • Very limited change in area of agricultural land. • Very limited volume of rock removed.
No change	• No loss or alteration of characteristics, features or elements; no observable impact in either direction.	• No change.

Table 12.3.3: Significance of Effect Categories

Magnitude of Impact	Value				
	Very High	High	Medium	Low	Negligible
Large	Major	Major	Moderate	Minor	Negligible
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

13.2.3 Identification and Assessment of Mitigation

Mitigation measures have been identified in line with best practice to prevent, minimise and mitigate impacts.

13.2.4 Assessment of Residual Effects

Where mitigation has been identified, the magnitude of the impact will be reassessed as per Table 13.3.2, and the overall significance of effect reassessed in line with Table 13.3.3 to understand the resultant residual effect.

13.2.5 Limitations of the Assessment

Trial pits and boreholes provide sample data only of specific locations and sampling depths within the ground strata.

This notwithstanding, the Stage 1 and 2 ground investigation to date has been planned by a qualified geotechnical engineer in consultation with the NorthConnect Permitting team, and specifically targeted at gaining the necessary information for developing the consent design and addressing the main issues anticipated to arise in an EIA and Planning application stakeholder context, for example:

- Establishing the depth of different strata to design the converter station platform and building level for landscape and visual purposes;
- Obtaining physical soil characteristics to estimate engineering methodologies and allow earthworks design for landscape screening and noise mitigation;
- Establishing groundwater characteristics to assess potential pollution pathways; and
- Testing for existing soil contamination.

From this, trends and extrapolations can be made to establish the level of risk associated with the assessment, but a residual risk will always remain that ground conditions between two points for example, may differ greatly from those measured at the two points in question. However, being a greenfield site with relatively uniform strata marked on geological maps and no obvious surface signs of non-conformities, we could estimate this residual risk to be reasonably low.

More detailed development of the design involving further targeted ground investigation will be carried out at later stages of the project, during the main design and build contract preparation and execution. If a significant difference is discovered at that point, this impact assessment would be reviewed to identify whether or not the findings are still appropriate.

13.3 Baseline Information

The results informing this Baseline Information are drawn from a desk study of the information sources listed in 13.1.2, and also from the physical ground investigation findings.

13.3.1 Designated Sites

There are no geological designations within 500m of the Fourfields site or proposed cable route (Drawing 3042). The Bullers of Buchan Coast SSSI is located approximately 700m East and South of the Fourfields site, its main geological features being the Coastal Geomorphology of Scotland and Marine cliff. The Hill of Longhaven SSSI is located approximately 2.8km to the West of the Fourfields and AC cable route sites. Its features are Quaternary geology and geomorphology, which are also the main features qualifying the Moss of Cruden SSSI which is located approximately 7 km to the West.

The Skelmuir Hill, Stirling Hill, Duwick Local Nature Conservation Site LNCS) has been designated by Aberdeenshire Council. The main interest of the site is the preglacial Buchan Gravels Formation which is deemed unique in nature in Scottish Context. The site includes the Den of Boddam Glacial Meltwater Channel.

13.3.2 Geology

The British Geological Survey (BGS) onshore digital map DiGMapGB-50 (BGS, 2014a) and the BGS borehole records (BGS, 2014b) were consulted to gain a general understanding of the geological conditions in the area.

BGS mapping indicates that the drift geology of the area consists of glacial drift of Pleistocene Age, fluvioglacial and glacial sand and gravel and glacio-lacustrine deposits. Recent drift overlay includes coastal deposits of a very thin to absent alluvium associated with watercourses on the coast resulting from erosion. Over much of the inland area, glacial deposit comprises diamicton (otherwise known as boulder clay) of mainly red Hatton Till formation. These Hatton Till formation deposits are frequently very variable and fissured in nature, with sediment type varying rapidly horizontally and vertically. In general, there appears to be an increase in thickness towards the north and east of the site location.

The BGS records of the area also indicate that the underlying bedrock of the area is dominated by Peterhead Pluton granite which creates a ragged coastline, highly sculpted/fractured cliffs and sea stacks. In general the granite, understood to belong to pre-Lower Old Red Sandstone Age, is a coarsely crystalline red rock, resting unconformably on the old platform of slates and schists. The strata consist mainly of conglomerates and sandstones, associated with lenticular bands of andesite indicating contemporaneous volcanic action.

Peterhead Pluton Granite is mined at the Stirling Hill Quarry, owned and operated by Breedon Aggregates, which is located immediately to the east of the Fourfields converter station site. The granite here is blasted, graded and sold principally for use in road stone and other civil engineering purposes (commonly referred to as Type 1 and Type 2 aggregates), but there are also concrete batching facilities at the quarry which uses the granite for concrete aggregate to supply local civil and structural engineering uses.

The generalised soil conditions anticipated in the area from BGS records are summarised in Table 13.4.1.

Table 13.4.1: Anticipated geology in the area of the Fourfields site

Age	Geological Unit	Depth (mbgl)	Lithology
Drift (recent and Pleistocene	Lake Alluvial (undifferentiated)	0.2 to 4m	Flood-plain, river-terrace and alluvial fan deposits of clay, silt, sand and gravel
	Hatton Till Formation (Diamicton)	Typically 2m, locally up to 10m	Unsorted glacial deposits of clay, sandy clay, sand with pebbles and boulders
Solid (Silurian)	Red Peterhead Pluton granite	Typically 1 to 10m	Conglomerate, with subsidiary horizons of sandstone and clay

Through the trial pit and borehole observations, logging and the later laboratory soil classification and PSD testing, the soil types encountered across the study site can be identified and categorised into the approximate stratigraphy shown in Table 13.4.2 below. The sample descriptions are mapped to the appropriate BGS lithology description, and then also assigned a simplified geotechnical grouping for engineering purposes, and further interpretation within the project engineering. This is a summary table of the generalised encountered stratigraphy at the study site. The full details of soil depths, height and descriptions at each investigation location are presented in Trial Pit and Borehole log sheets in Appendix D.

Table 13.4.2: Encountered generalised geology at the Fourfields site

Sample Descriptions	BGS Area-Wide Lithology	Depth (mbgl)	Geotechnical Grouping
Loose soft dark brown slightly silty slightly gravelly sandy clayey TOPSOIL with rootlets noted. Gravel is fine rounded to sub-rounded of mixed lithologies.	(N/A – Topsoil / ploughing layer)	Zero to 0.35m	Topsoil
Loose red clayey slightly gravelly SAND. Gravel is fine to coarse sub-rounded to angular of mixed lithologies.	* Hatton Till Formation (Diamicton): Unsorted glacial deposits of clay, sandy clay, sand with pebbles and boulders	Typically from 0.3m to between 1.25m and 3.1m	Glacial Till
Medium dense orangey brown slightly clayey gravelly SAND. Gravel is angular to rounded of mixed lithologies.			
Soft to firm orange brown sandy slightly gravelly CLAY with cobbles and boulders. Gravel is subangular to subrounded fine to coarse of mixed lithology.			
Stiff to very stiff orange brown sandy slightly gravelly CLAY with cobbles and boulders. Gravel is subangular to subrounded fine to coarse of mixed lithology.			
Weathered GRANITE recovered as pink and orange angular fine to coarse gravel.	Red Peterhead Pluton granite: Conglomerate, with subsidiary horizons of sandstone and clay	Typically from 1.25m to 3.1m	Granite Bedrock
Moderately strong pink and grey GRANITE. Fractures: close to medium spaced subhorizontal dipping approximatley 45°, rough stepped.			

* Examples of Hatton Till sample descriptions are given to show the range of soil types encountered. Several other descriptions were obtained which varied slightly or were different combinations of the above.

The general finding of stratigraphy at the site was in line with the area-wide BGS expectations of Topsoil over Glacial (Hatton) Till over (Peterhead Pluton) Granite, however, the possibility of encountering Lake Alluvium indicated in BGS area maps appears not to be present at any of the Fourfields site area, or AC cable route test locations in question.

13.3.2.1 Topsoil

The topsoil was encountered extending to a consistent depth of 0.30 to 0.35m at all trial pit and borehole locations, across both the converter site and AC cable route. There was a sharply defined change in all cases, presumably at ploughing depth, to the underlying undisturbed ground beneath. As the proposed converter station and AC cable route are all located within similar stretches of arable land, it can be assumed that this condition will be encountered site wide.

The soil is a typical loose topsoil medium of mixed lithologies and, although the current farm manager reports the ground at Fourfields is not very productive arable land, this is probably due to the poor draining, high clay content subsoil medium (the Glacial Till), rather than the topsoil itself. In terms of grass planting for landscaping post-construction, the topsoil should provide a reasonably good growing medium.

13.3.2.2 Glacial Till

These were the predominant drift geology strata from the Hatton Till Formation (Diamicton) encountered across all test locations. They were generally undifferentiated and ranged from loose, slightly gravelly sand, to firm to stiff and very stiff, sandy, slightly gravelly clay. These strata covered the full depth at all test locations on the Fourfields site, from below the topsoil to the rock level at between 1.20 to 3.10 metres below ground level. This was also the case at all test locations on the AC cable route, either down to rock or at least to the extent of the trial pits when rock was not encountered.

In TP03 up the hill to the west of the proposed converter station site, a single cobble sized piece of black, friable, glassy rock was encountered within the Glacial Till, possibly a type of flint or similar diagenetic sedimentary particle which has become entrained in the Till during glaciation. It was about 100mm in size and was embedded in the side wall of the trial pit at a depth of 0.7m, having been partially dislodged by the excavator bucket.

Referring to the BGS map for the area, the site is located on the intersection of three different surface drift materials: the Lake Alluvium to the east; the Glacial (Hatton) Till Formation to the north; and Head 1 Flinty Gravel deposits to the west. A designated archaeological site for Neolithic flint workings also lies approximately 500m further west of the TP03 location. This would indicate that further up the hill, to the west of the Fourfields site, may be close to the overlap of the Glacial Till with the Head 1 Flinty Gravel. As the flint cobble was found 400mm down within the undisturbed ground at TP03, and as there was no evidence of other flint pieces in the trial pit, then it is believed that the occurrence is geological rather than archaeological at this particular location.

13.3.2.3 Granite Bedrock

The Peterhead Pluton Granite was encountered in all trial pits and boreholes on the Fourfields site. This ranged from a minimum of 1.25m depth to 3.10m. The rock head was generally shallower towards the south and west of the converter station site area higher up the hill, and deeper towards the north and east boundaries of Fourfields at the lower parts of the site. There was also a greater degree of weathering of the granite towards the same boundaries, coinciding with the locality of the burn / field drains and presence of groundwater, which therefore may be connected with hydraulic related weathering. The rock was stronger and more competent, the higher up the site to the south and west it was encountered.

The rock was only encountered in the first trial pit on the AC cable route, on the top of the hill close to the property Highfield (TP04) at a depth of 1.30m. At all other test locations along the cable route lower down the hill to the north, rock head was absent down to at least 3m below ground, and so appears to be well below the proposed minimum engineered depth of the cable installation of 1.5m, and allowing the possibility for the cables to be installed deeper if required for topographical or other constraint reasons.

13.3.3 Hydrogeology

An assessment of the baseline hydrogeology of the proposed Fourfields site and AC cable route can be obtained from the desk information and studies referenced in Section 13.1.2, as well as from observations in boreholes and trial pits.

As shown in Drawing 3008 the closest surface water features to the Fourfields site consist of:

- An unnamed burn flowing north along the eastern boundary of the site;
- A field drain flowing east along part of the northern boundary to meet the above burn at the north east corner of Fourfields; and
- A large fish pond known as Braeside Trout Fishery beyond the northern boundary of the site.

Surface water features along the AC cable route consist of (See Drawing 3008):

- An unnamed burn flowing north east from the Den of Boddam Dam which crosses the cable route and unnamed road leading north from Lendrum Terrace; and
- Another unnamed burn, flowing east across the unnamed road, close to the point at which the cable route is proposed to cross the road just south of the property known as Hjaltland.

The granite bedrock geology in the area is typically impermeable and is a poor aquifer. The interactive map of the 2008-2015 River Basin Management Plan (RBMP) published by SEPA shows that that groundwater body in the area is part of the, *"Peterhead bedrock and localised sand and gravel aquifer"*. The BGS and SEPA classify the regional bedrock aquifer to be of low productivity (0.1-1 l/s) characterised by fracture flow processes within an unnamed igneous intrusion of late Silurian to early Devonian age. These rocks have negligible intergranular porosity and, therefore, can store groundwater only within fractures. All groundwater flow is through fractures, along bedding planes, joints or fault lines. Small amounts of groundwater are likely in the near surface weathered zones and secondary fractures, and there are also rare springs. This groundwater body was classified in quality terms at good status with high confidence in 2008 and is also a Drinking Water Protected Area with a Pass status. The site is also located in a Nitrate Vulnerable Zone.

The Hatton Till Formation deposits may have sand and gravel lenses of local importance to private water supplies. Three wells are located within a 1km radius of the Converter Station site. One is in the vicinity of the currently derelict Denend Farm buildings, one is beside the residential properties at Lendrum Terrace and the other is adjacent to the property Highfields. The Braeside Trout Fishery beyond the northern boundary of the site has no visible inflow watercourse but does have an overflow pipe which falls into the burn a little to the north and downstream of the site. It is possible, therefore, that the pond may be spring-fed.

Given the above findings from the desk study information, a significant focus of the physical ground investigation was concerned with establishing potential risk to these various local water bodies. Hence, in addition to the topographical survey information available, investigation and testing locations were targeted at the northern and eastern boundaries between the site and the surrounding water bodies (TP01, BH01, BH02 and BH03)

Groundwater was encountered in TP01 and BH01, both located in the north-east corner of Fourfields, and BH03 along the eastern boundary. It was struck at or close to the rockhead level of the Peterhead Pluton granite, but then in TP01 and BH01 had a rebound effect up to around 1.0-1.3 metres below ground level. The presence of groundwater seems to be localised and coincident with the occurrence of weathered granite in these particular locations.

Firstly, this would be consistent with the BGS and SEPA data that,

"*These rocks have negligible intergranular porosity and, therefore, can store groundwater only within fractures. All groundwater flow is through fractures, along bedding planes, joints or fault lines. <u>Small amounts of groundwater are likely in the near surface weathered zones</u> and secondary fractures, and there are also rare springs*".

Secondly, the rebound would suggest that the groundwater present within the weathered rock has a slight artesian effect due to the relatively impermeable overlaying Glacial Till, although this effect was not observed at BH03 on the eastern boundary close to the burn. The permeability of the ground was measured in both BH02 and BH03 at an average of 0.5 l/s, which is very low and in line with the BGS and SEPA classification that:

"*The regional bedrock aquifer to be of low productivity (0.1-1 l/s)*".

Given the strike depth at BH03, it is possible the groundwater is in hydraulic continuity with the burn at this location. However, further down the field in the north east corner, the strike depth of 3m and slight artesian effect would suggest that it is not in hydraulic continuity at this location.

Groundwater was not encountered at all in BH02 on the northern boundary next to the small field drain / ditch, which would suggest this is surface water drainage only and, indeed, this ditch has been observed to be dry in the summertime. The neighbouring Braeside Trout Fishery pond is also situated around 50m north of the TP1 / BH01 and BH02 locations. However, the water level in the fishery pond was found to be 1.2m above the rebound (artesian head) level of the groundwater in TP1/BH01 and, as stated above, no groundwater was encountered in BH02. Furthermore, the pond has low embankments around three sides (north, south and east), raising it up above the level of the nearby field drains / ditches and the ground level of the adjacent areas of Fourfields. The pond embankments therefore, are assumed to be engineered to be impermeable (e.g. clay core or similar) to isolate the pond from the surrounding groundwater, otherwise the pond would simply drain away via the ditches. All of this evidence would point to the fact that the groundwater below the site cannot be in hydraulic continuity with the pond, substantiating the possibility that the pond is fed by either a spring emanating from a discontinuity within the granite around Highfield, or perched groundwater / surface water run-off from the rising ground west of the pond.

In terms of the private water supply wells, it is not known whether these are used anymore, but the well at Highfield is at a higher elevation than the Fourfields site. The well close to Lendrum Terrace is at a similar elevation, but lower lying ground and the burn are situated in between, so the prevailing direction of any groundwater flow is likely to be in the same direction as the underlying strata, making any connection pathway with the converter station site unlikely. Similarly, although the well at the derelict Denend Farm is lower lying than Fourfields, it is separated by both the crest of the hill around Highfield and the unnamed burn flowing from Boddam Den. The AC cable route runs close to Denend Farm, but at a lower level than the farm and the well.

Finally, groundwater was not encountered in any of the AC cable route test locations. The areas of the AC cable construction that will be different in this respect are the burn and field ditch crossings, where groundwater is likely to be encountered, but appropriate pollution and sediment control measures as described in Chapter 2: Project Description and Chapter 12: Water Quality will be employed here.

13.3.4 Agricultural Classification

According to the Land Capability for Agriculture (LCA) in Scotland maps (Macaulay Institute for Soil Research, 1981), the Fourfields site belongs to the LCA Class 3.2, Land Capable of Supporting mixed Agriculture as,

"land capable of producing a moderate range of crops with an increasing trend towards grass within the rotation".

The Fourfields site is currently comprised of four square-shaped arable fields separated by stone walls and covering 19.7ha.

The AC cable will be mostly laid over improved grassland fields along 40% of its length (500m) with a category of LCA class 5. There are three arable sites between Highfield and Denend (total 440m) at LCA category 3.2 and finally semi-improved neutral grassland (410m) at LCA class 4.2 north of the derelict Denend farm property.

13.3.5 Contamination

13.3.5.1 Historic Mining Activity

From historic maps of the area, the proposed site is adjacent to and crosses areas where quarrying has formerly taken place. Therefore, there is a possibility that the development may encounter contaminated spoil and waste from quarrying operations and unmarked infilled pits.

From site walkover surveys and observations as part of the ground investigation, there is surface evidence of old quarry workings around Stirling Hill to the south east of the site, such as: pits; exposed faces; ponds; and other uneven ground features which appear man-made. However, these do not seem to extend beyond the present quarry boundary, formed by the burn, into NorthConnect's proposed Fourfields site area itself. There is no evidence in the archaeological records including historical mapping of the area (see Chapter 9) that quarry works extended into Fourfields. There were no crop marks identified during site visits over two years, which might be an indication of such subsurface features.

In physical terms, neither the Stage 1 trial pits or the further Stage 2 boreholes, showed any evidence of “made ground” below the topsoil, which is how a ground investigation would record any man-made quarry workings, infill pits or spoil cast, should they be present. In all test locations on Fourfields, only 250-300mm of the disturbed topsoil ploughing layer was found, overlaying undisturbed Glacial Till of the Hatton formation, which is in line with the drift geology records of the area. Hence the risk of finding any infill pits or spoil area related to be the quarry works is deemed to be very low. Nevertheless, contamination testing was undertaken at the Fourfields site as described in the following section.

13.3.5.2 Contamination Testing

Of the six samples taken, the vast majority of the contamination results were below the test traceability limits. This applied to all of the tests undertaken within the suites for Inorganics, Aromatic Compounds, Chlorinated Hydrocarbons and Pesticides. The exceptions where trace contaminants were detected are as follows:

Metals

Metals are generally naturally occurring and traceable in any soil, even in very small concentrations, and the detected concentrations of the metals were all less than the Dutch Standard target values except for Nickel, which showed two samples out of the six, both from TP01, which at 34 and 35 mg/kg, are close to the target value of 35 mg/kg. This represents an average, naturally occurring level and poses no risk to receptors. It is significantly less than the intervention value for Nickel, which is six times greater at 210 mg/kg.

Polycyclic-Aromatic Hydrocarbons (PAH)

Again, the majority of the samples had PAH compounds below the test traceability limits. However, PAH compounds were detected in trace amounts in one sample from the Topsoil at TP01 and these were Fluoroanthene, Pyrene, Benzo(a)Anthracene and Benzo(b)Fluoroanthene. The Dutch Standards for these are measured in solution (mg/l) in groundwater. As the groundwater was below the level of this particular sample in TP01, a direct comparison to Dutch Standards cannot be derived for the individual PAH compounds.

These compounds, however, are often reported as “Total PAH”, being the sum of the ten compounds concerned. Total PAH has a solids intervention value of 40 mg/kg, whereas the detected concentration of the TP01 Topsoil sample was just 0.06 mg/kg, a fraction of what would be considered as a harmful level. (Note: PAH's do not have target values in the Dutch Standards as they are not generally naturally occurring compounds in soils).

The trace PAH is found in one sample out of six from the site and is from the topsoil layer of TP01. This trial pit was located 10m inside the main field access gate, in the direct line of the agricultural vehicles which traffic in and out of the field. It is likely, therefore, that small amounts of engine oil or diesel fuel being transferred from the underside of these vehicles onto the grass at this location, has been the source of these trace amounts of PAH in the topsoil. Two other samples deeper in the same trial pit, and other trial pits across the site, yielded no trace of PAH.

13.4 Impact Assessment

13.4.1 Ascribing Sensitivity to Land Assets

In this section the various land assets (or *receptors*) are identified, which may be impacted by the proposed development, and they are ascribed an environmental value (or *sensitivity*) in accordance with the criteria and methodology set out in Table 13.3.1.

13.4.1.1 Designated Sites

The Bullers of Buchan Coast SSSI is located approximately 700m East and South of the Fourfields site. This is ascribed Very High sensitivity and will be considered further for any magnitude of impact there may be from the development at Fourfields.

Skelmuir Hill, Stirling Hill, Duwick LNCS is of medium sensitivity.

