Scottish and Southern Energy
Power Distribution

Moray Firth Hub &
Caithness HVDC Connection

Caithness Converter Station

Volume 1: Environmental Statement

June 2011

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Aquatera Ltd
Stromness Business Centre
Stromness
Orkney
KW16 3AW

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Non-technical Summary

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Introduction

Background

This document is the Non-technical Summary of the Environmental Statement for the Caithness Converter Station. This facility is proposed by Scottish and Southern Energy's (SSE's)[1] transmission business Scottish Hydro Electric Transmission Limited (SHETL)[2]. The converter station[3] will transform high voltage electricity from alternating current (AC)[4] to direct current (DC)[5]. These upgrades are needed to meet the demand for new electricity connection from various proposed renewable energy projects in the area.

The detailed findings of the environmental impact assessment (EIA) process, including detailed information about the project and planned mitigation commitments, are presented in the main Environmental Statement.

The proposed project

This converter station is part of a wider electricity transmission upgrade in the north of Scotland and the Northern Isles which includes:

- an onshore high voltage direct current (HVDC)[6] buried cable from the converter station to the coast;
- a directionally drilled[7] landfall at the coast, north of Wick;
- a subsea HVDC cable from the coast to the outer Moray Firth; where it connects to
- the Moray Firth, HVDC Hub platform[8], to act as the offshore connection point for various planned subsea cables (see Figure 2).

Future electricity flow into the converter station site could come from a variety of possible connections. All these proposals would be subject to separate, individual consent processes. The site selection process has taken into account the potential for future grid connections to the facility.

The proposed site

The proposed site for the converter station is at Spittal Mains Farm (National Grid Reference ND 153 554), approximately 2 kilometres (km) north of Spittal, 5km south from Halkirk and 13km south of Thurso. The site sits in the valley of the Achanarras Burn, some 500 metres (m) from the A9 trunk road (T). The project will involve construction of a permanent central engineered platform of approximately 6.5ha, which will house a large converter station building along with high voltage substation equipment. There is an additional 7ha core development area surrounding the platform that contains landscaping, drainage and tree planting, and some 6ha north of the platform that contains an existing conifer shelterbelt and an area designated for new shelterbelt planting (see Figure 1).

[1] SSE is the second largest energy generator in the UK as well as the second largest energy supplier in the UK.
[2] Scottish Hydro Electric Transmission Limited (SHETL) owns and maintains the 132kV and 275kV electricity transmission network in the north of Scotland. SHETL is owned by Scottish and Southern Energy Power Distribution, which is a trading name of SSE Power Distribution Limited.
[3] The converter station is a large metal-clad building containing the high voltage equipment for controlling the HVDC circuit.
[4] In alternating current the movement of electric charge constantly reverses direction at 50 cycles per second.
[5] In direct current the flow of electric charge is only in one direction.
[6] A high-voltage, direct current (HVDC) electric power transmission system uses direct current for the bulk transmission of electrical power, in contrast with the more common alternating current (AC) systems. For long-distance point to point transmission or networks with limited interconnection, HVDC systems are less expensive and suffer lower electrical losses than AC.
[7] Directional drilling is a method of drilling through rock at an angle used in this case to create a suitable cable landfall in an area too steep for trench cutting methods.
[8] The offshore hub platform is a steel platform - similar to an offshore oil platform - for housing the hub switching gear apparatus.

Approach to the EIA

Environmental impact assessment (EIA)

SHETL is submitting a planning application to The Highland Council under the Town and Country Planning (Scotland) Act 1997[9] as amended by the Planning etc. (Scotland) Act 2006. The proposals require a formal environmental impact assessment (EIA) to be completed under the provisions of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 because of the scale of the proposals and potential for significant effects.

As part of the EIA process, The Highland Council, other statutory consultees (Historic Scotland, Scottish Environment Protection Agency (SEPA) and Scottish Natural Heritage (SNH)), local landowners, local communities and other interest groups/organisations have been consulted. The views and information gathered from these consultations have been used to help shape the proposed project and ensure that wherever possible, adverse effects on people, the natural environment and cultural heritage have been avoided or reduced, and where possible benefits have been delivered.

During the EIA process, assumptions have had to be made about the design, construction and mitigation measures in order to allow the assessment to progress. If any changes to these project assumptions and commitments are made that could result in effects greater than those described in the Environmental Statement, then additional intervention measures will be considered and, if necessary, an addendum will be published for public consultation and comment and further consideration by The Highland Council.

Pre-application consultation (PAC)

The project is defined as a major project under the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009. Therefore, pre-application consultation (PAC) between the developer and the local community has been carried out in accordance with the relevant regulations. The PAC procedures were agreed with The Highland Council. They included public exhibitions in Halkirk, on 15th September and Watten, on 16th September 2010, as well as informing Halkirk and Watten Community Councils.

Habitats Regulations Assessment (HRA)[10]

Information has also been collated as part of the EIA to inform the appraisal[11] by The Highland Council of the likely significant effects of the converter station on sites of European nature conservation value to meet the requirements of the Habitat Regulations[12]. The sites and qualifying interests which have been considered are salmon in the River Thurso Special Area of Conservation (SAC)[13], otter from the Caithness and Sutherland Peatlands SAC and wintering wildfowl for the Caithness Lochs Special Protection Area (SPA)[14] sites.

[9] The Town and Country Planning (Scotland) Act 1997 is the main legislation governing the planning system in Scotland.
[10] The Conservation (Natural Habitats, &c.) Regulations 1994 place a statutory duty on the competent authority, in this case The Highland Council, to consider the likely significant effects of the project on sites designated for their nature conservation interest.
[11] An appraisal under the Habitats Regulations is completed by the Competent Authority and comprises an Appropriate Assessment which is an evaluation of possible impacts affecting the integrity of European sites.
[12] The Habitats Regulations enact the requirements of the Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats Directive).
[13] Special Areas of Conservation (SACs) are strictly protected sites designated under the Habitats and Species Directive (92/43/EEC) (the Habitats Directive). The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).
[14] Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds 79/409/EEC, the Birds Directive. They are classified for rare and vulnerable birds, listed in Annex I to the Birds Directive, and for regularly occurring migratory species.

Figure 1 The proposed site for the Caithness Converter Station

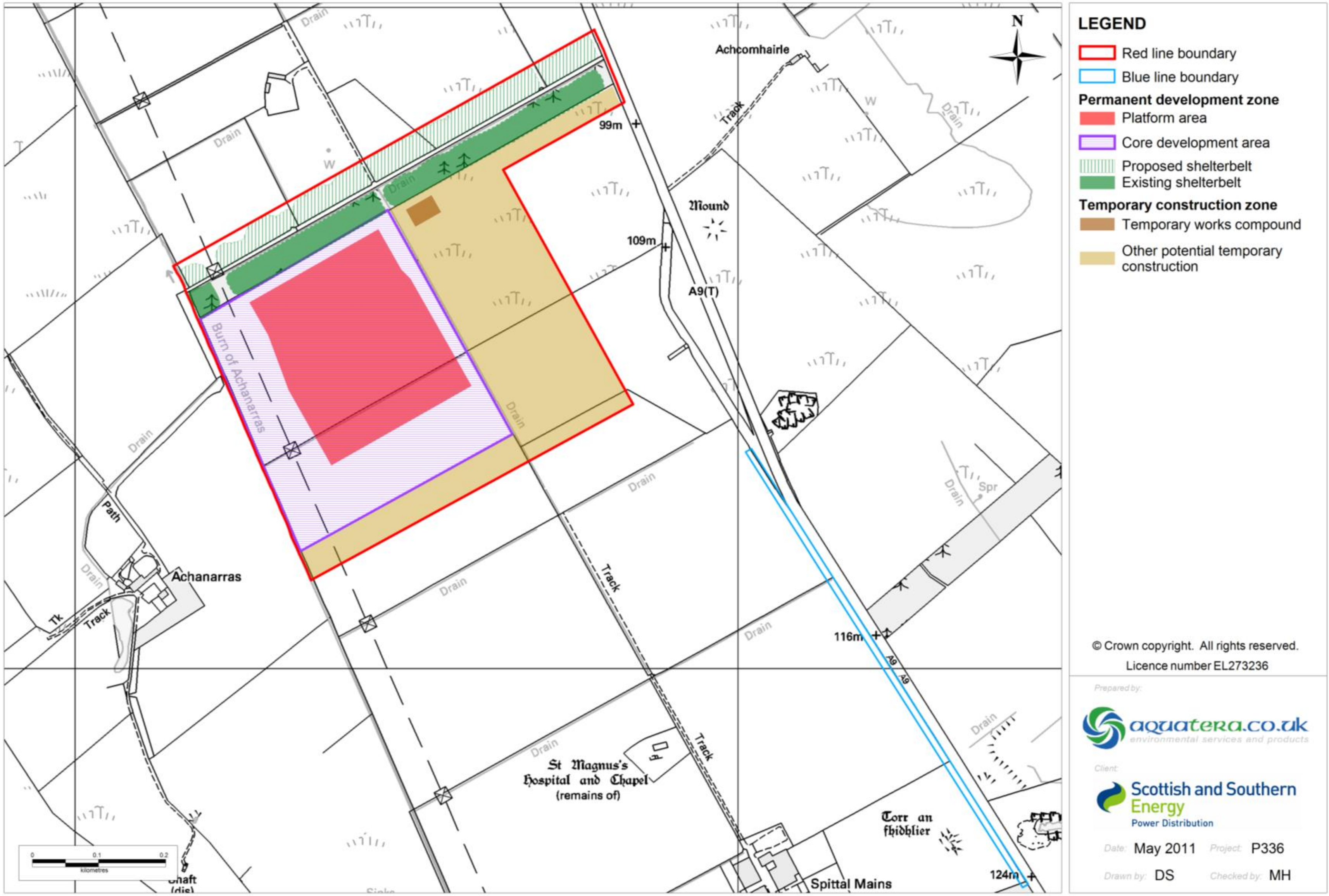

Figure 2 Overview of the Moray Firth Hub & Caithness HVDC Connection

The conclusions of the assessment are that although some possible connections between the proposed project and the qualifying interests of the site were identified, there will be no impacts arising that will affect the integrity of the sites, their qualifying species or the associated conservation objectives for each site.

Project design process and comparison of alternatives

Project need

SHETL has developed reinforcement proposals for the Caithness area which includes an HVDC Converter Station at Spittal, as a response to its statutory obligations as the holder of a Transmission Licence for the North of Scotland.

The reinforcement of the Caithness area was recognised in the National Planning Framework for Scotland 2 (Scottish Government, 2009) and also in the Electricity Networks Strategy Group (ENSG) report [15]. The need for reinforcement arises from the high volume of renewable generation, both contracted to connect to the grid and in the application process. This includes:

- multiple applications for connection of renewable generation schemes onshore in Caithness; and
- the initial stages of connection applications for marine energy projects in the Pentland Firth and Orkney Waters strategic area.

As part of an optimised and integrated electrical design, it is proposed that the Caithness proposals will also include an offshore platform or hub which will allow the possibility for connecting the following:

- a high-voltage direct current (HVDC) connection from Shetland; and
- possible future offshore wind proposals in the Moray Firth.

In determining the preferred reinforcement option for the Caithness area, a range of alternative schemes have been fully assessed by SHETL from a technical, cost, timing and environmental point of view.

Project objectives

The objectives which have been defined to underpin the development of the proposals are:

- to safely construct and operate a converter station with a design life of at least 40 years;
- to integrate successfully with other land uses in the area taking account of landowner interests;
- to safeguard the quality of surface and groundwater and minimise water crossings where practicable;
- to safeguard the natural and cultural heritage of the area, where practicable;
- to design, as far as practicable considering other constraints, a converter station that visually integrates with the landscape;
- to avoid significant effects on peat where these could be avoided;

[15] Electricity Networks Strategy Group (ENSG), 2009. ENSG Summary Report: 'Our Electricity Transmission Network: A Vision for 2020', (URN/09/752). Published by DECC.

- to contribute to the delivery of UK and Scottish renewable energy and carbon reduction targets[16]; and
- to produce a robust, cost effective design that is transferable to construction whilst taking account of environmental constraints[17].

Option selection process for sites and technologies

The key objective for this project was to establish an electricity transmission connection between existing and new generation in Caithness and Orkney and new transmission infrastructure planned for the Moray Firth. The initial target search area for locating the HVDC converter station was therefore established as between Thurso substation and Mybster substation, on the basis of the distribution of existing, and possible future generation sites.

The design development process undertaken comprised the following six key stages:

Stage one:	Establishing strategic needs
Stage two:	Definition of site and route search areas
Stage three:	Preliminary screening
Stage four:	Detailed assessment of routes and sites
Stage five:	Selection of preferred sites and routes
Stage six:	Selection of suitable layout and technology solutions

Seven sites were evaluated in detail as part of an initial screening. These were identified from preliminary sensitivity maps and supporting fieldwork. Subsequently five of these were taken forward into the final selection process: Mybster South, Mybster North, Spittal South, Spittal North, and Spittal Mains.

From the selection process it became clear that the Spittal Mains site was the preferred site. On balance it had the best combination of advantages in terms of engineering and environmental issues: it is located close to the existing 132kV line and so would not require an overhead line diversion; it is not located on peat; it is already partially screened by trees; it has good screening from nearby properties; it has a low prominence in the overall Caithness landscape as it is located in a valley; and ecological sensitivities are limited and can be protected.

The project proposals

The key components of the proposed converter station development (see Figure 3) are:

- a level hardcore platform supporting: the converter station building and an electrical substation;
- an access track to the platform from the A9(T) and around the compound;
- a temporary construction compound housing offices, car park, and equipment and materials storage areas;
- new drainage systems to prevent flooding of the platform and deal effectively with field drains, ground water and water flows from the surrounding land;
- landscaping to screen the facilities from key nearby view points including a Scheduled Ancient Monument; and
- security fencing to ensure that the public, livestock and wildlife do not enter an operational area.

[16] The Climate Change (Scotland) Act 2009 sets a CO_2 reduction target for the year 2050, an interim target for the year 2020, and makes provisions for annual targets, for the reduction of greenhouse gas emissions.
[17] Including potential impacts on people and the natural and cultural heritage

Site facilities

The converter station facilities will be established on a crushed rock platform constructed from rock material excavated from the site. The platform has been designed to sit above the predicted 1:1000 year flood level, and further ground profiling will ensure that any surface water flows are directed away from the converter station site.

The main outside area of the core platform will function much like a normal 275/132kV substation, accommodating open metal busbar[18] structures up to 10.5m high. There will also be a substation control room. The high voltage equipment for controlling the HVDC circuit will be contained within large metal-clad buildings up to 17m in height (the converter station). The converter station will also house stores, workshops, control rooms, staff welfare facilities and storage for spare equipment.

The main buildings will be finished in an unobtrusive dull dark green colour. The sheds will be designed, as far as practical, to mimic agricultural sheds thus further reducing landscape impact (see Figures 4 and 5). The full details of the building design will be finalised and agreed with The Highland Council once the procurement process concludes and a chosen supplier has been identified.

The construction supply lines to the site could include road, rail and marine means of transport. Road access will be via the A9(T). The access to the converter station from the A9(T) will be via the existing track to Achanarras Farm. The site will not be permanently lit during darkness and the orientation of lighting will prevent lights shining out of the site.

During the construction phase of the project a contractor's compound will be located just to the northeast of the excavated platform area. The compound will contain offices, mess rooms, chemical toilets and parking for around 30 light vehicles. Areas for storage of materials such as topsoil, sand, stone and equipment will also be established.

Site activities

The construction phase of this project is due to start in 2013/14 with the facility being commissioned in 2015/16. Civil works are expected to take about 12 months and construction of the converter station and associated electrical works around 15 months. The 2 to 2½ year programme takes into account restrictions in working times due to seasonal restrictions on activities, weather or other delays.

The project will employ some 20 staff for platform civil works and 25 - 30 staff for electrical/specialist converter station works. Construction hours will be: 8am - 7pm Monday to Friday, 8am - 1pm Saturday. Any out of hours working will be agreed in advance with The Highland Council.

A project Construction Environmental Management Document (CEMD)[19] will be prepared and will include all agreed mitigation measures set out in the Environmental Statement. It will be updated with any future planning conditions and landowner agreements. The contractor will be required to implement these measures. All site staff will receive environmental training at the beginning of the contract and throughout the construction period as required. The contractor's compliance with environmental procedures will be audited.

The converter station will operate unmanned with periodic staff visits for inspection and maintenance from the transmission team based in Inverness. Control of the facility will normally be managed remotely from SSE's central control facility in Perth.

[18] A busbar is a thick strip or rod of copper or aluminium that conducts electricity within a substation or other electrical apparatus. Busbars are used to carry very large currents, or to distribute current to multiple devices within switchgear or equipment.
[19] This document sets out the requirements for protecting the environment and promoting sustainable construction for all elements and at all stages of the project and ensures that all commitments are delivered by the contractor.

Figure 3 Key features of the Caithness Converter Station development

Figure 4 Indicative view of converter station building and associated electrical equipment looking northeast from Achanarras Hill, near Achanarras Quarry

Figure 5 Indicative view of converter station building and associated electrical equipment looking northwest from the A9(T) after growth of the hedge to 2m height [effect of 3m hedge shown in inset]

Effects of the proposals

The environmental effects of the proposals are summarised in the following sections. Effects can be classified as negligible, minor, moderate, major or severe, adverse or beneficial. Only effects classified as moderate or major are considered to be significant.

Planning policy

This converter station project will provide new transmission infrastructure which will help the grid system in the north of Scotland mainland and Orkney deliver the connection capacity required by future renewable energy generation projects. The project is thus strongly aligned with many national and regional policies relating to the reduction of greenhouse gas emissions and the facilitation of renewable energy as part of the solution for this issue.

The project proposals comply with most of the policy that applies to the location and the development. The residual planning issues are as follows:

- In the Caithness Local Plan[20], the core platform area is zoned as an area suitable for development. Parts of the access track and some of the planned roadside planting lie in a more strictly controlled buffer area alongside major roads. There are no obvious alternatives to using these areas and care has been taken to minimise any environmental impacts associated with the layout.
- The proximity of the proposals to the scheduled St Magnus' church, burial ground and hospital, where the assessment indicates that there would be moderate effects on setting (see below for details).

The selected site and linked developments have limited scope for combined or cumulative effects with other, nearby, planning applications and will not have any direct influence upon the suitability of other planned projects. Indirectly the converter station will help to reduce uncertainty over the provision of suitable grid connections for some of the renewable generation projects that are currently being planned.

Land use and utilities

The development will result in a permanent land use change affecting approximately 17 hectares of mostly agricultural land. No residential properties will be directly affected by construction and no properties will be demolished. The nearest property, Achanarras Farm, is some 200m away from the development area with Spittal Mains Farm approximately 730m away. Residents and local businesses will be kept informed about construction activities and the contractor will be required to keep disruption to a minimum.

The central development area will lead to permanent land use changes with a temporary change in land use for the temporary works compound required during the construction period. Following construction, the central development area will be fenced and the temporary construction compound will be re-instated to a condition as near as is reasonably practicable to that before the commencement of the works. Existing stock fencing will be retained where possible, with new fencing

[20] The Caithness Local Plan is a statutory document prepared by The Highland Council which guides decisions on planning applications in the Caithness Area. The Caithness Local Plan was adopted in September 2002.

provided if necessary. This will incorporate Caithness flagstones where appropriate.


Existing farm track to Achanarras Farm

The access track from the A9(T) will be of shared use with the nearby Achanarras Farm. A secure gate to the platform area, will integrate with the security fencing around the platform area. This will ensure existing farm access is maintained.

Security and safety considerations also require the installation of signage around the perimeter of the converter station development platform.

The existing mature shelterbelt of trees in the area will be maintained to provide ongoing visual screening. Additional planting will take place north of the track on Achalone Farm to provide long term screening. Full use will be made of existing land drainage systems, with any necessary alterations made to be compatible with the existing drainage arrangements.

A water main which runs through the site will be re-routed but the supply maintained. The existing 11kV wood pole distribution electricity line will also be re-routed and undergrounded from the existing farm track running past the site down to the Achanarras Burn.

Geology and soils

There are three geological Sites of Special Scientific Interest (SSSI)[21] in the area of the proposals. None would be directly or indirectly affected by the proposals.

The geological interests in the area of the converter station include a seam of shale/mudstone with fossils. Based upon the location of the site and the proposed depth of excavation, the Achanarras Fish Bed[22] rock seam, which contains the fossils, should not be penetrated by the development works.

Excavated materials will be reused on site to build the platform for the converter station. The overall impact on local geology is assessed as moderate locally, but not significant in the wider context.

No significant areas of contaminated land have been identified which could be affected by the works. The implementation of best management practices will also ensure that any potential impacts on soils are minimised and no significant effects arise.

Hydrology, drainage and water quality

The key hydrological feature associated with the converter station site is the Achanarras Burn. This burn flows along the western boundary of the development

[21] A SSSI is an area that has been notified as being of special interest due to its flora, fauna or geological or physiographical features under the Wildlife and Countryside Act 1981 and the Nature Conservation (Scotland) Act, 2004.
[22] The Achanarras Fish Bed is a distinct layer of rock containing fossil fish that was deposited about 380 million years during the Middle Devonian geological period in an area known as Lake Orcadie.

site. The burn is not itself designated, but it is a tributary of the River Thurso which is a designated site (SAC) for salmon.

One key objective for all new developments is to avoid and reduce flooding potential. The proposed converter station platform lies outside flooding areas for 200 year and 1000 year return events, which would be contained by the existing banks of the burn.

Standing water on existing fields at the site is thought to arise from surface water flows off adjacent farmland. Suitable drains and earth mounds have been designed to deal effectively with such surface water flows.

A drainage plan has been designed to protect the Achanarras Burn from high sediment loads or contaminated flows in surface or percolated water during construction and operational phases. This plan will include spill prevention and response measures along with staff training in their implementation.

No residual significant adverse effects on hydrology, drainage or water quality are predicted as a result of the proposed development.

Ecology and nature conservation

There are no designated nature conservation sites near to the converter station that could be directly impacted by this project. The River Thurso SAC could possibly be impacted indirectly by high sediment loads or other pollutants arising from the development site (see above). However, the assessment has determined that with appropriate mitigation in place, the likelihood of any such harmful scenarios developing is extremely low and no adverse affects on the integrity of the River Thurso SAC or its conservation objectives are predicted. These findings have been discussed and agreed with SNH during consultation.

The proposed landscaping and screening for the site provide an opportunity to enhance local biodiversity. New drainage and water storage features will be designed to encourage biodiversity. Any new woodland planting will also be designed with open glades, good structure and with a mix of deciduous and evergreen trees, and shrubs. Native species typical of the local area and of local provenance will be used where possible.

Buzzard, kestrel and long eared owl breed in the existing shelterbelt. Curlew also breed in field margins in the area. None of these species are specially protected, although curlew is a locally important biodiversity indicator species. The area is already subject to regular agricultural activity and disturbance from nearby traffic. Although disturbance from construction will be more intense, it will only last two summer seasons and there are alternative breeding areas nearby. As an additional protection measure it is proposed to avoid the start-up of significant construction works during key nesting periods. The site is also used periodically by foraging wintering geese. However, the use is not heavy; there are already disturbances arising from farming on the site; and there are a variety of alternative foraging areas nearby. Consequently it is considered that there will only be minor, non-significant, impacts on breeding or wintering birds from the development.

Otter, a European Protected Species[23], is known to travel through the wider site area, although no shelters were found during the protected species site survey. Water vole has been recorded in the Achanarras Burn in the past (last record

[23] Species listed on Schedule 2 of the Habitats Regulations (1994)

1980s). No signs of water vole were detected during the more recent site surveys. Further checks for protected species will be undertaken before construction starts and specific mitigation will be put in place to ensure that no otter or water vole habitat will be adversely impacted by the project and to ensure that both species are adequately protected.

With appropriate mitigation in place only minor, non-significant, impacts to ecological or conservation interests are therefore predicted.

Impacts during construction will be monitored and if any signs of disturbance or changes from the anticipated conditions are noted, then additional mitigation measures will be agreed with SNH and The Highland Council and implemented.

Landscape and visual impacts

Landscape has been a key driver in the identification of a suitable location and in the approach to the design and layout of the selected site. The site for the converter station development was partly selected because it is a locally enclosed pocket within the generally open and expansive Caithness landscape. Local topography and existing shelterbelts combine to restrict visibility and thus also landscape impact of the proposed development to a substantial degree.

View looking north west across the proposed converter station site from the A9(T) toward the River Thurso valley

Further landscape screening will be achieved using earth mounds to the south of the site and new planting. The design will also seek to enhance local biodiversity through planting trees and shrubs alongside the interceptor drains and over the earth mounds. The primary aim of this landscaping is to help screen the electrical equipment and converter station, particularly when viewed from the south.

A new shelterbelt will be planted to the north of the existing mature shelterbelt and access track. The aim of this planting is to ensure that the visual barrier formed by the existing shelterbelt is continued as the existing trees reach the end of their life.

A third area of landscaping lies next to the A9(T) where a hedge line with some trees will be used to partially screen the site as vehicles pass the site from the south. In the context of the large scale landscapes of Caithness, the degree of change is limited. However very locally, in the Achanarras valley between the shelterbelt and Spittal Mains Farm, there will be a more intensive change and a major adverse effect on the landscape.

The converter station building and outside electrical equipment will only be clearly visible from the out buildings of Spittal Mains and Achanarras Farms and from a short section of the A9(T).


View across the Achanarras Burn from the access track to Achanarras Farm looking south- southeast towards Spittal Mains Farm

To the north, the existing shelterbelt will block most views, although the access track will be overlooked locally, and the bulk of the converter station may be distinguished through the shelterbelt when backlit during winter. There would be distant views of part of the site from a small area of high ground around Stemster, a glimpse through the gap in the shelterbelt from a narrow strip of ground north to Sordale but almost no view from Halkirk. To the east, the rising ground of Spittal Hill will restrict visibility to fields and hillside within one to two kilometres.

To the south, rising ground at the head of the valley of the Achanarras Burn will block almost all views, although there will be a restricted distant view from a short section of the A9(T) at Halsary. To the southwest, Achanarras Hill will block any visibility from the upper valley of the River Thurso.

Consequently the only middle distance views will be from the northwest. This view is created between the end of Achanarras Hill and the existing shelterbelt, however, the impacts on these views will be minor and not significant.

There will be moderate and major adverse visual effects on a number of viewpoints within about a kilometre of the development. In the first few years after completion there will be a major adverse visual impact from the A9(T) passing the site, reducing to moderate adverse as the mitigation planting along the roadside develops.

From the adjacent farmhouses at Spittal Mains and Achanarras there will be no direct view and thus no visual impact but the overall visual experience on approach to the properties will be subject to a moderate adverse visual impact, which will not change substantially over time.

There will be a moderate adverse visual impact on views from the highest parts of the Achanarras Quarry SSSI.

Archaeology and cultural heritage

Within the proposed converter station development area there is only one recorded cultural heritage site, a pile of modern field clearance stones, identified during the walkover survey. This feature is of no conservation value and its loss is considered insignificant.

The Scheduled Ancient Monument (SAM)[24] of the medieval St Magnus' church, burial ground and hospital lies some 450m south of the boundary of the converter station site and 595m from the core platform area. This site is of national

[24] Any archaeological or historical site which is considered to be of national importance and has been protected under the Ancient Monuments and Archaeological Areas Act 1979

importance and, as a SAM, has statutory protection. It is however not regularly maintained and is rarely visited.

View north northwest across St Magnus' church, hospital and graveyard to the proposed converter station site

The proposed converter station will lie to the north of St Magnus' church in full view of the scheduled site. The assessment of the current setting of this site has concluded that this is not one of the factors that make the site of national importance, since its original setting is already highly changed by other developments.

Once the construction work is completed the converter station facilities, when viewed from St Magnus' church, will be back dropped against the existing shelterbelt minimising any influence over the setting. Additional mitigation is planned in the form of landscaping works, planting and using an appropriate unobtrusive paint colour for the buildings which will help soften the visual impact of the building. The residual effect on setting is assessed as moderate and therefore significant.

Residual impacts on four other designated sites within 2km of the proposed development have been assessed as minor taking account of existing screening and committed mitigation measures.

The impact upon sites lying more than 2km from the development site were all considered to be negligible or minor adverse and therefore not significant as were the views across the site towards archaeological features in the landscape.

Traffic and transport

Access to the site will be gained directly from the A9(T) and it is anticipated that all deliveries to the site would finish their journey by road. Some congestion at ports and harbours may occur, however measures within the CEMD will ensure no significant impacts occur. Once plant and machinery is on the site it will mostly stay there until the construction works are completed. During the converter station's operational phase little traffic is anticipated to/from the site since the site will not normally be manned.

Junction of A9(T) and access track looking south

Traffic will increase on local roads during the construction phase and this will be most noticeable in the peak periods at the start and end of the day as the site staff arrive and leave the site. Through the day traffic levels are likely to be lower and steadier but will have a high proportion of heavy goods vehicles (HGV) traffic. The selected contractor will be required to ensure any disruption from construction traffic is reduced to the minimum for the safe delivery of the works. Appropriate measures will be implemented to reduce the impacts and traffic disruption and consequently severance and amenity effects are not predicted to be significant.

The construction of the converter station will also require the movement of abnormal loads[25] which requires careful management so that large and heavy vehicles use only those parts of the road network that can safely accommodate them. With careful management and planning no long term significant impacts are anticipated.

Any impacts on the local road network from the increase in traffic due to construction of this project will be made good.

Noise and vibration

There are seven residential dwellings within 1km of the proposed development. The closest of these properties, Achanarras Farm, is approximately 200m from the development area. In addition, the Scheduled Ancient Monument, St Magnus' church, burial ground and hospital, is located some 450m from the boundary of the converter station site, within which construction works will take place. It is anticipated that there may be some temporary increases in noise levels at these locations during construction works; however, the assessment indicates that the impacts will not be significant. Mitigation measures have been agreed to further reduce construction noise levels.

Vibration and potential noise impacts as a result of construction generated traffic will also be minor, (limited and temporary) and not significant. Any vibration and air overpressure impacts as a result of possible blasting works at the site are also predicted to be negligible to minor (not significant) and again temporary in nature. Traffic levels arising during the operation of the converter station will be small (see above) and noise impacts will be negligible.

Based on applicable national guidance, the requirements of The Highland Council, and the prevailing local noise environment, a series of noise level limits have been proposed for the control of plant noise emissions from the development once operational. Compliance with the proposed limits will ensure that operational plant noise will give rise to negligible noise impacts.

Air quality

With the mitigation measures implemented, it is predicted that there will be no significant effects on air quality (including from dust) during construction or operation of the converter station. There will be no significant effects on local air quality from emissions from site plant, HGVs or other vehicles because of the low level of traffic associated with the proposals.

Socio-economic effects

Some positive socio-economic effects are predicted during the construction phase with likely use of local construction workers, and of the local supply chain to some degree and an increased demand on local services.

There are no nearby businesses which will be directly affected negatively by the proposals. The landowners of Spittal Mains Farm have been fully engaged in the

[25] Abnormally heavy, long or wide loads

project development process and are content that their ongoing business activities will not be significantly affected.

There will be spin-off benefits for the local renewables sector through increased capacity for exporting energy.

There will be no significant impacts on tourism and recreation sites due to the location of the development away from key sites for such activities, the low visual profile of the site and the low level of servicing and maintenance required during its operation.

Cumulative effects

Cumulative effects arise from the interaction of multiple impacts acting on a property, area or site at one time, impacts arising during different project phases, and impacts associated with different projects.

Nearby residential properties may be affected by a variety of environmental impacts during construction but no significant effects have been identified. Fewer impacts arising during the operational phase of the project reduces the potential for longer term operational cumulative effects.

No significant cumulative effects have been identified with proposed wind farm projects due to the careful siting of the development.

Care has also been taken to select a site that has reasonable potential for future connection of buried cables or overhead lines. The cumulative effects of any future projects will be taken into account as part of those applications. The close proximity of the site to the existing 132kV overhead line is helpful as part of this strategy.

Major positive cumulative effects are likely to result from the combined economic stimulus that multiple development projects could provide for Caithness. The converter station will allow some 600MW of new renewable generation to connect to the national grid helping to contribute to national renewable generation targets.

Sustainability

The importance of incorporating sustainability principles in developing the concept and detail of the project has been recognised and this approach will be continued through procurement of a contractor and during construction of the facilities.

Review and comments

Upon receipt of a valid planning application, The Highland Council will invite formal comment on the proposals, which the Council will take into account before reaching a decision on the application. The Environmental Statement can be viewed during the consultation period during normal working hours at the Council offices:

The Highland Council
Glenurquhart Road
Inverness, IV3 5NX

and at the following locations:

The Highland Council Planning Office
Market Square
Wick KW1 4AB

Thurso Service Point Council Offices
Rotterdam Street
Thurso KW14 8AB

The Environmental Statement can also be viewed on the SSE website at http://www.sse.com (follow links to Media Centre>Project Portfolio>Caithness HVDC Connection).

Copies of the environmental statement are available from SHETL (at the address below) in hard copy for £200 or on CD for £20 (including postage and packing). Please note that VAT will be charged on the supplied CD ROMs.

Scottish Hydro Electric Transmission Limited
Major Projects Support Group
Inveralmond House
200 Dunkeld Road
Perth. PH1 3AQ

The Environmental Statement comprises five volumes:

Volume 1: Main Environmental Statement report and Non- technical Summary

Volume 2: Report figures for the Environmental Statement

Volume 3: Annexes to the Environmental Statement

Volume 4: Appendices to the Environmental Statement

Volume 5: Appendices to the Environmental Statement presented on A3

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List of Tables

Abbreviations and Acronyms

AA	Appropriate Assessment
AC	Alternating Current
AIL	Abnormal Indivisible Load
AOD	Above Ordnance Datum
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
BGS	British Geological Survey
BS	British Standard
CAR	The Water Environment (Controlled Activities)(Scotland) Regulations (2011)
CASE	Caithness and Sutherland Enterprise
CEMD	Construction Environmental Management Document
CNSRP	Caithness and North Sutherland Regeneration Partnership
CRTN	Calculation of Road Traffic Noise
DC	Direct Current
DEFRA	Department of Environment, Food Rural Affairs
DMRB	Design Manual for Roads and Bridges
DWPA	Drinking Water Protection Area
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EPS	European Protected Species
ES	Environmental Statement
FWF	Freshwater Fish
FWPM	Freshwater Pearl Mussel
GES	Good Ecological Status
GIS	Geographic Information System
HBRG	Highland Biological Recording Group
HGV	Heavy Goods Vehicle
HLA	Historic Land-use Assessment
HPA	Health Protection Agency
HRA	Habitats Regulations Assessment
HRES	Highland Renewable Energy Strategy
HRESPG	Highland Renewable Energy Strategy and Planning Guidelines
HS	Historic Scotland
HVDC	High Voltage Direct Current
HwLDP	Highland-wide Local Development Plan
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
JNCC	Joint Nature Conservation Committee
LBAP	Local Biodiversity Action Plan

LGV	Light Goods Vehicle
LLCT	Local Landscape Character Type
LSE	Likely Significant Effect
NBN	National Biodiversity Network
NDA	Nuclear Decommissioning Authority
NERC	Natural Environment Research Council
NGR	National Grid Reference
NPFS	National Planning Framework for Scotland
NR	Noise Rating
NTS	Non-technical Summary
OHL	Overhead Line
ORCA	Orkney Research Centre for Archaeology
OS	Ordnance Survey
PAC	Pre- Application Consultation
PAN	Planning Advice Note
PP	Primary Policies
PPV	Peak Particle Velocity
RBMP	River Basin Management Plan
RCHAMS	Royal Commission on the Ancient and Historical Monuments of Scotland
RIGS	Regionally Important Geological / geomorphological Site
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SEPA	Scottish Environment Protection Agency
SHETL	Scottish Hydro Electric Transmission Limited
SNH	Scottish Natural Heritage
SNH LCA	Scottish Natural Heritage Landscape Character Assessment
SPA	Special Protection Area
SPG	Special Planning Guidance
SPP	Scottish Planning Policy
SSE	Scottish and Southern Energy
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage System
TA/TS	Transport Assessment/ Statement
THC	The Highland Council
TRL	Transport Research Laboratory
TRRL	Transport and Road Research Laboratory
UK BAP	UK Biodiversity Action Plan
VSC	Voltage-sourced Converter
WCA	Wildlife and Countryside Act 1981 as amended
WEWs	The Water Environment and Water Services (Scotland) Act 2003
WFD	Water Framework Directive
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 The Moray Firth Hub & Caithness HVDC Connection

Scottish and Southern Energy's (SSE) transmission business Scottish Hydro Electric Transmission Limited (SHETL)[26] is developing proposals to upgrade the electricity transmission infrastructure in the north of Scotland to meet demand for connection from various renewable proposals. To help meet these requirements a project has been devised for a high voltage direct current (HVDC) link to connect onshore grid infrastructure in Caithness with offshore grid infrastructure in the Moray Firth. This link would comprise:

- a new alternating current (AC) to direct current (DC) converter station near Spittal in Caithness (the subject of this document);
- an onshore HVDC buried cable from the converter station to the coast north of Wick;
- a directionally-drilled landfall at the coast near Field of Noss Farm, north of Wick;
- a subsea HVDC cable from the coast to the outer Moray Firth; where it connects to
- the Moray Firth HVDC Hub platform, to act as the offshore connection point.

SHETL wish to take forward the proposals in a responsible manner, with due regard for the environment as is required by the terms of their statutory obligations (see Section 1.4), and has completed an Environmental Impact Assessment (EIA) for the Caithness converter station. This document is the Environmental Statement (ES) for the Caithness Converter Station EIA. It reports the findings of studies and assessment of effects associated with the construction, operation and decommissioning of the converter station at a site near Spittal in Caithness. Figure 1.1[27] shows the key elements of the overall Caithness HVDC Connection. The location of the proposed converter station at Spittal is shown in Figure 1.2. The proposals are described in more detail in Chapter 4: The Project Proposals.

1.2 Grid network connections

At the Caithness Converter Station future connections will be made to the existing 132kV line from Thurso to Beauly and to any new connections arising from new power generation projects. These will be subject to separate consents and are not part of this EIA process. It is likely that the existing 132kV line from the connection point northwards to Thurso will be required to upgrade to 275kV. This again will be taken forward by SHETL as a separate project.

1.3 Project timescales

The construction phase of the project is anticipated to take some 2½ years, beginning in 2013 with the facility being commissioned in 2016.

1.4 Statutory context and development consents

Due to the nature of this project there is a need to meet a variety of legislative requirements and as a result follow specific processes and obtain necessary

[26] Scottish Hydro Electric Transmission Limited (SHETL) owns and maintains the 132kV and 275kV electricity transmission network in the north of Scotland. SHETL is owned by Scottish and Southern Energy Power Distribution, which is a trading name of SSE Power Distribution Limited.
[27] All figures are detailed in Volume 2.

consents which will ultimately set out the boundaries of operation. SHETL's functions are defined through its Transmission Licence (awarded by Ofgem through the Electricity Act 1989 s6). For SHETL to undertake this project there is a need to comply with requirements relating to:

- Transmission Licence
- Planning
- Other licences

1.4.1 Transmission licence requirements

The Caithness Converter Station project must comply with the framework of statutory obligations that apply to SHETL as a holder of a Transmission Licence. Amongst the obligations that SHETL must fulfil is a duty, under Section 9 (2) of the Electricity Act, 1989 for the holder of a Transmission Licence to:

- Develop and maintain an efficient, co-ordinated and economical system of electricity transmission; and
- Facilitate competition in the supply and generation of electricity.

Additionally, Section 38 and Schedule 9 of the Electricity Act, 1989 require the holder of a Transmission Licence to preserve amenity and fisheries in Scotland stating:

> *In formulating any relevant proposals, a licence holder or a person authorised by exemption to generate or supply electricity:*
>
> - *shall have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and*
> - *shall do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.*

1.4.2 Development consents

Development consents required for the Caithness Converter Station include:

- an application to The Highland Council under the Town and Country Planning (Scotland) Act 1997 as amended by the Planning etc. (Scotland) Act 2006, submitted at the same time as this ES;
- pre-application consultation because the development is 'major' development' under The Town and Country Planning (Hierarchy of Development) (Scotland) Regulations 2009 (see Section 2.4.2);
- formal environmental impact assessment (EIA) under the provisions of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (EIA Regulations) because of the scale of the proposals and potential for significant effects.

The extent of the planning application for the converter station is outlined in Figure 1.2.

1.4.3 Pre-application Consultation

All national and major developments require Pre-application Consultation (PAC) between developers and communities. The project is defined as a major project[28] under the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009. Pre-application consultation between the developer and local community has thus been carried out in accordance with the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2008 and the relevant provisions of the Town and Country Planning (Scotland) Act 1997 as amended by the Planning etc. (Scotland) Act 2006 (see Section 2.4.2).

1.4.4 Environmental Impact Assessment

Projects specified within Schedule 1 of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 are required to undertake an EIA. Schedule 2 however sets out those developments for which the need for an EIA is determined by the local planning authority on a case by case basis through a screening process. In the case of the Caithness Converter Station, early discussions with The Highland Council determined that because of the scale of the development, the project should be considered to have the potential for significant effects and should therefore be considered formally under the EIA Regulations.

Although it has been determined that there is the potential for there to be significant environmental effects, and that an EIA is therefore required, it does not mean that a significant effect is the ultimate conclusion of the Environmental Statement (ES). The EIA process facilitates identification of the potential for significant impacts and then allows environmental measures to be incorporated into the design of the development, or the method of construction and operation, which may reduce or eliminate any negative effects. It is the significance of any residual effects that is then assessed and on which the determination decision is based.

Under the EIA Regulations a formal Scoping Opinion can be requested. On this project it was considered that the regular interactions and discussions with statutory bodies had helped scope the EIA (see Annex I) and a formal opinion was not requested.

1.5 Structure of this Environmental Statement

This ES has been prepared to meet the requirements of the EIA Regulations and the approach has been informed by Scottish Government Planning Circular 3 2011: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 and other EIA guidance (IEMA 2004). Table 1.2 and Table 1.3 (at the end of this chapter) summarise where the information required by the EIA Regulations can be found in the ES. The individual technical assessments have been carried out with reference to relevant legislative and policy requirements and current best practice and where relevant this is quoted in each technical chapter. The focus of the EIA was informed by the comments from consultees (see Section 2.4).

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[28] Major development includes 'Business and General Industry, Storage and Distribution: for any industrial process – the gross floor space of the building, structure or other erection is or exceeds 10,000 square metres' or 'The area of the site is or exceeds 2 hectares'. The proposed converter station would occupy a compound measuring up to 300m x 250m, equalling 75,000m^2, and is therefore classed as 'major' development and is therefore subject to PAC.

This Environmental Statement for the Caithness Converter Station is presented in five volumes:

- Non-technical summary
- Volume 1 — The main ES report also including the non-technical summary (NTS)
- Volume 2 — All figures associated with the main reports, organised by chapter
- Volume 3 — Five annexes supporting the ES
- Volume 4 — Appendices including data and technical reports supporting the main ES presented in A4 format
- Volume 5 — Two appendices (10-A and 11-D) presented in A3 format

Within the remainder of **Volume 1** the following chapters are presented:

Chapter 2 – Approach to the Environmental Statement
This chapter summarises the approach taken to the ES, including the project team, sources of information, objectives of the ES, consultation, and approach to the assessment.

Chapter 3 – Project Design Process and Comparison of Alternatives
This chapter summarises work undertaken to define objectives for the project and to evaluate alternatives. It outlines the alternatives considered, and describes the process for selecting the preferred option for the converter station.

Chapter 4 – The Project Proposals
This chapter describes the project proposals for the selected option focussing upon issues relevant to the environmental performance of the project.

Chapter 5 – Planning Policy and Guidance
This chapter outlines the relevant policy and planning framework for the project and assesses compliance with relevant policies.

Chapters 6 to 15: Individual topic-based assessment
These chapters address the environmental impacts of the proposals, set out agreed mitigation and summarise the residual environmental effects that could result. The topic areas addressed are:

- Chapter 6. Land Use and Utilities
- Chapter 7. Geology and Soils
- Chapter 8. Hydrology, Drainage and Water Quality
- Chapter 9. Ecology and Nature Conservation
- Chapter 10. Landscape and Visual Impacts
- Chapter 11. Archaeology and Cultural Heritage
- Chapter 12. Traffic and Transport
- Chapter 13. Noise and Vibration
- Chapter 14. Air Quality
- Chapter 15. Socio-Economic Impacts

Chapter 16 – Cumulative effects
This chapter considers the intra-project pressures and opportunities arising from combinations of the topics outlined above and then goes on to consider the in-combination issues (i.e. cumulative effects) that may arise with other existing and planned projects in the area.

Chapter 17 – Sustainability of the project
This chapter includes a review of the sustainability principles that have been incorporated in the project to date.

For each of the environmental topics the key points outlined in Table 1.1 have been addressed:

Table 1.1 System used to assess each topic in the EIA process

What is covered in this chapter?
Subjects included in the chapter and reference to chapters where related issues are covered
Why could the issue be important?
A qualitative overview by the project team on why the issue is important in the context of this project
Sources of information
The various sources of information that have been used for the assessment
Survey and analysis work undertaken
The need for and the approach to any survey work and project specific baseline data gathering
Consultation feedback
Summary of relevant feedback received from consultation
Guidance and regulations
Where appropriate, outlines any regulations, policies or other requirements of particular relevance to understanding the content of the chapter that have not been discussed in earlier chapters
Methodology
Describes the specific approach to assessing impacts, including any definitions of sensitivity, magnitude and significance specific to the topic, and a description of any specific analytical methods applied Describes any limitations to the assessment
Established baseline conditions
A description of the baseline conditions for each topic in the project area as they are currently understood, including results from specific surveys Defines the project area relevant for the topic being discussed
Range of possible impacts
List of the possible impacts described according to the phase of activity (e.g. construction, operation, decommissioning), including an indication of any permanent impacts
Mitigation
Lists agreed mitigation measures
Assessment of residual effects
Discussion of the anticipated residual impacts for the project considering implementation of agreed mitigation measures
Potential for cumulative effects
Addresses whether there are any cumulative issues associated with the topic Any that are identified are addressed in Chapter 16

Summary of key findings
A summary of the key findings of the assessment
References
A list of any references used for the assessment

In addition, mitigation measures relevant to the discussion of residual impacts are cross-referenced in each chapter.

Volume 2 of this report contains the various figures referenced in the report. These include maps, layouts, and design illustrations.

Volume 3 of this report contains supporting information for the project in five annexes:

- Annex I: Consultation Table
- Annex II: Summary of Environmental Mitigation Measures
- Annex III: Gazetteer of Photographs[29]
- Annex IV: Habitat Regulations Assessment
- Annex V: Caithness Underground Cables Environmental Appraisal

Volume 4 contains the data and technical appendices relevant to the technical chapters in the ES:

- Appendix 3-A: SSE Substation Site Selection Guidelines
- Appendix 3-B: Converter Station Site Comparison Table
- Appendix 5-A: Planning Policy Tables
- Appendix 8-A: Drainage Statement
- Appendix 9-A: Phase 1 Habitat Survey Report
- Appendix 9-B: Breeding Birds and Protected Species Survey Report
- Appendix 9-C: River Thurso SAC -- Schedule and Conservation Objectives
- Appendix 10-B: Visual Effect Schedule
- Appendix 11-A: Gazetteer of Sites of Cultural Heritage Interest
- Appendix 11-B: Importance of Cultural Heritage Sites
- Appendix 11-C: Impact Assessment for Setting of Cultural Heritage Sites
- Appendix 13-A: Glossary of Acoustic Terminology

Volume 5 of this report contains two appendices that include visualisations and are presented in A3 format.

- Appendix 10-A: Landscape Assessment Visualisations
- Appendix 11-D: Archaeology and Cultural Heritage Visualisations

[29] All plates are to be found in this annex.

A summary of the findings of the assessment is presented in the Non-technical Summary (NTS) at the front of this ES and as a stand-alone document.

The Moray Firth Hub & Caithness HVDC Connection Optioneering Report describes the design process, and the alternatives considered, for all aspects of the Moray Firth Hub & Caithness HVDC Connection project. It is also available as a stand-alone document (Aquatera, 2010).

Table 1.2 Matters for Inclusion in Environmental Statements as required by Schedule 4, Part I of The Environmental Impact Assessment (Scotland) Regulations 2011

Requirement **Part I**	**Location of Information in the ES**
1 Description of the development, including in particular:	
(a) a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases;	*Chapter 4, Sections 4.2.2- 4.2.5* *Chapter 6*
(b) a description of the main characteristics of the production process, for instance, nature and quantity of the materials used;	*Chapter 4, Section 4.2.5, 4.2.6, and 4.2.7*
(c) an estimate by type and quantity, of expected residues and emissions (water, air, and soil pollution, noise, vibration, light, heat, radiation *etc*) resulting from the operation of the development.	*Chapters 4, 13 and 14* *Chapter 7 Section 7.11.7* *Chapter 8 Sections 8.11.6, 8.8.6,* *Chapter 9 Sections 9.11.7, 9.11.8*
2 An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for the choice made, taking into account the environmental effects.	*Chapter 3, Section 3.6*
3 A description of the aspects of the environment likely to be significantly affected by the development, including, in particular:	*Chapters 6 to 15*
• population	*Chapters 6 Section 6.7.2* *Chapter 11 Section 11.5* *Chapter 15, Section 15.7*
• fauna and flora	*Chapter 9, Section 9.8*
• soil	*Chapter 7, Section 7.8*
• water	*Chapters 8 and 9, Sections 8.8 & 9.8*
• air and climatic factors	*Chapter 14, Section 14.7*
• material assets, including the architectural and archaeological heritage	*Chapters 11. Section 11.8*
• landscape	*Chapter 10, Section 10.8*
• the inter-relationship between the above factors	*Chapters 6 to 16*
4 A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary or cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development resulting from:	*Chapters 6 to 15*

Requirement Part I	Location of Information in the ES
(a) the existence of the development;	*Chapters 6 – 15* *Sections 6.9, 7.9, 8.9, 9.9, 10.9, 11.9, 12.9, 13.9, 14.9, 15.9, 6.11, 7.11,8.11, 9.11, 10.11, 11.11, 12.11, 13.11, 14.11, 15.11, 6.12, 7.12, 8.12, 9.12, 10.12, 11.12, 12.12, 13.12, 14.12, 15.12*
(b) the use of natural resources;	*Chapters 7 -9* *Sections 7.9, 8.9, 9.9, 7.11, 8.11, 9.11, 7.12, 8.12, 9.12*
(c) the emission of pollutants, the creation of nuisances and the elimination of waste;	*Chapters 4, 7, 8, 9, 12, 13, and 14* *Sections 7.9, 8.9, 9.9, 12.9, 13.9, 14.9, 7.11, 8.11, 9.11, 12.11, 13.11, 14.11, 7.12, 8.12, 9.12, 12.12, 13.12, 14.12,*
(d) and the description by the applicant or appellant of the forecasting methods used to assess the effects on the environment.	*Section 7 in each of chapters 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15*
5 A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	*Chapters 4, and 6 - 15, Sections 4.9, 6.9, 7.10, 8.10, 9.10, 10.10, 11.10, 12.11, 13.10, 14.9, 15.9 and Annex II*
6 A non-technical summary of the information provided under *Paragraphs 1 –5* of this Part.	*Non-technical Summary*
7 An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant or appellant in compiling the required information.	*Chapter 2, Section 2.6 and in relevant sections of technical chapter*

Table 1.3 Matters for Inclusion in Environmental Statements as required by Schedule 4, Part II of The Environmental Impact Assessment (Scotland) Regulations 2011

Requirement Part II	Location of Information in the ES
1 A description of the development comprising information on the site, design and size of the development.	*Chapters 1 and 4, Sections 1.1, 4.2*
2 A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse impacts.	*Chapters 4, and 6 - 15, Sections 6.9, 7.10, 8.10, 9.10, 10.10, 11.10, 12.11, 13.10, 14.9, 15.9 and Annex II*
3 The data required to identify and assess the main effects that the development is likely to have on the environment.	*Chapters 6-15. See Sections 6.3, 7.3, 8.3, 9.3, 10.3, 11.3, 12.3, 13.3, 14.3, 15.3*
4 An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for the choice made, taking into account the environmental effects.	*Chapter 3, Section 3.6 & 3.7*
5 A non-technical summary of the information provided under *Paragraphs 1 –4* of this Part.	*Non-technical Summary*

1.6 References

Aquatera, 2010. *Moray Firth Hub & Caithness HVDC Connection: Optioneering Report*. Project report to SHETL. October 2010.

Institute of Environmental Management and Assessment, 2004. *Guidelines for EIA.*

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2 Approach to the Environmental Statement

2.1 The project team

SHETL recognised the need for EIA in developing its proposals and commissioned Aquatera Ltd as lead consultant for the EIA. SHETL has provided specific information about the proposals and their construction. The Aquatera team has been supported by the following specialists:

Firth Ecological	Phase 1 habitat surveys; breeding bird surveys
NDR Environmental Services	Protected mammal surveys
ORCA Ltd.	Archaeology and cultural heritage
Grontmij Ltd.	Landscape and visual appraisal
URS	Civil design
WSP Acoustics	Noise and vibration

2.2 Sources of information

The following sources of information have informed this Environmental Statement (ES):

- technical information, plans and drawings from within the project team;
- published information including relevant planning documents;
- statutory organisations and other relevant bodies and individuals consulted on the proposals;
- unpublished information made available by consultees;
- relevant Ordnance Survey (OS) maps; and
- site survey work.

Other specific technical information, guidance sources and reports which have been used for the EIA are referenced in the appropriate sections of the ES.

2.3 Objectives of the ES

The objectives of the ES can be summarised as follows:

- to identify the potential environmental impacts from construction and operation of the proposals, taking into account the characteristics of the development, the sensitivities of the local environment and the concerns of interested parties;
- to identify and describe measures which will be taken to mitigate identified adverse environmental impacts and deliver environmental benefits; and
- to predict and evaluate the extent and significance of residual effects taking into account the agreed mitigation.

2.4 Consultation

A range of individuals and organisations whose interests might be affected by the proposed development was consulted at the scoping stage for their initial views on the proposals, and to gather information and a better understanding on the scope of detailed assessment which would be required for the detailed EIA (see Section 1.5.2).

Individuals and organisations who were contacted and a summary of their responses are provided in Annex I: Consultation Table. The information which was provided has helped to inform an initial appraisal of the potential environmental effects of the proposals.

Meetings and telephone contact with relevant regulatory authorities and key stakeholders have further helped to agree the proposed way forward on the required environmental assessments for each part of the proposals.

The key meetings that have been held are outlined below in Table 2.1.

Table 2.1 Key meetings related to the proposals (see also Annex I: Consultation Responses)

Date	Consultation Type	Purpose
23 March 2010	Meeting with regulators and advisors	To establish the regulatory basis for the project
30-31 March 2010	Project team site visit	To review and validate desk based assessment results
15th June 2010	Meeting with The Highland Council	To present land based options and understand any key drivers from consultees
4th-6th July 2010	Project team site visit including representative from The Highland Council	To review and validate more detailed site and route assessment results
26-30 July 2010	Landowner visits	To determine any site-specific constraints to routing or siting from landowners' perspective
27 July 2010	Meeting with Historic Scotland	To discuss concerns related to historic environment resources
17 August 2010	PAC Meeting (The Highland Council)	To formally present proposal for Pre-application Consultation
25-26 August 2010	Site visit with project team and selected consultees (SNH, SEPA, The Highland Council)	To discuss specific issues with selected site, including concerns for flooding and visibility
September, November 2010, January 2011	Correspondence with SNH	To review and comment on Draft Habitat Regulations Assessment documents
December 2010	Correspondence with Transport Scotland	To discuss routes and abnormal loads
December 2010, January 2011	Further discussions and exchange of information with Historic Scotland	To discuss mitigation related to St. Magnus church Scheduled Ancient Monument
January 2011	Correspondence with SEPA	To review and comment on details of drainage plan and flood risk assessment
April 2011	Meeting with The Highland Council	To discuss changes to the size of the proposed converter station to accommodate 275kV bars and transformers required in the future when the existing 132kV line is upgraded to 275kV and to propose including the 275kV busbars in the Caithness Converter Station application.

Two public exhibitions outlining the proposed approach to the proposed converter station within the context of the overall project were held in Halkirk and Watten in September, 2010 as part of the pre-application consultation process (see Section 2.4.2).

2.4.1 Pre-Application Consultation (PAC)

Pre-application consultation has been carried out with the local community in accordance with the relevant regulations (see Section 1.4.3). A Pre-Application notice was sent to The Highland Council on 23 July, 2010. A Pre-Application Advice meeting was held with The Highland Council on 17 August, 2010. The Highland Council responded on 14 September with a Pre-Application Advice Pack (The Highland Council, 2010a). As part of this consultation process public exhibitions were held on 15, 16 September, 2010 in Halkirk and Watten, which included a number of display boards about the proposals. Local communities including relevant Community Councils were invited to the exhibitions where there was an opportunity to talk to representatives from the project team, and people were invited to give their feedback.

The response to the Pre-Application Advice Pack, and comments from the public exhibition, have been collated in a PAC Report which includes information on how the comments were taken on board in the developing proposals and EIA. The PAC Report also includes copies of the Pre-Application Notice, The Highland Council response to this notice and the exhibition material which was used. A copy of the PAC Report has been submitted to The Highland Council with this ES and the planning application. The feedback from the PAC process included in the PAC report is included in Annex I: Consultation Responses.

2.5 Habitat Regulations Assessment

The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), known as the Habitats Regulations', place a statutory duty on the competent authority, in this case The Highland Council, to meet the specific requirements of the Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats Directive). Under these regulations the competent authority must consider whether there is potential for likely significant effects from a plan or project on sites designated for their European nature conservation interests. Where this potential exists, if the integrity of a site could be affected, or its conservation objectives compromised, the competent authority must undertake an Appropriate Assessment[30].

Information relevant to the converter station development has been provided in a Habitat Regulations Assessment (HRA) document, which is Annex IV of the Environmental Statement, to inform the Appropriate Assessment(s) by The Highland Council. The sites and qualifying interests covered in this report are outlined in Table 2.2.

[30] Appropriate Assessment: The Habitats Regulations require competent authorities to undertake appropriate assessments in certain circumstances where a plan or project affects a Natura (European) site. Appropriate assessment is required when a plan or project affecting a Natura site: (a) • Is not connected with management of the site for nature conservation, and (b) • Is likely to have a significant effect on the site (either alone or in combination with other plans or projects). An appropriate assessment should focus exclusively on the qualifying interests of the Natura site affected and must consider any impacts on the conservation objectives of the site. SNH has advised that The Highland Council will be required to carry out an Appropriate Assessment for this proposal.

Table 2.2 Designated sites and qualifying interests that have been considered in the HRA

Site	Type of site	Qualifying features
Caithness Lochs (Special Protection Area (SPA), Ramsar)	Freshwater lochs with valuable plants and bird life	Greylag goose
Caithness and Sutherland Peatlands (Special Area of Conservation (SAC))	Blanket bog and associated wetlands and moorlands	Otter
Caithness and Sutherland Peatlands (SPA)	Blanket bog supporting important bird life	Golden plover
River Thurso (SAC)	River system	Atlantic Salmon

Additional information on the potential effects of the project on these sites can be found in Chapter 9: Ecology and Nature Conservation and in Annex IV.

2.6 Approach to the assessment

In the EIA process a common approach has been used for the assessment of each environmental topic. This has included:

- establishing the *baseline conditions* through a combination of desk review, consultations and site surveys, taking account of any committed development projects which could change the baseline in the future;
- identifying *potential environmental impacts*[31] which could result from development of the proposals; identification of *mitigation measures* to prevent, reduce and, where possible offset any impacts which could either by themselves, or in combination with other impacts, have a significant adverse effect; and
- assessment of the level of *significance of all residual effects* (direct and indirect, adverse and beneficial, short-term and long-term, permanent and temporary) taking account of committed mitigation measures.

Potential impacts have been taken into account in the iterative development of the proposals. Where the potential for a significant adverse effect either by itself or in combination (i.e. cumulatively) with other impacts has been identified, the environmental team has fed back concerns to the design teams who have taken account of the issues in refining the design for the project and the construction methodology.

All mitigation measures have only been taken into account in assessments after SHETL has given a commitment to their delivery. A collated list of mitigation measures is included in Annex II.

The assessment takes account of:

- **Routine and planned activities –** where it is likely or certain that such activities will take place or occur

[31] Impact is specific and applies to a particular element of the environment (i.e. air, water, etc). In order to assess the impact of a proposed development on a particular aspect of the environment, it is firstly necessary to measure the degree of change caused to that element by the proposal. A description of the change to an element of the environment caused by a proposed development can be made factually. Effect is a broader based view of the effect of a cumulation of the consequence of one or more impacts on a specific aspect of the environment (often referred to as the receptor). Assessment of effect involves not only a degree of professional judgement but also some extrapolation and generalisation, both of which also involve judgement (IEMA, 2004).

- **Accidental and unplanned events –** where it is uncertain whether the event will ever take place

Within each of these classes there are then subdivisions relating to the stage of the project that is being undertaken. This will therefore take account of the following stages:

- **Construction** – Impacts may arise from the construction activities themselves, or from the temporary occupation of land. The effects are often temporary and of limited duration, it is also the case that construction activities create permanent change and in this ES are reported in relation to the construction activities;
- **Operation –** Effects are typically permanent, subject to any future decommissioning, though may also be related to operational emissions or effects that will stop if the operation stops; and
- **Decommissioning** - Effects may arise from the decommissioning activities themselves or from the temporary occupation of land during this process. The effects would often be temporary and of limited duration and additional permanent change (unless associated with restoration) would normally be unlikely.

Definitions for temporal aspects of possible impacts used in this assessment are shown in Table 2.3 below.

Table 2.3 Definitions of the temporal aspects of possible impacts arising from the project

Duration	Description
Temporary	Likely to be related to a particular activity and will cease as soon as the activity ceases
Short term	Normally considered to be between a period of a few weeks or months or occasionally a few years depending on the topic and effect being discussed and its recoverability from an impact
Long term	Typically a period lasting past the end of construction up to the life of the development
Permanent	Typically an unrecoverable change

Permanent effects have been considered associated with permanent development and use of land for the project such as visual changes or loss of habitat.

The EIA Regulations require significant effects to be described (see Schedule 4). Significance is not defined in the Regulations. The definition of a significant effect which has been adopted in this assessment is one which the project team considers, in isolation or in combination with others, is material[32] to the environment and should be taken into account in the decision-making process.

The significance of an effect results from the interaction between its magnitude (which is related to the extent of the physical change, its spatial extent, duration and frequency) and the value of the resource or the number and sensitivity of those people who might be affected.

[32] i.e. important or having an important effect and of sufficient importance to take into account in development decisions

The process of assessing significance includes:

- selecting criteria (for each discipline) from recognised sources (including legal standards, policy and best practice guidance and accepted practice) against which effects have been assessed (assessment criteria);
- establishing significance thresholds[33] drawing on the above sources, consultations, experience etc; and
- comparing the predicted impacts with the significance thresholds and defining the nature of residual effect taking account of the reversibility of the effect, its probability of occurring and confidence in prediction including any uncertainty.

In this ES, where relevant, effects have been categorised into:

- neutral: no detectable change to the environment;
- negligible: a change within existing variability, difficult to measure or observe;
- minor: a detectable but non-material change to the environment;
- moderate: a material but non-fundamental change to the environment;
- major: a fundamental change to the environment.

Effects categorised as being moderate or major (adverse or beneficial) are considered in this ES to be significant.

Cumulative effects are also considered in terms of the overall importance of effects of a different nature occurring at the same location.

Cumulative effects may arise from a combination of effects upon one receptor from:

- the different parts of the converter station project;
- combinations of effects with other parts of the overall Caithness HVDC Connection project such as the onshore cable; and
- the potential for effects from this project to occur at the same time as those from other developments which have been approved and those in the planning system.

2.7 Limitations of the EIA and dealing with uncertainty

Any limitations to the EIA are summarised in each technical chapter, where relevant, together with the means proposed to mitigate these.

Where details of the project have still to be finalised (such as detailed construction methods that depend on the contractor chosen for the job etc.), assumptions have been made in the ES to allow potential impacts to be considered and appropriate mitigation to be identified. Figures for land take and habitat loss should be considered as approximate and could vary slightly once the detailed design is

[33] For some environmental aspects such as noise or air quality it is possible to use measurable, quantifiable criteria from legislation or guidance to establish at what level an effect becomes significant. For other areas this may not be possible and it may be necessary to rely on more qualitative criteria and this necessarily involves the use of professional judgement. Choosing the relevant criteria also depends in part on the particular characteristics of the project which is being assessed.

developed, although all changes would be within the red and blue line planning application boundaries.

If as the detailed proposals are developed, changes are made to the proposals that have potential to cause any significant effects which are considered greater than those reported in this ES, then an addendum to the ES would be published for public consultation and comment and further consideration by The Highland Council.

2.8 Copies of the ES

The Environmental Statement can be viewed during the consultation period during normal working hours at the council offices:

The Highland Council
Glenurquhart Road
Inverness IV3 5NX

and at the following locations:

Highland Council Planning Office
Market Square
Wick KW1 4AB

Thurso Service Point
Council Offices
Rotterdam Street
Thurso KW14 8AB

Copies of the ES can be purchased on request to the following address:

Scottish Hydro Electric Transmission Limited
Major Projects Support Group
Inveralmond House
200 Dunkeld Road
Perth. PH1 3AQ

The cost, including postage, is £200 for a hard copy of the ES and £20 for a copy of ES on CD-ROM. Please note that VAT will be charged on the supplied CD ROMs. Alternatively the Non-Technical Summary of the Converter Station ES, can be viewed at (and downloaded from) the Scottish & Southern Energy website at: http://www.scottish-southern.co.uk/ and follow the links to Media Centre and Project Portfolio. A copy of the NTS can be requested from the above address free of charge. The NTS can also be viewed on The Highland Council website: www.highland.gov.uk.

2.9 References

The Highland Council, 2010a. *Pre-Application Advice Pack*. Reference No.: 10/03711/PREAPP. September 2010.

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3 Project Design Process and Comparison of Alternatives

This chapter describes the design development process for the Caithness Converter Station, including the alternatives which have been considered.

Chapter 1 discussed the requirements that the Electricity Act 1989 places on SHETL, as a Transmission Licence holder, in relation to environmental protection. In discharging these obligations, SHETL developed a specification for the staged development of options for the project based on environmental appraisal to an increasingly focused and detailed level (SSE, 2009; see Appendix 3-A). An iterative approach has been adopted to progressing the project design by the project engineers and environmental team, with the objective that the overall project could be shaped by minimising environmental impact.

Following current best practice, the design development process involved extensive consultation, both with the relevant statutory bodies and non-statutory organisations, and with the local communities affected by the project (see Section 2.4). A report summarising feedback from the consultation process is presented in Annex I.

3.1 Project need

SHETL has developed reinforcement proposals for the Caithness area which includes an HVDC Converter Station at Spittal, as a response to its statutory obligations as the holder of a Transmission Licence for the North of Scotland.

The reinforcement of the Caithness area was recognised in the National Planning Framework for Scotland 2 (Scottish Government, 2009) and also in the Electricity Networks Strategy Group (ENSG) report (ENSG, 2009). The need for reinforcement arises from the high volume of renewable generation, both contracted to connect to the grid and in the application process. This includes:

- multiple applications for connection of renewable generation schemes onshore in Caithness; and
- the initial stages of connection applications for marine energy projects in the Pentland Firth and Orkney Waters strategic area.

As part of an optimised and integrated electrical design, it is proposed that the Caithness proposals will also include an offshore platform or hub which will allow the possibility for connecting the following:

- a high-voltage direct current (HVDC) connection from Shetland; and
- possible future offshore wind proposals in the Moray Firth.

In determining the preferred reinforcement option for the Caithness area, a range of alternative schemes have been fully assessed by SHETL from a technical, cost, timing and environmental point of view.

3.2 Development objectives

The objectives which have been defined to underpin the development of the proposals are as follows:

- to safely construct and operate a converter station with a design life of at least 40 years;
- to integrate successfully with other land uses in the area taking account of landowner interests;
- to safeguard the quality of surface and groundwater and minimise water crossings where practicable;
- to safeguard the natural and cultural heritage of the area, where practicable;
- to design, as far as practicable considering other constraints, a converter station that visually integrates with the landscape;
- to avoid significant effects on peat where these could be avoided;
- to contribute to the delivery of UK and Scottish renewable energy and carbon reduction targets; and
- to produce a robust, cost effective design that is transferable to construction whilst taking account of environmental constraints.

3.3 The project design process

The design development process undertaken for the Moray Firth Hub & Caithness HVDC Connection project comprised the following six key stages, described in more detail below:

Stage One	– Establishing strategic needs
Stage Two	– Definition of site and route search areas
Stage Three	– Preliminary screening
Stage Four	– Detailed assessment of routes and sites
Stage Five	– Selection of preferred sites and routes
Stage Six	– Selection of suitable layout and technology solutions

During the early development stages of this project a number of alternative locations for sites and routes as well as technology options were considered and compared. This work for the overall project, considering all onshore and offshore elements, is presented in a separate internal project report (Aquatera, 2010). This report provides a more detailed discussion of these stages and the options considered.

The key findings from this report relevant to the Caithness Converter Station are outlined below.

3.4 Stage One – Defining the project and establishing strategic needs

Aquatera has followed SHETL's preferred approach and selection guidelines (see Appendix 3-A), incorporating the Holford Rules[34] (National Grid, undated). This requires the project to identify and explore a range of potential sites and route

[34] Guidelines for the routeing of new high voltage overhead transmission lines considering environmental sensitivities

corridors, in an environmentally-led manner, in order to select preferred sites and routes. In addition to the environmental considerations, the preferred options must also take account of technical and economic factors.

The approach taken to evaluating geographical location options for the Caithness HVDC Converter Station was to apply good environmental practice including the following:

- An environment-led process, taking into account operational needs, to identify and evaluate possible sites;
- Early and active consultation to get a good understanding of stakeholder concerns and aspirations;
- Early baseline studies to validate assumed conditions identified by desk research;
- Use of local expertise and understanding in the project team wherever possible.

The Caithness HVDC Connection will directly link Caithness and the Moray Firth, two areas with extensive energy generation potential. It will also have relevance to adjacent supply areas in Orkney and Shetland and demand centres in mainland Scotland and England through the wider grid infrastructure systems. It is recognised therefore that it was important to look ahead and ensure that the proposed scheme would meet both short term and foreseeable grid and power generation developments.

The target area for the Caithness Converter Station was established as lying between Thurso substation and Mybster substation on the basis of the distribution of these infrastructure and generation nodes.

3.5 Stage Two - Definition of site and route search areas

In order to establish broad search areas for the converter station and related infrastructure the following were mapped to create sensitivity maps:

- designated international and national sites;
- built up areas in settlements and towns;
- wetlands and water bodies; and
- close proximity to existing transmission grid.

On the basis of these maps a search area for the converter station was identified within an onshore corridor near to the existing 132kV overhead line between the Thurso substation and the Mybster substation (see above).

A more detailed analysis of possible constraints and opportunities was then carried out. This analysis showed that the best opportunity areas for the converter station are located where there is good access (e.g. near to A roads), where there is connectivity to the existing grid (e.g. adjacent to the existing 132 kV line), and where there is potential for screening (e.g. in a valley or near forestry plantations). The areas of most constraint are designated areas, such as Special Protection Areas (SPAs)[35], Special Areas of Conservation (SACs)[36], Sites of Special Scientific

[35]Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds 79/409/EEC, the Birds Directive. They are classified for rare and vulnerable birds, listed in Annex I to the Birds Directive, and for regularly occurring migratory species.

Interest (SSSIs)[37] (see Section 9.6) as well as scheduled monuments (SAMs[38]; see Section 11.6), near to dwellings, and areas with peat or sensitive habitats such as blanket bog, wetlands, and heather moor.

During initial screening using sensitivity maps, four potential sites for a converter station were identified: Thurso Substation, Georgemas Junction, Mybster South, and Spittal South. These search areas are described in Table 3.1 below.

Table 3.1 Initial converter station site search areas

Site	National grid reference	Description
Thurso substation	ND12186610	This area is adjacent to the existing 132kV line at Thurso Substation, less than 2km southeast of the town of Thurso. It is in relatively flat agricultural land.
Georgemas Junction (Georgemas East)	ND160593	The area is near the Georgemas Junction railway junction, more than 5km north of Spittal village and about two kilometres east of the village of Halkirk. It is approximately eight kilometres from the Thurso substation. It is located on unimproved land near the railway line in an area of other industrial uses. It is located slightly more than one kilometre from the existing 132kV line; overhead line diversions would be required.
Mybster South	ND172516	This area is the forestry plantation just to the east of the existing Mybster Substation. Because it is virtually adjacent to the existing substation, no overhead line diversions would be needed. The forestry could potentially be managed to provide screening of the substation, although the building may be slightly above the current height of the trees.
Spittal South	ND171546	This area is the moderately sloping site on the south flank of Spittal Hill in improved grassland just above a working quarry (Spittal Quarry), and approximately 0.5km to the northeast of the village of Spittal. It is approximately one kilometre from the existing 132kV line, and overhead line diversions would be required. It is approximately 3km from the Mybster substation.

3.6 Stage Three – Preliminary screening

During the initial field reconnaissance, the suitability of these potential converter station sites was confirmed. Observations made during the initial field reconnaissance are listed below in Table 3.2.

[36] Special Areas of Conservation (SACs) are strictly protected sites designated under the Habitats and Species Directive (92/43/EEC) (the Habitats Directive). Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds). Of the Annex I habitat types, 78 are believed to occur in the UK. Of the Annex II species, 43 are native to, and normally resident in, the UK (www.jncc.gov.uk).

[37] Sites of Special Scientific Interest (SSSIs) are sites designated for their natural heritage and/or geological interests and together form a network of the best examples of species, habitats and rock and landform features throughout Scotland.

[38] A Scheduled Monument (SAM) is any archaeological or historical site which is considered to be of national importance and has been protected under the Ancient Monuments and Archaeological Areas Act 1979.

Table 3.2 Observations and initial appraisal of potential converter station sites

Potential converter station site	Observations and Initial Appraisal
Thurso substation	• Very open landscape – high visibility • Appears to be in floodplain • Decision not to carry forward
Georgemas Junction (Georgemas East)	• Visibility challenges for nearby dwellings • Probably not seen at a distance due to location in a hollow • Carried forward
Mybster South	• Screening advantages in forest • Other energy infrastructure nearby, e.g. wind farm, substation • West side of road could also be acceptable • Carried forward
Spittal South	• Located adjacent to SSSI (geological) • Some screening from east and north • Wind farm planned for Spittal Hill • Carried forward

Three sites appeared to have potential for siting of the converter station. The Thurso substation site was eliminated from further analysis based on landscape issues including its proximity to Thurso and visibility in the open landscape.

3.7 Stage Four – Detailed assessment of sites

During fieldwork the team identified other potential areas for siting a converter station in the landscape, including west of the Georgemas Junction site and north of the Mybster South site. A later field reconnaissance identified a further site at Spittal Mains, west of the Spittal Hill, also referred to as Spittal West. As a result of the preliminary appraisal, new sites were added including Mybster North and Spittal Mains. Another new potential site on the north side of Spittal Hill also was identified (Spittal North) following conversations with the landowners at Spittal South. These new sites are described in Table 3.3.

Table 3.3 Additional potential converter station sites identified during preliminary appraisal

Site Name	National grid reference	Description
Mybster North	ND178525	This site is located in forest plantation approximately 1km north and east of the existing Mybster substation. It is separated from the A9(T) by open moorland, and sits lower in the landscape than Mybster South. The forestry could potentially be managed to provide screening of the converter station. This site is approximately 1km from the existing 132kV line and would likely entail an overhead line diversion.
River Thurso valley (Georgemas West)	ND146592	This site is a low point in the landscape in the shallow valley of the Burn of Halkirk, close to the existing 132kV OHL between Georgemas Junction and Halkirk. It is more than 7km south of the Thurso substation.
Spittal North	ND166564	This site is adjacent to a small working quarry (Banniskirk Quarry), at the foot of the north side of Spittal Hill. The site is currently in improved grassland and young forestry plantations and is relatively flat and open. The site is approximately 1.5km from the existing 132kV line, and overhead line diversions would be required. It is approximately 5km from the Mybster substation.