13.4.1.2 Groundwater

Groundwater is present across limited areas of the Fourfields site and the AC cable route, and so is a potential receptor for impacts. The presence of private water supply wells in the area, and also surface water features, mean that groundwater as a land asset will be considered for impact assessment in respect of its inherent quality and possible pollution pathways.

Although none of the sensitive receptors will be affected by the development directly, their relatively nearby presence and the soils intermediate potential to transmit contaminants (e.g. Glacial Clays with occasional sand bands), warrants a groundwater sensitivity of Medium.

Any private water supply wells would be classed as having a High sensitivity.

13.4.1.3 Soil (Land Use)

The development across Fourfields and the AC cable route will involve significant earthworks and a certain amount of permanent “land take”, within what are currently various grades of agricultural land.

Although a section of the AC cable route (500m) is in LCA class 5 (poor) for land use / soil quality and so of Medium sensitivity, the vast majority of the total plan area of the development along the rest of the cable route and Fourfields itself, is dominated by land use / soil quality of LCA class 3.2 or 4.2 (moderate), and hence is of High sensitivity.

13.4.1.4 Bedrock

Finally, the bedrock itself should be considered as a receptor, due to the scale of the excavation in rock which will take place at Fourfields for the converter station platform, and also because blasting will be required which may have the potential for physical impacts on the surrounding bedrock due to seismic vibration effects.

Table 13.3.1 does not give any specific guidance on ascribing sensitivity to bedrock, but we will assume a Medium sensitivity in order to consider the magnitude of any potential effects.

13.4.2 Nature of Potential Impacts

The potential impacts on land quality, and the mechanisms by which those impacts may occur as a result of the development, should be considered in order that their magnitude can be assessed. The potential impacts that will be considered are as follows:

- Change of land-use (Permanent or Temporary);
- Direct physical impacts on land quality;
- Physical changes to groundwater;
- Chemical contamination from disturbing existing contaminated land; and
- Pollution incidents from plant and machinery.

13.4.3 Construction

13.4.3.1 Change of Land Use

For the Converter Station site a large, levelled ‘platform’ area will be created, by stripping the topsoil and removing the underlying glacial till and bedrock. Once a suitable platform has been formed, it will be engineered to form hard standing or foundations for the converter station layout. Moving south west across that footprint, the North east corner of the platform will be more or less at the existing ground level. This will then transition to ‘cut’ into the glacial till towards the centre of the platform as the existing ground rises, and finally cutting into rock towards the south west corner. The rock excavation will include the use of blasting. The topsoil strip will extend to a larger area than just the excavation, as the surrounding screening mounds will also be engineered earthworks, and most of the rest of Fourfields will be used for temporary construction and soil storage areas.

As a result of this, 19.7 Ha of LCA class 3.2 agricultural land will be lost temporarily, but only 3.4 Ha will be lost permanently within the platform area. The magnitude of this impact is considered to be small in that LCA class 3.2 land makes up 20% of Scotland Land area totalling 1,541,100 ha, with a considerable proportion of it being in Aberdeenshire. The overall effect significance is minor and hence not significant.

The 331,000 m^3 of material removed during the works will be graded and utilised within the landscape screening mounds covering a further 7.8 ha. The topsoil will be reinstated and planting will take place over these landscaped areas for screening purposes. Although this will provide ecological value (see Chapter 7), it will no-longer be suitable for agricultural purposes and, as such, could be deemed to reduce the land quality. Overall the area affected is small in relative terms and as such the impact magnitude is deemed to be negligible with an effect significance of negligible and as such is not significant.

As shown in Drawing 3012 the southeast section of the Fourfields will be utilised as a construction compound, and other areas are likely to be used for temporary soil storage. This use will be temporary, and part of the area will be restored post-construction to agricultural use, hence the magnitude of the impact is deemed to be negligible, the significance of the effect is negligible and it is not significant in EIA terms.

The cable route construction corridor covers a total area of 6.0 ha. Within this, the topsoil strip for the haul road, drainage and cable trenches has an area of 1.8 ha, and will remove approximately 6,000 m^3 of topsoil. The cable trenches themselves at a further 1.2m deep will generate a further 5,000 m^3 of glacial till. The topsoil and glacial till removed during construction will be stored and once the cables have been installed, the ground will be reinstated and land returned to its previous use. Overall, the loss of primarily LCA class 3.2 and 4.2 agricultural land will be temporary and, hence, the magnitude of the impact is deemed to be negligible, and the significance of the effect is negligible and is not significant in EIA terms.

Impacts on the Skelmuir Hill, Stirling Hill, Duwick LNCS due to construction are deemed to be low impact magnitude due to the small area of designated site affected, giving rise to a minor effect significance which is not significant in EIA terms.

13.4.3.2 Physical Impacts

In addition to the potential land affected by the change, there is a small potential to have a physical impact on the land surrounding the converter station platform, due to the need to carry out blasting.

Blasting will be utilised to fracture and fragment rock within the south west sector of the converter station platform area before it is excavated, as the ground investigation found the rock to be harder in this area. A study has been carried out to assess the blasting requirements so as to minimise the vibration effects on local properties (see Chapter 6). As such, the size of the charge and packing of the charge holes will be designed in such a way as to focus the blast energy on the area of material to be removed.

The energy from the blasts will, however, dissipate from the source of the blast through the surrounding rock, so there is a potential for some localised fracturing of the rock around the blast location, or to increase existing fissures in rock which will not be removed as part of construction. The vibration assessment has shown that the energy of the blast will dissipate quickly and, as such, the area affected by fracturing will be small. Whilst this may increase the permeability of the rock over a localised area, it will be limited to well within the site boundaries and hence any possible pathways (for groundwater flow) to off-site receptors. Beyond this, the effects will be vibrational only, with the rock behaving as an elastic medium under the influence of the blast wave. As such the magnitude of the impact is deemed to be low giving rise to an effect significance of minor, which is not significant in EIA terms.

13.4.3.3 Changes to Groundwater

The Bullers of Buchan geological / geomorphological SSSI discussed in Section 13.4.1.1 is too far from the construction areas to have any impact on its geology. This is either via direct physical impacts as discussed above, or via groundwater pathways, as there can be no physical connectivity given the presence of Stirling Hill between the two, and the prevailing northerly downslope direction of the surface and pre-quaternary (rock head) geology away from the Fourfields site. On the basis that impacts on designated sites will not be measurable, the magnitude is negligible and significance of effect minor, which is not significant in EIA terms.

In terms of the potential impacts on the groundwater over the working areas themselves, the physical changes to groundwater regimes will be limited. The parts of the platform area at Fourfields over which groundwater was found (associated with the weathered granite along the northern and eastern boundaries), then the majority of the platform construction will be above groundwater level, and hence will have no impact. The exception may be a small length of the southern end of the eastern perimeter, where the platform excavation could encroach below groundwater level. It is thought the groundwater at this location is in hydraulic continuity with the burn; however, the platform will be lower than the burn here, so the platform excavation may well change the direction of groundwater flow over a localised area, from towards the burn, to instead draining / seeping into the excavation. As mitigation and management arrangements will need to be considered for this, the unmitigated magnitude of impact of this is medium, leading to a moderate significant effect.

Similarly, it is expected that two small section of the AC cable route, where the trench excavations will cross the two unnamed burns near to Denend farm and Hjaltland, will also dip below groundwater level. However, these will not significantly change the groundwater flow direction, as it will still percolate towards the burn around any temporary shuttering or culverting of the excavation across the burn. Consequently, the magnitude of impact here is low and the significance of effect is minor, not significant in EIA terms.

As discussed above only very localised impacts are predicted on groundwater and no effects to private water supplies are expected.

13.4.3.4 Contaminated Land

The risk from the recorded historical quarrying activity in the area and the details of contamination testing undertaken in the ground investigation have been discussed at length above in the Baseline Information sections 13.3.5.1 and 13.3.5.2 respectively.

From both observations and testing during the ground investigation, no evidence of old quarry workings or associated contaminated ground has been found at the test locations on the Fourfields site. Some trace contaminants were found in the topsoil at TP01, but these are not normally associated with quarry workings. The only compounds found at or above naturally occurring levels here were trace amounts of PAH, likely to have originated from agricultural vehicles trafficking through the field access gate. Due to the very low level and localised nature of these contaminants, they do not represent a material risk to human, plant or animal health. It is not recommended that any isolation or remediation measures would be required in relation to these, and the storage and reinstatement of the Topsoil during construction should not pose any increased risk of exposure for receptors.

On this basis, the magnitude of the impact from existing contaminated land is deemed to be negligible making the significance of the effect negligible and overall not significant in EIA terms.

13.4.3.5 Pollution Incidents

During construction there is a risk of a pollution incident from the storage and use by plant, machinery and equipment of fuel, oils and other non-inert materials such as hydraulic fluids. Standard best practice techniques for handling of these, such as adequate tanking and bunding of fuels, locked storage of chemicals, maintenance records of plant and equipment, refuelling procedures and training of personnel, will need to be employed to reduce the risk. Taking account of these primary mitigation measures, there is still a chance of a release to ground, but the volumes should be restricted. In addition, the permeability of the ground itself is relatively low, which will provide a degree of self-filtering or attenuation, lowering the risk to receptors. It has also been discussed in the Baseline Information section 13.3.3 that there does not appear to be any hydraulic continuity with the main off-site receptors of the Braeside Trout Fishery or water supply wells due to the geology, topography and levels. Hence, the magnitude of impacts on ground and groundwater is deemed to be low, giving rise to an effect significance of minor, which is not significant in EIA terms.

In addition, the permanent design of the converter station involves multiple chemical elements which will be installed and tested during the construction works. These will also be appropriately designed with a combination of primary and secondary containment measures where necessary and in accordance with design standards, e.g. tanks, bunding, double containment, oil/water separators and emergency dump tank attenuation. Taking account of these primary mitigation measures, there is still a chance of a release of chemicals to ground, but for the same reasons as above (restricted volumes, low permeability and lack of hydraulic continuity), the magnitude of impacts on ground and groundwater is deemed to be low, giving rise to an effect significance of minor, which is not significant in EIA terms.

13.4.4 Operation and Maintenance

13.4.4.1 Change of Land use

Outwith the converter station site and the landscape screening mounds, the remainder of the Fourfields area will be utilised for recreation, with the inclusion of new paths and agricultural uses, primarily grazing. Land quality impacts will be of negligible magnitude leading to an effect of negligible significance and are not significant in EIA terms.

13.4.4.2 Pollution Incidents

The risk of chemical contamination will persist from the elements of the permanent converter station equipment which use oils and other non-inert substances. The protection measures that will be incorporated into the design and installation of this equipment have been described in 13.4.3.5. Taking account of these primary mitigation measures, there is still a chance of a release of chemicals to ground, but for the same reasons as above (restricted volumes, low permeability and lack of hydraulic continuity), the magnitude of impacts on ground and groundwater is deemed to be low, giving rise to an effect significance of minor, which is not significant in EIA terms.

13.4.5 Decommissioning

Decommissioning will, in essence, constitute a reverse sequence of the construction operations. In land quality terms, this will pose the same risk and need for similar methodologies as discussed above to be applied.

The major difference will be the removal of contaminated equipment, and potential contamination of bund structures, drains and possibly the ground itself in localised areas of the site. In this respect a detailed site survey and appropriate testing would be required prior to any decommissioning works, and a risk assessment carried out in order to formulate task specific method statements to address any contamination risks identified.

Providing this is carried out, the magnitude of impact will be low, leading to a minor effect significance which is not significant in EIA terms.

13.5 Mitigation Measures

13.5.1 Change of Land Use

The converter station site layout and landscaping has been optimised throughout the design process and, as such, cannot be reduced further. The length of temporary impacts are associated with the construction programme which will be optimised by the design and build contractor and no additional mitigation is identified at this stage.

13.5.2 Physical Impacts

The design of blasts will be optimised through by a suitably qualified expert, to focus the energy for the most efficient blast possible to achieve the objectives, whilst minimising vibration effects on the surrounding area. No secondary mitigation measures have been identified in this respect.

Ground and groundwater protection measures will be implemented in all construction methodologies and managed by the contractor on site. No secondary mitigation measures will be required in respect of the AC cable route construction.

Secondary mitigation measures will however be required in respect of physical change to the groundwater flows around the south east corner of the platform excavation at Fourfields, due to the moderate significant effect identified in 13.4.3.3. Given the low permeability of the ground, the seepage rates into the excavation over the area concerned have been estimated as amounting to less than 0.5 l/s. One option for mitigating this would be to construct a groundwater cut-off underneath the landscape screening bund at that corner of the site, however, this would have greater environmental impacts than the issue it was solving, due to the additional temporary excavation required close to the burn. The preferred solution is to simply install a toe-drain and divert the flow into the site drainage, which will gravitate down through the attenuation structure and swales (see Chapter 11: Water Quality) and then back into the burn a maximum of 200m distant.

13.5.3 Pollution Incidents

Pollution Incidents could give rise to effects of minor significance and, in line with best practice, it is appropriate to identify mitigation measures. In addition to employing good construction practices and design to ensure materials are appropriately stored, etc. as described in Section 13.4.3.5, an appropriate spill response plan will be put in place.

The spill response plan will take account of the specific site inventory and risks. Appropriately specified and sized spill kits will be made available and staff will be trained in their use. The spill response plan will be updated throughout the various construction phases and into operations, to ensure that it is always appropriate for the risks present on the site.

Details of both the primary and secondary mitigation proposed to prevent pollution incidents are detailed in the Schedule of Mitigation (Chapter 19).

13.6 Residual Effects

The magnitude of impacts associated with pollution incidents during construction and operation will reduce to negligible, leading to an effect significance of negligible, which is not significant in EIA terms.

If the mitigation measures discussed above are implemented, the magnitude of impacts associated with the groundwater pathways at the south east corner of the Fourfields platform will reduce to low leading to an effect significance of minor, which is not significant in EIA terms.

13.7 Summary of Effects

Table 13.7.1 provides a summary of effects before and after mitigation. No significant effects were identified.

Table 13.7.1: Summary of Land Quality Effects

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Direct and indirect impacts on Skelmuir, Hill, Stirling Hill, and Duwick LNCS due to construction and change of land use.	Medium	Low	Minor	Optimise design, land take and construction planning / programming	-	-	Not Significant
Change to groundwater flow direction in localised south east corner of Fourfields platform	Medium	Medium	Moderate	Install toe-drain and divert seepage via site drainage, through attenuation and back into burn 200m downstream	Low	Minor	Not Significant
Groundwater effects from AC cable burn crossings working below groundwater level	Medium	Low	Minor	Appropriate construction methodology and management arrangements	-	-	Not Significant
Impacts on private water wells	High	Negligible	Negligible		-	-	Not Significant
Blasting affecting bedrock outside of construction zone	Medium	Low	Minor	Design for efficient blasting	-	-	Not significant
Permanent loss of 3.4	High	Low	Minor	Optimise design, land	-	-	Not Significant

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Ha of LCA class 3.2 agricultural land				take and construction planning / programming			
7.8 Ha land being reinstated and landscaped, but no longer practical for agricultural use	High	Negligible	Negligible	Optimise design, land take and construction planning / programming	-	-	Not significant
8.5 Ha at Fourfields and 6.0 Ha on the AC cable route being reinstated to agricultural use	High	Negligible	Negligible	Optimise design, land take and construction planning / programming	-	-	Not significant
Risk from existing contaminated land being disturbed to affect ground or groundwater	High / Medium	Negligible	Negligible	Watching brief for made ground or other evidence which could indicated contamination	-	-	Not Significant
Pollution incidents (construction plant and machinery)	High / Medium	Negligible	Negligible	Best practice and emergency spill measures	-	-	Not Significant
Pollution incidents (electrical equipment installation and testing)	High / Medium	Negligible	Negligible	Best practice and emergency spill measures	-	-	Not Significant
Operation							
Change of land use	High	Negligible	Negligible	Optimise design and land take	-	-	N/A

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Pollution incidents (electrical equipment ongoing operation)	High / Medium	Negligible	Negligible	Best practice and emergency operational measures	-	-	N/A
Pollution incidents (decommissioning)	High / Medium	Negligible	Negligible	Risk assessment, planning and best practice measures	-	-	N/A

Chapter 14

Resources

Contents

14 Resource Usage

14.1 Introduction

This chapter provides an understanding of the resources required to construct and operate the converter station. It details the methods taken to reduce the impact magnitude associated with resources through the design process. In addition it identifies the material and waste management proposed to mitigate environmental effects as far as practicable.

14.2 Sources of Information

14.2.1 Regulatory Framework

14.2.1.1 Waste Management

Section 34 of the Environmental Protection Act 1990 (As Amended) (UK Parliament, 1990) lays out a duty of care for waste producers. It states that waste must be managed correctly by storing it properly, only transferring it to the appropriate persons and ensuring that when it is transferred it is sufficiently well described to enable its safe recovery or disposal without harming the environment.

The Waste (Scotland) Regulations 2012 (Scottish Ministers 2012a) amended Section 34 of the Environment Protection Act to implement a number of actions in the Scottish Government's Zero Waste Plan. Under these amendments, holders of waste, including producers, have a duty to take reasonable steps to increase the quantity and quality of recyclable materials. This includes implementing the waste hierarchy and promoting high quality recycling.

The Special Waste Regulations 1996 (As Amended) (UK Parliament, 1996) controls the movements of hazardous or special waste. The law refers to a list of materials in the schedule of the act, including oils and alkaline solutions. Special wastes must be disposed of or treated by specifically licensed facilities, and covered by separate consignment notes. Mixing of special wastes is strictly prohibited.

14.2.1.2 Pollution Prevention Control

The Pollution Prevention Control (PPC) (Scotland) Regulations 2012 (Scottish Ministers, 2012b) were brought into force in January 2013 in order to implement the Industrial Emissions Directive (European Parliament et al, 2010), and consolidate the Pollution Prevention Control (Scotland) Regulations 2000 (Scottish Ministers, 2000). The purpose of the PPC regulations is to provide an integrated approach to environmental management for certain industrial activities. A PPC permit is required for operations which fall within the PPC regulations. The following aspects of the PPC regulations are pertinent to the proposed NorthConnect construction methods:

'"Mobile plant" means plant which is—

(a) designed and intended to move or be moved regularly from place to place with a view to being used at each place (or if not so designed capable of being, and intended to be, so moved), and

(b) used to carry out an activity listed under the heading "Part B" in any Section of Part 1 of Schedule 1'

Where the relevant activities listed under Part B include:

'…blending cement in bulk or using cement in bulk other than at a construction site, including the bagging of cement and cement mixture, the batching of ready-mixed concrete and the manufacture of concrete blocks and other cement products.'

and:

'…the crushing, grinding or other size reduction (other than the cutting of stone), or the grading, screening or heating of any designated mineral or mineral product, except where the operation of the activity is unlikely to result in the release into the air of particulate matter.'

Hence, if cement is to be blended on site or if mobile crushers and screens are to be utilised, then PPC mobile plant permits may be required.

14.2.2 Oil Storage Regulations

The Water Environment (Oil Storage) (Scotland) Regulations (Scottish Ministers, 2006), require oils including petrol, diesel and waste oils to be stored appropriately to prevent environmental pollution. It sets out specific requirement including: the suitability of the primary containment; the requirements for secondary containment, vent pipes, fill pipes over fill protection; and requirements for mobile bowsers.

14.2.3 Guidance

14.2.3.1 Waste Hierarchy

Guidance on waste management in Scotland is provided in the document, Guidance on Applying the Waste Hierarchy (Scottish Government 2013). This guide sets out how to apply the waste hierarchy. The waste hierarchy identifies the prevention of waste as the highest priority, followed by reuse, recycling, recovery of other value (e.g. energy), with disposal as the least desirable option. This principal has been used throughout the design phase of NorthConnect, and will continued to be implemented moving into construction, operation and decommissioning.

14.2.3.2 Pollution Prevention Guidelines

A range of Pollution Protection Guidelines (PPGs) have been produced by SEPA along with the UK's other environmental protection agencies, and provide a comprehensive set of guidance on environmental management across a range of areas. The PPGs do make references to legal obligations, however, this is not applicable in Scotland, and hence they only provide advice for implementing good practice. The relevant PPGs have been used during the design phase, and will influence the CEMD going forward.

14.2.3.3 Sustainable Resourcing

There are currently no regulations on, or pertaining to, sustainable resourcing in Scotland, outwith the Public Sector. However, in 2010 the Scottish Government published Scotland's Zero Waste Plan (Scottish Government, 2010a), which sets out the government's vision for a sustainable and resource efficient future. While the sustainable resourcing aspect of the vision is still to be brought into the legislation, NorthConnect will strive to fulfil the following two components of the vision:

'Individuals, the public and business sectors - appreciate the environmental, social and economic value of resources, and how they can play their part in using resources efficiently.'

and,

'Reduce Scotland's impact on the environment, both locally and globally, by minimising the unnecessary use of primary materials, reusing resources where possible, and recycling and recovering value from materials when they reach the end of their life.'

14.3 Assessment Methodology

It is not proposed that an assessment of effect significance is undertaken in this Chapter, as per the approach detailed in Chapter 3. Instead, as discussed in the scoping report (NorthConnect, 2014), it is proposed that the construction materials are identified and quantified in terms of volume, and an understanding of the environmental impacts associated with the materials given, to facilitate the minimisation of effects.

14.3.1 Resource Identification and Quantification

Resources that have been identified through the design process to date are included in this document and, where possible, initial estimates of quantities provided with assumptions made are detailed. It should be noted that the converter station is still to pass through the detailed design process and, as such, accurate figures are not available at this point.

Potential waste streams arising are based on knowledge of this and similar construction projects. However, due to the lack of specific detail available at this point, it cannot be assumed to be comprehensive, but rather it gives an indication of waste types.

14.3.2 Mitigation & Management

Mitigation and management techniques proposed with regard to both resource use and waste management are based primarily on construction best practices, such as those identified in Section 14.2.2. The waste hierarchy has been employed throughout to minimise environmental impacts.

14.4 Resource Identification and Quantification

14.4.1 Construction

14.4.1.1 Wall Translocation

As part of the Phase 1 enabling works, prior to earthworks starting on the Fourfields site, the existing drystone walls will need to be removed from the converter station and landscaping area. The intent is to utilise the stone to restore existing walls and build new walls around the boundaries of the Fourfields site. This reuse of material complies with the waste hierarchy in addition to minimising ecological effects (Chapter 7: Ecology) and contributing to the landscaping (Chapter 10: Landscape and Visual).

14.4.1.2 Earthworks

Earthworks will be undertaken primarily during Phase 2 of the project however they will not be completed until Phase 4 when the stage 2 landscaping and reinstatement is completed. As discussed in Chapter 3 and 10 the layout and landscaping of Fourfields has been an iterative process, to find the balance between numerous environmental and technical constraint and optimisation factors. From the outset, one of the factors was to balance the cut and fill associated with the earthworks, as it was recognised that there was a potential to need a large amount of material for landscaping, or produce a large amount of waste, if the converter station base height was too high, or too low. The avoidance of waste production aligns with the waste hierarchy.

To reach the 63m level for the base of the converter station, there is a need to excavate (cut) in the region of 331,000m^3 of material. Table 14.4.1 provides the breakdown of materials within this, based on the results of the Ground Investigation work described in Chapter 13: Land Quality.

Table 14.4.1: Earthworks Arising's

Material	Volume	Source	Comment
Top Soil	35,000m^3	Converter Station Footprint Soil Stripping	To be reused in the landscaping mounds.
Glacial Till	85,000m^3	Cut to reach base level for converter station.	To be reused in the landscaping mounds.
Rock	211,000m^3		To be reused in the landscaping mounds and crushed for use as aggregate (Type 1) during construction.

Soil will be stripped as part of the initial earthworks, however, it will not be possible to place it until the glacial till and rock has been excavated, as these will need to be placed first in the landscaping mounds. Hence, the materials will need to be appropriately stored to prevent silt laden water run-off and dust issues, as discussed in Chapters 11: Water Quality and 12: Air Quality respectively.

The intent is that all of the materials arising from the earthworks will be reused on the site as identified in Table14.4.1. It is not clear at this point the exact techniques that will be utilised, but it is likely crushing and grading will be required. Crushing and grading could be done by mobile plant. It would be brought to site and operated under its own PPC license, requiring appropriate material handling and dust suppression techniques to be employed. Alternatively, it could be taken to a neighbouring facility for processing. The approach to be employed will be determined by the construction contractor, however, the most practical technique requiring the least handling is likely to be utilised.

The material removed during the cable trenching will be stored and utilised as infill once the cable has been laid. Any excess materials will be utilised within the Fourfields site landscaping.

In the unlikely event that any materials arise which cannot be utilised on the site, then they will either be processed for use elsewhere or, if this is not possible, they will be disposed of to landfill.

14.4.1.3 Concrete and Aggregates

The quarry access road will be upgraded during Phase 1 to make it suitable for access throughout the construction period. In addition, there will be a new section of road between the existing quarry access road and the converter station site, and roads within the converter station as detailed in Drawing 3022.

The buildings will have concrete foundations and floor rafts and some of the external components will be sat on concrete plinths. The remainder of the converter station area will be made up of hardstanding. These will be installed during the civils work completed during Phase 3 of construction. An estimate of the quantities of each bulk material required is provided in Table 14.4.2.

Table 14.4.2: In-situ Concrete and Aggregate Requirements

Material	Amount	Assumptions	Requirement
Concrete	10,000m^3	An area of 2Ha to be concreted, average base thickness 500mm.	Building foundations and rafts, and equipment plinths.
Steel Rebar	1,250tonnes	125kg/m^3 of reinforced concrete	Building foundations and rafts, and equipment plinths.
Road Tarmac for Converter Station	1620m^3	0.54Ha of roads 300mm thick	Access to site and buildings.
Resurfacing Tarmac for Access Road	384.5m^3	3845m^2 of road 100mm thick Density of 2tonnes/m^3	Make existing road fit for purpose.
Type 1 Aggregate	3,360m^3	1.12Ha assumed to be 300mm thick	For hardstanding

Concrete, steel, tarmac and aggregates are all finite resources and, as discussed in Chapter 12, have an associated carbon cost. Hence, where possible their use will be minimised and this will be taken into account during the detailed design process.

Concrete will be either mixed on site utilising mobile plant operated under its own PPC license, or ready mixed concrete will be brought in from a local supplier.

Where practicable, recycled material will be utilised. Steel is commonly recycled and at least a proportion of the steel will be recycled. The use of material 'won' onsite will assist in reducing environmental impacts. Section 14.5.1 provides additional detail on the design process and material sourcing principles to be employed by the project.

In addition to the bulk materials detailed in Table 14.4.2, there will be wide range of additional items such as culvert pipes, drainage pipework, kerb stones, road furnishings, etc.

14.4.1.4 Buildings

As discussed in Chapter 2 the buildings will be a steel frame with cladding construction, it will be built during the Civil & Structural works completed in Phase 3 of construction. Table 14.4.3 provides estimates of the bulk building material requirements.

Table 14.4.3: Building Bulk Components

Material	Quantities	Assumptions	Use
Hot Rolled Steel	1450tonnes	Estimate based on concept design.	Building Primary Steel
Cold Formed Steel	230tonnes	Estimate based on concept design	Purlins and sheeting rails
Red granite	$1510m^3$	7551m2 area of walls to be clad, 200mm thick.	Cladding
Translucent Cladding	$8165m^2$	Area of walls to be clad.	Cladding
Sedum Roof	$18800m^2$	Area of the roof.	Roofing material

As discussed in Section 14.4.1.2, steel is a finite resource and recycled steel should be utilised as far as practicable. Volumes required will be minimised through the design process.

Red Granite was identified during the consultation process as being the favoured material for the cladding. Although this is a finite resource it is a local material and, as such, will have low associated transport distances, keeping the carbon cost down.

The sedum roof is a sustainable material. It was selected to aid in making the building blend into the existing natural environment as discussed in Chapter 10. However, it has the additional benefits of contributing to the local ecology (Chapters 7: Ecology & 8: Ornithology) and utilising or at least attenuating rainwater, thereby reducing the drainage requirements for the site.

14.4.1.5 Cable and Equipment

The HVAC cable route is 1.7km long, however, there are six cables and hence a total of 10.2km of armoured copper cabling will be required. The cable materials are finite resources and, as such, the cable route has been optimised to take account of environmental constraints but also to minimise the route length. The HVAC cable will be installed during Phase 3 of construction.

The electrical equipment will include a range of materials selected for their electrical and thermal properties. Many of these will be finite resources, the design process will optimise the component requirements.

14.4.1.6 Fuels, Oils and Chemicals

To refuel plant items during construction, there will be a requirement for a mobile fuel bowser to be on the site throughout the construction period. The volumes of diesel required have been estimated, as discussed in Chapter 12: Air Quality, to be 127,500 gallons throughout construction. Hence, at peak times up to 1100 gallons – 5,000 litres of fuel a day may be required. A range of oils and chemicals will be required for machinery and maintenance, including hydraulic oils.

14.4.1.7 Waste

Wastes arising during construction will include:

- Domestic wastes from welfare facilities: food, paper, plastics etc.;
- Office wastes: paper, printer cartridges etc.;
- Packaging from materials delivered to site: pallets, cardboard, plastics etc.;
- Waste oils and chemicals (hydraulic fluids) from vehicle and equipment maintenance activities;
- Oily rags and spill containment materials from vehicle and equipment maintenance activities;
- Wood from concrete shuttering, scaffolding boards etc.;
- Metal: offcuts of wire and rebar;
- Concrete/cement;
- Cement washings; and
- Silt laden waters including those from wheel washing.

It is not possible to quantify waste arisings at this point, however, early identification of waste types during the detailed design process will inform the mitigation and management.

14.4.2 Operation

During operations and maintenance there will be a very low requirement for resources. These will include electricity, water, office consumables, maintenance parts and various fuels oils and chemicals to operate and maintain the equipment. The latter will require appropriate storage and management to minimise environmental effects. These are discussed in more detail here.

14.4.2.1 Fuels, Oils and Chemicals

If an onsite generator is required to facilitate black starts, then this will most likely be a diesel generator. It is assumed that it will require 5m^3 of diesel to run for 24 hours. The generator will be kept fuelled ready for operation and, in addition, there may be a requirement to store 48 hours' worth of fuel (10m^3) onsite.

The cooling circuit for the converters contains ethylene glycol anti-freeze to prevent freezing in winter if the equipment is out of service. It will be a closed circuit, but it will need to be topped up and maybe fully replaced during maintenance.

Mineral oils are used for insulation and cooling in the SGT's (see Chapter 2). The SGT's will be sealed and hence, once filled, they should only require topping up from time to time. During maintenance there may be complete oil changes, but this will be an infrequent activity. Mineral oils are derived from petroleum which is a finite resource. If oil escapes into the environment it can have harmful effects, especially if it reaches a water course.

14.4.2.2 Wastes

The main day to day waste arising from the operational site will be office and domestic wastes, including paper, glass and plastics, all of which are readily recycled.

Maintenance activities will give rise to a wider range of wastes, including oils and metal components. Where practicable, components will be serviced and repaired to allow reuse in line with the waste hierarchy.

14.4.3 Decommissioning

During the decommissioning phase the construction materials will become waste, however, many of the construction materials will be suitable for reuse. Electrical components can either be refurbished for use elsewhere or, alternatively, they can be broken up and recycled, as the majority of their components will be metals.

The building steel work can be recycled. The red granite cladding and concrete bases and hardstanding could be processed for use as aggregate, either within the reinstatement or on an alternative site.

It is unclear at this stage whether or not the cables will be left in situ or recovered for recycling. This will be determined by the value of the copper at the time and whether or not it is economically feasible to dig the cables back out.

Other materials and wastes arisings during decommissioning are likely to be similar to construction, as they will be associated with the operation and maintenance of plant and equipment utilised.

14.5 Mitigation Measures

The mitigation and management detailed here focuses on the use of resources, correct material storage and waste management. Dust mitigation measures associated with material storage are covered in Chapter 12: Air Quality and hence are not repeated here. Similarly, mitigation in the event of loss of containment is discussed in Chapter 11: Water Quality and, as such, are not repeated here. All mitigation measures are included within Chapter 19: Schedule of Mitigation, which will be taken forward through the CEMD process for implementation on site.

14.5.1 Design

As discussed in Chapter 2: Project Description, once the contract for the design, build and provision of the electrical equipment is in place, the contractor will carry out the detailed design process. There is a possibility through the detailed design process that the components specified require a smaller building envelope than that currently proposed. As such, the building size and associated resource requirements will reduce.

In addition to the scale of the building, the material specifications will be detailed through the design. As with the design process to date, there will be environmental specialist input to ensure that, where possible, resources, along with other environmental effects, are minimised through the process.

Appropriate selection of construction materials will increase the amount of materials suitable for reuse or recycling at the decommissioning stage. Hence decommissioning will be kept in mind through the detailed design process.

14.5.2 Procurement

The procurement strategy for NorthConnect will be rolled down through the contractor and their supply chain. It will include due consideration to sustainability, consideration of components and materials lifecycle cost, including their ability to be recycled. Where possible, materials should be sourced locally to minimise impacts associated with transport to site and to maximise the projects benefits to the local economy (see Chapter 17: Local Community and Economics).

14.5.3 Construction

14.5.3.1 Earthworks

Mitigation measures with regard to material storage are discussed in Chapters 11: Water Quality and 12: Air Quality, and incorporated into the Schedule of Mitigation to prevent silt laden water run-off and dust issues. This will ensure the appropriate material management for soils, glacial till and rock arising.

14.5.3.2 Concrete and Aggregates

There is an opportunity to optimise the concrete and rebar requirements through the design process. The foundations and floor rafts will not be of a uniformed depth, they will be designed within each area to take the weight of the components to be set upon them, thereby optimising the material requirements.

Cement and aggregate materials will be stored as discussed in Chapter 12: Air Quality and detailed in Chapter 19: Schedule of Mitigation. If concrete is to be mixed on site, then it will be under a PPC licence and all conditions of that license will be followed. A dedicated concrete batching area would be setup in an impermeable area at least 10m away from watercourses and drains. Guidance detailed in PPG6: Working at Construction and Demolition Sites (SEPA et al, 2011) will be followed.

14.5.3.3 Fuels, Oils and Chemicals

The fuel bowser will be under strict management controls to prevent pollution incidents, keep it secure and protected from oil thefts, and to comply with the requirements of the oils storage regulations. The fuel bowser will be double skinned, stored in an appropriate area away from watercourse and drains where it cannot be ‘crashed into’. It will be locked when not in use. Refuelling will be carried out in designated areas, by trained operatives following site refuelling procedures. The refuelling procedure will take into account requirements under the oil storage regulations and best practice laid out in Pollution Prevention Guidelines (PPG)2: Above Ground Oil Storage Tanks (SEPA et al, 2010) and PPG6 (SEPA et al, 2011).

Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction. All oils and chemicals will be subject to Control of Substances

Hazardous to Health (COSHH) assessments under the COSHH Regulations (UK Government, 2002). All COSHH assessments will include a section on the environment to highlight any particular precaution or mitigation requirements. Oils and Chemicals will be appropriately stored and managed.

Appropriately bunded oil and chemical storage cabinets will be provided onsite. These will be kept locked, with the key under management control to ensure appropriate use and accountability.

14.5.3.4 Wastes

An appropriate Site Waste Management System (SWMS) will be put in place through the CEMD. It will ensure that appropriate records are kept for all waste arisings including volumes, categories and waste carriers used, and that waste transfer notes will be retained.

The SWMS will be based around the waste hierarchy and, as such, every effort will be made to minimise waste arisings, and to reuse materials on site. Where this is not practicable, the next step down the waste hierarchy is recycling. Recycling will be facilitated by the segregation of wastes. Clearly marked and labelled waste receptacles will be provided in designated areas. Waste receptacles (bins and skips) will incorporate lids or covers to protect against vermin gaining access and wind blowing wastes out of skips. Wastes suitable for recycling are likely to include wood, metals, paper, plastics and oils. Waste oil storage will be of the same standard as that for oils discussed in Section 14.5.3.2.

Solid waste not suitable for recycling will be sent to landfill as waste, or special waste, depending on its constitution. A suitable licensed waste contractor will be employed to collect wastes for recycling and disposal.

The ECoW will carry out regular audits of the SWMS and review details of waste arisings to identify areas for opportunity to reduce or recycle more wastes.

Cement washings will be carried out in a dedicated area. Washing arisings will be collected for onsite treatment. This will include settlement and, if required, pH correction. The liquids will be reused onsite as grey water, if suitable, or disposed of via a consented discharge onsite route, if available. Alternatively, they will be tankered offsite for disposal. The solids will be disposed of as solid waste.

Similarly, silt laden waters will be allowed to settle and the water if suitable reused as grey water, or discharged via a consented routes. Solid arising will be disposed of as solid waste.

14.5.4 Operation

14.5.4.1 Fuels, Oils and Chemicals

All mineral oil containing components including the SGT's will be contained within bunds that can contain 110% of the total volume of oil. The bunds will be designed taking account of PPG2 (SEPA et al, 2010).

14.5.4.2 Wastes

Similar to the construction process, waste management will be incorporated into the Environmental Management System (EMS), to ensure that the waste hierarchy continues to be employed and subject to regular audits.

A selection of appropriate bins will be provided for various waste types to ensure waste is segregated for recycling purposes.

Waste oils arising will be disposed of by an oil waste contractor and, where possible, they will be recycled. Oily rags and waste oils not suitable for recycling will be disposed of as special waste by an appropriately licensed waste contractor.

14.5.5 Decommissioning

Similar to construction, a waste management plan will be put in place for decommissioning, to ensure reuse and recycling of materials is maximised.

Material management and storage will be similar to that employed through construction.

14.6 Summary

Due to the scale of the converter station buildings and associated landscaping, the resource requirements during construction have the potential to be significant. However, the environmental effects have been greatly reduced through the design process by ensuring a cut and fill balance, and through appropriate material selection. The detailed design process and procurement strategy will further reduce the effects associated with the resource requirements.

A SWMP will be incorporated into the CEMD to ensure the waste hierarchy is implemented to the fullest extent, in order to minimise waste effects.

Chapter 15

Traffic and Transport

Contents

15 Traffic and Transport

15.1 Introduction

This chapter considers the effects of road traffic arising from the proposed development focusing primarily on the construction phase, as this is when the majority of traffic movements will occur.

15.2 Sources of Information

15.2.1 National Policy

Advice on transportation is provided within the Scottish Planning Policy (SPP) (Scottish Ministers, 2014b) and PAN75: Planning for Transport (Scottish Executive, 2005). PAN75 provides good practice guidance for planning authorities and developers. One of the objectives of the document is to highlight the linkages between the planning and transportation systems.

The objectives of PAN75 and SPP are to integrate planning and transport at the national, regional, strategic and local level and to promote more sustainable transport choices both for carrying people and moving freight.

15.2.2 Local Policy

The Aberdeenshire Council Local Transport Strategy (LTS) (Aberdeen City and Shire, 2012c) sets out the vision to cater for all transport users across the region. It identifies the key transport issues affecting Aberdeenshire and sets out an approach to ensure that existing resources are used and developed to their full potential. The LTS highlights the main objectives as:

'Promote Sustainable Economic Growth - maximise the effectiveness of the transport network, services and facilities.

Promote Social Inclusion and Accessibility - improve connections within and between communities, increasing accessibility of the transport network.

Protect the Environment - remove barriers to active and sustainable travel helping to improve health and reduce emissions.

Improve Safety - enhance the safety of all users of the transport network.

Improve Integration - develop and improve integration between all forms of transport and improve connectivity within and beyond Aberdeenshire'.

Nestrans is the North East of Scotland Transport Partnership, as set out in the Transport Scotland Act 2005, and is one of seven Transport Partnerships set up across Scotland to provide a co-ordinated approach to transport planning and delivery between different local authority areas. The Nestrans Regional Strategy (Nestrans) and the subsequent Strategy Refresh document (Nestrans, 2013) aim to provide a long term strategy to support and improve the economy, environment and quality of life across Aberdeen City and Shire.

15.2.3 Guidance Documents

Transport Assessment Guidance (Transport Scotland, 2012) provides guidance on the preparation of Transport Assessments for development proposals in Scotland, setting out requirements according to the scale of development being proposed.

The Institute of Environmental Management and Assessment (IEMA) publication Guidelines for the Environmental Assessment of Road Traffic (hereafter referred to as the IEMA guidelines) (IEMA, 1993) sets out a methodology for assessing traffic and transport related environmental effects and has been used in this assessment.

15.3 Assessment Methodology

The methodology used in the assessment adheres to that set out in the IEMA guidelines. In order to define the scale and extent of this assessment, the IEMA guidelines identify the following rules by which to undertake an assessment of potentially significant traffic and transport related environmental effects:

- Rule 1: Include roads where traffic flows are predicted to increase by more than 30% (or where the number of HGVs are predicted to increase by more than 30%).
- Rule 2: Include any specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

15.3.1 Evaluation of Receptors

Research using OS mapping and aerial photographs was carried out to assess the access routes and areas surrounding the site. This was used to identify any receptors that may be affected by the development. The IEMA guidelines define potential receptors as:

- Those that are located alongside the road affected by the development construction traffic; and
- Those that use the roads affected by the development construction traffic.

In terms of defining ‘sensitive’ areas according to the IEMA guidelines, receptors such as schools, churches, hospitals and areas of high pedestrian activity are defined as high sensitivity areas. Table15.3.1 provides the main sensitivity criteria, this classification is based upon subjective judgment, and relative sensitivity to the potential traffic and transportation effects of the proposed development.

Table 15.3.1: Road Receptors Sensitivity

Sensitivity	Criteria
High	Medium to large rural settlements, containing some community and public services and facilities (particularly schools, churches, hospitals, areas of high pedestrian activity), areas with traffic control signals, waiting and loading restrictions, traffic calming measures and minor rural roads not constructed to accommodate frequent use by HGV.
Low	Small rural settlements with no community or public facilities or services (particularly schools, churches, hospitals, areas of high pedestrian activity), areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.

15.3.2 Magnitude of Impact

Overall the magnitude of potential effects is defined in terms of increase in traffic flow, as set out in Table 15.3.1.

Table 15.3.1: Magnitude of Potential Impact

Magnitude	Change in Predicted Traffic Flow
Major	Greater than 90% (greater than 70% when receptor is considered sensitive)
Moderate	Between 60-90% (40-70% when receptor is sensitive)
Minor	Between 30-60% (10-40% when receptor is sensitive)
Negligible	Less than 30% (less than 10% when receptor is sensitive)

According to IEMA guidelines, all minor, moderate and major impacts must be further considered by undertaking a detailed assessment of potentially significant traffic and transport related environmental impacts. The key impacts that must be considered are:

- Severance;
- Driver Delay;
- Pedestrian Delay;
- Pedestrian Amenity;
- Fear and Intimidation; and
- Accidents and Safety.