Site Name	National grid reference	Description
Spittal Mains	ND154554	The site is located in improved grassland in a valley just northwest of Spittal along which the overhead line is routed, so no OHL diversion would be required. It is approximately 4km from the Mybster substation. Immediately north of the site is a forested shelterbelt, which partially screens views from the north.

The team Landscape Architect appraised the remaining seven potential site locations. The results of the assessment are presented in the project Optioneering Report (Aquatera, 2010) and summarised in Table 3.4.

Table 3.4 Results of initial skilled eye assessment of converter station sites

Potential site (National grid reference)	Initial assessment
Georgemas Junction (ND160593)	• Low in the landscape • Agricultural landscape where large sheds are reasonably common • No OHL diversion required • Scale of building would be very obvious in contrast to the houses of Halkirk • Very close to Halkirk and thus very visible from a lot of residential properties • Decision not to carry forward
River Thurso valley (Georgemas West) (ND146592)	• Area as a whole is low lying but within this, the site is relatively high, so clearly skylined from Halkirk • Substantial OHL diversion required, also skylined in views from Halkirk • Clearly visible from A882 and from houses along the road • There are no immediate landscape features to help sit the development well into this landscape • On a slight ridge in a very uniform area of landscape and would create a new focal point on the skyline in many views • Decision not to carry forward
Mybster South (ND172516)	• On slight rise, so low in the landscape in relation to Mybster but slightly high from elsewhere, particularly in views from A9(T) from the south • Very few local visual receptors • Large scale landscape, few scale references in views • No OHL diversion, no additional towers (some reconfiguration of existing towers) • Existing forestry would partly screen converter station and would screen substation • Potential to retain / manage forestry as longer-term screen • Potential to locate sufficiently far into forestry to allow complete screening but risk that wind farm proposals or future forest management would require clear-felling • By existing substation, so effects concentrated • Relationship with wind farms needs to be considered further (cumulative impacts with and without forest)

Potential site (National grid reference)	Initial assessment
Mybster North (ND178525)	• Low in the landscape, small number of local visual receptors • Large scale landscape, few scale references in views • Probably back-dropped in most views but towers might be skylined • Existing forestry would partly screen converter station • Potential to retain / manage forestry as longer-term screen but risk of it having to be clear-felled for wind farm proposals or future forest management • Very uniform landscape and backdrop, risk of creating new focal point in landscape • Relationship with wind farm proposals would need careful consideration
Spittal South (ND171546)	• Well screened from the north • Probably back-dropped in most views from the south but skylined in views from the east and west • OHL diversion skylined in views from the south and unlikely to sit well in relation to the shape of the hill • Sits slightly high in the landscape • Alongside large-scale disturbance (quarry) • Unlikely to create new focal point in landscape • Little visible from Spittal • The converter station could be made to sit comparatively comfortably in the landscape, alongside the Spittal Quarry and with some visual relationship to the existing quarry sheds • It would necessitate an extensive OHL diversion, which would be visually intrusive for a significant number of receptors in and around Spittal and Mybster
Spittal North (ND166564)	• Well screened from the south • Back-dropped in most views from north, seen against mosaic of activity on Spittal Hill • Skylined from west, potentially skylined from east • Sits slightly low in the landscape • Few houses close • Unlikely to create new focal point in landscape, except locally from the west • OHL diversion likely to be skylined in views along the A9(T) and from nearby houses
Spittal Mains (ND154554)	• Low in the landscape • Would appear to be back-dropped in most important views • No OHL diversion required (new terminal towers replacing one or two line towers) • Unlikely to create new focal point in landscape • An agricultural landscape where large farm sheds are relatively common, giving a degree of context for the converter station sheds • Significant adverse visual impact likely for one residential property • Reasonable potential for off-site mitigation planting to break up views

The overall result of the detailed assessment was to add four additional potential converter station sites, and to screen out the two sites at Georgemas in addition to the Thurso substation site screened out earlier. Although the wind farm developments were a consideration, the project team decided to continue moving forward with the sites potentially affected by these proposals.

The following five converter station sites were therefore carried forward for further evaluation: Mybster South, Mybster North, Spittal South, Spittal North, and Spittal Mains (Spittal West).

3.8 Stage Five – Selection of preferred site

A detailed evaluation of the five converter station sites was conducted considering engineering, environment, and planning issues. This evaluation considered the following:

- SSE guidelines (see following paragraphs and Appendix 3-A)
- Consultation for additional information (see Annex I)
- Additional data collection (see Appendices 9-A and 9-B; Aquatera, 2010)
- Mapping additional sensitivities (see Aquatera, 2010)

SSE Guidelines

SSE's Substation Site Selection Guidelines (SSE, 2009 and included in Appendix 3-A) include the technical and environmental guidance related to selecting an appropriate site for a substation, as outlined in Table 3.5 below. These guidelines were considered in evaluating the five converter station options.

Table 3.5 Considerations from SSE's Substation Site Selection Guidelines (from SSE, 2009)

Considerations	Guidelines
Environmental considerations	• Avoid the following where possible: o areas of environmental designation (e.g. SPA, SAC, SSSI, etc.) o close proximity to other environmental designations (including SAMs, listed buildings, etc.) o areas of standing water or peat or boggy ground o rocky outcrops o areas of flood risk o close proximity to properties o proximity to areas where children would be expected to congregate o proximity to watercourses o areas of high land value (such as high quality agricultural land, prime development land)
	• Seek areas with the following characteristics: o dry and firm ground conditions o areas where the substation may be concealed from view o areas which are flat o sites where the landowner is willing to sell the land
	• Protect, as far as possible, areas of local amenity value, local areas of conservation and important landscape features
	• Consider local development plans
Technical considerations	• Minimise overall length of new construction (underground cable as well as overhead line re-alignment)

The complete results of this evaluation are presented in Appendix 3-B, and are summarised in Table 3.6.

The key considerations in the final selection included the suitability of the site from an engineering standpoint, as well as landscape and visibility issues, recognising that a large building could have a significant impact in the largely agricultural landscape. The two Mybster sites had engineering advantages in terms of being on relatively flat ground and near to the existing 132kV line and out with any flood risk areas. However, both sites were located on peat and had complex visual relationships with the surrounding landscape. The Spittal South and Spittal North sites would require significant overhead line diversions that were undesirable both in terms of cost and because of the potential visual impact.

The Spittal Mains site was identified as a preferred site as it had the best combination of advantages in terms of both engineering and environment. It was located close to the existing 132kV line and would not require an overhead line diversion, and was not located on peat. In terms of visibility it was located in a valley and partially screened by trees. A summary of the key evaluation factors for each site is provided in Table 3.6.

Table 3.6 Summary of site appraisals for the converter station site

Site	Comments
Mybster South	Engineering: • No overhead line (OHL) diversion needed • Relatively flat ground Environment: • Peat depths of 0.5 m or less were common over the Mybster South site. • No flood risk • Visible, and complex visual relationship with surrounding wind farms and forest
Mybster North	Engineering: • OHL diversion needed • Relatively flat ground Environment: • Peat depths 1 to 3 m were found at the Mybster North site. It was concluded that significant peat issues would be associated with this site. • No flood risk • Visible, and complex visual relationship with surrounding wind farms and forest
Spittal South	Engineering : • Significant OHL diversion needed • Sloping ground Environment • No flood risk noted • Highly visible • Some Scheduled Ancient Monuments could be affected
Spittal North	Engineering: • Significant OHL diversion needed • Sloping ground Environment • Flood risk possible • Visible, but some screening

Site	Comments
Spittal Mains	Engineering: • No OHL diversion needed • Sloping ground Environment • Flood risk possible • Low visibility, good connection options • Highest potential to affect Scheduled Ancient Monuments

In selecting a preferred option it was recognised that although every attempt had been made to find sites that were universally advantageous, there were some areas where compromises had been made because of the balance of advantages over disadvantages. The key advantages and disadvantages of the Spittal Mains site are outlined in Table 3.7.

Table 3.7 Listing of the key advantages and disadvantages for the Spittal Mains converter station site

Advantages	Disadvantages
• Very close to existing overhead line route • Low visibility for dwellings • Few ecological sensitivities	• Sloping site with bedrock close to the surface • Near to stream (possible flood risk) • Near to St Magnus chapel SAM (ruins)

There was therefore an ongoing assessment process put in place to assess in more detail flood risk, visibility, and ground investigations in order to help inform a final micro-siting, layout and design of the infrastructure and reduce potentially adverse impacts.

3.9 Stage Six – Selection of suitable layout and technology solutions

Due to the early design stage of this project, many of the finer details of the design and execution plan are yet to be finally determined. Many will become established nearer to the deployment as suitable contractors are appointed. There are however, some guiding principles which will be important for the environmental performance of the project and have therefore been examined in the EIA process. The findings of these deliberations will feed into any tendering processes and will help to shape the solutions that are ultimately brought forward.

The main issues related to layout of the converter station were landscape compatibility, flooding risk and volume of excavation.

3.9.1 Converter building layout

Two converter building layout options were considered:

- Option 1 - aligned along the axis of the valley to fit the grain of the landscape, in a manner similar the way Spittal Mains Farm is laid out.
- Option 2 - aligned across the valley “tucked in” to the line of the shelterbelt (Table 3.8) (see also Chapter 10: Landscape and Visual Impacts).

Table 3.8 Comparison of converter station building layout arrangements

Options	Advantages	Disadvantages
Aligned along axis of valley	• Fits into classic landscape practice for large long buildings, aligning with strongest landscape element	• Reduces future connectivity options • Potentially requires larger land take
Aligned across the valley, in line with shelterbelt	• Shelterbelt provides second most strong landscape element • Provides better future connectivity with potentially least land take	• Lies with secondary rather than primary landscape element

For the purposes of this assessment the option 'Aligned across the valley, in line with shelterbelt' was taken forward for further consideration.

3.9.2 Equipment Layout

Two configurations of equipment layout were considered:

- Option 1 - a compact near-square site layout developed to be close in size and shape to the existing field pattern; and
- Option 2 - a 'linear' layout with the converter station building and the busbar[39] array in line with each other and aligned along the valley.

Table 3.9 Comparison of equipment layout arrangements

Options	Advantages	Disadvantages
Compact near-square site layout contained within field	• Minimises alteration to existing utilities and drains, keeps development within existing scale of landscape divisions	• Compact design may limit future connectivity
'Linear' layout with the converter station building and busbar array aligned along the valley	• This would allow the site to be set back from the burn, whilst also avoiding creep up the slope. • The cut and fill requirements would be minimised • Very good for future connectivity	• Visually the site would appear more extensive in the landscape

Technically the best configuration was a 'compact near-square site layout'. The linear layout was not only technically less efficient but was seen to "straggle" along the valley floor in a way that would present more of a visible face to the A9(T) and Achanarras Farm. For the purposes of this assessment the option 'compact near-square site layout' was therefore taken forward for further consideration.

3.9.3 Micro-siting

In terms of micro-siting two basic options have been developed. Option 1 has the converter station elevated up the slope, furthest from the burn. Option 2 has the converter station lowered near to stream partially concealed by the cut into the hillside, and on the side of the site nearest the existing shelterbelt – to take best advantage of the screening and back-drop that this provides.

39 A busbar is a thick strip or rod of copper or aluminium that conducts electricity within a substation or other electrical apparatus. Busbars are used to carry very large currents, or to distribute current to multiple devices within switchgear or equipment.

Both of these options have the busbar array aligned across the valley because this gives best flexibility in terms of future connections and has the array well back-dropped or screened (depending on viewpoint) by the shelterbelt and the converter station building.

Table 3.10 Micro-siting options for the converter station

Options	Advantages	Disadvantages
Elevated up the slope	• Avoids flooding issues	• Increased visibility from A9(T) and to the west • More excavation needed • Longer future connections to over head lines
Lowered near to stream	• Lower visibility of buildings and other site infrastructure	• Requires site infrastructure to be too close to Achanarras Burn and at risk of flooding

For either of the above a minimum distance from the Achanarras Burn was required to ensure the development lies outwith the 200-year flood risk area. It was also desirable to maintain the platform as low on the slope as possible for mitigation of visibility issues.

The selected option was to keep the platform 'Lowered near to stream' but to contain it as much as possible in one field so as to avoid unnecessary land take from the farm[40]. Fill material from the upper section of the site will be used to raise the platform level to 83.2m above ordnance datum (AOD) to bring the platform away from the floodplain, and further ground profiling will be used to further lower flood risk by directing any sheet flood waters away from the site.

3.9.4 Building Design

Two possible building designs were also considered, although these are indicative at present, until the tendering process has been finalised (see Section 4.1.1).
For this assessment it was decided to assess the taller of the two preliminary designs.

3.9.5 Options for the converter station site access road

The key issues associated with the access track relate to its interaction with the shelterbelt and the need or otherwise for felling any existing trees (See Table 3.11).

[40] The initial design had a smaller platform than that actually taken forward in the application. The increased capacity was required to allow for future generation connections (see Aquatera, 2011).

Table 3.11 Options for the converter station access road

Options	Advantages	Disadvantages
Follow existing track, through existing gap and east entry	• No felling of existing trees required Minimum length of track build / upgrade	• Access track slopes into site at slightly enhanced gradient • Additional land required north of shelterbelt
Follow existing track, through existing gap and north entry	• No additional gradient on track	• Minimal felling of trees, but may be required
Use existing upper track with new cut through shelterbelt for platform access	• None	• Will require felling tens to hundreds of trees
New access along south of shelterbelt	• No disturbance to trees • Avoids conflict with farm / property access	• All new track required with higher cost and more visual intrusion
New access around lower western end of shelterbelt	• No tree felling required • Avoids conflict with farm / property access	• Longest track upgrade, • possible complication with over head lines above track

The selected option 'Follow existing track, through existing gap and north entry' uses the existing farm access route to the north of the shelterbelt, but where any widening is required uses further land to the north of the track, rather than encroaching into the ditch bordering the shelterbelt.

3.10 Summary

The project proposals described in the next chapter reflect the following selected options:

- a converter station located at Spittal Mains site;
- the converter station building aligned across the valley;
- compact near-square site layout developed to be very close in size and shape to the existing field pattern;
- lowered near to stream with a platform level of some 83.2m AOD to bring the platform away from the floodplain; and
- follow existing track, through existing gap north of the shelterbelt.

For this assessment it was decided to assess the taller of the two preliminary designs, on converter building layout Option 1, detailed previously as a "worst-case" scenario in landscape and visibility terms.

The details of site layout and in particular the building alignment will be reconsidered once the procurement process concludes which supplier and thus which building design will be used.

3.11 References

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4 The Project Proposals

4.1 Introduction

This chapter describes the Caithness Converter Station site and provides an overview of the proposals for the development. It describes how the site will be constructed operated, maintained and decommissioned.

The construction phase of this project is due to start in 2013 with the facility being commissioned in 2016.

There are four other linked elements which are also being planned in parallel with this converter station project. These are:

- an onshore HVDC buried cable from the converter station to the coast;
- a directionally drilled[41] landfall at the coast, north of Wick;
- a subsea HVDC cable from the coast to the outer Moray Firth; where it connects to
- the Moray Firth, HVDC Hub platform[42], to act as the offshore connection point for various planned subsea cables.

The overall layout of these elements is shown in Figure 1.1 and Figure 4.1. Further description of the onshore cable route and offshore components of the scheme are given in Box 4.1 and Box 4.2 below. These linked elements are the subject of other applications under marine planning processes or are being taken forward under permitted development rights awarded to transmission system operators.

[41] Directional drilling is a method of drilling through rock at an angle used in this case to negotiate a suitable cable landfall in an area too steep for trench cutting methods. The directional drilling method will also be used to negotiate burns and ditches along the terrestrial cable route.
[42] The offshore hub platform is a steel platform - similar to an offshore oil platform - for housing the hub switching gear apparatus.

Box 4.1 Description of HVDC underground cables and landfall

Underground onshore HVDC cables
One circuit comprising two underground cables will serve the converter station. The cables extend from the converter station for approximately 29km passing by Watten village and to the shoreline at Long Berry, some 2km north of Wick (NGR 385 534), where they will join up with the subsea section of the DC cable. The proposed corridor is predominantly across agricultural land, or along roadsides when passing through wetter marshland/peatland areas.

The two underground cables will be laid in a single trench approximately 1 m wide and 1 m deep, or will be ploughed into the ground when passing through peaty soils. The cables will be laid following a standard sequence of events involving the following:

- establishment of an approximate 20m wide working corridor in normal soil conditions and a narrower 5m corridor where mole ploughing is to be used;
- identification of access points along the route from the nearest public road to the cable route;
- establishment of a number of works compounds to accommodate and store construction tools and plant;
- excavations of trench and joint bays (in which the sections of cables will be joined together) including any appropriate shoring. Joint bays must be clean and dry. These will be formed by building a concrete floor (or similar) in the base of the trenches of approximately 10m by 5m, with a temporary cover to create the required conditions. Once the joints are finished, the joint bays will be buried with no structure visible at ground surface;
- detailed design of the cable trench and its fill materials. This will depend on local ground conditions to ensure appropriate heat conduction and cable protection. Trenches will be laid with sand, soil or cement bound sand (CBS);
- pumping equipment and waste water facilities may be required to deal with discharged water from trench works to the wider environment;
- lengths of cable will be in the region of 800m. Cable will be winched off drums into trench;
- where cable ploughing is used the above three actions will not be required, the cable will be laid straight into the soil using a special tractor;
- vegetation replaced or soil reseeded appropriate to the location;
- restoration of field boundaries etc along the working corridor;
- cable markers installed throughout the length of the cable at regular intervals to ensure third party awareness of the presence of cables; and
- access to the works areas for deliveries of cable, concrete, bedding etc. Public road improvements to be agreed with THC.

No intervention to the buried cables is anticipated once they are installed, unless a fault develops. Repair or replacement of a section would require its excavation and reburial.

Landfall section
Landfall will be achieved using horizontal directional drilling technology. This will involve establishment of a temporary compound near Long Berry to house the drilling equipment. A fibre optic cable connection may be required to facilitate control of the offshore platform. A 33kV cable connection will also be made to the existing grid network at Wick, linking to the landfall site. This electricity supply will feed the offshore hub platform and this may require a double offshore circuit. Up to five conduits will therefore be drilled, one for each HVDC circuit, one for each 33kV cable and one for a possible fibre optic control cable. A small shed may be needed at the landfall to house heat dissipation equipment.

Box 4.2 Description of subsea cable and marine hub platform

Subsea HVDC and other cables
Subsea HVDC cables, the 33kV electrical supply cables and a fibre optic cable will be laid over the 32km between Long Berry and the offshore hub platform in the Moray Firth. It is planned that three cable routes are established lying some 240m apart, with the two HVDC cables and the fibre optic sharing the centre route and the two 33kV AC circuits lying either side. The cables will be buried 1-2m into the sediment using seabed fluidisation where jets of water from a subsea bottom crawling ROV are directed horizontally into the seabed and used to fluidise sands and clays.

If there are areas where the seabed is rocky then the cable will be protected (by rock mattresses etc), but no such areas have been found to date in surveys along the route. Protection will be required between the emergence point of the cables from the landfall and the start of the buried cable sections. This area may stretch for 20m or so from the cable emergence points.

There is an area of horse mussels, which has been found during route survey work, lying off the coast between Wick Harbour entrance and Noss Head. In this area a protective iron sleeve is planned to be used to provide additional protection for the cable since the seabed excavation, proposed elsewhere along the route, would be more damaging to the horse mussel bed. In areas where jetting would be used the estimated speed of jetting is 150m per hour indicating that works would be anticipated to last about a month for each cable.

Offshore hub platform
An offshore hub platform will be located in the outer Moray Firth, more than 12 nm from the Moray coast. The hub will comprise of two main components: the foundation frame (jacket structure) and the hub module itself (topside structure). In appearance the hub would be similar to an oil platform. The jacket and topside structure will be designed and constructed in accordance with current practices employed in the offshore oil and gas industry. The design will consider maximum load conditions for load-out, transportation, installation, in-place and abandonment, as well as accidental load conditions (e.g. boat impact and helicopter crash landing loads). The indicative pile diameter to be used is 1.8m.

The main structure will be approx 62m x 45m x 26m (LWH), and is likely to be steel tubular space frame comprising two or three decks. Main components will be hub switching gear apparatus, workshop, equipment store, emergency accommodation, heli-deck, emergency diesel generator and diesel storage tank. The installation of the hub platform will consist of the following stages:

- installation of subsea structures and fixing to seabed by piling;
- installation and attachment of the hub component onto substructures;
- installation of the pre-laid umbilicals; and
- testing and commissioning.

The installation will take place during the summer months. Installation will require careful and well planned use of several different types of vessels (a vessel spread) that will be active in and around the planned site during the time of installation. Total installation time at the hub location is estimated at approximately 1 -3 months.

A 500m exclusion zone will be established during installation and operation of the platform taking into account that the cables emerge from the seabed for some 100-200m on the approach to the hub. The safety zone will be marked on relevant nautical charts. Standard navigation lights will be provided to mark the installation.

The hub is designed to operate automatically, with the minimum of intervention and maintenance. The platform will normally be unmanned and operated/monitored remotely from an onshore transmission operations centre. The onshore operational centre will provide day to day operational requirements and will also have the ability to shut down operations as required for safety reasons.

SHETL will provide a 24-hour surveillance and response capability based at the onshore operational centre.

The required operational design life of this offshore facility is to be a minimum of 40 years.

4.1.1 The contract

The development of the HVDC connection will be completed in three stages. The civils works including the control building will be with a traditional contract form. The remainder of the work is specialised and will be subject of a 'design and build' form of procurement and delivery, which will be tendered on the open market. The precise details of the proposed engineering design at this stage are thus not yet known.

As part of this contract the design and mitigation will be developed to a level suitable for construction. Feedback from consultees and any conditions of planning consent will be taken into account. During the execution of the works, the contractor will be audited to ensure that all the commitments agreed are implemented.

In the EIA, assumptions have been made about the design, construction and mitigation in order to allow the assessment to progress. If any changes to the project assumptions are made by the contractor, which the project team considered could result in significant effects (which were different from those described in the ES), then further mitigation will be identified, and an addendum will be triggered to the Environmental Statement. This addendum will be submitted for comment and consideration by The Highland Council. All changes and assumptions will also be discussed and agreed with appropriate consultees (Section 2.4).

4.2 Key components of the converter station proposal

4.2.1 Overview of proposals

Key elements of the proposed converter station development are:

- a level hardcore platform supporting:
    - the converter station building; and
    - an electrical substation including transformer(s);
- an access track to the platform and around the compound;
- a temporary construction compound housing offices, car park, equipment and materials storage areas;
- new drainage systems to prevent flooding of the platform and deal effectively with field drains, ground water and sheet water flows;
- landscaping to screen the facilities from key nearby view points; and
- fencing to ensure that the public, livestock and wildlife do not enter a hazardous area.

Further details are provided below and an overview of these key elements is presented in Figure 4.1.

4.2.2 Location

The development will be located at Spittal Mains Farm in a shallow valley adjacent to the Achanarras Burn, lying to the west of the A9(T) just north of the settlement of Spittal. The location of the centre of the core platform area is approximately:

- National grid reference ND 153 554

The centre of the site is approximately the following (straight line) distances from nearby settlements:

• Spittal	2km
• Halkirk	4.5km
• Thurso	13km
• Wick	21km

The location of the site in a regional and local context is shown in Figure 4.2.

4.2.3 Site layout

A converter station site will have a number of equipment types that relate in a sequence to one another. This dictates to a large extent the layout required for the site.

Future electricity flow into the converter station site could come from a variety of possible connections. All these proposals would be subject to separate, individual planning consent processes (see Section 1.2). The site selection process has taken into account the potential for future grid connections to the facility.

There needs to be sufficient room for these various connections to access the site. The electricity from these connections is then controlled through a series of transformers, switches and other electrical equipment including busbars. The flow of electricity then passes through the converter station itself, where the AC is converted. This electricity is then exported from the site through the buried HVDC cable to the offshore hub.

Existing converter stations from around the world are illustrated in Plate 4.1[43] with some examples of the equipment they contain presented in Plate 4.2.

4.2.4 Development zones

Within the project a number of development zones have been defined where different types of work will be undertaken. These zones are shown in Figure 4.3 and detailed in Table 4.1. Further information on these areas is provided below.

Planning area (Red line area)

The planning area, also known as the red line area, encompasses the extent of the formal planning application, and is approximately 30ha (Figure 1.2). All construction will take place within the planning area boundary. Within this area are the following zones:

- zones that will be subject to permanent change;
- zones that will be subject to temporary change during construction; and
- zones that are essential to the development but will not be subject to change during construction, such as areas for visual screening.

[43] All plates are contained within Annex III.

Permanent development zone

Platform area

The platform area comprises the levelled area at the heart of the site. The footprint of the platform to hold the proposed converter station and associated transmission equipment is around 240m by 275m or an area of approximately 6.5 hectares (ha) (see Section 4.2.5). This area will be surrounded by a security fence (Section 4.2.12).

Core development area

Around the platform area construction activities will take place to develop landscaping and batter slopes (Section 4.2.11); platform drainage and an attenuation pond (Section 4.2.10); the access road from the A9(T) to the access track into the site; and the access track to the platform site (Section 4.2.8). These works amount to around 7ha.

The platform area and core development area together total 13.6ha.

Visual screening

In addition to the constructed landform and planting to the south of the platform, some 6ha north of the platform will be managed for visual screening. There is an existing shelterbelt (~3ha) to the north of the platform area that will be managed for visual screening. Adjacent to this is an area of some 3ha where additional trees will be planted to supplement visual screening (see Section 4.2.11).

The total area subject to permanent development change will therefore be just under 20ha. All of these areas will be fenced with stock fencing to keep livestock out (Section 4.2.12).

Temporary development zone

The area extending beyond the permanent development zone encompasses some 10ha. Within this area construction activities may take place, but there will be no permanent development. A temporary construction compound will be located within this area (Section 4.2.14).

Blue line area

Additional planting is proposed to help screen the site on a 780m long strip along the western side of the A9(T), between Spittal Mains Farm and the development area. This area will be developed through agreements with the landowner at Spittal Mains Farm and the land will remain in his ownership. This area is identified as a blue line area and amounts to approximately one hectare. The location is shown in Figure 1.2.

Table 4.1 Development zones for the Caithness Converter Station

Development zone			Area (ha)
Planning area (Red line area) (30ha)	Permanent development zone (20ha)	Core platform area	6.5
		Core development area	7.1
		Visual screening -- existing	3.0
		Visual screening – new planting	3.0

Development zone			Area (ha)
	Temporary contstruction zone (10ha)	Temporary construction compound	1.0
		Other potential temporary construction	9.0
Blue line area		Supplementary planting adjacent to A9(T)	1.3

4.2.5 Platform

The site lies on a gentle west-northwest facing slope. The site will therefore need to be levelled prior to construction. This will be achieved through a 'balanced cut and fill' operation, whereby material excavated on the 'up-slope' sections will be used to provide fill material in the 'down-slope' sections. It is anticipated that the amount of material removed will be approximately equal to the amount of material required for infilling.

The overburden cut (topsoil and subsoil) is circa 48,850m^3 which will be used for landforming, and soiling embankments etc. around the site (see Section 4.2.11).

The rock cut is calculated to be some 92,000m^3, all of which will be used in the cut / fill balance for the platform. No excavated material is anticipated going off site from the works.

The platform will be constructed of crushed rock, predominantly taken from the site, and constructed to a minimum depth of one metre below the agreed finished levels. The crushed rock will be compacted but will still form a permeable surface. Electrical earth matting and localised reinforced concrete bases supporting electrical equipment will be installed within this granular platform. Approximately 4,100m^3 of 75mm gravel is likely to be imported for the final finish over the open platform areas. The finished level is presently expected to be 83.2m AOD.

A cross sectional view of the platform is shown in Figure 4.4.

4.2.6 Electrical equipment

The main outside area of the core platform will function much like a normal 275/132kV substation, accommodating an open metal busbar structure about 195m long, and135m wide. A section of the busbar structure will accommodate 132kV busbars, up to 7m high, while another section of the structure will accommodate 275kV busbars up to 10.5m in height. These are required to facilitate the upgrade of the line infrastructure into the converter station from 132kV to 275kV in the future (see Chapter 16, Section 16.6.3)[44]. A substation control room will be required; this may be connected to the main converter station building but may also be separate as currently indicated in layout drawings.

4.2.7 Converter station buildings

The high voltage equipment for controlling the HVDC circuit will be contained within a large metal-clad building – the converter station building. This building will be located in the north-eastern sector the platform. The building will be up to 17m in height, approximately 110m long and 65m wide. These buildings are sized to accommodate the large AC to DC conversion equipment. The converter transformers weigh up to 290 tonnes each. Four of these units will be required,

[44] Permissions for the line upgrade and any other associated works will be applied for separately (see Section 1.2).

three in service and one spare. The converter station buildings will also house operational accommodation, including stores, workshops, control rooms, staff welfare facilities, and storage space for the spare converter transformer.

It is expected that the main buildings of the converter station will be finished in metal cladding of a colour, which is subject to planning approval, designed to minimise visual contrast with the landscape backdrop (see Section 10.10). This colour scheme is important as it allows the building's visual effect on the surrounding environment to be reduced. The sheds will be designed, as far as practical, to mimic agricultural sheds thus further reducing visual impact. The compound will be designed to fit as low in Achanarras valley as possible to reduce visibility whilst not compromising flooding.

For this assessment the taller of two preliminary converter station designs will be considered as a "worst-case" scenario. A conceptual layout of the buildings for the "worst-case" scenario is shown as a three dimensional sketch and in plan form in Figure 4.5. The details of the building design will be finalised when the procurement process concludes which supplier will be used (Section 4.1.1).

4.2.8 Main access to the site

The site access road to the converter station from the public road A9(T) will utilise the existing track to Achanarras Farm that lies to the north of the existing shelterbelt (Figure 4.6; Plate 4.3). This track will be widened to the north to avoid moving the ditch on the south side of the track and affecting the existing tree belt. The track will be widened to 6m, with a further 3m of ground to the side of the track prepared as runoff when manoeuvring very large vehicles. A few trees, probably less than ten, will need to be felled to allow large vehicular access to the converter station site. A cross section of the track widening is shown in Figure 4.7.

It is proposed to use existing tracks during the construction works to help reduce damage to soils from plant moving around the site. These will apply in particular to the outer areas where landscaping will take place. In the area of the proposed platform, vehicle access will be limited until excavation takes place to avoid compacting the soil and creating excess mud.

The existing entrance to the track from the A9(T) and associated sightlines will be improved. The detailed design of this junction is shown in Figure 4.8. The access track will be completed with a tarmac surface, kerbed sides and suitable drainage.

The link road from the access track to the platform will use the existing gap in the shelterbelt and will then drop, with a gentle gradient, from the northeast corner of the platform to the middle of the eastern side of the platform. Here it will turn westwards to run across the southern face of the converter station building (see Figure 4.6).

There will also be an internal ring road around the converter station platform, with a tarmac or concrete surface. All of these access upgrades will use hardcore won from the site where possible, backed up by supplies from nearby quarries if required (Figure 4.6).

The plans for site access can be seen in Figure 4.1.

4.2.9 Road, rail and marine supply routes

The supply lines to the site during construction could use road, rail and marine means of transport. Road access will be via the A9(T). It is anticipated that most load deliveries will arrive from the south except for the transhipment of goods from the nearby ports of Scrabster or Wick. For the chosen option of these latter routes access must be available for long and heavy loads (abnormal indivisible loads (AIL)). In some instances this may involve improvements to the local road network such as widening of bends and strengthening of bridges. Some goods may be supplied via rail to Georgemas Junction. There are storage and laydown areas at Georgemas Junction and there is then a short road link along the A9(T) to the site. The main supply routes to the site are shown in Figure 4.9.

The final selection on the routes for transport of equipment and materials to the site has not yet been decided. An assessment is currently being carried out by the project engineers in consultation with The Highland Council and Transport Scotland on the selection of appropriate routes. The final routes will be determined by SHETL and agreed with The Highland Council and Transport Scotland in advance. Any necessary upgrades will be carried out in advance.

4.2.10 Natural channels & drainage

Gradients of the existing ground to the south and west of the proposed platform ground are typically 1:25 with steeper areas towards the northwest. The existing ground slopes from 94.0m AOD in the southwest to 77.5m AOD in the northeast, with the proposed platform at 83.2m AOD (see Section 4.2.5). Ground conditions consist of poorly draining shallow topsoil overlying a thin layer of glacial till with a shale type bed rock typically 0.75m below ground.

The existing interceptor ditch to the south of the site will be diverted to out with the landscape bund (see Section 4.2.11). The new ditch will be naturalised with shallow sloping sides to encourage vegetation re-growth, and where possible made to follow a more meandering path at the base.

The existing interceptor ditch to the east of the site will be diverted for approximately 80m to allow the access road to the platform, provide access to the residual farm land and provide pluvial flood protection (sheeting flows) from the east (Figure 4.10).

These ditches will continue to take the surface water runoff from the surrounding areas of agricultural land to the south and east, the inflow from intercepted field drains and buried burn flows, as well as surface water from the outer slopes of the landscape bund (Figure 4.10).

Site drainage

A detailed drainage plan will be developed as part of the Construction Environmental Management Document (CEMD; see Section 4.4.2) and agreed with SEPA and The Highland Council. This will include measures to protect the Achanarras Burn from drainage flows and runoff from all parts of the site during construction and operations including ground water seepage from the northwest corner of the site.

The platform will be served by a drainage system to intercept any flows from the excavated rock faces, rainfall onto the site itself and surface water from the inner side of the landscape bunding[45].

Drains will therefore be formed at the base of cut slopes, around the periphery of the platform and across the middle of the platform.

In addition to the ditch realignments mentioned above, the site drainage plan will include the following:

- land within the new substation will be drained by installation of a porous drainage system within the granular layer. This drainage will outfall west to the Achanarras Burn;
- French drains have been designed along the lower north and west sides of the platform to intercept surface water runoff from the granular platform, and discharge it into an open channel drain leading to the Achanarras Burn;
- a penstock valve has been included in the outfall manhole to allow retention of any contamination which has breached the normal containment and spill measures;
- an outlet pond has been designed between the platform and the Achanarras Burn, which provides storage of water for fire fighting purposes. During construction stages this area will be used to collect and treat surface water from the platform, before discharge over existing grassland to the Achanarras burn; and
- drainage from the existing road is taken into an open ditch running parallel with the south side of the road. Surface water drainage from the proposed road widening will be taken into a new filter trench along the north side of the road, which connects back to the existing ditches.

All works will be carried out in accordance with Scottish Environment Protection Agency (SEPA) and other best practice guidance. The need for a full sustainable urban drainage system (SUDS) and attenuation scheme is limited due to the permeable platform design adopted throughout. The surface water flow from the substation platform to the burn will be restricted to not greater than the existing greenfield runoff from the same area. Preliminary arrangements have been discussed with SEPA (see Section 8.5 and Annex I) and further details will be submitted as the design works progress.

As a further level of control and protection a pond will be formed at the base of the site into which the platform drainage will flow. The primary purpose of the pond is to provide a fire water supply but it will also be able to function as a treatment area and storage area for any contaminated drainage flows or heavy sediment loadings, should they ever arise, and provide additional attenuation of the outflow. The storage volume of this pond will be approximately 580m^3.

The pond will be constructed out with the 1:200 year flood area.

The pond will out flow into the Achanarras Burn watercourse for which The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) licence will

[45] Bunding is a precautionary built structure to prevent spread of leakage from a holding vessel should a breach occur.

be required[46]. It is proposed that the pond is created early during the construction phases so that it can be used to collect and treat surface water from the platform area (see Section 8.11.5).

Other drainage measures to manage water movement at the site as well as to protect natural water sources include:

- maintenance access roads constructed within the perimeter of the site are drained into the granular layer which provides SUDS treatment and the required attenuation of the flows before discharge into the burn;
- foul drainage from staff areas will be to a septic tank, the tank will discharge to a soakaway away from the nearby burn;
- temporary interception ditches and attenuation ponds will be formed at spoil storage areas. It is expected that the interception ditches and attenuation ponds at spoil storage areas will be removed on completion of construction;
- transformers plinths will be constructed with bunding, oil separation, and flow controls to ensure the platform and the drainage system are not contaminated;
- during construction any fuel storage, vehicle maintenance, refuelling activities will only take place within fully bunded areas with impermeable bases and sufficient capacity for 110% of the liquids being handled; and
- spill response kits will be available on site.

After construction the substation is normally unmanned resulting in a low risk of contamination from vehicles etc.

Flood protection

A flood risk assessment has been carried out, and this shows the proposed works do not lie in the area of the functional flood plain (1:200 year) of the Achanarras burn (see Section 8.11.1). The development is regarded as a strategic asset and is therefore further protected from fluvial and pluvial flooding in a 1:1000 year event.

At the southwest corner of the platform, which is close to existing ground level, a small bund is proposed, to divert any sheet flows. The north and northwest areas of the platform are above nearby ditch levels and are naturally protected from any periods of high flow, which will continue to be directed by the natural landform to the north onto open land.

More details are available in the Flood Risk Assessment (URS, 2010), which is included as part of the planning application for this project.

4.2.11 Landscaping

Landscape mitigation will consist of planting, landform and reinstatement of traditional flagstone fences.

To the south, and wrapping round the southwest corner, there will be a naturalistic landform some 65m wide, between 1m and 4m above existing levels. This will

[46] The Water Environment and Water Services (Scotland) Act 2003 (WEWS) implemented the Water Framework Directive (WFD) in Scotland and provides Ministers with the powers to make regulations to control activities which could affect the water environment. The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR) came into force on 1st April 2006.

have an inner slope of 1:3, a very gently rounded out top and a back slope (the visible side) varying between 1:10 and 1:20 to tie in with the landform of the valley. Cross sections of landforms are shown in Figure 4.11.

There are three types of planting. There will be clumps and natural scatters of scrub willow along the Burn of Achanarras, across the top of the landform to the south of the site and smaller clumps along the east side. On the south side these will be supplemented by groups of native deciduous trees. A mixed hedge with occasional trees will be planted along the A9(T) from the Shelterbelt above Spittal Mains to the start of the remnant old road east of the site.

Together this planting and landform will largely screen views of the electrical equipment from the south and southeast, and over time as the planting develops filter and soften views of the converter station. The hedge along the A9 will screen views from the road.

Further planting will take place to the north of the shelter belt and new access track. This will comprise a more formal stand of new trees to extend and soften the existing shelter belt. The aim of this planting is to ensure that the visual barrier formed by the existing shelter belt is maintained as the existing trees mature and eventually require felling and replacement.

These landscaped areas will be protected from damage from stock by the installation of stock fences along the outer margins of the landscapes areas (Section 4.2.12). As the stands of trees mature some of these stock fences may be able to be removed and it may be possible to agree that the open grassed areas are grazed by the adjacent farmer.

See Section 10.10 for further details on landscaping and a plan of the proposed landscaping scheme.

4.2.12 Fencing and security

A security fence (palisade of a dull green colour) will enclose the platform area. As with the converter station building, the colour for the fence will be agreed with The Highland Council and will be designed to minimise visual contrast. It is expected that the main gate to the site will be of similar size and appearance to the fencing. The access road will be fitted with a low height gate of rural appearance at the gap in the shelterbelt near the access to the platform. The existing track to Spittal Mains Farm will not be gated.

Existing stock fencing will be retained where possible, such as along the Achanarras Burn to the west, and along the existing shelterbelt north of the platform.

The fence along the ditch to the east of the platform area will be replaced and, over a short length, realigned along with the ditch to accommodate the access road. The replacement fence will be a Caithness flagstone fence reinforced by post and wire fencing to make it stock-proof.

To the south of the platform area, the existing Caithness flag fence will be removed to accommodate the landforming and will be reinstated just to the north of the diverted ditch (see Figure 4.12). This flagstone fence will also be reinforced with post and wire to make it stock-proof.

In addition, the new shelterbelt planting to the north of the access track will be completely enclosed by new fencing to ensure successful establishment of trees.

Security and safety considerations also require the installation of signage around the perimeter of the converter station development platform.

4.2.13 Services

The converter station site will be connected to mains electricity (with diesel backup), water supplies, communications and a septic tank. All services are expected to be provided through underground connections to the existing public services that run close to or through the site. A water line and 11kV electricity supply will need to be realigned around the site (see Figure 6.4). A section of 11kV running through the site will be undergrounded. See Section 6.7.3 for further details about services provided on the site.

Lighting will be provided at the converter station to allow safe working during poor light and darkness, but the site will not be permanently lit during darkness and the orientation of lighting will prevent lights shining out of the site.

4.2.14 Temporary construction facilities

During the construction phase of the project a contractor's compound will be located just to the northeast of the excavated platform area, adjacent to the gap in the shelterbelt. The compound will contain offices, mess rooms, chemical toilets and parking for around 30 light vehicles. Electricity will be sourced from mains electricity, but opportunities for heat recovery and solar panel solutions will be investigated during detailed design. Areas for parking plant and for storage of materials such as topsoil, sand, stone and equipment will also be established. The proposed location for these temporary construction facilities is shown in Figure 4.1.

4.2.15 Future cable connections

Any future cable connections and modifications will be undertaken as individual projects subject to separate applications or completed under permitted development rights. The present project has sought to ensure that the location and layout of the facilities is suitable for future connection. Where appropriate, ducts will be placed around the site within the landscaped areas to facilitate easy installation of any future connections. The close proximity of the site to the existing 132kV line is another important feature of the planned project.

Checks have been made to ensure that there is sufficient space for the future planned upgrades to, and connections from, the 132kV line to be made (see Section 3.8). Further consideration of the implications of any future connections is included in Chapter 16 - Cumulative Effects.

4.3 Construction works

4.3.1 Introduction

All construction work will be undertaken to meet legal requirements and following best practice guidance including (but not restricted to):

- CIRIA C650 Environmental Good Practice Site Guide, 2005[47];

[47] Note that this is an old edition. The 3rd edition was available from November 2010.

- Control of water pollution from linear construction projects CIRIA C648, 2006;
- The requirements of the Water Environment (Controlled Activities) (Scotland) Regulations 2011; and
- Scottish Environment Protection Agency (SEPA) Best Practice Management Guidance (www.sepa.org.uk).

4.3.2 Construction programme

The construction phase of the entire project is anticipated to taken some 2½ years, beginning in 2013 with the facility being commissioned in 2016 (see Section 1.3). Civil works are expected to take up to 12 months and construction of the converter station and associated electrical works around 15 months. The programme takes into account restrictions in working times due to weather or other delays.

Site construction will involve a number of parallel and sequential steps:

Phase 1: Civil works

- Preparatory works
  - Preliminary site surveys (complete)
  - Site ground investigations (complete)
  - Pre-construction species surveys (repeat surveys required)
  - Setting out the site
  - Installing new stock fencing and gating
  - Establishing any early planting in the blue line (offsite) area
- Site establishment
  - Install traffic management on A9(T)
  - Form new improved access and road along existing route from A9(T)
  - Establish construction compound as area of hard standing
  - Erection of safety fencing and signage
  - Establish new drainage channels and ponds
    - Temporary during topsoil works
- Excavation for platform
  - Clear platform site and move top soil and subsoil into separate stores
  - Create new landscaping bunds
  - Excavate rock
  - Crush rock
  - Create rock platform
  - Create permanent platform access ramp
- Installation of foundations
  - Deliver pre-mixed concrete (concrete for construction will be mixed off site)
  - Create foundations and services trenches
  - Create platform trackways
  - Erect sub-station control room
  - Form transformer bases
  - Form internal access roads, paths and finishes

- Site restoration
  - Establish permanent drainage for all works
  - Landscape fire water pond and introduce aquatic plants
  - Seed and plant trees along screening bunds
  - Seed and plant trees along water courses
  - Plant trees for new shelterbelt
  - Seed other exposed soil areas

Phase 2: AC electrical installation

- Form busbars and controls and install transformers

Phase 3: HVDC installation

- Erection of buildings
  - Deliver building materials
  - Erect converter station building
- Installation of electrical plant
  - Deliver and transport equipment to site
  - Install and connect electrical equipment
- Commissioning
  - Energise electrical equipment

4.3.3 Earthworks

A core aim of undertaking the earthworks is to work in a way that avoids any risk of excessively muddy water reaching the Achanarras Burn. It is therefore proposed to initiate the topsoil works only after temporary surface drains and settlement ponds have been created, with late spring and summer months, when the ground will be driest, favoured for the works.

Once these drains are established the top soil will be removed from the underlying bedrock. This will be done such that most of the area is either cleared to bedrock or sitting as undisturbed soil. The cut face will advance though the top soil as the soil is removed.

As described in Section 4.2.5, the topsoil and subsoil will be used for landforming, and soiling embankments etc. around the site (see Section 4.2.11). Where vegetation typical of wetter areas is removed this will be placed in wetter areas of the new landscape.

As described in Section 4.2.5, it is anticipated that the amount of rock material removed will be approximately equal to the amount of material required for infilling. All excavated material will be used where practicable, and no excavated material is anticipated going off site from the works.

4.3.4 Waste generation and management

Wastes that cannot be safely re-used will be either recycled through appropriate recycling providers or disposed of to licensed facilities. The contractor will be required to set up waste segregation bins.

Domestic solid wastes will be dealt with by requiring removal from site by each worker and visitor.

4.3.5 Restoration and landscaping

Establishing the desired landscape forms will require reuse of the soils excavated from the platform area and placements of these soils in particular areas around the site. The sequence of actions that will be undertaken is outlined below. Importantly this approach to establishing the landforms seeks to preserve soil structure as far as is practical.

Sequence for establishing landscaped areas:

1. Strip topsoil (from construction and landform areas) and set aside carefully
2. Strip subsoil and move to form landscape bunding
3. Create new landforms with subsoil using low ground pressure vehicles
4. Topsoil new landforms using low ground pressure vehicles. Minimum 100mm topsoil for grass areas, 400mm for planting areas
5. Cultivate to smooth flowing contours
6. Plant scrub and woodland mixes and re-seed in the appropriate seasons

The outer perimeter of the site beyond the stock fencing will be reinstated to grassland habitat to return the land to agricultural use.

Planting mixes will include a mixture of native deciduous and appropriate evergreen species (see Section 10.10.3).

Seeding mixes will be developed in discussion with the landowner where land is to be returned to agriculture and with SNH and The Highland Council where the aim is to promote biodiversity.

The exposed bedrock of the upper batter slopes of the development platform will be left to naturally weather and re-vegetate over time. A more active approach will be adopted on the lower batter slopes to promote the establishment of vegetation that will both stabilise the slope surface and enhance the biodiversity of the site. This will favour rocky habitat plants appropriate for prevailing ground conditions.

4.3.6 Employment

Employment will be some 20 staff for platform civils (local workforce where possible) for 12 months; and 25-30 staff for electrical / specialist converter station works staff for 15 months.

4.3.7 Construction hours

Construction hours will be: 8 am – 7 pm Monday to Friday, 8 am – 1 pm Saturday. Any out of hours working will be similarly agreed in advance with The Highland Council.

4.3.8 Traffic management

Daily traffic during construction is predicted to be as follows: For the civil works which will last about 11 months:

- an average of 6 HGVs per day, with a peak of 15;
- 12 cars / vans for workers travelling to the site.

For the electrical works which will last about 15 months:

- Electrical grid work:
  - an average of 4 HGVs per day, with a peak of 6;
  - 8 cars / vans for workers travelling to the site.

- HVDC construction and installation:
  - an average of 4 HGVs per day, with a peak of 8;
  - 20 cars /vans for workers travelling to the site.

Over the duration of the construction period (2-2½ years) there will also be up to four abnormal loads for transporting the converter transformers. Additional abnormal loads may be required for other HVDC equipment, based on transportation size and shape, rather than weight.

4.3.9 Construction plant

Table 4.2 below sets out the typical plant types and numbers used in the predictions of noise levels resulting from the various construction phases (see Section 13.9.1).

Table 4.2 Assumed construction plant details

Phase	Plant Type	No. of plant
Ground works / formation of platform	Excavator	4
	Dozer	2
	Air Compressor	2
	Dump truck	4
	Generator	1
	Crusher	2
Building foundation works	Truck mixer with pump	4
	Dump Truck	2
	Excavator	3
	Grinder	1
	Compressor	2
	Generator	1
Road works for access road and car parking	Asphalt spreader with support lorry	1
Building fabrication	Hammering	3
	Lorry	3
	Dump truck	1
	Compressor	1
	Fork lift truck	2
	Scaffolding	1
	Mobile crane	1

4.3.10 Building materials

Building materials will be sourced locally wherever possible.

4.4 Construction management

4.4.1 Change control

If any changes to the project assumptions are made by the contractor, which the project team considered could result in significant effects greater than those identified in the ES, further mitigation will be identified. If the residual effects could not be fully mitigated to the level of those described in the ES an addendum to the

ES will be triggered. The addendum will be published for public consultation and comment and consideration by The Highland Council. All changes and assumptions will also be discussed and agreed with appropriate consultees (see Section 2.4).

Smaller scale changes will be tracked during the detailed design and construction of the project and measures taken to ensure that they do not exacerbate negative impacts and where possible opportunities are taken to enhance positive impacts.

4.4.2 Environmental management

SHETL will be required to develop and implement a Construction Environmental Management Document (CEMD) for construction following best practice (The Highland Council, 2010). This will be in addition to any more generic environmental management system (EMS) such as ISO 14001[48] which the contractor may work under. The CEMD will set out procedures to ensure all activities with potential to affect the environment are appropriately managed. All environmental risks and necessary protection measures (including mitigation measures set out in the ES) will be required to be identified and integrated in the contractor's method statements for all major construction activities. The CEMD will demonstrate how all topic specific and locational specific mitigation will be delivered.

The CEMD will consist of a suite of documents in addition to the main document. These will include but not be limited to:

- a Water Protection Plan;
- an Ecological Management Plan;
- a Landscape Management Plan;
- a Road Safety and Traffic Management Plan;
- a Noise Management Plan; and
- a Post Construction Restoration Plan.

All site staff will receive appropriate environmental training at the beginning of the contract and throughout the construction period as required. The contractor's compliance with environmental procedures will be audited on site at regular intervals during the construction works by the environmental clerk of works.

The CEMD will be periodically revised as required to take account of emerging best practice and SHETL standard procedures.

4.4.3 Community liaison

The contractor will be required to establish and maintain effective liaison with the local community throughout construction. This will include information about ongoing activities and provision of contact telephone numbers to contact the site for information during operational hours. A representative will be identified with appropriate authority to resolve any problems. A log of complaints and actions taken to remedy these will be available for inspection.

The contractor will be required to ensure disturbance to the local community from construction activities is minimised to that required for safe implementation of the works.

[48] ISO 14001 is an international standard for environmental management.

In accordance with best practice and company policy, SHETL will establish arrangements for community liaison throughout all stages of the Caithness – Moray Firth HVDC Connection.

4.5 Operation and maintenance

The converter station will operate unmanned with periodic staff visits for inspection and maintenance from the transmission team based in Inverness. Control of the facility will normally be managed remotely from SHETL's central control facility in Perth. Staffing levels will be low with a pool of trained staff allocated from existing staff employed by SHETL. Staff vehicular access will be required for maintenance and inspection over the operational period.

The converter station will be inspected every two weeks, and maintenance on each circuit will take place on a planned basis at a frequency of between one and six years. Operation and maintenance programmes will require regular attendance by staff and potentially the need to replace items of equipment.

When operational the main noise sources will be from fans and other heat dissipation equipment associated with the main electrical equipment, such as transformers (see Section 13.9). These cooling fans will be carefully located and designed so as to avoid noise impacts to receptors such as residential properties. There are no operational discharges of emissions from the converter station site. The only output is water from the drainage system. Normally this should flow as unpolluted rain and ground water.

Operational performance and safety of the converter station will be constantly monitored with an immediate shutdown triggered should any significant problem arise, meaning there is no operational risk to human health.

During detailed design of the converter station an overall study of the fire protection arrangements of the converter building will be carried out. The converter station will be designed in accordance with the required fire legislation and standards.

A pond as described in Section 4.2.10 above will be installed.

Guidelines on restrictions on exposure to electromagnetic fields (EMF) have been developed that are based on the avoidance of established biological effects of EMF. The Radiation Protection Division of the Health Protection agency (HPA) recommended the adoption of guidelines published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP, 2009). Full compliance with legal standards (set by the HPA) in respect of EMF will be achieved for all elements of the converter station. EMF within the converter station is controlled both by design of the equipment and the building with any residual EMF having dissipated to negligible levels at the site boundary. The bipolar configuration of each HVDC cable circuit involves one cable that is positively charged and the other negatively charged which substantially reduces the effect of any magnetic field to below that of the earth's natural geomagnetic field levels. Any residual magnetic field is static (as opposed to that of AC which alternates) and is similar to the earth's natural geomagnetic field in nature.

4.6 Decommissioning

The design life is 40 years although longer may be possible if capacity and condition of equipment continues to be fit for use.

A Decommissioning Plan will be prepared in accordance with SHETL's operational procedures. The plan will define what activities will take place once the project is no longer fit for purpose and becomes redundant. Public, staff and environmental safety will be central to this plan and will determine what decommissioning activities will be required.

Appointed contractors to undertake decommissioning works will be expected to prepare their own management and mitigation systems demonstrating compliance with the terms of their contracts.

The decommissioning of the site will involve a reverse of the construction phase with buildings and other equipment being removed for recycling or safe disposal and then, if no appropriate use is found for the site, a suitable re-instatement plan will be activated.

4.7 Sustainability of the project

The Highland Council have endeavoured to promote a more sustainable approach to project development and this ambition is strongly aligned with SHETL's policy objectives. The key factors selected by The Highland Council to define the sustainability of a project are listed below:

- Location and best use of site
- Socio-economic impacts and community
- Sustainable design and construction
- Energy efficiency and carbon emissions reduction
- Use of renewables
- Waste minimisation
- Water use and pollution prevention
- Traffic and transport
- Natural and cultural heritage protection

Chapter 17 of this document details how the project will meet recognised objectives related to these factors.

4.8 General mitigation measures

There are a great many mitigation measures that have already and will continue to be applied to this project. Table 4.3 below lists the general mitigation measures that have to a large extent already been adopted in the preliminary design strategy and are envisaged for the framework contracts to implement the project. Specific measures for each impact area that still need to be implemented are addressed in each of the EIA topics addressed later in this document. An annex has also been prepared which collates all of them measures in the overall mitigation strategy (Annex II).

Table 4.3 General mitigation measures

GEN1	The final detailed design of the proposals will take account of all relevant committed mitigation measures.
GEN2	If any changes to the project assumptions are made by the contractor, which the project team considered could result in significant effects greater than those identified in the ES, further mitigation will be identified. If the residual effects could not be fully mitigated to the level of those described in the ES an addendum to the ES will be triggered. The addendum will be published for public consultation and comment and consideration by The Highland Council. All changes and assumptions will also be discussed and agreed with appropriate consultees.
GEN3	Smaller scale changes will be tracked during the detailed design and construction of the project and measures taken to ensure that they do not exacerbate negative impacts and where possible opportunities are taken to enhance positive impacts.
GEN4	SHETL will prepare a Construction Environmental Management Plan (CEMD) which sets out the requirements for protecting the environment and promoting sustainability for all elements and at all stages of the project and will ensure that all commitments are delivered by the contractor.
GEN5	The CEMD will consist of a suite of documents in addition to the main document. These will include but not be limited to: a Water Protection Plan; an Ecological Management Plan; a Landscape Management Plan; a Road Safety and Traffic Management Plan; a Noise Management Plan; a Post Construction Restoration Plan; and a Decommissioning Plan.
GEN6	The CEMD will be agreed with The Highland Council (THC), Scottish Environment Protection Agency (SEPA) and Scottish Natural Heritage (SNH) and will be periodically reviewed and if required revised to account for any updates in emerging best practice and SHETL standard procedures.
GEN7	The CEMD will incorporate the environmental mitigation measures identified in this ES, as well as any other standards and measures already adopted by SHETL
GEN8	Tenderers will be required to demonstrate their approach to protecting the environment as part of the procurement process.
GEN 9	The contractor and SHETL will be required to appoint an Environmental Clerk of Works (ECoW) to audit activities on site on at least a monthly basis and more frequently during stages of construction with potential to cause environmental impact such as soil stripping.
GEN10	Successful implementation of mitigation will be audited by SHETL and the appointed Environmental Clerk of Works on site and action taken as necessary where it is considered that any measure could be improved to better protect the environment.
GEN11	SHETL will audit the success of site restoration and will ensure that that all new habitats are created and maintained as defined in the ES.
GEN12	In accordance with best practice and company policy, SHETL will establish and maintain arrangements for community liaison throughout all stages of the Caithness HVDC scheme. This will include circulation of information about ongoing activities.

GEN13	The contractor will be required to establish a contact telephone number. The telephone will be available during operational hours and representative(s) with appropriate authority to resolve any problems that occur will be available. A log of all complaints and actions taken will be kept and made available for inspection. SHETL will also provide a 24-hour telephone number for emergency contact.
GEN14	The detailed design for the site will be required to demonstrate how adequate fire protection will be delivered.
GEN15	The converter station platform will be designed to have a finished level of 83.2m AOD. If SHETL proposes a change to this level then an assessment must made to the environmental implications of the change to check that no residual environmental effects will be greater than those demonstrated in the ES.
GEN16	A detailed drainage plan will be developed as part of the CEMD and agreed with SEPA and The Highland Council. This will include measures to protect the Achanarras Burn from drainage flows and runoff from all parts of the site during construction and operations including ground water seepage from the NW corner of the site. (See also H4).
GEN17	A bund will be constructed at the southwest corner of the converter station platform to divert any sheet flows. The outer edge of the bund will grade towards the interceptor drains so that they drain into these features.
GEN18	Excavated crushed rock for the platform will be compacted to form a permeable surface through which rainwater will percolate.
GEN19	The existing and newly planted shelterbelts will be retained and managed as a long-term visual screen to the development (see also LV 7 & 9)
GEN20	Maintenance access roads constructed within the perimeter of the site will be drained into the granular layer which provides SUDS treatment and the required attenuation of the flows before discharge into the burn.
GEN21	An attenuation pond will be formed at the base of the site into which the platform surface drainage will flow. This pond will also be used as a fire water supply.
GEN22	Where appropriate, ducts will be placed around the site within the landscaped areas to facilitate easy installation of any future connections without disrupting newly established planting.
GEN23	Cut and fill will be balanced as far as practical in the detailed design to reduce the need for import of material or production of waste
GEN24	The development will be designed to fit as low in Achanarras valley as possible to reduce visibility whilst not compromising flooding.
GEN25	The sheds will be designed, as far as practical, to mimic agricultural sheds thus further reducing visual impact.
GEN26	The main buildings of the converter station will be finished in metal cladding of a colour subject to approval by The Highland Council (see also measures LV2 and LV3).
GEN27	A security fence (palisade) will enclose the converter station site.
GEN28	Foul drainage from staff areas will be to a septic tank, the tank will discharge to a soakaway located away from the nearby burn.
GEN29	The existing entrance to the track from the A9(T) and associated sightlines will be improved to meet required standards.
GEN30	The access track from the A9(T) will be completed with a tarmac surface, drained to the adjacent ditch.
GEN31	The access road will be fitted with a low height gate of rural appearance at the gap in the shelterbelt near the access to the platform.

GEN32	Construction hours will be 8am-7pm Monday to Friday and 8am-1pm Saturday. Any out of hours working will be agreed in advance with The Highland Council.
GEN33	The contractor will be required to ensure disturbance to the local community from construction activities is minimised to that required for safe implementation of the works.
GEN34	A detailed site map of features of environmental interest will be compiled as part of the CEMD to inform ongoing site management plans and for site induction.
GEN35	All site staff will receive a general induction covering the site environmental sensitivities and the importance of ensuring the successful implementation of all committed mitigation measures. Tool box talks will be given to update staff of any changes.
GEN36	The working areas of the site will be fenced to control access to adjacent sensitive areas including farmland, the Achanarras Burn and the existing shelterbelt.
GEN37	All equipment, plant and vehicles used during the construction phase will be well maintained and regularly inspected for signs of oil leaks and suitable replacement or repair undertaken. Plant and vehicles used for the construction works will be maintained on impermeable surfaces to contain oil spills. Maintenance and refuelling of machinery will be undertaken within designated bunded areas. In these designated areas contingency plans will be implemented to ensure that the risks of spillage are minimised.
GEN38	All fuel and other chemicals will be stored within the site compounds in accordance with best management practice and to meet the requirements of the Oil Storage Regulations[49]. All oil and fuel storage facilities and small static plant will be well managed to minimise the risks of leaks to soil and groundwater.
GEN39	During construction, refuelling activities will only take place within fully bunded areas with impermeable bases and sufficient capacity for 110% of the liquids being handled.
GEN40	Transformer plinths will be constructed with bunding, oil separation, and flow controls to ensure the platform and the drainage system are not contaminated.
GEN41	Appropriate oil spill kits will be provided on site and site staff trained in their use.
GEN42	Wastes which cannot be safely re-used on site will be either recycled through appropriate recycling providers or disposed of to appropriately licensed facilities.
GEN43	All solid and waste materials will be disposed of in accordance with best practice to licensed facilities
GEN44	Site management will include regular litter sweeps of the works area to ensure no problems from litter arising from the construction site.
GEN45	All drainage works will be carried out in accordance with Scottish Environment Protection Agency (SEPA) and other best practice guidance.
GEN46	Lighting will be provided at the converter station to allow safe working during poor light and darkness, but the site will not be permanently lit during darkness and the orientation of lighting will prevent lights shining out of the site.
GEN47	Operational performance and safety of the converter station will be constantly monitored with an immediate shutdown triggered should any significant problem arise, meaning there is no operational risk to human health.
GEN48	An “end of life” plan for the converter station will be prepared as part of the CEMD and agreed with The Highland Council.

[49] The Water Environment (Oil Storage) (Scotland) Regulations 2006

4.9 References

Aquatera. 2010. *Moray Firth Hub &Caithness HVDC Connection: Optioneering Report*. Internal project report.

Entec UK Ltd., 2009. *Shetland HVDC Connection: Upper Kergord Converter Station Environmental Statement.* Prepared by Entec UK Ltd for SHETL 2009.

ICNIRP, 2009. *Guidelines on Limits of Exposure to Static Magnetic Fields*. Health Physics 96(4):504-514.

The Highland Council, 2010. *Guidance Note: Construction Environmental Management Process for Large Scale Projects.* The Highland Council Planning and Development Service. August 2010.

5 Planning Policy and Guidance

5.1 Introduction

This chapter reviews the national, regional and local planning policies relating to this proposal and assesses the extent to which the proposal complies with them. The effects of the proposal on existing planning applications / permissions and other known or anticipated future developments are also considered (see also Chapter 16: Cumulative Effects).

National Planning Policy in Scotland is set out in the Scottish Planning Policy (SPP) and provides a statement of the Scottish Government's policy on nationally important planning matters. The National Planning Framework for Scotland (NPFS) is the Scottish Government's strategy for Scotland's long term spatial development which highlights developments of national significance. Advice on good practice is set out in Planning Advice Notes (PANs) which have been reviewed where relevant.

Regional strategic planning is undertaken by The Highland Council over its entire jurisdiction informed by the regional Structure Plan and supporting Special Planning Guidance (SPG) on issues such as renewables.

At a local level the Caithness Local Plan reflects the particular priorities and needs of the community in Caithness itself.

5.2 Sources of information

Published documents including:

- Scottish Planning Policy (SPP), Scottish Government (February 2010);
- National Planning Framework for Scotland 2 (NPFS2), Scottish Government (June 2009);
- Relevant Planning Advice Notes (PANs), Scottish Government, Available: www.scotland.gov.uk;
- Highland Structure Plan, Highland Council (approved March 2001);
- Caithness Local Plan, Highland Council (adopted September 2002);
- Highland Renewable Energy Strategy and Planning Guidelines (HRESPG), Highland Council (approved May 2006); and
- Other relevant national guidance and policy information.

5.3 Scottish Planning Policy

This section reviews national planning policy relevant to the proposals. Only policy and guidance relevant to the development proposals are assessed.

Scottish Government's strategic objectives

The Scottish Government's five overarching strategic objectives aim to 'focus Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth'. The strategic objectives are:

Wealthier and Fairer	Enable businesses and people to increase their wealth and more people to share fairly in that wealth;
Healthier	Help people to sustain and improve their health, especially in disadvantaged communities, ensuring better, local and faster access to health care;
Safer and Stronger	Help local communities to flourish, becoming stronger, safer places to live, offering improved opportunities and a better quality of life;
Smarter	Expand opportunities for Scots to succeed from nurture through to life-long learning ensuring higher and more widely shared achievements; and
Greener	Improve Scotland’s natural and built environment and the sustainable use and enjoyment of it.

Underpinning these objectives are 15 Key National Outcomes that describe what the Government wants to achieve and 45 National Indicators that enable it to track progress against these.

Scottish Government’s Renewable Energy Policy

The Scottish Government is committed to promoting the increased use of renewable energy sources. The previous Government has set clear targets for renewable electricity, announcing increases in November 2007 and September 2010. Ministers wanted renewable sources to generate the equivalent of 80 per cent of Scotland's gross annual electricity consumption by 2020, with an interim milestone of 31 per cent by 2011. Similarly, a target has been set for renewables sources to provide the equivalent of 11 per cent of Scotland's heat demand by 2020. An election pledge has been made by the new First Minister to produce 100% of electricity from renewable resources.

These commitments recognise renewables' potential to support economic growth. It also provides new opportunities to enhance our manufacturing capacity and to provide new employment, not least in the remote and rural areas (Scottish Government 2011).

The Moray Firth & Caithness HVDC Connection will play a role in facilitating increased production of energy from renewable sources.

The Climate Change (Scotland) Act 2009

The Climate Change (Scotland) Act 2009 is a key commitment of the Scottish Government, aimed at reducing greenhouse gas emissions and transitioning to a low carbon economy thereby helping to create a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth.

The Act sets a CO_2 reduction target for the year 2050, an interim target for the year 2020, and makes provisions for annual targets, for the reduction of greenhouse gas emissions. It also confers power on Ministers to impose climate change duties on public bodies and to make further provision with regard to mitigation of / and adaptation to climate change.

The Moray Firth & Caithness HVDC Connection will play a role in reducing greenhouse gas emissions and carbon via the development of electricity infrastructure supportive to renewable technologies.

Choosing our Future Scotland's Sustainable Development Strategy (2005)

The Sustainable Development Strategy for Scotland sets out how Scotland will implement the UK shared Framework for Sustainable Development, One Future-Different Paths and build a more sustainable future. Key outcomes of the Sustainable Development Strategy includes the reduction of greenhouse gas emissions, supported by energy efficiency, generation of energy from renewable sources, new technologies and renewable energy at domestic level.

This project will support the ability to meet such targets. Other commitments to protecting environment and natural heritage have been met through the EIA process.

Securing a Renewable Future: Scotland's Renewable Energy 2003

The aim of this strategy is to encourage the development of renewable energy as a response to climate change commitments and as a measure to promote the Scottish economy. It acknowledges that there is need for higher levels of renewable energy (in line with improvements to the grid) but with a reduction in overall demand (through improved energy efficiency). The opportunity exists to promote energy efficiency as well as encourage renewables. It further highlights the importance to take into account natural heritage and impact on the landscape within planning decisions. The proposals have the potential to contribute to reduction of carbon dioxide emissions and to support sustainable communities.

National Planning Framework for Scotland 2

The National Planning Framework for Scotland 2 (NPFS2) (published June 2009 replaced the first NPFS, published in 2004) discusses the Scottish Government's strategic vision for Scotland. NPFS2 guides Scotland's spatial development to 2030 and sets out strategic development priorities to support the Scottish Government's central purpose - promoting sustainable economic growth.

The Planning etc. (Scotland) Act 2006 requires that the NPFS2 be taken into account in the preparation of strategic and local development plans.

The NPFS2 identifies 'Electricity Grid Reinforcements' as a 'National Development' (paragraph 104). Although Map 10 within the Annex highlights that this project falls in an area that is not defined as a 'National Development,' there is recognition that additional projects will be necessary to realise the renewable potential of the Outer Hebrides, Orkney and Shetland through grid reinforcement, subsea links, new connections and route modifications (paragraph 158 and 213).

Getting the best from our land, a draft land use strategy for Scotland, Consultation for discussion and feedback 2010

This sets out proposals for how Scotland can achieve a prosperous and sustainable low-carbon economy, underpinned by successful land-based businesses, flourishing natural environments and vibrant communities. It refers to the potential for Scotland to become a larger producer of renewable energy. It refers to landscape change as a result of deliberate decisions or a lack of them and makes specific reference to renewable infrastructure. It includes the following maps for Scotland:

1. Land cover
2. Land capability for agriculture
3. Woodland cover in Scotland
4. Natural heritage designations
5. Suitability of land for woodland
6. Depth of peat
7. Areas of high flood risk
8. Topsoil organic carbon content

The Strategy aims to show how different policies relating to the use of land can work to provide the best outcome for Scotland. Local authorities and other public bodies will wish to ensure that the Strategy is fully considered in all their actions and decisions relating to land use. The maps included in this strategy and the priorities identified were used to help inform the site selection process (see Section 3.4)

Scottish Planning Policy

The Scottish Planning Policy (SPP) was published in February 2010. This single document replaces the previous series of SPPs 1-4, 6-8, 10-17, 19-23, Circular 12/1986, PAN 53 (which replaced previous NPPGs). The SPP sets out the Government's purpose of planning, core principles, statutory guidance on sustainable development and planning, concise planning policies and implications, and expectations of outcomes from planning policies. Information contained in the SPP is supplemented by Planning Advice Notes (PANs) which provide advice and information on technical planning matters.

The SPP is structured with a series of preliminary chapters highlighting the purpose and core principles of the planning system in Scotland. Of particular significance are the sections on:

- **Community engagement** – highlights the need for meaningful public involvement to occur at the earliest possible stage so as to ensure the views of the community can be reflected in the development plans;
- **Sustainable economic growth** – sets out that the planning authority should proactively support development that will contribute to sustainable economic growth and high quality sustainable places. Planning authorities are encouraged to take a positive approach to development, recognising and responding to economic and financial conditions in considering proposals that could contribute to economic growth; and
- **Sustainable development –** explains the role of the planning system by promoting development that supports the move towards a more economically, socially and environmentally sustainable society, and doing this through its influence of location, layout and design. This section also refers to climate change and ways in which the system can encourage reductions in carbon emissions e.g. through sustainable transport and building design.

The proposals have been considered in the context of sustainability and broadly comply with the Scottish Government's overarching strategic objectives, the NPFS2 aims and with the Government policies and guidance. A detailed review of how the proposals comply with relevant national policy is presented in Table 1 in Appendix 5-A.

5.4 The Regional Development Plan

Under Section 25 of the Town and Country Planning (Scotland) Act 1997 the proposed development stands to be determined against the policies contained within the development plan, unless material considerations indicate otherwise. The development plan for the area comprises:

- The Highland Structure Plan Written Statement, March 2001; and
- Caithness Local Plan, September 2002.

Additional plans relevant to the development include:

- The Highland Wide Local Development Plan 2010 (see Section 5.4.3); and
- Highland Renewable Energy and Planning Guidelines 2006 (see Section 5.4.4).

It is recognised that in the coming months a new Highland-wide local development plan will be produced which will update and replace parts of The Highland Council Structure Plan and local plans. The key development plan policy issues relating to the proposal and land subject of the application are outlined below.

5.4.1 Approved Highland Structure Plan 2001

The Highland Structure Plan, adopted in March 2001, provides the regional strategy for planning and development in the Highlands. This document contains a number of policies which are directly relevant to the proposed converter station; these are referred to in each chapter of the ES. The area of the Caithness Converter Station is not identified specifically for development within the Structure Plan.

Specific structure plan policies relevant to the proposals include:

- **Policy G1: Conformity with Strategy:** where The Council will support developments, having regard to the Plan's sustainable objectives, which promote and enhance the social, economic and environmental wellbeing of the people of Highland;
- **Policy G2: Design for Sustainability:** where Proposed developments will be assessed on the extent to which they:
    - are compatible with service provision (water and sewerage, drainage, roads, schools, electricity);
    - are accessible by public transport, cycling and walking as well as car;
    - maximise energy efficiency in terms of location, layout and design, including the utilisation of renewable sources of energy;
    - are affected by significant risk from natural hazards, including flooding, coastal erosion, land instability and radon gas, unless adequate protective measures are incorporated, or the development is of a temporary nature;

- are affected by safeguard zones where there is a significant risk of disturbance and hazard from industrial installations, including noise, dust, smells, electro-magnetism, radioactivity and subsidence;
- make use of brownfield sites, existing buildings and recycled materials;
- impact on individual and community residential amenity;
- impact on non-renewable resources such as mineral deposits of potential commercial value, prime quality or locally important agricultural land, or approved routes for road and rail links;
- impact on the following resources, including pollution and discharges, particularly within designated areas:

  - habitats
  - freshwater systems
  - species
  - marine systems
  - landscape
  - cultural heritage
  - scenery
  - air quality;

- demonstrate sensitive siting and high quality design in keeping with local character and historic and natural environment and in making use of appropriate materials;
- promote varied, lively and well-used environments which will enhance community safety and security and reduce any fear of crime;
- accommodate the needs of all sectors of the community, including people with disabilities or other special needs and disadvantaged groups; and
- contribute to the economic and social development of the community.

- Developments which are judged to be significantly detrimental in terms of the above criteria shall not accord with the Structure Plan;
- **Policy G3: Impact Assessments:** where environmental and/or socio-economic impacts of a proposed development are likely to be significant by virtue of nature, size or location, The Council will require the preparation by developers of appropriate impact assessments. Developments that will have significant adverse effects will only be approved if no reasonable alternatives exist, if there is demonstrable over-riding strategic benefit or if satisfactory overall mitigating measures are incorporated;
- **Policy G5: Integration of Environmental and Community Interests:** where the Council will support measures that link the protection, enhancement, understanding and enjoyment of the natural and cultural heritage with the sustainability and vitality of local communities;
- **Policy G6: Conservation and Promotion of the Highland Heritage:** where the Council will seek to conserve and promote all sites and areas of Highland identified as being of a high quality in terms of nature conservation, landscape, archaeological or built environment;
- **Policy G7: Partnerships and Community Planning:** where the Council will adopt a partnership approach in developing and implementing community planning initiatives at both the strategic and local levels;

- **Policy G8: Precautionary Principle:** where in the relatively rare situation of assessing development proposals where the potential impacts are uncertain, but where there are scientific grounds for believing that severe damage could occur either to the environment or the wellbeing of communities, The Council will apply the precautionary principle;
- **Policy T6: Scenic Views:** where the Council will protect important scenic views enjoyed from tourist routes and viewpoints, particularly those specifically identified in Local Plans. There will be a presumption against development in narrow areas of land between roads and railways and open water;
- **Policy A1: Safeguarding of Agricultural Land:** where Development on prime quality or locally important agricultural land will not be permitted except where the development is essential to the interests of the local community and no reasonable alternative location is feasible;
- **Policy N1: Nature Conservation:** where new developments should seek to minimise their impact on the nature conservation resource and enhance it wherever possible. The Council will seek to conserve and promote all sites according to the following hierarchy:

    - **sites and species of international importance** - Developments which would have an adverse effect on the conservation interests for which a site has been designated will only be permitted where there is no alternative solution and there are imperative reasons of over-riding public interest, including those of a social and economic nature. Where a priority habitat or species would be affected, prior consultation with the European Commission is required unless the development is necessary for public health or safety reasons
    - **sites of national importance** - Developments will only be permitted where the objectives of designation and the overall integrity of the area will not be compromised or any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social and economic benefits of national importance
    - **sites of local importance** - Developments will be assessed for their effects on the interests of sites of local conservation importance and will be resisted where these are judged to be unreasonably detrimental;

- **Policy N4: Local Biodiversity Action Plans:** In respect of habitats and species, The Council will have regard to Local Biodiversity Action Plans, where available, in addition to Strategic Policy G6, in the consideration of development proposals;
- **Policy L4: Landscape Character:** where the Council will have regard to the desirability of maintaining and enhancing present landscape character in the consideration of development proposals, including offshore developments;
- **Policy B6 Diversification of Dounreay:** where the Council will work closely with the operators and the Local Enterprise Company, as well as the local community, to identify opportunities for diversification in the Dounreay area;
- **Policy BC1: Preservation of Archaeological Sites:** where archaeological sites affected by development proposals should be preserved, or, in exceptional circumstances where preservation is impossible, the sites will be recorded at developers' expense to professional standards. Provision

will be made in Local Plans for the appropriate protection, preservation and enhancement of archaeological sites;

- **Policy BC2: Archaeology, Tourism and Education:** where sympathetically developed and well-managed proposals which increase the tourism potential of archaeological sites or increase public understanding and awareness through research projects will generally be supported; and
- **Policy U1: Electricity Distribution Network:** where the Council welcomes the refurbishment and strengthening of the electricity distribution network. Proposals for new and replacement lines will be assessed for environmental impact, and in sensitive locations by virtue of landscape character, visual intrusiveness or bird movements, the case for undergrounding should be strongly considered.