The criteria used to determine the magnitude of each of the potentially significant traffic-related environmental impacts listed above are based on the advice provided within the IEMA guidelines, summarised in the following paragraphs.

15.3.2.1 Severance

Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. For example, severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities.

The impacts of severance can be applied to motorists, pedestrians or residents. The IEMA guidelines suggest that changes of traffic flow of 30%, 60% and 90% are regarded as producing ‘slight’, ‘moderate’ and ‘substantial’ changes in severance respectively. There are no predictive formulae which give simple relationships between traffic factors and levels of severance.

The IEMA guidelines state that marginal changes in traffic flow are unlikely to create or remove severance, but that consideration in determining whether severance is likely to be an important issue should be given to factors such as road width, traffic flow and composition, traffic speeds, the availability of crossing facilities and the number of movements that are likely to cross the affected route. Consideration should also be given to different groups such as the elderly and young children.

The extent to which additional traffic will exacerbate this problem will be assessed in accordance with Rule 1 (i.e. where traffic flows are predicted to increase by more than 30%) on the A90 and Rule 2 (i.e. where traffic flows are predicted to increase by more than 10%) on the A982. Impacts below the thresholds are considered to be not significant.

No count data was obtained for the local unnamed roads. It is assumed that these roads are very lowly trafficked, so any increase in traffic levels is likely to be significant.

15.3.2.2 Driver Delay

Delays to non-development traffic can occur at several points on the local highway network as a result of the additional traffic that would be generated by a development. The IEMA guidelines state that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.

15.3.2.3 Pedestrian Delay

Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads, and therefore, increases in traffic levels are likely to lead to greater increases in delay. Delays will also depend upon the general level of pedestrian activity, visibility and general physical conditions of the crossing location.

Given the range of local factors and conditions which can influence pedestrian delay, the IEMA guidelines do not recommend that thresholds be used as a means to establish the significance of pedestrian delay, but recommend that reasoned judgements be made instead. The IEMA guidelines do note that, when existing traffic flows are low, increases in traffic of around 30% can double the delay experienced by pedestrians attempting to cross a road.

15.3.2.4 Pedestrian Amenity

Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic.

The IEMA guidelines note that changes in pedestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a beneficial impact and the latter an adverse impact.

15.3.2.5 Fear and Intimidation

The scale of fear and intimidation experienced by pedestrians is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths, as well as factors such as the speed and size of vehicles.

There are no commonly agreed thresholds by which to determine the significance of the impact. The IEMA guidelines, however, note previous work that has been undertaken which puts forward thresholds that define the degree of hazard to pedestrians by the average traffic flow, 18 hour/day heavy vehicle flow and average speed over an 18 hour day in miles per hour.

The IEMA guidelines also note that special consideration should be given to areas where there are likely to be particular problems, such as high speed sections of road, locations of turning points and accesses. Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups.

15.3.2.6 Accidents and Safety

Where a proposed development is expected to produce a change in the character of the traffic on the local road network, as a result of increased HGV movements for example, the IEMA guidelines state the implications of local circumstances or factors which may elevate or lessen risks of accidents, such as junction conflicts, would require assessment in order to determine the potential significance of accident risk.

15.3.3 Significance Evaluation Methodology

The sensitivity of each receptor and magnitude of potential change will be compared to determine the overall significance of the effects, as outlined in Table 15.3.3. Effects classified as major or moderate are considered to be significant.

Table 15.3.3: Significance of Potential Effects

Magnitude of Impact	Sensitivity of Receptor	
	High	Low
High	Major	Moderate
Medium	Moderate	Minor
Low	Minor	Negligible
Negligible	Negligible	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

In the absence of established significance criteria for traffic and transport impacts, professional judgment has been used to assess whether the impacts on traffic and transport are considered to be significant, using the IEMA guidelines to identify the scale and extent of the assessment to be undertaken. The IEMA guidelines state that:

'[..] for many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources'.

The IEMA guidelines also state that:

'[…] the detailed assessment of impacts is…likely to concentrate on the period during which the absolute level of an impact is at its peak, as well as the hour at which the greatest level of change is likely to occur'.

15.3.4 Data Sources

The following data sources were used to inform this assessment:

- Permanent Automatic Traffic Counts (ATC): two, annual classified counts were obtained from the Department for Transport (DfT).
- Personal Injury Accident (PIA) data for the study area were obtained from Crashmap.co.uk and have been used to determine if there is a history of accidents in the area.

15.3.5 Consultation

Aberdeenshire Council were consulted in regard to the access routes for the proposed development through the A90 and A982. In their response they propose that transport and traffic issues including road safety and impact on local road network during and after construction should be addressed as part of the ES.

Aberdeenshire Council also acknowledged that the proposed routes for deliveries and personnel using the A90, A982 and passing the harbour are all A-class roads and should be capable of handling any additional traffic during construction, and that the effects of the development in the longer term will be very limited for the road network.

15.4 Baseline Information

The A90 is the major north to south road in eastern Scotland, running from Edinburgh to Perth in the form of the M90, then as the A90 to Dundee, through Aberdeen, around Peterhead to Fraserbourgh. All deliveries and personnel travelling to the site from the north or south will utilise the A90.

In addition the A982 out of Peterhead passing the harbour, will be utilised to transport materials which are delivered by sea, and potentially personnel from the town. The A982 is a single carriageway two-way road with a 40mph speed limit as it approaches the town, with footways on both sides.

There is also a network of local roads allowing access to residential properties, farms, farmland and industrial units around the proposed site. These roads are unnamed, single track roads without pedestrian footways, but offer a number of alternate access routes to the A90.

Sections of the old A90, decommissioned when the road was upgraded, are used as lay-by facilities. One is located east of the Fourfields site between the quarry entrance and Stirling Village, and another immediately east of the existing electricity substation, both on the northbound carriageway of the A90.

15.4.1 Routing Assumptions

General construction materials are proposed to be transported to the converter station site utilising standard HGV's, via the A90 which runs to the east of the site. This includes vehicles with the following maximum sizes:

- Weight: 44 tonnes for lorries with 6 axles with axle load not greater than 10.5 tonnes; or 40 tonnes for lorries with 5 axles with axle load not greater than 11.5 tonnes;
- Length: 12 metres for a rigid vehicle; 16.5 metres for an articulated vehicle; or 18.75 metres for a road train;
- Width: 2.55 metres excluding driving mirrors; and
- Height: No limit, but 4.95 metres should be adhered to in order to make maximum use of motorway and trunk road networks.

NorthConnect have agreed with Breedon Aggregates use of their quarry access road, from the A90 to the east side of Fourfields. The existing culvert on the middle of the eastern boundary of Fourfields will be upgraded to an appropriate road width and strength to provide access onto the main construction site.

The main entrance/exit of the quarry is from the A90 southeast of the quarry and converter station location, the driving distance is approximately 550m between the entrance at the A90 and the converter station site (Drawing 3019). There is also a back entrance to the quarry accessed from the local unnamed roads, west of Lendrum Terrace. The quarry no longer use this for routine access and there is no intention for NorthConnect to utilise this route.

Larger sections of electrical equipment will be shipped into Peterhead Harbour and then transported directly to the construction site. This includes four transformers, each requiring abnormal load transport. The assumed route for the abnormal loads carrying transformer units is: Smith Quay, Peterhead Harbour - Bath Street - Charlotte Street - Kirk Street - A982 - A90 – Turning right into quarry access track. This route is illustrated in Drawing 3024 and a swept path analysis has been carried out in order to check the extent of the abnormal load transporters will not interfere with walls, buildings, trees and other constraints as they travel along the roads and sweep around corners.

In order to gain access through the quarry it has been assumed that minor improvement works, including widening of junction with the A90, localised strengthening/repair and probably resurfacing of the quarry service road will be required. The extent of these improvement works will be agreed with Breedon Aggregates to roads owners. The rest of the route from Peterhead harbour has been assessed as suitable for the transport of abnormal loads (including preliminary discussions with representatives of Transport Scotland's Operating and Maintenance company) and, other than the temporary movement of some street furniture, no other road upgrades will be needed.

Delivery of abnormal loads will need to be arranged with a police escort at suitably quiet times of the day/night or week in accordance with normal protocols (Transport Scotland, 2007).

15.4.2 Existing Traffic Flows

In order to establish the baseline situation, traffic survey data were sought along the road network in the vicinity of the development site. Average Daily Traffic Flows (ADTFs) for the period 2009-2013 have been obtained from the DfT (DfT,2014). This data provides a daily average flow of the number of vehicles passing a point in the road network each day averaged over a four-week (Monday to Saturday) period in a neutral month.

Aberdeenshire Council has two existing permanent traffic count points nearby, providing daily traffic flow data. The location of those can be seen in Drawing 3143.

- Count Site 1 - (CP 20803) is located south of the proposed site on the A90 between the junction with the A975 (just south of Longhaven) and the junction with the A982 (into Peterhead); passing the proposed access point to the converter station site. Traffic is counted over a length of 6.2km.
- Count Site 2 - (CP 80574) is located north of the proposed site, on the A982. This is the route in and out of Peterhead, to access the port. Traffic is counted over a length of 2.4km.

The traffic data is for a 24 hour period, the traffic levels for the last 5 years of data (2009-2013) is relatively steady, hence an average of that data is provided in *Table 15.4.1*.

No pedal cycles have been counted at Count Site 1 on the A90 since 2005, daily numbers at Count Site 2 average 22 a day. The A90 is a busy, fast road so it is not all that surprising that cyclist avoid it, the Formartine & Buchan Way heads east from Peterhead to Maud with the option to head north to Fraserburgh or south to Ellon and Dyce, these routes are much less direct that the A90 but offer a safer more relaxing cycling option (Aberdeenshire Council, 2014).

Table 15.4.1: Average Daily Travel Numbers for (2009-2013) (Department for Transport, 2014)

Survey Location	Motor Cycles	Cars & Taxis	Buses & Coaches	Light Goods Vehicles	Heavy Goods Vehicles (HGV)	Total Traffic
Count Site 1 - A90	10	6534	133	1096	814	8587
Count Site 2 - A982	37	7781	89	1474	570	9951

No traffic flow information is avaiblefor the unclassified road which the AC cable route crosses. Flows are expected to be small and associated with residents of Lendrum Terrace and the other rural properties in the immediate vicinity, and potentially recreational visitors to the Den of Boddam and the Stirling Hill Access Network paths.

15.4.3 Personal Injury Accident Data

PIA’s are road traffic accidents where either slight, serious or fatal injuries to people have been recorded. The data would generally include such information as the location of the accident, number of casualties, modes of travel involved, age and gender of those involved and factors contributing to the accident.

Recorded PIAs were obtained from Crashmap (2015) which uses data derived directly from the Department for Transport published sources. Data was obtained for the road network surrounding the proposed site for the three years 2011 and 2013. The accident assessment area is illustrated in Drawing 3143.

The recorded PIAs were reviewed in order to determine whether there is a history of accidents in the vicinity of the development site. The results are summarised in Table 15.4.2 below.

Table 15.4.2: Summary of PIA Data

Years	Severity of Injury		
	Slight	**Serious**	**Fatal**
Section 1 - A90 (from junction with A975 to junction with A982)			
2011	3	0	0
2012	3	2	0
2013	3	0	1
Total	**9**	**2**	**1**
Section 2 - A982 and Approach to Harbour			
2011	2	1	0
2012	1	0	0
2013	1	0	0
Total	**4**	**1**	**0**

Source: (Crashmap, 2015)

Table 15.4.2 shows a total of 17 accidents were recorded during the three year period in the survey area. Of these, 13 were classified as 'slight' and three classified as 'serious'. The fatal accident involved a pedestrian and a goods vehicle and occured on the A90 just north of the B9108 into Boddam

Two accident hotspots have been identified in the area, one in the junction between the A90 and the B9108 in Boddam which registered three accidents between 2011 and 2013 including the fatality just to the north of the junction, the other hotspot is also on the A90, the 1km stretch from the A90/A982 roundabout south to the turning for Newton there have been 3 slight and one serious accident in this area in the three years considered.

15.4.4 Sensitive Receptors

The A90 is considered to be of low sensitivivity due to the fact that there are no receptors such as schools, churches, hospitals and areas of high pedestrian activity located along the route. The A982 however, is considered to be of high sensitivity due to a hospital and recreational area on the approach to Peterhead.

The receptors along the local road located to the north of the converter station site, namely Highfields, Whinbush, Denend and Gateside are classed as low sensitivity according to IEMA guidelines criteria.

The Quarry Access road is a not a public road and as such is not considered in terms of increase in traffic useage, however, it is noted that public footpaths cross the route and, as such, pedestrian safety should be considered. Chapter 17: Local Community and Economics provides more information on the paths in the area. The sensitivity of the Quarry Acces Road, in terms of pedestrians, is conservatively assumed to be high.

15.5 Impact Assessment

15.5.1 Construction

15.5.1.1 Additional Vehicle Movements

At the peak of construction a predicted maximum of 200 people (staff and site management) will work on the site, whether they are coming from the north or south of the site they will all travel along the A90. Although car sharing and use of employer transport will be encouraged (car/minibus from Peterhead), in order to assess potential traffic increase under a worst case scenario, it is considered for the sake of the assessment that everyone is to drive to site in individual cars. Hence, there would be an additional 400 car movements on the A90 each day, an increase in traffic of <5% in relation to average 8587 vehicles that the road supports at the Count site 1. Details are shown Table 15.5.1.

Predicted HGVs movements over the 35 month construction and commissioning period, are shown in Table 15.5.2 for various stages of the project. Whilst allowing for processing the majority of aggregates from site won material (principally excavated rock), there are expected to total in the region of 1491 deliveries (2982 movements). This includes 1000 deliveries (2000 movements) which could be avoided if the local quarry is utilised for the provision of non-site process aggregates and concrete. The maximum number of HGV movements in one day will be 80 (40 deliveries), increasing HGV movements on the A90 by 9.83% a day as shown in Table 15.5.1, but this could be as little as 5 deliveries and 10 movements a day if Stirlinghill Quarry is utilised to supply aggregates and concrete, equivalent to only a 1.23% increase, as shown in Table 15.5.1.

It can be concluded that the expected increase in traffic impact magnitude will be negligable, as all traffic increase will be below 10%, the significance of effects on all receptors are therefore negligable and not significant.

15.5.1.2 Abnormal Loads

There will be a handful of extremely large components, including four transformers which will have to be shipped by suppliers to Peterhead, and moved to site on specialist vehicles requiring the A90 to be closed with an arranged police escort. It can be assumed that the four deliveries required will be spread over a number of weeks and carried out during quiet hours (probably night time at weekends). The transport activities will be planned and agreed with Aberdeenshire Council, Transport Scotland and the Police, and road users appropriately notified in advance. Overall the impact magnitude is low, as they are large movements, they should have a low increase in delays for a short period and they should not pose safety risks to road users. The effect significance is deemed Minor on the A982 and Negligable on the A90, neither of which is significant in EIA terms.

Table 15.5.1: Predicted Percentage Impact at Traffic Count Locations

Survey Location	Baseline Total Vehicles	Baseline HGVs	Construction HGVs	Ancilliary (vans, etc.)	Private Cars	% Impact HGVs	% Impact Total Vehicles
Count Site 1 - A90*	8587	814	80	30	160	9.83%	3.14%
Count Site 1 – A90* (assuming aggregates/concrete supplied from Stirlinghill Quarry)	8587	814	10	30	160	1.23%	2.33%
Count Site 2 - A982*	9951	570	0	0	240	0%	2.41%

***It is assumed that 60% of construction staff are traveling from Peterhead and 40% of construction staff and 100% of materials and deliveries are from the south via the A90.**

Table 15.5.2: Predicted Total Vehicle Movements for Construction

Construction Stage	Duration of Stage (wks)	Vehicle Type				Total
		HGV's	Ancilliary (vans, etc.)	Private Cars	Abnormal Loads	
Access roads	3	180	90	60	0	330
Soil strip, platform and Stage 1 bunding	32	40	770	6930	2	7742
Converter Main build and AC cable installation	60	2650	3630	32670	6	38950
Equipment Installation and Commissioning, Stage 2 bunding and reinstatement	28	112	818	7362	0	8292

15.5.1.3 Quarry Access Road – Pedestrian Impacts

The traffic volumes on the quarry access route will increase condsiderably during construction periods, however, this is a private access road and, as such, there will be no impacts on general road users. The access to Fourfields will, however, cross a footpath and hence temporary impacts on pedestrians during construction need to be considered, see Table 15.5.3.

Table 15.5.3: Impacts on Pedestrians in the Vicinity of the Quarry Access Road

Impact	Magnitude of Impact	Comment
Severance	Negligible	The paths are primarily utilised for recreation and do not provide obvious links between areas of the local community. As such, the community is unlikely to be subject to severance by the development.
Driver Delay	Negligible	The only other users of the road will be Stirlinghill Quarry and the road upgrade will ensure that there are appropriate marked places for passing to avoid driver delays.
Pedestrian Delay	Low - Medium	Pedestrians may need to wait while vehicles pass before they can cross the road. The magnitude will vary with time of day, for example, the start or end of the working day will give rise to a higher volume of vehicle movements.
Pedestrian Amenity	Medium	The number and size of vehicles moving during construction are such that impacts on amenity including noise and dust are not low.
Fear and Intimidation	Medium	Although vehicles will be slow moving, some will be large and noisy which could be intimidating to some.
Accidents and Safety	Low	All vehicles will be slow moving, there is good visibility on the route and pedestrians will be able to hear vehicles coming, all of which reduce the accident risk. The route is utilised by dog walkers, hence there could be concern with regard to risk to dogs, especially if they are not under close control/on a leash.

Assuming a high sensitivity of the quarry road the effect significance is negligable to moderate giving rise to a significant effect in EIA terms.

15.5.1.4 Un-named Road Closure

During HVAC cable laying the construction movements will be within the 45m construction corridor. The HVAC cable route has to cross the unnamed road to connect into the substation. As described in Chapter 2, the road will be shut for a maximum of 2 weeks. The excavated road surface will be reinstated to at least its former quality at the end of the works. Access from the A90 to all properties will be maintained throughout the works, although there will be no through route during the road closure. As the route runs along the boundary of agricultural land next to the lane, arrangements will be made with the landowners to allow farm vehicle access across the cable working route at certain locations. Pedestrians or walkers will also be able to use the same crossing points. These areas will have appropriate barriers, signage and plant management arrangements in place to ensure no hazardous interaction between pedestrian and construction plant movements can take place. Due to the short period of the works, the impact magnitudes will be negligible to low, with effect significance being negligible and not significant in EIA terms.

15.5.2 Operation

During operations there will only be a few vehicles on site each day, and this will increase slightly during planned maintenance. Large vehicle access would only be required in event of a component failing and needing to be replaced. This is a very infrequent occurrence and would be managed in the same way as deliveries during operations. It is considered that the magnitude of impacts from operational traffic on all receptors will be negligible, hence the significance of effects are negligible and not significant in EIA terms.

15.5.3 Decommissioning

In effect, decommissioning will be the reverse of construction, requiring various components and building materials to be removed from the site. Vehicle movements arising can be expected to be less than that associated with construction due to the retention in situ of some elements of the infrastructure like cables.

Decommissioning would not occur before 60 years, hence it is not possible to predict traffic levels and road status at that point hence an assessment of effects cannot be completed at this point. However, it is assumed that it will not be greater than that of construction.

15.6 Mitigation Measures

One significant effect has been identified and mitigation measures focussed on reducing impacts on pedestrian utilisation of the quarry road are as follows:

- A Safety Committee will be established including Stirlinghill Quarry operators: Breedon Aggregates and other appropriate groups, for example the Boddam Community Association whom look after the Stirling Hill Access Path Network, to assist in the management of issues such as pedestrian safety (see Chapter 17);
- NorthConnect will work with Breedon Aggregates, the owners of the road, to develop safe crossing points for pedestrians;
- It is proposed that, to avoid pedestrian delays, pedestrians will have priority at the crossings in the way a ‘zebra crossing’ works;

- Speed limits will be put in place and compliance with them will be monitored;
- Proper transport of materials will be employed, e.g. vehicle loads will be enclosed or covered with tarpaulin to restrict the escape of particulate matter;
- Loads will be appropriately strapped down;
- Road sweeping will be carried out as required, in order to keep the site entrances and the approach routes used by construction vehicles free from vehicle deposits and debris;
- Wheel and vehicle body washing facilities will be provided if deemed necessary to keep the site entrances and routes used by construction vehicles free from vehicle deposits and debris; and
- Appropriate signage will be employed to make drivers and pedestrians aware of each other.

In addition the following mitigation will be employed to further reduce traffic and transport impacts.

A Traffic Management Plan (TMP) will be produced as part of the Construction Environmental Management Documentation (CEMD), detailing environmental measures aimed at minimising adverse environmental impacts associated with traffic and transport during construction. The TMP will be agreed between the developer, the contractor, the local highway authority and any other relevant parties prior to the start of construction. The TMP will include details on a series of aspects relating to traffic and transport issues during the construction stage of the project, including:

- Car parking layout;
- Measures to encourage multi-occupancy of vehicles bringing construction personnel to site, e.g. minibuses provided by contractors, car-sharing scheme, etc.;
- Temporary road signage requirements;
- Off-loading proposals;
- Construction traffic routing and timing of deliveries; and
- Liaison details between local residents, NorthConnect, its contractors and local police, including the scheduling of major traffic movements to reduce impact on local residents where possible.

Other mitigation measures will include the following:

- All construction vehicles and site personnel will be instructed to use only the approved access routes to the site;
- Construction plant, equipment and vehicles will be parked onsite. No vehicles associated with the proposed development will be parked on the public roads;
- All abnormal loads and any other suitable loads will, where practicable, be transported to the site via Peterhead port, reducing the distance they would have to be transported by road and reducing the burden on trunk road and motorway networks;
- Following discussion and agreement with the local highway authority, appropriate information and signs will be provided on the approach to the proposed site access;
- Similarly, appropriate barriers, signage and arrangements will be provided in areas where pedestrian interaction may be anticipated;
- The police will be notified when abnormal loads (i.e. transformer units) are being transported; and

- Tool box talks will be given to construction workers and drivers to remind them of the importance of following the highway code, curteous driving and to highlight the the need to take care especially at accident hotspots (see Section 15.4.3).

15.7 Residual Effects

Taking into account the mitigation measures identified in Section 15.6, the magnitude of impacts on the Quarry Access Road is reduced for Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation from medium to low, resulting in minor effect significance. For accidents and safety, the impact magnitude reduces from low to negligible giving rise to negligible effect significance. With mitigation employed there are no significant residual effects.

15.8 Cumulative Effects

As discussed in Chapter 18, there is a potential for cumulative impacts with the planned 400kV Substation and the Energetica Industry Park during the construction phase. Both of which are considered within this section.

15.8.1 400kV Substation

Cumulative effects will only occur if the construction periods overlap. SHETL obtained full planning permission on the 13th of June 2014. Their permission requires them to begin development within 5 years of the consent being granted, and hence they must start by June 2019 (Aberdeenshire Council, 2014a). However it is understood that they are planning to start construct in 2017 and will complete in 2019 as such there would be no overlap between the projects as NorthConnect don’t plan to construct until late 2019 at the earliest.

The worst case scenario is that construction of the substation is delayed and there is an overlap with the two projects. Their peak vehicle volumes are 30 heavy vehicles and 50 light vehicles a day (URS, 2014). Assuming all of these travel from south of both sites up the A90 then, the total increase in traffic flow on the A90 would be 4.07% which is not significant.

15.8.2 Energetica Industry Park

The Energetica Industrial Park has outline planning consent, it is currently unclear the timeframes for construction. Once constructed it is assumed that unlike the NorthConnect Converter Station and the 400kV Substation that there will continue to be an increase in traffic associated with the site once it is operational. Hence if it is assumed that construction is started on the Energetica site prior to the NorthConnect starting construction then there will be a cumulative effect associated with traffic from both projects during the NorthConnect construction phases.

Assuming both phases of the Industry Park are operational, it is predicted that there will be 730 car movements each day (WSP, 2010). Worst case scenario is that all of these travel on the A90 from south of NorthConnect site, the total increase in traffic at the peak of construction would be 1000movements, this is an 11.6% increase in existing traffic volumes, this is not deemed to be significant.

15.8.3 Additive Effects

The worst concieveable case would be for the Energetica Industrial Park to have both phases operational and for the 400kV substation and NorthConnect to be constructing at the same time. This would give a total increase in traffic levels by 1080 vehicle movements, if they were all to travel from the south of the NorthConnect site up the A90, traffic volumes on the A90 would increase by 12.58%. This is below the 30% level demed to require detailed assessment by IEMA (1993). The effect would be temporary and not significant.

15.9 Summary

Traffic flow data was obtained at two traffic count sites in the vicinity of the proposed development, one on the A90 to the south and the other on the A982 in Peterhead to the north. The traffic flow calculated has averaged the data available within the period 2009-2013.

It is not expected that the traffic flow on the road network under consideration as a result of the construction of the development will be increased by more than 30% along low sensitivity areas (A90) or 10% on high sensitivity areas (A982). Therefore, further detailed assessment of the traffic effects on the identified receptors has not been deemed as necessary.

Significant effects associated with the Quarry Access Road and pedestrian users were identified. Appropriate mitigation can be employed to manage the effects down to not significant levels.

Only a minimum number of vehicles will be on site each day during the operation stage, these will be associated with the transport of permanent personnel working at the converter station. A very low volume of HGVs will be attending site as part of planned or unplanned maintenance operations, so overall the traffic associated to the operation of the facilities will represent a negligible effect on the road network in respect to baseline conditions.

This assessment has determined that the impact of traffic levels associated with the decommissioning stage cannot be predicted at the current time, as it is not possible to assess traffic levels and road status in sixty years, which is the expected operative period for the facilities.

Cummulative effects that could occur during the construction phase have all be deamed to be not significant.

A summary of all the potential impacts derived from traffic flow associated to the development is included in Table 15.9.1.

Table 15.9.1: Summary of Traffic and Transport Effects

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Construction							
Increase in HGVs along A90	Low	Negligible	Negligible	No specific mitigation required. Best practice and TMP.	Negligible	Negligible	Not significant
Increase in general traffic along A982	High	Negligible	Negligible	No specific mitigation required. Best practice and TMP. Encouragement of car sharing for staff and use of company transport.	Negligible	Negligible	Not significant
Abnormal Loads along A982 and A90	High/Low	Negligible	Negligible	No specific mitigation required. Best practice recommends abnormal loads delivered to port to minimise distance travelled by road. Escort during quiet hours, with advanced warning	Negligible	Negligible	Not significant
Quarry Access Road – Pedestrian Impacts	High	Negligible – Medium	Negligible to Moderate	Safe, pedestrian priority crossing points. Speed limits. Dust management techniques. Good signage.	Negligible to Low	Negligible	Not Significant
Un-named road temporary closure	Low	Low	Negligible	No specific mitigation required. Best practice and TMP.	Negligible	Negligible	Not significant
Operation							
Increase in general traffic along A90	Low	Negligible	Negligible	No specific mitigation required	Negligible	Negligible	Not significant
Decommissioning- Effects from decommissioning will need to be assessed nearer to the time of decommissioning to take into account of traffic conditions.							
				Key		Significant effect	

Chapter 16

Electric and Magnetic Fields

Contents

16 Electric and Magnetic Fields

16.1 Introduction

The proposals do not give rise to any significant environmental effect due to Electric and Magnetic Fields (EMF), as such this chapter does not provide a full impact assessment, rather it provides information on what EMF is and discusses the effects in qualitative terms.

16.2 Sources of Information

There is no specific legislative requirement in terms of EMF and EIA assessment and within the UK there are presently no statutory regulations to limit the exposure of people to power-frequency electric or magnetic fields. There are, however, some sources of relevant advice regarding exposure to EMF, although these primarily relate to AC cables. These are outlined below:

- National Radiological Protection Board (2004). Advice on Limiting Exposure to Electromagnetic Fields (0-300 GHz). Documents of the National Radiological Protection Board (NRPB), Volume 15 No 2 2004;
- European Commission (1999). Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) EU Recommendation 1999/519/EC. L199/59. 30.7.1999.
- International Commission on Non-Ionising Radiation Protection (1998). Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). Health Physics April 1998, Volume 74, Number 4:494-522; and
- Department of Energy & Climate Change (2010). Power Lines: Demonstrating compliance with EMF public exposure guidelines. A Voluntary Code of Practice. January 2010.

16.3 Introduction to EMF

16.3.1 Electric Fields

Electric field strength is an expression of the intensity of an electric field at a particular location. The standard unit is the volt per meter. Field strength of 1 V/m represents a potential difference of one volt between points separated by one meter. Electric fields are produced by voltage. The cables between the Converter Station and the SHETL- substation are at AC voltages only. AC voltages produce alternating electric fields and DC voltages produce static electric fields.

The observer can be assumed to be at earth potential so is effectively screened from electric fields if there is an earth between them and the source.

Electric fields are easily screened by trees and buildings. Metal clad Building structures act as a Faraday cage i.e. an earthed metal box and hence effective screen for electric fields generated within the substations and Converter Station. Buried cables are covered by earth and therefore provide no electric field.

16.3.2 Magnetic Fields

Magnetic Fields are produced by electric current flow. Magnetic Fields are not easily screened and can pass through building and cable screens.

AC currents produce alternating magnetic fields and DC currents produce static magnetic fields. HVAC systems use three conductors, cables with a phase displacement of 120 degrees between the currents. If the observer is at an equal distance from the three conductors the resulting magnetic field is zero. Where the outgoing and return paths of a DC circuit are in close proximity, magnetic fields cancel within relatively short distances. For example, if the positive and negative cables are buried in the same cable trench, the magnetic fields generated will be minimal.

Magnetic Fields are measure in Tesla (symbolized T) is the standard unit of magnetic flux density.

16.4 Baseline Information

16.4.1 Electric Fields

Existing sources of Electric fields in the area include, the existing Peterhead substation and overhead electricity cables, these are AC. The electric fields associated with the substation are likely to be screened by the building structure.

16.4.2 Magnetic Fields

The Earth provides a background static magnetic field which in the Peterhead area is approximately 50,000nanotesla (nT).

Existing overhead AC cables will give rise to magnetic fields.

16.5 Impact Assessment

16.5.1 Construction

There should be no significant sources of electric or magnetic fields onsite during construction works.

16.5.2 Operation

16.5.2.1 Electric Fields

Within the Converter Station there will be AC voltages and DC voltages and hence both alternating and static electric fields. The converter building will be constructed as a Faraday cage. This contains the electric fields produced by voltages within the building and also prevents radio interference from the converters escaping to interfere with public systems.

The AC voltages will be at 400kV in the connections from the SSE substation through the switchgear within the Converter Station to the converter transformers. An as yet to be defined but similar voltage will be present on the connections from the transformers to the converters.

The DC voltages will be in the converters, the DC equipment, connections to the DC cables, and in the DC cables themselves.

The connections from the Peterhead substation are to be by buried cable with an earthed screen. As these cables are in the ground then the outside of the cable will be at earth potential and the electric field will be contained within the cables. The switchgear is to be GIS which is contained within an earthed metal box; hence the electric field will be contained within the box. The connections from the switchgear to the transformers will also be by cable with a grounded screen; hence the electric field will be contained within the cables. The transformers are within earthed steel boxes so again, the electric fields will be contained within the boxes. The connections from the transformers will be open busbars similar to overhead transmission lines.

16.5.2.2 Magnetic Fields

Within the Converter Station there will be DC currents and AC currents and hence both static and alternating magnetic fields. The converter building will be constructed as a Faraday cage; however this provides little or no attenuation to the magnetic fields.

The AC currents will be in the connections from the SHETL substation through the switchgear within the Converter Station to the converter transformers. As the loading of the three phase AC circuit will be balanced net magnetic field at a remote location will be zero. Closer to the equipment, the degree of cancellation will depend on the location of the observer. At the boundary fence of the Converter Station the net magnetic field will be similar or less than 18,000nT, less than 1/2 of the magnetic field of the earth.

The largest magnetic fields will be produced by electrical coils where the multiple turns amplify the field. These coils exist in the transformers and reactors of the converters. Magnetic fields in transformers are contained within the transformer by use of iron cores, but there will be several air cored reactors producing uncontained magnetic fields. The proximity of the three phases of reactors and the clearances to walls, and hence to operations and maintenance staff is carefully controlled primarily to limit induced currents in structural steelwork, but this as a side effect limits the exposure of staff to high magnetic fields.

The DC current will be in the converters, the DC equipment and connections to the DC. These are within the converter building in areas where access is not permitted when the Converter Station is “live”. Clearance from live conductors to the walls must be in excess of 5m hence operations and maintenance staff inevitably must be at a distance greater than 5m. Where the “go” and “return” paths of the current in the converter system are so remote from each other that the cancellation effects are minimal, at 5m from any conductor the magnetic field is approximately 57,000nT, i.e. slightly higher than the local magnetic field of the Earth.

The connections from the SHETL substation to the Converter Station are to be by buried cable. The three cables, one for each phase, will be in a single trench and close together. The cables will carry ac current, so the magnetic field generated by each cable will be continuously varying as a sine wave with a frequency of 50Hz. As the loading of the cables will be balanced and the phase angles of the cables will be displaced one from the others by +/-120 degrees, the net magnetic field at a remote location will be zero. The cables will be buried at a depth of 1.5m or greater. The highest magnetic field at ground level will be approximately 18,000nT and at 1.5m above the ground this will be reduced to approximately 12,000nT, i.e. less than 1/3 of the magnetic field of the earth [Barrett, 2014, 2014.03.28_NorthConnect_TEC_REP_E&MFields]

The NRPB; now the Health Protection Agency (HPA) has published Advice on Limiting Exposure to Electromagnetic Fields (NRPB, 2004). Magnetic fields are often linked to increases in childhood leukaemia, the NRPB suggest that the evidence is not strong enough to justify a firm conclusion. The epidemiological evidence available is with regard to magnetic fields of above 400,000nT.

The public exposure to magnetic fields associated with NorthConnect is an order of magnitude lower than those that may have an effect on human health.

16.5.3 Decommissioning

There should be no significant sources of electric or magnetic fields onsite during decommissioning.

16.6 Mitigation Measures

No secondary mitigation is required as there are no significant effects.

16.7 Conclusion

The building design is such that it will operate as a faradays cage and the HVAC cables are appropriately buried, as such no significant EMF effects will occur. Magnetic fields will be of similar magnitude to or less than that of the Earth.

Chapter 17

Local Community and Economy

Contents

17 Local Community and Economy

17.1 Introduction

This chapter describes the baseline of the socioeconomic conditions, identifies potential impacts and assesses the significance of effects which may arise from the construction, operation and decommissioning of the project. Where required, mitigation measures to avoid, reduce or offset potential adverse effects or further enhance potential beneficial effects are identified.

17.2 Sources of Information

This assessment has been undertaken based on standard EIA guidance and practices. The primary resources for the data within this section are the Scottish Neighbourhood Statistics (Scottish Government, 2015a) and National Records of Scotland Scottish Government' (Scottish Government, 2015b) websites, along with Aberdeenshire Council population statistics (Aberdeenshire Council, 2012e).

17.3 Assessment Methodology

17.3.1 Sensitivity of Receptor

Standard EIA methodology has been applied in terms of assessing the sensitivity of receptors, the magnitude of any potential impact and the resulting significance of effect. Terminology and approach has followed the process as set out within Chapter 3: Methodology. Table17.3.1 shows the criteria applied within this chapter to determine the sensitivity / value of receptors.

Table 17.3.1: Sensitivity of socioeconomic receptors

Sensitivity	Definition
International	International effects on socioeconomics, tourism or recreation
National	Effects on Scotland
Regional	Effects on the Aberdeenshire region
High Local	Effects on the Buchan area
Moderate Local	Effects on neighbouring villages e.g. Boddam, Longhaven
Low Local	Effects in the immediate vicinity and rural residences, Lendrum Terrace, Stirlinghill

17.3.2 Magnitude of Impact

Table 17.3.2 provides definitions with regard to the magnitude of impacts for socioeconomic receptors.

Table 17.3.2: Magnitude of Impacts for Socioeconomic Receptors

Magnitude of Impact	Definition
High	A permanent or long-term effect on the socioeconomics, tourism or recreation. If adverse in nature, this is likely to threaten the sustainability of the area. If beneficial, it is likely to enhance the area.
Medium	A permanent or long-term effect on the socioeconomics, tourism or recreation. If adverse in nature, this is unlikely to threaten the area's sustainability. If beneficial, it is likely to be sustainable, but not enhance the area.
Low	A short-term but reversible effect on the socioeconomics, tourism or recreation area, that is within standard levels of variation, and is unlikely to cause a noticeable difference.
Negligible	A short-term but reversible effect on the socioeconomics, tourism or recreation of the area, and that is within standard levels of variation.

17.3.3 Assessment of Effects

The sensitivity of receptor and magnitude of impact are combined to determine the significance of the effect using a matrix, as shown in Table 17.3.3Table.

Table17.3.3: Significance of Effects

Magnitude of Impact	Sensitivity				
	International	**National**	**Regional**	**Moderate Local/ High Local**	**Low Local**
High	Major	Major	Moderate	Moderate	Minor/ Negligible
Medium	Major	Moderate	Moderate	Minor	Minor / Negligible
Low	Moderate	Minor	Minor	Minor	Minor / Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

Key

(orange)	**Significant Effect**
(blue)	**Non-Significant Effect**

In order to assess the significance of the potential effects derived from the proposed development, professional judgement has been applied. It is accepted that only effects considered to be moderate and major must be regarded as significant and, therefore, further attention and specific mitigation measures are to be applied to ensure appropriate minimisation of the significance.

17.4 Baseline Information

17.4.1 Socio-Economic

The population of Aberdeenshire in 2013 was 257,000, an increase of 0.9% from 2012, which represents 4.8% of the Scottish population. It is projected that by 2037 the population will be 299,000, an increase of 17.3%. The 2013 age demographic for Aberdeenshire is 'younger' than the Scottish average with 18.7% below 16 years of age, 1.6% higher than the rest of Scotland, and 23.6% above 60 years of age com[pared to the average in Scotland which is slightly higher at 23.8%. The employment levels in Scotland in 2013 were 71%, while in Aberdeenshire they were 78.6%, the fourth highest rate in the country.

When analysed by gender, Aberdeenshire has the highest male employment rate at 86.9% (the overall level for Scotland is 75.1%), whereas the area was not in the top three for female employment rates, with a level of 72.3%, but still higher than the Scottish average of 66.5%.

By the end of 2014, the unemployment rate in Buchan was 0.9%, compared to a Scottish rate of 2.8% (Aberdeenshire Council, 2015).

Table *17.4.1* 17.4.1 provides an overview of the basic socioeconomic baseline for the Aberdeenshire Local Authority.

Table 17.4.1: Statistical overview of the Aberdeenshire area demography in 2013

Socioeconomic parameter	**Value**	
	Aberdeenshire*	**Scotland**
Total population	257,740	5,327,700
Percentage of population between 0-15 year of age	18.7%	17.1%
Percentage of population between 16-59 year of age	57.7%	59.1%
Percentage of population between 60-+75 year of age	23.6%	23.8%

*not including Aberdeen City

The settlement of Boddam is the closest to the proposed development. Its population by 2012 was of 1,290 people. Peterhead is the nearest major town with a population of 18,450 (Aberdeenshire Council, 2012). Peterhead relies heavily on fishing and the oil and gas sector for local employment, while the harbour facilities are also now starting to provide support to the renewable energy industry, as Peterhead has been identified as a potential location for development to support the rapidly expanding renewable energy industry within Scotland, building on its experience in supporting the oil and gas industry of the North Sea.

The largest education facility in the region (and in Scotland, in terms of area, at 22,920m^2) is the Peterhead Academy, run by Aberdeenshire Council, and catering for around 1,400 students from 11 to 18 years of age.

The Scottish Government has set a target of achieving 100% of its demand for electricity (gross consumption) from renewable sources by 2020. As part of this, it is anticipated that a total investment of £46 billion is required in both electricity generation and the transmission network. As stated above, Peterhead has been identified as a potential location for development to support the rapidly expanding renewable energy industry within Scotland, building on its experience in supporting the oil and gas industry of the North Sea.

At a local level, Boddam is the closest community to the Converter Station, just under 5km south of Peterhead. As with Peterhead, Boddam grew during the 18th century due to the local fishing industry, however, in the 1800s, the local fleet outgrew the harbour and many vessels moved to use the expanding Peterhead harbour instead. Quarrying was also an important local industry, with 'Peterhead granite' being exported both around the UK and overseas. The town was also the location of a former RAF base, and a railway branch, both now closed, although the RAF Buchan Ness radar station still maintains a small operations staff of around 30 people made up of military and civilian personnel.

In the present day, Boddam is a commuter settlement for workers in Aberdeen or Peterhead, with some low level fishing still ongoing, primarily for lobster.

17.4.2 Recreation

The rights of way within the vicinity of the site and cable route are shown in Figure 17.4.1. As shown, there is a right of way on the west side of Fourfields; this route has been in use since the 17th Century (see Chapter 9: Archaeology).

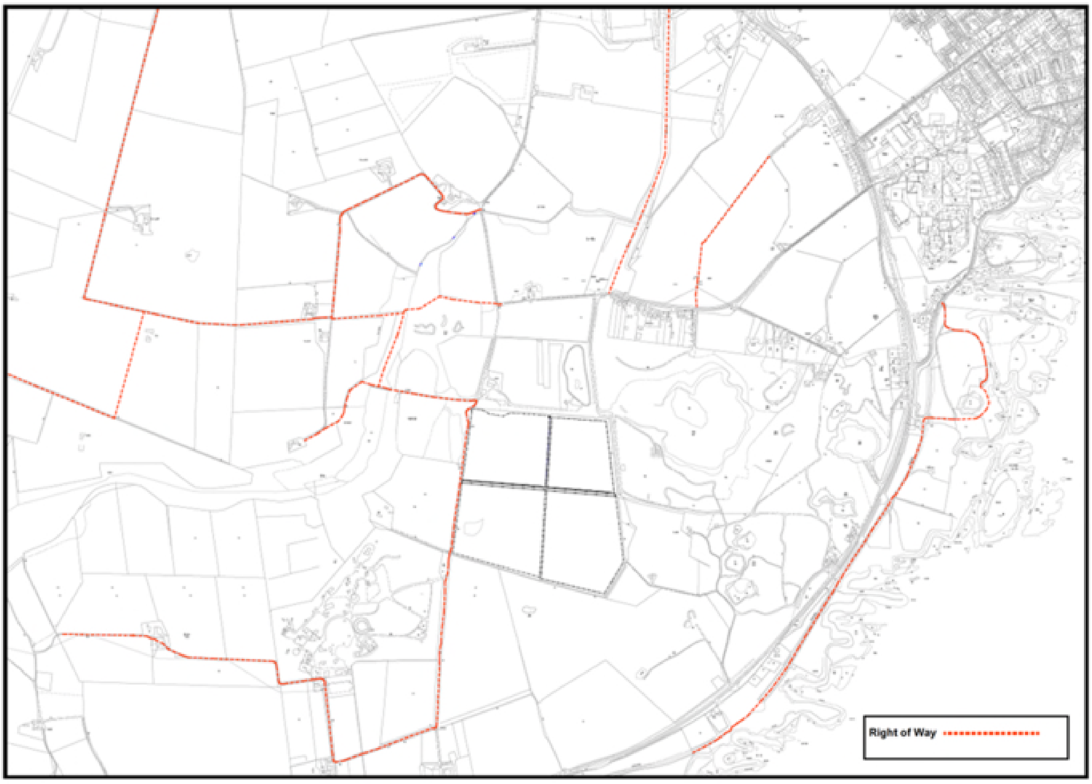

Figure 17.4.1 Rights of Way

In addition to the rights of way there are core paths around the east, west and south sides of the Fourfields site as shown in Figure 17.4.2.