An assessment of the proposals in the context of relevant Structure Plan policies is provided in Table 2 in Appendix 5-A.

5.4.2 Caithness Local Plan (adopted 12th September 2002)

The Caithness Local Plan is a statutory document prepared by The Highland Council which guides decisions on planning applications in the Caithness Area setting out a hierarchy of primary policies (PP) relating to development.

The majority of the site for the converter station is within an area zoned as PP1. In PP1 zoned areas “the Council will favour development subject to detailed site factors”. The site is within 150m of the A9(T) and this has been taken into account in the assessment. Other relevant policies contained within the local plan are summarised in Table 3 in Appendix 5-A with further detail provided in other chapters of the ES where relevant.

Local Plan policies relevant to the Proposals include:

- **Primary Policy 1 (PP1):** where the Council will favour development subject to detailed site factors;
- **Primary Policy 2 (PP2):** where the Council will favour development, unless this would significantly affect important features;
- **Primary Policy 3 (PP3):** where the Council will presume against development, particularly where there is significant damage to heritage, amenity, or public health; and
- **Primary Policy 4 (PP4):** The Council will not approve development, unless there is a strong and over-riding social, economic, public health or safety reason, or for benefits of primary importance to the environment.

The current Local Plan identifies the two settlements on the A9(T) to the south of the subject site - Inset R28 Mybster (Landward Policy 6l) and Inset R38 Spittal (Landward Policy 7j) - as having some limited scope for housing development under (PP2). To the west of the subject site, the Local Plan sets out a presumption against housing development that would add to these groups although it states that there may be limited opportunities for housing to be added to the identified housing groups in exceptional cases (Landward Policy 12). Therefore, whilst there may be some limited future housing development in the area, there is not significant planned housing expansion. More significant development growth may occur at Halkirk (and at Georgemas Junction) which lie further afield (see Figure 4.2).

5.4.3 Highland-wide Local Development Plan (HwLDP)

The draft HwLDP was reported to Committee on 11th August 2010. The Proposed Plan was published in September 2010, and the public consultation on the Proposed Plan finished on the 3rd December 2010. The next step is for the Proposed Plan to be submitted to the Scottish Government's Directorate for Planning and Environmental Appeals.

The HwLDP will update and replace parts of the Highland Structure Plan as well as parts of existing Local Plans which cover strategic policy issues. It will set out:

- the spatial strategy and vision for the area;
- clear policy guidance for development of all types (including reference to Supplementary Guidance where appropriate); and
- the development principles of key action areas (including the A96 corridor).

Policies in the HwLDP relevant to the Proposals include:

- Policy 29 – Sustainable Design
- Policy 31 – Physical Constraints
- Policy 32 – Developer Contributions
- Policy 37 – Wider Countryside
- Policy 56 – Peat and Soils
- Policy 57 – Travel
- Policy 58 – Natural, Built and Cultural Heritage
- Policy 59 – Protected Species
- Policy 60 – Other Important Species
- Policy 61 – Other Important Habitats
- Policy 62 – Landscape
- Policy 63 – Geodiversity
- Policy 64 – Water Environment
- Policy 65 – Flood Risk
- Policy 68 – Renewable Energy Developments
- Policy 70 – Electricity Transmission Infrastructure
- Policy 73 – Pollution; and
- Policy 78 – Public Access

The HwLDP will update and supersede a number of policies within the current development plan. The above policies identified as relevant to the proposals in the HwLDP are detailed and considered in the Planning Policy Tables, Table 4 in Appendix 5-A.

The Proposed Plan is supportive in principle of the development of renewable energy, including marine and other renewables and acknowledges the need for both onshore and offshore transmission infrastructure. This is apparent from the Vision and Spatial Strategy, the general policies and their supporting text. With regard to Electricity Transmission Infrastructure specifically, Policy 70 states:

"Proposals for electricity transmission infrastructure (including lines, pylons/ poles, transformers, switches and other plant) will be supported if assessed as not having a significantly detrimental impact on the environment. In locations that are

sensitive, mitigation may help to address concerns and should be considered as part of the preparation of proposals. Underground or sub-sea alternatives to over-ground route proposals will generally be supported where they would not have a significantly detrimental impact on the environment. Where new infrastructure provision will result in existing infrastructure becoming redundant, the Council will seek the removal of the redundant infrastructure as a requirement of the development."

A review of all relevant sections of the Highland Wide Local Development Plan is provided in Table 4 in Appendix 5-A.

5.4.4 Highland Renewable Energy Strategy and Planning Guidelines (HRES)

The Highland Council approved HRES on 4th May 2006 as non-statutory supplementary planning guidance to the Structure Plan and Local Plans. The document outlines policy, joint actions and recommendations related to renewable energy developments in Highland. Of particular relevance are:

- **Strategic Topic Z.1: Upgrades to existing grid:** Encourage upgrades to focus on existing grid routes unless significant impact improvements or energy benefits can be seen through change; and
- **Strategic Topic Z.2: Through transmission:** Support through transmission along existing routes.

An appraisal of all the policies relevant to the proposed development are summarised in Appendix 5-A.

At a more general level related specifically to renewable energy, this development will facilitate significant amounts of renewable energy produced in the north of Scotland to be transmitted south and has the potential to replace conventional fossil fuel powered generation. The converter station will provide a capacity of 600MW to allow renewable energy projects to connect to the national grid and to contribute towards government targets.

5.5 Alignment with planning policies and other applications

5.5.1 Policy alignment

The aims of the Structure Plan, Local Plan and their policies have been considered and the project team has sought, as far as possible, to develop the design proposals for the converter station, to comply with them.

The general policies (G1-G8) identified in the Approved Highland Structure Plan 2001 are all guiding principles in the proposed development. Strong emphasis has been placed on preservation of ecological, cultural / historical and amenity values of the proposed development location.

The Local Plan policies as identified in the Caithness Local Plan 2002, relevant to the development, highlight that proposals are in compliance with planning constraints in the specific location.

The additional guidelines to development as outlined in the Highland Wide Local Development Plan, and the Highland Renewable Energy Strategy and Policy Guidelines have all been taken into account.

Table 3 in Appendix 5-A presents the appraisal of the proposals against the Strategic and Local Plan policies. In addition, issues identified during the Pre-Application Consultation process are also considered in greater detail.

5.5.2 Planning Permissions

A review of the Highland Council ePlanning Portal (15/11/10) identified the following planning applications in the area of Spittal.

Table 5.1 Planning applications in the vicinity of the Caithness Converter Station

Ref	Applicant Name	Description	Location	Status
07/00217/S36CA	Spittal Wind Farm Ltd	Erection of 27 wind turbines with a height of 70m to hub and 110m to tip of blade, erection of 3 no turbines with a height of 60m to hub and 100m to tip of blade, installation of associated infrastructure, site tracks, temporary contractors compound and hard standing, erection of 2 no. anemometer masts.	Land to east of Spittal Hill , with adjacent site boundaries at the A9(T) to the east of the converter station	Refused...to go to public inquiry (Committee met on 22/6/2010)
(Reference 07/00227/FULCA)	Spittal Hill Wind Farm Ltd	Renewal of permission for erection of a 60m high anemometer mast	Spittal Hill, boundary 1.3 km to the east of the converter station	Granted (14/1/08)

5.5.3 Summary

As a major industrial project there are a variety of national, regional and local planning focused policies that apply to the proposed works. The requirements of these policies are set out in this chapter and an assessment of the project with these requirements is provided in Appendix 5-A. It is apparent from this assessment that it has been possible to site, design and plan this project in such a way that it is compliant with virtually all of the policy requirements that could apply to it.

In the Caithness Local Plan, Policy PP3 stipulates that the Council will presume against development in this area, particularly where there is significant damage to heritage, amenity, or public health. There is a buffer zone created alongside major roads which is covered by this policy. The proposed access track to the site and some of the proposed tree planting for screening purposes will be located in an area covered by this policy. However, care has been taken to ensure that there will be no damage to heritage, amenity or public health. The Highland Council has also been consulted on the site layout through the formal pre-application consultation process and has not indicated any concerns about the choice of access track and the use of land for screening purposes in this buffer zone.

There are a number of local planning guidelines relevant to the landscape and visual aspects of the proposals are outlined in the Highland Wide Local Development Plan (HwLDP). The site selection, design, and mitigation associated with the development will ensure that significant impacts are kept to a local level. Although the development will have significant impacts at a very local landscape level (such as views from the Achanarras Quarry SSSI), in the wider context, the effect of the development on the landscape would be minor. In addition, visual effects of the development are concentrated at a local level, and will be reduced as mitigation planting develops.

Strategy G6 of the Structure Plan specifies that the Council will seek to conserve and promote all sites and areas of Highland identified as being of a high quality in terms of nature conservation, landscape, archaeological or built environment. In the Highland-wide Local Development Plan, Policy 58 stipulates that developments should not compromise the amenity and heritage resource for features of national importance and that any significant adverse effects must be clearly outweighed by social or economic benefits of national importance.

The St Magnus' church, burial ground and hospital Scheduled Ancient Monument (SAM), is a heritage resource of national importance that is located approximately 450m south of the converter station site, and in full view of the development. The development has been assessed to have a significant impact of the setting of this site (see Section 11.11.1). However, the assessment also concludes that the current setting is not one of the factors that make the site of national importance, since the setting is one of change. Discussions have taken place with Historic Scotland and the principles of mitigation to address impacts on setting have been agreed. Mitigation in the form of landscaping works such as planting small groups of screening trees, using the height of an existing shelterbelt as backdrop and an appropriate paint colour for the station will help soften the impact upon the site, but the residual effect will remain moderate.

In relation to other planning applications in the area, the site that has been selected has limited scope for cumulative effects with other nearby applications and will not have any direct influence upon the suitability of other planned projects. Indirectly this converter station will help to reduce uncertainty over grid connections for some of the renewable generation projects that are being planned. To that extent this project will therefore facilitate such developments.

The converter station development will also lead to related projects within the overall scheme which are a buried set of cables between Spittal and Noss, north of Wick; a landfall at Noss and offshore cables extending to an offshore hub platform in the Moray Firth. These linked developments also have a high level of policy compliance. The approach taken to developing the converter station has in fact helped to ensure such compliance by allowing routes to avoid sensitive areas, minimising the need for new overhead lines etc.

This project will provide new infrastructure for the transmission grid which will help the grid system deliver the capacity applied for by renewable energy power generators in the north of Scotland and Orkney. Consequently the project is strongly aligned with many national and regional policies relating to the reduction of greenhouse gas emissions and the facilitation of renewable energy as part of the solution for this issue.

5.6 References

DECC, 2010. *Digest of United Kingdom energy statistics (DUKES) 2010*. Department of Energy and Climate Change.

The Carbon Trust, 2010. *Conversion Factors - Energy and Carbon conversions (2009 Update)*. The Carbon Trust.

The Scottish Government. 2011. *Renewables Policy* [online] Available at:<http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/17612>; [Accessed January 2011].

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6 Land Use and Utilities

6.1 What is covered in this chapter?

This chapter describes the land uses within the site boundary and surrounding area as well as utilities links that may be impacted by or have an impact on the project, and appraises the effects that could arise from the development. Key issues include:

- Agriculture
- Forestry
- Public spaces
- Residential and commercial properties
- Access
- Electricity
- Water and sewerage
- Communications

Other chapters addressing related topics include:

Chapter 12: Landscape and Visual Impacts: effects on visual amenity
Chapter 13: Traffic and Transport: transport Infrastructure

6.2 Why could the issue be important?

The possible issues associated with existing land uses and near neighbours are major priorities for development projects on managed land and in proximity of residential properties.

6.3 Sources of information

The following sources of information have been used in this assessment:

Discussion and consultation:

- Discussions with SHETL and the project team
- Site visits: March 30-31; July 5-7; August 25-26, 2010
- Consultations undertaken with the statutory agencies and key consultees (see Annex I)

Maps

- Ordnance Survey, 2003. Wick and the Flow Country. *Explorer Maps*, Sheet 450, 1:25,000, Southampton: Ordnance Survey
- Ordnance Survey, 2007. Thurso; John O' Groats. *Explorer Maps* Sheet 451, 1:25,000, Southampton: Ordnance Survey
- Ordnance Survey, 2009. Thurso and Wick, *Landranger Maps*, Sheet 12, 1:50,000. Southampton: Ordnance Survey
- Ordnance Survey, 2009. Northern Scotland, Orkney and Shetland, *Travel Map,* Sheet 1, 1:250,000, Southampton: Ordnance Survey
- Ordnance Survey 1:10,000 GIS data for the project area
- Estate publications (unknown publication date). Caithness and Sutherland, *Official Tourist Map*, 1:185,000. Estate Publications

- Google Earth satellite imagery and Google Street View photo images for the area: http://earth.google.co.uk/
- The Macaulay Institute. Land Capability for Agriculture Maps (Coloured, scale 1:50 000) : Map 12: Thurso and Wick
- URS Geo-environmental survey (URS, 2010)

Utilities

- Mains water pipes data from Scottish Water (June 2010)
- Sewerage systems data from Scottish Water (June 2010)
- Electricity network data from SSE (December 2007)

Property

- Address Point data from Ordnance Survey (April 2008)
- Landowner information from SSE wayleave officers (SSE Wayleave Registry records and meetings with local landowners on the ground).

6.4 Survey and analysis work undertaken

Information about the distribution of land use, property and utilities was largely obtained as digitised information suitable for use with GIS software. Ordnance Survey Address Point data was used as a first source of information about housing; this has then been supplemented by direct observation during site visits. The key task for the assessment team was therefore to verify the accuracy of the digital data that was available.

High resolution aerial photography of the converter station site is available though Google Earth. These images were used as an initial basis for a land use assessment, and these were again backed-up and verified by local observations during site visits.

6.5 Consultation feedback

The following comments were received from consultees regarding land use and utilities. Further details may be found in Annex I: Summary of Consultation Responses.

The Highland Council made the following comments.

- Any Caithness flag boundaries to fields should be reinstated.
- There is a need to manage the conifer plantation to the north of the development to ensure that it offers a back drop to the development for future years.

Discussions with the landowners at Spittal Mains brought out that they were interested in enhancing biodiversity on their land, and open to taking land out of agricultural production.

6.6 Methodology

The approach taken to this assessment was based upon the following sequence of activities:

1. Map established land uses, property, and utilities;
2. Visit the site to verify mapped information and gain a better understanding of current land use activities;
3. Consider the changes, interference and influences that the project activities may create;
4. Assess the significance of these on the basis of methods described in Chapter 2: Approach to Environmental Statement; and
5. Consider interventions that could reduce negative consequences and maximise positive influences in discussion with the project engineering team.

The appraisal of impacts has been undertaken primarily using a qualitative approach based on professional judgement, using the approach described in Section 2.6. The specific criteria used to evaluate the significance of impacts of the proposal on land uses are presented in Table 6.1 to Table 6.3. In Table 6.1 examples of different land use and utility receptors are categorised according to level of sensitivity.

Table 6.1 Categories of sensitivity and examples related to land use and utilities

Sensitivity	Characteristics and examples	
	Land Use	Utilities
High	• Residential property • Land attached to a residential property • Property or land used by the community e.g. schools, community halls, etc. • Land attached to a community property • Core path, long distance path and national cycle route	• Core utility hub
Moderate	• Other footpaths, bridleways, cycleways • Farmland • Land designated for development	• Major utility lines
Low	• Commercial property • Land attached to commercial property • Utilities	• Local community supply lines

The prediction and assessment of impacts on land uses and utilities was undertaken using the classification of magnitude of effect provided in Table 6.2.

Table 6.2 Classification of magnitude of impact

Magnitude of effect	Impact description
High	• Demolition of property • Significant land take from property • Possible barrier to other land users • Change to utilities over wide area
Medium	• Moderate land take from property • Possible obstacle to other land users • Change to utilities over localised area
Low	• Minor land take from property • Possible nuisance to other land users • Change to utilities for some properties
Very low	• Negligible change to any of the above factors

Using these criteria, a series of impacts was predicted for the project, as outlined in Table 6.3 below. Table 6.3 provides a guide to the significance of impact, although it should be noted that professional judgement is used to determine the final significance category. The significance of impact is assessed taking account of agreed mitigation to define residual effects. Impacts rated as moderate or higher are considered significant in this assessment.

Table 6.3 Overall scheme for establishing impact significance

Sensitivity	Magnitude of effect								
	High	Medium	Low	Very Low	None	Very low positive	Low positive	Medium positive	High positive
High	Major	Major	Moderate	Minor	Neutral	Minor	Moderate	Major	Major
Moderate	Major	Moderate	Minor	Minor	Neutral	Minor	Minor	Moderate	Major
Low	Moderate	Moderate	Minor	Negligible	Neutral	Negligible	Minor	Moderate	Moderate
Not sensitive	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral

6.7 Established baseline conditions

6.7.1 Introduction

The proposed development is located in the valley of the Achanarras Burn 3km north of Spittal and 5km south east of Halkirk. The site for the converter station and the working areas associated with it, consist of approximately 30ha, most of which is owned by Spittal Mains Farm. A narrow strip of land north of the access track is also required for screening and access improvements; this 3ha is currently part of the Achalone Farm property (see Figure 4.1).

The A9(T) runs north-south to the east of the site and access into the site for the converter station will be taken from the trunk road using an existing access track located north of the existing shelterbelt (see Figure 1.2). This track will be upgraded (see Section 4.2.8).

Surrounding land uses are mainly agricultural with some plantation woodlands and scattered properties, and villages (see Figure 6.1).

6.7.2 Land use

The planning area is located on agricultural land and contains primarily improved grassland fields. There is also a narrow belt of coniferous trees, a farm track, and further improved grassland fields and marshy grassland north of the access track (see also Section 9.8.2).

Agriculture

The farmland in the planning area, both north and south of the access track, is graded as Class 4 agricultural land, as defined by the Macaulay Institute (Wright *et al.*, 2006)[50]. The improved grassland fields are used primarily for the production of silage and additional livestock grazing. Livestock tend to be housed inside over the winter and turned out in the spring to graze the permanent pasture on the holding. The fields are drained by a series of field drains and ditches (see Section 8.8.4).

There is a Caithness flag fence running along the southeast side of the field in which the converter station platform will be located from the Achanarras Burn up to the farm track and continuing beyond this track up to the A9. Another Caithness flag fence meets this one at the farm track and continues south towards Spittal Mains Farm. There is also a Caithness flag fence located on the north side of the shelterbelt. Other fences around the development area are post and wire. Examples of field boundaries in the planning area are shown in Plate 6.1.

The proposed converter station site lies one field west from the A9(T) and is directly accessed by a hardcore track which runs to Achanarras Farm. The track is currently pot-holed but is serviceable.

Forestry and plantations

A narrow strip of semi-mature conifer trees is located immediately to the north of the converter station platform area and south of the access track. This shelterbelt is some 720m long by 50m wide (approximately 3ha; see Figure 4.1 and Plate 6.2).

The current owners of Spittal Mains Farm are actively engaged in a range of farm diversification initiatives, and a key aspect of this work is the re-establishment of mixed woodland across Spittal Mains and connected farmsteads. The extent of this work to date can be seen in Figure 6.2 along with photographs of the woodland habitats as they currently stand in Plate 6.3.

Public spaces and footpaths

There are no public open space areas within 2km of the converter station. The nearest public spaces or facilities are in Halkirk, some 5km north of the converter station site, and comprise playing fields and a cemetery.

There are no footpaths or core paths[51] running through the converter station site. However, there are three recognised footpaths in the vicinity of the converter station (Figure 6.1). The first links the Achanarras Quarry with the B870 at Ballone

[50] The land is suitable for enterprises based primarily on grassland with short arable breaks (e.g. barley, oats, and forage crops).
[51] Every local authority in Scotland is required under section 17(1) of the Land Reform (Scotland) Act 2003 to draw up a plan for a system of paths (core paths) sufficient for the purposes of giving the public reasonable access throughout their area.

and follows the track which also provides vehicle access to the Achanarras Quarry. There is a car park at the end of the track by the quarry. The second path provides a circular walk to the west of Spittal at Threipland Place. The third footpath follows the access track for the Causeymire wind farm. These three paths are all candidates for the core paths network.

At present informal access to the area is permitted under the Land Reform (Scotland) Act 2003 which establishes rights to be on land or to cross land for recreational, educational and commercial purposes (for *"an activity which the person exercising the right could carry on otherwise than commercially or for profit").* A person has access rights only if they are exercised responsibly.

There is informal recreational use of the tracks through Spittal Mains Farm, including the track north of the shelterbelt that will be used for access to the site, as well as the track to the east of the site that passes through the farm and by the cultural heritage site of St. Magnus church, burial ground and hospital (see Section 11.8.3). Nearby, Spittal Hill has access for walkers and is likely to attract interest as one of the topographical highpoints in Caithness.

Although there are no formal recreational facilities in the vicinity of the site, various facilities are located in the wider area. Potential impacts on these sites are discussed in Section 15.10.

There are six residential properties within one kilometre of the converter station site (see Figure 6.3):

- Achanarras Farm (NGR ND15135511) – approximately 200m southwest of the development site is currently unoccupied and owned by Spittal Mains landowner
- Achalone Farm (NGR ND15465621) – approximately 260m northeast of the site; owner of the 3ha north of the access track
- Bungalow, Achalone (NGR ND15675619) – approximately 370m northeast of the site
- Achalone Cottage (NGR ND15525656) – approximately 650m northeast of the site
- Mossgiel, Achalone (NGR ND15565643) – approximately 520m northeast of the site
- two dwellings at Spittal Mains Farm (NGR ND16105464) – approximately 780m and 900m south of the development. The farthest away of these two dwellings is currently unoccupied.

The nearest residential areas are the settlement of Spittal, a rural settlement with 15-20 loosely grouped residential properties approximately three kilometres to the south of the site, and the town of Halkirk, with a population of approximately 1,000, seven kilometres north / northwest of the site.

The nearest non-residential properties include:

- Caithness Stone Industries – 1.2km south-southeast of the site
- Spittal Quarry – 2km south-southeast of the site

Halkirk Primary School is the closest school, approximately 4.5km northwest of the site, while the closest hospital is in Thurso (Dunbar Hospital), 12km north-northwest of the site. There is a doctor's surgery in Halkirk, 4.5km away.

6.7.3 Utilities

The distribution of utility infrastructure around the proposed converter station site is shown in Figure 6.4.

Existing electricity distribution system

In Caithness there are both transmission and distribution level electrical systems (See Figure 6.5).

The transmission system runs from Dounreay southwest through a 275kV single circuit, which is currently being upgraded to double circuit on existing towers, and southeast, via Thurso and Mybster, though a double 132kV circuit. These 132kV circuits run next to the proposed converter station site at Spittal Mains Farm. The circuits are suspended from lattice steel towers of a height of approximately 26m with approximately 250m between towers. It is planned that this line will be upgraded to 275kV and linked to the converter station in the future (see Section 1.2).

Distribution lines operating at 11kV and 33kV supply the local area. These circuits are supported on single and double wood poles. An 11kV line runs down the southern side of the proposed site and will be used to provide an electricity supply to the proposed site without the need for additional overhead infrastructure. A section of the 11kV line running through site will be undergrounded along the southern edge of the development area between the Achanarras Burn and the existing farm track.

The nearest electrical substations are south of Halkirk and at Mybster.

Water and sewage services

In the vicinity of the proposed converter station a water main runs along the western side of the A9(T) road from Achalone to Spittal. There is a spur off this main which runs to Achanarras Farm along the southern side of the site, very closely aligned with the 11kV electrical supply.

There are no private water supplies in the footprint of the converter station. The closest one is a Type B (domestic) supply located at Lower Toftingall, 2.3km to the southeast of the site boundary in a separate drainage catchment (see Section 8.8.3).

There are no main sewage pipes in the area; rather the properties in close proximity to the proposed converter station are served by septic tanks for sewage disposal.

There are no gas mains in the area.

Telecommunications

The nearest telecommunications cables run along the verge of the A9(T) and along the southern verge of the access track.

6.8 Range of possible impacts

Table 6.4 presents an overview of the potential impacts associated with land use and utilities and the findings of the pre-mitigation assessment for these issues using the methodology described in Section 6.6.

The agricultural land in question, including the adjacent shelterbelt, is considered to be of moderate sensitivity as farmland. However, the activities occurring on the land that are important to the livelihood of the residents, such as agricultural activities and access to properties, are highly sensitive.

The utilities that will be affected are primarily local community supply lines or individual household supplies and are of low sensitivity. However, the development as a core utility hub is of high sensitivity.

Table 6.4 Catalogue of possible impacts on land use and utilities

Issue	Sensitivity	Magnitude of effect	Pre-mitigation significance
Permanent			
Permanent change in land use of 17ha of Class 4 agricultural land	Moderate	Medium	Moderate
Felling of fewer than ten trees in a shelterbelt plantation for access track construction	Moderate	Very low	Minor
Planting screening trees on 10ha of non-prime agricultural land	Moderate	Low	Minor
Introduction of core electric utility infrastructure	High	High	Major Positive
Change to local electricity and water supplies	Low	Low	Minor
Construction			
Temporary change in land use of approximately 1ha of agricultural land for working areas	Moderate	Low	Minor
Interruption or disturbance to existing land uses and agricultural activities by ongoing construction activities	High	Medium	Moderate
Interruption of access to properties	High	Medium	Moderate
Conflicts between construction activities and users of the existing site including informal recreation	Low	Very Low	Negligible
Interruptions to services through interference with utilities (realignment of supply; additional loading)	Low	Low	Minor
Operation and maintenance			
Managing existing 3ha shelterbelt and new 3ha shelterbelt for visual screening	Moderate	None	Neutral

The threshold for consideration as a significant impact has been set at moderately negative or moderately positive (see Section 2.5).

6.9 Mitigation

Table 6.5 provides a catalogue of all of the measures that will be implemented to avoid, reduce and manage unwanted impacts and to capture and increase potential benefits of the project on land use or utilities.

Table 6.5 Catalogue of committed intervention measures related to land use and utilities

Ref	Title	Description
L1	Land take	The land take for the proposals will be kept to the minimum necessary for safe construction of the works.
L2	Farming activities	Close liaison with affected landowners will be maintained by SHETL and the contractor during planning, and construction phases to ensure that they are fully aware of proposals and the sequence of construction activities and how these could interact with planned farm and other activities (see also GEN12).
L3	Boundaries	Boundary features that have to be removed to allow construction, including Caithness stone fences, will be reinstated with appropriate materials at the end of construction.
L4	Land re-instatement	Agricultural land will be re-instated to a condition as near as is reasonably practicable to that before the commencement of the works unless used for other purposes.
L5	Land re-instatement	All soils disturbed by the works will be handled, stored and re–spread following best practice[52] to minimise adverse effects upon soil quality (see GEO6 for details).
L6	Farming activities	Water supplies for livestock will be protected at all times and alternative supplies will be provided where access could be compromised by any works.
L7	Farming activities	Effective stock fencing will be maintained throughout the project.
L8	Disease control	All reasonable precautions will be taken during construction to avoid as far as is possible, the spreading of soil borne pests and diseases, and animal and crop diseases. Precautions as recommended by the Scotland's Environment and Rural Services[53] will be observed.
L9	Liaison with local residents	Local residents and businesses in proximity to the works will be informed about ongoing plans for the works and the construction timetable, in particular periods where there could be delays on local roads.
L10	Access	Access to all properties and businesses will be safeguarded during construction, and access for land owners and managers to agricultural land will be maintained.
L11	Public health and safety	Health and Safety signage will be installed around the site perimeter fence during construction and statutory signage will be displayed during operation.
L12	Public health and safety	The approach to planning access and construction works will take account of necessary public health and safety requirements including the potential use of nearby land for informal recreation and how such interests can be protected and maintained.
L13	Land re-instatement	The farm track from Spittal Mains Farm to the shelterbelt will be re-instated to a condition at least equivalent to that before the commencement of any works.
L14	Farming activities	Planting of new plants / trees will take place at a time which takes account of the needs of the farm, the progress of the works and the suitability of the time for establishing new planting.

[52] For example see Ministry of Agriculture, Fisheries and Food, Good Practice Guide for Handling Soils http://webarchive.nationalarchives.gov.uk/20090306103114/http://www.defra.gov.uk/farm/environment/land-use/soilguid/index.htm and BS3882
[53] Available: http://www.sears.scotland.gov.uk/

Ref	Title	Description
L15	Tree felling	All tree felling within the existing shelterbelt will be planned to reduce the risk of wind throw. Felling works will be supervised by a qualified forester.
L16	Utilities	All utilities that could potentially be affected by construction will be protected to ensure that the supplies of water, electricity, telephone etc to properties will be maintained. In the event of any planned interruptions to utility supplies any affected parties will be notified in advance.

A full list of all intervention measures planned for this project, including all of those listed above, and the parties responsible for their implementation is compiled in Annex II.

6.10 Assessment of residual effects

The residual effects on land uses and utilities are discussed below and summarised in Table 6.6.

Permanent

6.10.1 Permanent loss of agricultural land

The planning area for the converter station consists of approximately 30ha of non-prime agricultural land (including a shelterbelt). The land take for the development will be kept to the minimum necessary for safe construction and will total 20ha. The land take will include the area for the platform (6.5ha), the associated landscaping, including the batter slopes and pond (7ha), the existing shelterbelt (3ha), and the land for the new shelterbelt planting (3ha). This equates to two percent of the land holdings for Spittal Mains Farm and 5 percent of the land holding for Achalone Farm.

The current farming strategy which is being implemented by the landowners at Spittal Mains Farm is strongly influenced by the desire to encourage biodiversity, and the proposed change in land use will not disrupt the farm management strategy being followed.

This residual effect of change in land use is considered **minor adverse** because the land take is small in the context of the landholdings, and the land is not prime agricultural land. On Achalone Farm, the land take is limited to a narrow strip at the edge of the property. On Spittal Mains farm, the development will be a diversification of the use of land by the farmer, in line with the current landowner's land use strategy.

6.10.2 Tree felling

A few trees will be felled to allow widening of the access track (see Section 4.2.8). Felling will be undertaken with advice from a competent forester to reduce the risk of windthrow. This will be a **minor adverse** effect at most to land use as fewer than 10 trees are expected to be felled and the integrity of the shelterbelt will be maintained.

6.10.3 New planting

There are some additional changes to land use that will arise from the planting of new stands of trees for site screening purposes (see Section 4.2.11). In addition to the tree planting around the converter station platform in the development area, a 3ha strip of agricultural land north of the existing shelterbelt and access track will be planted as an additional shelterbelt. A hedge with occasional trees will be planted alongside approximately 780m of the A9(T) (see Figure 4.1 and Section 10.10.3).

This planting out with the development area will change the primary focus of the land from agricultural grazing use, to a focus on providing trees for screening. Although the new planting could create some inconvenience to existing farming activities, particularly if fields are cultivated, it is expected that this will be a **minor adverse** effect as very little land will be involved.

See Section 9.11.2 for an assessment of the impacts and benefits of tree planting on ecology. Sections 10.11 and 10.12 consider the landscape and visual impacts of this new planting.

6.10.4 Introduction of core electric utility infrastructure

The most significant change in utility infrastructure associated with this project arises from the additional electricity export potential that the converter station provides. The physical performance of the new facilities is such that around 600MW of new generation capacity could be added due to this system.

This additional capacity will provide a possible export route to market for the initial phases of renewable energy projects currently proposed in the area. This is expected to provide a **major positive** benefit.

Construction

6.10.5 Temporary change in land use for working areas

There will be a temporary change of land use over approximately 1ha for the temporary works compound. Following construction, the 13.6ha development area and new shelter belt planting will be fenced and the temporary construction compound will be re-instated to a condition as near as is reasonably practicable to that before the commencement of the works. As this impact will be temporary and impacts a very small area, this is expected to a **minor adverse** effect.

6.10.6 Interruption or disturbance to existing land uses and agricultural activities by construction activities

Temporary disruption to existing land uses will occur during construction. Some existing fences, including Caithness flag fences, will have to be removed to allow construction and landscaping works. Livestock that normally graze the site will have to be moved to other fields for safety reasons until fences are reinstated. Field drainage systems may be disrupted during establishment of new site drainage systems.

These impacts will be reduced through close liaison with the local farmer, protecting water supplies, and reinstating any fences that are removed to provide a secure field boundary. Any Caithness flag fences that are removed will be reinstated with appropriate materials. Precautions relating to the exclusion of stock will be combined with due care and attention by construction staff to prevent the straying of livestock. Any existing field drainage systems affected by construction will be re-instated and any damage will be immediately repaired.

Construction works may have the potential to introduce or spread soil borne pests and diseases that could affect the productivity of nearby stock and farmland. All reasonable precautions will be taken during construction to avoid as far as is possible, the spreading of soil borne pests and diseases, and animal and crop diseases.

Due to the temporary nature of the construction activities, combined with the aforementioned mitigation measures, any interruptions to existing land uses are expected to have only **minor adverse** effects.

6.10.7 Interruption of access to properties

A farm access track leading to Achanarras Farm runs through the proposed development area. This track and the farm that it serves are owned by the Spittal Mains landowner as for the converter station site. This track will be used as the route for access to the converter station site.

Access on this track for the landowner and other users will be maintained during construction through the measures described above. Through implementing these mitigation measures, access to Achanarras Farm and to farming activities is expected to only be occasionally temporarily delayed, and the adverse effect on access reduced to **minor**.

6.10.8 Conflicts between construction activities and users of the existing site including footpaths and the road network

Beyond farming activities, use of the site is limited to informal recreation. Access for informal recreation could be temporarily disrupted during construction, but will be maintained. Access to the majority of the area will be restored when construction is completed, so the impact will be temporary. As this access is used only informally and alternative access can be used, the adverse effects of construction are expected to be **negligible** to **minor**.

Impacts on the A9(T) adjacent to the site are discussed in Chapter 12: Traffic and Transport.

6.10.9 Interruptions to services through interference with utilities

The utilities that pass through and close to the proposed site are a 132kV transmission line, an 11kV distribution line, a water main, and a telecoms cable. The water main and distribution line and telecoms cable service local properties only. The water main will need to be rerouted around the outside of the site. A section of the 11kV line will be undergrounded along the southern boundary of the development area (see Section 6.7.3).

These utilities will also be routed to the site for use during construction and operation of the converter station, resulting in additional loading. The highest additional loading to the supply will be during construction when workers are on site. However, the number of workers is not expected to result in loading that cannot be handled by the existing supply.

In the future, the 132kV line will be upgraded and connected to the converter station site (see Section 1.2). This will be the subject of a separate consents process.

A new telecoms connection will need to be installed and used for site connection into the operating phase of the site. Dependant on the available data transfer speeds and bandwidth available, this may be provided from the public telecom network or via SHETL’s private network.

As these works will only impact a few properties, the impact is expected to be minor. However, to ensure that any impacts are minimised, all utilities that could potentially be affected by construction will be protected to ensure that the supplies of water, electricity, and telephone to properties are maintained. If any short interruptions were required to join in new connections to the site, the affected parties will be notified in advance. Adverse effects due to connections and additional loading on utilities are therefore expected to be **negligible** following mitigation.

6.10.10 Operation and maintenance

Once operational, it is unlikely that there will be frequent activity on site apart from routine or unforeseen maintenance activities. There will be no staff permanently employed on site.

The existing and new shelterbelts will be maintained and managed to provide screening for the converter station (see Section 10.10.3). This is considered to have **minor positive** benefits to the land use of the shelterbelts.

The development is not expected to have any significant effects on existing land uses once operational.

6.10.11 Decommissioning

The site is planned as long-term transmission infrastructure and the equipment will be replaced as it approaches the end of its economic operational life. In the event that the site is decommissioned, the planned shut down procedures will essentially be a reverse of the construction process. It is envisaged that the site will be cleared to ground level and that any profiling infill will be distributed around the site, before a topsoil layer is put on top. Upon restoration of the site it is envisaged that all buildings and electrical equipment will be removed and the site will return to an improved grassland state. The potential impacts on land use will be similar to those during construction, and providing all activities were carefully planned and controlled, effects will be temporary and not significant.

Table 6.6 Catalogue of residual effects on land use and utilities

Issue	Residual significance
Permanent	
Total land take of 17ha and permanent change in land use of 14ha of Class 4 agricultural land	Minor
Felling of fewer than ten trees in a shelterbelt plantation for access track construction	Minor
Planting screening trees on 10ha of non-prime agricultural land	Minor
Introduction of core electric utility infrastructure	Major positive
Change to local electricity and water supplies	Minor
Construction	
Temporary change in land use of approximately 1ha of agricultural land for working areas	Minor
Interruption or disturbance to existing land uses and agricultural activities by ongoing construction activities	Minor
Interruption of access to properties	Minor

Issue	Residual significance
Conflicts between construction activities and users of the existing site including informal recreation	Minor
Interruptions to services through interference with utilities (realignment of supply; additional loading)	Negligible
Operation and maintenance	
Managing existing 3ha shelterbelt and new 3ha shelterbelt for visual screening	Minor positive

6.11 Potential for cumulative effects

The upgrading of transmission grid infrastructure will facilitate the ongoing development of renewables in Caithness, Sutherland and nearby Orkney. There will however still be some residual consequences upon land use resulting from this new wave of renewable energy development.

6.12 Summary of key findings

This assessment has considered the potential impacts of the project on land use and utilities, including permanent impacts of the development as well as impacts arising during construction.

The approach to the assessment included mapping established land uses, properties and utilities, considering the changes the development will have on these, and assessing the significance of these changes based on sensitivities and magnitude of effect defined for this project.

The following conclusions have been drawn:

- No significant adverse effects are expected on land uses or utilities as a result of this project.
- The development will require land take of some 20ha of agricultural land, including a 3ha coniferous tree belt, which will be maintained for screening purposes.
- The development will result in a permanent land use change of approximately 17ha from agricultural grazing land to land used for infrastructure to facilitate transmission of renewable energy and for visual screening of this infrastructure; this will be a **minor adverse** effect.
- No residential properties will be directly affected by construction and no properties will require to be demolished.
- The proposals will result in a temporary change in land use of 1ha during construction for a works compound including parking and buildings for construction workers. This land will be restored and returned to grazing in the future.
- The existing and new shelterbelts will be maintained and managed to provide screening, and additional tree planting will take place on the site.
- Residents and local businesses will be informed of the sequence of construction activities and the contractor will be required to keep disruption to a minimum.
- Access will be maintained for all properties and for the farm during construction and operation of the converter station.
- Impacts due to rerouting the water main and distribution line service are not expected to be significant following mitigation to ensure that supplies to all properties are maintained.

- The converter station is expected to provide a **major positive** benefit to electrical utility infrastructure.

6.13 References

Scottish Environment and Rural Services (SEARS), 2010. SEARS. Accessed Sept 2010 available at: http://www.sears.scotland.gov.uk/

Wright, I. A., Birnie, R. V., Malcolm, A., Towers, W., and McKeen, M., 2006. *The Potential Use of the Land Capability for Agriculture Classification for Determining Support to Disadvantaged Areas of Scotland.* Aberdeen: Macaulay Institute.

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7 Geology and Soils

7.1 What is covered in this chapter?

This section covers the potential effects of the proposal on geological resources and soils. It also includes discussion of contaminated land.

Related issues including hydrogeology are covered in Chapter 8: Hydrology, Drainage & Water Quality.

7.2 Why could the issue be important?

Geology and soils are important aspects of the physical environment in their own right. The rocks in an area help to form the overall shape of the land, its stability over time, as well as its suitability for development. Rocks can have value in terms of their mineral content, structural value or scientific interest.

Soils have a profound effect upon the behaviour of water on the site as well as on the plants that grow there. The type of soils can affect the land use made of an area particularly with regards to farming and forestry. Certain soil types and structure can be prone to issues such as waterlogging, slipping, etc.

The keys interests at the converter station site with respect to geology and soils relate to:

- the underlying geology and nature of soils at the proposed site location;
- the amounts of material that will need to be moved to create the site;
- the presence of any geological sensitivities on the site such as faults, fossil beds etc.;
- ensuring that nearby geological Sites of Special Scientific Interest (SSSIs)[54] are not affected by development; and
- the presence of any sensitive soils on site such as soils on steep slopes, waterlogged soils etc.

7.3 Sources of information

The following sources of information have been used for this assessment:

Maps

- British Geological Survey (BGS),1978a. Thurso, Scotland. Geological survey, Sheet 116 (W), 1:50,000, British Geological Survey
- The Macaulay Institute, 1982. Soil survey of Scotland map. Sheet 3 Northern Scotland, 1:250,000, Aberdeen, The Macaulay Institute
- Ordnance Survey, 2003. Wick and the Flow Country, Explorer Maps Sheet 450, 1:25,000, Southampton: Ordnance Survey
- Ordnance Survey, 2007. Thurso; John O' Groats, Explorer Maps Sheet 451, 1:25,000, Southampton: Ordnance Survey

[54] Sites of Special Scientific Interest (SSSIs) are sites designated for their natural heritage and/or geological interests and together form a network of the best examples of species, habitats and rock and landform features throughout Scotland.

Websites

- BGS, 2010. Hazards Theme Map, [online] Available at: http://www.bgs.ac.uk/GeoIndex/hazards.htm [Accessed Sept 2010]
- The Coal Authority, 2010. Gazetteer for Scotland, [online] Available at: http://www.coal.gov.uk/services/propertysearch/gazetteer/scotlandgazetteer/scotlandgazetteer.cfm [Accessed Sept 2010]
- Hall, A, 2006. Caithness Landscapes [online] updated 20th November 2010. Available at: http://www.landforms.eu/caithness/ [Accessed Dec 2010]
- Joint Nature Conservation Committee (JNCC) undated. [online] Available at: http://www.jncc.gov.uk/ [Accessed Sept 2010]
- UK Onshore Geophysical Library, 2010. [online] Available at: http://www.ukogl.org.uk/ [Accessed Sept 2010]

Geological conservation

- Scottish Natural Heritage (SNH), 2010. SNH Information Services, SiteLink, Designated site database of qualifying interests and conservation objectives, Available at: http://www.snh.org.uk/snhi/ [Accessed September 2010]
- Scottish Natural Heritage (SNH), 2010. SNH Information Services, Natural Spaces, Digital site boundary data, Available at: http://www.snh.org.uk/snhi/ [Accessed September 2010]

Personal communications

- Geological experts:
  - Adrian Hall, glacial and quaternary geology
  - Jack Saxon
- The Highland Council TEC Services 28.09.2010 – location of contaminated land in the project area

- Engineering drawings based on recent topographic survey with close spaced contouring provided by SHETL

- Feedback from consultation (see Section 7.5)

- Fieldwork and site visits (28 July, 26 August and 16 September, 2010)

7.4 Survey and analysis work undertaken

The sequence of investigation involved:

- desk studies making scale maps of geological trends laterally and in cross-sections;
- seismic interpretation from “quick look” web based resources for the study area (details above);
- skilled eye evaluation of geological landscape features; and
- analysis of engineering drawings for civil works.

A geo-environmental assessment of the site was conducted by URS (see URS, 2010).

Site test pits were dug at selected locations for geotechnical reasons. At the time of writing the complete report on the data was not available but information from a summary report as well as the geo-environmental assessment of the site is incorporated in this document.

Engineering drawings for civil works provided by SHETL were analysed. These drawings are based on recent topographic survey with closely spaced contouring show clearly the topographical features of interest.

7.5 Consultation feedback

Consultation responses relevant to geology and soils at the proposed converter station site focused concerns with respect to peat lands and borrow pits. As a result of site selection, the proposed site does not affect any peat, and borrow pits are not a part of the application. Other relevant comments received with respect to geology and soils included the following.

- SNH noted that although the proposal is located within 2.5km of three Sites of Special Scientific Interest (SSSIs) designated for their geological interest, the interests of these sites will not be affected by the proposal.
- A member of the public inquired at the public meeting about the reuse of flagstones from excavation.

See Annex I for a complete list of consultation responses for this project.

7.6 Guidance and regulations

A summary of various planning and policy requirements and guidance related to geology and soils and their relevance to the project are described in Chapter 5: Planning Policy and Guidance.

7.7 Methodology

The approach taken to examine the geology and soils of the converter station site was to use established knowledge about the area backed up by any specific data that was available and further supported by direct field observations.

The approach taken to assess the impacts followed the general methodology outlined in Chapter 2: Approach to the Environmental Statement. The definitions shown in Table 7.1 below were used to define the sensitivity of geological and soils receptors. Table 7.2 defines the magnitude of effect and Table 7.3 shows the overall approach for establishing impact significance considering sensitivity and magnitude of effect.

Table 7.1 Classifications of sensitivity with examples related to geology and soils

Sensitivity	Geology	Soils	Contaminated Land
High	• Geological site of national or regional conservation importance (e.g. SSSIs, GCRs, RIGs) • Former mineral extraction sites	• Area of deep peat (greater than 0.5m) and low peat stability • Steep and unstable sloping ground • Prime agricultural ground	Highly contaminated sites

Sensitivity	Geology	Soils	Contaminated Land
Moderate	• Bedrock outcrops • Non-designated site with geological or mineral resource of national or regional importance	• Shallow peat and other loosely consolidated deposits • Thin upland soils • Lesser sloping ground • Soils capable to supporting arable agriculture	Contaminated sites with shallow contamination
Low	• Other geology	• Soils capable of supporting grazing pasture • Deeper lowland soils • Level and well consolidated ground	Sites where contamination is low or is located deep underground.

Table 7.2 Definitions of magnitude of effect for geology and soils

Magnitude of effect	Criteria
High	• Complete loss or change of the baseline environment, such that its quantity, quality or characteristics will be irrevocably changed. • Removal of or restriction of access to important geological / mineral resource (e.g. fossils)
Medium	• Loss or change to key features of the baseline environment leading to partial change of quality, quantity or characteristics.
Low	• A small degree of change to the baseline environment as a result of the proposed development which is noticeable, but overall quantity, quality and characteristics are similar to those prior to the developments.
Very low	• A very slight change to the baseline environment that is barely discernible.

Table 7.3 Overall scheme for establishing impact significance

Sensitivity of receptor	Magnitude of effect								
	High	Medium	Low	Very Low	None	Very low	Low	Medium	High
High	Major	Major	Moderate	Minor	Neutral	Minor	Moderate	Major	Major
Moderate	Major	Moderate	Minor	Minor	Neutral	Minor	Minor	Moderate	Major
Low	Moderate	Minor	Minor	Negligible	Neutral	Negligible	Minor	Minor	Moderate
None	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral

7.8 Established baseline conditions

7.8.1 Topography

The site is located at a transition between a wide river flood plain associated with the River Thurso at an elevation up to 60m AOD and a higher plateau at approximately 100 - 150m AOD that forms the Causeymire peatlands. This transition is represented by a series of low hills and ridges through which a number of streams flow down glacial valleys. The proposed converter station site is in one of these valleys. The general topography of the area is shown on Figure 7.1.

The site slopes down towards the west and northwest from a maximum height of approximately 100m AOD in the east, and southeast of the site to a minimum height of approximately 75m AOD in the northwest of the site (URS, 2010). Gradients of the existing ground to the north and south of the proposed platform are typically 1:25 with steeper areas towards the west and east. Across the proposed excavation area for the development platform the ground slopes downwards from 91.0m AOD in the southeast to 77.5m AOD in the northwest, with the proposed platform level at 83.2m AOD (see Appendix 8-A).

The site is bounded east and west by two small hills. Spittal Hill rises to 176m AOD to the east and Achanarras Hill rise to 120m AOD to the west. The average slopes from the site up these hills are generally 1:16 on Spittal Hill, and 1:30 on Achanarras Hill (see Figure 7.2).

The smaller scale landforms on and around the site are not particularly remarkable. Relict streambeds are still visible across fields as are old stone quarrying sites (Aquatera, 2010).

7.8.2 Geology

Rock types

The geology of Caithness consists principally of sedimentary rocks of the Caithness flagstone group. The converter station site is located on the geological formation of the Latheron subgroup which is found immediately above the Achanarras limestone. This is illustrated in Figure 7.3a.

The solid strata underlying the site are recorded to comprise rocks of the Caithness flagstone group of the middle old red sandstone. The Achanarras limestone is recorded to outcrop approximately 280m west of the site. The strata beneath the site are recorded to range from horizontal to inclinations of eight degrees towards the north and three degrees towards the east (URS, 2010). Table 7.4 details the rocks found in the vicinity of the converter station.

The thickness of the superficial deposits is not indicated on the geological maps. However, numerous measurements of rock strata inclination and a number of historical quarries are recorded both on site and within its immediate surroundings. This indicates that the superficial cover overlying bedrock is likely to be relatively thin.

Table 7.4 Description of rocks found in the vicinity of the converter station (BGS, 1978a)

Sedimentary Rock Type	Flagstone Group	Geological Character	Visual Character
Latheron subgroup (also known as Spittal beds)	Upper Caithness	Also know as the Spittal Beds, their cycles are characterised by thick sequences of both dolomitic laminite and thinly bedded carbonate-rich siltstone.	Weathered rock is characterised by greenish-grey, light grey and occasionally reddish brown colouring
Achanarras limestone	Separating the upper and lower Caithness flagstone groups	The most distinctive lithological and faunal marker horizon 3.3m of carbonate laminite at its base	Thicker than any other cycle amongst the Caithness flags. The strata overlying the Achanarras horizon are characterised by the presence of the thick beds of pale grey non-laminated mudstone and siltstone.
Lybster subgroup (also known as Wick beds)	Lower Caithness	Tends to have an overall drab to dark grey colour and contains relatively thin sandstone members	Grey or dark grey weathered rock

The Latheron subgroup / Spittal beds have been extensively quarried for flagstone around Spittal (ND 170 540), Banniskirk (ND 168 568) and Achscrabster (ND 090 633) (BGS, 1978a). The Achanarras limestone layer including the layer of 3.3m of carbonate laminite[55] at the base has been used for roofing slate due to the fact that it is finely laminated and likely to split along planes of weakness into thin sheets (BGS, 1978a).

It is not expected that the Lybster subgroup / Wick beds will be disturbed by the works due to their depth. It is estimated that the Achanarras fish bed passes approximately 10m below the converter station site, with the Lybster subgroup beneath as shown in Figure 7.3b.

The flagstones of this group consisted of thick sequences of dolomitic laminite[56] and thinly bedded carbonate-rich siltstones[57] which have been extensively quarried around Spittal for flagstones. The flagstones in the area of the converter site dip gently at between three degrees and four degrees downwards to the northeast (BGS, 1978a).

Minerals and mining

An abandoned mine shaft is recorded some 500m southwest of the development area. The BGS hold a mine plan associated with the abandoned shaft and a review of this plan revealed the shaft is associated with Achanarras Lead Mine. The mine plan (dated April 1929) records that the underground workings extend between 14m and 20m below ground level. At their closest recorded point the underground workings are located 315m south of the site. The locations of the quarries historically recorded on site and the extent of the underground lead mine are shown in Figure 7.4.

[55] A rock composed principally of carbonates composed of millimeter- or finer-scale
[56] A magnesia-rich sedimentary rock resembling limestone composed of millimeter- or finer-scale
[57] Fine-grained rock of consolidated silt

A search of the Coal Authority Gazetteer was undertaken and revealed that a coal mining search is not required for the Spittal area (URS, 2010).

Seismicity and earthquakes

Due to its central position on the tectonic plate, the UK is region of minimal tectonic activity. Therefore it is noted that tectonic activity is minimal in the area of the development. The closest tectonic activity would originate from the Great Glen Fault which travels through Scotland from the northeast to southwest; where offshore it passes the coast of Wick. Earthquake hazards are of low frequency and of low severity (BGS, 2010).

7.8.3 Designated sites

Caithness is renowned for its fish fossil beds and there are other fossilised remains in particular rock strata within the sedimentary sequence. Figure 7.3b shows a cross-section of the strata with the depth of the fossil beds. Where these are known to outcrop at the surface, or in quarries that have reached these layers, geological conservation designations are often applied (Crampton and Carruthers, 1914). There are three SSSIs that have been notified due to their geological / physiographical features of special interest located within a 2km radius of the converter station, as described in Table 7.5 and shown in Figure 7.5.

The Achanarras Quarry approximately 0.5km west of the site, is world-famous for the exceptionally well-preserved fossil fish that are found there (Saxon, 1991). There are 15 different species discovered there and this is possibly the most diverse and the best-preserved fauna of this age from anywhere in the world (Caithness Community, 2008).

Table 7.5 Location of SSSIs relative to the converter station site

Site	Description	Area	Proximity to site
Achanarras Quarry (SSSI)	Disused quarry with fish fossils	42ha	0.5km
Banniskirk Quarry (SSSI)	Active quarry with fish fossils	4ha	1.6km
Spittal Quarry (SSSI)	Active quarry with fish fossils	14ha	1.2km

The converter station site is out with any of these designated sites.

7.8.4 Soils

Soil types in the vicinity of the proposed converter station are shown in Figure 7.6. In general, the superficial drift deposits over the converter station site consist of variable thicknesses of agricultural soil (± 30cm), boulder clay[58] (30cm – 2m), alluvial mud[59] (1m), and periglacial[60] fractured bedrock (± 30cm).

The land on the converter station site is graded as Class 4 agricultural land, which is primarily suitable for grassland with short arable breaks (see Section 6.7.2).

The existing soil maps and preliminary skilled eye assessment has indicated that peat deposits are not present at the site.

[58] Boulder clay, in geology, is a deposit of clay, often full of boulders, which is formed in and beneath glaciers and ice-sheets wherever they are found.
[59] Alluvial mud is mud deposited by flowing water.
[60] Periglacial is an adjective originally referring to places in the edges of glacial areas but has later on been widely used in geomorphology to describe any place where geomorphic processes related to freezing of water occur.

Ditches and burns in this area mostly cut down through the soil profile to flow on top of bedrock therefore giving some estimate of general soil thicknesses in various areas. At the point of writing this report final data from trial pits dug over the area were not available so detailed analysis could not be made of the soil cover. Nevertheless enough information is available to make some general comments.

To the east of the site climbing up Spittal Hill where the A9(T) road cuts through the topography, bedrock is very close to the surface with little or no boulder clay apparent and only a relatively thin agricultural soil cover. The soil profile thickens, in general, going down the hill towards the west reaching about 75cm in the ditch flowing south – north at the top of the converter site field. Since the Achanarras Burn flows in a channel 1.5m – 2m deep in soil and flowing on top of bedrock it is thought that soil depths over the converter site will be between 0.75m and 2m thick.

At the lower, western, end of the site analysis of the landforms show the position of the ancestral Achanarras burn floodplain. A 0.75m thick profile represented in the east and west drainage ditch shows the soil to consist of – from top to bottom – agricultural soils, floodplain alluvial mud, reddish brown boulder clay and fractured periglacial layer on top of flagstone bedrock.

Infiltration of precipitation over the area occurs rapidly in the soil layers but it does appear that this water does not get dispelled deeper in the soil. In many locations water can be found in shallow pools on the surface after prolonged rainfall. Also the presence of water-loving plants such as rushes indicate that despite extensive field draining the effective water table over much of the area is not very far below surface. Wet layers in depressions were probably related to plough podsols[61] of compacted clay keeping precipitation near to the surface where most rain would follow gravity by surface flow.

Test pits in the site investigation showed flowing groundwater in the periglacial fractured rock layer at the base of the pits. Thus the major groundwater flow used the porosity[62] of the periglacial layer as the main aquifer[63]. It has been suggested that the boulder clay could be porous, where sandy, recharging the deeper aquifer.

Waterlogging has only been apparent in parts where wetter conditions prevail. However, slumping and mud slides are not likely as the soil is shallow and considered stable.

The converter station site itself will have an excavation area of around 6.5 hectares, with works taking place over a further 7ha, including areas of landscaping. The total affected area for soils is therefore approximately 13.5ha. A strip (750mm) of soil and subsoil will be removed, generating just under 50,000m^3 of material. This does not take account of the topsoil below the landscape areas, which will be stripped and replaced on top.

[61] In soil science, podzols (also known as podsols or spodosols) are the typical soils of coniferous, or boreal forests.
[62] Porosity is the ability to absorb fluids.
[63] An aquifer is an underground storage of water which could be porous stone, earth or gravel.

Once the strip of soil has been removed, the site will be excavated for the platform. The platform cut and fill[64] using mainly rock won from the site will be approximately 92,000 m^3. It is not anticipated that any bulk filling materials will need to be imported; any excess on the site will be incorporated into the site landscaping.

Approximately 4100m^3 of 75mm gravel is likely to be imported for the final finish over the open platform areas.

7.8.5 Contaminated land

There are no known contaminated soils in the area. Potential sources of contamination could include backfilled quarries; animal carcasses and chemicals used for agricultural purposes. A land cover search noted that the converter station site was previously occupied by three small quarries between 1872 and 1971 (see Figure 7.4). During the site walkover it was noted that backfilling was very localised and that the quarry depressions were still identifiable with bedrock and spoil visible; however, the nature of the backfill is unknown (URS, 2010).

The site has been in agricultural use since the earliest available historical map, dated 1872, and as such the site may have been exposed to a variety of chemicals within pesticides, insecticides and fertilisers. However, it is unlikely that ground contamination from on site sources is a significant issue given that the site is largely 'greenfield'[65] and as such the risk to surface and groundwater is negligible.

7.9 Range of possible impacts

Table 7.6 presents an overview of the possible impacts that have been identified for geology and soils for each phase of the development. This table also presents the potential significance of these impacts as ranked prior to mitigation being implemented.

The geology at the converter station site is generally considered to be of low or medium sensitivity. The Achanarras Fish Bed lies approximately 10m below the surface (see below). There are several quarries in the area that are used for Caithness flagstone, a resource that is of some local and regional interest.

The soils at the converter station site are considered to be of medium sensitivity. They are graded as Class 4 agricultural land which is primarily suitable for grassland with short arable breaks. Although primarily used for grazing, they are capable of supporting arable agriculture on lesser sloping, but not level ground (see also Section 6.8.2).

[64] Cut and fill describes the process of taking material (usually earth or rock) from one location on site which requires excavation and using it to fill in at another part on site which requires to be built up.
[65] Greenfield land is a term used to describe undeveloped land in a city or rural area either currently used for agriculture or landscape design or left to naturally evolve.

Table 7.6 Areas of possible impact related to geology and soils

Issue	Sensitivity	Magnitude of effect	Pre-mitigation significance
Permanent			
Permanent loss of approximately 92,000m^3 of rock due to excavation	Medium	High	Major
Disturbance of Achanarras Fish Bed during platform excavation	Medium	High	Major
Loss of access to geological resources (mineral, aggregate, fossils) beneath permanent infrastructure	Medium	Medium	Moderate
Construction			
Encountering locally contaminated land	High	Low	Moderate
Removal of some 50,000m^3 of topsoil	Medium	High	Major
Physical disturbance or damage to soils due to construction works	Medium	Medium	Moderate
Contamination of soils from spills due to construction	Medium	Medium	Moderate
Operation and maintenance			
Contamination of soils from spills during operation or maintenance	Medium	Medium	Moderate

7.10 Mitigation

Table 7.7 provides a catalogue of all of the measures that will be implemented to avoid, reduce and manage unwanted impacts of the project on geology and soils. A full list of all intervention measures planned for this project, including all of those listed above, and the parties responsible for their implementation is compiled in Annex II.

Table 7.7 Catalogue of committed intervention measures related to geology and soils

Ref	Title	Description
GEO1	Cut and fill	The platform will be constructed using a balanced cut-and-fill operation with the intention to utilise the rock strata below the site to form a level platform (see GEN23).
GEO2	Geological watching brief	An on-site geologist will be appointed for the initial opening to identify presence or absence of fish-bed laminite prior to excavation and crushing. If appropriate, the geologist will provide a watching brief, to advise in the case of fossil exposure and retrieve any fossil samples of interest.
GEO3	Excavation	The contractor will be required to implement best practice measures to ensure disturbance to local geology and soils is reduced to the minimum necessary for the safe implementation of the works.
GEO4	Reuse of soil	Soils removed, as part of the earthworks to facilitate construction will be re–used wherever possible in the final landforming.

Ref	Title	Description
GEO5	Soils	All soils disturbed by the works will be handled, stored and re–spread following best practice[66] to minimise adverse effects upon soil quality.
GEO6	Soils	Soil storage areas will be designed and managed to provide easy access, minimise runoff and avoid erosion, including minimising the time soil is stockpiled.
GEO7	Bund design	All landscaping will be designed to meet landscaping needs, minimise run–off and avoid erosion (see LV4).
GEO8	Soils	In the area of the proposed platform, vehicle access will be limited until excavation takes place to avoid soil compaction and the creation of excess mud.
GEO9	Soils	The contractor will be required to ensure that vehicles will be kept within designated tracks where practicable. Existing farm tracks will be used where possible during the construction works to help reduce damage to soils from plant moving around the site.
GEO10	Contamination	Contaminated materials from any spill cleanup will be placed within a dedicated skip that will be present on site at all times and waste disposed of to a suitably licensed facility.
GEO11	Contaminated material	Should any previously unidentified contaminated material be encountered the contractor will be required to make provision for appropriate investigation of the material and its safe handling and disposal if necessary.

7.11 Assessment of residual effects

Permanent

7.11.1 Permanent loss of rock due to excavation

In order to create a level site for construction of the converter station, rock and soil will be excavated from the site. It is estimated that the excavation will impact approximately 92,000m^3 of the site. The geology on the site is considered to be medium sensitivity as the underlying geology includes a fossil layer estimated to be approximately 10m below the site. The magnitude of effect is high as the material will be permanently removed, resulting in a complete change to the baseline environment.

The potential for the permanent loss of rock and soils extracted during excavation of the platform will be minimised by the reuse of these materials as far as possible on site, as a result of a balanced cut and fill solution. It is not anticipated that any bulk filling materials will need to be imported. Although the impact will be minimised, the magnitude of the effect is expected to remain at a medium level and the residual effect is expected to be **moderate adverse**.

7.11.2 Disturbance of Achanarras Fish Bed

The Achanarras Fish Bed is estimated to lie approximately 10m below the site. This stratum has been important for holding fossils that are scientifically significant. Given the rarity of exposure of the Achanarras Fish Bed in Caithness any new exposure created by engineering work would be considered to be of international importance.

[66] For example see Ministry of Agriculture, Fisheries and Food, Good Practice Guide for Handling Soils http://webarchive.nationalarchives.gov.uk/20090306103114/http://www.defra.gov.uk/farm/environment/land-use/soilguid/index.htm and BS3882

The location of the site and design of the excavation has taken the location of the Achanarras Fish Bed into account. The excavation is not expected to intercept this layer unless previously unseen faulting is encountered. This will be monitored by having a geologist on-site for the initial opening to identify presence or absence of Fish Bed laminite prior to excavation and crushing. The geologist will provide a watching brief and will advise in the case of fossil exposure and would retrieve any fossil samples of interest if required.

No damage should occur to the Achanarras Fish Bed as a result of the shallow excavation. However, having a geologist on site will ensure that if there are unexposed faults that have lifted the fish bed, the fossils may be retrieved. Since these fish beds cover most of Caithness then very little is lost by destroying part after examination. As a result of the mitigation the residual adverse effect to the Achanarras Fish Bed should be **negligible or minor** at worst.

7.11.3 Loss of access to geological resources

The presence of the converter station will result in loss of access to mineral and aggregate resources beneath permanent infrastructure. Although there is evidence of quarries on the site from the past, and a mine entrance nearby, there is no evidence of recent use of the site for mineral or aggregate resources. The value of these resources on this site is low, and the impact on approximately five hectares quite small, resulting in a residual **negligible adverse** effect.

Construction

7.11.4 Encountering locally contaminated land

The risk of encountering contaminated land is considered to be small. The survey of sources of contamination (see Section 7.8.5, and URS, 2010) noted that it is unlikely that ground contamination from on site sources is a significant issue given that the site is largely ‘greenfield’ and as such the risk to surface and groundwater is negligible. It is therefore not anticipated that any significant areas of contaminated ground would be encountered during construction. Should any previously unidentified contaminated material be encountered the contractor will be required to make provision for appropriate investigation of the material and its safe handling and disposal if necessary.

7.11.5 Removal of topsoil

The soils on the site are considered to be medium sensitivity as the soils are arable (Grade 4 agricultural land), but relatively thin. A strip of soil and subsoil (750mm) will be removed from the site prior to excavation. This strip generates approximately 50,000m^3 material down to rock. Some of this material will be used for structural fill, and the remainder will be used for site landscaping. In addition, a strip of topsoil will be removed below the landscape areas, but this will be placed on top following the landscaping operations. By re-using the material on site, the residual effects from removal of soil in excavation will be minimised and the resulting effect to soils will be **minor adverse**.

7.11.6 Physical disturbance to and damage to soils due to construction works

Adverse impacts could result if damage occurred to the soils during handling and storage. Soils may be lost to wind and water erosion, and soil moisture levels could be changed through inadequate storage or drainage. In addition, soil structure could be damaged by being compacted by machinery during construction works.

Loss of soils by wind and water erosion due to poor storage methodology and by inadequate soil reinstatement methods will be minimised through ensuring the adoption of best practice soil handling reinstatement and storage methodology by the contractor. Changes to soil moisture will similarly be minimised through ensuring best practice methods of soil storage and providing adequate drainage (see Section 8.11.2).

Machinery will be kept to access tracks, and will not track over storage areas. Any disturbance is expected to occur during the construction phase when machinery is present and while soils are being stored prior to landscaping. Thus, disturbance to soils will be short-term and after implementation of the mitigation agreements described above, the residual effects to soils resulting from storage and handling or from compaction are expected to be **minor adverse**.

7.11.7 Contamination of soils

Contamination of soils may result from leakage or accidental spillages of chemicals, fuel or oil during construction. Any such spillages are likely to affect a small area; however, these events could occur any time during construction. By implementing best practice measures to avoid spills and contamination and to respond to any spills in an appropriate manner, the residual adverse effects due to contamination are reduced to a **negligible** level.

Operation and maintenance

7.11.8 Contamination of soils during operation

Contamination of soils may also result during operation and maintenance. However, measures put in place to contain any contamination and to respond appropriately to these events will ensure that these impacts are not significant.

Provided all agreed mitigation measures are successfully implemented most adverse effects on geology and soils are expected to be **minor** or **negligible**. However, the residual effect due to the excavation of rock is considered to be moderate due to the sensitivity of the geology in the area and the extent of change to the site due to this activity.

7.11.9 Decommissioning

There are not anticipated to be any additional impacts to geology as a result of decommissioning, and the potential impacts on soils will be similar to those during construction, and providing all activities were carefully planned and controlled, impacts would be temporary and not significant.

Table 7.8 Scale of residual effects anticipated after mitigation measures have been applied

Issue	Residual impact
Permanent	
Permanent loss of approximately 92,000m^3 of rock due to excavation	Moderate
Disturbance of Achanarras Fish Bed during platform excavation	Minor
Loss of access to geological resources (mineral, aggregate, fossils) beneath permanent infrastructure	Negligible
Construction	
Encountering locally contaminated land	Negligible
Removal of some 50,000m^3 of topsoil	Minor
Physical disturbance or damage to soils due to construction works	Minor
Contamination of soils from spills due to construction	Negligible
Operation and Maintenance	
Contamination of soils from spills from during operation or maintenance	Negligible

7.12 Potential for cumulative effects

The assessment undertaken above indicates that there are no cumulative effects associated with geology and soils from the proposed converter station project.

7.13 Summary of key findings

This assessment has considered the potential impacts of the project on geology and soils at the converter station site, including permanent impacts of the development as well as impacts arising during construction.

The approach to the assessment has been to use established knowledge about the area backed up by specific data for the site and further supported by direct field observations. The sensitivity of the geology and soils on the site was assessed, and criteria were used to assess the magnitude of effect of the activities affecting these resources. The following conclusions have been drawn:

- No sites designated for their geological interest would be affected by the proposals.
- The potential impact on geology of the site due to excavation will be reduced by the re-use of material in the cut-and-fill operation. However, excavation of the platform is expected to have a **moderate adverse** residual effect on the geology of the site.
- The Achanarras Fish Bed should not be intercepted by the development; however, an on-site geologist will ensure that if geological resources of particular significance are disturbed by the excavation, they are properly retrieved and recorded.
- No significant areas of contaminated land have been identified which could be affected by the works.

- Implementation of best management practices including good design of the works would ensure that any residual effects to soils are minimised, and no significant adverse effects on soils are predicted provided all agreed mitigation measures are implemented.

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8 Hydrology, Drainage and Water Quality

8.1 What is covered in this chapter?

This chapter introduces the hydrological interests of the site, including surface and groundwater, drainage issues, and water quality. It presents an assessment of the potential direct and indirect impacts of the development on these interests. Measures to protect water quality are set out.

This chapter does not cover impacts of the development on the aquatic species and habitats of conservation interest, which are covered in Chapter 9: Ecology and Nature Conservation. Impacts on soils are covered in Chapter 7: Geology and Soils.

8.2 Why could the issue be important?

The building of a converter station and the activities associated with such an operation can influence water movement and land drainage, and could also lead to effects downstream of the site. In addition there are a number of ways by which water can influence the project itself, through flooding, ground conditions, erosion etc.

The significance of maintaining and even enhancing water quality has been recognised by national government, agencies (SEPA and SNH) and The Highland Council. There are a range of regulatory provisions and planning policy objectives that make management of hydrological issues a priority.

8.3 Sources of information

Maps

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- SEPA 2010. *Pollution Prevention Guidelines* [online] Available at <http://www.sepa.org.uk/guidance/ppg/index.htm> [Accessed September 2010] with special reference to:
  - PPG1 General Guide to prevention of pollution
  - PPG2 Above ground oil storage tanks
  - PPG3 Use and design of oil separators in surface water drainage systems
  - PPG5 Works and maintenance in or near water
  - PPG6 Working at construction and demolition sites (under review)
  - PPG8 Safe storage and disposal of used oils
  - PPG13 Vehicle Washing and Cleaning
  - PPG18 Managing fire water and major spillages
  - PPG21 Pollution incident response planning
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- SEPA 2010. *Annex B SEPA Policy 41: Development at Risk of Flooding, Advice and Consultation – as SEPA Planning authority protocol* [online] Available at <www.sepa.org.uk/flooding/idoc.ashx?docid=5768590c-8a08/> [Accessed September 2010]
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- 'SNIFFER 2009. *WFD95 – A Functional Wetland Typology for Scotland'* [online] Available at: <http://www.sniffer.org.uk/home/Default.aspx> [Accessed September 2010]
- The Highland Council, (The Highland Council), 2010. Information on Private Water Supplies, Environmental Health Dept. [email] (Personal. Communication, September 2010)

Other sources
- Google Earth images
- Local knowledge of specialist and direct observation of geomorphological features during field visits.
- Feedback from consultation (see Section 8.5 and Annex I)

8.4 Survey and analysis work undertaken

A survey of existing water features and examination of flood risk potential was conducted through a combination of desk-based analysis and site walkover. Desk-based investigations were based upon the "Flood Map" programme on the SEPA website supported by examination of modern and archive materials and data for the site from BGS website and the Ordnance Survey "old maps" website.

These sources were used to identify all modern and ancient water courses.

Various water and drainage management options were then considered for the site. These included investigations to establish possible functional flood plains to ensure that the converter station site and associated works avoided such areas (see Brown 2010).

Three separate visits were made to the converter station location for purpose of hydrological investigation on:

- 26 August 2010
- 31 August and 1st September 2010
- 16 September 2010

The site is easily accessed from a nearby track down the north side of the shelterbelt, and has been overwalked. Checks were made of Achanarras Burn dimensions and to see if the stream was bottoming on bedrock.

A flood risk assessment for the site was completed by, engineering and environmental consultants, URS and is included with the planning application for this proposal (see URS, 2010).

8.5 Consultation feedback

The following comments were received from consultees during the EIA process (see also Annex I).

SEPA emphasised the need to take account of Water Framework Directive and River Basin Management Planning to ensure that all surface water bodies achieve 'Good Ecological Status (GES)' and that there is no deterioration in existing status.

More detailed feedback was gained during the Pre-Application Consultation process and focussed on the following:

- Flood Risk:
    - avoiding the 1 in 200 year functional flood plain and the need to discuss any additional flood mitigation measures proposed for use;
- Surface Water Drainage:
    - treating surface water runoff by Sustainable Urban Drainage Systems (SUDS) in line with Scottish Planning Policy and the Local Plan;
    - seeking comments from Scottish Water where SUDS proposals would be adopted by them;
    - outlining details of SUDS during the construction phase in a Construction Environmental Management Document (CEMD);
- River Basin Management Plan (RBMP):
    - addressing River Basin Management Planning in the ES;
- Construction Environmental Management Document (CEMD) and pollution prevention :

  - systematically identifying all aspects of site work that might impact upon the environment, potential pollution risks associated with the proposals and identifying the principles of preventative measures and mitigation;
  - producing a draft Schedule of Mitigation that covers all the mitigation measures identified to avoid or minimise environmental effects and includes a timetable of works that takes into account all environmental sensitivities, such as fish spawning, which have been raised by stakeholders;
  - including the principles of a Construction Environmental Management Document (CEMD) in the ES which forms the basis for site specific Construction Environmental Management Plans (CEMDs);
- Water abstraction:
  - assessing cumulative impacts associated with other development projects in the vicinity;
- Groundwater:
  - providing a list of groundwater abstraction sources and all groundwater dependent terrestrial ecosystems (within a radius of:

    i) 100m from roads, tracks and trenches and;

    ii) 250 m from borrow pits and foundations).

A full account of all consultation comments and the actions taken to address them is contained in Annex I.

8.6 Guidance and regulations

This section deals specifically with the relevant regulations, guidance and other specific requirements with a direct relevance to hydrology, drainage and water quality. The national, regional and local planning policy requirements have been considered in Chapter 5: Planning Policy and Guidance.

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR)

The Water Environment and Water Services (Scotland) Act 2003 (WEWS) implemented the Water Framework Directive (WFD) in Scotland and provides Ministers with the powers to make regulations to control activities which could affect the water environment. The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) came into force on 31st March 2011. Regulation 4 of CAR defines the scope of SEPA's powers to authorise activities defined within section 20(3) of WEWS. This includes abstractions, impoundments, building and engineering works, and activities liable to cause pollution.

SEPA's powers under CAR are defined under section 20(1) of WEWS as for the purpose of 'protecting the water environment'. SEPA considers that the WFD and WEWS Regulations require a wider view of the water environment, which should include the protection of uses of water and mitigating the risks of flooding.

WEWS requires the authorisation of building or engineering works (other than impoundments) that are carried out in:

- wetlands, rivers and lochs; or
- in the vicinity of groundwater, wetlands, rivers and lochs and likely to have a significant adverse effect upon the water environment.

SEPA aims to focus proportionate controls over those aspects of building and engineering works which clearly pose an environmental risk. Controls would be applied over the engineering process as well as the indirect consequences which might follow from the engineering works.

Private Water Supplies (Scotland) Regulations 2006

The overriding objective of this legislation is to ensure the provision of clean and wholesome drinking water and to deliver significant health benefits to those using such supplies. The 2006 Regulations incorporate the latest advances to improve drinking water quality including the use of risk assessments from 'source to tap' as part of an effective drinking water surveillance programme.

The Water Environment (Oil Storage) (Scotland) Regulations 2006

These regulations apply to any kind of container which is being used and stored on premises above ground whether inside or outside of a building. The regulations set design standards for new and existing above-ground oil storage facilities to ensure that containers are unlikely to burst or leak in ordinary use and to ensure that any leaking or spilt oil cannot enter the water environment.

The River Basin Management Plan and North Highland Area Management Plan

Under the Water Environment and Water Services (Scotland) Act 2003, SEPA is responsible for producing and implementing River Basin Management Plans (RBMPs) for the Scotland and the Solway Tweed River Basin Districts (RBDs). River basins comprise all surface waters (including transitional (estuaries) and coastal waters) extending to three nautical miles (nm) seaward from the Scottish territorial baseline. Any proposed development within these waters must have regard to the requirements of the Water Framework Directive to ensure that all surface water bodies achieve ‘Good Ecological Status (GES)’ and that there is no deterioration in this status.

The Scottish Planning Policy (SPP) Part 8: Flooding and Drainage - identifies that a flood risk assessment may be required for developments in an area with a flood risk of close to 1:200 or where the nature of the development or local circumstances indicate heightened risk. Built development should only take place on functional flood plains (defined as having a greater than 0.5% (1:200) probability of flooding in any year) where it will not affect the ability of the flood plain to store and convey water, where the development will not be at risk of flooding and where the development will not increase the risk of flooding elsewhere.

Scottish Planning Policy PAN 61 on Sustainable Urban Drainage Schemes (SUDS) – advises that all development will be expected to comply with SUDS and best practice for surface water management.

Technical Flood Risk Guidance for Stakeholders
This document outlines methodologies that may be appropriate for hydrological and hydraulic modelling. It details the information SEPA requires to be submitted as part of a flood risk assessment in order to provide an improved response time to planning consultations.

Other details of regulatory requirements and good practice advice from SEPA related to the water environment can be found can be found in the references to this chapter and at:
www.sepa.org.uk/planning.aspx.

SSE Substation Site Selection Guidelines – establishes that the site should be able to withstand a 1 in 1000 year flood event (see Appendix 3-A and Section 8.11.1).

8.7 Methodology

The approach taken to assessing the impacts of the development on surface and groundwater quality as well as on drainage and runoff was to first understand the historical pattern of drainage and streams over and adjacent to the proposed site. This was backed up by specific data from contour maps, Google Earth images, and further supported by direct field observations. These information sources were then combined with the possible and ultimately selected engineering solutions to examine possible impacts, define appropriate mitigation and ultimately the residual impacts that could be anticipated.

8.7.1 Basis for assessment of criteria

The appraisal has been undertaken primarily using a qualitative approach based on professional judgment as well as the recommendations contained within statutory and general guidance measures. The general methodology and approach detailed in Chapter 2: Approach to the Environmental Statement was followed. The specific criteria used to assess hydrological impact are presented in Tables 8.1 to 8.3. In defining sensitivity, it is important to note that a wide variety of factors may be important and some qualitative judgement is used in defining sensitivity in any location.

The criteria for sensitivity are based on a hierarchy of factors relating to the quality of the aquatic environment including international and national designations, water quality information, waterbody status from the Water Framework Directive (WFD) review work undertaken to date by SEPA, consultations, site visits and the professional judgement of the project team. The criteria were used to guide the analysis of the sensitivity of the baseline hydrological, hydrogeological and water quality environment along the scheme (Table 8.1).

Table 8.1 Definitions of sensitivity related to hydrology, drainage and water quality

Sensitivity	Location	Criteria
High	In vicinity of site (within 1km)	• Protected site • Wetland / watercourse habitat of particular ecological importance • Groundwater supplies important areas of nature conservation value • Directly affects a water body classed as 'at risk' by SEPA • Highly vulnerable groundwater • Affecting private water supplies • Active public and floodplain area
	Downstream	• Protected area near to site (<5km) • Sensitive area adjacent to site
Moderate	In vicinity of site (within 1km)	• Wetland / watercourse habitats of some ecological importance • Indirectly affects a water body classed as 'at risk' by SEPA • Potential for indirect or limited effects on private water supplies • Moderately vulnerable groundwater • Some floodplain
	Downstream	• Protected area further down catchment (>5km) • Sensitive area near to site (<5km)
Low	In vicinity of site (within 1km)	• Low environmental importance • Resilient to changes • Supply not used for private water supply • Low vulnerability groundwater • Changes to groundwater unlikely to affect local ecology
	Downstream	• Sensitive area further from site (beyond 5km)
None	In vicinity of site (within 1km)	• No aquatic habitats or watercourses present • No significant groundwater present
	Downstream	• No sensitive or protected areas downstream

The prediction and assessment of impacts on hydrology, hydrogeology and other aquatic resources was undertaken using the guideline criteria for magnitude of effect set out in Table 8.2.

Table 8.2 Criteria for defining magnitude of effect

Magnitude of effect	Criteria
High	Total loss of, or alteration to, key features of the baseline resource such that post development characteristics or quality would be fundamentally and irreversibly changed e.g. watercourse realignment
Medium	Loss of, or alteration to, key features of the baseline resource such that post development characteristics or quality would be partially changed e.g. in-stream permanent bridge works
Low	Small changes to the baseline resource, which are detectable but the underlying characteristics or quality of the baseline situation would be similar to pre-development conditions
Very low	A very slight change from baseline conditions, which is barely distinguishable, and approximates to the 'no-change' situation e.g. short term compaction from plant movements

Using these criteria, a series of impacts was predicted for the project, as outlined in Table 8.3 below. The significance categories are further defined in Table 8.4.

Table 8.3 Overall scheme for establishing impact significance, combining magnitude of possible effects and sensitivity of the receptor

Sensitivity	Magnitude of effect								
	High	Medium	Low	Very Low	None	Very Low	Low	Medium	High
High	Major	Major	Moderate	Minor	Neutral	Minor	Moderate	Major	Major
Medium	Major	Moderate	Minor	Minor	Neutral	Minor	Minor	Moderate	Major
Low	Major	Minor	Minor	Negligible	Neutral	Negligible	Minor	Minor	Major
Very low	Moderate	Minor	Negligible	Negligible	Neutral	Negligible	Negligible	Minor	Moderate
None	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral

Table 8.4 Effect Significance Categories

Significance	Definition	Guideline Criteria
None	No detectable change to the environment	No impacts to drainage patterns, surface and groundwater quality
Minor	A small but detectable change to the environment	Localised changes in drainage patterns or groundwater flows, or changes resulting in minor and reversible impacts to surface and groundwater quality
Moderate	A larger, but non-material change to the environment	Changes in water quality or quantity affecting part of a catchment or groundwaters of moderate vulnerability
Major	A material change to the environment	Changes in water quality or quantity affecting widespread catchments or groundwater reserves of strategic significance

The matrices used to guide the assessment were applied with a degree of flexibility since the evaluation of impacts will always be subject to particular location-specific characteristics which need to be taken into account. Cumulative effects were taken into account through prediction and evaluation of impacts at a catchment-wide level.

8.8 Established baseline conditions

8.8.1 Natural water flows

Rainfall

The regional rainfall is between 800 and 1200mm per annum (Hydrogeological Map of Scotland, 1998). The average annual rainfall is 1057mm at Halkirk (ND 131 595) (NERC, 2008). Monthly rainfall over the past 96 years at Wick airport has never exceeded 100mm (Met Office, 2010).

Catchment areas

The converter station site is located alongside the Achanarras Burn in the River Thurso catchment area (see Figure 8.1). The headwaters of the River Thurso rise about 50km southwest of its mouth in Knockfin Heights at 438m high. The elongate drainage basin which doglegs about halfway through to travel north-south consists of a dendritic[67] pattern of small streams draining mosses and lochans of the Flow Country. Some larger lochs such as Loch More and Loch Calder along with the marshy ground help maintain a continuous flow regime in the River Thurso throughout dry seasons. This drainage basin is over 400km² (approximately 40,000ha).

The drainage basin of the Achanarras Burn, at less than 400ha only contributes about one percent of the total water to the River Thurso. Therefore the dilution factor of any discharge to the River Thurso through the Achanarras system is about 1:100.

The predominance of vegetated land in this catchment, low river gradient and the fact that waters, for the most part, flow over bedrock indicate that sediment burdens are generally relatively low.

The converter station site is located to the west of the divide between east flowing rivers and the north and west flowing rivers. This is an area of relatively poor drainage in some parts, and the water table is close to the surface in the vicinity of the site.

Surface waters

The converter station platform sits on a sloping strip of farmland between Spittal Hill, 1.1km to the northeast, and the Achanarras Burn, 85m to the southwest. The fields surrounding the converter station platform contain a complex of field ditches at right angles to each other that eventually run southwest into the Achanarras Burn (see Section 4.2.10).

The Achanarras Burn passes along the western boundary of the proposed site area, draining from southeast to northwest and flowing parallel to and about 85m away from the converter station site (Plates 8.1 and 8.2). In the northwest corner of the site, it passes under an existing gravel access track via two 600mm culverts on the site boundary. The channelised Achanarras Burn flows into the Moss of Halkirk through ditches and into the Halkirk Burn, joining the River Thurso northeast of Halkirk, about 4km north of the site (Figure 8.2).

The upstream catchment of the Achanarras Burn extends to some 2.68km^2 (URS 2010).

Near the converter site the stream gradient is relatively high (greater than 10 percent) and the channel is straight. No obstruction is encountered until the culverts under the road to Achanarras Farm. Under flood conditions the road is seven metres lower than the platform (Aquatera, 2010).

The characteristic morphology of rivers and streams can persist in the landscape long after stream diversion. The burn formerly occupied a meandering course across a 250m wide floodplain, as shown in Figure 8.3 (Aquatera, 2010). More than 150 years ago, agricultural improvements in the district involved cutting of rectilinear drainage channels and confining the ancestral Achanarras Burn into a straight channel of about 1.5m deep and 3.0m wide at the top (Aquatera, 2010).

[67] Resembling or having dendrites : branching like a tree

8.8.2 Groundwater

The converter station site is predominantly flagstone, largely confining groundwater to dilated joints[68] and bedding planes[69] within the uppermost section of the rock. In Caithness, groundwater is largely confined to a shallow zone of weathered rock, and borehole yields are limited (BGS, 1988). The groundwater vulnerability[70] map of Scotland shows that there is moderately permeable geological classification for the Caithness region. These do not have highly permeability, or other formations of variable permeability. Superficial drift deposits[71] that overlie the solid geological strata can sometimes be substantial in thickness (NERC, 1995).

The only groundwater dependent ecosystem within 250m the platform is the marshy ground between the platform and the Achanarras Burn. This area only receives water from the converter site field at present as surface and groundwater flows are intercepted by ditches on the east and south sides of the site.

Groundwater on the sites is not used for watering farm animals.

8.8.3 Abstractions

There are no private water supplies in the footprint of the converter station (The Highland Council pers. comm., 27.9.2010). The closest one is a domestic supply located at Lower Toftingall at a distance of 2.3km to the east in a separate drainage catchment (see Section 6.7.3).

There are no deep groundwater wells within 250m of the site, and only one surface well in this area. This well is approximately 80m north of the access track (Figure 8.4).

8.8.4 Drainage

General drainage

Ground conditions consist of poorly draining shallow topsoil overlying a thin layer of glacial till with rock typically 0.75m below ground level (see Section 7.8.2). The clay content of the overlying soils restricts the surface permeability of the site. The steep topographic gradients combined with the poor quality soils increases the likelihood of overland sheet flow runoff. Such surface flows are therefore a major risk on this site.

A groundwater aquifer exists in the fractured rock that lies between the base of the till and the solid bedrock. This aquifer is fed from high land on Spittal Hill. Field drains also guide significant flows of water underground across the site. Details of known drainage features are shown in Figure 8.5.

Open ditches

The most obvious drainage features are a series of open ditches that have been dug along field boundaries. Typically the ditches are 1m or more in depth and

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[68] In geology the term joint refers to a fracture in rock where there has been no lateral movement in the plane of the fracture (up, down or sideways) of one side relative to the other. This makes it different from a fault which is defined as a fracture in rock where one side slides laterally. A dilated joint is one that has expanded.
[69] In sedimentary or stratified rocks, a surface that separates each layer from those above or below it. It usually records a change in depositional circumstances by grain size, composition, colour, or other features. The rock may tend to split or break readily along bedding planes.
[70] Groundwater vulnerability is defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.
[71] Permeable unconsolidated (loose) deposits, for example, sands and gravels

around 1 – 2m wide at the top, 50cm wide at the bottom with steeply sloping sides. They are often cut down to bedrock level through the topsoil. Most of the ditches have been cleared and maintained on a periodic basis. Where ditches cross under access tracks they flow through steel or plastic pipes or stone built culverts. There are two ditches on the converter station site (Figure 8.5); one ditch to the northeast of the development area flows oriented southeast to northwest. This ditch joins a ditch on the north side of the shelterbelt which then runs into the Achanarras Burn (Plate 8.3). The second ditch flows northeast to southwest into the Achanarras Burn along the southeast side of the platform area (Plate 8.4).

The area has several man-made drainage ditches located on field boundaries which fall north and westwards with the natural topography into the Achanarras burn.

Field drains

Intersecting with the ditches and feeding directly into the Achanarras Burn are a series of field drains. These lie some 1m down in the soil and emerge near the bottom of the drainage ditches.

Flows through field drains can be considerable and at times provide more flow to a ditch than the ditch has itself. The field drains appeared to have been located to intersect the old depressions in the landscape that are thought to be old surface streams from Spittal Hill. These old stream paths are also preferential groundwater drainage paths. Therefore the field drains intercept groundwater and surface water paths and enhance the drainage flow into the surface ditches (Aquatera, 2010).

8.8.5 Flooding

A Flood Risk Assessment has been conducted for this site (URS, 2010; see also Section 8.11.1).

A review of the SEPA 2nd Generation Flood Map was undertaken to identify the potential extent of fluvial flooding associated with the Achanarras Burn. However, no flooding was noted although flooding was identified to downstream reaches of the burn (see Figure 8.6 and Section 4.2.10). It is therefore likely that the watercourse was not modelled adjacent to the proposed site given that the catchment appears to be smaller than $3km^2$ (see Section 8.8.1) the minimum catchment criteria set by SEPA (URS, 2010).

The Achanarras Burn channel follows the old floodplain initially on the eastern margin then crossing at the present hydrological divide and continuing down past the converter site on the western margin of the floodplain. If the channel was ever to block or breach its banks, the consequent floodwaters would reoccupy this ancestral floodplain (Aquatera, 2010).

A quantitative assessment was undertaken in order to establish the likely flood extents to the Achanarras Burn. The calculated flows and water levels associated with the Achanarras Burn indicate that the 200 year and 1000 year flows can generally be accommodated within the channel. A portion of land within the site boundary and directly adjacent to the watercourse itself may be at flood risk given the proximity to the Achanarras Burn (URS, 2010).

An assessment was undertaken to review the potential flood risk associated with overland flow and pluvial flooding. This reviewed the surrounding topography and the topography within the development site. It is considered that the development proposals are not at risk from overland flow and pluvial flooding as:

- the site does not have any topographical low spots which currently have the potential to cause pluvial flooding; and
- the surrounding topography conveys excess storm water away from the site through a series of field drains and ditches.

8.8.6 Water quality

River Basin Management Planning
The current status of water bodies and protected waters falling within the area influenced by the converter station was accessed from datasheets available on SEPA's river basin management planning website and is summarised in Table 8.5 (SEPA, 2010).

According to these data, the current status of the Thurso River – Loch More to the Sea and of the Thurso Bedrock groundwater system is good. The Achanarras Burn flows into the Halkirk Burn, which is rated as moderate due to overall ecology and morphology. The pressures in the water body are related to morphological alterations such as channelisation.

Table 8.5 River Basin Management Plan - water bodies and parameters (SEPA, 2010)

Name of water body	Type of water body	Dimensions	Overall Status Condition	Date Status Established
Halkirk Burn	River	Length =8km	Moderate	15.3.10
Thurso River -Loch More to the Sea	River	Length = 39.3km	Good	15.3.10
Thurso Bedrock	Groundwater	Area = 1062km^2	Good	15.3.10

The converter station site lies within the "Thurso bedrock and localised sand and gravel aquifers" drinking water protection zone, the River Thurso freshwater fish protected area and is 2.5km upstream from the River Thurso SAC (see Section 9.8.1). The status of these areas is shown in the Table 8.6.

Table 8.6 River Basin Management Plan – other protected areas and parameters (SEPA, 2010)

Name of Protected area	Type of Protected area	Parameter	Condition	Date
Thurso bedrock & localised sand and gravel aquifers	Drinking water protection zone (DWPA)	DWPA Status	Pass	15.3.10
Thurso River	Freshwater fish (existing) (FWF)	FWF Overall status	Pass	9.11.09
River Thurso	Special Area of Conservation	Natura Overall status	Favourable	9.11.09

8.9 Range of possible impacts

Table 8.7 presents an overview of the potential impact issues that have been identified for hydrology, drainage and water quality. In addition to these issues, possible impacts that were considered to be more appropriate to deal with elsewhere in this document are addressed in the following chapters:

- Chapter 7: Geology and Soils
- Chapter 9: Ecology and Nature Conservation

The site lies adjacent to the 1:200 year flood envelope of the indicative River and Coastal Flood Map (Scotland), and may therefore be at medium to high risk of flooding; therefore, the site is considered to have moderate sensitivity with respect to flooding risks.

The hydrology of the site in terms of surface and groundwater flows does not have any particular environmental importance and is considered of low sensitivity. However, the groundwater vulnerability has been identified as moderate, leading to a moderate sensitivity for this receptor.

There are no private water supplies, thus surface and groundwater abstractions are considered of low sensitivity.

The converter station site lies within protected areas for drinking water and freshwater fish, and is 2.5km upstream of the River Thurso SAC, making the Achanarras Burn a receptor of high sensitivity in terms of water quality issues.

Table 8.7 Summary of identified pre-mitigation impacts associated with hydrology, drainage and water quality

Issue	Sensitivity	Magnitude of effect	Pre-mitigation significance
Permanent			
Flooding risks for the site	Moderate	High	Major
Altered ground and surface water flows	Low	High	Major
Impacts on surface water and groundwater abstractions	Low	Low	Minor
Construction			
Disturbance to Achanarras Burn due to construction of pond outflow	High	Low	Moderate
Sediment rich runoff from poor quality stone used in access track construction	High	Low	Moderate
Risks of eroded channels on access tracks and in areas of the works leading to increased runoff and sediment loads	High	Low	Moderate
Compaction of soils by construction traffic reducing permeability and therefore increasing runoff	High	Low	Moderate
Discharge of construction drainage potentially contaminated with sediments or materials used on site affecting flood storage capacity, water quality, water supplies	High	Low	Moderate
Impacts from discharge of sewage and effluent from the site compound facilities	High	Low	Moderate

The site is not located on peat and hydrological issues associated with peat are not relevant to this site. There are no water abstractions proposed for this project and borrow pits are not part of the application. The only direct impact on water bodies is the outlet from the fire fighting pond to the Achanarras Burn. These potential impacts are discussed below.

The primary issues associated with hydrology, drainage and water quality for the development are related to the potential for flooding, altered ground and surface water flows, and indirect effects due to increased sediment loads and potential contamination on water quality downstream of the site. A number of mitigation measures will be implemented that are designed to reduce these potential impacts. These are described in more detail below.

8.10 Mitigation

Table 8.8 provides a catalogue of all of the measures that will be adopted for this project to avoid, reduce and manage unwanted impacts and to capture and increase potential benefits.

Table 8.8 Catalogue of committed intervention measures related to hydrology, drainage, and water quality

Ref	Title	Description
H1	Detailed Design and Construction	The contractor will be required to meet all SEPA best practice relevant to the proposals as set out in: http://www.sepa.org.uk/water/water_regulation/guidance.aspx (GEN 44).
H2	Establish SUDs	Detailed site drainage will be developed consistent with sustainable urban drainage system (SUDS) principles and agreed with SEPA.
H3	Site flood protection	Site design will include bunding to protect the site from rising floodwaters and any breakout by the Achanarras Burn upstream of the site. (see Gen 17)
H4	Water Protection Plan	The contractor will be required to develop and implement a Water Protection Plan as part of the Construction Environmental Management Document (to ensure proactive protection of water courses, groundwater and potable water supplies (see GEN5 and GEN16).
H5	Drainage works	All planned drainage works will be completed during the early part of construction where practical to reduce likelihood of water logged ground during construction.
H6	Drainage works	Where practical drainage realignment works will be completed during periods of dry weather to reduce the risk of sediment rich runoff.
H7	Drainage works	Any existing field drains disrupted by the works will be reinstated and made good.
H8	Water course re-instatement	The banks and bed of any watercourse disturbed by construction activities will be reinstated to a condition as close as possible to that existing before construction.
H9	Drainage works	All water runoff will be adequately controlled and the detailed design will ensure that the future runoff rates are similar to existing greenfield conditions.
H10	Drainage works	The design of new drainage ditches will use best practice to ensure the risk of erosion is minimised.

Ref	Title	Description
H11	Drainage works	Drainage channels will be constructed in front of soil bunding and at the base of cut slopes to ensure interception of surface and groundwater flows. They will follow natural contours as far as practical and be naturalised if possible.
H12	Drainage works	A manually operated sump will be located in the northwest corner of the platform. This will facilitate control of any suspended sediment or spill contaminants.
H13	Drainage works	A combined attenuation/fire fighting pond with ecologically enhanced margins will be constructed to the west of the site to serve all surface drainage from the platform area. This will be put in place before excavation of the main site starts to capture any surface water flows during construction (see GEN 21).
H14	Sedimentation	Topsoil works will only be initiated under conditions that allow for adequate protection of nearby water courses, for example avoiding water logged soils and periods of heavy rainfall. The approach taken will reduce the risks of high turbidity flows reaching the Achanarras Burn. All detailed protection measures will be included in the water protection plan of the CEMD.
H15	Sedimentation	Open excavations will be protected as far as possible during heavy rainfall. Water will be allowed to collect at the base of a series of excavated sumps prior to pumping to settlement ponds. This will be incorporated into the CEMD at the detailed design stage.
H16	Sedimentation	Temporary interception ditches and attenuation ponds will be formed at spoil storage areas and will be removed on completion of construction.
H17	Drainage monitoring	The contractor will establish a monitoring protocol to maintain ongoing review of the effectiveness of the measures in controlling water movement on and around the site. Any required improvements to practice will be implemented as soon as practicable.
H18	SEPA guidance	The contractor will be required to consult with SEPA on all temporary and permanent pollution control measures.
H19	Contamination	Measures will be implemented by the contractor to avoid particulate or chemical contamination of drains or the Achanarras Burn during construction and operation. These measures will be included in the Water Protection Plan.
H20	Contamination	If any concrete is batched on site, it will be batched within a designated area at least 50m away from any surface water drains or watercourses.
H21	Contamination	The contractor will be required to agree any cement/concrete washing out facilities with the Scottish Environment Protection Agency in advance of use and incorporated in the CEMD. Any concrete washout will be dealt with in accordance with best practice.
H22	Contamination	All chemical/fuel storage areas will be located at least 50m away from any surface water drains or watercourses.
H23	Contamination	All waste from welfare facilities used during construction will be collected and removed from the site.
H24	Contamination	An emergency plan will be developed by the contractor to deal with accidental spills and included in the CEMD.

In addition, there are various pieces of published guidance, including a number of SEPA Pollution Prevention Guidance (PPG) Notes, which are listed in Section 8.17 and relate to best practice to be adopted for construction, these will be adopted. In addition, all works will follow appropriate legislation.

CAR licenses

All works on site that could affect watercourses would be controlled by the required authorisation under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). These Regulations control discharges to watercourses and land and also cover abstractions, impoundments and engineering works within and in the vicinity of inland surface waters. There are three levels of authorisation (General Binding Rules; Registration and Licence). The level of authorisation depends on the activities which are proposed and SEPA will advise on what is required post-consent and pre-construction.

Sustainable Urban Drainage Systems (SUDS)

Although the need for a full SUDS and attenuation scheme is limited due to the permeable platform design adopted throughout, SUDS measures for the converter station project were developed as an integral part of the outline design (see Section 4.2.10). Such measures would provide settlement to deal with suspended solids, some breakdown of pollutants by natural processes and attenuation to ensure that runoff is limited to greenfield rates. Table 8.9 below details the SUDS measures adopted for this project along with the mitigation measures listed in Table 8.8.

Table 8.9 SUDS Measures

Facility	SUDS Measure
Details of the proposed drainage and flood protection scheme	Bunding will be provided along the full length of the eastern and southern flanks of the site to protect from surface sheet flows.
	The existing ditch along the south side of the site will be moved outside the new landscape bund. This ditch and the one to the east of the site will continue to take the surface water runoff from the agricultural land to the south and east, and the outer slopes of the landscape bund. The new ditch will be bottomed in the bedrock to also intercept groundwater flow.
	Drains filled with clean granular material, “French” drains, will be placed along the north and west sides of the platform. These drains will intercept any percolated flows or runoff from the granular platform. They will discharge through an open channel drain to the Achanarras Burn. A penstock valve included in the outfall manhole allows retention of any contamination which has breached the normal containment and spill measures.
Substation platform drainage	The substation platform consists of a platform area made up of granular materials (crushed rock) gathered from the site, placed to a minimum depth of 1m below finished levels. Maintenance access roads built within the perimeter of the site drain into the granular layer.
	Porous drains, installed within the granular platform, will drain the new substation platform. These drains feed into the fire water storage pond, which also provides additional attenuation control over the site drainage. This drainage will outfall north and west to the Achanarras Burn.
	Areas of special contamination risk at transformers are built with bunding, oil separation, and flow controls.
Water storage	An outlet pond creates extra treatment and attenuation beyond the normal design needs of SUDS. This area collects and treats surface water from the platform during development and discharges to the Achanarras Burn.
Connection to the Achanarras Burn	The full length of the channel providing the outlet to the Achanarras Burn will be excavated first with break through to the burn planned for dry / low flow conditions.

Facility	SUDS Measure
Access road drainage	Drainage from the existing road is taken into an open ditch running parallel with the south side of the road. Surface water drainage from the proposed road widening will be taken into a new filter trench along the north side of the road, which connects back to the existing ditches.

8.11 Assessment of residual effects

Permanent

8.11.1 Flooding risks for the site

The site lies adjacent to the 1:200 year (0.5% annual probability) flood envelope of the Indicative River and Coastal Flood Map (Scotland), and may therefore be at medium to high risk of flooding (see Section 8.8.5). SEPA require the development to be out with this flood risk area. Scottish Planning Policy states that development on the functional flood plain (0.5% annual probability) will not only be a risk itself, but will add to the risk elsewhere.

SSE's Substations Site Selection Guidance (SSE, 2009; see Appendix 3-A) states that areas of flood risk should be avoided and furthermore that if a site option is close to the flood area a further assessment should be completed to identify the 1 in 1000 year flood area. It is possible to design substations to accommodate the 1:1000 year flood risk but better to avoid such areas.

A Flood Risk Assessment has been conducted for this site (URS, 2010) to assess whether the integrity of the converter station site could be jeopardised by flood surges from the nearby Achanarras Burn, and whether flooding is possible from overland flow should surface and emerging groundwater flows from Spittal Hill reach the site. The following section summarises the results of this assessment.

The Flood Risk Assessment concludes that the 200 year and 1000 year flows can generally be accommodated within the channel of the Achanarras Burn. A portion of land within the site boundary and directly adjacent to the burn may be at flood risk given the proximity to the watercourse; however, no development is proposed within this area.

A review of the surrounding topography also indicates that should blockage occur at the downstream access track culvert crossings then there would be sufficient level difference to allow flood waters to find relief before impacting the proposed development site. This indicates that relief can be achieved at a level of some 76.22m OD while the proposed platform level is to be set above a level of some 83.2m OD. This indicates that there is some 7m level difference between the available relief level to the existing culvert crossing and the proposed development site. It is considered that this level difference is sufficient to protect against flooding associated with culvert blockage.

As summarised in Section 8.8.5, the Flood Risk Assessment concludes that the development proposals are not at risk from overland flow and pluvial flood risk.

Site selection is the primary solution to avoiding the 1:200 year flood plain. The site has been located at 83.2m, which has been demonstrated to be out with the functional flood plain (URS, 2010). The Achanarras Burn channel follows the old floodplain initially on the eastern margin then crossing at the present hydrological divide and continuing down past the converter site on the western margin of the floodplain. If the channel was ever to block or breach its banks the consequent floodwaters would reoccupy its ancestral floodplain but would not compromise the integrity of the converter site. Under flood conditions the road is seven metres lower than the platform and any excess floodwater will easily overtop without risk to the converter site (see above).

Mitigation in the form of field drains to intercept groundwater flow and bunding to protect the site from rising floodwaters will be put in place to accommodate a 1:1000-year flood risk.

The converter site platform will have about 1m thickness of porous gravel with drainage restriction allowing slow release of precipitation in the northwest corner of the site. It is expected that this pore space within the platform will be sufficient to deal with any expected precipitation rates.

The southwest corner of the platform is close to, but slightly lower than existing ground level. To protect this area a bund will be added to the southwest and east sides of the platform. The north and northwest areas of the platform are above nearby ditch levels and are naturally protected from high flows, which would continue be directed by the natural landform to the north onto open land.

Choice of a suitable site and design of the converter station platform which has taken account of flooding, will ensure there is **no threat of flooding** to the site from a 1:1000 year event.

8.11.2 Altered ground and surface water flows

The establishment of the site platform, access tracks and bund formation will alter ground conditions and topography leading to permanent changes to surface water and ground water flow.

A number of interventions are planned to deal with the consequences of these alterations to water flow (see Appendix 8-A). One core overall aim of the measures is to keep as much water as possible away from the core development site by using interceptor drains. This means that the site drainage system will only have to consider groundwater seeping into the site and rainwater fall onto the site. The drainage measures will be detailed and sized to these water sources. The site drainage measures are described in Appendix 8-A: Drainage Statement and Table 8.8. Details of the integrated drainage systems that are proposed are presented in Appendix 8-A and Figure 4.8.

It is possible for these altered flows to affect groundwater dependant ecosystems and groundwater abstractions in the area. The one groundwater dependant ecosystem is a marshy area near the Achanarras Burn. Since the groundwater and surface water "fall" in this area is north-west then it is extremely unlikely that any groundwater and surface water interception by the drainage ditches will actually affect the flow regime for this area. If anything, it is likely that this area will be wetter after construction.

As the drainage ditches will be retained in their current state, surface water should continue to be intercepted by these ditches and to flow as before into the Achanarras Burn.

The careful design of site drainage to manage changed flows will ensure that any potential residual adverse effects are **minor** at worst.

8.11.3 Effects on surface water and groundwater abstractions

The one shallow surface well in the area is northwest of the access track. It will be potentially affected by widening of the track, and runoff from the track construction may also affect this well. The ditch on the south side of the track is being retained therefore water runoff on the north side will be towards the well. However, the volume of runoff towards this well will be limited by runoff to the other ditch. In addition, any runoff towards the well will be attenuated by crossing over vegetation. As the resource is of low sensitivity, and the magnitude of any potential effects are expected to be low, any potential adverse effects on surface and groundwater abstractions are expected to be of **minor** significance.

There are no other groundwater, or surface water abstractions, that would be affected by the proposed scheme (see Section 8.8.3).

Construction

8.11.4 Disturbance to the Achanarras Burn due to construction of pond outflow

A combined fire-fighting / attenuation pond will be created to the west of the converter station platform, which will have an outflow to the Achanarras Burn (see Figure 4.8). The SUDS measures incorporated with this pond include an outflow channel routed northwards to intercept with the outflow channel from the French drains bordering the raised northern and western sections of the platform area. These channels will be open ditches, around 0.75m deep, with sloping sides suitable for encouraging regrowth of vegetation. The channel will intercept the Achanarras Burn near to the existing shelterbelt and the confluence will be similar to those associated with existing drainage ditches elsewhere along the burn. The full length of the channel will be excavated first with break through to the burn planned for dry / low flow conditions. The contractor will be required to obtain a CAR licence for this work, which will be conditioned by SEPA before commencement of the works. Any residual adverse effects are expected to be **minor**.

8.11.5 Potential impacts due to increases in sedimentation downstream

The pre-works and construction phases have the potential for indirect impacts on downstream waters. There are a number of potential sources of increased sedimentation downstream including:

- sediment rich runoff from poor quality stone used in access track construction;
- excavation works have the potential to lead to large amounts of mud over the site, which, in turn could be too great for the site SUDs and other site drainage systems and lead to turbid runoff into the Achanarras Burn;
- risks of eroded channels on access tracks and in areas of the works leading to increased runoff and sediment loads; and
- compaction of soils by construction traffic reducing permeability and therefore increasing runoff.

Sedimentation of watercourses can have a detrimental impact on flood storage capacity, water quality, as well as on ecology of aquatic plants, fish, and invertebrates. Sediment can settle out in slower moving stretches of a watercourse, with the potential to smother gravels used for salmonid spawning and hatching (see Section 9.11.7), whilst deposits of significant quantities of sediment can alter river morphology.

Key sources of sediment-rich runoff could therefore be:

- along site vehicle tracks;
- during the excavation of top soils;
- along routes from the site to the soil bunding areas;
- during the grading of soils to make the landscaping bund; and
- around any stone crushing equipment.

A key aim is therefore to manage water flows around and through the site during construction in such a way that they do not create mud and associated turbidity issues. This is considered to be a significant ongoing task during construction. A Water Protection Plan as part of the site CEMD (see Section 4.4.2) will be developed which will include detailed measures to manage water flows and sedimentation. This plan will be approved by SEPA before implementation.

In keeping with SUDS guidance, the realignment of the main drainage systems will be undertaken before wider works start in order to isolate these more important water flows from future site working areas. Measures will be put in place to prevent the creation of mud, dust and turbidity in water courses at the source. If any such materials or conditions do arise, measures are in place to contain them and manage then so that they do not spread to or reach the Achanarras Burn. The fire-fighting pond will intercept all site drainage flows and help to greatly reduce any turbidity and suspended sediment to minor or negligible levels for natural burn and river systems.

A key aim of the Water Protection Plan for the site is to avoid and minimise any flow of suspended sediments into the Achanarras Burn and onwards to the River Thurso and to ensure that there is no deterioration in water quality status of water bodies and protected waters. The specific measures described in Table 8.8 and outlined in Appendix 8-A are predicted to reduce the potential adverse effects during construction to a **minor** level at worst.

8.11.6 Impacts on water quality during construction

This section covers the following impacts:

- Discharge of construction drainage potentially contaminated with sediments or materials used on site (fuels, lubricants, hydraulic fluids, cement etc) affecting flood storage capacity, water quality, water supplies and ecology; and
- Impacts from discharge of sewage and effluent from the site compound facilities.

Any spillage of concrete, lubricants, fuels, oils and other fluids stored and used on-site during construction may adversely affect water quality of watercourses and groundwater. If spills are to groundwater then residence times may be prolonged and present a risk to both existing and future domestic and commercial abstraction. No effluent will be produced by the converter station site. Therefore, no direct discharges of untreated effluent to watercourses will occur.

Liquid concrete spills and leaching

Spillages of concrete may occur during pouring of the foundation pad, which may runoff into surface watercourses. Concrete is highly corrosive and can cause pH changes in watercourses, adversely affecting species dependant on peaty waters that are naturally acidic.

Concrete works are particularly associated with foundations for the sheds, foundations for outside electrical equipment, roadway construction, drainage culverts etc.

Particular care needs to be taken regarding the storage of cement and other materials, as to where concrete is batch made and to procedures for shuttering and pouring concrete.

Fuel and lubricant spills and leaks

Point source pollution incidents can arise from mechanical construction activities. All vehicles have the potential to develop leaks from hoses and fuel tanks and any refuelling stations have the potential for spilling during refuelling or from storage tank leakage.

The works to construct the converter station will involve the use of the following vehicles (see Section 4.3.9):

- Excavators
- Earth movers / bulldozers
- JCB
- Lorries
- Dumper trucks
- Drilling units
- Cranes
- General personnel vehicles
- Heavy load delivery vehicles

There could be up to 20-30 plant vehicles working on the site at any one time (Section 4.3.8). Refuelling these vehicles on a weekly basis will be a key requirement. This operation provides a key source of risk of spillage, but there are also many measures that can be utilised to firstly avoid and then contain any spillages, such as keeping equipment well maintained and regularly inspected (GEN37), an ensuring refuelling activity only take place within fully bunded areas with sufficient capacity (GEN39). All fuel and other chemicals will be stored in accordance with best management practice and to meet the requirements of the Oil Storage Regulations[72] (see Section 8.6).

Electrical equipment spills and leaks

Some of the electrical equipment that will be used on site, such as transformers, may have specialist cooling or lubricating materials that could be hazardous if they leaked from the equipment or were spilled during topping up etc.

Spillages inside the buildings should be able to be dealt with without any environmental risk arising. Spill prevention and response measures to include the following, will be agreed with SEPA prior to construction as part of the site CEMD. Transformers plinths will be constructed with bunding, oil separation, and flow controls to ensure the platform and the drainage system are not contaminated (GEN40). During construction any fuel storage, vehicle maintenance, refuelling activities will only take place within fully bunded areas with impermeable bases

[72] The Water Environment (Oil Storage) (Scotland) Regulations 2006

and sufficient capacity for 110% of the liquids being handled (GEN39); and spill response kits will be available on site (GEN41).

These measures will reduce the potential adverse residual effects to a **minor** level and will ensure that there is no deterioration in status of water bodies and protected waters.

8.11.7 Decommissioning

Decommissioning activities would be similar in terms of hydrological impacts to those during construction and provided all activities were carefully planned and controlled, impacts would be temporary and non-significant.

8.11.8 Summary

In summary, careful design and implementation of mitigation measures will ensure that impacts on hydrology, drainage, and water quality will be sufficiently managed so the residual adverse effects are **minor**. Predicted residual effects are described in Table 8.9.

Table 8.10 Residual effects of project on hydrology, drainage, and water quality

Issue	Sensitivity	Magnitude of effect	Residual significance
Permanent			
Flooding risks for the site	Moderate	None	No effect
Altered ground and surface water flows	Low	Low	Minor
Impacts on surface water and groundwater abstractions	Low	Low	Minor
Construction			
Disturbance to Achanarras Burn due to construction of pond outflow	High	Very Low	Minor
Sediment rich runoff from poor quality stone used in access track construction	High	Very Low	Minor
Risks of eroded channels on access tracks and in areas of the works leading to increased runoff and sediment loads	High	Very Low	Minor
Compaction of soils by construction traffic reducing permeability and therefore increasing runoff	High	Very Low	Minor
Discharge of construction drainage potentially contaminated with sediments or materials used on site affecting flood storage capacity, water quality, water supplies	High	Very Low	Minor
Impacts from discharge of sewage and effluent from the site compound facilities	High	Very Low	Minor

8.12 Potential for cumulative effects

Given the focus on maintaining good water quality in the Achanarras Burn, it is important to consider the implications of effects from the converter station works in combination with nearby future activities within the catchment that could have similar or antagonistic effects. Currently there are no planned projects within the catchment area of the Achanarras Burn.

8.13 Summary of key findings

This assessment has considered the potential impacts of the project on hydrology, drainage and water quality at the converter station site, including permanent impacts of the development as well as impacts arising during construction.

The approach to the assessment has been to use established knowledge about the area backed up by specific data for the site and further supported by direct field observations. The sensitivity of the hydrology, drainage on the site and on water quality downstream of the site was assessed, and criteria were used to assess the significance of any impacts resulting from these. The following conclusions have been drawn:

- The key hydrological feature in proximity to the site is the Achanarras Burn, which is also a tributary of the River Thurso (an SAC-see Section 9.8.1).
- The converter station is sited above the 1:200 year flood plain.
- The siting of the converter station and appropriate design of the site will ensure that the site is protected from a 1:1000 year flooding event.
- Site design, including detailed drainage plans, will ensure that alterations to ground and surface water flow resulting from re-alignment of drainage ditches, alterations to topography and changed ground conditions do not result in significant effects.
- A Water Protection Plan will be collated, agreed with SEPA and implemented to ensure there are no significant effects arising due to direct or indirect impacts on watercourses due to sedimentation.
- Adequate spill prevention and response measures will reduce the risk of contamination of water courses.
- There are not expected to be any residual significant effects to the hydrology, drainage or water quality as a result of the proposed development.

8.14 References

Aquatera, 2010. *Flood risk at Spittal West converter site*. Unpublished report to Aquatera by Dr. JF Brown. August 2010.

Hicks TG. ed., 2007. *Handbook of Civil Engineering Calculations* Mcgraw-Hill

Reddy RN ed., 2010. *Soil Engineering, Testing, Design and Remediation*, Gene-Tech Books

Robertson M & Davies I., 2009. *A Review of the Sources and Scope of Data on Characteristics of Scottish Waters. An Assessment of the Adequacy of the Data and Identification of Gaps in Knowledge*, Fisheries Research Services Internal Report No 06/09, 14pp. [online] Available at <http://www.frs-scotland.gov.uk/FRS.Web/Uploads/Documents/Int0609.pdf> [Accessed September 2010]

Shaw EM., 1994. *Hydrology in Practice*, Taylor & Francis Ltd

SSE 2009. *Substation Site Selection Guidelines, Applies to HV Substations PR-PS-453 Valid from December 2009 to December 2012.* Unpublished: SSE

URS, 2010. *Proposed substation Spittal West: Flood risk assessment*. Project report to SHETL.

9 Ecology and Nature Conservation

9.1 What is covered in this chapter?

This chapter addresses the potential impacts of the development on both terrestrial and aquatic wildlife in the vicinity of the converter station site, including sites and species designated for conservation interests at international and national levels and other species or habitats of local importance. Measures to mitigate the potential impacts of the proposed development have been addressed.

Physical issues related to the natural environment are considered in:

Chapter 6: Land Use and Utilities
Chapter 7: Geology and Soils
Chapter 8: Hydrology, Drainage, and Water Quality

9.2 Why could the issue be important?

Protection of wildlife and habitats is a key element of the environmental stewardship process for any development project and is required through numerous statutory regulations, policy requirements and as part of good practice. There are also numerous stakeholders including government advisors, non-governmental organisations, local groups and members of the public for whom protection of nature is a key priority.

9.3 Sources of information

The following sources of information have been used:

General information

- Macaulay Land Use Research Institute, 1988. Land Cover of Scotland 1988 (LCS88)
- Google Earth satellite imagery Available at: http://maps.google.co.uk
- Ordnance Survey, 2005. Landranger Map12, Thurso and Wick 1:50,000
- Ordnance Survey, 2003. Wick and the Flow Country, Explorer Maps Sheet 450, 1:25,000
- Ordnance Survey, 2007. Thurso; John O' Groats, Explorer Maps Sheet 451, 1:25,000

Survey results

- Phase 1 habitat survey (JNCC, 2010) and breeding bird survey undertaken by Firth Ecology (Appendix 9-A and Appendix 9-B)
- Protected mammal surveys undertaken by NDR Environmental Services (Appendix 9-B)

Specific datasets

- RSPB dataset on wintering and breeding birds within 2km received on 15/6/2010
- National Biodiversity Network (NBN) Gateway database for ND15 (http://www.searchnbn.net/), accessed 20/7/2010
- Highland Biological Recording Group (HBRD) data within 2km, received 13/8/2010

Relevant published and unpublished reports (see Section 9.14: References)

Consultations and interviews

- Consultations undertaken with various stakeholders including SNH, SEPA and other organisations such as RSPB (see Annex I)
- Records from local wildlife recorders
- Information from local bird recorders
- Personal communication with landowners about use of fields by birds, in particular, over-wintering geese and swans
- Personal communication with River Thurso Superintendent regarding salmon in River Thurso

Web-based information

- SNH, 2010. *Natural Spaces* [online database] Available at: http://gateway.snh.gov.uk/pls/htmldb_ddtdb1/f?p=101:1:2507693899473453594 [Accessed Sept 2010] - used to download protected sites boundary data and ancient woodland and semi-natural woodland inventories
- SNH, 2010. *SiteLink* [online database] Available at: http://gateway.snh.gov.uk/portal/page?_pageid=53,910284,53_920284&_dad=portal&_schema=PORTAL [Accessed Sept 2010] - used to locate designated sites and source citations and conservation objectives
- JNCC, 2010. *UK Protected Sites* [online database] Available at: http://www.jncc.gov.uk/default.aspx?page=4 [Accessed Sept 2010] - used to source information on designated sites, qualifying features and citations
- SEPA, 2010. *River Basin Management Plans Interactive Map* [online] Available at: http://213.120.228.231/rbmp/ [Accessed Sept 2010] - used to identify catchment areas

9.4 Survey and analysis work undertaken

The project specific work that has been undertaken includes the following.

Habitats

- Phase 1 habitat survey (see Appendix 9-A: Phase 1 Habitat Survey Report);

  The survey was carried out on 28th June 2010 using standard methodology (JNCC, 2010). The survey area covered the proposed platform footprint and a surrounding buffer. The survey consisted of a walkover of the entire survey area during which habitats were identified to Phase 1 standard and recorded onto 1:10,000 scale maps. Aerial survey photographs at the same scale were used to assist in accurately marking out the boundaries of different habitat types where they did not coincide with mapped field boundaries. Target Notes were used to record features of particular interest providing supplementary information on the nature conservation value of habitats. Photographs were also taken of key features and areas of interest (see Appendix 9-A). All field boundaries were recorded, with a distinction being made between traditional dry-stone walls and Caithness flag fences.

Birds

- Breeding bird survey (see Appendix 9-B: Breeding Bird and Protected Species Survey Report);

  Two visits were made to the proposed converter station site, the first on 18th June 2010 (06:20 – 07:05) and the second visit on 28th June 2010

(17:45 – 22:45). The first visit consisted of a quick walkover covering the conifer plantation on the northern edge of the site and the two fields south of the trees and back again. On the second visit, the standard Brown and Shepherd (1993) methodology was used to survey the converter station site and a surrounding buffer area. The entire survey area was walked to within 100m of each point on the ground and all evidence of breeding birds recorded. To provide an overview of birds otherwise using the site, all non-breeding species recorded during the breeding bird survey were also noted.

- Desk-based assessment of all available breeding and wintering bird records (see Section 9.14: References); and
- Collation of local knowledge on wintering bird locations, in particular, foraging areas used by over-wintering geese and swans.

Mammals

- Protected mammals survey (see Appendix 9-B: Breeding Bird and Protected Species Survey Report);

  A search of the converter station site and surrounding area was carried out for protected mammal species including badger, pine marten, and wildcat on 5th August 2010 using standard survey methodology (Harris et al. 1989; SNH 2003), as adapted by NDR(ES) to local conditions (NDR(ES) 2010a)[73]. As there are no standard survey methods for pine marten and wildcat, the general survey technique for badger was considered adequate to survey for these species. Standard badger survey methodology recommends an area of search extending to 1km from the periphery of the proposed development area (SNH, 2003). Within the survey area, all fence lines, ditches and woodland were systematically surveyed for field evidence indicating presence of protected mammal species.

  A searching survey of otter and water vole using standard survey methodology (Ward et al. 1994; Strachan and Moorhouse 2006; SEPA 2010; SNH 2008), as adapted by NDR(ES) 2010 for local conditions (NDR(ES) 2010b) was also carried out on 5th August 2010 along Achanarras Burn to a distance of 250m upstream and downstream of the development site[74]. Any field evidence indicating presence of these two species was recorded.

- Desk-based assessment of all protected mammal records.

General

- Observations during site visits in June and August 2010.

9.5 Consultation feedback

Some of the feedback provided during consultation relevant to Ecology and Nature Conservation is listed below. A complete report of consultation feedback can be found in Annex I.

[73] NDR(ES) (2010) Procedures (surveys) 1: Terrestrial mammals. NDR (Environmental Services) Ltd, Castletown.

[74] NDR(ES) (2010) Procedures (surveys) 3: Riparian mammals: Water shrew, *Neomys fodiens*, Water vole, *Arvicola terrestris*, European otter, *Lutra lutra*. NDR (Environmental Services) Ltd, Castletown.

- An Appropriate Assessment would need to be undertaken by the competent authority if there are any potential significant effects on qualifying criteria of a Natura site.
- Infrastructure should not have direct or indirect impacts on wetlands.
- Both wintering and breeding bird interests of designated sites could be potentially affected either through disturbance of roosting or foraging activities or by destruction of nesting habitat.
- Local bird recorders should be contacted to determine if there are any records of sensitive species.
- Fields outwith the SPA should be checked for use by golden plover *(Pluvialis apricaria*).
- Site investigations should include badgers and pine martens as well as water voles and otter; however, no need to survey for bats as no potential roosts will be destroyed.
- An onsite ecologist whose role would be to ensure that disturbance events are avoided or minimised should be employed for the duration of construction.

Information was also obtained through the PAC process (The Highland Council, 2010a; see Section 2.4 and Annex I). Relevant feedback included the following.

- European Sites – River Thurso SAC:
    - Details of proposed mitigation measures to control sediment discharge during construction and operation of the development are required in the event of Appropriate Assessment being undertaken by The Highland Council.
- European Sites – Caithness Lochs SPA:
    - Available data on the use of fields by foraging geese and swans should be collated for the area affected by the development.
- European Protected Species – Otter:
    - The planning application / ES should include proposals for a pre-construction otter survey, and mitigation measures against accidental injury or killing of otters during construction.
- Non-EPS Protected Species:
    - Any evidence for presence of water vole should be recorded during proposed otter surveys.
    - Measures to mitigate impacts of construction disturbance on nesting birds should be included in the ES.
- The process set out in the draft Highland Council Guidance Note Construction Environmental Management Process for Large Scale Projects (The Highland Council, 2010b) should be followed.

9.6 Guidance and regulations

The following legislation affording protection to wildlife in Scotland is relevant to this assessment. Further details on how these regulations afford protection to specific habitats and species have been included where relevant throughout this chapter.

The Birds Directive
Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds, commonly known as the Birds Directive, protects all wild birds, their nests, eggs and habitats within the European Community. It gives

It gives Member States of the European Union the power and responsibility to classify Special Protection Areas (SPAs)[75] to protect birds which are rare or vulnerable in Europe, as well as all migratory birds which are regular visitors.

All SPAs that could be affected by the proposed development are identified in Section 9.8.1 and their qualifying interests are fully considered in the impact assessment.

The Habitats Directive

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora is commonly known as the Habitats Directive. As well as establishing Special Areas of Conservation (SACs)[76] and setting out how they should be protected, the Directive has a number of wider implications, such as those relating to European Protected Species (EPS)[77].

All SACs that could be affected by the proposed development are identified in Section 9.8.1 and their qualifying features are fully considered in the impact assessment. EPS species potentially affected by the development are also identified and fully considered in the assessment.

The Habitats Regulations

In Scotland, the Habitats Regulations[78] implement the species protection requirements of the Habitats Directive in Scotland on land and inshore waters. The Habitats Regulations require that an Appropriate Assessment is carried out by the competent authority if any Natura interests are likely to be significantly affected by a proposed development (see also Section 2.5).

Wildlife and Countryside Act 1981 (as amended)

Part 1 of the Act details a large number of offences in relation to the killing and taking of wild birds, other animals and plants. The degree of protection afforded varies according to which Schedule a species is listed on.

Key Schedules include:

- Schedules 1 - 4 (birds);
- Schedules 5 and 6 (animals);
- Schedule 8 (plants).

National, regional and local planning policies also provide protection for habitats and species.

Local Biodiversity Action Plans (LBAPs)

Where available, Local Biodiversity Action Plans (LBAPs) are used to inform planning policy. In Scotland, the Scottish Biodiversity Group promotes the preparation of LBAPs as a means of identifying which habitats and species are priorities for conservation action at a local level. LBAPs are based on the UK BAP list of priority species and habitats which identifies species in need of conservation

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[75] SPAs are strictly protected sites classified in accordance with Article 4 of the Birds Directive. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive) and for regularly occurring migratory species.

[76] SACs are strictly protected sites classified in accordance with Article 3 of the Habitats Directive. This classification requires the establishment of a European network of important high quality conservation sites that will make a significant contribution to conserving the habitats and species identified in Annexes I and II of the Directive (as amended).

[77] Species of animals and plants listed on Annex IV of the Habitats Directive

[78] The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

action at a national level using the application of criteria based on international importance, rapid decline and high risk (Biodiversity Reporting and Information Group, 2007). The Caithness LBAP lists the local priority habitats and species present within the region (Caithness Biodiversity Group, 2003).

UK BAP priority species and any other species listed in the Caithness LBAP present at the site have been identified and are given full consideration in the assessment in the sections below.

9.7 Methodology

A desk-based assessment was undertaken of available information on ecology in the area, including acquisition of datasets of protected species relevant to the development area and other information from local sources. Additional surveys and studies were done at the converter station site for vegetation, breeding birds, and mammals (see Section 9.4).

The methodology used to assess the significance of potential effects on ecological receptors has been adapted from guidelines produced by the Institute of Ecology and Environmental Management (IEEM, 2006). The appraisal of predicted effects on ecological receptors is based on both the value of a receptor and the nature and magnitude of the effect 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 outside the development area).

9.7.1 Value of receptors

The first stage is to evaluate the nature conservation value of the receptors present at the converter station site using professional judgement based on available guidance and information. The value or potential value of an ecological resource or feature has been determined within a defined geographical context. Species' populations and habitats have been valued using the scale set out in Table 9.1, which shows examples provided of the criteria used to define the level of value.

Legal protection of species

There is also a need to identify all legally protected species that could be affected by the proposed development in order that measures can be taken to ensure that contravention of the relevant legislation is avoided. This may include licensing and the adoption of mitigation which is acceptable to Scottish Government and/or SNH. By implication, therefore, it is inappropriate to appraise the effects within the context of species' legal protection - effects on such species have to avoid contravention of the law, otherwise the development cannot be taken forward.

Table 9.1 Categories used to assign nature conservation value of ecological receptors together with examples of the criteria used

Level of value	Examples of criteria
International	Internationally important sites include: SACs, SPAs and Ramsar[79] sites. Candidate SACs, potential SPAs and proposed Ramsar sites should be given the same consideration as designated sites A qualifying feature of an SAC, SPA or Ramsar site or notified feature of a SSSI[80] A regularly occurring substantial population of an internationally important species (listed on Annex I of the Birds Directive or Annex II or IV of the Habitats Directive)
National (UK)	A nationally important designated site e.g. SSSI, or a site considered worthy of such designation A viable area of a 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 A regularly occurring substantial population of a nationally important species, e.g. listed on Schedules 1, 5 & 8 of the Wildlife and Countryside Act (1981) (as amended)
Regional: Scotland	UK BAP Priority species and habitats Areas of internationally or nationally important habitats which are degraded but are considered readily restored A regularly occurring, regionally significant population of a species listed as being nationally scarce Sites supporting species in regionally important numbers (>1% of regional population)
Local Authority Area (in this case, Caithness)	Viable areas of UK BAP priority habitat or smaller areas of such habitat which are essential to maintain the viability of a larger whole A site designated as a non statutory designated site A regularly occurring, substantial population of a nationally scarce species, including species listed on the UK and Local BAPs
Local (site and its vicinity, including areas of habitats contiguous with or linked to those on site)	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration A good example of a common or widespread habitat in the local area, e.g. those listed as broad habitats on the Local BAP Species of national or local importance, but which are only present very infrequently or in very low numbers within the subject area

9.7.2 Magnitude of effect

The IEEM guidance then recommends that the predicted impacts on the receptors be described and quantified, giving consideration to the following parameters:

[79] Ramsar sites are wetlands of international importance designated under the Ramsar Convention. The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) was adopted in Ramsar, Iran in 1971. The UK ratified the Convention in 1976. As a matter of policy the Governments in England, Scotland and Wales extend the same protection to listed Ramsar sites in respect of new development as that afforded to SPAs and SACs.

[80] Sites of Special Scientific Interest (SSSIs) are sites designated for their natural heritage and/or geological interests and together form a network of the best examples of species, habitats and rock and landform features throughout Scotland.

confidence in predictions, positive or negative, extent, magnitude, duration, reversibility and timing and frequency. These factors are brought together to assess the magnitude of the effect on the 'conservation status' of the particular valued ecological receptors, and on the 'integrity'[81] of the habitats that support them.

Conservation status is defined as:

- for habitats, conservation status is determined by the sum of the influences acting on the habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area; and
- for species, conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.

Wherever possible, the magnitude of the effect has been quantified. Professional judgement has been used to assign the impacts on the receptors to one of four levels of magnitude, defined in Table 9.2.

Table 9.2 Definitions of magnitude for ecology and nature conservation

Magnitude of effect	Definition
High	A permanent or long-term effect on the integrity of a site or conservation status of a habitat, species assemblage / community, population or group. If adverse, this is likely to threaten its sustainability. Major loss or major alteration to key elements of the baseline (pre-development) conditions such that the post-development character / composition / attributes will be fundamentally changed.
Medium	A permanent or long-term effect on the integrity of a site or conservation status of a habitat, species assemblage / community, population or group. If adverse, this is unlikely to threaten its sustainability. Loss or alteration to one or more key elements / features of the baseline conditions such that post-development character / composition / attributes will be partially changed.
Low	A short-term but reversible effect on the integrity of a site or conservation status of a habitat, species assemblage / community, population or group that is within the range of variation normally experienced between years. Minor shift away from baseline conditions. Change arising from the loss / alteration will be discernable but underlying character / composition / attributes of the baseline condition will be similar to the pre-development situation.
Very low	A short-term but reversible effect on the integrity of a site or conservation status of a habitat, species assemblage / community, population or group that is within the normal range of annual variation. Very slight change to the baseline condition. Change barely distinguishable, approximating the 'no change' situation.

[81] 'the coherence of a site's ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified'

9.7.3 Assessing significance

An ecologically significant impact is defined as an impact (negative or positive) on the integrity of a defined site or ecosystem and / or the conservation status of habitats or species within a given geographical area. Professional judgement has been used to determine whether an impact is significant or not based on the value of the ecological receptor and the magnitude of the predicted impact on it. The levels of effect are shown in Table 9.3. Those categorised as Moderate and above are considered Significant.

Table 9.3 Impact significance based on value of receptor and magnitude of effect

Value of receptor	Magnitude of effect								
	High	Medium	Low	Very low	None	Very low	Low	Medium	High
International	Major	Major	Moderate	Minor	Neutral	Minor Positive	Moderate positive	Major positive	Major positive
National (UK)	Major	Moderate	Moderate	Minor	Neutral	Minor Positive	Moderate positive	Moderate positive	Major positive
Regional (Scotland)	Major	Moderate	Minor	Minor	Neutral	Minor Positive	Minor Positive	Moderate positive	Major positive
Caithness	Moderate	Moderate	Minor	Negligible	Neutral	Negligible Positive	Minor Positive	Moderate positive	Moderate positive
Local	Moderate	Minor	Minor	Negligible	Neutral	Negligible Positive	Minor Positive	Minor Positive	Moderate positive

9.7.4 Study limitations and assumptions

The Brown and Shepherd (1993) method for surveying breeding waders requires a minimum of two visits, one early in the season (early April – mid-May) and the second, mid-May to late June. A full Brown and Shepherd survey could not be undertaken at the proposed converter station site due to the lateness in the season when the site first became an option. It was agreed with SNH that a partial survey at this time combined with a desk-based assessment using local information would provide a good indication of breeding birds at this site taking into consideration the possibility that a few early nesters could be missed.

9.8 Established baseline conditions

9.8.1 Designated sites

The proposed converter station site is outwith any sites designated for nature conservation interests at European, national or local levels. However, there are several sites designated for nature conservation interests of European or national importance within the wider area (see Figure 9.1). In particular, the Achanarras Burn flows into the River Thurso SAC, approximately 2.5km downstream from the proposed site.

Those sites of European importance that have qualifying interests that could potentially be affected by the proposed development are listed in Table 9.4, along with their corresponding qualifying interests. The potential connections between the development and the qualifying interests, along with the proximity to the proposed development area are discussed below.

Table 9.4 Designated nature conservation sites of European importance with qualifying interests with potential connections to the proposed development

Site name	SAC qualifying features
River Thurso SAC	**Annex II species[82] that are a primary reason for site selection: Atlantic salmon** *(Salmo salar)*

<table>
<tr><th>Site name</th><th colspan="3">SPA and Ramsar qualifying features</th></tr>
<tr><td rowspan="6">Caithness Lochs SPA, Ramsar</td><td colspan="3">Over winter, the site supports the following populations of European importance</td></tr>
<tr><td>Annex I[83] species:</td><td>Number</td><td>% of wintering GB population</td></tr>
<tr><td>Whooper swan (Cygnus cygnus)</td><td>250 individuals</td><td>4.5%</td></tr>
<tr><td>Greenland white-fronted goose (Anser albifrons flavirostris)</td><td>183 individuals</td><td>1.3%</td></tr>
<tr><td>Migratory species[84]</td><td>Number</td><td>% wintering Iceland / UK / Ireland population</td></tr>
<tr><td>Greylag goose (Anser anser)</td><td>6,872 individuals</td><td>6.9%</td></tr>
</table>

Site name	SAC qualifying features
Caithness and Sutherland Peatlands SAC	**Annex II species that are a primary reason for site selection:** Otter *(Lutra lutra);* **Annex I[85] habitats that are a primary reason for site selection:** Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the Isoëto-Nanojuncetea; Natural dystrophic lakes and ponds; Blanket bog **Annex I habitats present but not a primary reason for site selection:** Northern Atlantic wet heaths with *Erica tetralix*; Transition mires and quaking bogs; Depressions on peat substrates of the Rhynchosporian

[82] Species listed on Annex II of the EC Habitats Directive (92/43/EEC)
[83] Rare or vulnerable species listed in Annex I of the EC Birds Directive (79/409/EEC)
[84] Regularly occurring migratory species not listed in Annex I of the EC Birds Directive (79/409/EEC) (Article 4)
[85] Habitats listed in Annex I of the EC Habitats Directive (92/43/EEC)

Site name	SPA qualifying features		
Caithness and Sutherland Peatlands SPA, Ramsar	**During the breeding season, the site supports the following populations of European importance**		
	Annex I species:	**Number**	**% of breeding GB population**
	Black-throated diver *(Gavia arctica)*	26 pairs	16.3%
	Red-throated diver *(Gavia stellata)*	89 pairs	9.5%
	Golden eagle *(Aquila chrysaetos)*	5 pairs	1.3%
	Golden plover *(Pluvialis apricaria)*	1,064 pairs	4.7%
	Hen Harrier *(Circus cyaneus)*	14 pairs	2.8%
	Merlin *(Falco columbarius)*	54 pairs	4.2%
	Short-eared owl *(Asio flammeus)*	30 pairs	3.0%
	Wood sandpiper *(Tringa glareola)*	5 pairs	up to 50%
	Migratory species:	**Number**	
	Dunlin *(Calidris alpina schinzii)*	1,860 pairs	
	Greenshank *(Tringa nebularia)*	256 pairs	-
	Common scoter *(Melanitta nigra)*	27 pairs	-
	Wigeon *(Anas penelope)*	43 pairs	-
	Ramsar qualifying species		
	Species regularly supported during the breeding season: Dunlin		

River Thurso SAC

The River Thurso SAC is designated for its population of Atlantic salmon. The river supports the full range of salmon life-history types including multi sea-winter salmon, grilse and smolts. The Achanarras Burn, which forms the western boundary of the development area, is within the River Thurso catchment area. The development area is approximately 2.5km upstream of the River Thurso SAC. Construction works have the potential to affect the Achanarras Burn, which could have a downstream effect on the River Thurso SAC and an Appropriate Assessment will be required (see Annex IV).

The health and status of the salmon population in the River Thurso is unknown. However, recent catches from salmon fishing on the River Thurso have shown a marked increase, which coincides with the cessation of netting for salmon at the mouth of the River Thurso and also a strong initiative to attract anglers to the River Thurso. The water quality of the River Thurso, as assessed in its river basin management plan, is considered good and is anticipated to remain in that state in the foreseeable future (see Section 8.8.6). Some small (<10cm) salmonid fish were observed in Achanarras Burn in the slightly deeper water just downstream of the track crossing near the converter site during a site visit. The Halkirk Burn, further downstream of the converter station site and within the Thurso River SAC, is an important spawning area for salmon (River Thurso Superintendent, personal communication, 6 October 2010).

The schedule and conservation objectives for this SAC can be found in Appendix 9-C.

Caithness Lochs

Caithness Lochs qualifies as a SPA and a Ramsar site by supporting wintering populations of European importance of whooper swan, Greenland white-fronted goose and greylag goose. Caithness Lochs comprises six separate lochs and a mire, the nearest of which are Loch Scarmclate located 5km to the northeast of the site and Loch Watten which lies 6km to the east of the site. Over-wintering geese and swans forage in areas of agricultural land outwith the designated sites; therefore there is potential that they could be affected by the development. Construction activities could potentially temporarily displace foraging geese and swans if construction works were to take place during the period when the qualifying species are present (October to April inclusive).

Caithness and Sutherland Peatlands

The Caithness and Sutherland Peatlands qualifies as a SAC, SPA and Ramsar site as one of the largest and most intact areas of blanket bog in the world, supporting a good population of otter and a wide variety of breeding birds including internationally important populations of raptors, wildfowl and waders including golden plover (*Pluvialis apricaria*). The site covers an extensive area of over 1455km^2 made up of numerous non-contiguous component parts. The component part nearest the development area is the Shielton Peatlands which lies approximately 7km to the southeast. Although golden plover nest and rear their chicks in bogs within the SPA, adults forage in agricultural fields located close to the SPA (Whitfield & Thomas, 2006). Fields used for foraging by golden plovers breeding in the SPA are a potentially important supporting habitat for an SPA interest.

Construction activities have the potential to affect otter and could possibly affect some of the Caithness and Sutherland Peatlands SPA qualifying features if these populations were to use the proposed converter station site or surrounding area as foraging habitat.

9.8.2 Vegetation and habitats

The Phase 1 habitat survey map for the platform footprint and surrounding area is shown in Figure 9.2 and in Appendix 9-A along with the corresponding Target Notes and photographs. There are no protected habitats or nationally important priority habitats present within the proposed converter station site or surrounding area. The closest area classified as Ancient Woodland[86] is 1.5km northwest of the development area.

There are four broad habitat types listed as locally important priority habitats in the Caithness LBAP, which are present within the proposed converter station site and surrounding area; these are: improved grasslands, coniferous plantations, rivers and burns and hedges and dykes.

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[86] Ancient woodland in Scotland is land that is currently wooded and has been continually wooded, at least since 1740 and can have high nature conservation value.

The extent of the planning area will be some 30ha with a development area of approximately 11ha (platform and batter slopes). The entire development area, including the platform area, is located in an improved grassland field, with improved grassland fields to the east, southeast, and south. The improved grasslands are typical of the area, reseeded, with perennial ryegrass *Lolium perenne* and quite often timothy *Phleum pratense* and/or white clover *Trifolium repens*. The more recently reseeded fields are dominated by ryegrass or a mixture of the above, typically growing tall for silage. Older improved pastures also have other grasses and common grassland plants such as Yorkshire-fog *Holcus lanatus* and crested dog's-tail *Cynosurus cristatus*.

The field in which the proposed platform area is located has borders of species-poor semi-improved grassland along its northern and western edges. There is a fence marking the field boundary to the east of the site. Between this fence and the ditch below is a 1-2m wide unimproved acid grassland bank (Target Note <u>ev</u>).

On the opposite side of this ditch, the field to the east and uphill of the site is a patchily improved field, with large areas of reinvading soft rush *Juncus effusus* and creeping buttercup *Ranunculus repens*, as well as various plants of wet conditions too, more dense in areas forming marshy grassland (Target Note <u>eu</u>).

On the western edge of the development area is the Achanarras Burn, a shallow, narrow watercourse lined with meadowsweet *Filipenula ulmaria*, cow-parsley *Anthriscus sylvestris*, stinging nettle *Urtica dioica*, and iris *Iris pseudacorus* (Target Note <u>ew</u>, Plate 9.1). Further upstream, the burn is open to grazing and with little vegetative interest (Target Note <u>ex</u>, Plate 9.2).

To the south of the site is a Caithness flag fence. On the other side of this is a wet ditch, 1 to 1.5m deep, with a partly vegetated muddy bottom (Target note <u>ey</u>, Plate 8.4).

The northern part of the planning area includes a coniferous plantation (shelterbelt) of approximately 3ha (see Figure 9.2) located north of the development area. A track runs along the northern edge of this plantation. A narrow strip of ground north of the access track will be planted in trees to augment the screening provided by the existing shelterbelt (see Section 4.2.11). This area of some 3ha is currently in grassland, including improved fields, a small patch of semi-improved grassland, and a marshy grassland field.

Outside of the planning area to the west / northwest of the site across the Achanarras Burn is a young open mixed plantation sown over former agricultural land. North of the plantation is a strip of acid grassland grading into wet heath. Across the burn and to the south / southwest are semi-improved grassland fields sown with a flower-rich seed mix. South of the sown fields is another open mixed plantation surrounding a patch of marshy grassland.

9.8.3 Birds

Breeding birds

A desk-based assessment of all available records was conducted for all internationally and nationally important species recorded within 2km of the converter station site. The only records for the area were for foraging short-eared owl (*Asio flammeus*) (Annex I[87]) and barn owl (*Tyto alba*) (Schedule 1[88]) recorded approximately 1km to the east of the site in areas of marshy grassland and gorse.

There are no records of foraging golden plover for the proposed development area during the breeding season. In a study by Whitfield *et al.* (2006), golden plover were found to select fields with poor drainage with a sward kept short by sheep grazing and some cover of rushes. The results also showed that improved grassland fields, such as those drained, ploughed and planted with single palatable grass species or used for silage production, would be avoided.

During the breeding bird survey, a single pair of curlew (*Numenius arquata*) (a UK BAP priority species) was recorded breeding within the proposed platform area. Other species recorded breeding within the adjacent improved grassland fields included low numbers of species typically found nesting within this type of habitat; including curlew, skylark (*Alauda arvensis*), (both UK BAP priority species), oystercatcher (*Haematopus ostralegus*), meadow pipit (*Anthus pratensis*), pied wagtail (*Motacilla alba*) and wheatear (*Oenanthe oenanthe*). Two common linnets (*Carduelis cannabina*) (a UK BAP priority species) were observed foraging within the improved grassland fields.

Within the coniferous plantation strip along the northern boundary of the development area, one pair of long-eared owl (*Asio otus*), one pair of kestrel (*Falco tinnunculus*) (both LBAP species) and one pair of buzzard (*Buteo buteo*) were recorded breeding. Hunger calls of long-eared owl chicks were heard in late May along the eastern edge of the plantation. At this time of year, the young are likely to have still been in the nest (Hardey *et a*l., 2006).

Two male reed buntings (*Emberiza schoeniclus*) (a UK BAP priority species) were observed within the marshy grassland to the southwest of Achanarras Farmhouse. Two lesser redpolls (*Carduelis cabaret*) (a UK BAP priority species) were heard singing in the young open mixed plantations to the west of the site.

Birds of national or local importance recorded during the breeding bird survey at the proposed platform area and surrounding area are shown in Table 9.5. Full results of the breeding bird survey can be found in Appendix 9-B. Although the area was surveyed towards the end of the breeding season, taking into account that a few early nesters may have been missed, the range of species observed and the low numbers of breeding birds recorded are considered to be representative of the relatively low ecological importance of the habitats present at the site to breeding birds.

Table 9.5 Birds recorded during the breeding bird survey at the converter station site

Habitat type	Species	Numbers recorded	Breeding status	Conservation status
Improved grassland	Curlew *(Numenius arquata)*	1-2 pairs	Breeding	UK BAP
	Skylark *(Alauda arvensis)*	2 birds seen together	Probably breeding	UK BAP

[87] Rare or vulnerable species listed in Annex I of the EC Birds Directive (79/409/EEC)
[88] Schedule 1 of the Wildlife and Countryside Act (1981) (as amended)

Habitat type	Species	Numbers recorded	Breeding status	Conservation status
	Oystercatcher *(Haematopus ostralegus)*	4 pairs	Breeding	LBAP
	Meadow pipit *(Anthus pratensis)*	2 nests found	Breeding	LBAP
	Common linnet *(Carduelis cannabina)*	2 individuals	Feeding	UK BAP
	Starling *(Sturnus vulgaris)*	10 individuals	Feeding	UK BAP
Coniferous plantation	Buzzard (*Buteo buteo*)	1 pair	Breeding	
	Kestrel *(Falco tinnunculus)*	1 pair plus a juvenile	Breeding	LBAP
	Long-eared owl *(Asio otus)*	1 pair (hunger calls of young heard on 28th May along eastern edge)	Breeding	LBAP
	Goldcrest *(Regulus regulus)*	1 individual	Present	LBAP
	Chaffinch *(Fringilla coelebs)*	2 individuals	Present	LBAP
Marshy grassland	Snipe *(Gallinago gallinago)*	2 birds heard drumming	Possibly breeding	LBAP
	Reed bunting *(Emberiza schoeniclus)*	2 males	Present	UK BAP
	Meadow pipit (*Anthus pratensis)*	5 individuals	Present	LBAP
	Oystercatcher (*Haematopus ostralegus*)	1 individual	Present	LBAP
	Skylark (*Alauda arvensis*)	1 singing	Present	UK BAP
Young plantations	Lesser redpoll *(Carduelis cabaret)*	2 singing	Possibly breeding	UK BAP

The landowner provided the following additional information regarding breeding birds within the area for the 2010 season:

- long-eared owls (*Asio otus*) also use the shelterbelt near the Spittal Mains farmhouse, approximately 870m to the southeast of the converter station site boundary (Figure 9.2). As no long-eared owls were seen near the farmhouse in 2010, this may indicate that the pair using the shelterbelt plantation within the converter station site boundary in 2010 use the farmhouse shelterbelt as an alternate nest site.
- barn owls (Schedule 1) were occasionally observed in the farm buildings by the Achanarras Farmhouse, approximately 300m to the southwest of the site indicating a possible breeding site;
- a grasshopper warbler (*Locustella naevia*), (UK BAP priority species) was heard singing in the marshy grassland approximately 500m to the southwest of the site;

- the site was *not* used by breeding lapwing (*Vanellus vanellus*) (a UK BAP priority species)

Wintering birds

In winter, migrant geese are present in Caithness between the months of October and April. Agricultural land provides important foraging habitat for large numbers of waders and wildfowl throughout Caithness. The suitability of foraging habitat and therefore the distribution of species present from year to year are greatly influenced by how the land is in use at that time. Late autumn ploughing provides foraging habitat for autumn passage and over-wintering waders. Improved grassland fields and stubble fields provide important foraging habitat for over-wintering geese and whooper swans (*Cygnus cygnus*). Other agricultural practices such as supplement feeding of sheep may attract whooper swans in winter; whereas, any sheep on fields will deter foraging geese. Movement of agricultural vehicles, presence of people, drainage activities, stock levels and shooting of wildfowl will all further influence abundance and distribution of bird species in the area.

To establish the importance of the site and surrounding area to wintering birds, a desk-based assessment of wintering bird records was conducted and the opinion of local bird experts and landowners was sought.

The desk-based assessment found anecdotal evidence of mixed flocks of over-wintering greylag geese (*Anser anser*) (SPA qualifying species[89]) and pink-footed geese (*Anser brachyrhynchus*) (LBAP species) using the improved grassland fields to the south of the proposed development area sporadically over the last 30 years. According to surveys in recent years, geese were occasionally seen in the fields to the south of the development area only when there were standing pools present, and no more than 200 were seen at any one time. The impact of the proposals on geese are considered further in the Habitats Regulations Assessment (HRA), see Annex IV.

In the wider area, existing records show that flocks of up to 2,000 foraging geese regularly forage in the fields to the south of Loch Scarmclate and to the north of Loch Watten, both regularly used roost sites. To the southeast of the proposed development area, the fields to the north of Loch Toftingall around the Spittal Quarry area are also regularly used. Geese and swans leave their overnight roosts at dawn each morning to forage in the surrounding agricultural fields. Geese in Caithness are known to forage up to 8km away from their roost sites on fair weather days, often returning to particularly favoured fields (Mainwood, 1996). They move back towards their roost sites in stages, stopping off to feed in fields along the way before returning to the lochs at dusk.

Flocks of whooper swans (SPA qualifying species) have been recorded foraging within 1km of the converter station site within arable and improved grassland fields to the northeast of the site, to the east of the A9(T). Whooper swans have also been regularly observed approximately 3km to the southeast of the site in the Knockglass area.

Records from the mid 1980s show that small numbers of Greenland white-fronted geese (*Anser albifrons flavirostris*) (SPA qualifying species) occasionally used Loch Scarmclate and Loch Toftingall as roost sites and were also recorded

[89] Caithness Lochs SPA qualifying species

foraging in fields in the Knockglass area (Laybourne & Fox, 1985); however, there is no recent recorded evidence of any population using either of these roost sites (Laybourne & Legg, 1995). There is no evidence to suggest that the proposed converter station site or surrounding area is used by this species.

Large flocks of up to several thousand golden plover (Annex I) have been recorded in early spring on passage in the Knockglass area with smaller flocks observed in the Spittal Quarry area. There is anecdotal evidence of golden plover using the fields to the south of the proposed converter station site in winter or on passage.