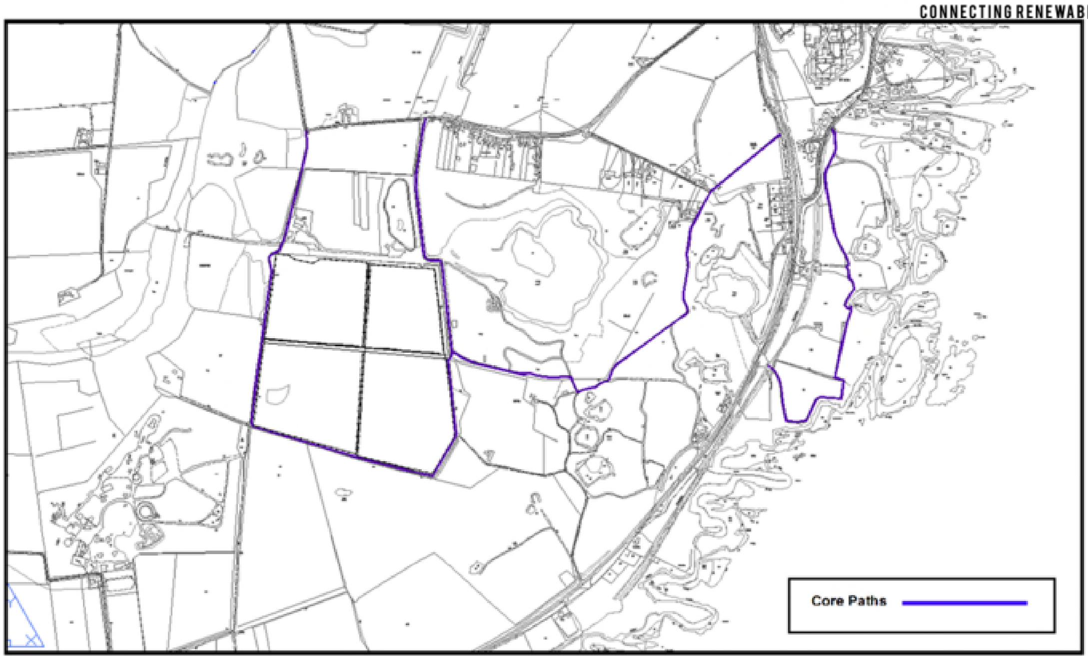

Figure 17.4.2: Core Paths

The Boddam Community Association has recently constructed an additional path, bisecting the Fourfields site west to east, and they are working to improve existing routes. Hence, the area around Fourfields is utilised for recreational purposes, primarily walking and exercising dogs but, as the path structure improves, this is likely to encourage runners and potentially cyclists onto the network of paths. As the Stirling Hill Access Path Network becomes better known, visitors from around the wider Buchan area are likely to visit.

As discussed in Chapter 9: Archaeology, the Den of Boddam flint mines site is of significant historical value, however, there is currently no site interpretation present and as such does not seem to attract the visitor's numbers one might expect.

The nearest hotels and Bed & Breakfasts are in Boddam, however, the area is not known as a tourist destination, and most visitors to the area are there for business reasons.

17.4.3 Local Residencies

The village of Boddam lies approximately 1km to the northeast of Fourfields, however, there are a number of smaller settlements closer to Fourfields namely: Highfield, Lendrum Terrace and Stirlinghill.

17.5 Impact Assessment

17.5.1 Construction

17.5.1.1 Direct Local Socio-Economic

During preparation of the Converter Station site and onshore cable route for construction and / or cable installation, there will be the potential for a range of jobs to be created. It is NorthConnect's intention to source the workforce locally where possible; however, given the technical and specialist nature of some elements of the work and the high employment levels in the area, some imported labour may be required.

It is currently anticipated that the requirement for workers on the site will vary through the phases between 40 and 200 people. This number will reach its peak in Phase 3 when Civils, Structural, Mechanical & Electrical Installation, and HVAC cable laying works are all ongoing (see Chapter 2: Project Description). This will be direct labour employed by the main contractors and their 1st or 2nd tier sub-contractors for the construction works.

In addition to the construction work force, during the proposed 30 month construction period for the Converter Station site and onshore cable route, there will be a requirement for non-construction personnel, for example cleaners, security guards and administrative staff.

The magnitude of impact associated with construction jobs will be low in the Buchan area, resulting in a minor effect significance. At a national level the impact magnitude will be negligible resulting in negligible effect significance. In EIA terms effects associated with direct employment through construction are not significant.

17.5.1.2 Indirect Local Socio-Economic

As well as those individuals and businesses directly employed by NorthConnect during the phases of the interconnector's development, there is also the potential for indirect benefits for local businesses. Due to the nature of the works involved in the construction of the Converter Station, there may be the need for specialist teams to be brought into the area. Furthermore, there will be the need for members of the project management team to be present during specific periods to oversee particular activities.

These individuals will require accommodation, food and drink and other services, therefore local hotels, restaurants and entertainment venues are likely to benefit from the influx of people and additional revenue generated. As indicated earlier, levels of tourism to Boddam are relatively low; therefore these additional visitors may prove beneficial, specifically to local businesses in that area.

It is currently anticipated that the bulk of the large-scale components for installation at the Converter Station site would be transported by sea and offloaded at Peterhead Harbour. Again, this would have an indirect benefit for the local economy through the payment of port, berthing and pilotage fees.

Some raw materials associated with the construction process will be sourced locally to avoid transport expenses. This is likely to include construction materials such as concrete, tarmac and red granite. In addition, consumable items are likely to be procured locally.

The impact magnitude of indirect construction impacts is low within the Buchan area giving rise to a minor effect significance which is not significant in EIA terms.

17.5.1.3 Local Residents

Impacts on local residents during construction have been assessed in topic specific chapters. Chapter 6: Noise and Vibration, and Chapter 10: Landscape and Visual have identified potential significant effects on a small number of local receptors. The impacts are not reassessed here, however, it is recognised that the project as a whole could affect local residents and, as such, there is a need for additional mitigation measures.

17.5.1.4 Recreation

The Converter Station and associated landscaping mounds are proposed on the eastern two thirds of the existing Boddam Community Associate path which bisects Fourfields. A new path network is proposed as shown in Drawing 3022, to connect the east and west sides of the site. However, full access will not be available until the later phases of the construction works.

The HVAC cable route crosses the right of way and, as such, appropriate diversions will be put in place during the short period of this work. The core path network crosses the quarry access road, so impacts on pedestrians associated with the use of this road during construction have been assessed in Chapter 15: Traffic and Transport.

There is no intention to restrict access to the core paths around the Fourfields during construction, unless there is a specific health and safety reason to do so (e.g. for rock blasting). As such, the impact magnitude on recreational use of the paths, with high local sensitivity, is deemed to be low with a resultant effect significance of minor. This does not take account of the landscape and visual impacts on path users as these have been considered within Chapter 10: Landscape and Visual.

17.5.2 Operation

17.5.2.1 Socio-Economic

Benefits of Interconnectors

The qualitative discussion of the benefits from NorthConnect and interconnection has been described in outline in Chapter 2: Project Description, Section 2.2 Needs Case. One of the quantified benefits, CO_2 reduction, has also been covered in Chapter 12: Air Quality.

The socio-economic benefits of interconnection between countries derive from connecting areas of surplus generating capacity with areas of high demand at every point in time. These differences fluctuate between regions on an hourly, daily, weekly or seasonal basis dependent upon many variables on both the supply side and the demand side. A greater proportion of renewables and the switch to low carbon over the coming decades will increase those fluctuations on the supply side (e.g. wind, wave, solar, hydro and biomass) many of which are heavily weather dependent, but also on the demand side through changing our energy-consuming behaviours (e.g. carbon tariffs, energy efficiency, the switch to electric vehicles and micro-generation such as home solar or ground source heat pumps).

Interconnection helps to ensure that across Europe, despite those fluctuations in supply and demand (and hence price), any one consumer can be connected to the cheapest source of power at any one time, and this is where the economic benefit of interconnection derives from.

Many studies have been carried out in this field, and the most pertinent are referenced here. As they are all based on economic models looking into the future, they all differ slightly in their methodologies and assumptions, and often quote their findings in ranges of values, or across a spread of different stated scenarios.

Most studies categorise benefits into several different factors, some of which can be quantified economically and some of which cannot. Even those that cannot will probably have a socio-economic benefit via indirect routes, they just cannot be directly quantified in monetary terms. It is the economic (monetary) quantities which we will quote here, and the value of this for interconnected power projects reflects such factors as:

- The value to consumers of being able to access lower power prices;
- The effect of greater competition creating a downward pressure on those power prices;
- The value to the generating countries of being able to sell that power rather than it being "stranded", i.e. unusable because the originating country has no route to market;
- The economic premium in all countries for developing new flexible sources of power generation to meet the changing demands of connected markets. This is the development of new engineering, construction and operation and maintenance industries and supply chains, sometimes referred to in renewables terms as "green jobs"; and
- Efficient and cost-effective operation of the pan-european power transmission grid networks.

In their 10-Year Network Development Plan (TYNDP-14) (ENTSO-E, 2014a) the European Commission quantified the total socio-economic benefit of transmission projects of pan-European significance to amount to savings of around 5% of operational generation costs (approximately £5 billion per annum) by 2020. Focussing in on the UK specifically, the EU also recognised that the socio-economic value of projects in the Northern Seas Offshore Grid, which includes NorthConnect and other projects between GB and the Nordic Region, are some of the highest in the whole of Europe, stating that:

"GB-Norway and GB-Denmark cables would be fully loaded for the majority of the time and present very strong socio-economic case for UK – Nordic region interconnection".

UK based studies over recent years have made similar findings. The Department of Energy & Climate Change in their report on interconnectors (DECC, 2013) stated that:

"4GW of interconnection with hydro-focussed markets has benefits to consumer welfare of around £2.5 billion".

The principal hydro-focussed market accessible to the UK is Norway and this figure would be the present value of the socio-economic benefits accruing over the whole life of proposed UK interconnectors. The supplementary economic study to the DECC report (Redpoint-Baringa, 2013), quantified the saving from all UK interconnection at between £800 million and £1.3 billion per annum. In addition, press releases and a report from National Grid (NGIL, 2014) claimed that:

"£1bn could be saved from electricity costs if UK doubles interconnector capacity by 2020".

Other UK studies have looked at the sensitivity of the modelling and analysis which takes place around these studies, given the range of different figures which are claimed. A report by the think-tank, Policy Exchange, last year (Policy Exchange, 2014) concluded that ENTSO-E's methodology above for all transmission projects of pan-european significance underestimates the value for interconnectors by up to 60%. Similarly, a report by Pöyry (2014) stated that:

"The value of flexibility is not recognised by current market models and interconnection is a key part of the solution in dealing cost effectively with renewables".

Another report for DECC (Pöyry, Dec-12), which examined interconnection scenarios for the UK's Electricity Market Reforms, found that:

"Interconnectors between the Nordic region and GB will be fully utilised, impervious to market conditions, policy changes, CO_2 pricing and have very strong profit and cost-benefit cases".

Benefits of NorthConnect

To examine the situation from the other end of the interconnector in Norway, studies have been carried out independent of the NorthConnect JV company which have found that up to four new interconnectors with the UK and Europe would be cost-beneficial for Norway (Thema, 2012).

NorthConnect have commissioned their own modelling which took place over two phases, firstly a revenue analysis, followed by a socio-economic welfare analysis (Redpoint/Thema, 2013). Various scenarios were analysed which showed socio-economic values of between £105 million and £190 million per annum. The conclusion of the study is that NorthConnect is estimated to be worth approximately £140 million per annum in socio-economic value and, crucially, that this is split more or less equally between Norway and the UK *[at 1.16 Euro to GBP, Feb-13]*. In UK, the benefit is derived principally from access to a cleaner, cheaper source of power and facilitating new green jobs and businesses around wind development. In Norway, it is through selling stranded power at times of surplus generation and also the development of new green jobs and businesses around the hydro-power industry.

During 2014, NorthConnect has been independently assessed as part of TYNDP-14, and also as a European Project of Common Interest, for its cost-benefit figures. The results are presented in the Northern Seas Regional Investment Plan (ENTSO-E, 2014b). Chapter 12: Air Quality has presented details of the scenarios which NorthConnect was assessed against and across the four scenarios; the study showed a socio-economic welfare value ranging from £75 million to £295 million per annum. Even in the worst case “Money Rules” scenario, the value ranges up to £140 million per annum *[at 1.22 Euro to GBP, May-14]*. This corresponds to NorthConnect’s own findings and, although the TYNDP-14 values are generally higher than NorthConnect’s across the scenarios, this is because the NorthConnect studies have always been aimed at ‘stress-testing’ the socio-economic and business case to see whether it stands up under (reasonable) worst-case scenarios.

A final key finding of both the NorthConnect and TYNDP-14 assessments is that they show no incremental degradation of the socio-economic or business cases for a second Norway-GB cable. This accords with DECC’s findings that up to 4GW of hydro-focused (mainly Norwegian) interconnection would be socio-economically attractive for the UK. (The current planned interconnectors to Scotland and England add up to only 2.8GW in total).

The NorthConnect project will therefore have a positive medium to high impact magnitude on an international level, giving rise to a major effect significance, which is significant in EIA terms.

17.5.2.2 Local Direct Socio-Economic

Once the project is operational, there will be further opportunities for operations and maintenance staff to be employed, which will be locally based personnel. It is currently estimated that a team of approximately five people would be employed at the Converter Station once operational. Additional, short-term, one-off, or specialist contractual opportunities may also arise for services at the site, for example, cleaning, grass-cutting, landscaping, building maintenance, etc.

It is assumed that effects will be on the Buchan area, the magnitude of the impact will be low to medium, giving overall minor effect significance. Local employment associated with operations is not significant in EIA terms.

17.5.2.3 Local Residents

Impacts on local residents of operations have been assessed in topic specific chapters and as such will not be repeated here. Once the site is operational it is expected that effects on local residents will reduce, however, this is not a reason for complacency and hence appropriate mitigation is identified.

17.5.2.4 Recreation

The proposed new paths (Drawing 3022) will be fully available during operations. In addition to the paths, a new shelter is planned to provide an area for recreational users to sit and enjoy the views. Interpretation boards providing information on the local historic sites, ecology and the NorthConnect project are planned. Overall it is hoped that there will be a positive contribution to recreational users by NorthConnect, at least at a low impact magnitude level, giving rise to a minor positive effect, and this will not be significant in EIA terms.

17.5.3 Decommissioning

17.5.3.1 Local Socio-Economic

If the site is to be reinstated at the point of decommissioning, there will probably be a significant workforce requirement during decommissioning and, as per construction; there will be both direct and indirect socioeconomic effects, the scale of which cannot be predicted at this point.

17.5.3.2 Recreation

The reinstatement of the site will ensure the ongoing recreational value of the area, although there may be some disruption during the decommissioning works. The extent of this also cannot be determined at this point.

17.6 Mitigation Measures

17.6.1 Construction

17.6.1.1 Direct and Indirect Socio-Economic

NorthConnect will take steps to maximise both direct and indirect socio-economic effect on the local economy. As discussed in Chapter 14: Resources, the procurement strategy for NorthConnect will be rolled down through the contractor and their supply chain. Supply chain plans will be developed going into the procurement phase of the project, which will be structured to make local content an important and appropriate component of tenderers proposals for contract delivery. They will include requirements for local sourcing, wherever procurement law allows, in order to maximise the projects benefits to the local economy. Prior to construction works commencing, there will be a programme of supply chain engagement including 'Meet the Supplier' events, to allow local companies to meet with the main design and build contractor(s) to offer their services. In addition a supply chain web portal will be set up for potential suppliers to register and form alliances and partnerships with other organisations up or down the supply chain. Works will be publicly tendered to ensure fair competition and to allow local companies to compete for work.

17.6.1.2 Local Residents

A communications plan will be developed by NorthConnect and the main construction contractors to ensure that local residents are kept informed about the project. Contact details will be provided to allow any concerns residents may have to be raised and dealt with in a timely manner.

17.6.1.3 Recreation

As discussed in Chapter 15: Traffic and Transport, a safety committee will be established which will assist in the management of pedestrian safety and a safe crossing of the quarry access road will be established. The communications plan will include communications with recreational users of the area around the proposed development. This will ensure that prior warning to any changes in path routes are provided, or if there is a need for a short-term closure of any areas for safety reasons. Contact details will be provided on signage around the site to allow recreational users to raise concerns or issues.

17.6.2 Operation

Throughout the operational life, NorthConnect will endeavor to positively impact the local community. The paths and landscaping will be maintained throughout the converter station's life for the benefit of recreational users. A communication protocol will be incorporated into the Environmental Management System to ensure that members of the public, local residents and recreational users alike can easily contact NorthConnect and that issues will be addressed promptly.

17.7 Residual Effects

The mitigation identified aims to minimise negative effects and maximise positive effects in line with best practise. However none of the mitigation is sufficient to change the effect significance determined in Section 17.5.

17.8 Cumulative Effects

For NorthConnect to operate and for the Socio-Economic benefits to be realised, it will require the NorthConnect HVDC Cable connection to Norway to also be installed and a connection into the National Grid. The connection to the grid is via the new planned 400kV Substation at Peterhead, hence, the projects in effect work in combination to provide the Socio-Economic benefits. However, it should be pointed out that the new planned 400kV Substation at Peterhead is not being constructed for NorthConnect's benefit alone. It is associated with many other connections and transmission upgrades being undertaken across the north east and wider Scottish grid.

17.9 Summary

During construction there is a potential for short-term direct and indirect positive impacts on the local economy. However, there may be negative effects on recreational users due to short-term impacts on the local path network.

Once operational, the NorthConnect Interconnector project will have significant positive Socio-Economic benefits at an international level.

Table 17.9.1 summarises the socio-economic effects of the project, both before and after mitigation.

Table 17.9.1: Summary of Local Community and Economy Effects

Nature of Impact	Receptor Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Construction							
Direct Local Socio-Economic, Job creation.	High Local	Low	Minor – Positive	Procurement Policy Supply Chain Engagement	Low	Minor – Positive	Not Significant
Indirect Local Socio-Economic	High Local	Low	Minor – Positive	Procurement Policy Supply Chain Engagement	Low	Minor – Positive	Not Significant
Recreation – Impacts on local paths.	High Local	Low	Minor - Negative	Appropriate Diversion Communications Plan	Low	Minor - Negative	Not Significant
Operational							
Socio-economic contribution	International	Medium - High	Major Positive		Medium-High	Major Positive	Significant Positive
Local Direct Socio-economic.	High Local	Low	Minor – Positive		Low	Minor – Positive	Not Significant
Recreation – Impacts on local Paths.	High Local	Low	Minor – Positive	Ongoing path and landscaping maintenance.	Low	Minor - Positive	Not Significant
				Key		Significant effect	

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Chapter 18

Cumulative Impacts

Contents

18 Cumulative Impacts

18.1 Introduction

Cumulative effects result from the impacts of other projects and plans influencing the impacts from the NorthConnect proposals. Cumulative effects are described as the combined effect of all developments, taken together (SNH, 2005). This chapter identifies other planned developments that require consideration within this ES. Developments already built are considered as part of the existing baseline conditions and as such are not discussed.

The assessment of the various 'inter-project' cumulative effects or 'interactions' effects for each specific environmental topic has been undertaken within each of the individual EIA chapters. A summary of which is provided here.

18.2 Assessment Methodology

18.2.1 Identifying Projects

In May 2014 during the scoping process, Aberdeenshire Councils eplanning website was reviewed to identify projects in the planning process at that stage. There were 90 planning applications listed on the eplanning website for Boddam & District Community Council. A number had been rejected, and many were for minor changes to dwellings. Applications with the potential for in-combination or cumulative effects were identified. In addition the Eastern HVDC Link has been identified in the area for consideration. Three projects were identified for consideration with regard to cumulative effects and agreed through the scoping process:

- Formation of new 400kV electricity substation (including 4 no. buildings housing switchgear and transformers) and associated infrastructure (APP/2014/1437).
- Upperton Industrial Estate Peterhead AB42 3GL Creation of Energetica Industry Park Comprising of Class 4 (Business) Class 5 (General Industrial) and Class 6 (Storage or Distribution) uses with Associated Access and Landscaping (APP/2011/0058).
- Eastern HVDC Link (SHETL / National Grid) Proposal for a HVDC subsea interconnector between Peterhead and Teesside in order to strengthen the transmission grid capacity in support of renewables development.

The eplanning website was reviewed again on the 12th of March 2015 to identify if there were any additional projects that should be added to the cumulative assessment process.