9.8.4 Mammals

A desk-based assessment of all protected mammal species recorded within 2km of the converter station site was conducted and the findings are listed in Table 9.6 along with details of each species' protection status under international and/or national legislation.

Table 9.6 Conservation status of protected mammal species recorded within 2km of the converter station site

Species	Conservation status	Evidence	Source[a]
Otter *Lutra lutra*	European Protected Species WCA, 1981: Schedule 5; UK BAP	Spraints	(RPS, 2007): 2006; HBRG: 2003; NBN: 2003, 1985
Scottish wildcat *Felis silvestris*	European Protected Species UK BAP	Not specified	NBN: 1985
Water vole *Arvicola terrestris*	WCA, 1981: Schedule 5; UK BAP	Not specified	NBN: 1985
Roe deer *Capreolus capreolus*	LBAP	Pair observed	HBRG: 1997
Water shrew *Neomys fodiens*	LBAP	Not specified	NBN: 1985
Weasel *Mustela nivalis*	LBAP	Individual seen	HBRG: 2002

[a] HBRG = Highland Biological Recording Group; NBN = National Biodiversity Network

The protected mammal survey of the converter station site found evidence of otter using the Achanarras Burn. In addition, a pair of roe deer (LBAP species) was observed in the young plantation across the burn from the development area. No other mammal species or signs were observed during the mammal survey.

Otter (EPS)

Otter is afforded the highest level of species protection as a European Protected Species (EPS), protected under Annex II and IV of the EC Habitats Directive (92/43/EEC). The Habitats Directive is transposed in Scottish law by the Habitats Regulations 1994. Otter is listed on Schedule 2 of the Conservation Regulations 1994. The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007 enhanced this protection. It is illegal to:

- deliberately or recklessly[90] kill, injure or take (capture) an otter;
- deliberately or recklessly disturb or harass an otter;
- damage, destroy or obstruct access to a breeding site or resting place of an otter (i.e. an otter shelter).

Thus, otter shelters (holts or resting places) are legally protected whether or not an otter is present.

Otter has been recorded within 2km of the converter station site on several occasions in recent years (see Table 9.6). During the protected mammal survey at the converter station site, two otter spraints were recorded along the Achanarras Burn adjacent to the planning area boundary. No evidence of holts or resting places used by otters was recorded at the site. It is likely that otter use the Achanarras Burn with its steep embankments and good vegetative cover irregularly as a corridor (see also Appendix 9-B).

Scottish wildcat (EPS)
The Scottish wildcat is afforded the same protection status as the otter. There is only one record for wildcat within 2km of the site, dating from 1985. Wildcat inhabit the margins of mountains and moorlands with rough grazing, often combined with forests and some crops. They avoid high mountains, coasts and intensive agriculture in fertile lowland areas (SNH, 2010). Although wildcats may occasionally pass through the area, it is considered unlikely that the site provides critical habitat for this species.

Water vole (Schedule V WCA)
The water vole is afforded legal protection through inclusion on Schedule 5 of the Wildlife and Countryside Act (1981) in respect of Section 9 (a) (as amended by the Nature and Conservation (Scotland) Act (2004). This section of the Act protects water vole places of shelter. Legal protection means that it is an offence to intentionally or recklessly damage, destroy or obstruct access to any structure or place which water vole use for protection or shelter. This legislation means that water vole habitat is fully protected in Scotland.

A study has shown that the water vole is widely distributed throughout Caithness with peatland habitats being the most suitable and the best populated (Fraser *et al.*, 2005). The water vole occurs in watercourses with stepped or steep inclined banks into which the vole can burrow and create nest chambers above the water table. The best sites have continuous tall and luxuriant riparian plants.

Water voles were recorded in the Achanarras Burn in 1985. However, no evidence of water vole was recorded during the survey for the converter station site. The survey of Achanarras Burn identified that in some areas the burn has good vegetative cover and has the potential to provide suitable feeding and burrowing grounds for water vole (Plate 9.1), while in other areas the Achanarras Burn is open to grazing, with little habitat interest (Plate 9.2).

The field drainage ditches provide less potential for water vole. The ditch running along the east of the proposed site was at times dry during the summer with no habitat suitable for water vole (Plate 8.3). The ditch to the south of the platform

[90] Reckless acts would include disregard of mitigation aimed at protecting otters, resulting in killing, injury, and/or disturbance of any otter or otter resting place.

footprint runs dry for a portion of its length, but does provide good vegetative cover near its junction with the Achanarras Burn (Plate 8.4).

Other species
There are no records of any bat species for the proposed converter station site. It was agreed with SNH that bat roost surveys were not required as no suitable roosting habitat will be disturbed by the project.

There are single records for weasel and water shrew, both LBAP species.

9.8.5 Aquatic life

The Achanarras Burn forms the western boundary of the development area. This burn flows into the Halkirk Burn approximately 2.5km downstream, which then flows into the River Thurso (see Section 9.8.1). The River Thurso is designated under the EC Freshwater Fish Directive (78/659/EEC) and is designated as an SAC as it supports an internationally important population of Atlantic salmon (see Section 9.8.1).

Small salmonids were observed in the Achanarras Burn in the slightly deeper water just downstream of the track crossing near the development area during a site visit. Salmon are known to spawn in the Halkirk Burn, downstream of the Achanarras Burn (River Thurso Superintendent, personal communication, 6 October 2010).

Freshwater pearl mussel (Margaritifera margaritifera) (FWPM)

The freshwater pearl mussel is an Annex II species under the Habitats Directive, and is protected under Schedule 5 of the Wildlife and Countryside Act in addition to being a UK BAP priority species. Freshwater pearl mussels live in coarse sand and fine gravel stabilised amongst large stones or boulders in clean, oligotrophic, fast-flowing and unpolluted rivers and streams (Skinner *et al*., 2003). FWPM require the presence of salmonids to complete their life cycle.

The characteristics of Achanarras Burn suggest that it is very unlikely that FWPM would be present. The Achanarras Burn experiences low summer flow velocities which may result in low oxygen levels. The substrate is predominantly flagstone sheets with cobbles and large stones, with very little gravel between the cobbles and areas of mud and silt in places. During the summer months, long stretches of the burn are completely covered by overhanging vegetation (Plate 8.1). Immediately upstream of the development area, the burn is open to grazing (Plate 9.2).

9.8.6 Other wildlife

Amphibians and Reptiles

There are no internationally protected species of amphibians or reptiles present in Caithness. Six species of national importance have been recorded in Caithness; three species of reptiles: adder (*Vipera berus)*, slow worm (*Anguis fragilis*) and common lizard, (*Lacerta vivipara*), and three species of amphibian: common toad (*Bufo bufo*), common frog (*Rana temporaria*) and palmate newt (*Lissotriton helveticus*). The reptiles are protected under Schedule 5 of the Wildlife and Countryside Act (1981) against intentional or reckless killing and injury and against trade. The three widespread species of amphibian are also protected under

Schedule 5 of the WCA (1981) but only against trade. Adder, common toad, slow-worm and common lizard are also listed as UK BAP priority species.

Records of amphibians and reptiles are in general very sparse for Caithness. There is only one record from 1986 of a common lizard found within 2km of the proposed converter station site.

Invertebrates

Highland Biological Recording Group records indicate that seven species of butterfly have been found within 200m of the converter station site. These include:

- Small tortoiseshell (*Aglais urticae);*
- Small copper (*Lycaena phlaeas);*
- Meadow brown (*Maniola jurtina);*
- Large white (*Pieris brassicae);*
- Green-veined white (*Pieris napi);*
- Common blue (*Polyommatus icarus); and*
- Red admiral (*Vanessa atalanta).*

None are listed as of local importance in the Caithness LBAP.

9.9 Range of possible impacts

The possible impacts of the development on ecology and nature conservation are presented in Table 9.7 along with a score for the significance of potential impacts prior to mitigation as determined using the methodology outlined in Section 9.7. Pre-mitigation significance scores consider the highest sensitivity receptors.

As there are no protected habitats or nationally important priority habitats present within the proposed converter station site or surrounding area, the sensitivity of vegetation and habitats is considered to be of **local** value only.

Breeding birds at the site are considered to be of **local** value only, as only very low densities of ground-nesting species such as curlew and skylark (UK BAP priority species) would be directly affected by the development footprint. Other species of local importance within the surrounding area could potentially be subject to temporary noise and visual disturbance during construction activities.

Use of the site by wintering birds is considered to be an issue of **international** value, as improved grassland fields such as those present at the site may provide potential foraging habitat for over-wintering geese from nearby SPAs.

Potential impacts on otter are also considered to be of **international** value as otter, which are known to occasionally use the site, are an EPS species. Potential impacts on water vole are considered to be of **national** value or sensitivity; however, as a legally protected species, measures must be taken to ensure that contravention of the relevant legislation is avoided.

Finally, the sensitivity of aquatic life is classified as **international** as Atlantic salmon is a qualifying species of the River Thurso SAC which is located downstream.

Table 9.7 Summary of identified potential impacts associated with ecological issues at the converter station site and scoring of significance prior to mitigation

Issue	Sensitivity	Magnitude of effect	Pre-mitigation significance
Permanent			
Permanent loss of approximately 14ha of improved grassland	Local	Low	Minor
Permanent loss of fewer than 10 trees for access track construction	Local	Very low	Negligible
Planting of trees on approximately 10ha of improved grassland	Local	Medium	Minor positive
Loss of approximately 14ha of improved grassland breeding habitat	Local	Medium	Minor
Construction			
Noise / visual disturbance to breeding birds within the vicinity due to construction activities	Local	Low	Minor
Displacement of foraging wintering birds due to noise / visual disturbance	International	Very low	Minor
Death / injury risk to otters entering open excavations	International	Low	Moderate
Noise / visual disturbance to otter during construction activities	International	Very low	Minor
Damage to aquatic habitats due to increased sedimentation (effects on otter and salmon)	International	Low	Moderate
Potential effects on vegetation due to contamination from leaks and spills	Local	Very low	Negligible
Potential effects on aquatic habitats due to contamination from leaks and spills (otter and salmon)	International	Low	Moderate
Operation and maintenance			
Disturbance to otter from operation of converter station and maintenance activities	International	Very low	Minor
Potential effects on vegetation due to contamination from leaks and spills	Local	Very low	Negligible
Potential effects on aquatic habitats due to contamination from leaks and spills (otter and salmon)	International	Low	Moderate

9.10 Mitigation

The following intervention measures address the potential impacts to ecology and nature conservation (see Table 9.8).

Table 9.8 Catalogue of agreed intervention measures related to ecological issues

Ref	Title	Measure
ECO1	CEMD	The site CEMD will include an Ecological Management Plan and a Post Construction Restoration Plan to help safeguard and where practical enhance biodiversity interests. The plans will include measures to ensure that habitats are protected and restored.
ECO2	ECoW	The contractor will be required to appoint an Environmental Clerk of Works (ECoW) with a good background ecological knowledge to oversee the works to ensure the successful implementation of all ecological, hydrological and environmental mitigation measures as well as with any SNH agreements (see also GEN 9). SHETL's ECoW will also audit the site on a regular basis.
ECO3	Breeding Birds	No stripping of ground vegetation or felling of trees will be undertaken during the bird breeding season (March to August inclusive) unless a checking survey is carried out by a suitably qualified ornithologist prior to clearance works and demonstrates that no nests are present on site or adjacent to site. If any are found, appropriate mitigation measures will be agreed with SNH and implemented.
ECO4	Breeding Birds	As part of the CEMD the contractor will be required to demonstrate how the construction operations will be planned to avoid disturbance to birds breeding in the existing shelterbelt. For example this may involve commencing major construction before or after sensitive nesting periods agreed with SNH.
ECO5	Pre-construction survey	A pre-construction survey for relevant protected species (e.g. otter and water vole) will be carried out. If any protected species are found, further protection measures will be discussed and agreed with SNH / SG and implemented, including the possible need for a Scottish Government licence if otter could be disturbed.
ECO6	Mammal exit ramps	Mammal exit ramps will be provided for potential hazards such as steep-sided exposed trenches or holes when contractors are off site (i.e. at night time). Similarly, temporarily exposed pipe systems will be capped when contractors are off site to prevent otters from gaining access.
ECO7	Planting	The exposed bedrock of the upper batter slopes of the development platform will be left to naturally weather and re-vegetate over time. A more active approach will be adopted on the lower batter slopes to promote the establishment of vegetation that will both stabilise the slope surface and enhance the biodiversity of the site. This will favour rocky habitat plants appropriate for prevailing ground conditions.
ECO8	Planting	Clumps of planting will be introduced along the Achanarras Burn and drainage ditches to enhance biodiversity.
ECO9	Planting	All new planting will be carried out using typical species of local provenance.
ECO10	Weed control	The contractor will be required to make regular checks that invasive weeds are not being carried into the site and spread as a result of construction activities. If any are identified, control measures will be implemented following advice from the Environmental Clerk of Works.
ECO11	Drainage design	Drainage measures will be designed to enhance local biodiversity where practical and feasible. For example, the attenuation pond will be designed to benefit local biodiversity.

Ref	Title	Measure
ECO12	Water Protection Plan	Best site management practises will be implemented to minimise risk of intrusion into sensitive habitats and the risk of pollution incidents that could affect the Achanarras Burn.

Many of the measures adopted to address impacts to watercourses in Chapter 8: Hydrology, Drainage, and Water Quality, will benefit ecology and nature conservation through protection of watercourses (see Section 8.10), particularly those measures addressing sedimentation and contamination (e.g. H4, H6, H10, H12-H16 and H19-H24). In addition, GEN37-GEN41 (see Section 4.8) will provide mitigation for ecology and nature conservation through minimising and avoiding risks of contamination to vegetation and water courses. For a full list of intervention measures, including General measures which will benefit ecology and conservation interests, see Annex II.

9.11 Assessment of residual effects

As a result of the site selection and the implementation of the above described mitigation measures, all significant impacts to ecology and conservation will be avoided. The following sections describe how the mitigation measures listed above will effectively reduce any residual adverse impacts to a **minor** or **negligible** level (not significant).

9.11.1 Designated sites

The development is located outwith any designated nature conservation sites. Therefore there will be no direct impacts to any designated sites. As there are no golden plover known to forage in the fields affected by the development, there are no impacts on qualifying species of the Caithness and Sutherland Peatlands SPA. Indirect impacts to qualifying species of the following sites will be discussed in more detail in the following sections:

• Caithness Lochs SPA	Greylag geese (see Section 9.11.5)
• Caithness and Sutherland Peatlands SAC	Otter (see Sections 9.11.7 and 9.11.8)
• River Thurso SAC	Atlantic salmon (see Sections 9.11.7 and 9.11.8)

Permanent

9.11.2 Vegetation and habitats

The development of the converter station site will result in a permanent change to approximately 16.5ha of improved grassland habitat, including the platform area (6.5ha), associated development area and access track (7ha), and shelterbelt planting (3ha). Although the development will result in an alteration of key features of the current improved grassland habitats, the fact that only a small area of improved grassland will be impacted, combined with the fact that this is a common and widespread habitat in the area lead to this being a **minor adverse** effect.

The access track will be routed through an existing gap in the shelterbelt plantation which would also be widened, requiring the felling of a fewer than ten trees. The loss of a fewer than ten trees in the existing shelterbelt is considered to have a **negligible adverse** effect on the habitat of that plantation.

New tree planting will occur across some 10ha of the planning area. There are three types of planting. There will be clumps and natural scatters of scrub willow along the Achanarras Burn, across the top of the landform to the south of the site and smaller clumps along the east side. On the south side these will be supplemented by groups of native deciduous trees. A mixed hedge with occasional trees will be planted along the A9(T) from the shelterbelt above Spittal Mains to the start of the remnant old road east of the development site (Section 4.2.4). Some 3ha of improved grassland north of the existing shelterbelt will be planted into a new shelterbelt with a mixture of native deciduous and appropriate evergreen species.

Planting will be with native species typical of the local area and where possible, of local provenance. New planting will be designed with open glades and a good structure with a mix of deciduous trees and shrubs and some evergreens. This has potential to enhance the biodiversity of the site in the longer term, thus having a **minor positive** benefit to ecological interests.

9.11.3 Breeding birds

There are low numbers of breeding birds present at the site, and no internationally important breeding birds were recorded during the breeding bird surveys. The construction of the converter station platform will result in the permanent loss of some 14ha of improved grassland used by breeding curlew and skylark (UK BAP priority species). The loss of a small area of otherwise abundant improved grassland habitat is likely to have a negligible effect on curlew and skylark, common and widespread species in Caithness. Therefore permanent loss of habitat for breeding birds is considered to be a **minor adverse** effect.

Construction

9.11.4 Breeding birds

Construction activities may result in noise and visual disturbance to breeding birds during works which take place during the breeding season (March to August inclusive). The construction period (2½ years) could potentially affect two consecutive breeding seasons although the level of disturbance in the second year may be less as most of the groundworks will have been completed. Disturbance is likely to result in the temporary displacement of a low number of ground-nesting species of local importance from breeding territories in the improved grassland fields in the immediate vicinity of the development area.

For birds within the shelterbelt and other nearby habitats across the Achanarras Burn, noise and visual disturbance from construction activities could result in the temporary displacement of breeding birds. Alternatively, birds may continue to breed in the area and be subject to disturbance which could potentially affect breeding success. Different species have different sensitivities to disturbance. Long-eared owl (LBAP species), recorded breeding in the shelterbelt, is considered to have an upper limit of active disturbance[91] at 50-100m during incubation and at 150-300m during chick rearing (Ruddock & Whitfield, 2007). The landowner said that long-eared owls also use the shelterbelt approximately 1km to the southeast of the site, near Spittal Mains. The Spittal Mains shelterbelt may be an alternate nest site for the pair in the plantation within the development area. If this alternate site were to be used during construction, the long-eared owls would be well away from construction disturbance.

[91] Active disturbance - where the animal flushes or otherwise moves away from the source of disturbance etc.

Barn owls (Schedule 1[92]) are considered to have an upper limit of disturbance of 10-50m during incubation and 50-100m during chick-rearing (Ruddock & Whitfield, 2007). The barn owls at the farm buildings by Achanarras Farmhouse are >200m from the development area therefore unlikely to be directly affected by the construction works.

It is an offence[93] under the Wildlife and Countryside Act (1981) to intentionally destroy or damage a wild bird's nest while that nest is in use. The implementation of the agreed mitigation measures to avoid tree felling during the breeding season (unless it can be demonstrated that no breeding birds will be affected), to avoid start-up of works during the breeding season, and to conduct a checking survey for breeding birds prior to stripping of ground vegetation will ensure that no nests will be destroyed or damaged.

As long as agreed mitigation is implemented, noise and visual disturbance from construction works are likely to have only a **minor adverse** effect on breeding birds.

9.11.5 Wintering birds

Construction activities during the months of October to April have the potential to cause noise and visual disturbance to a relatively small number of wintering greylag geese (qualifying features of the Caithness Lochs SPA) that have in the past been recorded to the south of the development area. Disturbance will be short-term although construction works may affect two winter seasons. As there are numerous alternative foraging areas within the wider area the residual effect to wintering geese is considered to be **minor adverse.**

9.11.6 Mammals

The Achanarras Burn is the western boundary of the development area, although the proposed platform area is located approximately 85m upslope from the Achanarras Burn. Otter are known to use the Achanarras Burn for foraging activities. Water voles have been recorded using the Achanarras Burn in the past and the burn continues to provide good habitat which could be suitable for water vole (see Section 9.8.4). The ditch draining into the Achanarras Burn from the south side of the site could also potentially provide suitable water vole habitat. Although no water voles were found during surveys of the site, it is possible that they could occupy the area in the future. It is an offence to intentionally damage, destroy or obstruct otter or water vole shelters (see Section 9.8.4).

The development of an attenuation pond and drainage ditch adjoining Achanarras Burn and the realignment of one other drainage ditch to accommodate the platform footprint have the potential for direct and indirect impacts to otter and water vole. Pre-construction surveys for these protected species will be conducted to ensure that no burrows for water vole or otter shelters (holts or resting places) are present prior to commencement of activities that may directly or indirectly affect Achanarras Burn. An Environmental Clerk of Works will ensure that if any are found, the proper procedures are put in place to avoid impacts to either of these species or their habitats. This will include discussion with SNH and agreement of further mitigation measures. The implementation of these mitigation measures will ensure that any risk of impact to these species is completely avoided; therefore **no residual effect** is expected.

[92] Schedule 1 of the Wildlife and Countryside Act (1981) (as amended)
[93] Wildlife and Countryside Act (1981) Part 1, 1 (b)

Otter may be at risk from potential construction hazards such as steep-sided trenches or holes during platform excavation which could act as pit-fall traps resulting in injury or death. With the implementation of the agreed mitigation measures to provide mammal exit ramps and to cap any temporarily exposed pipe systems when contractors are off site, any risk of adverse effects on otter will be reduced to **minor**.

Noise and visual disturbance during construction is not expected to have significant impacts on otter as no otter shelters (holts or resting places) are located near the development. However, best practice measures to control noise will be implemented (see Chapter 13: Noise and Vibration). Construction activity will cease at night when otters are most active. Therefore, noise and visual disturbance to otter are expected to results in **minor adverse** effects at worst.

9.11.7 Impacts due to sedimentation

The excavations and exposure of soils at the converter station site create the potential for sediment laden water to run off into drainage ditches and the Achanarras Burn. There will be no construction works that involve working directly within the Achanarras Burn. An outflow will be constructed from the fire-fighting / attenuation pond which will be connected to the Achanarras Burn. This activity will be conditioned by SEPA before commencement of the works (see Section 8.11.4).

Any increases in sedimentation in the Achanarras Burn have the potential to cause a negative impact on aquatic receptors in the burn and further downstream. Increased sedimentation may affect otter by reducing their ability to detect and catch prey or by changing the abundance and availability of prey. Increased sedimentation may also have a damaging impact on all life stages of salmonids. The effect of sediment on salmonids will depend on several factors including the amount of fine sediment, the time of exposure to sediment and the sediment composition. The potential impacts include fish mortality through smothering, or suffocation; reduced reproduction and growth through the degradation of spawning habitat; and fish behavioural changes such as impeding movement and altering feeding behaviour.

A number of measures will be put in place to protect the Achanarras Burn from the effects of increased sedimentation from surface water runoff (see Section 8.10).

Systems will be put in place in accordance with SUDS principles to ensure the suitable treatment and discharge of surface waters will be controlled during each of the phases of construction, by directing runoff to drainage ditches, settlement ponds and the incorporation of flow attenuation measures (see Chapter 8: Hydrology, Drainage and Water Quality). Such mitigation measures will ensure no detrimental effects to aquatic receptors occur downstream in the watercourse under normal conditions.

Construction activities will occur over an approximate 27-month period so avoiding activity in periods of high rainfall is not achievable. Attention therefore is focused on ensuring that when heavy and extreme rainfall occurs, open excavations will be protected as far as possible. Any water that needs to be removed will be allowed to collect at the base of the excavation in a series of sumps where it will then be pumped out into the attenuation pond. Further details of this process are provided in the drainage management plan / SUDS plan (see Section 4.2.10, Section 8.10, and Appendix 8-A).

Construction activities will be scheduled to minimise the area and period of time that soil will be exposed, particularly during winter periods.

The Ecological Clerk of Works would be responsible for monitoring of impacts and review of mitigation through construction to identify problems (see GEN10). The implementation of these mitigation measures along with daily monitoring of the effectiveness of the measures in controlling water movement on and around the site will ensure that the risk of introduction of sediment-laden waters into the Achanarras Burn will be minimised, and any residual effects to aquatic receptors such as otter and salmon will be reduced to a **minor adverse** level.

9.11.8 Impacts due to contamination

The accidental spillage of fuels, oils and other substances such as cement and concrete during construction activities can result in toxic effects to vegetation, as well as to aquatic receptors such as otter and salmon via adverse changes in water quality if contamination were to enter the Achanarras Burn.

The primary mitigation technique to reduce the risk of accidental contamination of Achanarras Burn to as low as practicable, is to provide a central fuel, oil and chemical storage area at the main construction compound (GEN38). This storage area will incorporate an impervious bund, and appropriate security (e.g. fencing). Oil spill kits will be provided and staff trained in their appropriate use. No storage or refuelling will be allowed within 50m of any surface water drains or watercourses (See Section 8.8).

As with all construction activities there will be the potential for accidental spillage of oils or other substances within the site boundary. In response to this, an emergency plan will be developed to deal with such an occurrence (H25). Contaminated materials will be placed within a dedicated skip that will be present on site at all times. Such material will be disposed of at an appropriate licensed waste management facility (GEO10).

As a result of these mitigation measures, significant impacts to aquatic receptors from accidental pollution events will be avoided and any residual adverse effect will be reduced to **minor**.

Operation and maintenance

There are not expected to be any significant impacts to ecology or nature conservation during operation and maintenance as the development will be unstaffed and any maintenance activity infrequent (see Section 4.5). The potential impacts include noise and visual disturbance effects to otter and effects to various receptors due to contamination from leaks and spills.

Noise and visual disturbance during operation is not expected to have significant impacts on otter as no otter shelters (holts or resting places) are located near the development. Operational noise will be minimal as the development will not be permanently staffed, and the noise from the converter itself is relatively low (see Section 13.9.5). In addition, the site will not be permanently lit during the hours of darkness. Any security lighting at the converter station during operation is not expected to result in a noticeable change of the existing baseline or result in any additional impacts on wildlife, and therefore adverse effects are expected to be **minor**.

The risk of leaks and spills occurring is much lower during the operational phase. However, there is a risk of contamination due to accidental events involving transformers. To mitigate this risk, transformers plinths will be constructed with bunding, oil separation, and flow controls to ensure the platform and the drainage system are not contaminated (GEN40).

As a further level of control and protection, the attenuation pond will also be able to function as a storage area for any contaminated drainage flows, should they ever arise. These measures should ensure that the risk of adverse effects due to contamination during the operational phase is **minor** and not significant.

9.11.9 Decommissioning

The site is planned as long-term transmission infrastructure and the equipment would be replaced as it approaches the end of its economic operational life. In the event that the site is decommissioned, the planned shutdown procedures will essentially be a reverse of the construction process. It is envisaged that the site will be cleared to ground level and that any profiling infill will be distributed around the site, before a topsoil layer is put on top. Upon restoration of the site it is envisaged that all buildings and electrical equipment will be removed and the platform area will return to an improved grassland state, albeit surrounded by mature trees. The potential impacts on ecology and nature conservation would be similar to those during construction, and providing all activities were carefully planned and controlled, impacts would be temporary and not significant.

9.11.10 Summary

A summary of the residual effects on ecology and nature conservation following implementation of agreed mitigation measures is given Table 9.9 below.

Table 9.9 Summary of residual effects on ecology and conservation

Issue	Magnitude of effect	Residual significance
Permanent		
Permanent loss of approximately 16.5ha of improved grassland	Low	Minor
Permanent loss of fewer than 10 trees for access track construction	Very low	Negligible
Planting of trees on approximately 10ha of improved grassland	Medium	Minor positive
Loss of approximately 16.5ha of improved grassland breeding habitat	Medium	Minor
Construction		
Noise / visual disturbance to breeding birds within the vicinity due to construction activities	Low	Minor
Displacement of wintering foraging birds due to noise / visual disturbance	Very low	Minor
Death / injury risk to otters entering open excavations	Very low	Minor
Noise / visual disturbance to otter during construction activities	Very low	Minor
Damage to aquatic habitats due to increased sedimentation (effects on otter and salmon)	Very low	Minor
Potential effects on vegetation due to contamination from leaks and spills	Very low	Negligible

Issue	Magnitude of effect	Residual significance
Potential effects on aquatic habitats due to contamination from leaks and spills (otter and salmon)	Very low	Minor
Operation and maintenance		
Disturbance to otter from operation of converter station and maintenance activities	Very low	Minor
Potential effects on vegetation due to contamination from leaks and spills	Very low	Negligible
Potential effects on aquatic habitats due to contamination from leaks and spills (otter and salmon)	Very low	Minor

9.12 Potential for cumulative effects

No cumulative effects associated with ecology and nature conservation have been identified.

9.13 Summary of key findings

There are no designated sites that will be directly impacted by this project. There is one designated site, the River Thurso SAC, which could be impacted indirectly by the project as a result of potential sedimentation or pollutants accumulating in the Achanarras Burn and being carried downstream. This assessment has determined that with appropriate mitigation in place, the likelihood of these scenarios developing is low therefore this development is unlikely to have any adverse effect of the integrity of the River Thurso SAC or its conservation objectives.

There will not be any significant adverse effects on vegetation and habitats. Additional trees will be planted on site. Planting will be with native species typical of the local area and if possible, of local provenance. New planting will be designed with open glades and good structure with a mix of deciduous trees and shrubs and some evergreens. This has potential to enhance the biodiversity of the site in the longer term, and thus have a positive benefit.

There will be no significant residual effects on breeding or wintering birds. There are low numbers of breeding birds present at the site, and no internationally important breeding birds were recorded during surveys at the site. Noise and visual disturbance to breeding birds or foraging birds is expected to have only minor adverse effects as there are few breeding bird territories, the disturbance will be short-term and there are numerous alternative foraging areas for wintering geese within the vicinity.

Otter, a European Protected Species, is known to travel through the site, although no shelters were found during the survey. Water vole has also been recorded in Achanarras Burn in the past, though not during recent surveys. A pre-construction protected species survey will be undertaken prior to construction beginning and specific mitigation will be put in place to ensure that no otter or water vole habitat will be adversely affected by the project and to ensure that both species are fully protected.

9.14 References

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10 Landscape and Visual Impacts

10.1 What is covered in this chapter?

Landscape and visual impact assessments describe closely related but distinct sets of effects.

Visual effects arise from changes in the composition and character of views available in the area affected by the proposed development. Visual impact assessment considers the response of the people who experience these effects, and it considers the overall consequence of these effects on the visual amenity - the pleasantness of the view or outlook - they enjoy.

Landscape effects are the outcome of physical changes to the fabric of the landscape arising from the development, such as the addition, removal or alteration of structures, trees, or woodlands, which may alter the character and the perceived quality of the area affected. Landscape impact assessment considers these effects - the changes arising from the proposed development - on the integrity and character of the landscape as a whole. It considers both the individual components of the landscape and the overall structure and coherence of the landscapes affected.

Landscape character and resources are considered to have value in their own right; they have intrinsic qualities that exist whether or not they are actually seen by people. Impacts on visual amenity as perceived by people are therefore clearly distinguished from, although closely linked to, impacts on landscape character and resources.

In this chapter the background and baseline to both topics are covered together, to avoid duplication. The assessment methodology and actual assessments are then covered in discrete sections.

Proposals to mitigate the potential impacts of the proposed scheme were developed as the landscape and visual assessments were carried out. The mitigation includes site selection as well as landform and planting proposals. The assessments are based on the complete outline scheme design including the mitigation proposals.

Landscape and visual impacts can be beneficial or adverse, and how they are considered can depend on the attitude of the observer or assessor. The construction of a major new development is normally considered by the general public to be of an adverse nature. The proposal involves the undergrounding of a short length of 11kV overhead line along the edge of the site. This element would be considered to be a change of beneficial nature.

The methodology used in the assessments is set out in Section 10.6, below.

10.2 Why could the issue be important?

The construction of the converter station will introduce a large development into a complex landscape. It will physically alter a small area of landscape whilst the scale of the development may be sufficient to alter the character of the landscape character area in which it sits, or affect the perceived character of adjacent landscapes.

The development will be visible from a comparatively wide area, in which there are people living, working and enjoying recreational activities. The introduction of the converter station into views enjoyed by these people may affect how they perceive these views – in other words it may affect the visual amenity they enjoy.

10.3 Sources of information

Information has been gathered primarily from a structured site survey but also by desk study and from consultations with relevant consultees (see Annex I).

Desk study referred to the publications below as well as:

- to Ordnance Survey mapping
  - Ordnance Survey (OS) Travel Map 1, 1:250,000 Northern Scotland, Orkney and Shetland
  - Ordnance Survey (OS) Landranger Map12, 1:50,000, Thurso and Wick
  - Ordnance Survey (OS) Explorer Maps 1:25,000, 450 Wick and 451 the Flow Country and Thurso & John o' Groats
- to aerial photography and Google Street View (http://maps.google.co.uk) which were used as an aide memoire and for cross-checking potential views

Relevant publications that have been taken into consideration include:

- the component parts of the current Highland Development Plan (see Chapter 5- Planning and Policy)
- Caithness and Sutherland Landscape Character Assessment (Stanton, 1998)

10.4 Survey and analysis work undertaken

Preliminary assessment was undertaken for the site selection process in site visits over the summer of 2010.

Detailed landscape and visual site survey work was carried out in the autumn of 2010, as far as practical choosing days when visibility was good. The field survey was designed to collect data for both the landscape and visual impact assessments, and therefore covered:

- landscape character;
- topography;
- vegetation of landscape value;
- areas of important features of cultural heritage or local importance;
- visual receptors; and
- identification of possible mitigation measures for discussion with the team.

10.5 Consultation feedback

Initial consultation was carried out through involving The Highland Council in the site selection process so that they had a full understanding of the issues involved (see Chapter 3: Project Design Process and Comparison of Alternatives). Once the preferred site was selected consultation was through the formal PAC process (see Section 2.4.1). The Highland Council Pre-Application Advice Pack helpfully summarises the responses from statutory consultees (see Annex I and The Highland Council 2010a).

During the site selection process key points made by The Highland Council were to:

- consider opportunities at any site for the converter station to drop down and reduce visibility;
- consider effects of overhead line (OHL) connections and diversions;
- consider whether there are any 'holes in the ground' available for the converter station, e.g. a quarry coming up for reinstatement;
- consider detail of landscape and visual issues at each potential site;
- avoid skylining of the converter station; and
- note that Spittal Hill is a focal point in the local landscape.

In the pre-application advice pack (The Highland Council, 2010a), The Highland Council acknowledged that the potential visual impact had been lessened through site selection (see Section 10.9 below), although they highlighted the need for long-term management of the conifer belt to the north.

They suggested that a careful approach was needed for earth mounding as part of the mitigation, to avoid this becoming an artificial feature in its own right. They also highlighted that careful consideration should be given to the construction access design.

The Highland Council expressed a firm preference for buildings to be aligned along the valley and they advised that planting, fencing and walling should all be designed to reflect the local character.

SNH highlighted the complex nature of the landscape in the Spittal area and expressed concern that the proposed development could dominate and create an industrial landscape. They considered that a key design aim should be to avoid amplifying the existing complexity of built elements in this landscape.

SNH also highlighted the sequential views for travellers along the A9(T) and the potential for cumulative impacts with wind farm proposals.

They suggested two design objectives to help mitigate landscape and visual impacts:

- for the buildings to have an agricultural character, both in design and in siting; and
- to break up the apparent mass of the buildings (separate elements if possible, scale, levels, profile, materials and colour)

They noted the importance of the existing woodland, and sought that it should be extended. They also suggested additional planting between the A9(T) and the site of locally appropriate native trees and shrubs.

10.6 Guidance and regulations

Designations

There are no locally or nationally designated areas of landscape interest that will be affected by the proposed development. However, there is an important point made in Scottish Planning Policy (Scottish Government, 2010)[94] on Landscape and Natural Heritage:

- "Planning authorities should take a broader approach to landscape and natural heritage than just conserving designated or protected sites and species, taking into account the ecosystems and natural processes in their area."

In other words all landscapes must be considered as having value, whether designated or not. The flow country and flagstone hills of Caithness are not designated for their landscape quality, but they are widely recognised as having a particular and special character (see below).

Development Plan policies

The site lies within the Caithness Local Plan area of Highland Council, and is therefore currently covered by the Highland Structure Plan 2001, Caithness Local Plan 2002, and supplementary planning guidance such as the Highland Renewable Energy Strategy 2006. A Highland-wide Local Development Plan is currently in preparation (The Highland Council, 2010b) which will supplement and partially supersede the Structure Plan (see Section 5.4.3).

There are a number of policies relevant to the proposed development, including those outlined in the Highland Structure Plan. In addition to the suite of General Policies outlined in the Highland Structure Plan (see Section 5.4.1), the following policies have particular relevance to landscape and visual impacts:

- **Policy T6: Scenic views:** where the Council will protect important scenic views enjoyed from tourist routes and viewpoints, particularly those specifically identified in Local Plans. There will be a presumption against development in narrow areas of land between roads and railways and open water;
- **Policy L4: Landscape Character:** where the Council will have regard to the desirability of maintaining and enhancing present landscape character in the consideration of development proposals, including offshore developments; and
- **Policy U1: Electricity distribution network:** where the Council welcomes the refurbishment and strengthening of the electricity distribution network. Proposals for new and replacement lines will be assessed for environmental impact, and in sensitive locations by virtue of landscape character, visual intrusiveness or bird movements, the case for undergrounding should be strongly considered.

[94] Superseded many previous Scottish Planning Policies (SPPs), Planning Advice Notes (PANs) and National Planning Policy Guidelines (NPPGs), with particular relevance to this proposal is NPPG 14 – Natural Heritage

Local Planning Guidance
Local planning guidelines relevant to the landscape and visual aspects of the proposals are outlined in the Highland Wide Local Development Plan (HwLDP), in particular:

- Policy 29: Sustainable Design;
- Policy 37: Wider Countryside;
- Policy 58: Natural, Built and Cultural Heritage;
- Policy 59: Protected Species;
- Policy 62: Landscape; and
- Policy 70: Electricity Transmission Infrastructure

The policies covering the area of the proposed area of development do not prohibit development. However, high standards of design and respect for the character and environment of the surrounding area are required.

An assessment of how the proposals meet the above and associated policies relevant to the area is contained in Appendix 5-A, Table 4.

10.7 Methodology

10.7.1 Introduction
This chapter follows the principles of landscape and visual assessment set out in the guidelines produced by the Landscape Institute (Landscape Institute & IEMA , 2002) and relevant technical advice notes from the Landscape Institute (Landscape Institute, 2009).

The photography for the visualisations takes cognisance of the Highland Council guidelines (The Highland Council, 2010c) and, in particular, the photomontages and visualisations have been produced at a size suitable for accurate use in the field.

Two distinct but closely related areas of impacts are assessed: landscape and visual.

10.7.2 Landscape
The character of the landscape derives from a combination of physical factors, natural processes and human intervention.

The landscape assessment considers the changes to the character of the landscape likely to result from the proposed development. It synthesises the effect of the development on the landscape as a whole, effects on significant individual elements of the landscape, and effects on characteristic combinations or patterns of elements.

Landscape character is generally considered to be a resource in its own right, which exists whether or not there are people present to experience it.

10.7.3 Visual
Visual impact assessment is concerned with the views that are available to people affected by the proposed development, and their perception and responses to changes in these views.

Visual impacts can arise from new elements in the landscape that viewers may find intrusive, from new features that obstruct views, or from the removal of existing elements in the view. The assessment considers the response of the people who experience these effects, and it considers the overall consequence of these effects on the visual amenity - the pleasantness, or otherwise, of the view or outlook – that they enjoy.

For the purposes of assessment, whilst it is the people living and working in the area and those using it for recreation who actually see the views and enjoy the visual amenity, it is the places they may occupy that are mapped and described as the ‘receptors’ of the views.

Where mitigation proposals include planting, this will take time to develop. The impact is therefore assessed both for a notional winter day in the year of opening, when the planting would have little effect, and for a summer day fifteen years later when vegetation growth will have made a difference to the degree of visual impact experienced.

10.7.4 Limits to visibility

The area of study for visual impact assessment is the area from which the proposed development may be seen (by definition, visual effects can only occur where at least some part of the development is visible). The first step in the assessment is therefore to establish this area, the ‘visual envelope’.

The visual envelope was produced by computer modelling. A three dimensional model of the development was overlain on to the Ordnance Survey’s digital terrain model (Ordnance Survey landform profile Digital terrain model at 10m resolution).

Computer generated ‘lines of sight’ were then generated from the highest point on the proposed building to show where it could be seen from, and thus where viewers (receptors) could see it.

Key items that might block the view, such as areas of plantation woodland and buildings, were factored in to improve accuracy. Smaller screening factors such as individual or small groups of trees were ignored.

The end result is a visual envelope map (Figures 10.1 and 10.2). This gives a good indication of the area from which the development may be visible. However, it is referred to as a “zone of theoretical visibility” (ZTV) to highlight the shortcomings in computer modelling. There are places shown as having visibility that in reality will have no view, because of local screening by a tree or a wall that cannot reasonably be modelled. There may also be places shown as not having visibility where there is in reality a view – for example, if there are local high spots that are not accurately represented by the digital terrain model.

Distance is important in considering visibility. The apparent size of any structure diminishes with distance, and atmospheric conditions help cause the development to fade from view as the distance increases.

In normal weather conditions, individual buildings are not normally perceived by the ordinary viewer beyond about five kilometres, although in the open landscape of Caithness and with the size of building proposed as part of this development, it is potentially visible well beyond this in clear conditions or if seen against the skyline or is a contrasting colour to its background. In setting the ZTV cut-off limit for this study, consideration was given to the T3 UK building near Thurso which at 22m high, prominently located and off-white in colour, can be clearly seen from Spittal Hill slightly over 10km away.

Taking the above into account, the ZTV has been cut-off at 10km on the grounds that beyond this distance the development is most unlikely to cause a visual impact even if it can be seen on a clear day.

10.7.5 Significance

Both for the landscape and visual assessments, significance of the various effects of the proposed development derives from the combination of the **magnitude** of change and the **sensitivity** of the site or of those human receptors who benefit from a given view.

Landscape

The **magnitude** of change to the landscape can be categorised as follows (Table 10.1):

Table 10.1 Magnitude of change

Landscape Magnitude	Description
High	A noticeable change to the landscape over a wide area or an intensive change over a limited area
Medium	Small changes to the landscape over a wide area or noticeable change over a limited area
Low	Very minor changes to the landscape over a wide area or minor changes over a limited area

The sensitivity to change of a landscape varies with the type of change being considered and how it affects the landscape. Sensitivity is a function of how much the landscape is able to accommodate the changes caused by the new development and the value ascribed to the landscape by the public and by public authorities.

Landscape **sensitivity** can be broadly categorised as follows (Table 10.2):

Table 10.2 Landscape sensitivity

Landscape Sensitivity	Description
Highly sensitive	Areas of landscape that are highly valued, particularly rare or distinctive, or considered susceptible to small changes
Moderately sensitive	Areas of landscape that are valued more locally and/or are tolerant of moderate levels of change
Slightly sensitive	Areas of landscape that are generally more commonplace, considered potentially tolerant of noticeable change, or undergoing substantial development such that their character is one of change

There is no precise link between landscape sensitivity and landscape quality but in general, areas that are considered of higher quality tend to be more highly valued.

Visual

The **magnitude** of change is a function of the scale and type of change to the landscape in the view under consideration. This includes the distance to the changed parts of the view, the type of change to the landscape (whether the changes are well integrated – tending to blend into the background, or if they stand in contrast to their background or project above the horizon), the location of the proposals in relation to the direction of the view (i.e. central to the view, or off to one side) and the extent of the view affected by the change.

Magnitude can be broadly categorised as follows (Table 10.3):

Table 10.3 Magnitude of change

Visual Magnitude	Description
High	The proposed development dominates the view and substantially changes its character and quality. Examples of this might be: • the development in full view in the near-ground • blocking a currently open view • projecting well above the horizon in the near- or middle-ground
Medium	The proposed development is clearly noticeable in the view and affects its character or quality. Examples of this might be: • the development in full view in the middle-ground of a rural view
Low:	The proposed development does not affect the character and quality of the view, or it is a minor element likely to be overlooked by the casual observer. Examples of this might be: • the development visible in the background or part of a wide view • temporary loss of vegetation which is only partially visible

The **sensitivity** of the receptors of visual effects is a function of their expectations and reasons for being there, the importance and value of the landscape viewed, and the nature and context of the viewpoint and the importance of the view.

Visual **sensitivity** can be broadly categorised as follows (Table 10.4):

Table 10.4 Visual sensitivity

Visual sensitivity	Description
Highly sensitive	Receptors for whom or from which the view is important and where changes will be particularly noticed. For example: • residential properties where the development is seen in a main outlook • regularly used or locally valued public open spaces or tourist routes • well used or locally valued footpaths or public viewpoints
Moderately sensitive	Receptors for whom or from which the change in the view is a small element in the overall view, not critical to the visual amenity, or where the nature of the view is of secondary importance to the user. For example: • secondary views from residential properties • hotels and restaurants • lightly used public open spaces • lightly used footpaths or public viewpoints • people travelling on roads and railways (except tourist routes, see above)

Visual sensitivity	Description
Slightly sensitive	Receptors for whom or from which the change is unimportant or irrelevant, or where their attention can reasonably be expected to be focussed on their work or activity, for example: • workplaces • indoor recreation centres

Significance categories

The significance of the visual and landscape impacts has been categorised as set out below (Table 10.5), on the basis of the professional judgement of skilled observers, working in the field. It must be emphasised, however, that there is a continuum of impacts and that the steps in the categories are guideline thresholds. Assessments of magnitude and sensitivity, as well as the choice of the significance category into which a given effect should be placed, are all matters of professional judgement.

Table 10.5 Guideline landscape and visual impact significance categories

Significance	Definition	Guideline landscape impact thresholds	Guideline visual impact examples
None	No detectable change to the environment	No discernible change to the landscape	The proposed development cannot normally be perceived.
Minor	A detectable but non-material change to the environment	Minor changes to a landscape considered tolerant of change	The changes caused by the development are a minor element in a view and/or the view is of minor importance to the viewer.
Moderate	A material but non-fundamental change to the environment	Noticeable change to a landscape tolerant of moderate levels of change	The changes caused by the development are clearly noticeable and affect the quality of a view and/or the view is incidental or of secondary importance to the viewer.
Major	A fundamental change to the environment	Noticeable change to a sensitive or nationally valued landscape, or intensive change to less sensitive or regionally valued landscape	The changes caused by the development dominate and substantially alter the character of the view, and/or the view is considered important to the viewer.

10.7.6 Assumptions and technical deficiencies

For the landscape assessment, the significance assessed is that of the effect of the proposed development on the landscape character zone as a whole. This can tend to under-record the significance perceived within a localised area, so comment is also made on a more local level.

For the visual assessment, all places from which it was considered there could be a significant impact were considered. However, in order to keep this assessment comprehensible, a representative sample of receptors was agreed and assessed, with a balance in terms of direction (north, south, east and west) and in terms of distance (a proportion close to the proposed development and a proportion further away).

Sensitive areas within the zone of theoretical visibility (protected sites, recreation, natural heritage and residential areas) and areas where a greater number of viewers may be present (roads, railways, edges to built-up areas) informed the selection of viewpoint locations, and the list of assessment points was agreed with The Highland Council and SNH.

The expected changes to views from residential properties were assessed from a representative viewpoint, covering similar views from a number of receptors. The views assessed are therefore not exactly that experienced by any one receptor.

Environmental assessment often considers impacts in three categories: permanent; construction; and operational. In the case of this proposed development, the operation of the site will not cause any visible change: there will be no visual or landscape effects arising specifically from the operation of the development and so there is no 'operational' section in this assessment. Similarly there are no potential cumulative landscape or visual effects.

On decommissioning, the site could be restored to a condition virtually indistinguishable from its existing state, with no remaining landscape or visual effects. The decommissioning process will have effects similar to, and with the same degree of significance as, the construction effects described below.

The views of the professional carrying out the assessment may not necessarily be those of other professionals or of people using the area; however the nature of the assessment has been made as objective as possible in order to reduce inconsistencies and anomalies.

The assessment is based upon the views of one professional carrying out the field survey work and is consistent over the study area. All assessment was carried out in the field, with preliminary visualisations to hand as an aid to ensure correct understanding of the size of the development in the view.

10.8 Established baseline conditions

10.8.1 Study area

The study area is fundamentally the area from which the development may be visible – the Zone of Theoretical Visibility (ZTV) – as described above. For the landscape impact assessment, the study area considers the landscape character areas touched by the ZTV out to the radius of 10km.

10.8.2 Description of the wider landscape

The study area is at the edge of the flow country, where the extensive peat moorlands meet the low rolling hills of northeast Caithness.

It is a very large scale and open landscape, in parts bleak. It is flat or slightly rolling to the east of the A9(T), gently rolling to the west. Levels vary from about 40m AOD at Halkirk to 100m at Mybster above ordnance datum (AOD) and with a high point at Spittal Hill of 176m. Spittal Hill is sufficiently prominent in this landscape that the Ordnance Survey has used it for a trig point.

The higher ground and the more peaty ground is moorland, whilst much of the more amenable land has been 'improved' to permanent pasture (some of which is degraded with areas of rushes), with a few arable fields. There are a number of forestry plantations, varying from small shelter strips to large areas of commercial conifers. Flagstone quarries such as at Spittal are noticeable because of their spoil-heaps and processing buildings, although the quarries themselves cut into the flat land and are not readily visible.

Human habitation is sparse across the southern and western part of the area. There is a scatter of cottages and houses along the A9(T), small settlements at Mybster and Spittal, and the planned town (clearances settlement) of Halkirk on the banks of the River Thurso in the more fertile ground towards the north of the study area.

There is a wind farm with about 20 turbines in the edge of the flow country east of the A9(T) at the south end of the study area (Causeymire Wind Farm). These are large scale structures in a large scale open landscape which attract the eye, and change the character from appearing wild to very much affected by man.

Whilst quite open and sparsely populated, this is a landscape that is actively used and altered by man. It is not a landscape that can be considered particularly sensitive to change.

10.8.3 Landscape character types and areas

In the Scottish Natural Heritage landscape character assessment (SNH LCA) of Caithness and Sutherland (Stanton C, 1998), the study area falls across four local landscape character types (LLCT): “Mixed agriculture and settlement”, “Sweeping moorland”, “Flat peatland” and “Lone mountains” (see Figure 10.3).

These were reviewed for this assessment, particularly to consider whether a finer-grained approach to the subdivision of the landscape would be appropriate. Overall, this was not considered necessary - the gradation between landscape character types in Caithness is generally very subtle and the SNH assessment catches these well. However, the finer scale of this study compared to the SNH assessment has allowed the boundaries between character areas to be refined slightly.

The SNH study shows extensive areas of forestry as a distinct character type. For the purposes of this assessment, commercial forest plantations were not considered as a landscape character type as it is possible that large areas of forestry in the study area may be cleared to permit wind farm development. Rather, this study has mapped the landscape character areas underlying the commercial forest plantations. The extent of current forestry is visible from the OS map background.

In addition, the description of the key characteristics of local landscape character type in which the proposed development lies highlights the existence of spaces defined at a more local level within the overall open landscape. This is the case for the proposed site and so this is highlighted in this assessment (see Section 10.10).

Mixed agriculture and settlement

The mixed agriculture and settlement LLCT is described as:

> *“a wide open landscape generally dominated by a horizontal emphasis, with the occasional location of a hill or woodland defining spaces at a more local level.”*

It goes on to note that this landscape is generally gently sloping and that in some places the slopes rise to form low hills or dip to create shallow glens. Achanarras Hill is one such low hill, with the valley of the Achanarras Burn between it and Spittal Hill a “space defined at a more local level”. For an example see Plate 10.1.

Sweeping moorland

The sweeping moorland LLCT is described as:

> *“It appears stunning on account of its simple composition of landscape elements and vast scale. Transitions between different areas and neighbouring landscape character types tend to be extremely subtle.”*

The SNH LCA notes that this landscape possesses a simple visual composition and that there is generally no visual focus (although these are sometimes provided by lone lochans, trees or other landscape elements). For an example see Plate 10.2.

Lone mountains

Spittal Hill is classed as ‘lone mountains’ LLCT, which is described as:

> *“individual mountains which lie isolated within an open ‘sea’ of moorland”.*

For an example see Plate 10.3. The SNH LCA notes that the focal dominance of mountains means that their influence extends far into other landscape character types. This emphasises the point that Spittal Hill is a local focal point, even though it is at the lower and less dramatic end of the range of lone mountains in Caithness.

10.8.4 Landscape guidance

The SNH LCA sets out key forces for change and design guidance for each LLCT and the points that are most relevant to the proposed development are abstracted in the following paragraphs.

Mixed agriculture and settlement

The SNH LCA notes that composition and balance of the complex mix of characteristics that make up this LLCT have changed over the years and continue to do so. This is in some respects a ‘landscape of change’ - one that is continually evolving. This means that many areas can accommodate new changes without marring their intrinsic qualities. However, it also notes that it is difficult to locate new elements into this landscape where there is no distinct pattern or organisation to which to relate them.

The design guidance for this character area states that whilst it is difficult to introduce any new elements into this landscape without adding to the visual complexity, the impact of this may be limited where new elements directly relate to the specific characteristics of a site or create an identifiable order and pattern of their own.

The LCA also highlights that new vertical elements will be particularly noticeable, with the degree of visibility tending to relate to the mass of the elements; that bulky objects can obstruct apparent visual movement along a skyline and become a dominant focus.

Relative to this, the design guidance states that it is important to consider the most appropriate design and location of a new element, particularly in respect of its scale and form and in relation to the skyline.

In respect of locating new built structures, the guidance notes that it may be appropriate to integrate new features into the existing arrangement of [landscape] components or to concentrate them as a distinct group in their own right.

Sweeping moorland

The design guidance for this character area notes that new elements in this landscape tend to become focal features and that it is important to consider how they may affect the sense of remoteness that exists in this landscape. It also notes that the introduction of numerous elements into this landscape will have a cumulative effect – an important point given the presence of the existing Causeymire Wind Farm and the wind farm proposals at Halsary and Spittal (see Table 15.2).

Lone mountains

The design guidance for this character area notes the importance of considering the impact of any development on the skyline in this LLCA. Perhaps more importantly in the context of siting and design of the converter station it makes the point that "new elements can compete with the existing focal dominance of the mountain."

10.9 Range of possible impacts

The proposals are described in full in Chapter 4: The Project Proposals. This section highlights the aspects of the development that may have landscape or visual impacts.

10.9.1 Potential landscape impacts

The proposed development may affect the landscape in a number of ways, including:

Permanent

- Introducing a focal point into a landscape without, or with other, visual foci;
- contrasting scale between the proposed development and the landscape in which it is located;
- direct loss of landscape features such as trees and shelterbelts;
- altering an individual landform by cutting and filling;
- altering the pattern of the landscape by introducing a strong form that cuts across the 'grain' of the landscape; and
- altering the pattern of field boundaries.

Construction

There may be localised landscape impacts from the presence of the construction compound and temporary spoil heaps. Overall however, the impacts on the landscape during the construction period will be the same as the permanent impacts, although generally of slightly greater significance because of the presence of these construction compounds and the sight of large machinery moving about. The landscape impacts will also be somewhat greater immediately after construction, before the raw scars of new landforms have had a chance to ‘green up’ from the landscape works.

Changes to the landscape are also likely to be more noticed by local residents or regular passers-by during the construction period because of the short time-scale over which they take place. On the other hand, construction impacts may be considered to be less significant due to their temporary, short term nature.

10.9.2 Potential visual impacts

The potential visual effects of the proposed development include:

Permanent

- the presence of a large building and associated infrastructure directly blocking existing views;
- the change in character resulting from adding industrial infrastructure into a comparatively rural part of a complex mixed landscape; and
- felling of trees that leads to the opening of new views.

Construction

- the installation of a large construction compound;
- the movement and activity of large construction machinery, usually with flashing hazard lights;
- views of cranes;
- new cut & fill, particularly noticeable because of changes over a short time-scale, and the extent of bare earth visible;
- temporary traffic management on the A9(T); and
- floodlighting of areas for evening and morning working during the winter.

10.10 Mitigation

The mitigation of potential landscape and visual effects for the proposed development has been an iterative process, running through site selection, site design and specific mitigation proposals.

This assessment accompanies a full planning application on the recommendation of The Highland Council, although the design is still evolving through a complex procurement process with two or three potential suppliers and consequently two or three potential building designs. Certain assumptions have therefore had to be made. The site design option selected for assessment is therefore deliberately a “worst-case scenario”, with the potential for detailed improvements as the procurement process is finalised (see Section 3.8). The landscape and visual issues are summarised in the following paragraphs.

10.10.1 Site selection

Mitigation of potential landscape and visual effects of the development has been considered from the outset. Most importantly, landscape fit was a fundamental issue in the site selection process.

The general location of the development – the initial site search area – was defined by electrical engineering requirements. Within this area a number of potential sites were identified and appraised for their various potential environmental effects. The proposed site at Spittal Mains (Spittal West) was initially identified because it was seen as likely to work well in landscape terms, which turned out to be the case. The preliminary landscape appraisal (Aquatera, 2010) concluded:

> *"Of the sites considered in this report, Spittal West provides the best possibilities for siting the converter station in a way that it sits comfortably in the landscape. It would appear to have few potential adverse visual impacts and would not require an OHL [overhead line] diversion."*

This fits with the point made in Scottish Planning Policy *"Different landscapes will have a different capacity to accommodate new development, and the siting and design of development should be informed by local landscape character,"* and the similar points made in the SNH LCA.

10.10.2 Site design

From a landscape and visual perspective there are two major elements to the proposed converter station and a variety of subsidiary ones. The major elements are the converter station itself, a building up to 17m high with a footprint of up to approximately 110m x 65m and the busbar array, an open metal structure about 195m long, and 135m wide. This busbar array includes an array of 132kV busbars at 7m high as well as an array of 275kV busbars which are 10.5m in height. In addition, allowance has been made for additional 275kV equipment (. A concept sketch of a converter station building is given in Figure 4.5. Images of these major elements are shown in Annex III, Plate 4.1.

For technical reasons a single level working platform is strongly preferred, so these two elements form the major items on a virtually flat development platform slightly less than seven hectares, cut into the gently sloping valley side. Ancillary elements include a security fence around the perimeter and the access tracks.

Technical constraints that had to be considered, beyond simply fitting the required infrastructure onto the site included:

- connections to the transmission network;
- connections from potential future renewable generation developments;
- flood risk;
- cut and fill into a hard rock formation; and
- site access sufficient for construction purposes.

From the preliminary analysis of the site, it was clear that the strong local landscape elements were the line of the valley, the line of the shelterbelt that runs across the valley, and the rectilinear field pattern.

Taking the landscape, technical and engineering elements into account, it was clear that there were two basic patterns of site development that could fit this landscape: aligned along the valley to fit the grain of the landscape, in a manner similar the way Spittal Mains Farm is laid out, or; aligned across the valley "tucked in" to the line of the shelterbelt (see Plate 10.4).

Various configurations of equipment layout were considered. Technically the best configuration was a compact near-square site layout which, following a design optimisation exercise, has been developed to be very close in size and shape to the existing field pattern. This was seen to accord well with the design guidance in the SNH LCA, by at the same time integrating new features into the existing arrangement of landscape components and concentrating them as a distinct group, a feature in their own right.

A 'linear' layout with the converter station building and the busbar array in line with each other and aligned along the valley was considered but this was not only technically less efficient but was seen to "straggle" along the valley floor in a way that will present more of a visible face to the A9(T) and Achanarras Farm. It also came closer to both Spittal Farm and the site of St. Magnus church, burial ground and hospital (Scheduled Ancient Monument; see Section 11.8.3).

Within the compact near-square site layout, certain elements are effectively fixed but some are variable, depending on the outcome of the converter station procurement process. Two basic options have been developed, which work for either potential building design (see Figure 10.4a and 10.4b). Both options have the converter station on the uphill side of the site – furthest from the burn and partially concealed by the cut into the hillside, and on the side of the site nearest the existing shelterbelt – to take best advantage of the screening and back-drop that this provides.

Both options have the busbar array aligned across the valley because this gives best flexibility in terms of future connections and has the array well back-dropped or screened (depending on viewpoint) by the shelterbelt and the converter station building.

Option 1 has the converter station building aligned with the shelterbelt, whilst Option 2 has the building aligned with the line of the valley. Both the preliminary designs from the procurement process look satisfactory in either alignment. With one design there is probably little to choose between the options. With the other, the along the valley – Option 2 – alignment sits more comfortably in the landscape.

The details of site layout and in particular the building alignment will be reconsidered once the procurement process concludes which supplier and thus which building design will be used. For this assessment it was decided to assess the taller of the two preliminary designs, on the Option 1 layout, as a "worst-case" scenario.

10.10.3 Mitigation commitments

The sections following contain specific mitigation commitments that will be incorporated into the detailed design at the "reserved matters" application stage.

Specific commitments are shown in plan form in Figure 10.5 and in cross section in Figure 10.6.

Table 10.6 Catalogue of agreed intervention measures related to landscape and visual issues

Ref	Title	Measure
LV1	Landscape fit	Landscape 'fit' and visual impact will be taken into consideration as part of a further iteration of the detailed design process once the procurement process has concluded which supplier and thus which building design will be used. As part of this the site optimisation exercise will be re-run to balance the technical and environmental issues in the design. The buildings will be aligned either parallel with the valley, or parallel with the shelterbelt.
LV2	Colour scheme	The colour scheme for the building will aim to make the development visually recessive and to break up the apparent bulk of the structure, potentially by using varying hues or colours on different building elements.
LV3	Colour scheme	The colours selected will be agreed with The Highland Council and be designed to minimise visual contrast with the landscape backdrop. Preliminary consideration of the local landscape suggests that colours are likely to be dull dark green and selected from the range RAL 6003 to 6013, potentially with some detail elements from the range RAL 8000 to 8004.
LV4	Landscape screening	Surplus material from the excavations will be used to reshape the valley immediately around the proposed converter station to reduce the extent to which it is visible from the A9, Spittal Mains and St. Magnus church, burial ground and hospital, but avoiding the creation of distinct 'bunds'.
LV5	Landscape restoration	The reshaped ground will be restored to grassland similar to the existing fields and returned to agriculture (except where planted – see LV12)
LV6	Boundary fencing	The site perimeter security fence will be located around the immediate boundary of the working platform, so that it too is screened by the proposed landscape mitigation.
LV7	Shelterbelt	The existing shelterbelt will be retained and managed as a long-term visual screen to the development.
LV8	Shelterbelt	The construction access will take advantage of an existing gap through the existing shelterbelt. Widening of this gap will be necessary but will be kept to the minimum practical and located to minimise the risk of windthrow.
LV9	Shelterbelt reinforcement	The shelterbelt will be reinforced with the planting of a parallel belt of woodland to the north. This will be a mixture of native deciduous and appropriate evergreen species to provide a more natural woodland edge whilst maintaining effective screening.
LV10	Roadside tree planting	Extensive linear clumps of planting will be introduced along the A9 between Spittal Mains and the existing shelterbelt to filter views from the road. This will be primarily of native deciduous species with a small proportion of evergreens to enhance screening in winter.
LV11	Burnside planting	Clumps of planting will be introduced along the Achanarras Burn, primarily for ecological / habitat enhancement but also serving to provide visual continuity with planting on the regraded valley slopes (below).
LV12	Site bund planting	Clumps of planting will be introduced close to the development on the regraded valley slopes immediately south of the site to filter views from Spittal Mains farmyard and from the site of St. Magnus church, burial ground and hospital.

Ref	Title	Measure
LV13	Scheduling of planting	All planting will be undertaken as early as possible during the project programme, and will be carried out by an experienced landscape contractor in accordance with a detailed landscape specification that will be provided as part of the project. All new planting will be protected by rabbit and stock proof fencing.
LV14	Alignment of drains	Diverted and new ditches will be designed to follow natural contours wherever possible and will be naturalised if possible (see H11).

Species used in the extension to the shelterbelt are likely to be selected from the following:

Crataegus monogyna	Hawthorn
Ilex aquifolium	Holly
Picea sitchensis	Sitka spruce
Pinus nigra	Black pine
Pinus sylvestris	Scots pine
Populus tremula	Aspen
Quercus robur	Common oak
Rosa spp	Wild roses
Sorbus aucuparia	Rowan
Ulmus glabra	Wych elm

Species used in the hedge along the A9(T) are likely to be selected from:

Crataegus monogyna	Hawthorn
Corylus avellana	Hazel
Fagus sylvatica	Beech
Ilex aquifolium	Holly
Quercus robur	Common oak
Rosa spp	Wild roses
Sorbus aucuparia	Rowan
Ulmus glabra	Wych elm

Species use in the planting clumps along the diverted naturalised ditches, beside the Burn of Achanarras and on the re-shaped landform are likely to be selected from:

Salix caprea	Goat willow
Salix cinerea	Grey willow
Salix viminalis	Osier
Alnus glutinosa	Alder

Species used in the groups of trees on the reshaped landform are likely to be selected from the following:

Ilex aquifolium	Holly
Pinus sylvestris	Scots pine
Populus tremula	Aspen
Quercus robur	Common oak
Sorbus aucuparia	Rowan
Ulmus glabra	Wych elm

Mitigation measures during construction and for reinstatement

During the construction period many of the potential construction mitigation measures will involve small-scale site management issues regarding the detailed location of construction activities. Individually these may have only minor impacts, but cumulatively these could have an influence upon the intrusiveness of the construction activities.

Table 10.7 Catalogue of agreed intervention measures to avoid or reduce potential construction effects

Ref	Title	Measure
LV15	Site Design	The extent of temporary materials and plant storage areas, contractors' compounds and security fencing will be kept to the minimum required, and potential landscape and visual impacts will be taken into consideration in deciding their detailed locations.
LV16	Lighting	Working lighting will be carefully located so as to minimise the potential for visibility from off site.

10.11 Landscape impact assessment

10.11.1 Existing character

The development will be located in the shallow valley of the Achanarras Burn , a locally enclosed part of the very broad and subtle valley of the River Thurso.

The valley of the Achanarras Burn runs north-northwest / south-southeast between Achanarras Hill and the lower slopes of Spittal Hill. It is about a kilometre wide and three kilometres long.

Achanarras Hill is a low hill that rises gently above Achlachan Moss to a height of about 115m AOD (25m above the Moss). It has a distinct broad ridge running north-northwest for a little under two kilometres, falling steadily to about 90m AOD then dropping more sharply and flattening out to form just a slight rise in the broader Thurso valley. The Achanarras Burn rises out of the moss around Mybster and is constrained in a complex of ditches before it becomes a distinct (though still ditched) stream in the valley proper, where it is generally some 20 to 25m below the ridge of Achanarras Hill.

The valley is under improved grassland, with a rectilinear pattern of fences and ditches in a grid running approximately parallel with the valley. Very locally the landscape has a distinct north-northwest – south-southeast 'grain' formed by the A9(T) which runs along the western flank of Spittal Hill, the ditched burn in the valley bottom and the ridge of Achanarras Hill. Three coniferous shelterbelts form visually strong features at right angles to the valley: two opposite each other just south of Spittal Mains and one from the A9(T) down to the burn opposite the end of Achanarras Hill.

The shelterbelts and the hills combine to make the valley a partially enclosed section of what is more widely a very open landscape.

As noted above, in the SNH LCA the area forms part of the mixed agriculture and settlement local landscape character type. This landscape is described as having an “extremely complex composition with no obvious hierarchy” – in other words it is hard to define the dominant elements in the landscape. Very locally the landscape is clearly agricultural. There are two existing developments, both farm steadings: Spittal Mains which is an active farm and Achanarras which is unoccupied. It is worth noting that large agricultural sheds are quite common in the wider landscape.

10.11.2 Nature of change

The proposed development will introduce a large building and substation complex into the lower part of this partially enclosed agricultural valley landscape. As far as technically feasible the form of the building and its detailing and colour will reflect the large agricultural sheds that have been built across this landscape in recent decades. The scale of the building and the associated electrical infrastructure will, however, make it unmistakeably industrial in nature.

10.11.3 Landscape sensitivity

The SNH landscape character assessment notes that the composition and balance of the complex mix of characteristics that make up this landscape have changed over the years and continue to do so. This is in some respects a ‘landscape of change’, one that is continually evolving, and as such can be regarded as comparatively tolerant of change – low sensitivity. However, the valley of the Achanarras Burn appears to be an area that has seen less change than the wider landscape so may be considered moderately sensitive.

10.11.4 Magnitude of change

The magnitude of perceived change to the landscape is very much dependent on the scale at which it is considered. In the context of the valley of the Achanarras Burn , the change will clearly be substantial. It will be an intensive degree of change over a limited area. However, in the context of the scale of the wider Thurso valley and the extent of the local landscape character type, it will be a low magnitude of change.

10.11.5 Effect during construction

During the construction period, the site will be undergoing active change, and construction compounds, materials stores and the like will mean that the area of landscape affected will be larger than the finished site. Very locally there will be a change to the landscape of sufficient intensity that it will be considered a major adverse effect to even a moderately sensitive landscape. However, in the context of the wider landscape (the valley of the River Thurso as a whole) the change will be **minor adverse**.

10.11.6 Effect during the winter following completion

On completion, the wider working area will be restored but the mitigation landscape works will be hardly noticeable. The magnitude of change will be slightly reduced from that during construction but not sufficiently to change the degree of significance.

Very locally there will be an intensive change to the landscape over a limited area, giving rise to a **major adverse** effect. In the context of the large scale landscapes of Caithness, in this case the broad valley of the River Thurso the physical extent of the change is sufficiently limited that its effect will be **minor adverse**.

10.11.7 Effect in the summer 15 years after completion

By fifteen years after completion, the mitigation landscape works will be well established, reducing the extent to which the development could be seen, increasing the degree of enclosure of the valley and itself changing to a degree the character of the valley very locally. Considered from within the enclosed area of valley, the effect will still be **major adverse** but the area from which this degree of change could be perceived will be reduced. In the wider context, the effect will remain **minor adverse**.

10.12 Visual impact assessment

10.12.1 Introduction

The visual impact assessment is illustrated from fourteen viewpoints (listed below) designed to give a balanced representation of potential views of the development (see Figure 10.7). The viewpoint list was agreed in advance with SNH and The Highland Council. An additional viewpoint, 15, was added for assessing the impact of the development on the setting of an archaeological site. The visual effects from this viewpoint are considered in see Chapter 11: Archaeology and Cultural Heritage (see Section 11.11.1).

The professional carrying out the assessment considered the visibility and potential impacts in the wider area, not simply from the agreed viewpoints. As a result of this, whilst undertaking the assessment it was found that the two agreed views from either side of Halkirk had very similar effects, so only the one with a clearer view to the site has been illustrated for the assessment, and an additional viewpoint (No 14 below) has been added to give better representation of views from the broad scatter of residential properties south of the town.

The effects anticipated at each viewpoint are set out in the form of a table, the Visual Effect Schedule, in Appendix 10-B.

Photomontages from viewpoints 1, 2, 3, 6, and 13 are shown in Appendix 10-A (VP1, VP2, VP3, VP6, and VP13) and simpler visualisations from the other viewpoints (VP4-6 and VP8-14) are also included in Appendix 10-A. A visualisation from viewpoint 15 is included in Appendix 11-D.

In all cases one illustration shows the proposed development in a view 37° wide[95], printed on an A3 page, designed to be viewed from a comfortable distance (about 50cm). If used in the field to compare existing and proposed, these give a 'life-size' image. Additional illustrations are provided to show the wider site context and the full extent of the works where this is not possible from the single image.

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[95] Base photography was taken using a Pentax K7 14Mp DSLR with a 35mm f2 prime lens. This is equivalent to a 53.5mm lens on a 35mm film camera, a very slightly closer view than the "standard" 50mm and higher resolution than provided by a film camera. Where possible the 37° images are a single frame photo, but where the site is not properly centred or the centred image doesn't show the full context an identical size crop has been taken from a cylindrical panorama stitched from adjacent levelled images. No visible distortion is produced by this process.

The illustrated viewpoints are:

VP1	Achanarras Farm
VP2	Achanarras Quarry
VP3	A9(T) above Spittal Mains Farm (the start of a 35 second view sequence for the northbound car traveller past the converter station)
VP4	A9(T) by Achalone (the view from the road and representative of a scatter of houses)
VP5	The minor road north of site (representative of a scatter of houses at Achalone)
VP6	Harpsdale road junction (representative of a group of houses)
VP7	B870 W of Mybster (also representative of a small group of houses)
VP8	A9(T) South of Mybster
VP9	A9(T)/A882 junction (also representative of some scattered houses)
VP10	Sordale (view from the A9(T) south of Thurso & a scatter of isolated houses)
VP11	Halkirk (a selected clear view to represent potential views from the edge of town)
VP12	Scotscalder
VP13	Ben Dorrery
VP14	A9(T) layby, Halsary viewpoint
VP15	Spittal Mains farm track (see Section 11.11.1)

10.12.2 Permanent effects

The converter station will be clearly visible from a short section of the A9(T) north of Mybster and from the ruins of St. Magnus church, burial ground and hospital (see Section 11.11.1). It will be clearly visible from parts of the curtilage of Achanarras and Spittal Mains but not from the farmhouses, and it will be clearly visible from some of the higher parts of the Achanarras Quarry SSSI. In all cases the converter station building itself will be back-dropped either by the existing shelterbelt or by the lie of the land, and local planting will substantially reduce views of the electrical infrastructure.

Beyond the immediate vicinity as described above, views of the converter station site will be limited by topography and by the existing shelterbelt. There will be views of the access road and of the widened cut in the shelterbelt from the group of houses at Achalone / Achcomhairle immediately to the north of the site. In bright conditions with the sun from the south, the presence of the converter station building will be distinguishable by the change in the pattern of light through the trees.

For potential receptors further afield to the north, including the whole of Halkirk, the existing shelterbelt will provide an almost complete screen. On a clear day with good light, a keen-eyed observer may be able to just distinguish the ridge line of the converter station building though the feathery tops of the shelterbelt, but it will not be noticed by the ordinary person. There will be some distant views from a small area of high ground around Stemster and a glimpse though the gap in the shelterbelt from a narrow strip of ground north to Sordale.

Achanarras Hill will provide a complete screen to potential receptors to the southwest.

Most available views will be from the northwest, with views to the development between the end of Achanarras Hill and the existing shelterbelt. The closest receptors in this direction are in the Harpsdale area. There will be more distant views from the higher ground around Scotscalder and Hill of Calder, partial views from an area west of Halkirk towards Loch Calder and distant views from Ben Dorrery and Ben Freiceadain.

To the south of the site, gently rising ground effectively blocks all views. Even at Balbeg, the nearest property to the south, the site is not visible. The ridge of the converter station may be just visible above the horizon but it will be back-dropped by the shelterbelt and thus hardly noticeable.

The development will be visible from the few high points in this generally open landscape. From Spittal Hill it will form part of the mid-ground of a very open view, and from the hills to the west such as Ben Dorrery it will form a small part of the middle distant scene.

In the first few years after completion, the converter station will be clearly visible for about 35 seconds to northbound traffic on the A9(T), a new industrial development in a dramatic open rural view. This will be a change of high magnitude to a receptor of moderate to high sensitivity, giving rise to a **major adverse** visual impact. Once the mitigation planting along the roadside starts to develop, it will partially block and filter this view, reducing the length of time for which the converter station is visible thus making it much less noticeable. The mitigation planting would however result in the loss of a currently open view, in itself a **moderate adverse** effect**.**

From the adjacent farmhouses at Spittal Mains and Achanarras there will no direct view and thus no visual impact. However, the converter station will be clearly visible from parts of the curtilage of both houses and from the approach to Achanarras Farm, such that the overall experience from both properties will be subject to a change of medium magnitude giving rise to a **moderate adverse** visual impact. With time there will be a reasonable degree of screening provided by mitigation planting but the development will remain clearly visible and thus there will be no reduction in the significance of the impact.

From Achanarras Quarry SSSI there will be little or no view from the vicinity of the shelter and the lower parts of the quarry but there will be a partial view from the approach track and a clear view from the highest parts of the quarry. Many visitors could be expected to have their attention focussed on the quarry site but others would be looking at the wider landscape. Overall therefore there will be a change of medium magnitude to a highly sensitive receptor giving rise to a **moderate adverse** visual impact.
Mitigation planting will not substantially reduce the extent of views of the development from the SSSI, so there will be no change in impact over time.

Beyond these areas, there will be no significant visual impacts.

The access road will have a **minor adverse** visual impact from close to the site to the north, including the group of houses at Achalone / Achcomhairle. This will reduce over time to a **minor neutral impact** as the mitigation planting developed and just the trees became visible.

From the middle distance to the northwest, including the Harpsdale area, the converter station will be a small back-dropped addition to a busy part of the far middle-distance of an extensive view, only marginally visible. This will be a change of low magnitude to views from receptors of mixed sensitivity, including high, but it will give rise to no more than a **minor adverse** visual impact. Mitigation planting will have little effect in views from this area, so there will be no change in effect over time.

From Halkirk and more widely to the north, there will be almost no view of the converter station, and thus no impact. In a few places an acute observer may be able to distinguish the presence of the development through the trees when lighting conditions are right. In these conditions the impact will be **negligible**.

From the high points in the landscape around the proposed development, the scale of the view is so enormous that even the converter station will be a small item in the scene, located in an area where there is already variation in texture and colour in the view so that it will not stand out particularly. It will be a change of low magnitude giving rise to no more than a **minor adverse** visual impact.

From the south there will be very limited visibility. The closest receptor, Balbeg Farm, will have no view from the farmhouse, and thus **no visual impact**. From parts of the curtilage of the farm, and from a short section of the B870 south of the farm, the ridge line of the building will be just visible but it will be backdropped by the shelterbelt and thus unlikely to be noticed, giving a **negligible** visual impact.

10.12.3 Construction period effects

During the construction period, the site will be undergoing active change and busy with moving vehicles. Both of these – active change and movement will make the works more visible locally.

From the group of houses at Achalone / Achcomhairle – where construction vehicles will be clearly visible (unlike the permanent works) this will be sufficient to increase degree of change to medium magnitude and thus the impact to **moderate adverse**.

Elsewhere the degree of difference during construction will not be such that the significance of impact will be greater than the permanent impact.

10.13 Potential for cumulative effects

There is an existing wind farm at Causeymire 4 to 5 km south of the converter station site (considered part of the baseline landscape) and two wind farm developments under consideration: Halsary and Spittal. These wind farms would be widely visible across most of the area from which the converter station would be visible.

From most places where the new wind farms would be seen in conjunction with the converter station, the converter station would be a small part of a view where the turbines would be a new focal point. The change in the view would be dominated by the wind farm, with the converter station a sufficiently minor element that the cumulative effect would be **negligible**.

From Achanarras Quarry, the Spittal Wind Farm is likely to be very visible in the same general direction as the converter station, with the landscape starting to become a ‘landscape of wind farms’. In this situation, with the converter station in the wider view, this would increase the degree of apparent ‘industrialisation’ of the landscape – giving rise a **moderate adverse cumulative effect.**

Drivers on the A9(T) northbound will see the converter station for a little over half a minute in a journey (and view sequence) from Latheron to Thurso taking about forty minutes. The effect of the development will be to slightly alter the balance of the landscape perceived through the Mybster / Spittal area to more industrial – extending the sense that the landscape is manmade slightly north of Spittal in the same way that the Spittal substation extends this aspect of character south of Mybster. This will, however, not give rise to a significant change in the character of sequential views experienced along the inland section of the A9(T).

10.14 Summary of key findings

10.14.1 Findings of the assessment

The converter station development will be located in a locally small and enclosed part of the generally open and expansive Caithness landscape.

Topography and existing shelterbelts combine to restrict visibility of the proposal to a significant degree. It will be clearly visible locally from the curtilage of the two adjacent properties (although not from the houses themselves) and from a short section of the A9(T).

To the east, the rising ground of Spittal Hill will restrict visibility to fields and hillside within one to two kilometres. To the north, the existing shelterbelt will block most views, although the access track will be clearly visible locally, and the bulk of the converter station may be distinguished through the shelterbelt when there is bright light to the south. There will be distant views from a small area of high ground around Stemster, a glimpse though the gap in the shelterbelt from a narrow strip of ground north to Sordale but almost no view from Halkirk.

To the south rising ground at the head of the valley of the Achanarras Burn will block almost all views, although there will be some restricted distant view from a short section of the A9(T) at Halsary. To the southwest, Achanarras Hill will block any visibility from the upper valley of the River Thurso.

Most available views will be from the northwest, with views in between the end of Achanarras Hill and the existing shelterbelt from the Harpsdale area and from the higher ground around Scotscalder, Hill of Calder and Ben Dorrery and Ben Freiceadain. There will be limited distant views from much of the area west of Halkirk as far as Loch Calder.

10.14.2 Significant effects

Very locally, on the enclosed valley of the Achanarras Burn, the development will have a **major adverse** effect on the landscape.

There will be significant adverse visual effects on a number of receptors within about a kilometre of the development. In the first few years after completion there will be a **major adverse** visual impact to the A9(T) past the site, falling to **moderate adverse** as the mitigation planting along the roadside develops.

From the adjacent farmhouses at Spittal Mains and Achanarras there will be no direct view and thus no visual impact but the overall visual experience from the curtilage or approach to the properties will be subject to a **moderate adverse** visual impact, which will not change substantially over time.

There will be a **moderate adverse** visual impact on views from the Achanarras Quarry SSSI.

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11 Archaeology and Cultural Heritage

11.1 What is covered in this chapter?

This chapter considers the potential impacts of the proposed converter station on archaeological and cultural heritage resources. Such resources include[96]:

- World Heritage Sites
- Scheduled Ancient Monuments (SAMs)
- Listed Buildings
- Gardens and Designed Landscapes
- Conservation Areas
- Other archaeological sites and monuments
- Other non-designated historic environment assets

Archaeological and cultural heritage resources of potential relevance to this project are identified individually (see Figures 11.1 to 11.3 and Appendix 11-A) and the possible impact(s) of the proposed development on them is assessed.

The potential impacts include:

- direct physical impacts that may be caused by the construction of the converter station, including ancillary works, access routes and temporary compounds and laydown areas; and
- indirect impacts that may be caused by the construction of the converter station on the historic landscape and setting of the identified sites and resources. Information on impacts on the landscape and visual setting of cultural resource sites can also be found in Chapter 10: Landscape and Visual Impacts.

The potential issues and effects of the proposed development are presented, followed by both suggested and agreed mitigation measures, which were developed as the field assessments were carried out. The subsequent impact assessment takes account of specific mitigation commitments.

11.2 Why could this issue be important?

Key heritage assets, such as SAMs and Listed Buildings, have statutory protection from direct physical disturbance and also from unacceptable intrusions into their setting. Therefore any project must be planned and designed around this strong regulatory framework and take into account the requirements contained therein. There is also strong local interest in the history of Caithness, and its cultural heritage forms a growing focus for tourism and amenity purposes. Therefore there could be concerns if the construction of the converter station physically impacts a site, or if it significantly adversely affects (or is perceived to affect) the visual character of the historic landscape, the setting of sites and monuments or even how people enjoy the historic environment amenities of the area (see Chapter 15: Socio-Economic Effects).

[96] See (Historic Scotland, 2010a) for definitions

11.3 Sources of information

The assessment has reviewed information from a variety of sources, including:

- The National Monuments Record for Scotland (via the Pastmap and Canmore on- line facilities: <http://canmore.rcahms.gov.uk/> and <http://jura.rcahms.gov.uk/PASTMAP/>)
- The local Sites and Monuments Record held by The Highland Council, both by a search conducted by the Highland Council Archaeological Unit and via the online Highland Historic Environment Record (<http://her.highland.gov.uk/>)
- Statutory lists, registers and designated areas, including List of Scheduled Ancient Monuments, Listed Buildings, Designed Landscapes and local authority Conservation Areas
- The appropriate Ordnance Survey (OS) maps:
    - OS County Series 1:10560 (6" to 1 mile) 1st edition 1887
    - OS County Series 1:2500 (25" to 1 mile) 1st edition 1887
    - OS County Series 1:2500 (25" to 1 mile) 1st revision 1906
    - OS 1: 25000 1965 edition
    - OS 1:10560 1971 edition
    - OS 1: 25000 2007 Explorer edition
- Historic Land-use Assessment (HLA) maps produced by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCHAMS) and Historic Scotland, accessed online at <http://hla.rcahms.gov.uk>
- Pre-Ordnance Survey maps of the area in the National Library of Scotland's online collection at <http://maps.nls.uk/> were checked, but none depicted the area in sufficient detail for any useful information to be discerned
- The Caithness and Sutherland Landscape Character Assessment, commissioned by Scottish Natural Heritage (Stanton, 1998)
- The Old and New Statistical Accounts of Scotland, and appropriate archaeological and historical journals, monographs and books (e.g. Baines et al., 2003; Barber, 2006; Batey, 1987; Davidson and Henshall, 1991; Heald & Jackson, 2001; MacKie, 2007; Pannett & Baines, 2003) were consulted to inform the understanding of the historic environment and context of the affected sites and monuments but did not result in the identification of any additional sites (a full list of these sources can be found in Section 11.14)
- Reports produced for this project by the Orkney Research Centre for Archaeology (ORCA), which included the results of desk-based assessments and walkover surveys
- Site visit 16-17 September, 2010 by ORCA
- Feedback from consultees (see Section 11.5 and Annex I).

11.4 Survey and analysis work undertaken

A desk-based assessment was conducted reviewing existing databases for the area to identify known sites in the vicinity of the proposed development, known sites within the Zone of Theoretical Visibility (ZTV)[97] and to assess the potential for unidentified sites and landscapes.

In addition, a walkover survey of the converter station site took place between 16 and 17th September 2010, to identify previously unknown sites. Also on these dates, several sites were visited for the consideration of setting issues.

These activities and the ZTV are described in more detail in Section 11.7 below.

11.5 Consultation feedback

Feedback regarding archaeology and cultural heritage issues is summarised below. Consultation was carried out with Historic Scotland and with The Highland Council. For a complete outline of Historic Scotland consultation feedback, including comments in The Highland Council's Pre-Application Advice Pack, see Annex I.

Historic Scotland's first consultation response of 25 June (AMNH/16/H) contained a number of key points.

- A number of assets (individually named in the response, see Annex I) within Historic Scotland's statutory remit are located in the vicinity of the original five proposed converter station sites and should be considered in terms of impact on their setting, as should any others in the wider area which may experience significant impacts. Only those relevant to the proposed site at Spittal Mains and within (or close to the edge of) the ZTV will be discussed in this chapter..
- The ES should contain appropriate visualisations such as photomontages and wireframe views of the development in relation to the sites and their settings, illustrating views both towards and from the proposed development, because the scale of the proposed converter station means that it has the potential to be particularly prominent.
- The ES should assess the potential cumulative and incremental impact of the proposed development in combination with other past, present and reasonably foreseeable developments in the vicinity.
- Historic Scotland recommended that alternative locations to the Spittal Mains site be considered, expressing concern that the Scheduled Monument of "*St Magnus' church, burial ground and hospital (Index no. 5413)* would be c.300m to the south of the compound. The scale and proximity of the compound would be likely to have an adverse impact on the setting of the church….If development was considered here [at West Spittal] impacts on the setting *of St. Magnus' Church and on the SAM Fairy Hillock, a chambered cairn SE of Spittal Mains (Index no. 528)* should be assessed and mitigation proposed."

[97] A visual envelope map giving an indication of the area from which the development theoretically may be visible. Due to shortcomings in computer modelling, there are places shown as having visibility that in reality will have no view, because of local screening by a tree or a wall that cannot reasonably be modelled. There may also be places shown as not having visibility where there is in reality a view – for example, if there are local high spots that are not accurately represented by the digital terrain model.

- Historic Scotland is keen to actively follow and discuss proposals and assessments as they progress, and provided guidance on setting in the documents: http://www.historic-scotland.gov.uk/scoping_of_development_proposals_2009.pdf and http://www.historic-scotland.gov.uk/managing-change-consultation-setting.pdf[98].

At a meeting with Historic Scotland on 27 July 2010 (minutes provided by Natural Capital Ltd for SSE),

- Historic Scotland re-iterated that the proposed location at Spittal Mains was the least preferred because of the effect of such a large development in this open, modified landscape, on the nationally important St Magnus' church, burial ground and hospital and the potential, given the church's attributes, that surrounding archaeology may exist.
- It was understood that due to other considerations the developer favoured the location.
- Mitigation measures discussed included suitable management of the nearby shelterbelts, which provide a high degree of screening, since felling them would increase the visual impact.
- Historic Scotland commented that all mitigation measures discussed for the proposed site at Spittal Mains were positive, even though it remained their least preferred site.

The Highland Council's Pre-Application Advice Pack (The Highland Council 2010) of 14 September points the developer to:

- Highland Structure Plan Policy BC1: "Archaeological sites [and in Strategic Policy G2 their setting] affected by development proposals should be preserved, or, in exceptional circumstances where preservation is impossible, the sites will be recorded at developers' expense to professional standards. Provision will be made in Local Plans for the appropriate protection, preservation and enhancement of archaeological sites."
- Highland Structure Plan Policy BC2, which provides for proposals that bring tourism or education benefits in relation to archaeological sites.
- The September 2010 proposed Highland wide Local Development Plan (HwLDP), which is a material consideration. This includes proposed policy 58 that "All development *proposals* will be assessed taking into account the level of importance and nature of heritage features, the nature and scale of development, and any impact on the feature and its setting. The following criteria will also apply: 1. For features of **local / regional importance** we will allow developments if we believe that they will not have an unacceptable impact on the amenity and heritage resource. 2. For features of **national importance** we will allow developments that can be shown not to compromise the amenity and heritage resource. Where there may be any significant adverse effects, these must be clearly outweighed by social or economic benefits of national importance. It must also be shown that the development will support communities in *fragile areas* who are having difficulties in keeping their population and services."

[98] The consultation document has now been formally adopted, see (Historic Scotland, 2010a).

- The Highland Council's comments and suggested mitigations in terms of the landscape and visual impact are outlined in the relevant chapter (see Section 10.5).

Historic Scotland's response to The Highland Council, contained in the Pre-Application Pack re-iterates the points raised in their previous consultation responses, especially that the preferred site at Spittal Mains raises concerns about impacts on the setting of one scheduled monument (St Magnus' church, burial ground and hospital (Index no. 5413)) because there is likely to be a significant impact on its setting; therefore alternative locations should be considered. Historic Scotland adds that:

- if this location (the least-preferred one for Historic Scotland) is the only one that proves to be feasible, there is potential to mitigate the most adverse aspects of the impact on setting;
- existing woodland shelterbelts should help screen the development and could mitigate some of the potential impact, but ensuring that the trees are not felled (or are suitably managed) during the operational lifetime of the structure would be helpful;
- orienting the main structure to ensure that it presents the smallest possible area facing the monument would also partly mitigate some of the impact on the setting of the church; and
- any other means by which the impact could be mitigated should be explored, including landscaping works or other screening measures.

In e-mail correspondence of 22 December 2010 concerning details of the proposed screening of the converter station[99], Historic Scotland made the following comments.

- The potential impact on the setting of St. Magnus scheduled monument is of particular concern.
- The medieval hospital site is directly beside a track leading to the development. This track is almost certainly the medieval road, and the spittal was located so it could be seen by passers-by. Therefore, views along the track towards and away from the monument are an important element in its setting.
- A large shed which is not screened would constitute a significant visual intrusion on that setting, and we would seek appropriate mitigation for this;
- the lower level screening (as proposed) would be appropriate for the lower-lying elements of the proposed development, but would not mitigate the impact of the converter station itself on the setting of the scheduled monument.
- Historic Scotland is of the opinion that the most appropriate form of mitigative screening would involve the use of conifers, which over time would have the potential to significantly reduce the visual impact of the converter station on this scheduled monument. This screening would also have the potential to blend with the existing shelterbelt to the north / northwest of the development site. Such shelterbelts are quite common in this part of Caithness.

[99] E-mail from Robin Campbell, HS, to project landscape consultant, 22 December 2010, 15:01

In a telephone conference of 19th January 2011 between members of Historic Scotland, Aquatera and ORCA (see Annex I), key points included the following.

- Historic Scotland confirmed that their concern is with the setting of St Magnus' church, burial ground and hospital and that the current setting is not an unobstructed landscape, comprising open grazing in valley with shelterbelts to the north and south with some views to middle and far distance to the north and south.
- Historic Scotland clarified that they do not necessarily believe the farm track follows the precise line of the medieval road, but that there is a medieval road in the vicinity passing the chapel and going onwards to Halkirk.
- Historic Scotland agreed that the converter station will not be skylined in views from the chapel and will not be impeding views that exist, and are only concerned with views from the chapel towards to the converter station, and not any views from the A9(T).
- Historic Scotland expressed no other concerns except for this one visual issue; no other concerns about any other sites of national importance were expressed.
- Historic Scotland clarified that they believe the converter station is bigger and more prominent than nearby farm sheds and will present a hard surface which will show up prominently against the shelterbelt, creating a harsh view from the St Magnus' church, burial ground and hospital that could be mitigated by planting along the south side of the converter station of sufficient bulk and height to break up and soften the views to the converter station. The mix of trees doesn't matter, but Historic Scotland would like to see the screening as high as possible – up to the eaves level as an absolute minimum, preferably to the roofline, following a reasonable amount of time for the trees to grow. They clarified that it doesn't have to be a total screening, but that at least half of the screening should cover the ridgeline of the building after some 15-20 years.

Visualisations of the proposed development with the proposed mitigation screening were presented to Historic Scotland in February (see Appendix 11-D), and in a follow up email on 14 February 2011, they stated:

- this appears to be along the lines of what we discussed and had in mind. Ideally when fully grown the planting shall have the effect of significantly screening the shed and certainly softening the hard edges of it.

11.6 Guidance and regulations

11.6.1 Legislative Context

There are two main international legally binding conventions concerning cultural heritage. These are: the *European Convention on the Protection of the Archaeological Heritage* (revised), known as the Valletta Convention, which was ratified by the UK government in 2000. This contains provisions for the identification and protection of archaeological heritage both under water and on land, preferably *in situ*, but with provisions for appropriate recording and recovery if disturbance is unavoidable; and *The European Landscape Convention*, ratified by the UK government in 2006, which promotes the protection management and planning of landscapes in Europe, including the historical and cultural aspects of landscapes. Various European Directives on environmental impact assessment have been incorporated into UK legislation including the *Environmental Impact Assessment (Scotland) Regulations* 2011 (see Section 1.4.3). This includes the requirement that the historic environment is included in the process to identify the environmental effects of development proposals to prevent, reduce and offset any adverse impacts.

The main piece of UK legislation is The *Ancient Monuments and Archaeological Areas Act* 1979 (AMAAA). It concerns sites that warrant protection due to being of national importance and are scheduled under the Act. Such sites or areas can be any "monument which in the opinion of the Secretary of State is of public interest by reason of the historic, architectural, traditional, artistic or archaeological interest attaching to it". A monument is defined as

> "any building, structure or work above or below the surface of the land, any cave or excavation; any site comprising the remains of any such building, structure or work or any cave or excavation; and any site comprising or comprising the remains of any vehicle, vessel or aircraft or other movable structure or part thereof" (Section 61 (7))."

The *Planning (Listed Buildings and Conservation Areas) (Scotland) Act* 1997 and amendments governs the listing and protection of buildings and areas of special architectural or historic interest. None was affected by the proposed converter station, so the implications of the Act will not be discussed further.

The criteria for the determination of national importance are contained in Historic Scotland's *Scottish Historic Environment Policy* (SHEP) 2009. The Act is administered in Scotland by Historic Scotland. Under the provisions of the AMAAA, it becomes an offence to carry out, without the prior written consent of the Scottish Ministers (scheduled monument consent), any works which would have the effect of demolishing, destroying, damaging, removing, repairing, altering, adding to, flooding or covering up the monument.

Article 15 of the *Town and Country Planning (General Development Procedure) (Scotland) Order* Statutory Instrument 1992 and amendments to it in Section 5 of the *Town and Country Planning (General Development Procedure) (Scotland) Amendment (No. 2) Order* 1994 and *The Town and Country Planning (Notification of Applications) (Scotland) Direction* 2007 requires planning authorities, prior to granting planning permission, to consult Scottish Ministers (through Historic Scotland) on any development proposals that may affect the site or setting of a Scheduled Monument, an A-Listed building or an Inventoried Garden or Designed Landscape. This means that the presence of such sites within the area of a proposed development and the protection of its setting are material considerations in the planning process and any planning proposal that would affect a site must be referred to Scottish Ministers (through Historic Scotland).

The *Town and Country Planning (Scotland) Act* 1997 and amendments, is the primary legislation which governs both development planning and development management in Scotland. The *Planning etc (Scotland) Act* 2006 amends in part the 1997 Act and makes further provision relating to town and country planning in Scotland. In essence these state that the historic environment (both statutory and non-statutory designations) are of interest in planning procedures and are of material consideration in the planning process.

11.6.2 Policy and guidance

Scottish Ministers' vision and strategic policies for the historic environment are set out in Historic Scotland's *Scottish Historic Environment Policy* (SHEP) 2009. Further, more detailed guidance is provided by Historic Scotland's *Managing Change in the Historic Environment* guidance series, to be found at their website (see Planning Advice Note (PAN) 9, 2009). The Scottish Ministers' key policy principles include that

> *"there should be a presumption in favour of preservation of individual historic assets and also the pattern of the wider historic environment; no historic asset should be lost or radically changed without adequate consideration of its significance and of all the means available to manage and conserve it"* (para 1.14)

and that there should be

> *"provision for recording where continued preservation is no longer possible or where loss is taking place through change or ongoing decay, and ensure that all records are retained in readily accessible archives"* (para 1.15).

Scottish Planning Policy (SPP 2010), with the companion Planning Advice Note (PAN 42): *Archaeology – the Planning Process and Scheduled Monument Procedures* 1994, sets out the government's planning policy on how the historic environment should be handled under the development plan and development control systems. The historic environment includes "ancient monuments, archaeological sites and landscape, historic buildings, townscapes, parks, gardens and designed landscapes and other features. It comprises both statutory and non-statutory designations. The location of historic features in the landscape and the patterns of past use are part of the historic environment." (SPP 2010, para 111).

It recognises that "archaeological sites and monuments are an important, finite and non-renewable resource and should be protected and preserved in situ wherever feasible" (SPP 2010, para 123), but also that "in most cases the historic environment can accommodate change which is informed and sensitively managed", with the proviso that "in some cases the importance of the heritage asset is such that change may be difficult or not possible" (SPP 2010, para 111). Where preservation is not possible, planning authorities should ensure that procedures are in place in order that appropriate excavation, recording, analysis, publication and archiving is undertaken before and/or during development and that the developer has made appropriate provision for this (SPP 2010, para 123).

The Highland Council's *Caithness Local Plan* (2002) and The Highland Council's *Structure Plan* (2001) set out the strategic framework for development of land in Caithness and the Highlands. These will shortly be supplemented and partly superseded by the Highland wide Local Development Plan (HwLDP), the proposed version of which was produced in September 2010 and which is a material consideration. These plans encourage appropriate developments while at the same time protecting *inter alia* archaeology and built heritage (Structure Plan policies BC1-5, HwLDP policy 58 – see Section 11.4 above).

Setting is an important consideration in legislation and in planning guidance on changes to the historic environment. In SPP 2010:

> *"Setting is more than the immediate surroundings of a site or building, and may be related to the function or use of a place, or how it was intended to fit into the landscape or townscape, the view from it or how it is seen from around, or areas that are important to the protection of the place, site or building. When…considering development proposals with a potentially*

> *significant impact on historic character, planning authorities should consider the capacity of settlements and the surrounding areas to accommodate development without damage to their historic value"* (para 113).

SPP 2010 (para 118) also states that a scheduled monument is of national importance and that part of the purpose of scheduling is to secure the monument "in-situ and as far as possible in its existing state and within an appropriate setting" and that

> *"Where works requiring planning permission affect a scheduled monument, the protection of the monument and its setting are important considerations. Development which will have an adverse effect on a scheduled monument or the integrity of its setting should not be permitted unless there are exceptional circumstances"* (para 118).

Scottish Ministers key principles as stated in SHEP 2009 include that the conservation of the historic environment should:

> *"have regard to retaining, or where appropriate enhancing, the setting of the site, monument, building or landscape; ensure that, where change is proposed, it is appropriate, carefully considered, authoritatively based, properly planned and executed, and (if appropriate) reversible;"* (para 1.15).

General guidance on setting is contained in Historic Scotland's 2009 *Scoping of Development Proposals: Assessment of Impact on the Setting of the Historic Environment Resource – Some General Considerations*, but its most recent and detailed guidance on setting is contained in its *Managing Change in the Historic Environment* series (Historic Scotland 2010a), dated October 2010. In the latter, setting is defined as how monuments were:

> *"deliberately positioned with reference to the surrounding topography, resources, landscape and other monuments or buildings. These relationships will often have changed through the life of a historic structure. Setting can be thought of as the way in which a historic structure's surroundings contribute to how it is experienced, understood and appreciated. Setting often extends beyond the immediate property boundary of a historic structure into the broader landscape"* (paras 2.2 & 2.3).

SSE's Substation Site Selection Guidelines (SSE, 2009), which were developed from the Holford Rules (National Grid undated), state that "close proximity" to environmental designations, including Scheduled Ancient Monuments, Battlefields, Listed Buildings, Conservation Areas, Historic Gardens and Designed Landscapes, should be avoided where possible. However, "close proximity" is not specifically defined in these guidelines.

Professional and industry standards and guidance on best practice are covered by The Landscape Institute and the Institute of Environmental Management and Assessment's *Guidelines for Landscape and Visual Impact Assessment* (Wilson, 2002) and the Institute for Archaeologists (IfA) Working Group on the Setting of Cultural Heritage Features' *Setting Standards: A Review* (Lambrick, 2008).

11.7 Methodology

This assessment involved the following activities:

- reviewing existing databases for the area to identify known sites in the area and known sites within the Zone of Theoretical Visibility (ZTV) and the potential for unidentified sites and landscapes;
- conducting a walkover survey of the converter station site and its immediate environs to identify previously unknown sites;
- categorising sites within the vicinity and within the ZTV in terms of local, regional, national or international significance;
- identifying any known or likely sensitive sites or areas within the vicinity or within the ZTV, predicting impacts and proposing mitigation or management strategies; and
- identifying the significance of residual effects.

These activities are described in more detail in the sections that follow. They follow standard practice and guidelines (referred to in each section) and have been approved by Historic Scotland[100].

11.7.1 Desk-based assessment

The desk-based assessment (DBA) was executed in accordance with the Institute for Archaeologists (IfA) *Standard and Guidance for archaeological desk-based assessment* (revised 2008, accessed 2nd June 2010 at www.archaeologists.net) and the relevant parts of The Highland Council's *Guidance for Archaeological Contractors* (available at www.highland.gov.uk).

The DBA covered the footprint of the converter station itself and anything within 1km (1km radius) of this. This was to identify any sites that might be affected by the proposed development, either directly (physically) or indirectly. Beyond this, in order to assess any setting issues, the DBA area of study was the area from which the proposed development may be seen, the visual envelope or ZTV, and the cultural heritage assets within. Guidance indicates that if a historic asset is not within the visual envelope of a development then most factors contributing to the setting of the asset will not be affected (Historic Scotland, 2010). The area of the ZTV has been established by a process described in Chapter 10: Landscape and Visual Impact, Section 10.7.4 and is shown on Figures 11.2 and 11.3. The distance from which a development is seen is important in considering the impact (see Section 10.7.4 for a detailed analysis). This has resulted in the potential impact of the development on the setting of heritage assets being assessed in zones: within 2km of the converter station, 2-5km away and 5-10km away. Beyond this it is most unlikely that the development will have an impact.

Within the ZTV in a 2km radius of the proposed converter station location, all sites were recorded and assessed in terms of the potential historic landscape and setting impact. For the ZTV between 2 and 5km from the converter station, sites of moderate to very high importance were assessed i.e. of regional, national or international significance), whilst 5 to 10km away only sites of high or very high importance, were assessed for the purposes of this report. Sites outwith the 10km ZTV were not assessed, because the level of impact is considered to be minor or none, even on sites of high or national importance. These bands are based on

[100] Phone conversation with Robin Campbell of HS EIA team, 28.1.11 and e-mail from John Malcolm, Inspector of Ancient Monuments in HS northwest team, 26.1.11

how prominent the development would be at increasing distances from the site (see Section 10.7.4) and concepts in national guidance (Scottish Government, 2002).

Each archaeological or historical site, monument and building identified within the assessment area was assigned an individual site number. All sites identified by the DBA, and the importance and significance of each individual site, are presented in tables appended to this chapter (Appendix 11-A and 11-B).

11.7.2 Walkover survey and site visits

The walkover of the converter station site took place between 16 and 17th September 2010. Also on these dates, several sites were visited for the consideration of setting issues. Although during the survey the weather was often wet with poor visibility, photographs were taken during clearer intervals.

The walkover survey of the converter station site was undertaken in a systematic manner, with transect width appropriate to the conditions (pasture field). The area fieldwalked included the field on the south side of the current location, the farm track on the east side of it, the shelterbelt and track to the north and visual inspections of a 30m wide corridor of the field on the east side of this and the fields flanking the track from Spittal Mains Farm. Any features or sites identified were assigned a unique site number, briefly recorded (see ORCA 2010b for details) and evaluated. Any sites identified by the DBA within the immediate vicinity were also visited to evaluate their nature, condition and potential impacts of the proposed works.

For the assessment of setting issues, SAM sites 62, 65 and 309 (see Figure 11.2) and a sample selection of non-designated sites were visited within the 2km ZTV. The photographic register detailing the record shots taken during the walkover survey can be found in ORCA 2010c.

11.7.3 Assessment of importance

The importance (or sensitivity) attributed to each identified area, site or feature will be determined using the criteria in Table 11.1, which incorporate general guidelines used by statutory agencies such as Historic Scotland, outlined in *Scottish Historic Environment Policy* (SHEP) 2009, *Scottish Planning Policy* (February 2010), with the companion Planning Advice Note (PAN 42): *Archaeology – the Planning Process and Scheduled Monument Procedures* 1994. It should be noted that a site that has not been statutorily designated can still be of high importance. Features that would require considerable further work to interpret them will be recorded as of uncertain importance and significance.

Table 11.1 Definitions of importance (or sensitivity) of cultural heritage sites

Level of importance	Criteria[101]
Very High	Archaeological and historical sites or areas of international importance, such as World Heritage Sites, and may also include some Category A Listed Buildings, Scheduled Ancient Monuments, Designed Gardens & Landscapes that are not only of national but of international importance
High	Archaeological and historical sites or areas of national importance, Category A Listed Buildings, Scheduled Ancient Monuments, Designed Gardens & Landscapes
Medium	Sites and areas of regional importance, Category B Listed Buildings
Low	Locally important sites or areas, other sites (e.g. findspots), Category C Listed Buildings
Negligible	Features that have been recorded but assessed as of no archaeological or historical interest, such as modern clearance cairns
Uncertain	Features that cannot be identified without detailed work, but potentially may be of some interest

The level of significance or sensitivity of a site usual correlates directly to its importance. However, some professional judgement may be needed when a site has more (or even less) significance than its importance would suggest. For example, a traditional croft house may be of only low importance as a structure, but may be associated with a person of high significance (even if of high local rather than national significance), such as a champion of crofter's rights, or an author, and thus the croft would be of higher significance than the structure on its own would merit. Where the significance of a site does not directly correlate with its importance, an explanation is given.

11.7.4 Assessment of magnitude and significance of direct physical impact

The magnitude of any potential adverse direct physical effect on a cultural heritage asset caused by the development proposals will be determined using the criteria shown in Table 11.2.

Table 11.2 Definitions of magnitude of direct physical effect

Magnitude or Level of effect	Criteria
Very High	Works would result in the complete loss of a site.
High	Works would result in the loss of an area, features or evidence fundamental to the historic character and integrity of the site. Severance would result in the complete loss of physical integrity.
Medium	Works would result in the loss of an important part of the site or some important features and evidence, but not areas or features fundamental to its historic character and integrity. Severance would affect the integrity of the site, but key physical relationships would not be lost.
Low	Works or the severance of the site would not affect the main features of the site. The historic integrity of the site would not be significantly affected.
Negligible	Works or the severance of the site would be confined to a relatively small, peripheral and/or unimportant part of the site. The integrity of the site, or the quality of the surviving evidence would not be affected.

[101]For definitions see (Scottish Government, 2010, para. 110-124; Historic Scotland, undated)

Magnitude or Level of effect	Criteria
Unknown	Groundbreaking works over features that have not been fully interpreted would reduce the chance of interpretation in the future. In the event of significant features this would constitute impact of high magnitude; for sites of lesser importance it is less problematical. Nevertheless, it remains a problem where features have not been or could not be interpreted.

The significance of any potential adverse direct physical impacts from the development proposal on any archaeological and historic sites, prior to the application of any management or mitigation strategies, will be determined by comparing the significance of the impact with the archaeological importance of each site or monument. The level of impact significance is defined as Major, Moderate, Minor, Negligible or Uncertain, as shown in Table 11.3.

Table 11.3 Determination of the significance of direct physical impact

Site Importance / Sensitivity	Magnitude of effect					
	Very High	High	Medium	Low	Negligible	Unknown
Very High	Major	Major	Major	Moderate	Minor	Uncertain/ Major
High	Major	Major	Moderate	Minor	Negligible	Uncertain/ Major
Medium	Major	Moderate	Moderate	Minor	Negligible	Uncertain/ Moderate
Low	Moderate	Minor	Minor	Negligible	Negligible	Uncertain/ Minor
Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Uncertain/ Negligible
Uncertain	Uncertain/ Major	Uncertain/ Major	Uncertain/ Moderate	Uncertain/ Minor	Uncertain/ Negligible	Uncertain/ Negligible

11.7.5 Assessment of magnitude and significance of impact on setting

Introduction

> *"The setting of a heritage structure, site or area is defined as the immediate and extended environment that is part of, or contributes to, its significance and distinctive character*" (ICOMOS, 2005).

It can be seen from the above and the definitions of Setting in SPP2010 and Historic Scotland guidance (see Section 11.6.2 above) that Setting can be a fluid concept, open to interpretation and difficult to quantify and tabulate, considering the range of factors that may contribute to the setting of a site. There is no statutory definition of setting. Historic Scotland's 2010 guidance note on setting lists ten factors and indicates this is not exhaustive (Historic Scotland 2010a).

- *"current landscape or townscape context;*
- *visual envelope, incorporating views to, from and across the historic structure;*
- *key vistas, framed by rows of trees, buildings or natural features that give a structure a context, whether or not intentional;*
- *the historic structure's prominence in views throughout the surrounding area;*
- *character of the surrounding landscape;*

- *general and specific views including foregrounds and backdrops;*
- *relationships between both built and natural features;*
- *aesthetic qualities;*
- *other non-visual factors such as historical, artistic, literary, linguistic, or scenic associations, intellectual relationships (e.g. to a theory, plan or design), or sensory factors;*
- *a 'Sense of Place': the overall effect formed by the above factors.*

Defining the setting of a historic structure will ultimately rely on professional judgement based on a range of considerations, including those set out in this section. The assessment of cultural significance must be rooted in a wider understanding of the historic environment. Both the definition of setting and the assessment of the impact of new development will be case specific."

All but the last three of the bullet points are visual- or landscape-related and, in order to keep the assessment clear, concise and robust, are addressed in separate landscape and visual sections below. This approach and the terminology used will also allow for a certain amount of standardisation with Chapter 10: Landscape and Visual Impacts. However, it is factors of setting that are addressed in this chapter, not landscape and visual impacts as defined in Chapter 10.

In this case, addressing visual- and landscape-related factors is enough to identify and evaluate all but the most serious setting concerns. These will be addressed individually, site by site and include, where relevant, the non-visual and – landscape factors outlined above.

In summary:
The **Landscape** assessment considers the changes likely to result from the proposed development to the character of the landscape in how it relates to cultural heritage assets. This may include physical changes to the fabric of the landscape, effects on significant individual elements of the landscape, and effects on characteristic combinations or patterns of elements, all in relation to archaeology and cultural heritage. It includes the factors identified by Historic Scotland concerning the current landscape or townscape context, character of the surrounding landscape and relationships between both built and natural features.

The **Visual** assessment considers changes caused by the proposed development in the composition and character of the views to and from the cultural heritage asset, with the asset itself considered as the main receptor and visitors to it or viewing it considered as secondary receptors[102]. It includes the factors identified by Historic Scotland concerning the visual envelope, incorporating views to, from and across the historic structure; key vistas, framed by rows of trees, buildings or natural features that give a structure a context, whether or not intentional; the historic structure's prominence in views throughout the surrounding area; general and specific views including foregrounds and backdrops.

[102] See (Historic Scotland, 2010a) setting guidance note para 4.10 for this distinction

Landscape

The level of **sensitivity** of a landscape to change in relation to the setting of cultural heritage assets can be broadly defined as in Table 11.4.

Table 11.4 Levels of landscape sensitivity in relation to setting

Landscape Sensitivity	Description of example factors
Highly sensitive	Areas of landscape that are highly valued in their contribution to a site's appreciation or understanding, particularly rare or distinctive historic landscapes, or considered susceptible to small changes because a heritage site is a key part of it
Moderately sensitive	Areas of landscape that are moderately valued in their contribution to a site's appreciation or understanding, are considered of historic value locally, are tolerant of moderate levels of change because heritage sites are not key to the landscape
Slightly sensitive	Areas of landscape that are generally more commonplace and/or contribute little to a site's appreciation or understanding, are considered potentially tolerant of noticeable change, or undergoing substantial development such that their character is one of change and heritage sites within it have therefore experienced much change to their surroundings
Unknown	Areas of landscape where it is uncertain how they contribute to a site's appreciation or understanding, because the feature or asset itself could not or has not been understood or interpreted

The **magnitude** of change to how a landscape relates to the setting of cultural heritage assets can be broadly categorised as:

Table 11.5 Magnitude of change to landscape setting

Landscape Setting Magnitude	Description of example guidelines
Very High	The removal of, or a fundamental and irreversible change to, the relationship between a heritage asset and a historically relevant landscape
High	A noticeable change to the relationship between a heritage asset and a historically relevant landscape over a wide area or an intensive change over a limited area
Medium	Small changes to the relationship between a heritage asset and a historically relevant landscape over a wide area or noticeable change over a limited area
Low	Very minor changes to the relationship between a heritage asset and a historically relevant landscape over a wide area or minor changes over a limited area
Negligible	Changes to a historically relevant landscape cannot be discerned or perceived in relation to the heritage asset

Visual

The level of visual sensitivity of the setting of a cultural heritage asset can be broadly defined as in Table 11.6. Sensitivity is not directly equivalent to the importance of the asset. The receptor is the asset itself, but can also include visitors to it.

Table 11.6 Level of visual sensitivity

Visual sensitivity	Description of example factors
Highly sensitive	Receptors for whom or from/to which the view is important and where changes would be particularly noticed. For example: • the setting of nationally important sites such as SAMs, where the view in question is of historic or heritage importance and relevant to it • highly visited sites • sites that have or are a clearly visible part of highly valued or key views • sites that are a major element of an Inventoried designed landscape
Moderately sensitive	Receptors for whom or from/to which the change in the view is a small element in the overall view, not critical to the visual setting, or where the nature of the view is of secondary importance. For example: • sites that have or are part of little valued, secondary or minor views • sites that are little visited or usually only seen from moving vehicles (except tourist attractions or feature on tourist routes) • sites that are a secondary element of a designed landscape, or hardly visible in highly valued or key views
Slightly sensitive	• Receptors for whom or from/to which the change is unimportant or irrelevant

The **magnitude** of change is a function of the scale and type of change to the view of, to or from the heritage receptor under consideration. This includes the distance to the change, whether the change blends in or stands out, the location of the development within the view and the extent of the view affected.

The magnitude of visual change for the setting of cultural heritage assets can be broadly categorised as in Table 11.7.

Table 11.7 Magnitude of visual change

Visual Magnitude	Description of example guidelines
Very High	The proposed development overpowers and radically alters or removes the view and completely changes its character and quality. For example: ○ the development is the only view in the near-ground; ○ lies directly in the foreground removing a line of view to which the site has been deliberately oriented or designed; ○ overpowers and dominates the horizon and skyline in the near, middle or distant ground.
High	The proposed development dominates the view and substantially changes its character and quality. This is more likely to be the case for the setting of sites in the ZTV within 2km. For example: ○ the development in full view in the near-ground; ○ lies directly in the near-ground of the line of view to which the site has been deliberately oriented or designed; ○ projects well above the horizon or skyline in the near- or middle-ground.
Medium	The proposed development is clearly noticeable in the view and affects its character or quality. This is more likely to be the case for the setting of sites in the ZTV within 2-5km. For example: ○ the development in full view in the middle-ground of an otherwise open view; ○ lies in the middle ground of a designed view, but does not block or completely dominate or badly break the skyline.

Visual Magnitude	Description of example guidelines
Low	The proposed development does not affect the character and quality of the view, or it is a minor element likely to be overlooked by the casual observer. This is more likely to be the case for the setting of sites in the ZTV within 5-10km. For example: ○ the development visible in the background or part of a wide view; ○ temporary loss of an element of the view, such as vegetation, or stone field dykes, which are only partially visible.
Negligible	The proposed development cannot be discerned in views relevant to the setting of heritage assets.

Significance of impacts on setting

The significance of the various effects of the proposed development on the setting of cultural heritage assets derives from the combination of the **magnitude** of change and the **sensitivity** of the heritage asset's setting, of the associated landscape or of those human receptors who value a particular view to or from it. This is shown in Table 11.8 below. It should be noted that the categories are guideline levels only, since assessments of magnitude and sensitivity, as well as the choice of significance category into which an impact is placed, are matters of professional judgement. The level of impact significance is defined as Very Major, Major, Moderate, Minor or None.

Table 11.8 Determination of significance of impact on setting

Impact Significance on Setting	Definition	Guideline landscape setting impact levels	Guideline visual setting impact levels
Very Major	An irreversible and radical change to the setting, removing or preventing appreciation of key characteristics of the asset	Major change to a highly sensitive or valued landscape, which removes or prevents appreciation of characteristics key to a heritage asset, or permanent change to or removal of less sensitive or valued landscape	The changes caused by the development overpower and completely alter views and vistas key to a highly sensitive heritage receptor
Major	A fundamental or key change to the setting	Noticeable change to a highly sensitive or valued landscape key to a heritage asset, or intensive change to less sensitive or valued landscape	The changes caused by the development dominate and substantially alter the character of a key or important view in relation to a highly sensitive heritage receptor
Moderate	A material but non-fundamental change to the setting	Noticeable change to a landscape not key to a heritage asset, tolerant of moderate levels of change	The changes caused by the development are clearly noticeable and affect the quality of a view, but are not critical to the receptor, or the view itself is of secondary importance

Impact Significance on Setting	Definition	Guideline landscape setting impact levels	Guideline visual setting impact levels
Minor	A detectable but non-material change to the setting	Minor changes to a landscape considered tolerant of change in relation to heritage asset	The changes caused by the development are a minor element in a view and/or the view is incidental or of minor or no importance to the receptor
None	No detectable change to the setting	No discernible change to the landscape	The proposed development cannot normally be perceived

Importance of setting impacts

In order to evaluate how important the impact on the setting really is, the importance of the site that the setting is associated with must be related to the impact, otherwise a major impact on the setting of a site of low or negligible importance would take on more significance than it merits. Impacts of **Moderate** and **Major** importance are significant effects that may require consideration by the competent authorities (The Scottish Government, 2007).

Table 11.9 Determination of the Importance of Setting Impacts

Site Importance / Sensitivity	Significance of Impact on Setting					
	Very Major	Major	Moderate	Minor	None	Unknown
Very High	Major	Major	Major	Moderate	Minor	Uncertain/ Major
High	Major	Major	Moderate	Minor	Negligible	Uncertain/ Major
Medium	Major	Moderate	Moderate	Minor	Negligible	Uncertain/ Moderate
Low	Moderate	Minor	Minor	Negligible	Negligible	Uncertain/ Minor
Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Uncertain/ Negligible
Uncertain	Uncertain/ Major	Uncertain/ Major	Uncertain/ Moderate	Uncertain/ Minor	Uncertain/ Negligible	Uncertain/ Negligible

11.7.6 Study limitations and assumptions

The DBA conducted for this report was extensive but not exhaustive. The walkover survey of the proposed location identified that these particular fields have been intensively cultivated, which will have removed or masked archaeology that showed on the surface. However, potential for undetected subsurface archaeology is likely to be limited, because the landowner advised that the soils were thin (0.3-0.4m) and lay directly on bedrock and that during ploughing, no concentrations of stone indicative of buildings or any artefacts of any age had been found.

It was not possible to visit Site 67, close to the development (see Figure 11.1), due to aggressive livestock.

The potential margin of error in the handheld GPS used during the walkover survey and the OS mapping (both old and current) used in the DBA has to be taken into account when identifying sites and determining impact. This error may be up to 10m in places.

The factors affecting the identification of the ZTV and its limits are discussed in Section 10.7.4. The ZTV has expanded since the time of fieldwork, but these changes have been incorporated in the DBA, the impact assessment and the maps in this chapter. There were a number of sites in the visual envelope beyond 2km (see Figure 11.3). The effect of the development on visual- and landscape-related setting issues was considered similar to the landscape and visual impacts looked at in Chapter 10. Therefore there was no added value by visiting each of these sites, since the issues are well-represented by the depictions of views and visualisations in Appendix 10-A.

It is assumed that any direct physical impact on a site from any ground-breaking works at any stage in the life of the project is adverse and, by the very nature of archaeological sites permanent and irreversible. No operational effects have been identified that are different from the impact of the construction of the station. The decommissioning of the converter station site is expected to essentially reverse any adverse setting impacts associated with its construction, and is not addressed further in this assessment.

This assessment is the product of the work of more than one professional, although there has been a final review by a single person in order to remove inconsistencies and anomalies.

11.8 Established baseline conditions

11.8.1 Historic environment potential

Caithness lies within one of the richest archaeological landscapes in Europe (Barber 2006) and possesses physical evidence for human occupation and activity dating from the Mesolithic right up to WWII. Although much of the area could be described as consisting of poor and marginal land, this has resulted in an exceptionally good level of archaeological preservation as it has consequently not been exposed to modern industrial farming to any great extent. Furthermore, the use of the local flagstone in construction means that a variety of upstanding and well preserved monuments survive. Despite this potential, there has been relatively little archaeological work conducted in the area in the past.

More recently, however, there has been an upsurge of interest and a number of new studies and surveys have highlighted the wider archaeological significance of the area and have demonstrated the potential for the discovery of previously unknown sites (e.g. Pannett and Baines, 2002; Heald and Jackson, 2001; Baines, Brophy and Pannett, 2003; MacKie, 2007; and Batey, 1987). As a result, our understanding of the prehistoric landscape of the region should be regarded as partial rather than exhaustive and there is a strong likelihood that further prehistoric sites may lie undiscovered.

Surviving archaeology of later periods such as traditional post-medieval stone farm buildings and sites associated with WWII also remain a valuable resource and an important part of the vernacular built heritage and character of the area. The potential for further significant discoveries to be made concerning sites of these periods is limited. This is reflected in the ‘Historic Land-Use Assessment’ maps

(RCAHMS, 2010) of the immediate area that show that the vast majority of the current landscape in the vicinity of the development relates to the post-medieval period.

11.8.2 Sites and monuments within the development footprint

No known sites were identified by the DBA in the fields containing the footprint of the proposed converter station, nor the shelterbelt and track on the north side of it. Only one site was identified (Site 290) during the walkover survey of this area (see Figure 11.1). The site comprised a modern (20th-21st century) heap of clearance stone of negligible importance. The fields have been intensively cultivated, which will have removed or masked archaeology. The landowner advised that the soils were thin (0.3-0.4m) and lay directly on bedrock and that no concentrations of stone indicative of buildings or any artefacts of any age had been discovered during ploughing.

11.8.3 Sites and monuments within 1km of the converter station

A total of 35 cultural heritage sites (including Site 290, the only site within the development footprint) were identified within 1km of the proposed location of this converter station by the DBA and walkover survey (Figure 11.1). These are presented in detail in Appendix 11-A (Gazetteer of Sites) in tabular form by site number for ease of use. The importance and significance of each individual site is then assessed in Appendix 11-B and the key findings summarised below.

Most (23) of these are of **low importance**, comprising sites such 18th-19th century quarries and ruined or upstanding farm buildings. There is one site that may be of low but could be of medium importance (Site 295). The importance of the site is uncertain because the nature of this small mound (possibly farm-related or possibly prehistoric) is not known. There are six sites likely to be of **medium importance**, including a lead mine, a broch that may be buried below a stackyard, Bronze Age hut circles and prehistoric mounds (sites 69, 72, 306, 308, 310, 315). There are five sites of **high (national) importance**, all of them SAMs (sites 65, 309, 311, 312, 314), comprising three Neolithic cairns, a Bronze Age hut circle and the remains of a medieval church, burial ground and hospital (Site 65).

These sites all lie outwith the development footprint and will not be subject to direct physical impact by the proposed development. However, the **scheduled monument of St Magnus' church, burial ground and hospital** lies only 450m south-southeast of the converter station site. This monument (and the other four SAMs listed above) carry statutory protection preventing intrusive works without consent and this protection also means that the setting of the SAMs is a material consideration in the planning process.

The Scheduled Monument of St Magnus' church, burial ground and hospital

The following information is derived from field notes, the RCAHMS Canmore web database (RCAHMS, 2010) and from Historic Scotland's online database via the Scheduled Monument Search engine (Historic Scotland, 2010).

The scheduled area of Site 65 measures a maximum of 100m east-west by 70m north-south, being within a recent boundary fence surrounding the monument. The SAM consists of the remains of St Magnus' church, hospital and graveyard, first recorded in a Royal charter of 1476. The upstanding remains belong to the chapel, which sits within a raised stony bank, containing a burial ground used by the Clan Gunn. This chapel of the hospital served as the parish church of Spittal until the 16th century. ('Hospital' indicates a place of hospitality, including a charitable foundation giving shelter to wayfarers and the poor, or care for the sick, Myatt, 1975.) The complex is surrounded by the remains of a turf-covered stone enclosure wall (see Plate 11.1).

The **chapel** itself is a plain, rectangular, east-west oriented flagstone building 21m x 7m with no visible decorative features or windows, and a doorway in the south wall. The east gable stands to a height of 2.7m, while the other walls survive to a height of 1.0 to 1.7m. A gravestone dated 1819 lies in the church, which contains rubble from the collapsing walls and is overgrown with nettles. The chapel was ruinous by 1910 and is still in a state of active decay.

The **hospital** remains comprise a sunken rectangular area 31m x 4m to the south of the church. Between the sunken area and the chapel are the remains of amorphous turf-covered footings, presumably a range associated with the hospital, the south wall of which can be seen in the stony bank to the south of the chapel. The last remains of the hospital were demolished in the first half of the 19th century.

The adjoining **graveyard** to the south of the church contains unmarked stones and three stones with inscriptions. Burials partly overlie the footings of the hospital buildings. The burial ground was used by the Clan Gunn and still in occasional use in 1872, with the most recent gravestone dated to 1911. It is now disused and overgrown with nettles and thistles.

The monument is considered to be of **national importance**

> *"because it contains upstanding medieval ecclesiastical remains that can be documented… from 1476. The monument's importance is enhanced because it is the site of a hospital that was an important stage on two pilgrimage routes: the route north to St Magnus' in Orkney and that south to St Gilbert's at Dornoch…. The monument is a valuable resource as it provides evidence, and has the potential to provide further evidence, through excavation and analysis, which may increase our understanding of secular and religious architecture, monastic settlement, the range of international contacts brought about through the important medieval pilgrimage trade, parish evolution, medical history, burial practices, and material culture during the medieval and early modern period[103]."*

The setting of the monument, which is not referred to by Historic Scotland as one of the factors that make the site nationally important, is described in Section 11.8.4 below.

11.8.4 Landscape setting, sites and monuments within the 2km ZTV

Landscape Setting within 2km ZTV

The **modern landscape** in the locality of the converter station is described and characterised in Chapter 10: Landscape and Visual Impacts (see Section 10.11). As this states, the converter station is located in a small dip in the landscape, in open fields that are mostly bounded to the north and south by shelterbelts (with gaps at the west end of both shelterbelts allowing views out to the northwest and to the south, see Figure 11.2), and bounded to the west by the ridge of Achanarras Hill and to east by Spittal Hill, along the slopes of which runs the A9(T) trunk road.

[103] Quoted from Historic Scotland's assessment of the site's national importance (see Historic Scotland, 2010b)

It should be noted that in the last decade blocks of mixed woodland have been planted on the east slope of Achanarras Hill and at the north end of the Achanarras ridge that are not yet depicted on Ordnance Survey maps (but see Figure 6.2). A line of electricity towers carrying overhead power cables runs north-northwest to south-southeast along the west side of the fields in which the development would be set, beside the Achanarras Burn (see Appendix 11-D, Plate 11.5). Also within the open fields in the immediate locality of the development are two farmsteads, Achanarras and Spittal Mains. The outbuildings of Spittal Mains, 850m south of the converter station platform, includes large agricultural sheds (see Plate 11.1 and Appendix 11-D, Plate 11.5), which are quite common in the wider agricultural landscape of Caithness.

The **historic landscape** here[104] is one of 18th- to 19th-century rectilinear fields and farming in the shallow valley, with 19th- and 20th-century managed woodland, including the shelterbelts to the north and south and larger areas of trees on the slopes of Spittal Hill and Achanarras Hill to the east and west. Some of the more recent plantations on Achanarras ridge are contained within the 18th-19th century rectilinear field patterns and around Achomchairle to the northeast within 18th-19th century crofting land use patterns. The route of the current A9(T) trunk road appears to be at least late 18th- or early 19th-century in date (Thomson 1832, Calder 1887 appendix 2; Watson 1985). There is evidence for a roadway to the south of Spittal from at least c1600 AD, probably a causeway built of turf, named as “The Myre Causay” (now Causeymire) on Pont’s map of the period, published by Blaeu (Blaeu, 1654; Watson, 1985)

It is a reasonable assumption from historical records that there were even earlier routeways across the area (Watson, 1986a), with the pilgrimage route running roughly south north across Causeymire towards Halkirk and a route from Wick and Watten across to Westerdale, Strathmore and beyond (Watson 1986a & b). Although the precise line of these is unknown and no physical evidence is visible, it is very likely that St Magnus’ church, burial ground and hospital was located beside these routes.

The very top of Spittal Hill where an annual market was held (Site 340), and the Achanarras hill ridge and the moss to the northwest of the development location, beyond the plantations, are moorland and rough grazing, sometimes drained. These are the areas (apart from the modern drainage ditches and the large spoil heaps of Achanarras Quarry, Site 302) most likely to resemble how they appeared in the medieval period when St Magnus Chapel and Hospital were in use. It is even possible that they may have changed little from the prehistoric period, indicated by the concentration of Neolithic cairns and Bronze Age hut circles identified here, (Sites 308, 309, 310, 311, 312, 314 and 315) although when they were built, the climate was slightly warmer and drier.

Sites and Monuments with settings that may be affected within the 2km ZTV

Within the 2km radius ZTV, a total of 38 sites were noted, ranging from small post-medieval farmsteads to Neolithic chambered cairns (see Figure 11.2; Appendix 11-A). Five of the sites are of high importance (all of them SAMs, see Table 11.10), six of moderate, two low-moderate and 24 of low importance (see Appendix 11-B). There are no listed buildings or other sites with statutory designations within the 2km ZTV. The historic and current landscape setting of these is summarised above.

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104 as defined on Historic Land-use Assessment maps, produced by HS and RCAHMS <http://hla.rcahms.gov.uk>

Table 11.10 Sites of high or very high importance within the 2km ZTV

Site No.	Site Name and Type	SAM No	Minimum distance from proposed converter station platform
65	St Magnus church, burial ground and hospital	5413	450m south-southeast
309	The Shean, Neolithic Cairn	475	800m west
311	Achanarras B, Neolithic Cairn	2400	800m west-northwest
314	Achanarras Hut Circle	2402	500m west-northwest
330	Achies East Broch	2235	1200m west

The sites of moderate and low-moderate importance (Sites 64, 69, 72, 295, 306, 308, 310 and 340) comprise a prehistoric cairn, two sets of Bronze Age hut circles, two brochs, a lead mine, the site of a medieval market and a possible prehistoric mound. Sites of low importance are mostly post-medieval buildings, farmsteads and associated features, usually completely ruinous if they survive at all. Of these sites, specific mention should be made of Site 64, a turf-covered probable Neolithic chambered cairn known as Torr an Fhidlier, or Fiddler's Mound. This lies approximately 1km to the southeast of the proposed converter station site in the open fields of Spittal Mains Farm. The proposed converter station site lies in full view of the mound. The mound is considerably denuded and robbed, and is compromised by the modern feeding station and concrete water tank on top (see Plate 11.2). The setting of the mound has also been subject to change, with the A9(T) trunk road 70m to the west, a large shelterbelt a similar distance to the south and a working farmstead (Spittal Mains) with large sheds 250m to the west. As such, the site's setting is one of change and no longer seems to be sensitive or a significant factor in the site's importance.

Details of all the sites can be found in the Site Gazetteer (Appendix 11-A, Table 2).

It should be noted that the Fairy Hillock, a Scheduled Neolithic chambered cairn 1.3km to the southeast (Site 62: the location though not the site number can be seen on Figure 11.1), and Achanarras A, a Scheduled Neolithic cairn 0.8km to the west-northwest (Site 312, see Figure 11.1) were both shown not to be in the visual envelope. The former is screened off from the development by the shelterbelt southeast of Spittal Mains Farm and the latter, which lies in a small fold in the land, by landform.

The Scheduled Monument of St Magnus' church, burial ground and hospital

Most concern has been expressed about the impact of the converter station on the setting of the Scheduled Ancient Monument of St Magnus' church, burial ground and hospital some 450m to the south-southeast of the converter station platform.

The immediate setting of the monument, within its modern perimeter fence, is overgrown with nettles and thistles, which have deep taproots that will be damaging the archaeology. The church ruins are in a state of active decay.

The monument lies on a slightly terraced slope in the shallow valley and is now so ruinous and low-lying that it is difficult to spot at a distance and has no prominence in views or the landscape, even from the A9(T) or the slopes of Achanarras Hill for example (see Appendix 11-D, Plate 11.5).

Very locally, the medieval SAM is set in a landscape of open fields bounded by higher ground to the east and west and shelterbelts to the north and south. Although open, the rectilinear field and ditch pattern and intensively cultivated land in which the site is set dates to the 19th century and is later than the date of the monument. The exact proximity of St Magnus church, burial ground and hospital to the medieval pilgrimage route and the precise route of the roadway at this location is unknown and no physical evidence is visible. The farm track that currently runs north-northwest south-southeast on the east side of the SAM was clearly laid out as part of the 19th-century improvement field pattern imposed on the landscape. It forms a strong focal line, leading north beside the converter station to a gap in the shelterbelt (see Appendix 11-D, Plate 11.3) and south to Spittal Mains Farm.

There are views from the site of the northern end of the Achanarras Hill ridge line to the northwest and of Spittal Hill to the east, which form the least changed aspects of what would have been near ground views contemporary with the medieval monument. The SAM also has middle and far distance views to the north and northwest over the shelterbelt to the Hill of Lieurary (see Appendix 11-D, Plate 11.3) and to the south to the Causeymire wind farm with the hills of southern Caithness in the far distance (see Appendix 11-D, Plate 11.4).

The landscape setting for St Magnus church, burial ground and hospital is one of change, being that of a working farm, with the SAM dominated by Spittal Mains Farm and its large modern sheds only 150-200m to the south (see Plate 11.1). There are several shelterbelts and plantations in the local area, as well as electricity towers with overhead powerlines running north and south near to the site. Plantations and Achanarras Quarry with its spoil heaps form much of the skyline to the west of the monument. In the middle distance to the south is Causeymire wind farm (Appendix 11-D, Plate 11.4) and in general the middle distance views are of an open improved agricultural landscape, including farm buildings, squared fields and shelterbelts (see Appendix 11-D, Plates 11.3a and 11.3b).

11.8.5 Landscape setting, sites and monuments within the 2-5km ZTV

Landscape setting within 2-5km ZTV

The **modern landscape** of the area is described and characterised in the Chapter 10: Landscape and Visual Impacts, (see Sections 10.8.2 and 10.11). As this states, it is quite an open and sparsely populated landscape, although the converter station is located in a space that is defined at a less open and more local level, see Section 11.8.4 above. Causeymire wind farm (approximately 20 turbines) lies some 5km to the south in open landscape. The turbines thus draw the eye and are moderately prominent in the mid-range of views to the south from many cultural heritage sites, including St Magnus church, burial ground and hospital (see Appendix 11-D, Plate 5). However, almost the entire visual envelope lies in the in the northwest quadrant of a circle centred on the converter station, comprising mostly fields and farming, some peaty mosses and the small town of Halkirk 5km away to the north (Figure 11.3).

The **historic landscape**[105] in the 2-5km ZTV area is essentially a patchwork mixture one of 18th- to 19th-century rectilinear fields and more open rough grazing on the mosses, with some relict crofting patterns, occasional 19th to 20th century plantations and isolated sites surviving within this. The mosses tend to be areas that may span a date range from the prehistoric to the present, although substantial parts of them have undergone peat extraction in the 19th and 20th centuries. Some unimproved medieval and post-medieval rough grazing survives around the fringes of the mosses, but mostly the landscape is one of change, reflecting post-improvement 18th-20th century activities, including rectilinear field patterns, ruined and modern farms, including large agricultural buildings. The 19th century railway and the early 19th-century planned town of Halkirk (created during the clearances on the site of an earlier settlement) are also in this quadrant.

Sites and monuments with settings that may be affected within 2-5km ZTV

Only sites of moderate to very high importance (i.e. of regional, national or international significance) were assessed for the ZTV between 2 and 5km from the converter station (Figure 11.3). There are two sites of **high importance** - Tulloch of Milton Neolithic chambered cairn (Site 331) and the ruins of the medieval Braal Castle at Halkirk (Site 339), both of which are SAMs. Nine sites of **moderate importance** were identified initially, but two of them, B-Listed churches in Halkirk (Sites 357 and 358), proved to be outwith the ZTV because of the effect of the surrounding town. No other sites with statutory designations were identified in the 2-5km ZTV. The other sites of moderate importance comprised a group of hut circles, a possible cairn, a possible broch, three funerary sites and a clan battle site. Further details on these sites can be found in the Site Gazetteer (Appendix 11-A; Table 3).

11.8.6 Landscape setting, sites and monuments within the 5-10km ZTV

Landscape setting within 5-10km ZTV

The **modern landscape** of the wider area is described and characterised in the Chapter 10: Landscape and Visual Impacts (see Section 10.8.2). As this states, it is quite an open landscape, with high ground, moorland, forestry and improved fields (mostly pasture) and although sparsely populated is clearly actively used and affected by people. To west, the ZTV encompasses mostly open moor and moss with frequent blocks of coniferous plantation, rising up to the prominent hills of Ben Dorrery and Beinn Freiceadain. To the northwest and north, the ZTV mostly encompasses more fertile land where fields and farming dominate.

The **historic landscape**[106] in the 5-10km ZTV area essentially falls into two broad types. To the north and northwest, it is a mixture of 18th to 19th century rectilinear fields and more open rough grazing on the mosses, with some relict crofting patterns and occasional 19th to 20th century plantations, similar to that described for the 2-5km ZTV above. The landscape is one of change, mostly reflecting post-improvement 18th to 20th century activities, including the railway, rectilinear field patterns, ruined and modern farms, including large agricultural buildings, with earlier landscapes surviving as patches in the mosses, or as isolated sites within the more recent landscape.

[105] as defined on Historic Land-use Assessment maps, provided by HS and RCAHMS <http://hla.rcahms.gov.uk>
[106] as defined on Historic Land-use Assessment maps, provided by HS and RCAHMS at <http://hla.rcahms.gov.uk>

Westwards, the open high ground, moorland, mosses and forestry appear to reflect a landscape that has changed less, with more prehistoric to medieval cultural heritage surviving. However, the organisation of the landscape is one of 18th to 20th century estate management, and its appearance is often a product of the clearances, sheep grazing and forestry grown for commercial purposes. Changes to the landscape are further evidenced by the telecommunications mast and support building on the summit of Ben Dorrery.

Sites and monuments with settings that may be affected within 5-10km ZTV

Only sites of high to very high importance (i.e. of national or international significance) were assessed for the ZTV between 5 and 10km from the converter station (Figure 11.3). Thirteen sites were identified, all of them SAMs, and no sites with other statutory designations. To the north and northwest the sites comprised two Neolithic chambered cairns and three brochs. Westwards, there is a cluster of eight sites, all on the slopes or summits of Ben Dorrery and Beinn Freiceadain, comprising five Neolithic cairns of various types, two hut circles and a hill fort. Further details on these sites can be found in the Site Gazetteer (Appendix 11-A; Table 4).

11.9 Range of possible impacts

The potential effects on the historic environment that could be caused by the converter station may include:

- direct physical impacts on cultural heritage assets that may be caused by the construction and maintenance of the converter station, including ancillary works, drainage, access routes and temporary compounds and laydown areas as shown on Conceptual Landscape Mitigation Plans (see Figure 10.5);
- direct physical impacts on cultural heritage assets that may be caused by the mitigation strategies such as tree-planting; and
- indirect impacts on the historic landscape and setting of the identified cultural heritage sites and resources caused by the presence of the converter station.

11.9.1 Direct physical impacts

No important sites will be directly impacted by the development.

Only one site has been identified that will be directly impacted by the construction and maintenance of the converter station, including ancillary works. However, Site 290 is a modern clearance cairn of negligible sensitivity. Although the works will result in the loss of this site, the significance is **negligible** and no mitigation strategy is necessary.

No sites will be physically impacted by ground-breaking mitigation strategies such as tree planting, assuming such works are confined to the areas shown on Conceptual Landscape Mitigation Plans (see Figure 10.5).

11.9.2 Impacts on setting

Settings are often individual to each asset or discrete groups of assets and therefore the impact of any development on setting is case-specific and this has been addressed in the impact assessment (see Appendix C). However, it is possible to summarise since there are several common potential impact issues.

Taken as a whole, impacts created during construction will be short-lived (e.g. compounds, temporary spoil heaps), therefore these have not been considered in relation to cultural heritage setting unless they are predicted to have a permanent impact. Permanent impacts will last for the lifetime of the development at least, and some may continue beyond decommissioning and remediation. Permanent impacts on setting may include:

- the introduction of a new large-scale building into the landscape, changing character and focal points;
- introduction of a building that is dominant enough to affect the setting of sites so that the appreciation and understanding of an asset is reduced;
- blocking or alteration of views to, from or between heritage assets;
- removal of trees opening up views of the development to more assets;
- the introduction of new mitigation planting; and
- changes to the immediate surroundings of the converter station, such as the realignment of fence lines, ditches and tracks, as depicted on Conceptual Landscape Mitigation Plans (see Figure 10.5).

11.9.3 Pre-mitigation assessment of likely effects

The area in the immediate vicinity of the development is likely to be significantly affected. However, even with this zone parts of the area within 2km of the development are not affected at all, mostly due to the effect of existing shelterbelts and plantations (see Figure 11.2). Beyond the immediate vicinity, it is the northwest quadrant of the 10km radius study area centred on the converter station that is affected, although several areas within this quadrant are not affected at all (see Figure 11.2). Between west and west-northwest all or part of the full height of the station (walls and roofs) and some of the associated busbars will be theoretically visible, from west-northwest to north-northwest the roofs are visible, whilst from north-northwest to north only the highest part of the roof will be visible. The level of visibility is reflected in the level of impact identified, as is distance from the development (see Appendix 11-C).

The following SAMs, which were highlighted for consideration by Historic Scotland (see The Highland Council 2010 and Annex I) in terms of impact on their setting, are not within the visual envelope of the development and their setting will not be affected:

- Ballone, broch 360m northeast of Spittal (SAM Index no. 521)
- Knockglass, broch east of (SAM Index no. 561)
- Fairy Hillock, chambered cairn southeast of Spittal Mains (SAM Index no. 528); Site 62, see Section 11.8.4 above
- Achies, broch 180m east of (Historic Scotland Index no. 509)
- Achanarras, cairn 800m northwest of (SAM Index no. 2401); Site 312, see Section 11.8.4 above
- Spittal Farm, broch 180m east of (Historic Scotland Index no. 582)
- Dale Farm, broch 800m southeast of (Historic Scotland Index no. 545)
- Cnoc Donn, broch 600m east-southeast of Dale Farm, Halkirk (Historic Scotland Index no.541)
- Halsary, standing stones 450m west-northwest of and 620m northwest of Halsary (Historic Scotland Index no. 5301)

- Gallow Hillock, cairn on Backlass Hill (Historic Scotland Index no. 450)

0-2 km ZTV

The potential impact on all sites of archaeological and historical interest within the 0-2km ZTV were assessed, as at this distance, the converter station could cause a high magnitude of change to the landscape setting within a very limited area, and high magnitude of change to visual aspects of setting. There are no designed views that will be impacted by the development, although there are unintended views between sites of similar dates and a focal line northwards towards the shelterbelt from the east side of the St Magnus church, burial ground and hospital past the east side of the converter station. The landscape is clearly one of change, with unimproved moor on the higher ground to the west and east and moss to the north, significantly changed by quarrying and spoil heaps, the imposition of rectilinear fields, by modern farming practices, such as tree plantations, shelterbelts and the construction of large agricultural buildings, and by modern installations such as the electricity towers with overhead powerlines and the Causeymire wind farm (see Section 11.8.4 above).

Six sites are regarded as **highly sensitive** to changes to their setting (sites 65, 308 to 311 and 314) and a further eight **moderately** so (sites 63, 64, 67, 294, 295, 321, 330 and 340). The other 24 sites are only **slightly** sensitive to changes to their setting.

It is assessed that the setting of seven sites could undergo a **high** or **very high** magnitude of change, 22 a **medium** level of change and 12 could undergo a **low** or **negligible** change to their setting (see Appendix 11-C; Table 1 for full details).

Table 11.11 Summary of magnitude of potential change to setting

Magnitude of Potential Change	Sites with potentially affected settings
Very High	290
High	63, 65, 67, 294, 295, 321,
Medium	64, 72, 296, 299, 301, 302, 303, 304, 305, 307, 308, 309, 310, 311, 314, 330, 340, 341, 344, 346, 347, 348,
Low	68, 69, 306, 342, 343, 345, 349
Negligible (or None)	42, 60, 62, 312, 315,

(see Appendix 11-C; Table 1 for detailed impact assessment).

Sixteen of the 29 sites with potential changes to their setting of medium or higher magnitude are of low importance, such as post-medieval farmsteads and farm buildings, both ruined and active. When the magnitude of change is compared with the site’s importance, it can be seen that the actual importance of the potential pre-mitigation impact on the setting of most sites is minor or negligible (see Section 11.7.5).

Table 11.12 Summary of importance of potential impact on setting

Importance of Potential Impact	Sites with potentially affected settings
Very Major	None
Major	65
Moderate	64, 308, 309, 310, 311, 314, 330,
Minor	63, 67, 72, 294, 295, 301, 302, 303, 304, 305, 306, 307, 321, 340, 341, 346,
Negligible	42, 60, 62, 68, 69, 290, 296, 299, 312, 315, 342, 343, 344, 345, 347, 348, 349

(see Appendix 11-C; Table 1 for detailed impact assessment).

Prior to the identification of mitigating measures and application of intervention measures, the potential impact upon St Magnus' church, burial ground and hospital (Site 65) is of major importance and has been raised as a serious concern by Historic Scotland (see Appendix 11-D, Plate 11.6). The potential impacts of moderate importance upon four Scheduled Ancient Monuments (Sites 309, 311, 314 and 330) within this ZTV are potentially of the next most significance prior to mitigation measures and the continued growth of existing plantations. These sites comprise two Neolithic cairns, a probable Bronze Age hut circle and an Iron Age broch respectively. The impact on moderately important prehistoric Sites 64, 308 and 310 (a prehistoric mound and two groups of probable Bronze Age hut circles) could be of moderate significance.

2-5 km ZTV

Only the setting of sites of medium or high importance within this ZTV was assessed, because these were the ones that could be significantly affected. Nine sites were identified and assessed, of which two are SAMs, (Figure 11.3 and Appendices 11-A, 11-B and 11-C). None of them was highly sensitive in terms of setting, often because the town of Halkirk, the railway, forestry or modern farms and farm practices have already changed it.

The setting of one of the SAMs (Site 331) could be moderately affected by the roof of the converter station and four more sites of regional importance (Sites 350, 351, 352 and 356) could be moderately impacted by having part of the station in the background of (but not impeding) views to other sites of a similar period. (See Appendix 10-A, images for viewpoints 5, 6, 11 and 12 for similar examples of views and effects.)

5-10 km ZTV

Only the setting of sites of high importance within the 5-10km ZTV was assessed. These sites were the only ones that could be significantly affected since at this distance from the proposed converter station, the building is only likely to be seen in conditions of clear visibility. Thirteen sites, all of them SAMs, were identified and assessed, eight of them prehistoric sites clustered in a group 8.5-10km to the west (see Figure 11.3 and Appendices 11-A and 11-C). None of the sites are highly sensitive in terms of their wider setting because at such a distance from the station, only high, dominant or extremely visible features are relevant.

The magnitude of change to all of the sites and settings potentially caused by the converter station is low, usually because only the roof would be visible and/or the station is too small a feature to stand out in such a wide landscape. In reverse, none of the sites are visible to the naked eye from the vicinity of the station and, in terms of the hillfort on the distant skyline (Site 322), the station is set too low to impact the dominance of this feature over the wider landscape (see Appendix 10-A, images for viewpoint 13 for examples of views and effects). Therefore, there will be no more than a **minor** impact on any site or setting within the 5-10km ZTV.

11.10 Mitigation

The continuous adaptation of the site design in response to concerns raised by consultations with organisations such as Historic Scotland has resulted in mitigation of the effects of the initial proposal on cultural heritage setting, separate from specific mitigation proposals and commitments. The building will sit in a slight dip in the landscape, which is surrounded by a combination of shelterbelts and higher ground, so that views of it are as contained and localised as possible (see Section 10.11 for a fuller description). The building will not be higher than the existing shelterbelt to the north of the site and thus will not break the skyline. It will emulate as far as possible the style of the agricultural sheds of the district. The converter station platform is now more contained than in the original proposal and will lie 595m away from cultural heritage site about which most concern has been expressed (Site 65, the Scheduled St Magnus' chapel, hospital and graveyard), not 300m as originally proposed.

In addition, existing shelterbelts and plantations, especially the shelterbelt to the southwest of Spittal Mains Farm, the one on the west slope of Spittal Hill, and the new plantations on Achanarras ridge, remove several sites from the visual envelope of the development, including the Scheduled Ancient Monuments of sites 62, 309 and 311. SAM sites 311, 314 and 330 are partly screened out by the plantations and may be completely screened out as the trees continue to grow.

Intervention measures specific to cultural heritage are listed in Table 11.12 below.

Table 11.13 Catalogue of Cultural Heritage intervention measures

Ref	Title	Measure
CH1	Avoidance of works near sites	The contractor will be made aware of those sites in closest proximity to the site (Sites 65, 67, 294 and 295). If the Ecological Clerk of Works (ECoW) identifies any activity which could impact on these sites directly or indirectly a buffer zone will be marked off to protect the site. The ECoW will make regular checks to ensure that no site is impacted on by the works.
CH2	Reporting historical artefacts	SHETL will instate a reporting protocol as part of the CEMD which will be agreed with The Highland Council Archaeologist for any accidental archaeological discoveries made during the construction works. The protocol will include contact information for the relevant cultural heritage authority (The Highland Council) and the requirement to stop work until an appropriate mitigation strategy is agreed with The Highland Council archaeologists. The content of the protocol will be part of the site induction for all site workers. The contractor and site ECoW will be responsible for ensuring the successful implementation of the measures in the protocol.

Several mitigation measures related to Landscape and Visual issues will also benefit cultural heritage setting issues. These are LV2 through LV5 and LV7 through LV12 (see Chapter 10, Table 10.6), concerning colour schemes, retention of the focal line of the trackway and associated gap in the shelterbelt, planting, screening and minor landform changes around the edge of the converter station. In particular, in terms of mitigation measures concerning the setting of St Magnus' church, burial ground and hospital, measure LV12 will comprise clumps of planting on the south side of the converter station, which will include a mix of native trees such as oak, alder and Scots pine. The intention is that there will be enough trees so that in 15-20 years, views up to the roofline of the converter station from the monument will be significantly screened or filtered (see Figure 10.5, and Appendix 11-D, Plate 11.7).

11.11 Assessment of residual effects

11.11.1 Sites and settings within 0-2km radius ZTV

The sites and settings have been described above in Section 11.8.4, how they may be impacted in Section 11.9 and committed intervention and mitigation measures in Section 11.10. After implementation of mitigation measures, it is assessed that the setting of only one site, St Magnus' church, burial ground and hospital, will have an adverse effect of **moderate** significance, whilst the other sites will have adverse effects of **minor** or **negligible** significance (see Appendix 11-C; Tables 11.8 and 11.9 for definitions and Table 11.13 below for summary).