A brief description of each of the projects included within the cumulative assessment has been provided.

18.2.2 Cumulative Effects

A systematic approach of has been taken to identify potential cumulative effects for proposed projects and NorthConnect. A matrix has been utilised to ensure that each project and environmental topic area are considered. Whether or not there is a potential for cumulative and in-combination effects in each instance has been identified, with reasoning provided.

18.2.3 Assessment of Effects

The assessment of cumulative effects is carried out in line with the methodology laid out in Chapter 3 and topic specific methodology provided in each chapter. The assessment of cumulative is included in each of the topic specific chapters a summary of which is provided in this Chapter.

18.3 Identifying Projects

On the 12th of March 2015 there were 166 planning applications listed on the eplanning website for Boddam & District Community Council. Table 18.3.1 provides a summary of the applications.

Table 18.3.1: Summary of Planning Applications

Application Type or Status	Number
Refused	10
Withdrawn	12
Residential <3 house development, garage, shed or alteration/modification to house.	74
Residential 3 house development or larger.	5
Small to medium non-residential applications including: change of use, signage, and warehouses.	57
Medium to large non-residential.	7 Plus NorthConnect

The residential <3 house developments are predominantly extensions and modifications to existing properties. With a few single house development, none of which are likely to have cumulative effects with the NorthConnect project, due to their scale and distance from the NorthConnect development site.

Three of the five larger housing developments are pre-2010 and, as such, they will either have been built and hence be included within the baseline, or the planning will have expired. Either way there is no reason to consider them further. The remaining 2 larger housing developments are considered further in Table 18.3.2.

The small to medium, non-residential applications included a wide range of topics from advertising signage to warehouse extensions. The applications date back to 2003 so many will be included within the baseline, as they will already have been implemented. None of the applications made within the last two years are within 500m of the NorthConnect project and hence it is highly unlikely that any of them will give rise to cumulative effects.

Seven larger non-residential applications were made. These are considered along with the two residential applications previously identified in Table 18.3.2. A brief description of the proposals are given and consideration of whether or not they should be ‘in’ or ‘out’ of the cumulative assessment process is discussed with reasoning provided.

In addition to the projects included within the planning document, two additional projects have been considered in Table 18.3.2:

- The Eastern HVDC Link as, when the scoping document was produced in May 2014, it was assumed that this project would have progressed into planning by this point; and
- The NorthConnect High Voltage Direct Current (HVDC) cable, which will be subject to a later planning consent, has also been included for consideration.

Pre-planning applications are difficult to consider, as information available on them is lacking and, as a result, the Post-Combustion Carbon Capture Facility and Eastern HVDC Link are not taken forward. As the NorthConnect Interconnector HVDC Cable is part of the same project, although not fully developed, a broad understanding of it is available to allow a cumulative assessment to be completed. The Stirlinghill Quarry extension will not change the level of activity in the quarry. Rather it will continue to operate during both construction and operation of NorthConnect. Hence, for many aspects the effects associated with the quarry will be as they are currently, and hence they are included within the baseline. For transparency, it has been taken forward for consideration of potential cumulative effects.

Table 18.3.2: Consideration of Project Inclusion in the Cumulative Assessment

Reference / Status	Proposal	In/Out	Reason
APP/2013/2390 Approved	Erection 11 Dwelling houses adjacent to the A90 off Rocksley Drive, Boddam	Out	• Planning consent was granted in August 2013 as such construction will need to start by 2016 hence the construction period does not overlap with NorthConnect. • No cumulative effects would arise once the houses are built.
APP/2014/2593 Pending Decision	Erection of 9 Dwelling houses at Inchmore Gardens Boddam	Out	• The development is more than 1km away and is likely if given the go ahead to be constructed before NorthConnect construction is started as such it is unlikely there will be any cumulative construction effects. • No cumulative effects would arise once the houses are built.
APP/2014/1437 - Approved APP/2013/1912 -Approved	Formation of new 400kV electricity substation (including 4 no. buildings housing switchgear and transformers) and associated infrastructure. Newton of Sandford, Boddam AB42 3AJ	In	• NorthConnect are likely to connect into this substation, as such the projects are inter related. • It is also a relatively large building hence could have in combination effects. • Proximity to cable route could have in combination during construction.
APP/2011/0058 -Approved	Creation of Energetica Industry Park Comprising of Class 4 (Business) Class 5 (General Industrial) and Class 6 (Storage or Distribution) uses with Associated Access and Landscaping, Upperton Industrial Estate Peterhead AB42 3GL	In	• Potential overlap in aims with regard to developing the energy sector in the area. • Large buildings which could have in combination effects.
ENQ/2014/2928 Pending Decision (application not yet submitted)	Extension to Quarry, Stirlinghill Quarry Boddam Peterhead, AB42 3PB	In	• Development immediately to the east of Fourfields. • Projects will utilise the same access road. • Although only limited information is available at this point it can be assumed that activities are similar to those currently being carried out.
ENQ/2014/2784 PAC agreed as Specified in Notice (application not yet submitted)	Installation of Post-Combustion Carbon Capture Facility, Peterhead Power Station, Boddam Aberdeenshire, AB42 3BZ	Out*	• Construction period expected to be 2017 to 2020, unlikely that large construction works will coincide with NorthConnect. • The planning application has not as yet been submitted hence the only information available is the EIA scoping report, which although highlighting topics for consideration does not provide enough detail to allow it to be considered further.
APP/2013/1786 Approved	Section 37 Notification for Reinforcement and Reinsulation of Existing Overhead Electricity Transmission Line to Upgrade Voltage from 275kV to 400kV	Out	• The work will be well away from the NorthConnect Converter Station. • Work doesn’t include any new transmission towers hence the visual impact will not change from the baseline situation. • No predicted cumulative effects with the HVAC cable route.

APP/2006/3038 External Decision Granted	Erection of 550MW Combined Cycle Gas Turbine Power Station	Out	• Already been built as such it is part of baseline and hence does not need considered in Cumulative Assessments.
	Eastern HVDC Link (SHETL / National Grid) Proposal for a HVDC subsea interconnector between Peterhead and Teesside in order to strengthen the transmission grid capacity in support of renewables development.	Out	• Similar project to NorthConnect hence potential for cumulative effects however there are uncertainties associated with the national grid future energy strategies and hence the project is on hold so no information is available on it. • If required by future energy strategy then it would not need be available until 2025, as such there will not be overlap in the construction periods so no construction cumulative impacts. • The assumed location is to the north of new 400kV electricity substation over 1km away from the NorthConnect project, which will limit in combination effects to landscape and visual, which cannot be assessed without their design.
	NorthConnect Interconnector HVDC Cable	In	• Will be installed at the same time as the Interconnector Converter Station and HVAC cable.

*On request of the planning department, landscape and visual impacts have been included within the cumulative assessment section of Chapter 10: Landscape and Visual Impact Assessment.

18.4 Potential Cumulative Effects

Table 18.4.1 identifies for each of the projects included within the cumulative assessment the environmental topics which require cumulative effects to be considered. The location of the developments is shown in Drawing 3031.

Table 18.4.1: Identifying Potential Cumulative Effects

	Project			
Topic	**400kV Substation**	**Energetica Industry Park**	**Stirlinghill Quarry Extension**	**NorthConnect HVDC Cable**
Noise & Vibration	Unlikely during operations as the Substation is inside and not expected to be a significant noise source. The substation should be constructed before the HVAC cable is installed as such no cumulative impacts are expected.	No information provided in the planning application. However, distance between the two sites makes cumulative effect unlikely.	The Quarry extension will not change the level of activity in the quarry rather it will continue to operate during both construction and operation of NorthConnect. It is already accounted for within the existing baseline hence no need to consider.	Potential cumulative effects during construction, depending on sequencing. Considered within Chapter 6

Topic	Project			
	400kV Substation	**Energetica Industry Park**	**Stirlinghill Quarry Extension**	**NorthConnect HVDC Cable**
Ecology	Substation is proposed for installation in a field of relatively low local ecological value as such it is unlikely that cumulative effects would be significant.	The only ecological information available is that they are required to survey for badgers. Due to the distance between the two sites it is unlikely that there will be cumulative effects.	Potential cumulative effects considered in Chapter 7.	Potential cumulative effects during construction considered in Chapter 7.
Ornithology	No significant effects from the Substation (an EIA was not required), unlikely to have cumulative significant cumulative effects.	No ornithological information available on the Energetica Project, no cumulative significant effects expected.	Potential cumulative effects considered in Chapter 8.	Potential cumulative effects during construction considered in Chapter 8.
Archaeology	No cumulative effects identified.			
Landscape & Visual	Potential cumulative effects considered in Chapter 10.	Potential cumulative effects considered in Chapter 10.	Not enough information available on the project to assess cumulative effects.*	Potential cumulative effects considered in Chapter 10.
Water Quality	Water quality issues primarily associated with pollution incidents hence no cumulative effects identified.			
Air Quality	In-combination effects associated with facilitating a low carbon energy market, this is covered within Chapter 12.	No cumulative effects identified.	The Quarry extension will not change the level of activity in the quarry rather it will continue to operate during both construction and operation of NorthConnect. It is already accounted for within the existing baseline hence no need to consider.	In-combination effects associated with facilitating a low carbon energy market. Dust issues associated with construction of both projects. These are considered in Chapter 12.
Land Quality	All three projects remove areas of arable land however the total area is not significant.		The Quarry extension will not change the level of activity in the quarry rather it will continue to operate during both construction and operation of NorthConnect. It is already accounted for within the existing baseline hence no need to consider.	Only temporary effects associated with the HVDC cable hence no significant cumulative effects predicted.

Topic	Project			
	400kV Substation	**Energetica Industry Park**	**Stirlinghill Quarry Extension**	**NorthConnect HVDC Cable**
Resource Usage	Both projects will have raw material requirements associated with construction however cumulative effects will not be significant.	Both projects will have raw material requirements associated with construction however cumulative effects will not be significant.	No cumulative effects identified.	Both projects will have raw material requirements associated with construction however cumulative effects will not be significant.
Traffic & Access	Only cumulative impacts if constructing at the same time, needs to be considered in combination with the Energetica Industry Park project in Chapter 15.	Potential cumulative effects during construction considered in Chapter 15.	The Quarry extension will not change the level of activity in the quarry rather it will continue to operate during both construction and operation of NorthConnect. It is already accounted for within the existing baseline hence no need to consider.	Cumulative impacts will not be significant, as minimal traffic associated with the HVDC Cable installation.
Electric & Magnetic Fields	No cumulative effects identified there are minimal EMF issues associated with NorthConnect			
Local Community & Economics	Potential cumulative effects considered in Chapter 17.	Potential cumulative effects considered in Chapter 17.	The Quarry extension will not change the level of activity in the quarry rather it will continue to operate during both construction and operation of NorthConnect. It is already accounted for within the existing baseline hence no need to consider.	Potential cumulative effects considered in Chapter 17.

* The Guidelines on Landscape and Visual Impact Assessment state that 'Schemes that are at the pre-planning or scoping stage are not generally considered in the assessment of cumulative effects because firm information on which to base the assessment is not available and because of uncertainty about what will actually occur, that is, it is not 'reasonably foreseeable'

Key

No cumulative effects	
Potential cumulative effects	

18.5 Assessment of Effects

The cumulative effects identified for assessment in Section 18.4, have been assessed as part of the topic specific chapters, the only two topic areas which gave rise to positive cumulative effects; Air Quality (Chapter 12) and Local Community and Economics (Chapter 17). The cumulative effects were recognition that the HVDC Cable and the 400kV substation will both be required for the Converter Station and HVAC cable route to link to Norwegian and Scottish power networks. The positive socio-economic effects and contribution to lower CO_2 emissions are a result of all three projects in combination.

Many of the potential cumulative effects identified under other topic areas would only occur if the construction periods of the various projects overlapped. It was assumed for the purpose of assessment utilising a precautionary approach that they would overlap. Even with this assumption no significant cumulative effects were identified.

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Chapter 19

Schedule of Mitigation

Contents

19 Schedule of Mitigation

19.1 Introduction

It is proposed that the methodology laid out in the Highland Council Guidance Note on the Construction Environmental Management Process for Large Scale Developments (The Highland Council, 2010), is followed in order to manage the environmental effects of the project. Figure 4.2 taken from the Highland Council guidance shows that at Stage 1, where the project currently is, a Schedule of Mitigation is required.

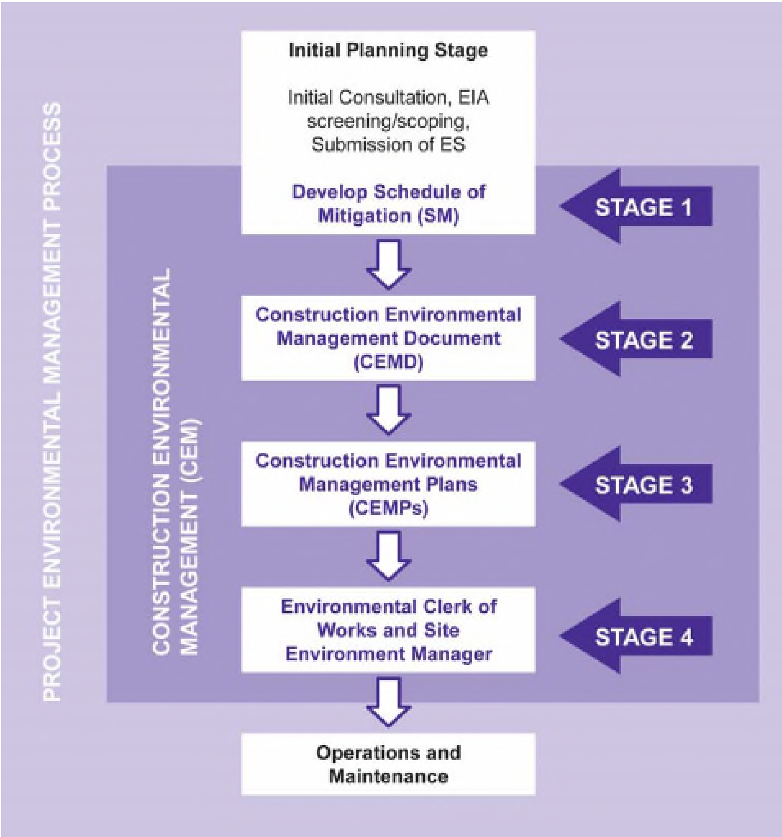

Figure 19.1 Project Environmental Management Plan Process, source The Highland Council (2012)

19.2 Schedule of Mitigation

The Schedule of Mitigation is provided in Table 19.2.1. During the detailed design and prior to the start of construction works, the Construction Environmental Management Document (CEMD) and underpinning Construction Environmental Management Plans (CEMP) will be developed. An Environmental Clerk of Works (ECoW) will be identified, to ensure the CEMD is appropriately implemented throughout the construction works.

Table 19.2.1: Schedule of Mitigation

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
Noise	Phase 2 Phase 3 Ph.4: Stage 2 Landscaping & Reinstatement	General Construction Noise	Noise assessment and Section 61 application completed prior to construction phases commencing. Louder activities to be completed in daytime hours where practicable.	PPG6: Working at Construction and Demolition Sites	Section 6
Noise	Construction	General Construction Noise	Equipment to be appropriately maintained. Engines to be switched off when not in use. Appropriate selection of plant for the task required.	PPG6: Working at Construction and Demolition Sites	Section 6
Noise	Construction	General Construction Noise	Noise audits and monitoring to be carried out at each new phase of works.	BS7455-1:2003 Description and Measurement of Environmental Noise	
Noise	Operations	Equipment noise.	Minimise noise through the design process.		
			Re-run noise model prior to installation to ensure that noise levels are acceptable. If not, incorporate more mitigation.	BS4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound.	
			Noise monitoring to be carried out during commissioning to ensure levels are as predicted.	BS7455-1:2003 Description and Measurement of Environmental Noise	
Vibration	P2:Earthworks & Creation of Landscaping Mounds	Rock Blasting	Blasts designed such that vibration levels at inhabited properties are below $6mms^{-1}$. Threshold monitoring during blasts.		

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
Ecology	Construction	Non-native species.	Non-native species locations to be mapped on the environmental layout plan.		
			If working within 50m of non-native species, then they will be clearly marked to avoid disturbance.		
			If work is to be carried out that could disturb non-native species, then appropriate qualified contractors will be employed to remove them, prior to work commencing.		
Ecology	P3: HVAC Cable Installation	Impacts on Otters and Water Voles	Pre-construction surveys for otter and water voles will be carried out prior to the start of construction works.	Ecology of the European Otter (Chanin, 2003)	
				Otters and Development Guidance Document (SNH, 2010)	
				Water Vole Conservation Handbook (Strachan, 2011	
				Using Field Signs to Identify Water Voles (Kemp, 2009)	
				The Handbook of British Mammals Corbet and Southern 1977)	
Ecology	P3: HVAC Cable Installation	Otters holt found in vicinity of works.	If disturbance is likely, a derogation licence will be sought from SNH.	Conservation (Natural Habitats &c.) Regulations 1994	
			Cable route will be microsited to minimise impacts.		
			A buffer around the holt will be clearly marked to avoid disturbance.		

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
Ecology	P3: HVAC Cable Installation	Water Vole Disturbance (if water vole are found).	If disturbance is likely, a derogation licence will be sought from SNH.	Wildlife & Countryside Act 1981	
			Cable route will be microsited to minimise impacts.		
			A buffer around the holt will be clearly marked to avoid disturbance.		
Ecology	P3: HVAC Cable Installation	Mammals get into excavations, or materials.	Ramps to be provided in open excavations to give mammal an appropriate escape route.		
	P3:Civil & Structural		Pipes or other such materials shall be stored upright, or have covers fitted to the ends to prevent entrapment.		
Ecology	Construction	Disturbance of mammals, bats and otters.	Minimise use of artificial lighting.		
Ecology	Construction	Impacts on badgers	Pre-construction surveys for badgers will be carried out prior to the start of construction works.		
			If works are to be carried out in the vicinity of a sett, a badger licence will be applied for to SNH.	Protection of Badgers Act 1992	
			If identified appropriate mitigation zones will be put in place.		
Ecology	P1:Preliminary Works	Amphibians and Reptiles impacts associated with moving the dry stone wall.	Walls to be moved outwith hibernation period (October to March).		
Ornithology	Construction	Disturbance of birds' nests.	Where possible vegetation will be cleared outwith the bird breeding season (April to August).		

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
			Pre-construction surveys to identify any nests, which will be marked out with an appropriate buffer to prevent disturbance.		
			Ongoing checks for nests throughout construction.		
Ornithology	P3: HVAC Cable Installation	Disturbance of Barn Owls	Pre-construction checks of unoccupied buildings.	Wildlife & Countryside Act 1981	
			Exclusion zones implemented to prevent disturbance.		
Archaeology & Cultural Heritage	P2:Earthworks & Creation of Landscaping Mounds	Impacts on previously unidentified archaeological asset.	Intrusive evaluation of the areas to be affected, to inform the need for additional work.		
	P3: HVAC Cable Installation		Watching brief during earthworks.	PAN02/2011	
			Post-excavation analysis and reporting of the significant features recorded and of the samples, records or finds recovered.		
Landscape and Visual	Operations	Visual impacts of converter station site.	Implementation of the planting strategy and ongoing maintenance.		
Water Quality	P1:Preliminary Works	Impacts on water quality while installing the culvert and HVAC Cables.	Installation techniques to be developed in line with guidance with ECoW input, to prevent siltation and pollution issues.	PPG6: Working at Construction and Demolition Sites	Section 1 & 2.
	P3: HVAC Cable Installation		General Binding Rules to be adhered to and licencing if required.	The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)	

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
Water Quality	Construction	Silt laden water impacts.	Drainage Management Plan to be put in place.	Engineering in the Water Environment. Good Practice Guide Temporary Construction Methods (SEPA, 2009a)	
			Silt laden water to be captured and settled prior to discharge.	PPG6: Working at Construction and Demolition Sites	Section 1 & 2.
Water Quality	Construction	Pollution Event	Spill response plan in place.	PPG6: Working at Construction and Demolition Sites	Section 1
			Spill kits available.	PPG21: Pollution Incident Response Planning	
			Training in spill procedures provided.		
Water Quality	Operations	Pollution Event	Spill response plan in place.	PPG21: Pollution Incident Response Planning	
			Spill kits available.		
			Training in spill procedures provided.		
Water Quality	Construction	Discharges	Appropriate consents to discharge in place.	The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)	
	Operations				
Water Quality	Operations	Sewage	Onsite sewage treatment to be installed.		
Air Quality	Construction	Dust	Dust Management Plan to be developed and implemented.	Assessment of dust from demolition and construction (IAQM, 2014)	
			Dust monitoring to be employed.	Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (IAQM, 2012).	

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
Air Quality	P2:Earthworks & Creation of Landscaping Mounds	Dust	Appropriate planning to minimise the number of times material is moved and the time material is stored and ground left bare.	PPG6: Working at Construction and Demolition Sites	Section 6
	P3: HVAC Cable Installation		Excavated materials to be kept damp.	Assessment of dust from demolition and construction (IAQM, 2014)	
			Prompt planting of landscaping mounds.		
Air Quality	Construction	Dust	Storage of materials on site minimised.	Assessment of dust from demolition and construction (IAQM, 2014)	
			Dedicated aggregate storage areas.		
			Bulk cement to be stored in enclosed tankers.		
			Bagged materials to be kept sealed.		
			Dust mitigation on crushers.		
			Good housekeeping.		
Air Quality	Construction	Dust - Trackout	Water assisted dust sweeping of roads as required.	Assessment of dust from demolition and construction (IAQM, 2014)	
			Delivery vehicles to be covered.		
			Appropriate routes onsite for private cars.		
			Hard surface haul roads utilised where practicable.	PPG6: Working at Construction and Demolition Sites	Section 6
			Wheel washing if required.		
Land Quality	Construction	Water seepage into excavation.	Install a toe-drain and divert flow into site drainage.	PPG6: Working at Construction and Demolition Sites	Section 3
			Pumping of water may require an abstraction license.	The Water Environment (Controlled Activities) (Scotland) Regulations	

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
				2011 (as amended)	
Land Quality	Construction	Pollution Event	Spill response plan in place.	PPG6: Working at Construction and Demolition Sites	Section 1
			Spill kits available.	PPG21: Pollution Incident Response Planning	
			Training in spill procedures provided.		
Resources	Construction	Resource usage	Consider materials selection and minimise volumes through the detailed design process.		
			Environment included within the procurement strategy Quality criteria.		
Resources	P3:Civil & Structural	Concrete production and laying and aggregate crushing.	Appropriate PPC licencing and controls in place.	Pollution Prevention Control (PPC) (Scotland) Regulations 2012	
			Activities to take place in designated areas, with the appropriate precautions in place to prevent pollution.	PPG6: Working at Construction and Demolition Sites	Section 7
Resources	Construction	Fuel, Oils and Chemicals	All fuels, oils and chemicals will be stored in appropriate containers with double containment provided.	PPG6: Working at Construction and Demolition Sites	Section 5
			Refuelling will be carried out in designated areas by trained personnel.	PPG7: Safe Operation of Refuelling Facilities	
			Fuel and chemical stores will be sited away from watercourses.	PPG8: Safe Storage and Disposal of Oil	
			Fuel and chemicals stores will be locked when not in use.	The Water Environment (Oil Storage) (Scotland) Regulations	

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
			All chemicals will be appropriately assessed under COSHH including environmental considerations. Where available, environmentally sensitive products will be used, e.g. biodegradable hydraulic fluids.	Control of Substances Hazardous to Human Health Regulations	
Resources	Construction	Waste	A Site Waste Management System will be put in place to manage all site wastes.	PPG6: Working at Construction and Demolition Sites	Section 10
			The waste hierarchy will be employed to minimise waste and reduce its environmental impact.		
			Waste segregation will be carried out.	The Water Environment (Oil Storage) (Scotland) Regulations	
			Waste will be appropriately stored awaiting disposal.		
Resources	Operations	Fuel, Oils and Chemicals	All fuels, oils and chemicals will be stored in appropriate containers with double containment provided.	PPG6: Working at Construction and Demolition Sites	Section 5
			Refuelling will be carried out by trained personnel.	PPG7: Safe Operation of Refuelling Facilities	
			Fuel and chemical stores will be away from watercourses.	PPG8: Safe Storage and Disposal of Oil	
			Fuel and chemicals stores will be locked when not in use.	The Water Environment (Oil Storage) (Scotland) Regulations	
			All chemicals will be appropriately assessed under COSHH including environmental considerations. Where available environmentally sensitive products will be used, e.g. biodegradable hydraulic fluids.	Control of Substances Hazardous to Human Health Regulations	

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
Resources	Operations	Waste	Waste management will be incorporated into the EMS.	ISO14001	
Resources	Decommissioning	Materials	Recycling at the point of decommissioning will be considered through the design process.		
Traffic & Transport	Construction	Pedestrian impacts on quarry access road.	A safety committee will be established which will assist in the management of pedestrian safety.		
			A safe crossing point will be provided		
			A 'zebra' style crossing will be used to give pedestrians priority		
			Speed limits will be enforced.		
			Loads will be covered and strapped down.		
			Appropriate signage will be in place.		
Traffic & Transport	Construction	Traffic impacts including abnormal loads.	A traffic management plan will be developed.		
			Only approved access roads to be utilised.		
			Abnormal loads are to be delivered to Peterhead by sea and road transfer to be coordinated with the authorities.		
			Appropriate signage will be installed at the junction with the A9.		
			Drivers will be appropriately briefed in areas of concern.		
Local Community and Economy	Construction	Direct and Indirect Socio-Economic impacts.	Supply chain engagement process to be developed and employed.		
Local Community and Economy	Construction	Local resident impacts.	Communications plan to be put in place.		

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Notes
		Recreational users impacts.			
Local Community and Economy	Operations	Local resident impacts.	Communications protocols will be incorporated into the EMS.		
		Recreational users impacts.	Landscaping and path network to be appropriately maintained.		

19.3 Environmental Clerk of Works

NorthConnect will retain the services of a suitably experienced Environmental Clerk of works (ECoW) for the duration of the construction, with the purpose of providing environmental site supervision and advice on a day-to-day basis. The EcoW will report directly to Northconnect and will be responsible for the assessment of the Contractor's compliance with requirements laid out in the CEMD and to liaise with the Contractor's Site Agent as and when required.

The ECoW will carry out regular audits and ensure monitoring requirements are met, and these will be tailored to the aspects arising on the site at the time. The ECoW will have the power to stop works if there is imminent danger to the environment. The ECoW will be a member of the Safety Committee.

19.4 Construction Environmental Management Document

The CEMD will bring together a number of plans into one place, this is likely to include:

- Dust Management Plan;
- Traffic Management Plan;
- Drainage Management Plan;
- Environmental Site Layout Plan;
- Schedule of Mitigation;
- Species Specific Management Plans;
- Construction Communications Plan;
- Spill Response Plan;
- Site Waste Management Plan; and
- Copies of consents and licences.

The CEMD will provide the policy and plans of how the construction site is to be managed from an environmental perspective. Task specific Risk Assessed Method Statements (RAMS) will be utilised to implement elements of the environmental plans. RAMS will also be provided for all construction tasks, they will identify task specific risks, including those to the environment, and detail the management in place to prevent or mitigate them.

The CEMD will clearly set out the lines of communication between NorthConnect's Project Manager (or nominated delegate), the Contractor's Project Manager and the ECoW and in particular set out the roles and responsibilities of the various parties to instruct site-based staff in the event that a matter of legislative compliance arises on-site unexpectedly, e.g. if during works a protected species is found at a location where it had not previously been anticipated to be.

The CEMD has close parallels, areas of overlap and similar management arrangements to the project Health & Safety and Quality Plans. These documents will be kept as a live suite as part of the Health & Safety File.

19.5 Training

The construction site induction will cover a range of environmental topics and their management on site. Specific training will be provided to appropriate staff as required, for example spill response training, and refuelling.

'Tool box talks' will be given on environmental topics of particular relevance to the activities that are being undertaken on site at that point, to ensure that the workforce's environmental awareness is current and relevant.

19.6 Environmental Management System

Moving into the commissioning and operational phases of the project, the CEMD will be replaced with an Environmental Management System, aligned to ISO14001 or similar. This will ensure that all aspects are appropriately identified and managed during the plant's operational life.

NORTHCONNECT
CONNECTING RENEWABLES

Chapter 20

Conclusion

20 Conclusion

NorthConnect propose to provide a HVDC Interconnector between Peterhead in Scotland and Simadalen in Norway. The linking of the two electricity markets has the potential to contribute significantly to the reduction in CO_2 emissions and help in the fight against climate change. The project would also bring socio-economic benefits to both Scotland and Norway.

An EIA process has been completed for the Interconnector Converter Station and the HVAC Cable route, to understand the associated environmental impacts and identify appropriate mitigations to reduce the effect significance wherever possible. The EIA and initial design stage have been completed together, to allow environmental impacts to be avoided, designed out, or mitigated through the design process. This has resulted in a unique building design including a sedum roof, curves and walls of local red granite and translucent panels. Landscaping and planting regimes have integrated the building into the landscape and incorporated elements which take account of local recreational users.

Table 20.1 provides a summary of the effects identified as significant prior to secondary mitigation being implemented. With mitigation, the number of negative significant effects reduces from 18 to 7, only two of which remain after the construction period.

The with mitigation noise effects deemed significant in EIA terms affect one property for the majority of the construction works, and a second property for a short period (8 weeks) of HVAC cable laying. NorthConnect are dedicated to working with the two properties residents to minimise the actual inconvenience caused by the works.

Any other significant negative effects are associated with landscape and visual impacts. The significant effects have been limited by careful site selection and through the design process. Unfortunately, due to the scale of the equipment required, it has not been possible to prevent or mitigate them all.

No significant cumulative effects were identified.

A schedule of mitigation has been produced to ensure that mitigation identified during the course of the EIA development is taken forward with the project and will form the basis of the CEMD. NorthConnect will continue to address and integrate environmental considerations through the procurement and design process, to ensure that the design is optimised from an environmental perspective. During the construction works, an ECoW will be on site to ensure that works are carried out in line with the CEMD, and that any issues arising are dealt with promptly.

Through the EIA process NorthConnect have engaged with the local community and the importance and benefit of this communications is acknowledged. As such, a communication plan will be put in place for all stages of the projects lifecycle, to allow the public's views to be taken account of throughout the detailed design, construction and operation, and the eventual decommissioning of the Converter Station.

Table 20.1: Summary of Significant Effects, With and Without Secondary Mitigation

Receptor or Nature of Impact	Receptor Type/ Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Construction: Noise Effects							
Highfield	Single Residential Property	Exceeds Cut off Values during Phase 2 & 3.	Significant	Good plant maintenance.	Exceeds Cut off Values during Phase 2 & 3.	Significant	Medium Term Significant
Hjaltland	Single Residential Property	Exceeds Cut off Values during HVAC (8 weeks)	Significant	Good plant maintenance.	Exceeds Cut off Values during HVAC (8 weeks)	Significant	Short Term Significant
Construction: Vibration Effects							
Highfield	Residential/ High	High	Moderate	Limit the peak particle velocity of the blast to below $6mms^{-1}$, at inhabited properties.	Medium	Minor	Not significant
Operations: Noise Effects							
Highfield	Single Residential Property	Night time > 5dB above background with Tonality Correction	Significant	Good design, equipment selected to minimise tonality.	Near Background	Not significant	Not significant
Lendrum Terrace 3	Cluster of residential properties	Night-time > 5dB above background with Tonality Correction	Significant	Good design, equipment selected to minimise tonality.	Near/ Below Background	Not significant	Not significant
Construction: Ornithological Effects							
Temporary habitat loss (disturbance to nesting birds).	Moderate/ Local	Negligible	Minor (but assessed as significant impact due to WCA compliance)	Restrictions on vegetation removal.	Negligible	Minor	Not significant

Receptor or Nature of Impact	Receptor Type/ Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Disturbance to Barn Owl.	National	Negligible	Minor (but assessed as significant impact WCA compliance)	Pre-construction surveys to determine presence.	Negligible	Minor	Not significant
Construction: Cultural and Archaeological Heritage Effects							
Disturbance of unknown buried archaeological artefacts.	Local - National	Low	Moderate	A staged programme of archaeological works will be undertake	Low	Minor	Not Significant
Construction: Landscape Effects							
Landscape elements and features of the site	Medium	Medium-Large	Moderate-Major	none	Medium-Large	Moderate-Major	Short to Medium Term Significant
BB1 Cliffs of the North and South-East Coasts LCT	Medium-High	Small	Moderate-Minor	none	Small-Negligible	Moderate-Minor	Short to Medium Term Not Significant
BB7 Eastern Coastal Agricultural Plain LCT	Medium	Small	Moderate-Minor	none	Small	Moderate-Minor	Short to Medium Term Not Significant
Construction: Visual Effects							
Dwellings within 1 km	Medium-High	Medium and Medium-Large	Moderate-Major	none	Medium and Medium-Large	Moderate-Major	Short to Medium Term Significant
Small settlements within 1-2 km	Medium-High	Small-Medium	Moderate	none	Small-Medium	Moderate	Short to Medium Term Not Significant
A90, A982	Medium-High	Small	Moderate-Minor	none	Small	Moderate-Minor	Short to Medium Term Not Significant

Receptor or Nature of Impact	Receptor Type/ Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Minor road Stirling Village to Newton	Medium	Medium	Moderate	none	Medium	Moderate	Short to Medium Term Not Significant
Aberdeenshire Coastal Path	Medium-High to High	Small	Moderate	none	Small	Moderate	Short to Medium Term Not Significant
Stirling Hill Access Network	Medium-High to High	Medium-Large and Large	Moderate-Major and Major	none	Medium-Large and Large	Moderate-Major and Major	Short to Medium Term Significant
Construction: Landscape Effects							
BB1 Cliffs of the North and South-East Coasts LCT	Medium-High	Small	Moderate-Minor	none	Small-negligible	Moderate-Minor	Permanent not significant
BB7 Eastern Coastal Agricultural Plain LCT	Medium	Small	Modedrate-Minor	none	Small	Moderate-minor	Permanent not significant
Operation: Visual Effects							
Dwellings within 1 km	med-high	medium and med-large	Moderate-Major	growth of woodland planting	Medium	mod-major	Permanent Significant
Stirling Hill Access Network	med-high to high	med-large to large	Moderate-Major to Major	growth of woodland planting	medium to med-large	mod-major	Permanent Significant
Construction: Water Quality Effects							
Pollution Incident during HVAC Cable Installation	Low	Large	Moderate	Spill Response Plan	Small	Negligible	Not Significant
Construction: Air Quality Effects							
Dust - Converter Station Earthworks	Low	Large	Minor-Moderate*	DPM Implemented.	Small to Medium	Negligible to Minor	Not Significant

Receptor or Nature of Impact	Receptor Type/ Sensitivity	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Impact Magnitude	Residual Significance of Effect	Assessment of Residual Effects
Lifetime: Air Quality Effects							
CO_2 Saving			Significant Positive				Significant Positive
Decommissioning: Air Quality Effects							
Dust - Earthworks	Low	Large	Minor-Moderate	PPG6 and IAQM Guidance (2014) followed.	Small to Medium	Negligible to Minor	Not Significant
Construction: Land Quality Effects							
Change to groundwater flow direction in localised south east corner of Fourfields platform	Medium	Medium	Moderate	Install toe-drain and divert seepage via site drainage, through attenuation and back into burn 200m downstream	Low	Minor	Not Significant
Construction: Traffic and Transport Effects							
Quarry Access Road – Pedestrian Impacts	High	Negligible – Medium	Negligible to Moderate	Safe, pedestrian priority crossing points. Speed limits. Dust management techniques. Good signage.	Negligible to Low	Negligible	Not Significant
Operation: Local Community and Economy Effects							
Socio-economic contribution	International	Medium - High	Major Positive		Medium-High	Major Positive	Significant Positive
				Key		Significant Effect	

*** No mitigation has been considered in the assessment of dust effects.**

Acknowledgements

The production of this ES was led by *Affric Limited.* The production however was a joint effort between environmental experts from various firms and the technical team. The results we hope is much more than a document to support a planning application, rather the joint iterative design process has resulted in a unique design for the converter station, which works with the surrounding landscape.

Thanks to all who have contributed, for their hard work (at all times of day), professionalism, sense of humour and tolerance through the EIA process.

NORTHCONNECT
CONNECTING RENEWABLES

Glossary

Glossary

Term / Abbreviation	Definition / Expansion
AC	Alternating Current
ACSEF	Aberdeen City and Shire Ecomic Futures
ADTF	Average Daily Traffic Flows
AGL	Above Ground Level
AHU	Air Handling Unit
ALDP	Aberdeenshire Local Development Plan
AOD	Above Ordinance Datum
AQMA	Air Quality Management Areas
ATC	Automatic Traffic Counts
BAP	Biodiversity Action Plans
BGS	British Geological Survey
BH	Borehole
BoCC	Birds of Conservation Concern
BS	British Standard
BSI	British Standards Institute
BTO	British Trust of Ornithology
CBC	Common Birds Census
CEMD	Construction Environmental Manage Document
CIRIA	Construction Industry Research and Information Association
CLVIA	The cumulative landscape and visual impact assessment
CO_2	Carbon Dioxide
CO_2 e	CO_2 Equivalent
Converter Station	Shorthand for - Interconnector Converter Station
COSHH	The Control os Substances Hazardous to Health
dB	Decibels
DC	Direct Current
DECC	The Department of Energy and Climate Change
DfT	Department for Traffic
DMP	Dust Management Plan
DTM	Digital Terrain Model
EcIA	Ecological Impact Assessment
ECoW	Environmental Clerk of Works
EGPS	Electricity Generation Policy Statement
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Feilds
EMS	Environmental Management System
ENSG	Electricity Networks Strategy Group
ENTSO-E	European Network of Transmission System Operators for Electricity
EPS	European Protected Species
ES	Environmental Statement
FFD	The Freshwater for Fish Directive
Fourfields	Site name
GBR	General Binding Rule

Term / Abbreviation	**Definition / Expansion**
GI	Ground Investigation
GIS	Gas Insulated Switch
GLVIA	Guidelines for landscape and Visual Impact Assessment
Ha	hectares
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
HPA	Health Protection Agency
HPDE	High-density polyethylene
HS	Historic Scotland
HVAC	High Voltage Alternating Current
HVAC cables	HVAC connection between the converter station and the substation
HVDC	High Voltage Direct Currnet
Hz	Hertz
IUCN	International Union for Conservation of nature
IEA	Institute of Environmental Assessment
IEEE	Institute of Electrical and Electronics Engineers
IEEM	Institute of Ecology and Environmental Management
IEMA	The Institute of Enviromental Management and Assessment
Interconnector converter station	The station converting the HVDC electricity to HVAC on import from the interconnector and HVAC to HVDC on export to the interconnector.
ISO	International Standards Organisation
JNCC	Joint Nature Conservation Committee
JV	Joint Venture
kT	Kilo tonnes – 1000 tonnes
kW	Kilowatts – 1000 watts
LA10	The A weighted sound level which is exceeded for 10% of a given monitoring period. A weighting takes account of perceived loudness to different frequencies of the human ear.
LA90	The A weighted sound level which is exceeded for 90% of a given monitoring period
LAeq	The A weighted equivalent continuous sound level which contains the same sound energy as a varying sound level over a given monitoring period.
LAmax	The maximum sound level arising during a given monitoring period
LAQM	Local Air Quality Management
LBAP	Local Biodiversity Action Plans
LCA	Land Capability for Agriculture
LCT	Landscape Character Types
LDP	Local Development Plan
LGS	Local Geodiversity SItes
LNCS	Local Nature Conservation Site
LNR	Local Nature Reserves

Term / Abbreviation	Definition / Expansion
LTS	Local Transport Strategy
LVIA	Landscape and Visial Impact Assessment
LwA	The A weighted sound power level, or the total sound energy radiated from a given source per second.
mbgl	Meters below ground level
MEICA	Mechanical, Electrical, Instrumental, Control and Automation
MEWP	Mobile Elevated Working Platform
mms^{-1}	Millimetres per second
MT	Millions of Tonnes
MW	Megawatts – a Million Watts
NAQ	National Air Quality Objectives
NBN	National Biodiversity Network
NESBReC	North East Scotland Biological Records Centre
NETS	National Electricity Transmission System
NGET	National Grid Electricity Transmission
NGTS	National Grid Technical Specification
NMP	Noise Monitoring Point
NNR	National Nature Reserves
NO_2	Nitrogen Dioxide
NPF	National Planning Framework
NPF3	The Third NPF
NRPB	The National Radiological Protection Board
NSR	Noise Sensitive Receptors
NT	Nano-Tesla's
NVC	National Vegetation Classification
OS	Ordnance Survey
PAC	Pre-Application Consultation
PACC	Pre-Application Communities Consultation
PAH	Polycyclic Aromatic Hydrocarbons
PAN	Planning Advice Notes
PEMP	Project Enviromental Management Plan
PIA	Personal Injury Accident
PM10	Particle matter of particles with a diameter of 10 micrometers or less
PPC	Pollution Prevention Control
PPG	Polluton Prevention Guidance
PPV	Peak Particle Velocity
PSD	Particle Size Distribution
PWS	Private Water Supplies
RBMP	River Basin Management Site
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
RES	Renewable Energy Systems
RIGS	Regionally Important Geological/Geomorphological Sites
SAC	Special Areas of Conservation

Term / Abbreviation	Definition / Expansion
SBL	Scottish Biodiversity List
SDP	Strategic Development Plan
SEPA	Scottish Environmental Protection Agency
SESA	Study of Environmentally Sensitive Areas
SG	Supplementary Guidance
SGNH	Supplementary Guidance on Natural Heritage
SGSR	Supplementary Guidance on Safeguarding of Resources
SGT	Super Grid Transformers
SHETL	Scottish Hydro Electric Transmission Limited
SINC	Sites of Important Nature Conservation
SINS	Sites of Interest to Natural Science
SLM	Sound Level Meters
SNH	Scottish Natural Heritage
SPA	Special Protection Areas
SPEN	Scottish Power Energy Networks
SPG	Supplementary Planning Guidance
SPL	Sound Pressure Level
SPP	Scottish Planning Policy
SPT	Standard Penetration Test
SSE	Scottish and Southern Energy
SSSI	Sites of Special Scientific Interest
SUDS	Sustainable Urban Drainage Systems
SWMP	Site Waste Management Plan
SWMS	Site Waste Management System
SWT	The Scottish Wildlife Trust
T	Telsa
t	Time
TMP	Traffic Management Plan
TP	Trial Pit
TWH	Tera Watt Hours, a million, million watt hours
WCA	Wildlife and Country Act 1981
WEWS	Water Enviroment and Water Services
WFD	Water Framework Directive
ZTV	Zone of Theoretical Visibility

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