The reduction of the significance of impact on sites and their setting is because of factors such as limited visibility, shelterbelts that backdrop the station and prevent it from breaking the current skyline, new screen and filter planting, appropriate colour choice and the continued growth of young plantations. For example, see the photomontage visualisation for Viewpoint 3 in Appendix 10-A, which depicts how the development may look from close to Site 64, the moderately important prehistoric mound of Torr an Fhidlier, described in Section 11.8.4, Plate 11.2.

Site 65: St. Magnus church, burial ground and hospital

The development, which is to the north, will impact St Magnus' by placing a large converter station in one of the remaining open fields (see Appendix 11-D, Plates 11.3 and 11.6). However, the converter station will not block the views to the remaining landscapes that have changed little since the medieval period on Achanarras ridge and Spittal Hill (see Section 11.8.4), nor will it significantly impact views to this rarely visited monument (pers. comm. from the landowner) from the A9(T), because it is low-lying and difficult to spot from here, unless the viewer already knows where to look. Even though the proposed converter station will affect the locality, it will not impact the qualities listed by Historic Scotland that make the SAM of national importance (see Section 11.8.3).

It should be noted that since initial concerns were raised by Historic Scotland (see Section 11.5), the converter station has been sited further from the monument, from 300 to 595m away. Several mitigation strategies have been agreed to further soften the impact (see Section 11.10):

- the converter station will be painted an appropriate colour to help it blend it the shelterbelt backdrop to the north (LV2 and LV3);
- the shelterbelt will be maintained and reinforced during the lifetime of the station (LV7);
- surplus material from the excavations will be used to reshape the valley immediately around the proposed converter station to reduce the extent to which it is visible (LV4);

- clumps of planting on the south side of the converter station, which will include a mix of native trees such as oak, alder and Scots pine, will create a filter of the converter station and busbars in views from the monument (LV12); and
- the gap in the shelterbelt will be retained, as will the associated focal line of the trackway through this gap (LV8).

It should also be noted that through siting and orientation of the building, the roof of the station will be at the same level as the top of the shelterbelt trees, thus maintaining the current skyline (see GEN24 and GEN25).

While these mitigation measures will not eliminate the effect of the development on St Magnus church, burial ground and hospital, they will reduce it to a **moderate adverse** level (see Appendix 11-D, Plate 11.7).

Other sites within the 0-2km radius ZTV

West of the converter station is a group of prehistoric cairns, hut circles and a broch at the north end of Achanarras ridge and the moss north of it, all of moderate or high importance (Sites 308, 309, 310, 311, 314, 330, see Figures 11.1 and 11.2). For these sites, the potential pre-mitigation impacts on their setting of moderate importance identified in Section 11.9.3 (see tables 11.10 and 11.11) have residual post-mitigation adverse effects of **minor** significance. This is because the setting and views between the sites are not impacted by the station because it lies outside the group area. Moreover, only the roof of the station will be visible and this will become more screened off as the existing mixed woodland plantations at the north end of Achanarras ridge continue growing, mixed with effect of the appropriate colour paint used on the roof. This woodland already screens off the scheduled site of The Shean (Site 309) – see Appendix 11-D, Plate 11.8.

Table 11.14 Summary of residual effect on setting

Significance	Sites with affected settings
Very Major	None
Major	None
Moderate	65
Minor	63, 64, 67, 72, 294, 295, 307, 308, 309, 310, 311, 314, 321, 330
Negligible (or None)	42, 60, 62, 68, 69, 290, 296, 299, 301, 302, 303, 304, 305, 306, 307, 312, 315, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349

(see Appendix 11-C; Table 1 for detailed impact assessment).

11.11.2 Sites and settings within 2-5km ZTV

The mitigation commitments (see Section 11.10) include selection of an appropriate colour for the converter station and the maintenance of the shelterbelt north of the converter station. Along with the continued growth of existing shelterbelts and plantations in the vicinity of the station, the effect of the development on the setting of all sites (including those of high importance and those that could have been moderately impacted) will be reduced to **minor adverse** or less, as a small change in the background of the setting of these sites (see Appendix 11-C, Table 2).

11.11.3 Sites and settings within 5-10km ZTV

The mitigation commitments (see Section 11.10) include selection of an appropriate colour for the converter station and the maintenance of the shelterbelt north of the converter station. Along with the continued growth of existing shelterbelts and plantations in the vicinity of the station, the effect of the development on the setting of all sites in the 5-10km ZTV will be reduced to **minor adverse** or **none** (see Appendix 11-C, Table 3). The minor effect is simply at the level of the station perhaps being visible in small part of the background of a site's setting in very clear conditions.

11.12 Potential for cumulative effects

The potential for cumulative impacts appears to be solely in setting effects, since physically the development makes no impact on any sites and will be built on enclosed and improved land rather than uncultivated land that may have survived from prehistoric times.

Because the development is backdropped against an existing shelterbelt, it creates little additional effect itself in combination with changes already made in the landscape. However, some sites may experience a **moderate adverse** effect from angles where the station does not have the backdrop, as viewed from the west when the proposed Spittal wind farm would be in the same view (see Section 10.13). As long as the shelterbelts are maintained and the new plantations at the north end of Achanarras ridge continue to grow, the group of prehistoric sites here (including SAMs) will be screened from this cumulative impact, because they will be screened from the converter station.

The combination of the converter station with other existing modern more 'industrial' structures in the landscape, including the Causeymire wind farm, the electricity towers, as well as with the proposed Spittal wind farm may result in a **moderately adverse** cumulative effect on the setting of the St Magnus church, burial ground and hospital (Site 65). However, only 11 turbine blade tips and two nacelles of the proposed Spittal Wind Farm would be visible from the monument (RPS, 2009). Therefore existing screening such as shelterbelts and walls and committed mitigation measures including the proposed hedge planting along the A9(T), may provide sufficient screening to reduce the potential adverse cumulative impact on the setting to **negligible**. The proposed Halsary wind farm will not be visible from here because of the proximity of the shelterbelt southeast of Spittal Mains Farm.

11.13 Summary of key findings

There is only one recorded site (recorded by the walkover survey) within the proposed footprint of the converter station platform. Although the works will unavoidably result in the loss of this site, it is a modern clearance cairn and the significance of this loss is **negligible**. Therefore, no mitigation is proposed.

The Scheduled Ancient Monument of the medieval St. Magnus' church, burial ground and hospital is some 595m south of the proposed footprint of the converter station platform. It is of national importance and has statutory protection. It is however not regularly maintained and is rarely visited.

The proposed converter station and associated busbars will initially be in full view of St Magnus' church, burial ground and hospital. The assessment of the effects of construction on the setting of this site concludes that the current setting is not one of the factors that make it of national importance, since it is one of change, including a working farmstead, post improvement squared fields, a disused quarry and spoil heaps to the west and shelterbelts to the north and south. Views that form part of the visual setting of the site are similarly affected and include shelterbelts to the north and south and Causeymire wind farm in the middle distance. Views to and from areas that have not changed from the medieval period will not be affected and the converter station will not break the current skyline or affect middle and long distance views. Mitigation in the form of landscaping works such as landforms and planting, using the height of an existing shelterbelt as backdrop and an appropriate paint colour for the buildings and fencing will help reduce the adverse effect upon the site to one of **moderate** significance.

Residual effects to the four other designated sites within the 2km visual envelope of the proposed development have been assessed as **minor adverse** after consideration of existing screening and committed mitigation measures.

The remaining sites within the 2km radius ZTV are not designated and are of local or regional significance only. Many of the sites are screened by trees that mitigate against much of the potential impact. On all of these, residual effects of the proposed development have been assessed as **minor adverse** or **negligible** after consideration of existing screening and committed mitigation measures.

Out with the 2km ZTV, only a few significant sites will be affected by the development. Some of these are clustered around the Sordale Hill area to the north of the proposed converter station. Further away only SAMs on and around Beinn Freiceadain to the far west of the converter site would be affected visually, but due to the distances involved the significance of the effect would be **minor adverse** or **negligible** and viewed as part of the wider landscape – the town of Halkirk would appear to be much more visually intrusive than the proposed development.

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12 Traffic and Transport

12.1 What is covered in this chapter?

This chapter includes an assessment of the effect of increased road traffic flows on communities, pedestrians and other road users. Possible transport infrastructure links are examined as key routes for materials and people to the site. The final selection of the routes for transport of equipment and materials to the site has not yet been determined, and an assessment is currently being carried out by the project engineers in consultation with The Highland Council and Transport Scotland (see Section 4.2.9). Therefore, this assessment is based on the worst case scenario.

Other impacts which may arise due to road traffic and transportation are covered in:

- Chapter 13 – Noise and Vibration - noise from vehicles
- Chapter 14 – Air Quality - emissions from vehicles

12.2 Why could the issue be important?

During construction of the converter station, there will be increased traffic flows and temporary changes in existing traffic flows due to the movement of vehicles associated with the project. These could in turn affect local people and businesses through impacts on other road users and pedestrians.

No permanent traffic increases or impacts during operation of the converter station are expected because the development will not be permanently staffed and any major maintenance activity at the converter station will be infrequent (see Section 4.5). These potential impacts are not discussed further.

12.3 Sources of Information

The following sources of information have been used:

- Traffic data from
  - Transport Scotland - www.transportscotland.gov.uk
  - National Atmospheric Emissions Inventory - www.naei.org.uk
    Spittal Wind Farm Ltd (2007) Environmental Statement – available at www.spittalwindfarm.co.uk
- Ordnance Survey, 2009. Northern Scotland, Orkney and Shetland, *Travel Map,* Sheet 1, 1:250,000, Southampton: Ordnance Survey
- Ordnance Survey, 2009. Thurso and Wick, *Landranger Maps*, Sheet 12, 1:50,000. Southampton: Ordnance Survey
- Information provided by the project engineers URS on abnormal loads, traffic generation etc.
- Feedback from consultation (see Section 12.5)

The Highland Council were also contacted to provide traffic data but no data were available that were applicable to this project.

12.4 Survey and analysis work undertaken

No survey work was undertaken as it was considered that sufficient traffic data already existed from Transport Scotland, and that further data was not required due to the relatively short timescale over which the impacts are likely to occur (2-2½ years).

12.5 Consultation feedback

The following comments related to traffic and transport issues were received during consultation. See Annex I for a complete list of consultation responses for this project.

The Highland Council:

- The impact of construction traffic should be assessed and information provided on how any impact will be managed.
- The local road networks should be assessed to establish whether they can carry the 300 tonne load of the transformer.
- As part of the ongoing site design the route from the port of entry should be identified and assessed.

Transport Scotland:

- A Transport Assessment/Statement (TA/TS) will be required to consider the short term transport issues associated with construction of the development as the development is accessed directly from the A9(T) and has the potential for abnormal loads.
- The existing A9(T) junction may require to be upgraded in accordance with Design Manual for Roads and Bridges (DMRB) guidelines.
- The movement of abnormal loads needs to be carefully managed so that large and heavy vehicles only use those parts of the road network that can safely accommodate them.
- The route through Wick town centre is mainly on local authority roads except a short section of the A9(T) which should not pose any problems.
- The section of the A9(T) between its junction with the A882 and the site may have issues in that any vehicle would have to be configured carefully to ensure that it could safely traverse over the road over rail bridge at Georgemas Junction.
- The bridge would require analysis when the vehicle configurations are known to check suitability prior to granting permission.

12.6 Guidance and regulations

Documents which have been used to inform this assessment are;

- *Design Manual for Roads and Bridges, Volume 11, Section 3, Part 8: Pedestrians, Cyclists, Equestrians and Community Effects;*
- The Institution of Highways and Transportation, 1994. *Guidelines for Traffic Impact Assessment; and*
- Institute of Environmental Assessment, 1993. *Guidelines for the Environmental Assessment of Road Traffic, Guidance Notes No.1*.

Further information on the guidance in this document is included in Section 12.7.

12.7 Methodology

A full Traffic Impact Assessment was not considered necessary due to low traffic volumes and the temporary nature of the impact.

A qualitative assessment of the traffic and transport effects of the proposal has been undertaken taking account of the potential impacts which have been identified and the mitigation measures which will be implemented.

The impacts of construction-related traffic on existing traffic flows have been assessed by comparing the predicted movements of traffic associated with the development with the baseline two way traffic flows on the local roads in vicinity of the development.

Guidance from the Institution of Highways and Transportation (1994) indicates that traffic flow changes should be appraised if traffic generated by the development increases the baseline two-way traffic flows by greater than 10%. If this criterion is exceeded a more detailed traffic assessment is recommended.

Guidance from a number of sources suggest that severance and amenity impacts may occur where traffic flows increase by 30% or more (10% in sensitive areas) or the number of HGVs will increase by more than 30% (see Department of Transport et al., 1993; The Institution of Highways and Transportation, 1994; Institute of Environmental Assessment, 1993). This guidance relates primarily to operational traffic rather than the shorter duration and more unpredictable flows associated with construction activities. However in this appraisal the criteria are considered to be a useful tool to help to appraise the effects of traffic during construction.

12.8 Established baseline conditions

The distribution of roads traffic and other transport infrastructure in the vicinity of the converter station and in relation to possible equipment supply routes is shown in Figure 4.7.

12.8.1 Roads

The project development area is mainly served by the A9(T)which runs directly past the converter station site. The other major roads in the area are the A882 which connects Thurso to Wick and the A99 which links Wick and Latheron along the Moray Firth Coast. The A9(T) also provides the main connection to Invergordon.

It is proposed that access to the converter station site will be immediately off the A9(T) close to the site (see Figure 1.2).

Landward transportation could involve loads being delivered by road, by rail to Georgemas Junction and or Wick, or loads being moved by road from the quayside at Scrabster, Wick or Invergordon or by road from supply centres locally (e.g. for aggregate, locally manufactured items, general supplies sourced locally). The various transportation options are shown in Figure 12.1.

12.8.2 Ports/ harbours

Wick and Scrabster are the nearest preferred ports and provide good onward access to the projects working areas for normal loads. Access for abnormal loads may be more complex with possible turning circle, axle weight, grounding and gradient issues. There are ongoing studies by the Project Engineers at present to identify preferred routes etc. Alternative ports of delivery would be at the Cromarty Firth (Invergordon or Nigg) or ports further south.

All materials for the converter station will need to be offloaded to a quayside, possibly stored for some time and then transferred by road to the site where they are to be used. A landward/site storage facility may also be required if quayside storage is impractical.

The key constraints regards local ports are the depth available at the quayside and for access, the loading capacity of the quayside. In particular Wick Harbour currently has a low water draft of only 2m, rising to perhaps 5m at high tide. This may be a key limiting factor for using this harbour. The final choice of delivery route will be by the chosen contractor in liaison with appropriate authorities including The Highland Council.

12.8.3 Railways

There is a single track railway line which passes some 4km to the north of the proposed site, at Georgemas Junction. This line links Inverness to Wick and Thurso and therefore provides rail access to the wider UK network.

The rail line is already used for transporting freight such as sections of pipeline to the region and the line could be used if appropriate for delivery of equipment to the converter station site. The rail route may also provide a useful link for project staff and site workers travelling from elsewhere in the UK. The journey times are however still generally longer than can be achieved by road.

12.8.4 Bus routes

Long distance bus routes link Thurso and Wick to Inverness five times a day. The route is either from Inverness up the A9(T) to Thurso, or to Latheron then via the A99 to Wick then on to Castletown via the A876 and then on to Thurso and Scrabster via the A836. A summary of the local bus routes are given in Table 12.1.

Table 12.1 Local bus routes

Service No.	Route	Frequency
X99	Inverness to Scrabster via Wick	5 times a day
75	Berriedale to Wick	8 times a day
76	Staxigoe to Wick	10 times a day
77	Wick-Ackergill-John O'Groats	7 times a day
78	Scrabster to Thurso	4 times a day
80/180	Thurso to John O' Groats	10 times a day
81/181	Thurso to Wick via Castletown	10 times a day
82/182	Thurso to Wick via Watten	15 times a day
83	Thurso to Wick via Durran and Gillock	Twice a day
183	Thurso to Spittal Quarry via Halkirk	Once a day
275	Wick via Latheron to Dounreay	Once a day
280	John O' Groats to Dounreay	Once a day
276, 277, 281	Wick-Ackergill-Castletown-Dounreay	4 times a day
282, 283	Wick to Dounreay via Watten and Thurso	Twice a day

12.8.5 Potential routes from port of entry

Four potential routes from ports of entry to the converter station have been identified (see Figure 12.1). The shortest route is from Scrabster Harbour to the site (Route 2). Two routes have been identified from Wick Harbour (Routes 1 and 3), and one route from Invergordon (Route 4). Much of the length of Route 3 was previously used for the transportation of the turbine components for Causeymire wind farm, and therefore is a proven route for large abnormal loads.

12.8.6 Traffic

Table 12.2 and Table 12.3 below show average annual daily traffic flow and average peak traffic flows respectively for various points along the potential routes to the converter station. The annual average daily flow past the proposed converter station site for 2009 was 1232 vehicles. Traffic flows through the year increase during spring and summer to a peak in August and decrease again in autumn and winter as shown in the Graph 12.1.

Table 12.2 Average annual daily flow (number of vehicles) for the potential routes to the converter station from Wick, Scrabster or Invergordon

	Baseline		
Location	**All**	**HGVs[107]**	**Data Source[108][109]**
Route 1 Scrabster			
A9(T) A836 Junction to Scrabster Harbour	3261	ND	3
A9(T) A836 Junction to Scrabster Harbour	2479	82	1
A9(T) Thurso town centre	12615	208	1
Thurso town centre	7574	234	1
A9(T) Roadside to Thurso (B874 to Town Boundary)	3044	ND	3
A9(T) north of roadside	2775	176	1
A9(T) Georgemas to Roadside (A882 to B874)	3005	ND	3
A9(T) Mybster to Georgemas (B870 to A882)	1232	ND	3
Route 2 Wick via A882			
A882 near Haster	2148	131	1
A882 near Wester Watten	1544	63	1
A882 east of Watten	1898	96	2
A882 Georgemas to Wick[110]	1773	ND	3
A9(T) Mybster to Georgemas (B870 to A882)	1232	ND	3
Route 3 Wick via A99			
A99 Latheron to Wick	2051	ND	3
A9(T) Mybster to Georgemas (B870 to A882)	1232	ND	3
A9(T) south of Mybster	1203	137	2
A9(T) north of Achavanich	1157	109	1
Route 4 Invergordon via A99			
A9(T) Mybster to Georgemas (B870 to A882)	1232	ND	3
A9(T) south of Mybster	1203	137	2
A9(T) north of Achavanich	1157	109	1
A9(T) Near Ord of Caithness	1539	153	
A9(T) Berriedale	2089	ND	3
A9(T) Helmsdale to Latheron	2165	ND	3
A9(T) Culgower, south of Helmsdale	2052	274	1

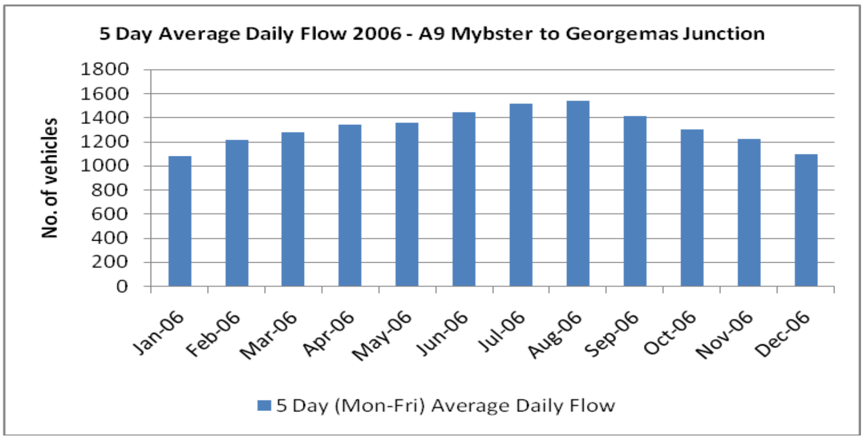
[107] ND (No Data)
[108] Data sources (1) National Atmospheric Emissions Inventory data for 2000, (2) Spittal Wind Farm Environmental Statement data for July 2007, (3) Transport Scotland data for 2010
[109] Spittal Wind Farm Environmental Statement data was collected in July 2006 (6^{th} to 12^{th}) by Count on Us using Metrocount Series 5600 Automatic Traffic Counters (ATCs), attached to pneumatic tubes, to provide vehicle class and speed data. These data were then used to calculate 5-day 12-hour (Monday to Friday 0700-1900) average two-way traffic flows.
[110] Traffic counts for Georgemas to Wick were not available from Transport Scotland but were estimated by subtracting the values for 'A9(T) Mybster to Georgemas'from'A9(T) Georgemas to Roadside'.

Location	Baseline		
	All	HGVs[107]	Data Source[108,109]
A9(T) Brora to Helmsdale	2475	ND	3
A9(T) Brora	4040	255	1
A9(T) Golspie to Brora	4090	ND	3
A9(T) Kirkton, south of Golspie	4033	201	1
A9(T) north of Poles	3339	176	1
A9(T) south of Evelix	4131	261	1
A9(T) Poles to The Mound (B9174 to A839)	4240	ND	3
A9(T) Dornoch Bypass (A949 to B9168)	3617	ND	3
A9(T) Dornoch	5743	ND	3
A9(T) Dornoch Bridge	5621	ND	3
A9(T) north of Dornoch Bridge	4335	269	1
A9(T) Tain North (B9174) to Dornoch Bridge RB	6549	ND	3
A9(T) north of Tain	5114	367	1
A9(T) Tain Bypass	4058	322	1
A9(T) south of Tain	7290	484	1
A9(T) Garrick Bridge to Logie Easter	7558	ND	3
A9(T) north of Nigg roundabout	6627	432	1
A9(T) Kildary (B817) to Nigg Junction (B9165)	8170	ND	3
A9(T) south of Nigg Roundabout	6254	570	1
A9(T) Tomich Junction to Kildary (B817)	7721	ND	3
A9(T) Tomich	8593	849	1

Table 12.3 Peak hour traffic flows (number of vehicles)

Location	Average Peak Hour Flow (AM/PM)
A9(T) A836 Junction to Scrabster Harbour	244/293
A9(T) Roadside to Thurso (B874 to Town Boundary)	244/284
A9(T) Georgemas to Roadside (A882 to B874)	253/283
A9(T) Mybster to Georgemas (B870 to A882)	105/112

Graph 12.1 Traffic count for Mybster to Georgemas Junction, 2006[1]



[1]Traffic Scotland: http://www.transportscotland.gov.uk/road/traffic-count/map-application

12.9 Predicted traffic during construction

The following assumptions have been made for this assessment (see Section 4.3.8).

For the civil works which will last about 9 months:

- An average of 6 HGVs per day, with a peak of 15;
- 12 cars /vans for workers travelling to the site.

For the electrical works which will last about 12 months:

- Electrical grid work:
    - An average of 4 HGVs per day, with a peak of 6;
    - 8 cars / vans for workers travelling to the site.

- HVDC construction and installation:
    - An average of 4 HGVs per day, with a peak of 8;
    - 20 cars /vans for workers travelling to the site.

The traffic movements to the converter station site are assumed to include workers travelling to the site. This traffic is assumed to arrive at the site at the peak time. Deliveries of materials by HGV will arrive throughout the day.

In addition there will be up to four abnormal loads (three HVDC transformers at 290 tonnes each, including one spare). Additional abnormal loads may be required for other HVDC equipment, based on transportation size and shape, rather than weight.

It should be noted that the traffic volumes are only indicative as traffic volumes are likely to fluctuate from day to day, week to week and from month to month throughout the duration of construction, depending on the activity at the time.

In order to assess the worst case scenario, the percentage change on each of the possible routes has been calculated using the following assumptions:

- the maximum number of vehicles coming to the site on a day is 24 vehicles (20 cars/vans and 4 HGVs, 48 journeys) which will occur during HVDC construction and installation;
- the maximum number of HGVs coming to the site per day is 6 vehicles (12 journeys) which will occur during civil works;
- the majority of construction workers will be based in either Wick or Thurso and will only use Routes 1 or 2;
- traffic on Routes 1 and 2 will be made up of both cars/vans and HGVs;
- Routes 3 and 4 will be used only by HGV traffic;
- there would be an maximum additional 48 journeys using routes heading north from the site (using Route 1 or 2);
- there would be a maximum additional 12 HGV journeys using routes heading south from the site (Routes 3 or 4).

Table 12.4 gives the percentage change in traffic on the local road network as a result of an increase in traffic generated by the construction of the converter station, using the highest numbers of traffic predicted. Table 12.5 summarises this information. Traffic volumes on the roads in the area are relatively low, and a small increase in the number of vehicles can result in a high percentage change.

Table 12.4 Assessment of Percentage Change in annual average traffic flow

Location	Percentage change in total annual average traffic flow	Percentage change in HGV traffic
Route 1 Scrabster		
A9(T) A836 Junction to Scrabster Harbour	2%	
A9(T) A836 Junction to Scrabster Harbour	2%	15%
A9(T) Thurso town centre	0%	6%
Thurso town centre	1%	5%
A9(T) Roadside to Thurso (B874 to Town Boundary)	2%	
A9(T) north of Roadside	2%	7%
A9(T) Georgemas to Roadside (A882 to B874)	2%	
A9(T) Mybster to Georgemas (B870 to A882)	5%	
Route 2 Wick via A882		
A882 near Haster	3%	9%
A882 near Wester Watten	4%	19%
A882 east of Watten	3%	13%
A882 Georgemas to Wick	3%	
A9(T) Mybster to Georgemas (B870 to A882)	5%	
Route 3 Wick via A99		
A99 Latheron to Wick	1%	
A9(T) north of Achavanich	2%	11%
A9(T) south of Mybster	2%	9%
A9(T) Mybster to Georgemas (B870 to A882)	2%	
Route 4 Invergordon via A99		
A9(T) Tomich	28	0%
A9(T) Tomich Junction to Kildary (B817)	27	0%
A9(T) south of Nigg Roundabout	26	0%
A9(T) Kildary (B817) to Nigg Junction (B9165)	25	0%
A9(T) north of Nigg Roundabout	24	0%
A9(T) Garrick Bridge to Logie Easter	23	0%
A9(T) south of Tain	22	0%
A9(T) Tain Bypass	21	1%
A9(T) North of Tain	20	0%
A9(T) Tain North (B9174) to Dornoch Bridge RB	19	0%
A9(T) north of Dornoch Bridge	18	1%
A9(T) Dornoch Bridge	17	0%
A9(T) Dornoch	16	0%
A9(T) Dornoch Bypass (A949 to B9168)	15	1%
A9(T) Poles to The Mound (B9174 to A839)	14	1%
A9(T) south of Evelix	13	1%
A9(T) north of Poles	12	1%
A9(T) Kirkton, south of Golspie	11	1%
A9(T) Golspie to Brora	10	1%
A9(T) Brora	9	1%
A9(T) Brora to Helmsdale	8	1%
A9(T) Culgower, south of Helmsdale	7	1%
A9(T) Helmsdale to Latheron	6	1%
A9(T) Berriedale	5	1%
A9(T) Near Ord of Caithness	4	2%
A9(T) north of Achavanich	3	2%
A9(T) south of Mybster	2	2%
A9(T) Mybster to Georgemas (B870 to A882)	1	2%

Table 12.5 Summary of assessment of percentage change in annual average traffic flow

Location	Percentage change in total annual average traffic flow	Percentage change in HGV traffic
Route 1 Scrabster to converter station	≤ 5%	≤ 15%
Route 2 Wick via A882 to converter station	≤ 5%	≤ 19%
Route 3 Wick via A99 to converter station	≤ 2%	≤ 11%
Route 4 Invergordon via A9(T) to converter station	≤ 2%	≤ 11%

Table 12.6 below shows the percentage change in peak traffic flows for several points along Route 1. No data were available for the A882 (Route 2).

Table 12.6 Change in peak hour traffic flows

Location	Average Peak Hour Flow (AM/PM)	Max. Predicted Traffic Generation	Percentage Change
A9(T) A836 Junction to Scrabster Harbour	244/293	20	7-8%
A9(T) Roadside to Thurso (B874 to Town Boundary)	244/284	20	7-8%
A9(T) Georgemas to Roadside (A882 to B874)	253/283	20	7-8%
A9(T) Mybster to Georgemas (B870 to A882)	105/112	20	18-19%

12.10 Range of possible impacts

Increased traffic levels as a result of the project may have knock-on effects including driver delay and community effects including pedestrian delay, severance and amenity effects.

Impacts on the road network are also discussed as the movement of abnormal loads requires careful management so that large and heavy vehicles use only those parts of the road network that can safely accommodate them.

12.11 Mitigation

The list below (Table 12.7) provides a catalogue of all of the measures that have been adopted in the project in order to avoid, reduce and manage unwanted impacts to traffic and transport infrastructure. For a full list of intervention measures, see Annex II.

Table 12.7 Catalogue of agreed intervention measures related to traffic and transport

Ref	Title	Measure
T1	TMP	A traffic management plan (TMP) will be developed by the contractor as part of the Construction Environmental Management Plan (CEMD). The plan will be agreed with The Highland Council Road Service in advance of construction.
T2	Car sharing	Appropriate measures (e.g. adoption of car sharing) will be encouraged by the contractor to seek to reduce the number of vehicles arriving and departing the site at any one time. Local transport information will also be displayed on staff notice boards.
T3	Timing of HGV traffic	The movement of traffic, such as HGVs, will be restricted to particular times of the day, e.g. out with ferry times, to avoid the start and end of the school day and to reduce the risk of vehicles convoying when arriving/departing the site. Specific restrictions will be agreed with The Highland Council Roads Service and any other affected local authority.
T4	Facilitating overtaking	Where possible on long journeys drivers of slow moving vehicles will be encouraged by the contractor to use laybys to allow other vehicles to pass safely.
T5	Resident liaison	Local residents will be kept informed of any potentially disruptive vehicle movement (such as delivery of abnormal loads) and the actions being taken to mitigate the impact of these vehicle movements.
T6	School liaison	Any local schools will be contacted prior to the start of any works on site. An agreed message that deals with traffic safety aspects of construction sites (as well as other related subjects considered appropriate and engaging) will be delivered by SHETL and the contractor.
T7	Managing delays	The contractor will be required as part of the TMP to monitor delays through and in proximity to the works and if any significant delays were identified to take account of this and programme activities to reduce the impacts on local traffic, including ferry traffic.
T8	Transport briefing	Transport briefings and detailed logistic plans will be issued to all service and material suppliers to ensure that required driving standards are maintained and appropriate routings and timings are followed.
T9	Driver induction	A driver's induction will be undertaken to include: the traffic management plan for the development, a safety briefing; the need for appropriate care and speed control; identification of specific sensitive areas; identification of the specified access route(s); and the requirement not to deviate from the specified route(s).
T10	Road loadings	The project team will work together with The Highland Council and Transport Scotland to make an assessment of the capacity of bridges and culverts to carry abnormal loads and general construction traffic and then to select appropriate routes and if necessary carry out necessary strengthening or improvement works with required consents.
T11	Abnormal loads	All necessary consents for the movement of abnormal loads will be obtained in advance by the contractor.
T12	Road condition	The contractor will be required to undertake road condition surveys throughout the development timescale and carry out any remedial road works resulting from the construction traffic as agreed with The Highland Council and Transport Scotland.
T13	New junction design	The new access junction from the converter station onto the A9 will be designed to meet standards set out in the Design Manual for Roads and Bridges and will follow guidance in The Highland Council's Road Guidelines For New Developments (2001) (see GEN 29 and 30).
T14	Delivery planning	The contractor will be required to plan delivery schedules to take account of port capacity and to liaise with other port users if usage is going to be heavy. Measures to reduce impacts on other users will be identified in the TMP in the CEMD.

12.12 Assessment of residual effects

Traffic-related effects

The A9(T) Mybster to Georgemas (B870 to A882) section of road is relevant to all potential routes. The two sections below describe how increased traffic levels on the this section of road as a result of the project may have knock-on effects including driver delay and community effects including pedestrian delay, severance and amenity effects.

12.12.1 Driver Delay

Driver delay (including effects on bus services) may result from:

- increase in the volume of traffic on the existing road network;
- presence of slow moving construction traffic, for example, HGVs and vehicles carrying abnormal loads;
- the presence of traffic management measures (such as traffic lights or speed controls) that may be put in place while the access track is established.

The Mybster to Georgemas section of the road goes past the converter station and is included in all potential routes. In a worst case scenario, the analysis indicates that daily flows on this section of road could increase up to 5%. Construction workers are likely to arrive and leave the site during peak traffic flows associated with commuting times and ferry schedules at the beginning and end of the day, potentially increasing peak hour traffic flows on this section. The analysis indicates that peak flows could increase by 18-19 percent. However, baseline traffic flows are low on the road (112 vehicles/hour) and the increase will be short-term.

The Institute of Highways and Transportation guidance (1994) suggests increases of more than 10 percent in two-way traffic flows should be further appraised (see Section 12.7). This threshold is not exceeded for daily flows. Although peak hour traffic flows could exceed this threshold in a worst case scenario, the potential impact of this can be minimised by encouraging site staff to arrive at different times and by promoting the benefits of car-sharing. These measures will be included in the TMP and implemented by the contractor.

By restricting HGV traffic to particular times of day and encouraging use of passing places, disruption due to slow-moving vehicles can be minimised.

The contractor will be required to keep the local communities informed about ongoing activities and any particular activities which have potential to cause disruption. The timing of activities that may cause more substantial delay will take account of commuter and ferry traffic in particular since any delays for traffic meeting connections will mean further knock-on effects for the individuals concerned. Construction and traffic management measures can be timed to deal with these peak times of travel.

Although there will be an increase in traffic during construction which will be noticeable during the busiest periods it will be short term. Combined with agreed mitigation, these impacts are unlikely to cause significant disruption. The contractor will be required to monitor delays through and in proximity to the works and if any significant delays are identified to take account of this and programme activities to reduce the effects on local traffic as part of the TMP.

Driver delay may also result from disruption during traffic management measures (such as traffic lights or speed controls) that may be put in place while the access track is established. It is acknowledged that there may be some periods when driver delay may be longer and result in a more significant impact; however, these times will be infrequent and temporary.

The contractor will be required to keep the local communities informed about ongoing activities and any particular activities which have potential to cause disruption. As part of the TMP the timing of activities that may cause more substantial delay will take account of ferry traffic and commuter traffic. If any significant effects are identified, the contractors will be asked to take account of this and programme activities to reduce the effects.

12.12.2 Community effects from construction traffic including pedestrian delay, severance and amenity effects

Potential impacts on pedestrians include severance, pedestrian delay and pedestrian amenity due to increased traffic.

Community severance is defined here by the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows[111]. Developed from guidance in DMRB Volume 11 a change in flow of 30% or more has been taken as significant. The predicted increases in traffic flow are well below this threshold and the effects will not be significant.

Amenity is defined as the relative pleasantness of a journey and is concerned with the changes in the degree and duration of people's exposure to traffic (Department for Transport, undated.). The DMRB does not give any set criteria for assessing amenity. However it can be stated that there will be some reduction in amenity for villages along the routes chosen by the transport contractor due to increases in HGV traffic. However as previously stated existing traffic flows are relatively low on the local roads and any increases are large in percentage terms but the actual numbers are very low. Although there will be an increase in traffic during construction/decommissioning which will be noticeable during the busiest periods it will be short term and unlikely to cause significant effects.

Effect on transport infrastructure

12.12.3 Damage to existing road infrastructure

The movement of abnormal loads requires careful management so that large and heavy vehicles use only those parts of the road network that can safely accommodate them. Restrictions on certain roads and bridges may be a constraint for transporting abnormally heavy, long or wide loads.

An assessment is currently being carried out by the Project Engineers in consultation with The Highland Council and Transport Scotland on the selection of appropriate routes considering:

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[111] Design Manual for Roads and Bridges, Volume 11 Section 3, Part 8

- the capacity of bridges and culverts to carry abnormal (heavy, long or wide) loads as well as general construction traffic;
- the capacity of roads to accommodate vehicles with a large swept path.

Any necessary strengthening or improvement works to the A9(T) identified in the assessment will be done in agreement with Transport Scotland with all necessary consents.

Movement of abnormal loads may require Special Order authorisation under Section 44 of the 1988 Road Traffic Act. The selected transport contractor (in consultation with Transport Scotland, its operating companies, The Highland Council and the Police where necessary along the route of the proposed movement) will assess the whether the existing road network can accommodate abnormal loads, if any other route options are available, whether any temporary removal of street furniture is necessary etc, and apply for any necessary consents.

There may be impacts from additional HGV traffic and especially from abnormal loads on the roads network. The contractor will undertake road condition surveys throughout the development and carry out any remedial road works resulting from the construction traffic. Therefore no permanent effects are anticipated to the road network as any defects that occur from the construction period will be rectified.

12.12.4 Impacts to other transport infrastructure

Depending on the route chosen by the transport contractor impacts such as congestion at ports and harbours may occur. The TMP will form part of the site CEMD and will include measures to reduce the potential for congestion. Measures will include a requirement for the contractor to plan delivery schedules to take account of port capacity and to liaise with other port users if usage is going to be heavy. With these measures in place impacts are predicted to be **minor** and not significant.

12.13 Potential for cumulative effects

There is a possibility of cumulative effects from traffic associated with other construction projects such as wind farms. There are a number of wind farms which may be under construction in Caithness in the foreseeable future (see Section 15.7.1). At present however, it seems very unlikely that the construction windows for the converter station and any wind farms will overlap significantly.

There is also a possibility of cumulative traffic effects generated by the construction of the converter station and the installation of the underground cable especially since they are likely to occur at the same time. The contractor will be required to plan activities to reduce the potential for effects on the local road system. The TMP will be developed taking account of the need to mitigate such impacts and all measures will be agreed with The Highland Council in advance of construction.

12.14 Summary of key findings

The key findings of this assessment are as follows:

- Traffic will increase on local roads during construction and this will be most noticeable in the peak hour periods. Appropriate measures will be implemented to reduce the impacts and traffic disruption and severance and amenity effects are not predicted to be significant.
- The contractor will be required to ensure any disruption was reduced to the minimum for the safe delivery of the works.
- The construction of the converter station will require the movement of abnormal loads (abnormally heavy, long or wide loads) which requires careful management so that large and heavy vehicles use only those parts of the road network that can safely accommodate them. With careful management and planning no significant effects are anticipated.
- No permanent effects are anticipated to the road network as any defects that occur from the construction period will be corrected.
- Some congestion at ports and harbours may occur however measures within the traffic management plan will ensure there are no significant residual effects.

12.15 References

Department of Transport et al., 1993 and amendments. *Design Manual for Roads and Bridges, Volume 11, Section 3, Part 8: Pedestrians, Cyclists, Equestrians and Community Effects.* [online] HMSO, London. Available at: <http://www.standardsforhighways.co.uk/dmrb/vol11/section3/11s3p08.pdf>. [Accessed 30 November 2010].

The Institution of Highways and Transportation, 1994. *Guidelines for Traffic Impact Assessment.* The Institution of Highways and Transportation, London.

Institute of Environmental Assessment, 1993. *Guidelines for the Environmental Assessment of Road Traffic, Guidance Notes No.1*. IEA, London.

Transport Scotland, 2007. *Abnormal Load Movements: A brief guide to Notification and Authorisation requirements.* [online] Available at: <http://www.transportscotland.gov.uk/files/documents/roads/Guide-to-Regulations.pdf>. [Accessed 19 October 2010].

RPS, 2007. *Spittal Wind Farm Environmental Statement, Chapter 11 – Traffic and Transport.* [online] Available at: <http://www.spittalwindfarm.co.uk/environmentalstatement/11ch11.pdf>. [Accessed 18 October 2010].

13 Noise and Vibration

13.1 What is covered in this chapter?

This chapter assesses the noise and vibration impacts that could arise as a result of the proposed development. Consideration is given to potential noise and vibration impacts during both the construction and operational phases of the development and to the impacts that the scheme could have on existing local noise and vibration sensitive receptors.

In particular, this chapter considers:

- the potential construction noise impacts that could arise on existing local receptors, including the effects of noise from construction traffic;
- the potential construction vibration impacts that could arise on existing local receptors;
- the potential impacts of air overpressure and groundborne vibration as a result of possible site blasting works on existing local receptors; and
- the potential noise impacts that could arise at local receptors as a result of noise emissions from the facility, and noise from traffic associated with the proposed facilities.

This chapter describes the methods used to assess the potential impacts, the baseline conditions currently existing in the vicinity of the site, the potential impacts of the development arising from construction and operation, the mitigation measures required to prevent, reduce, or offset identified impacts and the resulting residual impacts.

This chapter is necessarily technical in nature so to assist the reader a glossary of acoustic terminology is provided in Appendix 13-A.

13.2 Why could the issue be important?

The importance of potential noise and vibration impacts is identified by consideration to the prevailing local noise environment, the proximity and sensitivity of local receptors, and the potential for the development to generate noise and/or vibration during both the construction and operational phases.

The proposed development is sited in a rural area, remote from significant environmental noise sources such as heavily trafficked road traffic routes (e.g. motorways and dual carriageways), railways and airports. The rural nature of the site therefore increases the likelihood of potential impacts and hence the importance of their consideration.

There are isolated residential dwellings in the local area, although the closest to the site is approximately 200m from the site boundary. The high sensitivity of residential dwellings therefore increases the likelihood of potential impacts and hence the importance of their consideration.

13.3 Sources of Information

The following sources of information have been used to inform the completed assessment:

- Ordnance survey mapping for the site and surrounding areas:
  - Ordnance Survey (OS) Address-point data
  - Ordnance Survey, 2003. Wick and the Flow Country. *Explorer Maps*, Sheet 450, 1:25,000, Southampton: Ordnance Survey
  - Ordnance Survey, 2007. Thurso; John O' Groats. *Explorer Maps* Sheet 451, 1:25,000, Southampton: Ordnance Survey
- The Transportation Assessment, as presented in the Traffic chapter (Chapter 12) of this Environmental Statement, in particular the scheme traffic data
- The noise chapter (Chapter 10) of the Environmental Statement for the proposed Spittal Hill Wind Farm, entitled *Spittal hill wind farm environmental statement* (RPS, 2007), in particular the results of noise measurements undertaken at the two adopted measurement locations closest to the proposed converter station site
- Consultation responses from the Environmental Health Department at The Highland Council

In addition to these sources, the documents referenced in Section 13.6 below were used in this assessment.

13.4 Survey and analysis work undertaken

No specific surveys were undertaken, as sufficient information was available from previous work to inform the assessment.

13.5 Consultation feedback

At the outset of the project, consultation was undertaken with the relevant Environmental Health Officer at The Highland Council, to discuss and agree the approach to the proposed noise and vibration assessment.

It was advised that to control construction noise, The Highland Council would typically impose a planning condition restricting the times at which construction operations can be undertaken, for example, to limit operation which could generate noise which was audible at the site boundary to between 0800 hours and 1900 hours Monday to Friday and between 0800 hours and 1300 hours on Saturdays.

The Highland Council also provided advice with regards to the level of plant noise that is generally accepted once such developments are in operation. It was stated that a noise level criterion of 35 dB $L_{Aeq,T}$ was commonly accepted within habitable areas of local residential properties (assuming open windows), and that a Noise Rating Curve criterion of NR20 should also be sought to be achieved in such spaces.

With regards to the establishment of the local noise environment, discussions were held regarding background noise measurements which have previously been undertaken as part of the Spittal Hill Wind Farm planning application. The noise assessment for this wind farm development included a 4 week baseline noise survey with measurements both to the southeast and northeast of the proposed

HVDC converter station. This baseline noise survey included extensive measurements during both night-time and quiet daytime periods during wind speed conditions of less than 5m/s (as appropriate for this proposed development). It was agreed that the results of this baseline noise survey could be used to inform this noise assessment.

The noise and vibration impact assessment methodology as outlined in Section 13.7 was also discussed and agreed.

13.6 Guidance and regulations

13.6.1 National Planning Policy

Planning Advice Note 56: Planning and Noise

Planning Advice Note (PAN) 56, *Planning and noise,* published in April 1999 (The Scottish Government, 1999), sets out the Scottish Office's policies on noise-related planning issues. It gives guidance to Local Authorities in Scotland on the use of their planning powers to minimise the adverse impact of noise.

The document outlines the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which would generate noise, and advises on the use of planning conditions to minimise the impact of noise.

For proposed industrial development, PAN56 states that British Standard 4142:1997: *Method for rating industrial noise affecting mixed residential and industrial areas* (British Standards Institute (BSI), 1997) is a useful guide to determine the likelihood of complaints from local residents, but that this should not be relied upon solely. In addition to the use of BS4142, PAN56 suggests that noise limits expressed in terms of the L_{Aeq} or Noise Rating (NR) curves may be appropriate. The guidance goes on to state that general guidance on acceptable noise levels within buildings can be found in BS8233:1999: *Sound insulation and noise reduction for buildings - Code of practice* (BSI, 1999).

Planning Advisory Note (PAN) 50: Annex D: Controlling the effects of surface mineral workings, Annex D:

Whilst this proposed development does not include mineral extraction per se, there is a possibility of minor blasting operations being required during works associated with the formation of the development platform, and this document does provide guidance which can be applied to such works.

Paragraphs 33 to 38 of this document (The Scottish Government, 2000) are concerned with blasting, including vibration and air overpressure. It is confirmed that the levels of vibration generated by even mineral workings are well below those required to cause structural damage to properties, but that vibration and air overpressure may give rise to nuisance. It is also confirmed that the levels of air overpressure and noise can be significantly affected by meteorological conditions.

It is recommended that any planning conditions pertinent to blast induced vibration should look to set acceptable vibration level limits, but that this approach would be impractical for air overpressures, due to affecting factors outside the control of the operator (e.g. meteorological effects). It is identified that the operator will always be concerned with maximising the effectiveness of the blast, and therefore minimising lost energy through air overpressure.

A summary of good practice on blasting works is presented in Section 13.10.4.

13.6.2 Regional Planning Policy

The Highland Structure Plan

The Highland Structure Plan presents the overall strategic goals and values of The Highland Council and has been approved by the Scottish Ministers (The Highland Council, 2001). This document presents a series of policies, of which only Policy G2 makes specific reference to noise.

Policy G2 states that:

> "*Proposed developments will be assessed on the extent to which they:* [achieve several points, including,] *are affected by safeguard zones where there is a significant risk of disturbance and hazard from industrial installations including noise, dust, smells, electromagnetism, radioactivity and subsidence*"

It can therefore be seen that this policy is therefore concerned with the potential impact on proposed sensitive development rather than the impact on existing sensitive receptors from development with the potential to generate noise.

13.6.3 Local Planning Policy

The Caithness Local Plan

Adopted in September 2002, the Caithness Local Plan takes forward The Highland Structure Plan and translates its policies into more detailed land allocations (The Highland Council, 2002). This plan also contains a series of policies, and although none of these make specific reference to noise or vibration, they do make reference to potential effects in more general terms. The stated policies include the following:

> "*PP1 - the council will encourage development subject to detailed site factors*
>
> *PP2 – the council will favour development, unless this would significantly affect important features,*
>
> *PP3 – The council will presume against development, particularly where there is significant damage to heritage, amenity or public health*
>
> *PP4 – The council will not approve development unless there is a strong and over-riding social, economic, public health or safety reason, or for benefits of primary importance to the environment.*" and
>
> *"Industry (I) – The council will maintain or promote industrial uses."*

13.6.4 Guidance Documents

British Standard 4142: 1997: Method for rating industrial noise affecting mixed residential and industrial areas

BS 4142 sets out a method to assess whether noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises are likely to give rise to complaints from noise-sensitive receptors in the vicinity (BSI, 1997).

The procedure contained in BS 4142 for assessing the likelihood of complaint is to compare the measured or predicted noise level from the source in question, known as the $L_{Aeq,T}$ specific noise level, immediately outside the dwelling, with the $L_{A90,T}$ background noise level that exists in the absence of the source in question.

Where the noise contains a "*distinguishable discrete continuous note (whine, hiss, screech, hum etc.,)"* or if there are "*distinct impulses in the noise (bangs, clicks, clatters or thumps)*", or if the noise is "*irregular enough to attract attention*" then a correction of +5 dB is added to the specific noise level to obtain the $L_{Ar,T}$ rating level.

The likelihood of the noise giving rise to complaints is assessed by subtracting the background noise level from the rating noise level. BS 4142 states:

> '*A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely.*'

This document goes on to state that for the purpose of this standard, rating noise levels below 35 dB and background noise levels below 30 dB(A) are considered to be '*very low*', and that below such levels, the prescribed assessment method "*is not suitable*" for use.

BS8233: 1999: Sound insulation and noise reduction for buildings - Code of practice

The scope of this Standard is the provision of recommendations for the control of noise in and around buildings (BSI, 1999). It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings, or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30 dB $L_{Aeq,T}$ within bedrooms is a 'good' standard, whilst 35 dB $L_{Aeq,T}$ is a 'reasonable' standard. For living areas in the daytime, the standard recommends 30 dB $L_{Aeq,T}$ as a 'good' standard and 40 dB $L_{Aeq,T}$ as being a 'reasonable' standard. BS8233 also states that individual noise events should not normally exceed 45 dB L_{AFmax} in bedrooms at night.

With regards to external noise levels, BS8233 states:

> "*it is desirable that the steady state noise level does not exceed 50 dB $L_{Aeq,T}$ and 55 dB $L_{Aeq,T}$ should be regarded as the upper limit.*"

BS5228: Noise and vibration control on construction and open sites: Part 1: Noise: 2009

This standard sets out techniques to predict the likely noise effects from construction works, based on detailed information on the type and number of plant being used, their location and the length of time they are in operation (BSI, 2009).

The noise prediction method is used to establish likely noise levels in terms of the $L_{Aeq,T}$ over the core working day. For the purpose of this assessment, it is assumed that the core working day would be between 08:00 and 19:00 hours, with a 1-hour break for lunch Monday to Friday, and 08:00 to 13:00 hours on Saturdays.

This standard also documents a database of information, including previously measured sound pressure level data for a variety of different construction plant undertaking various common activities.

Example criteria are presented for the assessment of the significance of noise effects. Such criteria are concerned with fixed noise limits and ambient noise level changes. For fixed noise limits BS5228 presents those included within Advisory Leaflet 72: 1976: *Noise Control on Building Sites* (The Department of the Environment, 1976). These fixed limits are presented according to the nature of the surrounding environment, for a 12-hour working day. The presented limits are:

- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise; and
- 75 dB(A) in urban areas near main roads and heavy industrial areas.

Given that the site is located in a rural area, the construction works have been assessed against a core working daytime noise level criterion of 70 dB $L_{Aeq,T}$. For weekend daytime periods, the core working day is proposed to be less than 12 hours. Applying this criterion to a shorter daytime period (e.g. 10 hours rather than 12), ensures a more stringent assessment.

BS5228: Noise and vibration control on construction and open sites - Part 2: Vibration: 2009

This standard provides recommendations for basic methods of vibration control relating to construction and open sites (BSI, 2009). The legislative background to vibration control is described and guidance is provided concerning methods of measuring vibration and assessing its effects on the environment.

Guidance criteria are suggested for the assessment of the significance of vibration effects, such criteria are provided in terms of Peak Particle Velocities (PPV) and are concerned with both human and structural responses to vibration. Those applicable to human perception and disturbance are presented within Table 13.1 below.

Table 13.1 Guidance on effects of vibration levels based on human perception

Vibration Level	Effect
0.14 mm s_{-1}	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm s_{-1}	Vibration might be just perceptible in residential environments.
1.0 mm s_{-1}	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm s_{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

The standard goes on to present guidance criteria applicable to the vibration response limits of buildings again in terms of the component PPV. These are presented within Table 13.2 below.

Table 13.2 Transient vibration guide values for cosmetic building damage

Type of building	Peak Component Particle Velocity in Frequency Range of Predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
NOTE 1: Values referred to are at the base of the building. NOTE 2: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

It should be noted that the values presented within Table 13.2 are applicable to cosmetic damage only. It is stated within BS5228-2 that minor damage is possible at vibration magnitudes which are greater than twice those given in the table. It can be seen that the guide values for building damage are an order of magnitude higher than for human disturbance.

This standard also provides guidance on potential impacts as a result of blasting operations. In view of the possibility of blasting being undertaken during the construction works, consideration has been given to the potential impact of associated vibration and air overpressures on existing residential receptors.

On page 73, a calculation method for vibration levels resulting from blasting at different distances is presented. The method presented is based on analysis of the results of vibration measurements undertaken at the site in question. This method therefore relies upon a degree of blasting works being undertaken at the site, before accurate distance calculations can be undertaken. Once completed, the calculation method allows the resultant PPV vibration level to be determined at different distances for known charge weights.

This standard also provides guidance regarding air overpressures resulting from blasting works. The majority of energy generated within the atmosphere from surface blasting is of a sub-audible nature (i.e. at frequencies <20Hz), although there is a component that is audible to the human ear and as such would be heard as noise. Audible noise and the sub-audible element (sensed as concussion) are together known as air overpressure.

Air overpressure may be sensed or felt by humans and can excite secondary vibrations at audible frequencies in buildings (e.g. rattling of windows and ornaments on shelves) that have been found to give rise to adverse comments from occupants of buildings affected by the blasting. However, this standard states that there is no known evidence of structural damage to buildings/structures from excessive air overpressure levels from quarry blasting. It is stated that "*routine blasting can regularly generate air overpressure levels at adjacent premises of around 120 dB (lin). This level corresponds to an excess air pressure which is equivalent to that of a steady wind velocity of 5 m/s (Beaufort force 3, gentle breeze) and is likely to be above the threshold of perception.*" Research is referenced that has identified that a poorly mounted window that is pre-stressed might crack at 150 dB (lin), with most windows cracking at around 170 dB (lin), whereas structural damage would not be expected at levels below 180 dB (lin).

It is stated that due to uncertainties with meteorological conditions, it is not possible to predict the location of maximum air overpressure. However, a methodology for air overpressure measurement is presented within this standard, whilst it is stated that pressure variations in the atmosphere due to windy conditions can mask the blast generated air overpressure, and that for this reason, it is not accepted practice.

<u>The Design Manual for Roads and Bridges (DMRB): Volume 11: Environmental Assessment</u>

Published by the Department of Transport in 1993 (with later amendments), this document sets out procedures for undertaking the environmental assessment of new road schemes, including the assessment of noise impacts from road traffic (The Highways Agency, 2008). In particular, it describes a method for assessing the severity of a noise impact, in terms of the number of people who will be bothered "very much" or "quite a lot" from any noise increase/decrease due to a new road scheme. In undertaking a DMRB assessment, the prediction of traffic noise should utilise the methodology contained within the *Calculation of road traffic noise* (CRTN) memorandum as described below.

Although the DMRB strictly applies to new road schemes, the assessment principles adopted in this document can also be applied to the assessment of noise from road traffic in general. This proposed development has the potential to affect road traffic noise levels along existing roads, hence the need for this assessment.

The DMRB assessment requires that the noise changes determined should be related to research evidence on dissatisfaction with road traffic noise. The National Environment Survey (1977) has shown that once people are accustomed to a change in noise, their general dissatisfaction with traffic noise does not alter until changes in the level on the $L_{A10,18hour}$ scale exceed at least 3 dB(A).

The DMRB assessment suggests that the magnitude of noise changes from a project should be classified into levels of impact. An example classification of impact magnitudes for traffic noise level changes is provided within the document and has been replicated within Table 13.3.

Table 13.3 Classification of magnitude of noise impacts (road traffic noise level changes)

Noise Level Change, $L_{A10,18hour}$ (dB)	Magnitude of Impact
0	No change
0.1-0.9	Negligible
1-2.9	Minor
3-4.9	Moderate
5+	Major

The DMRB goes on to state that the scale provided in Table 13.3 may not be applicable to all situations or projects, in that other factors such as time of day, and the spectral content of the noise can also influence the magnitude of effect.

It is considered that the descriptions specified in the above table provide a good indication of the likely magnitude of impacts in this case. Therefore, these have been used in the determination of associated impact significance.

<u>Calculation of Road Traffic Noise (CRTN)</u>

Published by the Department of Transport and the Welsh Office in 1988, this document sets out standard procedures for calculating noise levels from road traffic. The calculation methods use a number of input variables, including traffic flow volume, average vehicle speed, percentage of heavy goods vehicles, type of road surface, site geometry and the presence of noise barriers or acoustically absorbent ground. CRTN predicts the $L_{A10,18hour}$ or $L_{A10,1hour}$ noise level for any receptor point at a given distance from the road.

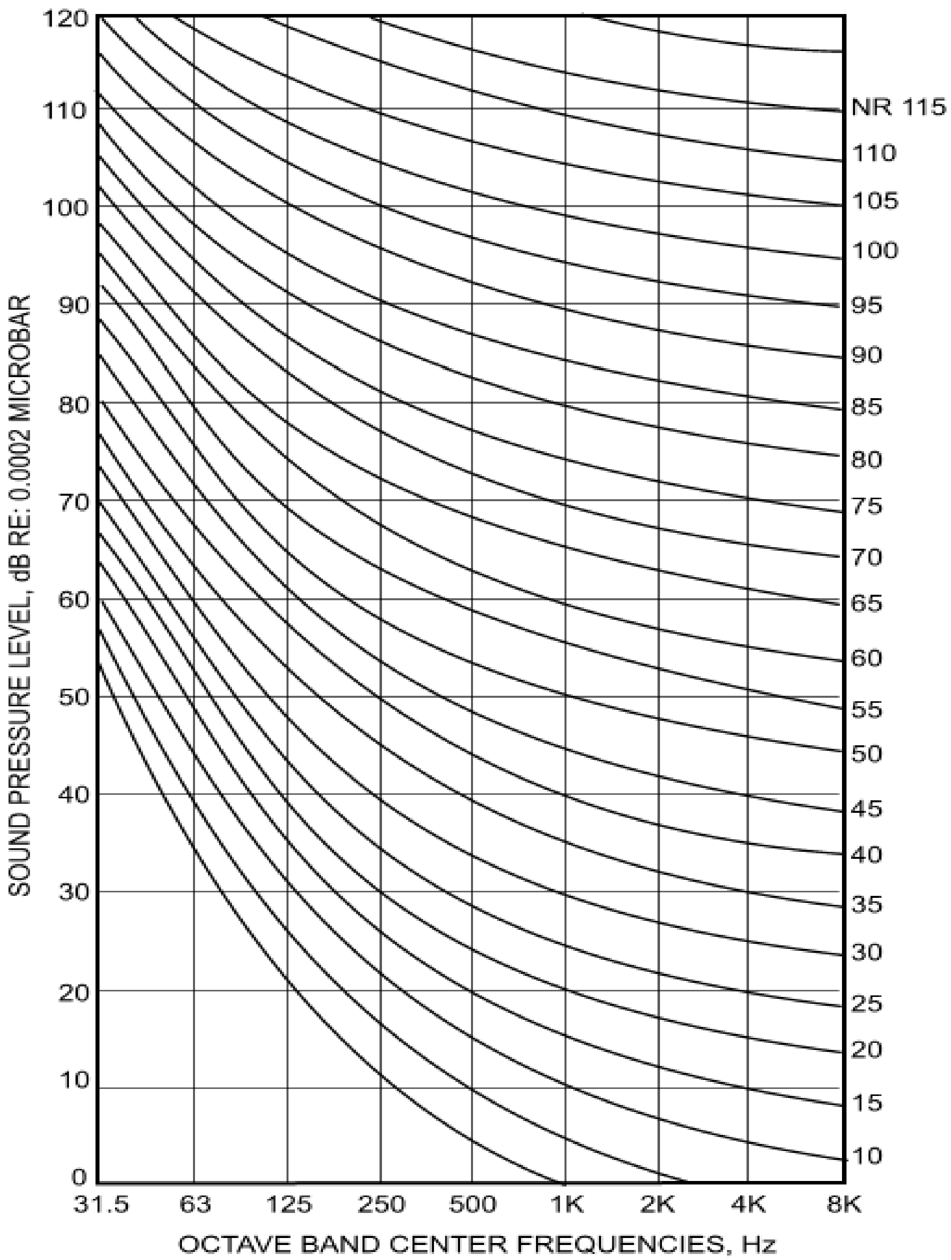
<u>ISO/R 1996: 1971: Acoustics - Assessment of noise with respect to community response</u>

Noise rating curves were defined in ISO/R 1996: 1971 (The International Organization for Standardization, 1971) and can be used to determine the acceptable indoor environment for hearing preservation, speech communication and annoyance.

NR levels are defined by a set of curves plotted over frequency which are akin to equal loudness curves. The NR single number value (e.g. NR 20) is the number of the highest curve just touched by the source noise level data when plotted against the NR curves. The lower the single figure NR value, the more stringent the adopted criteria.

A copy of the noise rating curves is presented in Graph 13.1.

Graph13.1 Noise rating curves



13.7 Methodology

At the outset of the project, the Environmental Health Department of The Highland Council were consulted to agree the scope of the assessment, the assessment methodology, and the approach to the determination of baseline conditions (see Section 13.5).

The following assessment methodology was agreed:

- The prevailing local noise environment has been determined by a review of the baseline noise survey results obtained for the proposed Hill Wind Farm, as detailed within the noise chapter of the corresponding scheme Environmental Statement (RPS, 2007);
- A series of noise level predictions have been undertaken in accordance with the methodology presented in BS5228-1:2009 (BSI, 2009), to establish construction noise levels that would typically be generated at the closest noise sensitive receptors. Predicted construction noise levels have been compared with the applicable assessment criteria adopted from BS5228-1:2009;
- Drawing on the scheme traffic data, a series of noise level change predictions have been undertaken for local road traffic routes, to determine the likely noise changes as a result of anticipated construction traffic movements. The significance of noise level changes has been determined drawing upon the guidance contained within the *Design Manual for Roads and Bridges* (The Highways Agency, 2008);
- Based on the groundborne vibration prediction methodologies presented within BS5228-2:2009 and the Transport Research Laboratory's TRL report 429 entitled *Groundborne vibration* (Hiller and Crabb, 2000) *caused by mechanical construction works*, a series of worst case set back distances from typical vibration generating construction activities have been derived. Distances have been calculated for vibration levels corresponding to different thresholds of perception, drawing upon the historic groundborne vibration measurement data presented in BS5228-2:2009. The derived distances have been compared with the distances of the closest identified noise sensitive receptors;
- Drawing on the prevailing local background noise levels, the operational noise emission requirements of The Highland Council, and the guidance contained within BS4142:1997, a series of plant noise level limits have been determined for both daytime and night-time periods. It has been demonstrated how the derived plant noise level limits could be incorporated into a conditional planning discharge to ensure a commensurate level of protect against plant noise for local residents; and
- An assessment of operational phase traffic noise impacts has been undertaken by consideration to the relative traffic generation figures for both the construction and operational phases, and drawing on the results of the completed construction traffic noise impact assessment.

Following consultation, a review of the anticipated construction plant and operations identified that whilst it is anticipated that rock would be excavated with the use of machines, there is a possibility that light blasting could benefit breaking of the bed planes, making the process faster and easier. Accordingly, in addition to the agreed assessment methods presented above, consideration has also been given to possible blast related vibration and air overpressure impacts in accordance with the guidance contained within BS5228-2:2009 (BSI, 2009) and PAN 50 (The Scottish Government, 2000).

13.7.1 Significance criteria

For this assessment, the significance of noise and vibration impacts has been determined by consideration to both the sensitivity of the receiving receptor, and the magnitude of the impact. To reflect the different guidance applicable to different impact areas (e.g. BS5228 (BSI, 2009) for construction noise and the DMRB for road traffic noise (The Highways Agency, 2008)), the impact magnitude has been determined based on a dedicated scale for each assessed impact area.

Table 13.4 presents the scale used in the determination of receptor sensitivity. Tables 13.5, 13.6 and 13.7 present the scales used in the determination of impact magnitude for construction noise, construction vibration and road traffic noise level changes respectively.

The corresponding impact significance for each impact area is determined by comparing the identified receptor sensitivity and impact magnitude with the Impact Matrix presented in Table 13.8.

<u>Receptor Sensitivity</u>

Table 13.4 below presents the criteria used to determine the sensitivity of receptors.

Table 13.4 Criteria used to define the sensitivity of receptors

Sensitivity	Example Receptors
High	Residential dwellings Schools in the daytime Hospitals / residential care homes
Medium	Scheduled Ancient Monuments Listed Buildings
Low	Offices Restaurants
Slight	Factories Commercial installations Storage centres Industrial sites

<u>Construction Noise Impact Magnitude</u>

A façade noise level criterion of 70 dB $L_{Aeq,T}$ has been adopted for this assessment, based on the guidance contained within BS5228 which specifies this limit as applicable to rural areas. Accordingly, predicted construction noise levels above this criterion are categorised as Medium or High, whilst levels below this criterion are specified as being Low or Slight. BS5228 also presents a 5 dB higher criterion (75 dB $L_{Aeq,T}$) for urban areas. Accordingly, impact magnitudes have been determined adopting 5 dB noise level bands. The adopted impact magnitude scale for construction noise is presented in Table 13.5.

Table 13.5 Criteria used to determine the impact magnitude for construction noise

Construction Noise Level (LAeq,T)	Impact Magnitude
≥75.1	High
70.1 to 75.0	Medium
65.1 to 70.0	Low
≤65.0	Slight

Construction Vibration Impact Magnitude

For construction vibration, the impact magnitude has been determined according to the resulting vibration levels in absolute terms. The impact magnitude criteria for construction vibration is presented in Table 13.6 below, based on the guidance contained within BS5228 for human perception.

Table 13.6 Criteria used to determine the impact magnitude for construction vibration - human perception - absolute levels

Vibration Level	Effect	Magnitude of effect
<0.3 mm s^{-1}	Unlikely to be perceptible in residential environments	Slight
0.3>1.0 mm s^{-1}	Onset of perceptibility in residential environments	Low
1.0>10.0 mm s^{-1}	Onset of complaints in residential environments	Medium
>10.0 mm s^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level	High

With regards to potential blast induced vibration impacts at residential receptors, consideration has been given to the likelihood of building damage arising. Where it is identified that this is determined to be unlikely, the magnitude of impact has been categorised as Minor. Given the intermittent, occasional nature of blast induced vibration, it is considered most appropriate to consider the likelihood of building damage rather than nuisance / annoyance.

Similarly, the impact magnitude arising as a result of blast induced air overpressure at residential receptors has been considered with respect to the likelihood building damage. Where building damage is determined to be unlikely, the magnitude of impact is considered to be Minor.

Road Traffic Noise Level Changes Impact Magnitude

For road traffic noise level changes, the impact magnitude has been determined drawing on the guidance contained within the *Design Manual for Roads and Bridges* (The Highways Agency, 2008). Table 13.7 below presents the criteria used to determine the impact magnitude for road traffic noise level changes.

Table 13.7 Criteria use to determine the impact magnitude for road traffic noise level changes

Noise Level Change, (dB(A))	Magnitude of Impact
0	None
0.1-0.9	Slight
1-2.9	Low
3-4.9	Medium
5+	High

Plant Noise Emissions Impact Magnitude

At this stage, the precise plant specifications are not known, accordingly, it is appropriate to specify a series of plant noise level limits, drawing upon national guidance, the Local Authority requirements, and the prevailing local noise environment. Where these plant noise level limits are achieved, or imposed by planning condition, an impact magnitude of Slight is registered at worst, as there is considered to be an appropriate control measure in place to protect amenity at local sensitive properties.

Impact Significance Matrix

The impact significance has been determined by assessment of the determined impact magnitude and receptor sensitivity in accordance with the Impact Matrix presented in Table 13.8 below.

Table 13.8 Matrix for determining the significance of impacts (impact magnitude versus receptor sensitivity)

Magnitude of Effect	Sensitivity of Receptor / Receiving Environment to Impact (see Table 13.4)			
	High	**Medium**	**Low**	**Slight**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	None
Low	Minor	Negligible	None	None
Slight	Negligible	None	None	None
None	None	None	None	None

In addition to the above impact matrix, it should be noted that impact significance may be influenced by other factors such as whether the impact is direct or indirect, the absolute noise levels, the time at which the noise / vibration occurs, whether the effect is temporary or permanent, whether the impact is as a result of a new source, or whether it is a change to an existing source The impact matrix presented above does not account for this. Therefore, it is possible that the impact significance may be tempered where, for instance, the impact is known to be temporary, or the resulting absolute noise level is low.

13.8 Established baseline conditions

13.8.1 Local noise sensitive receptors

A review of ordnance survey mapping and a site walk over has identified the following noise sensitive receptors within 1km of the site boundary.

- Achanarras, a residential dwelling approximately 200m to the south-west of the site boundary (currently unoccupied and owned by Spittal Mains landowner);
- Four residential dwellings between approximately 260m and 650m to the north of the site boundary (north of the site access road), and west of the A9(T);
- Two dwellings at Spittal Mains, approximately 780m and 900m to the south of the site boundary; and
- St. Magnus chapel and hospital, a Scheduled Ancient Monument approximately 450m south of the site boundary.

The distances presented above have been measured to the closest site boundary, rather than the site centre and rounded down to the nearest 10m. This approach ensures that construction noise level predications presented within this chapter represent a worst case scenario.

Other more distant receptors include further isolated dwellings across the area, including one on Halkirk Road to the north and those within the settlement of Spittal to the south-east.

13.8.2 Prevailing local noise environment

The prevailing local noise environment has been determined from a review of the baseline noise survey undertaken as part of the environmental noise assessment for the proposed Spittal Hill Wind Farm (RPS, 2007). The completed baseline noise survey for this project was undertaken over a four week period and comprised eight measurement locations, of which two (named Kakkers and Banniskirk Mains) are in the vicinity of the proposed converter station site. The details of the completed baseline noise survey, as presented within the corresponding scheme Environmental Statement, are presented in RPS (2007), with a summary presented below.

The baseline noise survey was undertaken between the 8th October 2005 and the 8th of November 2005, with measurements undertaken using Type 1 specification noise measurement equipment, mounted with windshields and bird spikes.

All measurements were undertaken under free-field conditions and were at least 3.5m from the nearest façade, with the microphone mounted at a height of 1.2m above ground.

All measurement equipment was calibrated at the beginning and end of the survey period, and at the time of battery changeovers.

Periods of significant rainfall (defined as being 1mm of rainfall or more within an hour period) were omitted from the survey results. Noise measurements were undertaken to determine the background noise level in terms of the $L_{A90,10minute}$ noise index during night-time periods (all days 23:00 to 07:00 hours) and quiet daytime periods (defined as being 18:00 to 23:00 hours on all days, as well as 13:00 to 18:00 hours on Saturdays and 07:00 to 18:00 hours on Sundays).

Accordingly, it can be seen that daytime measurements have not been undertaken during periods when higher background noise levels would normally be experienced, e.g. weekday mornings and late afternoons etc, and the survey results therefore represents a worst case for this assessment.

The closest measurement locations to the proposed converter station were 'Kakkers', which is approximately 1.6km to the southeast of the southeastern site boundary, and Banniskirk Mains, which is approximately 2.3km northeast of the northeastern site boundary. These measurement locations are presented in Figure 13.1. Kakkers was subject to a total of 68 hours of adopted daytime noise measurements and 72 hours 20 minutes of adopted measurements during the night-time period. Similarly, Banniskirk was subject to 92 hours and 50 minutes of adopted measurements during the daytime and 104 hours during the night-time.

As appropriate for a wind farm baseline noise survey, measurements were undertaken over a range of different prevailing wind speed conditions. This is confirmed by consideration to Graphs 10.1, 10.2, 10.5 and 10.6, in RPS (2007). For the purpose of this development, it is appropriate to consider the measurement results when prevailing wind speeds were below 5m/s (in accordance with BS7445:1996: *Description and measurement of environmental noise: Part 2: Guide to the acquisition of data pertinent to land use*.

As the data includes measurements undertaken at different times during night-time and quiet daytime periods, and on a series of different days, there is naturally a range of different measured background noise levels for each period. Table 13.9 below presents a summary of the typical background noise levels arising at each measurement location during both night-time and quiet daytime periods. These noise level ranges have been obtained from a visual inspection of Graphs 10.1, 10.2, 10.5 and 10.6 in RPS (2007).

Table 13.9 Summary of local baseline noise levels, free-field, dB(A)

Measurement Location	Period	Typical Range of Measurement Background Noise Levels (L_{A90},10minutes) for wind speeds below 5m/s
Kakkers	Quite Daytime	18 to 38
	Night-time	18 to 34
Banniskirk Mains	Quite Daytime	18 to 32
	Night-time	18 to 23

13.9 Range of possible impacts

13.9.1 Construction noise Impact

Whilst the *Design Manual for Roads and Bridges* (The Highways Agency, 2008) is pertinent to the design and construction of highways and associated infrastructure, it provides useful information on the distances at which construction phase impacts might arise. Volume 11 Section 3 Part 3, entitled *Disruption due to construction* states that "*Disruption due to construction is generally a more localised phenomenon than the impacts of a scheme once it is open to traffic. One study has shown that at least half the people living within 50 metres either side of the site boundary were seriously bothered by construction nuisance in one* *form or another, but that beyond 100m less than 20% of the people were seriously bothered (see TRRL Supplementary Report SR 562)*."

In the case of this development, local noise sensitive receptors are considerably further removed from the site boundary than 100m, with the closest residential property being at a distance of approximately 200m. Notwithstanding this, a series of construction noise level predictions have been undertaken in accordance with the prediction methodology presented in BS5228-1:2009.

This prediction method adopts the $L_{Aeq,T}$ noise index over the core working day, which is assumed to be 08:00 to 20:00 hours, with a one hour lunch break. The predictions are worst case in that it is assumed that any mitigation measures (such as those identified later in this chapter) have not been implemented.

For the purpose of predicting the likely noise impact, the construction works have been divided into the following phases:

- Ground works / formation of platform (including landscaping);
- Building foundation works;
- Access road and car parking works; and
- Building fabrication.

Table 13.10 below sets out the typical plant types, numbers and utilisations (the percentage of time plant is actually operating during the working day – the on-time) used in the predictions of noise levels resulting from the various construction phases.

Table 13.10 Assumed construction plant details

Phase	Plant Type	Sound Power Level L_{wA} dB	No. of plant	Assumed percentage on-time
Ground works / formation of platform	Excavator (Earthworks)	102	2	100
	Excavator (Hydraulic Breaker)	113	2	100
	Dozer	107	2	75
	Air Compressor	100	2	100
	Dump truck	105	4	70
	Generator	100	1	100
	Crusher	116	2	80
Building foundation works	Truck mixer with pump	103	2	10
	Dump Truck	105	2	50
	Excavator (Earthworks)	102	3	80
	Grinder	108	1	50
	Compressor	100	2	100
	Generator	100	1	100

Phase	Plant Type	Sound Power Level L_{wA} dB	No. of plant	Assumed percentage on-time
Access road and Car parking works road works	Asphalt spreader with support lorry	106	1	100
Building fabrication	Hammering	103	3	25
	Lorry	109	3	50
	Dump truck	105	1	50
	Compressor	100	1	100
	Fork lift truck	105	2	50
	Scaffolding	100	1	25
	Mobile crane	102	1	50

Predictions have been carried out of the noise levels likely to be generated by each of the above phases. For the purpose of these predictions, it is assumed that the intervening ground between the construction noise sources and the receivers will be acoustically hard such that there will be no attenuation of sound due to ground absorption.

The completed predictions also assume that all of the plant pertinent to each phase will be operated simultaneously at the closest site boundary to the receptor in question. This assumption represents a worst case, as in practice it is anticipated that plant will be spread across site. This will give rise to lower noise levels than those which have been predicted, due to the associated greater distances.

The predictions have been undertaken for the two closest noise sensitive receptors, which are at distances of 200m from the western site boundary (Achanarras), and 260m from the northern site boundary (closest dwelling at Achalone). Receptors at greater distances will be subject to lower construction noise levels.

Table 13.11 below sets out the predicted unmitigated construction noise levels.

Table 13.11 Predicted worst case construction noise levels, Façade, dB(A)

Construction Phase	Predicated Noise Level, $L_{Aeq,12hour}$ (dB(A))	
	Achanarras	Achalone
Ground works / formation of platform	69	67
Building foundation works	60	58
Access road and car parking works	55	52
Building fabrication	62	59

Drawing on the content of Tables 13.11 and 13.9, it is anticipated that there will be temporary periods when construction operations will give rise to changes in the prevailing ambient noise levels at local receptors. However, Table 13.11 above reveals that even without mitigation, construction noise levels at sensitive receptors will be within the adopted 70 dB(A) construction noise guidance criterion (applicable to rural areas), even with all construction plant assumed to be operational at the nearest site boundary (rather than spread across the site as anticipated to occur in practice).

Comparing the predicted construction noise levels presented in Table 13.11 above with the impact matrix detailed in Tables 13.5, 13.5 and 13.8, it can be seen that construction noise will give rise to temporary Negligible to Minor impacts (not significant).

13.9.2 Construction traffic noise

Chapter 12: Traffic and Transport of this Environmental Statement identifies that, during the construction phase of the proposed development, the greatest number of daily HGV movements, 12 (6 in each direction) is anticipated during the Civil work, whilst the greatest number of car movements 40 (20 in each direction) is anticipated during the HVDC construction and installation works (see Section 12.9) Accordingly, consideration has been given to the significance of noise level changes across the local road network that would arise from these construction traffic movements. To represent a worst case, it has been assumed that these numbers of HGV and car movements could arise at the same time (although in practice the greatest HGV and car movement numbers are anticipated during different phases of work).

In addition, the completed assessment represents a worst case in that the total number of construction traffic movements has been applied to every considered route, rather than dispersing anticipated traffic movements across the local network as would be more representative.

The completed assessment represents a worst case in that the total number of construction traffic movements has been applied to every considered route, rather than dispersing anticipated traffic movements across the local network as would be more representative.

A series of road traffic noise calculations have been carried out in accordance with CRTN, being undertaken for a notional receptor location 10m from the edge of the carriageway of each road considered, and 1.5m above ground level. A notional receptor has been used because the change in traffic noise level adjacent to any given road will be the same at all distances where noise from that route is dominant. Traffic noise calculations have been undertaken to establish the change in the daytime $L_{A10,18hour}$ noise level. Predictions have assumed a nominal speed of 30mph, although it should be noted that this does not affect the noise level 'change' value that is being assessed.

The baseline traffic data presented in Chapter 12 – Traffic and Transportation (Table 12.2) has been provided in terms of the 24 hour Annually Averaged Daily Traffic Flow for each route. In order to determine the 18 hour road traffic flows data required to inform predictions in accordance with CRTN, it has been assumed that the traffic flow data is evenly spread across a 24 hour period (i.e. each hour of the day is subject to the same level of traffic flow). This assumption represents a worst case for the daytime (the period assessed) as typically higher flows would be expected during this period compared to the night-time. Making this assumption therefore gives rise to a greater percentage change in traffic flows, and therefore a greater associated noise level change than would realistically be the case.

Predictions have been undertaken for each of the four Route Options being considered.

Table 13.12 below presents the results of the noise level predictions both with and without the construction traffic flows, and the difference between the two predicted noise levels.

Table 13.12 Predicted changes in road traffic noise levels resulting from operation of the proposed development, free-field, dB(A)

Road Section	Predicted Noise Level $L_{A10,18hour}$		Difference in Noise Levels [B-A]
	Without Construction Flows[A]	With Construction Flows [B]	
Route 1 – Scrabster to converter station			
A9(T) A836 Junction to Scrabster Harbour	56.4	56.7	0.3
A9(T) A836 Junction to Scrabster Harbour	56.1	56.4	0.3
Thurso town centre	63.2	63.3	0.1
Thurso town centre	61.5	61.6	0.1
A9(T) Roadside to Thurso (B874 to Town Boundary)	56.1	56.4	0.3
North of roadside	57.6	57.9	0.3
A9(T) Georgemas to Roadside (A882 to B874)	56.0	56.3	0.3
A9(T) Mybster to Georgemas (B870 to A882)	50.1	50.9	0.8
Route 2 – Wick via A882 to converter station			
A882 near Haster	56.1	56.4	0.3
A882 near Wester Watten	53.3	53.8	0.5
A882 east of Watten	55.0	55.3	0.3
A882 Georgemas to Wick	52.7	53.3	0.6
A9(T) Mybster to Georgemas (B870 to A882)	50.1	50.9	0.8
Route 3 – Wick via A99 to converter station			
A99 Latheron to Wick	53.7	54.0	0.3
A9(T) Mybster to Georgemas (B870 to A882)	50.1	50.9	0.8
A9(T) south of Mybster	53.3	53.7	0.4
A9(T) North of Achavanich	52.5	53.1	0.6
Route 4 – Invergordon via A99 to converter station			
A9(T) Mybster to Georgemas (B870 to A882)	50.1	50.9	0.8
A9(T) south of Mybster	53.3	53.7	0.4
A9(T) North of Achavanich	52.5	53.1	0.6
A9(T) Berriedale	53.8	54.3	0.5
A9(T) Near Ord of Caithness	54.7	55.1	0.4
A9(T) Helmsdale to Latheron	54.0	54.5	0.5
A9(T) Culgower, south of Helmsdale	57.4	57.6	0.2
A9(T) Brora to Helmsdale	54.9	55.2	0.3
A9(T) Brora	59.7	59.8	0.1

Road Section	Predicted Noise Level $L_{A10,18hour}$		Difference in Noise Levels [B-A]
	Without Construction Flows[A]	With Construction Flows [B]	
A9(T) Golspie to Brora	57.6	57.8	0.2
A9(T) Kirkton, south of Golspie	59.3	59.4	0.1
A9(T) North of Poles	58.4	58.6	0.2
A9(T) south of Evelix	59.8	59.9	0.1
A9(T) Poles to The Mound (B9174 to A839)	57.8	58.0	0.2
A9(T) Dornoch Bypass (A949 to B9168)	57.0	57.2	0.2
A9(T) Dornoch	59.1	59.3	0.2
A9(T) Dornoch Bridge	59.1	59.2	0.1
A9(T) North of Dornoch Bridge	60.0	60.1	0.1
A9(T) Tain North (B9174) to Dornoch Bridge Roundabout	59.7	59.8	0.1
A9(T) North of Tain	61.0	61.1	0.1
A9(T) Tain Bypass	60.1	60.2	0.1
A9(T) south of Tain	62.4	62.5	0.1
A9(T) Garrick Bridge to Logie Easter	60.3	60.5	0.2
A9(T) North of Nigg Roundabout	61.9	62.0	0.1
A9(T) Kildary (B817) to Nigg Junction (B9165)	60.7	60.8	0.1
A9(T) south of Nigg Roundabout	62.3	62.4	0.1
A9(T) Tomich Junction to Kildary (B817)	60.4	60.6	0.2
A9(T) Tomich	63.9	63.9	0

It can be seen from the table above that predicted noise level increases due to construction traffic are all less than 1 dB, with some routes subject to no change.

Comparing these increases in traffic noise levels with the impact matrix detailed in Tables 13.4 13.7 and 13.8, it can be seen that for existing residential dwellings fronting the considered routes, adverse impacts ranging from None to Negligible at worst are predicted to arise (not significant). Such impacts would be temporary in nature.

13.9.3 Construction vibration impact

Groundborne vibration calculations have been undertaken for typical construction activities / machinery based on the empirical prediction procedures presented within BS5228-2:2009, TRL RR 246 (applicable to HGV induced vibration) (Watts, 1990), and TRL Report 429 (applicable to vibratory rollers) (Hiller and Crabb, 2000).

Such predictions have been made to determine the possible distances at which the adopted magnitude of effect criteria may be registered based on a specified confidence limit (where applicable). In this regard, the following groundborne vibration levels and associated distances have been identified for a sample of typical construction vibration sources. It is noted that there may be a variety of different potential vibration generating activities employed during the construction phase other than those presented below. The data presented within Table 13.13 are general in nature and not specific to any one site; however, the vibration levels and associated distances can be used to determine the typical distances at which specific impacts may be registered.

Whilst the vibration calculations have been included for driven and augured piling operations, it should be noted that the need for such works is not anticipated to be necessary, with foundations proposed to be formed by the use of poured concrete onto an excavated rock platform. Accordingly, this assessment represents a worst case.

Table 13.13 Predicted groundborne vibration levels applicable to typical vibration generating construction activities

Operation	Confidence limit	Distance (m)	PPV (mm/s)
Vibratory Rollers – start & end	95	60	0.3
	95	23	1.0
Vibratory Rollers – steady state[1]	95	3.3	10
Piling – Driven cast in place	95	215	0.3
	95	85	1.0
	95	15	10
Rotary Bored Piling - Augering	N/A	20	≤0.3
	N/A	6	≤1.0
	N/A	0.6	≤10
Rotary Bored Piling – Auger hitting base	N/A	45	≤0.3
	N/A	14	≤1.0
	N/A	1.4	≤10
Rotary Bored Piling – Driving casing	N/A	75	≤0.3
	N/A	23	≤1.0
	N/A	2.3	≤10
HGVs[2]	N/A	50	≤0.3[3]
	N/A	17	≤1.0[3]
	N/A	2.5	≤10[3]

[1] Assumes 2 rollers, 0.4mm amplitude, drum width of 1.3m, e.g. heavy duty ride on roller
[2] Assumes max height / depth of surface defect of 50 mm, max speed of 30 km/h, and that surface defect occurs at both wheels.
[3] Where alluvium soils are present, higher vibration levels can be expected.

In comparison to the distances presented above, the closest existing vibration sensitive receptors to the site are located at distances of approximately 200 and 260m from the site boundary, and 350 and 560m from the proposed platform.

For each of the operations presented in Table 13.13, with the exception of 'Piling – driven cast in place', it can be seen that local receptors are at greater distances from the site boundary than those associated with vibration levels of 0.3 PPV or less. With regards to driven piling operation, it is appropriate to adopt the distances to the proposed platform, which are again greater than that associated with vibration levels of 0.3 PPV or less for this activity.

Accordingly, based on the data presented in Table 13.13 above, and the significance matrix presented in Tables 13.4, 13.6 and 13.8, the significance of potential vibration impacts can be determined at the closest existing sensitive receptors to the site (Achanarras and closest dwelling at Achalone). It should be noted that the significance ratings presented within the table, in some cases, have been generated based on a 95 percent confidence limit. In reality it is likely that even lower vibration levels will prevail for the majority of activities.

Table 13.14 Predicted significance of construction vibration effects at Achanarras (closest sensitive receptor).

Activity	Significance of Effect	
	Achanarras	Achalone
Vibratory Rollers	Negligible	Negligible
Piling – Driven cast in place	Negligible	Negligible
Rotary Bored Piling – Augering	Negligible	Negligible
Rotary Bored Piling – driving casing	Negligible	Negligible
HGV's	Negligible	Negligible

From Table 13.14 above it can be seen that negligible impacts (not significant) are predicted to arise for all of the considered construction works, even without mitigation measures. Such impacts would also be temporary in nature and of short duration.

It should also be noted that this is very much a worse case assessment based on the minimum possible distances at which construction activities may take place from existing vibration sensitive receptors. In reality, lower vibration levels will be generated for the majority of the time, e.g. when works are undertaken towards the centre or far sides of the site from the receptor considered.

Furthermore it should be noted that the vibration predictions have utilised a large dataset covering a range of measured levels applicable to each operation. It is evident from this dataset that, for the majority of operations (approximately 95 % in most cases), predicted levels will be lower than those presented within Table 13.14.

In summary it is anticipated that even without mitigation, construction phase vibration impacts would be temporary and of negligible significance for the typical considered construction operations.

13.9.4 Blast-induced vibration and air overpressure

At this stage, the need for blasting works at the proposed converter station site is only a possibility rather than anticipated likely. Whether blasting works would be undertaken would depend on the progress of works using hydraulic breakers.

However, given that this has been identified as a possibility, consideration has been given to the potential impacts on local residential receptors as a result of vibration and air overpressures.

Vibration

The closest residential receptor to the proposed converter station platform (area of possible blasting is at a distance of approximately 340m, with the next closest being at approximately 580m.

PAN 50 (The Scottish Government, 2000) states that the levels of groundborne vibration as a result of blasting during surface mineral workings "*are well below those required to give rise to structural damage*".

With respect to human perception of vibration due to blasting, BS5228 states that "*ground borne vibration can lead to concern being expressed by residents around open cast sites*", but that this is "*usually over the likelihood of property damage*" rather than annoyance / nuisance (which is unsurprising given the infrequent, occasional nature of the source). The standard goes on to state that "*Good public relations have shown to reassure the public of the fact that normal production blasting has not been found to damage property, and that even the most cosmetic of plaster cracking is extremely unlikely*".

Accordingly, appropriate mitigation measures are presented within the corresponding mitigation section below and the impact of associated groundborne vibration as a result of possible blasting would result in a temporary negligible to minor effect (not significant).

Air Overpressures

Meteorological conditions, over which the operator has no control, such as temperature, cloud cover, humidity, wind speed, turbulence and direction would all affect the intensity of air overpressure at a given location. These meteorological effects cannot be reliably predicted, although under still conditions, once outside the immediate vicinity of the blast, air overpressure intensity will reduce at 6dB per doubling of distance.

Due in part to the effects of the prevailing meteorological conditions, which would influence generated air overpressure levels, it is not possible to predict air overpressure from blasting with any certainty. This is confirmed in BS5228. Furthermore, it is not generally accepted practice to set specific limits for air overpressure. In order to control air overpressure the best practical approach is to take measures to minimise its generation at source. Accordingly, appropriate mitigation measures are outlined in the corresponding section below.

However, providing that an exposed detonating cord is not used (which is the usual situation), the characteristic noise from a blast is no longer a sharp crack but rather a 'dull thump' (PAN50 Paragraph 50: The Scottish Government, 2000). Peak noise levels from blasting are comparable to the sort of levels typically generated at properties by passing cars[1], but in the case of blasting would only exist for around a second and also occur relatively infrequently.

Because of its very brief duration, infrequent occurrence and low frequency content (much of which is below 20Hz and hence inaudible to the human ear) blast noise is usually considered not to be a significant problem with respect to disturbance to humans.

Air overpressure may be sensed or felt by humans and can excite secondary vibrations at audible frequencies in buildings (e.g. rattling of windows and ornaments on shelves) that has been found to give rise to adverse comments from occupants of buildings affected by the blasting. However, there is no known evidence of structural damage to buildings / structures from excessive air overpressure levels from quarry blasting (BS5228 Part 2: Vibration Annex 3 Section G1 paragraph 3).

Accordingly, air overpressure as a result of possible blasting is anticipated to result in a temporary Negligible to Minor effect (not significant).

13.9.5 Operational plant noise levels

It is anticipated that there is the potential for the proposed development to emit noise once operational, for example from the externally mounted air conditioning units, fans or other heat dissipation equipment and electrical components. However, at this stage, the precise details, type, number and location of such plant is not known (see Section 4.5).

It is therefore appropriate to specify suitable noise limits to which any such plant should conform. These limits should include any corrections for acoustic characteristics, account for the location of the receptors and draw upon the requirements of The Highland Council.

During consultation, The Highland Council stated that they would seek to ensure that noise emissions from the development, once operational, do not exceed 35 dB $L_{Aeq,T}$ and Noise Rating Curve NR20 within habitable spaces at existing local residences (with windows open).

However, these criteria do not consider potential noise impacts in external habitable spaces at local residences. In accordance with PAN56 it is appropriate to consider the guidance contained within BS4142 for such areas. However, the introduction of BS4142 states that the BS4142 assessment method "*is not suitable for use"* where background noise levels are "*very low*" or where rating levels are "*very low*". The definition of 'very low' is given as background noise levels below about 30 dB (L_{A90}) and rating levels below about 35 dB ($L_{A,r}$).

Considering Table 13.9 and the environmental noise assessment for the Spittal Hill Wind Farm (RPS 2007), it can be seen that the prevailing daytime and night-time background noise levels commonly fall below 30 dB(A) (L_{A90}), and therefore the full BS4142 assessment method is not suitable for use. Application of the BS4142 assessment methodology would result in an over estimation of the likelihood of complaint, because under such conditions, it is the absolute level of the noise which dictates the likely impact / likelihood of complaints, rather than the difference between the background noise level and the rating level (the approach adopted by BS4142).

It is therefore appropriate to acknowledge that BS4142 considers a plant rating noise level of 35 dB $L_{A,r}$ to be "*very low*". Compliance with such a rating level criteria outside residential dwellings is therefore considered to ensure a commensurate level of protection to amenity. Compliance with such a rating level would also be likely ensure achieving the internal $L_{Aeq,T}$ noise level criteria stipulated by The Highland Council as explained below.

In accordance with BS4142, a 35 dB rating level ($L_{A,r}$) is equivalent to a noise level of 30 dB ($L_{Aeq,T}$). Furthermore, PAN56 and BS8233 state that the noise reduction through an open window is typically 10 to 15 dB. Assuming the lower attenuation value of 10 dB, it can be seen that achieving the 35 dB rating noise level ($L_{A,r}$)externally would be equivalent to achieving an internal $L_{Aeq,T}$ criterion of 20 dB. This is considerably more stringent than the internal 35 dB $L_{Aeq,T}$ criterion proposed for use by The Highland Council.

The following noise level limits are therefore considered appropriate during both daytime and night-time periods:

- Compliance with an internal noise level criterion of Noise Rating Curve 20 (with windows open); and
- Compliance with an external rating noise level criterion of 35 dB ($L_{A,r}$), as defined within BS4142.

The above noise level limits should be applied at the closest noise sensitive receptors to the site and apply to the cumulative noise from all proposed plant items, not individual plant items acting alone.

Compliance with the above noise level limits would be sufficient to ensure a commensurate level of protection to residential amenity. Accordingly compliance with these limits would ensure giving rise to a Negligible noise impact at worst (not significant).

13.9.6 Operational development generated traffic noise

For the construction stage, it has been identified that impacts as a result of noise from construction traffic will range in significance from Negligible to Minor at worst.

It is anticipated that once operational the converter station would generate significantly less daily traffic movements than during the construction phase. Accordingly, it is anticipated that impacts as a result of noise from development generated traffic during the operational phase will be of negligible significance.

13.10 Mitigation

13.10.1 Construction noise impact

Although it is predicted that construction noise levels will only give rise to temporary Negligible to Minor Adverse impacts, it is acknowledged that there may be some periods when there will be temporary increases in the prevailing daytime noise environment.

Accordingly, consideration has been given to available noise mitigation measures that can be applied to further reduce construction noise levels.

Several safeguards exist to minimise the effects of construction noise, these include:

- The various EC Directives and UK Statutory Instruments that limit noise emissions of a variety of construction plant
- Guidance set out in BS5228: Part 1: 2009, which covers noise control on construction sites and
- The powers that exist for local authorities under Sections 60 and 61 of the *Control of Pollution Act 1974* to control noise from construction sites

The adoption of Best Practicable Means, as defined in Section 72 of the *Control of Pollution Act 1974* is usually the most effective means of controlling noise from construction sites. In accordance with Best Practicable means, the following measures will be employed (Table 13.15). A full list of intervention measures, including general measures is included in Annex II.

Table 13.15 Catalogue of agreed intervention measures related to construction noise

Ref	Title	Measure
N1	Noise reduction	The contractor will be required to silence any compressors brought onto the site or to use sound reduced models fitted with acoustic enclosures.
N2	Noise reduction	The contractor will be required to fit all pneumatic tools with silencers or mufflers.
N3	Noise reduction	The contractor will take care when erecting or striking scaffolds to avoid impact noise from banging steel. The contractor will be required to instruct all operatives undertaking such activities accordingly and to program deliveries to arrive during normal working hours only.
N4	Noise reduction	The contractor will be required to take care when unloading vehicles to minimise noise.
N5	Noise reduction	The contractor will be required to route delivery vehicles to minimise disturbance to local residents where practical.
N6	Maintenance for low noise	The contractor will be required to properly maintain and operate all plant according to manufacturers' recommendations in such a manner as to avoid causing excessive noise.
N7	Siting of noise sources	The contractor will be required to site all plant so that the effect of noise at nearby noise-sensitive properties is minimised where possible.
N8	Noise suppression	The contractor will be required to undertake construction works from the outer edge of the site inwards, such that acoustic screening will be afforded to existing receptors by completed structures where possible.
N9	Working hours	The contractor will be required to avoid problems concerning noise from construction works by taking a considerate and neighbourly approach to relations with the local residents. Works will only take place during given periods (e.g. during normal construction hours: 8am-7pm Monday to Friday and 8am-1pm Saturday (see GEN32).
N10	Cooling fans	SHETL will locate cooling fans carefully and design them so as to avoid noise impacts to receptors such as residential properties.

Notwithstanding the above, it should be noted that through the provisions of the Section 60 and 61 of the Control of Pollution Act 1974 (UK Government, 1974), the Local Authority have means of controlling construction noise where they consider that an unacceptable noise nuisance is being generated by the works.

13.10.2 Construction traffic noise
Given that construction traffic has been predicted to give rise to temporary Negligible to Minor Impacts at worst, implementation of noise mitigation measures is not considered warranted.

13.10.3 Construction vibration impact
The completed assessment has identified that for the considered sample of construction operations, temporary negligible groundborne vibration impacts are

predicted to arise at local receptors. Accordingly, further consideration to vibration mitigation measures is not considered warranted.

13.10.4 Blast-induced vibration and air overpressure

At this stage the need for blasting works at the converter station site is only a possibility and not anticipated to be likely. However, in the event that such works are required, the following mitigation measures would be employed to mitigate resulting vibration and air overpressure levels:

Table 13.16 Catalogue of agreed intervention measures related to blasting

Ref	Title	Measure
N11	Blasting	The contractor will be required to take care with the development of blast faces, and with trial blasts, as anomalous vibration levels might be produced when there is no free face to relieve the energy produced;
N12	Blasting	The contractor will ensure appropriate burden to avoid over or under confinement of the charge.
N13	Blasting	The contractor will ensure that accurate drilling and setting out are undertaken.
N14	Blasting	The contractor will ensure charge levels are appropriate to the location and needs.
N15	Blasting	The contractor will ensure stemming with appropriate material such as sized gravel or stone chippings is undertaken.
N16	Blasting	The contractor will ensure decking charges / in hole delays / delay detonation are used to ensure smaller maximum instantaneous charges (MICs).
N17	Blasting	The contractor will ensure each charge is individually designed to maximise efficiency and reduce energy loss through vibration and air overpressure.
N18	Blasting	The contractor will avoid the use of surface detonating cords and secondary blasting wherever possible.
N19	Blasting	The contractor will minimise the areas of heave and the total charges.
N20	Blasting	The contractor will avoid blasting in adverse weather conditions (i.e. wind in the direction of sensitive receptors).
N21	Blasting	The construction contractor will be required to establish and maintain effective liaison with the local community throughout the construction period, including advising of, and advertising the timings of anticipated blasting works.

13.10.5 Operational plant noise levels

Drawing on the requirements of The Highland Council, and national planning policy, a series of noise level limits have been derived for daytime and night-time periods, to which noise emissions from the proposed development should comply.

The noise level limits have been selected to provide a commensurate level of protection to local residential amenity in both internal and external areas of local properties. The external criterion has been selected at a level described in BS4142 as "*very low*". It has also been determined that compliance with the external rating level limit would likely ensure compliance with The Highland Council internal noise level criteria of 35 dB $L_{Aeq,T}$ by a significant margin.

Compliance with the proposed plant noise level limits could be ensured by incorporation into an appropriate planning condition.

A detailed noise assessment can be undertaken as part of the detailed scheme design. The results of this assessment can be used to ensure that appropriate noise mitigation measures are incorporated such that the proposed noise level limits will be achieved. Such noise mitigation measures may include:

- The selection of appropriate plant;
- The specification of the converter station façade and roof constructions including the acoustic specification of appropriate glazing and ventilation products etc;
- Specification of appropriate acoustic enclosures; and
- Appropriate location of external plant items (e.g. well screened from local noise sensitive receptors).

13.10.6 Operational development generated traffic noise

Given that operational phase traffic noise impacts have been predicted to be of negligible significance at worst, implementation of noise mitigation measures is not considered warranted.

13.11 Assessment of residual impacts

13.11.1 Construction noise impact

Even without mitigation, it has been predicted that construction noise will only give rise to temporary **Negligible** to **Minor adverse** impacts. Notwithstanding this, because it is anticipated that construction operations could give rise to some changes in the local daytime noise environment, consideration has been given to noise mitigation measures. With these mitigation measures in place it is anticipated that impacts of **negligible** significance will arise for the vast majority of the time, with the potential to increase to **Minor adverse** significance for limited periods.

13.11.2 Blast-induced vibration and air overpressure

It is anticipated that both vibration and air overpressure as a result of possible site blasting works would give rise to temporary **Negligible** to **Minor adverse** effects (not significant).

13.12 Potential for cumulative effects

It is anticipated that there would be no significant time overlap between the construction and operational phases of the proposed development. The identified construction phase and operational phase impacts can therefore be considered independently of each other.

For the construction phase, consideration has been given to the potential for both noise and vibration impacts at local receptors. Each completed assessment has been undertaken drawing on guidance specific to the assessed impact, and it is not reasonable to apply the guidance from one impact area to another. Accordingly, it is inappropriate to combine the predicted impacts associated with each impact area, except to say that identified Negligible / Minor noise and vibration impacts may occur simultaneously.

Whilst the assessment of development generated traffic during the construction and operational phases of the development has not included the effect of any other local developments, it is anticipated that the identified affects would be generally localised, before associated traffic generation is dispersed across the wider network.

In general terms, when two noises of the same level are present at a given location (e.g. at a receptor), the combined noise levels will only be 3dB higher than each individual noise level. Such a 3dB noise level change is generally considered to be only just noticeable by humans unless under controlled (e.g. laboratory) conditions. Similarly, where one of the two noise levels is higher than the other, the combined noise level will be less than 3dB higher than the upper individual level, as the combined level is dominated by the upper level. Through consideration of these principles, it can be seen that there is limited potential for cumulative noise impacts from the different considered impact areas (e.g. construction noise and road traffic noise), or the proposed development in conjunction with other local developments, and that the significance of cumulative impacts will generally be dominated by the more significant effect.

13.13 Summary of key findings

The completed noise and vibration assessment has considered the potential noise and vibration impacts that could arise during both the construction and operational phases of the proposed development.

The significances of potential noise and vibration impacts have been determined drawing upon applicable national and international guidance on noise impacts, the results of a baseline noise survey previously undertaken in the vicinity of the site, and the requirements of The Highland Council.

The completed assessment, has allowed for the following key conclusions to be drawn:

- Existing noise and vibration sensitive receptors in the vicinity of the site are located at distance from the site boundary, with the closest being at approximately 200m.
- A total of seven existing residential dwellings are located within 1km of the proposed development, and a scheduled ancient monument is located within approximately 480m of the planning area boundary (630m from the platform.
- A predictive assessment of construction noise impacts has identified compliance with noise level criteria applicable to rural areas at the closest noise sensitive receptors (Achanarras to the west and dwellings at Achalone to the north). It is anticipated that there may be some temporary increases in the prevailing daytime ambient noise levels during construction works, but associated impacts are classified as **Negligible** to **Minor adverse**, and would be temporary in nature. Notwithstanding this, mitigation measures have been proposed to further reduce construction noise levels.
- Predictive assessments of construction vibration and potential noise as a result of construction generated traffic have identified **Negligible** to **Minor adverse** impacts at worst. Such impacts would be temporary in nature.
- Consideration has been given to the potential for vibration and air overpressure impacts as a result of possible blasting works at the site. Resulting effects are predicted to be **Negligible** to **Minor adverse** (not significant) whilst being temporary in nature.
- Based on applicable national guidance, the requirements of The Highland Council, and the prevailing local noise environment, a series of noise level

limits have been proposed for the control of plant noise emissions from the development once operational. It has been demonstrated how these plant noise level limits could be imposed by means of an appropriate planning condition. Compliance with the proposed limits would ensure that operation plant noise would give rise to a **negligible** impact.

- A review of the scheme traffic data has identified that significantly less trip generations are anticipated for the operational phase of the development, compared to the construction phase. Accordingly, **negligible** impacts are predicted to arise from development generated traffic during the operational phase.

13.14 References

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British Standards Institute, 2009. *BS5228: Noise and vibration control on construction and open sites Part 1: Noise & Part 2: Vibration*. Milton Keynes: BSI.

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14 Air Quality

14.1 What is covered in this chapter?

This chapter presents the findings of an assessment of the potential effects of the converter station development on air quality, including the potential impacts of dust, on local properties and other sensitive areas. Consideration is given to potential air quality impacts during construction, operation and decommissioning.

During construction, operation and decommissioning, vehicle and plant emissions have the potential in some circumstances to have an impact on local air quality by emitting pollutants such as nitrogen dioxide and particulate matter. However, emissions from construction equipment are not considered here as the number of items of construction plant is low (23 items of plant at maximum (see Table 4.1 in Section 4.3.9) and the number of vehicles travelling to the site is also low (Section 4.3.8). It is assumed that decommissioning traffic would at worst be of a similar volume to construction traffic and not significant.

Air quality in Caithness is very good with pollutant concentration well below the national air quality objectives and with no Air Quality Management Areas[112] (AQMA) being enforced. It is therefore unlikely that emissions from the predicted vehicle and plant numbers could significantly affect the ability of the local authority to meet the air quality objectives (DEFRA, 2009). The assessment of vehicle emissions during construction and decommissioning has therefore been scoped out.

Any emissions during the operational phase are expected to be negligible as the development will not be permanently staffed and any major maintenance activity at the converter station will be infrequent (see Section 4.5). Operation of emergency standby generators will be limited and infrequent. The assessment of operational impacts has therefore been scoped out.

14.2 Why could the issue be important?

Dust generation and dispersal particularly from earthworks and from unmade ground in dry conditions may impact local air quality. Given the windy character of Caithness, any stockpiles of materials and vehicle activities (such as HGVs delivering materials) have the potential to create dust that could be a nuisance to near neighbours.

14.3 Sources of information

The following sources of information were used in this assessment:

- Scottish Government (2009) Scottish Air Quality Database Annual Report for 2009. Available at: http://www.scottishairquality.co.uk
- Ordnance Survey (OS) Address-point data
- Feedback from consultation (see Section 14.4).

[112] Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area with the aim of meeting the air quality objectives by the years defined in the Regulations. Where the objectives of the Air Quality Regulations are not likely to be achieved by the objective year, an authority is required to designate an Air Quality Management Area (AQMA) and to draw up an Air Quality Action Plan to secure improvements in air quality.

14.4 Consultation feedback

Key issues raised by consultees included:

- The Highland Council requested that cumulative effects on air quality were considered (i.e. those of these proposals in combination with other construction activities in the area) (The Highland Council, 2010);
- The Highland Council requested a dust management plan to be submitted to the Council before construction begins (The Highland Council, 2010).

14.5 Guidance and regulations

The Environment Act 1995 also included important provisions relating to air quality, with particular regard to preparing a National Air Quality Strategy. An Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published in 2003 (DEFRA, 2007) which sets out air quality standards and objectives. Air quality standards that specifically relate to Scotland are set out in Air Quality Standards (Scotland) Regulations 2007.

Dust is identified as a statutory nuisance under Part III of the Environmental Protection Act 1990. The provisions of Part III of the Environmental Protection Act 1990 relating to statutory nuisance were enacted in Scotland by the Environment Act 1995.

Emission of dust can be identified as a statutory nuisance if prejudicial to health or a nuisance. Local authorities have a duty to serve an abatement notice if it is satisfied that a statutory nuisance exists, or is likely to occur or recur.

14.6 Methodology

Although there are a number of ways in which dust can be quantified, it is difficult to relate the amount of potential dust deposition to significant effects; therefore this assessment is qualitative rather than quantitative. A desk-based study was undertaken to establish the key baseline conditions at the site and a qualitative assessment of potential impacts was undertaken using professional judgement and in general the assessment follows the approach defined Section 2.6, where significance (informed by professional judgement) is considered as a function of receptor sensitivity and magnitude of change.

Planning Advice Note 50 (PAN 50) Annex B (Scottish Office, 1998) describes the sensitivity of potential dust sensitive receptors. The significance of any effect should also take into account the proximity of a receptor to a potential dust generating activity, the nature and duration of an activity, and other climatic factors and site specific factors (including prevailing wind direction, sheltering features and ground moisture conditions). PAN 50 suggests that residents can potentially be affected by site dust up to 1km from the source, but that continual or severe concerns about dust sources are most likely to be experienced near to dust sources, generally within 100 metres. The proximity of the closest properties was determined by reviewing maps of the study area.

14.7 Established baseline conditions

14.7.1 Local air quality sensitive receptors

As discussed above receptors up to 1km from the source can potentially be affected by dust. A review of ordnance survey mapping and a site walk over has identified the following dust sensitive receptors within 1km of the site boundary (see Figure 6.3).

- Achanarras Farm (NGR ND15135511), a residential dwelling approximately 200m to the southwest of the site boundary (currently unoccupied and owned by Spittal Mains landowner);
- four residential dwellings between approximately 260m and 640m to the north of the site boundary (north of the site access road), and west of the A9(T):
  - Achalone Farm (NGR ND15465621) – approximately 260m northeast of the site;
  - Bungalow, Achalone (NGR ND15675619) – approximately 370m northeast of the site;
  - Achalone Cottage (NGR ND15525656) – approximately 650m northeast of the site; and
  - Mossgiel, Achalone (NGR ND15565643) – approximately 520m northeast of the site;
- two dwellings at Spittal Mains Farm (NGR ND16105464), approximately 780m and 900m to the south of the site boundary (owner of the site and Achanarras Farm). The farthest away of these two dwellings is unoccupied; and
- fields all around the site boundary.

14.7.2 Local air quality

Climate

The potential for any site to emit dust is greatly influenced by weather. Rainfall decreases dust emissions, due to both surface wetting and increasing the rate at which airborne dust is removed from air. In contrast, strong drying winds increase the rate at which dust is lifted from an untreated surface and emitted into the air and also has the effect of spreading dust over a larger area. Thus construction works over the winter are likely to emit less dust than in the summer as in the UK the weather is generally wetter in the wintertime.

Meteorological data from the Met Office (Met Office, 2010a) indicates that the prevailing wind direction for Caithness is southwesterly. The annual wind rose for the Highlands and Islands is typical of open, level locations across the Northern and Western Isles, with a prevailing southwest wind direction through the year and frequent strong winds.

Rainfall data (Met Office, 2010b) indicate the annual average rainfall for the majority of Caithness is 500-1200mm and an average of 160-200 days per year with more than 0.1mm ranging from about 10 days per month in the summer time to about 19 days per month in the wintertime.

Quarries

There is one operational quarry at Spittal approximately 2km to the southeast of the of the converter station site which may be an existing source of dust. However it was not possible to obtain any monitoring data from this site for this assessment.

14.8 Range of possible impacts

A period of twelve months for the civil works at the converter is anticipated. During this time a number of activities will occur that will have the ability to create dust, including movement of vehicles on the access road, digging of new ditches for field drainage, excavation and storage of soil, and crushing and grading of rock.

The closest properties are Achanarras and Achalone some 200m southwest and 260m northeast of the site, respectively.

Any effects will be temporary and only likely to arise during dry weather at a time when dust is being generated and when the wind is blowing towards the receptor. Such conditions would only be expected to arise occasionally during the construction period.

Dust impacts could be created by construction traffic carrying materials to site if not properly protected. Construction traffic will use the A9(T) and will pass in proximity to properties for example in Spittal village.

14.9 Mitigation

Mitigation measures to reduce the potential for dust generation are set out in Table 14.1. Best practice measures to reduce unnecessary emissions are also included.

Table 14.1 Catalogue of proposed mitigation measures related to air quality

Ref	Title	Description
AQ1	Dust control	A dust management plan will be included in the CEMD for the approval of The Highland Council before construction.
AQ2	Dust control	Best management practices will be implemented on site to control dust.
AQ3	Dust control	The contractor will be required to implement a proactive approach to management of all potential dust nuisances.
AQ4	Dust control	Exposed soils and stock piles will be damped down during periods of dry and/or windy weather to reduce airborne dust and the risk of nuisance. Surface areas of stockpiles (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) will be minimised to reduce the area of surfaces exposed to wind pick-up where practical.
AQ5	Dust control	The unnecessary handling of materials will be minimised to avoid the potential for creating dust.
AQ6	Dust control	Surfaces of completed earthworks will be restored as quickly as possible and revegetated where necessary.
AQ7	Dust control	All stock piles of materials kept onsite will be covered with sheeting if dust becomes a nuisance.
AQ8	Dust control	All lorries will be sheeted during transportation of construction materials and spoil export if required where it is identified that dust could be created and be a nuisance.
AQ9	Dust control	All containers will be covered or enclosed whenever possible to prevent escape of dust and waste materials during loading and transfer.
AQ10	Dust control	The site access route will be regularly inspected and if necessary

Ref	Title	Description
		cleaned to reduce the potential for dust generation.
AQ11	Dust control	All access routes will be regularly inspected and, if necessary, cleaned.
AQ12	Dust control	Wheel washing facilities will be provided for all vehicles leaving the site, if necessary.
AQ13	Speed restrictions	Speed will be kept to a minimum on site and on the access track (20mph or less on surfaced roads and 5mph or less for unmade surfaces) to reduce the potential of creating dust and to enhance site safety.
AQ14	Dust control	If there is a significant risk of dust from a tool then dust suppression measures will be considered.
AQ15	Dust control	Crushing plant will be sited to reduce the potential for dust release towards properties. When the crushing plant is in operation, water sprays will be used to damp down all material and minimise airborne release.
AQ16	Burning	There will be no unauthorised burning of any material anywhere on-site.
AQ17	Monitoring	The success of all measures to reduce dust will be monitored on site and amended if found not to be efficient.
AQ18	Complaints	All complaints about dust will be taken seriously and investigated to reduce the risk of the nuisance happening again.
AQ19	Maintenance	All construction plant and equipment will be maintained in good working order and not left running when not in use.

A full list of all intervention measures planned for this project is compiled in Annex II.

14.10 Assessment of residual effects

14.10.1 Permanent

There will be no permanent effects from the proposals. The site will be restored following construction and the access tracks will be finished with tarmac, thus negating potential dust release. In addition the area has reasonably consistent rainfall and ground conditions are often damp which will reduce any risk of dust from areas around the site.

14.10.2 Construction

Early construction activities will involve establishing an access road from the A9(T) onto the site. The existing track to the north of the shelterbelt will be used for most of this distance cutting through the shelterbelt about half way down the slope where a break in the shelterbelt already exists (see Section 4.2.8). Dust could be generated on the track from the movements of vehicles prior to the track being surfaced with tarmac. Water sprays will be used to damp down surfaces during dry weather and wheel washing will be provided for all vehicles leaving the site. In addition, speed will be kept to a minimum on the access track, further reducing the potential to produce dust.

The site will be cleared and soils will be stripped and segregated for temporary storage on site. There is an average of 0.75m of top soil and subsoil over the underlying rock, some 40,000m^3 of soil will therefore be produced, which will be used for landscape filling. Handling of soil during site levelling and its exposure to dry windy conditions has a limited potential to lead to dust emissions. However, with rainfall >0.1mm on more than a third of the days in summer, the potential for drying to occur in practice is low. The potential for these activities to produce dust will be further minimised through avoiding the unnecessary handling of materials; restoring surfaces of completed areas and bunds as quickly as possible and seeding if required; and through keeping all stock piles of materials onsite covered with sheeting.

Approximately 64,000m^3 of material is expected to be removed and re-used to level the site. The underlying rock strata are dense and may require drilling or blasting. This has the potential to generate dust emissions. It is probable that a crushing plant will be required to grade excavated material for re-use at the converter station site.

The new access track and a ring road around the compound site will be built prior to the construction of the converter station. This will involve extracting rock graded to the appropriate specifications as a base layer for the road and surfacing with tarmac. Where possible the rock used will be from the site and will be crushed and graded on site. Crushing of the rock on-site has the potential to generate dust.

The contractor would be required to implement best management practices and to adopt a proactive approach to dust control at all times. A dust control plan would be part of the site CEMD (see Section 4.4.2).

The potential impacts of crushing activity will be reduced through careful siting of any crushing plant. When the crushing plant is in operation, water sprays will be used to damp down all material and minimise airborne release. The implementation of this mitigation will effectively minimise the potential of dust production from this source.

If any materials were transported that could create dust the contractor would be required to sheet the load to reduce the potential for dust impacts on properties close to the road.

Effects on local air quality from dust generation are considered to be at most **minor adverse**. The closest properties are Achanarras and one of the dwellings at Achalone both over 100m from the site (see Figure 6.3). In addition, the ground conditions would be likely to be damp and the scale of the required works in proximity to any property or sensitive area of habitat is relatively small.

Emissions from construction vehicles would not be significant because of the scale of development and required works and the short term period over which any additional emissions would occur. The traffic assessment in Chapter 12 indicates that traffic during construction would not be significant. Any adverse effects would be **minor** and short term (spread over 2-2½ years).

14.10.3 Decommissioning

Effects of decommissioning activities would be similar to those during construction and would not be significant provided all agreed mitigation was successfully implemented on site.

14.11 Potential for cumulative effects

Cumulative effects in relation to dust could occur from activities associated with the cable route, the existing quarry at Spittal and if any wind farm or other development was built at the same time as the converter station. The potential for dust from the site is low and it is not considered that cumulative effects could be significant.

This development will play a role in replacing conventional power generation, and thus improving air quality, through facilitating significant amounts of renewable energy produced in the North of Scotland to be transmitted south (see Section 16.6).

14.12 Summary of key findings

The key findings of the assessment on air quality are as follows.

- Mitigation measures will ensure there are no significant effects on air quality (including from dust) during construction or operation of the converter station.
- There would be no significant effects on local air quality from emissions from site plant, HGVs or other vehicles because of the low level of traffic associated with the proposals.

14.13 References

DEFRA, 2007. *Air Quality Strategy for England, Scotland and Northern Ireland; Volume 1*. [online] DEFRA. Available at: <http://www.defra.gov.uk/environment/quality/air/airquality/strategy/documents/air-qualitystrategy-vol1.pdf>. [Accessed on 23 September 2010].

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15 Socio-Economic Impacts

15.1 What is covered in this chapter?

The key topics to be addressed in this section include potential impacts on:

- employment levels and existing business activity;
- tourism; and
- facilities and services used by the community and/or visitors.

Other issues related to the socio-economic environment are considered in separate chapters:

Effects of disturbance to near neighbours by dust, traffic or noise:

- Chapter 12: Traffic and Transport Infrastructure
- Chapter 13: Noise and Vibration
- Chapter 14: Air Quality

The effects of visual impacts from the development on near neighbours, communities and tourists:

- Chapter 10: Landscape and Visual Impacts

Baseline information on population is provided as context for the assessment.

The operation and maintenance of the HVDC Connection will not result in the creation of any new local employment as the development will not be permanently staffed. Operational expenditure on plant, materials and services for maintenance purposes are expected to be of a specialist nature and are likely to be sourced from out with Caithness.

15.2 Why could these issues be important?

One of the aims of regional development and renewables-related development in particular is to create job opportunities and economic development. Optimising these economic influences is a key focus for the project alongside other factors. There will be a need for a number of suppliers and services that have potential to be provided through local businesses. The use of local facilities and service providers for the project helps to connect local communities to the projects that are taking place nearby and is thus likely to increase acceptance of the project within the community during construction.

Tourism is an important part of the Caithness economy. There can be a perception that change may alter attractiveness of an area for visitors, and major industrial developments such as this project can therefore raise fears in the tourist sector about future prospects. Added to this there is also a well developed debate in Caithness about the merits of renewable energy (onshore wind in particular), where concerns about visitor perceptions of the area are often articulated. Thus the addition of infrastructure to service renewable energy development may add to this discussion.

15.3 Sources of information

The following websites were used as sources of information about the socio-economic environment in Caithness:

- Census 2001 as accessed at http://www.gro-scotland.gov.uk/
- The Highland Council - Facts and figures: http://www.highland.gov.uk/yourcouncil/highlandfactsandfigures/
- Visit Scotland www.visitscotland.org
- Highlands of Scotland tourist board (www.visithighlands.com)
- Caithness community website (http://www.caithness.org/)
- Caithness and Sutherland enterprise (CASE) www.hie.co.uk/case
- Caithness Community Organisation (www.caithness.org)
- The Caithness Chamber of Commerce (http://www.caithnesschamber.com)
- North Scotland Industries Group (http://www.nsig.co.uk/)

15.4 Survey and analysis work undertaken

The assessment undertaken is qualitative and no specific survey work has been undertaken.

15.5 Consultation feedback

The Highland Council has emphasised the need to engage with the local communities in the area of the converter station. They have also highlighted the support that The Highland Council has for renewable energy developments in terms of clean energy, potential for local jobs, and potential economic development.

The Highland Council's economic development department highlighted the desire to see local businesses benefit as much as possible from the proposed project.

15.6 Methodology

The assessment of effects on the socio-economic environment is essentially a comparison of existing information compared to the opportunities and challenges presented by the project.

A desk-based study was undertaken to establish the key baseline conditions in Caithness and a qualitative assessment of potential impacts was undertaken using professional judgement. In general the assessment follows the approach defined in Chapter 2: Approach to the Environmental Statement where significance is considered as a function of receptor sensitivity and magnitude of change informed by professional judgement.

15.7 Established baseline conditions

Caithness has an estimated population of approximately 25,200 (The Highland Council, 2001), which represents 0.5% of Scotland's population according to the 2001 census.

Within Caithness the main population centres are the ward of Thurso, with a population of approximately 7,400, and the ward of Wick with a population of 6,800. The converter station is located in the ward of Landward Caithness (which excludes the wards of Wick and Thurso). The population of Landward Caithness is estimated to be approximately 11,200 and covers an area of 1,719km^2.

Landward Caithness is one of the least densely populated areas of Europe with 6.5 inhabitants per km^2 (The Highland Council, 2010a)[113]).

15.7.1 Business and employment

In Landward Caithness 3600 people are in employment and there are a high proportion of jobs in manufacturing and a low dependency on public jobs.

There is a range of traditional industries which operate in the area and which continue to play an important role as wealth generators and employers in the area. Although in a period of transition, agriculture continues to be an important focus in the area. Industries such as tourism are growing, and others like the reopened flagstone quarries will continue to be an important part of a healthy mixed economy.

As well as the more traditional industries, the area has a wide range of businesses over diverse sectors. The level of manufacturing is higher than in comparable rural economies, with export of numerous products to the oil and gas, defence, domestic appliance, and primary sectors. Construction and engineering are also major employers serving not only the local area but also wider national and international markets. Further, a relatively high proportion of jobs are in banking and finance.

The unemployment rate for the whole of the UK for the three months to November 2010 was 7.9% (Office of National Statistics). In comparison the unemployment rate for Landward Caithness ward, Wick and Thurso was 2.7%, 5.7% and 4.5% respectively (see Table 15.1).

Table 15.1 Employment in Caithness

	Landward Caithness[114]	Wick	Thurso
Total population[115]	11 179	6676	7344
Number of people in employment	3600	3500	4800
Unemployment rate[116]	2.7%	5.7%	4.5%
Percentage of people employed in:			
Agriculture & fishing	2.2	0.8	0.2
Energy & water	1.3	0.0	0.0
Manufacturing	17.7	3.0	24.9
Construction	6.7	9.0	2.0
Distribution, hotels and restaurants	25.4	19.8	20.6
Transport and communications	5.0	3.2	5.0
Banking, finance & insurance, etc.	25.7	7.0	22.5
Public admin., education & health	14.9	51.5	21.7
Other services	1.1	5.7	3.0

Source: (The Highland Council, 2010a)

[113] GRO(S) 2009 mid-year estimates
[114] Excludes Wick and Thurso
[115] Mid 2008 estimate
[116] Unemployment rate for December 2010

Dounreay

Since the early sixties the nuclear power station at Dounreay has underpinned the economy of Caithness and was at one time the largest employer in Caithness. It ceased generating electricity in 1994 and since then has been in a decommissioning phase. It still remains a significant source of local employment however and is likely to remain so as the plant is decommissioned up to planned completion in 2025. The local economy is heavily dominated by Dounreay and its spin-off industries. One in five jobs in Caithness is allocated at Dounreay, and estimates suggest one in every three jobs in Caithness is associated indirectly with the facility.

The value of the decommissioning work to the local economy is estimated at approximately £75 million a year (Caithness.Org, 2003). Offsetting the major loss of employment when the plant eventually closes is of prime focus to the Nuclear Decommissioning Authority (NDA).

The Caithness and North Sutherland Regeneration Partnership (CNSRP) was formed in 2007 between the four key public sector organisations: Highlands and Islands Enterprise, The Highland Council, Scottish Government and the NDA. The CNSRP has the specific remit of developing, implementing and delivering the economic regeneration required as a result of the decommissioning programme at Dounreay.

Quarries

There are three working quarries located less than 2km from the proposed development area. These generate characteristic rock slates and slabs as well as producing a range of aggregates and construction materials. The largest quarry is at Spittal, 1.7km southeast the site, a smaller quarry operated by Caithness Stone Industries (1km southeast) and a further small operational quarry at Banniskirk, some 1.8 km away to the east. There are local sources of hard core (but not sand). The flagstone industry, once exporting all over the world, is making a comeback and old quarries have been re-opened in recent years to meet renewed demand.

Onshore wind farms

Onshore wind farm sites are well established with many more in the planning stages. There is currently 244MW of either installed or planned output from wind turbines within Caithness. The Highland Renewable Energy Strategy (HRES) earmarked Caithness to have no more than 250MW of onshore wind capacity by 2050, thus the targets for 2050 are very nearly satisfied. Wind farms in the vicinity that are in the various stages of the planning process are listed in Table 15.2 below.

Table 15.2 Details of existing and proposed wind farms in the vicinity of the converter station

Location	Grid Ref.	Capacity (MW)	No. of Turbines
Operational			**48**
Forss, By Thurso	ND019695	2	2
Causeymire	ND155505	48	21
Buolfruich, Houstry, Dunbeath	ND160355	12.75	15
Forss Extension (A)	ND021695	5	4
Flex Hill, Bilbster	ND271518	4.5	3
Achairn, Wick	ND299504	6	3
Approved			**66**
Causeymire Extension	ND149508	7	3
Camster	ND258474	50	25
Baillie Hill, Westfield	ND035650	52 - 63	21
Stroupster, Nybster	ND342664	36	12
Wathegar	ND283507	10	5
Submitted But Not Yet Determined			**94**
Dunbeath	ND115305	51	17
Hill of Lieurary, Westfield	ND078625	4	2
Burn of Whilk, Yarrows	ND295411	27	9
Spittal Hill, Spittal	ND180560	77.5	30
Bower	ND202589	1	1
Halsary	ND183499	41.4	18
Upper Smerral Wind Cluster	ND163339	3.2	4
Scoping Opinion			**60 - 70**
Rumster	ND208408	9	3
Nottingham Mains	ND199365	4.6	2
Westerdale	ND110525	135	50 - 60
Forss Extension (B)	ND019695	6.5	5

(Source: Caithness Wind Farm Information Forum and the Highland Council, 2010b)

Other relevant businesses in the area

There are numerous construction services companies within the region, mainly located in either Wick or Thurso. These companies range from small organisations to larger companies providing a broad range of construction services and could provide key services and goods during the construction and operation of the project.

There are many manufacturing companies within the region. Services include chemicals, electronics, furniture, engineering / metal working, health services, ceramics, timber and timber products, scrap merchants, security services, catering, telecommunications etc.

A full suite of professional services is established within the area and includes lawyers, accountants, IT services, conference facilities, photographers etc. A full range of retail services is also present in the area.

There are numerous small hotels and B&Bs scattered throughout the area, the closest being the Auld Post Office B&B located in Spittal, approximately two kilometres south of the site.

15.7.2 Tourism and recreation

The scenery, coastline, history and wildlife of the north of Caithness are major features in attracting tourists to the area. Although tourism in Caithness and Sutherland has developed at a lesser rate than other areas of the Highlands, it is still important in economic terms. The 2001 Census Profile published on the Highland Council website demonstrates that tourism is important in Caithness, providing approximately 13% of jobs in the region (The Highland Council, 2001)[117].

There are many self-catering establishments scattered throughout the area as well as bed and breakfast accommodation. Hotels are rather small and tend to be traditional town based facilities.

Much of the recreation tends to be on an informal basis with little infrastructure to support it.

In the wider area seasonal game shooting and angling are popular. The Wick and Thurso Rivers are popular angling areas. The other main visitor attractions in the study area away from the major towns tend to be historical or archaeological sites (see Section 11.8), walks, wildlife areas and museums. Other activities involve horse riding and quad biking etc. There is a network of paths in Caithness (see Section 6.7.2).

In the vicinity of the converter station the main recreational activities are horse riding, fishing as well as fossil hunting at the Achanarras Quarry.

Achalone Activities is a riding school / equestrian centre situated just off the A9(T) at Achalone just over a kilometre to the north of the site.

Harpsdale Fishery Park, the most northerly still water fishery on mainland Britain, lies some 2km to the west of the site. There is no fishing in the Achanarras Burn, which is a tributary to the River Thurso (see Section 9.8.1).

This area of Scotland is famous for fish fossils. There are two quarries with fossilised fish in the immediate vicinity to the converter station (see Section 7.8.3). Spittal Museum is housed in the Spittal Village Hall. It contains a number of fossil fish specimens from the local quarries.

15.8 Range of possible impacts

The main impacts associated with socio-economic issues include:

Permanent

- changing of setting for certain tourist / recreational activities

Construction

- increased employment;
- contributions to local economy through use of local facilities and services;

[117] Tourism figures include the Hotels/Catering and Transport/storage/communication sectors.

- contributions to local economy through use of local supply chain; and
- interference with recreation during construction activities.

15.9 Mitigation

The following intervention measure in Table 15.3 is specific to the socio-economic environment. For a full list of intervention measures, including general measures that will benefit social and economic interests, see Annex II. Reference should also be made to the mitigation measures listed in Section 10.10.

Table 15.3 Catalogue of agreed intervention measures related to socio-economic issues

Ref	Title	Measure
SOC1	Local benefit	The contractor(s) awarded the construction work will be encouraged to source local labour and materials wherever possible, maximising the positive impact to the local economy.

15.10 Assessment of residual effects

Permanent

15.10.1 Impacts on tourism and recreation

The operation of the converter station is expected to have very few impacts on tourist and recreational activities in the area due to the location and considerable screening by landform and proposed planting. The potential for impacts on recreational amenity is addressed as part of the Landscape and Visual assessment (see Section 10.12).

Although there are places where the converter station may be visible or partially visible (including Achalone Activities riding centre, Harpsdale Fishery Park, Achanarras Quarry and from the A9(T)), no significant effects on these businesses or generally on the amenity value of these recreation sites / routes is anticipated as none are considered to interact with the converter station site in a way that will affect business activity.

Construction

15.10.2 Interference with recreation during construction activities

The construction of the converter station is expected to have very few impacts on tourist and recreational activities in the area. During construction, there may be some restriction of access to dispersed horse-riding activities due to construction and use of the access track; however access will be maintained for these activities (see Section 6.10.7).

15.10.3 Increased employment and use of local supply chain

Construction of the HVDC converter station will offer temporary employment opportunities both in terms of direct construction jobs and in the supply chain, providing other professional services and materials to the project. The civil works is expected to employ around 20 personnel (local workforce where possible) and the construction of the converter station will employ around 30 personnel in total, over a total construction period of 2-2½ years.

There will be a variety of materials and services that will be needed for the civil works and construction that could be sourced from the local area. These could include sourcing or hiring the following:

- construction plant for the ground works;
- ready mixed concrete for foundations;
- aggregate;
- materials for construction of the new access track;
- temporary office accommodation and stores;
- catering services; and
- landscaping services.

At this stage it is not possible to identify the proportion of the workforce recruited locally. It is likely that some jobs will not be able to be filled locally because of the specialist nature of the work (especially the electrical work) and will be brought in from out with the area. However, through encouragement of use of local labour, the positive impacts of the project on local business and employment will be optimised.

Likewise, at this stage it is not possible to identify which materials and services will be sought locally (though this will be encouraged), but some level of positive impact on the local supply chain is anticipated.

Overall, direct effects on employment and indirect effects on local supply chains during construction are predicted to be positive and temporary. The scale of the impacts will be dependent on the proportion of the workforce recruited locally and the proportion of goods and services sought locally.

15.10.4 Use of local facilities and services

There is likely to be a positive impact on the use of local facilities and services. The presence of a construction workforce in the local area has the potential to increase demand for local services although this is dependent on the proportion of the workforce that is hired locally. The higher the number of people employed from outside the area the higher the additional spend. The most significant impact is likely to be on accommodation such as local hotels and B&Bs in the surrounding villages or rental properties in larger towns of Wick and Caithness. Other benefits to the local economy will be additional spend in local shops, petrol stations, restaurants etc.

Overall, direct and indirect effects on use of the local facilities and services during construction are predicted to be positive, temporary and dependent on proportion of the workforce recruited locally.

15.11 Potential for cumulative effects

There is also a possibility of cumulative effects on employment, use of local services, and supply chains as a result of construction of the converter station and other activities that may occur around the same time, such as the installation of the underground cable or construction of wind farms (see Table 15.2). At present however, it seems very unlikely that the construction windows for the converter station and any wind farms will overlap significantly.

15.12 Summary of key findings

Some positive socio-economic effects are predicted during the construction phase with likely use of at least some local construction workers, likely use of the local supply chain to some degree and an increased demand on local services.

No significant impacts on tourism and recreation sites are predicted due to the location of the development and considerable screening of the development offered by the landscape, existing shelterbelt and planned new tree planting.

15.13 References

Caithness.Org, 2003. *Dounreay launches first apprenticeships in decommissioning*. Available at: <http://www.caithness.org/fpb/dounreay/apprenticeships.htm>. [Accessed on 17 November 2010].

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16 Cumulative Issues

16.1 What is covered in this chapter?

The key cumulative topics that will be addressed in relation to the converter station are:

- Intra-specific: Within the project
- Inter-specific: With other projects

Within project effects include where several impacts act at the same time on one receptor (e.g. simultaneous noise, vibration, and visual impacts at a residential property). They can also relate to sequential combinations of impacts arising from different project phases or activities (e.g. job opportunities from construction and operation or traffic impacts of the converter station and the connecting cable).

Other projects which may create cumulative issues include future connections to the converter station from the existing transmission grid, from future high voltage connections to new generation and from local generation connections. Cumulative effects analysis also includes possible effects associated with local generation projects themselves as well as any connections to the converter station and also a number of unconnected but nearby projects.

16.2 Why could the issue be important?

Each of the individual influences of this project upon key receptors such as the local community or local wildlife does not occur in isolation they occur together with or in sequence with each other. Likewise the influences from this particular project will take place alongside those from other existing and planned future projects. In order to understand and take account of the combined influences of these intra- and inter-specific interactions, any cumulative effects need to be taken into account. Such an assessment may, for example, show that whilst each of the individual impacts is acceptable, the cumulative impact may in fact be considered unacceptable.

16.3 Sources of information

Details of the design of the project were provided by SHETL, along with an indication of other foreseeable network strengthening projects. In terms of other separate projects, information was provided by The Highland Council of any projects in scoping and local landowners were approached regarding any future development projects that they were aware of. Information about possible activities and supply locations outside Highland were provided by SHETL.

16.4 Consultation feedback

The Highland Council and SNH both highlighted the need to consider cumulative effects.

16.5 Survey and analysis work undertaken

No survey work was planned. Details of the specific locations of any existing or future projects in the vicinity of the converter station were obtained so that they could be entered into the GIS and presented on the relevant maps.

16.6 Range of possible impacts

The site has been chosen to minimise the influence on sensitive receptors. The approach to developing the site has also been planned to avoid disturbance where possible. Factors such as the sequence in which activities will be undertaken, the timing of activities and the techniques used have all helped to minimise both short term and longer term impacts and therefore any cumulative effects. However, some cumulative impacts may still arise.

16.6.1 Cumulative interactions between project activities

The receptors which are likely to be most affected by the sequence of construction and operational activities and/or multiple impact vectors are neighbouring dwellings, the Achanarras Burn, wildlife using the shelter belt to the north of the site, and local businesses. An indication of the potential cumulative issues associated with each of these receptors is provided in Table 16.1.

Table 16.1 Possible cumulative impact factors associated with key receptors (significance drawn from individual topic chapters)

Key receptor	Additive factors (Occurring at one time)
Nearby dwellings	Noise from construction (not significant adverse) Visibility of construction (**significant adverse** effect within 1 km from east, south and west) Dust from construction (not significant adverse) Disruption to services (not significant adverse) Increased traffic congestion (not significant adverse)
Achanarras Burn	Site run-off from excavation areas during construction (not significant adverse) Run-off from temporary construction area (not significant adverse) Run-off from access track (not significant adverse)
Nearby wildlife	Noise from construction (not significant adverse) Visibility of construction (not significant adverse)
Economic development	Employment opportunities from construction (**significant benefit**) Service and supply opportunities during construction (**significant benefit**)

It can be seen that most of the vectors that could give rise to possible cumulative effects were considered to be not significant. Areas where a significant impact has cumulative potential are:

- in terms of adverse affects upon nearby dwellings, within 1 km of the site to the east, south and west, Spittal Mains Farm and Achanarras Farm; and
- in terms of economic development benefits the direct employment and service / supply opportunities.

By recognising the potential for cumulative effects in these areas there is a potential to consider how such potential can be avoided for adverse and maximised for beneficial impacts through micro-management of activities. This may relate to scheduling, applying additional mitigation measures or ensuring that the receptor is prepared for the impacts that may arise (e.g. briefings for near neighbours and local businesses).

16.6.2 Cumulative interactions with the wider development programme

The major linkage between the converter station and the onshore cable route relate to the need for the cable route to reach the converter station site and the rather complex pattern of land use and ground conditions on the final approach to the converter. These issues were taken into account during site selection for the converter station and route selection for the cable. None of the constraints were considered, on balance, sufficient enough to merit moving the converter station site or altering the preferred cable route.

No significant impacts are anticipated to arise from cable laying, therefore cumulative interactions with the converter station project will be minimal.

16.6.3 Cumulative interactions with future grid connections

Future connections to the converter station could arise from existing grid infrastructure and from new connections associated with new renewable generation schemes.

Existing grid infrastructure

The existing grid infrastructure that could have most bearing on the current project is the existing 132kV overhead line that runs from Thurso to Mybster substations. This line could be connected at its current voltage into the converter station. However, preliminary planning for the grid, in the locality, has indicated that an upgrade of the line between Dounreay and Spittal to a higher voltage, probably 275kV, would be advantageous for overall grid management purposes. It is foreseeable therefore that a separate Section 37 application for upgrading this section of line may emerge over the next few years.

These connections whether at 132kV or 275kV would not affect the design of the converter station but they would require equipment to be placed in the platform bays provided for such connections. These connections would also, most likely involve erecting a new terminal tower adjacent to the converter station where the sections of line would terminate.

The main cumulative issue associated with these connections is the visual impact of the new terminal tower. The options for this structure will be the subject of a separate consent process, but an indication of how this may look is outlined in Figure 16.1.

Future upgrades to the onshore transmission infrastructure in Caithness are essential if the region is to fulfil its energy generation potential. As discussed in the project Optioneering Report (Aquatera, 2010) the approach of converting the generated power to DC and exporting it via a subsea cable is considered to minimise the level of impact associated with increasing transmission capacity. The level of cumulative impact is therefore considered to have been minimised by the approach proposed through this project

New grid connections

There are a variety of new grid connections which could seek to link into the converter station. In fact these connections may well be contingent upon the provision of this facility since other transmission upgrade options appear less deliverable.

These connections could approach the site from a number of different directions but due to local topography, land use and possible cable and line constraints, the final approach to the converter station is most likely to be from the north or south.

The number of connections is at present uncertain but there are: numerous onshore wind farms in the planning system; Round One wave and tidal energy projects in the Pentland Firth and Orkney Waters area; as well as planned upgrades to connections between Orkney and Caithness.

The main cumulative issues associated with these possible connections are the requirements for a suitable corridor to approach the converter station site. The routes for buried cables or overhead lines would need to be carefully planned so as to minimise negative impacts. It is likely that the final approaches to the converter station itself would be via buried cables and that they would tend to approach the site from the south and east rather than the north and west due to the presence of the shelterbelt and the Achanarras Burn. Possible approaches to the converter station have been left clear for such routing, and it is planned to install conduits through the base of the landscape bunding to facilitate underground cable access to the platform area with minimal disturbance to the screening around the site.

The development of the converter station will also reduce the pressure for the future upgrade of the existing 132kV over head line down the east coast between Dounreay and Beauly.

Contribution to emissions reduction

This development will facilitate significant amounts of renewable energy produced in the North of Scotland to be transmitted south where the demand is and will therefore replace conventional power generation. Consequently, the converter station will provide a capacity of 600MW to allow renewable energy projects to connect and contribute toward government targets.

16.6.4 Cumulative interactions with other future local projects

As well as the connectivity issues outlined above, local wind farm projects and other local industrial projects may have other interactions with the converter station project. The possible projects and activities include:

- Spittal wind farm, 1km from converter station site;
- Halsary wind farm, 5km from converter station site;
- Toftingall wind farm, 5km from converter station site;
- Causeymire wind farm, 5km from the converter station site;
- Spittal quarries operations, 1km from the converter station site; and
- established farming and land management practices in the area.

Given the significant visual influence of the project within the Achanarras Valley, cumulative visibility is likely to be a key issue. From feedback at previous public meetings in the area, the public consultation meetings and local press reports there are concerns in sectors of the community about the industrialisation of the Caithness landscape. The careful siting of the converter station means that inter-visibility with other projects will be restricted to a very narrow viewing arc to the northwest of the site, but any developments on Spittal Hill, for example, would be in the same viewing arc when viewed from Achanarras Quarry, or from dwellings to the west. These issues are discussed in Chapter 10, Section 10.13.

The existing quarry operations at Spittal can give rise to both noise and dust but these appear to be well controlled. Although there is potential also for noise and dust to emanate from the construction activities at the converter station, there are a range of control measures planned and consequently no adverse impacts on nearby properties are envisaged.

The landowners at Spittal Mains Farm have a keen interest in establishing a woodland network on their land and the plans for screening type tree planting seem to be entirely compatible with the future development of woodland that the landowners were already planning. There should be a beneficial cumulative effect in terms of biodiversity from such initiatives.

The general level of project investment into a rural area such as Caithness can also have a profound influence upon local economic development opportunities. Caithness is facing a major restructuring of its industrial base as the result of the closure of the Dounreay nuclear research facility. Although the decommissioning programme is in itself a major project there is a keen interest in creating a more diverse economic base for Caithness.

There will also be significant spin-off benefits to neighbouring areas from the development of this HVDC connection. In Orkney for example, the Orkney Islands Council is committed to expanding its renewables generation capacity. The proposed scheme will help to establish larger capacity export routes for electricity, a key strategic objective for the islands.

In Moray and other regions with existing grid transmission lines, the use of the direct marine route using HVDC will lessen pressure for future strengthening and expansion of onshore over head line AC grid infrastructure. This will avoid significant planning issues in these areas.

This latter theme can be developed further in that this project contains a level of innovation which sets it apart from other grid infrastructure projects. This is why the EU has offered grants towards the development of the project. Delivery of a project such as this has the potential to transform thinking about grid infrastructure across the UK, Europe and indeed the world. This may be one of the most important legacies from this project.

16.7 Mitigation

The following measure is proposed to minimise negative and maximise positive effects from cumulative issues:

Table 16.2 Catalogue of agreed intervention measures related to cumulative impacts issues

Ref	Title	Measure
CU1	Cumulative effects	The contractor will be required to manage all activities so as to minimise the potential for accumulation of impacts at one time or in a sequence that could lead to unacceptable levels of disturbance, nuisance, harm or damage.

16.8 Assessment of residual effects

The most likely source of residual cumulative effects is upon nearby properties, from the landscape changes that could take place and from economic opportunities.

The likelihood of collective effects upon nearby properties from a number of impact vectors are reduced due to specific factors associated with each property. The nearest property at Achanarras Farm is not permanently inhabited and the owner plans to keep it vacant during the construction period. The next closest property at Achalone is shielded from the core site works by the shelter belt. The Spittal Mains farm house is situated on the far side of extensive farm buildings and has no view of the site itself. Each of these factors serves to reduce the likely cumulative impacts that may arise.

Cumulative landscape change assuming that the Spittal Wind Farm if approved has been examined in Chapter 10: Section 10.3, and is assessed as **moderate adverse**.

The facilitation of renewables projects in wider Caithness and other nearby areas will lead to local negative and positive impacts associated with such projects. However, each of these projects will be the subject of separate planning processes, and the converter station project does not directly interfere with, or alter, any of these planning processes.

The greatest residual benefit from this project will be the carbon free energy that it supplies to the national grid. The contribution that the project will make is small in percentage terms, but it is a novel project which will signal a significant advancement in the creation of smart grid solutions to serve a low carbon economy.

16.9 Summary of key findings

The main findings regards cumulative effects are listed below.

- The converter station project could potentially interact with other projects and activities at a number of different levels.
- Significant cumulative adverse effects could be foreseen for three nearby dwellings; however, the arrangement of these buildings or their patterns of use will ensure that there are no significant effects.
- Cumulative benefits may arise in terms of employment and supply chain opportunities.
- Factors such as the sequence in which activities will be undertaken, the timing of activities and the techniques used can all help to optimise both short term and longer term impacts and therefore any cumulative effects.
- The converter station will not have direct impacts upon any other nearby project. Levels of traffic and other offsite impacts are relatively low and these other projects are all distant enough to avoid direct interactions.
- The project will have a positive influence upon the connecting power generation projects by providing a cost effective means of exporting generated power.
- The project will also make a contribution to the export of renewable power that will help the UK achieve its carbon emissions reduction targets.

- The economic activity stimulated by the project will, along with other projects, help to stimulate economic development in Caithness and the connected areas.
- The development of an HVDC solution for exporting electricity will reduce the need for further expansion of onshore grid infrastructure between Caithness and Beauly.

16.10 References

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17 Sustainable Design Statement

The importance of incorporating sustainability principles in developing the concept and detail of projects is widely recognised including in the various statutory development plans which provide a framework for the development of the proposals (see Chapter 5 for further detail on the policy context) and in the various guidance documents which have been used in the preparation of the ES. These include The Highland Council Development Plan Policy Guidance, Designing for Sustainability in the Highlands (November 2006).

The Planning etc. (Scotland) Act 2006 introduced a requirement that functions relating to the preparation of the National Planning Framework by Scottish Ministers and development plans by planning authorities must be exercised with the objective of contributing to sustainable development.

Scottish Planning Policy (SPP) published in February 2010 emphasises that:

"The planning system has an important role in supporting the achievement of sustainable development through its influence on the location, layout and design of new development."

Sustainability principles are critical to the overall requirement for the project as well as the development of the design of the project to date. Those that would be incorporated during construction are summarised in Table 17.1 which has drawn on The Highland Council guide to inform its contents (see Section 4.7). The principles relating to sustainable development are grouped under the following topic headings:

- Location and best use of site
- Socio-economic impacts and community
- Sustainable design and construction
- Energy efficiency and carbon emissions reduction
- Use of renewables
- Waste minimisation
- Water use and pollution prevention
- Traffic and transport
- Natural and cultural heritage protection

Table 17.1 Design Principles for Sustainable Development

Principle	ES Text Reference (if relevant)	Comment
Location and best use of site		
• *Demonstrate that the project is the most suitable and sustainable for the context*	Chapter 3: Project Design Process and Comparison of Alternatives; Chapter 4: The Project Proposals; Optioneering Report for the Moray Firth Hub and Caithness HVDC Project (October 2010)	Significant effort has been put into the evolution of the proposals to ensure the preferred solution on cost, engineering, operational and environmental grounds including site location.
• *Choose an appropriate site*	Chapter 3: Project Design Process and Comparison of Alternatives; Chapter 4: The Project Proposals; Chapter 10: Landscape and Visual Impacts; Optioneering Report for the Moray Firth Hub and Caithness HVDC Project (October 2010)	A detailed site selection process was undertaken to identify the preferred site. This is described in detail in the Optioneering Report. The chosen site is in a valley, adjacent an existing shelterbelt and has few immediate environmental constraints which cannot be mitigated. The chosen site lends itself well to adaptation for mitigation purposes, for example in promoting new vegetation to increase the screening effect.
• *Use existing public utilities where possible*	Chapter 3: Project Design Process and Comparison of Alternatives Chapter 6: Land Use and Utilities	The contractor will make best use of existing public utilities to facilitate construction and operation of the facility (see Section 6.7.3 and 4.2.13 of the ES).
• *Align buildings for shelter and solar gain*	Chapter 3: Project Design Process and Comparison of Alternatives Chapter 6: Land Use and Utilities Chapter 10: Landscape and Visual Impacts	The converter station, associated buildings and infrastructure are designed and orientated in order to take advantage of shelter in the valley and from existing tree shelterbelts as far as practical. The buildings would be electrically heated but opportunities to for heat recovery and solar panel solutions will be investigated during detailed design.
• *Demonstrate fit with local landscape character*	Chapter 3: Project Design Process and Comparison of Alternatives Chapter 10: Landscape and Visual Impacts	The converter station buildings and infrastructure have been planned to reduce intrusion into the surrounding landscape. The proposals are designed to mimic large agricultural buildings present in the surrounding area. The outer cladding on buildings would be of a colour to help best fit into the local landscape (see Section 4.2.7). Mitigation measures to reduce visual impact have been crucial during the design evolution process (see Annex II).
• *Avoid community severance*	Chapter 12: Traffic and Transport	Community severance is not predicted to be significant (see Section 12.12).

Principle	ES Text Reference (if relevant)	Comment
• *Efficient use of land*	Chapter 6: Land Use and Utilities	The project has been designed to limit land take to the minimum necessary for the safe construction and maintenance of the facility (see Section 6.10.1).
• *Reuse land*	Chapter 6: Land Use and Utilities	Following decommissioning, the site would be returned to its original state, allowing reuse of the land (see Section 6.10.10).
Socio-economic impacts and community		
• *Involvement of local communities in developing the project*	Section 2.4: Consultation; Annex I: Consultation Responses; Pre-application consultation report.	Community consultation has included two public exhibitions, during the Pre-Application Consultation process and notification by letter to community councils to inform them of the EIA process. Community Councils in proximity to the site (Watten and Halkirk) were informed about the proposals and invited to the exhibitions.
• *Consultation with relevant stakeholders*	Section 2.4: Consultation Annex I: Consultation Responses; Pre-application consultation report.	Consultation with statutory and non-statutory organisations and interest groups has taken place throughout the study, including a Pre-Application Consultation process.
• *Consideration of the effects of the project on local communities*	Chapter 4: The Project Proposals Chapter 6: Land Use and Utilities Chapter 10: Landscape and Visual Impacts Chapter 12: Traffic and Transport Chapter 13: Noise and Vibration Chapter 14: Air Quality Chapter 15: Socio-Economic Effects Chapter 16: Cumulative Issues	Consultation has identified concerns of those potentially affected by the proposals and feedback taken into account in the appraisals. Consultation meetings have taken place with the local community. The EIA process has assessed the impacts on communities and identified appropriate mitigation (see Annex I: Consultation Responses and Annex II: Mitigation Measures).
• *Consideration of the local economic effects of the project*	Chapter 15: Socio-Economic Effects	The proposals are expected to incur financial benefit to the local community (see Section 15.10.3). Local labour and resources will be used wherever possible during construction (see Section 15.9 or Mitigation Measure (SOC1).
• *Consider how the project can promote social inclusion*	Chapter 15: Socio-Economic Effects	The development is not expected to have any specific effects on social inclusion, aside from the potential benefits of job creation (see above).
• *Consider how the project can promote a healthy environment*	Chapter 1: Introduction Chapter 4: The Project Proposals	The key objective of the development is to facilitate the transfer of renewable energy from where it is produced to where it is required (see Section 1.3). The converter station would operate in accordance with best practice guidelines.
• *Specify materials that cause minimal harm to the environment and have a positive social impact*	Chapter 4: The Project Proposals	The contractor will be encouraged to source materials locally and sustainably where practical (see Section 4.3.10.

Principle	ES Text Reference (if relevant)	Comment
• *Avoid conflict with tourists*	Chapter 10: Landscape and Visual Impacts Chapter 12: Traffic and Transport Chapter 15: Socio-Economic Effects	Visual impacts from the development will be minimised and mitigation measures will reduce the potential impacts on traffic on access roads to the site (see Section 12.11).
Sustainable design and construction		
• *Seek to minimise use of non-renewable resources*	Chapter 4: The Project Proposals	The design of the proposals seeks to balance cut and fill and reduce the need for import or export of materials for the converter station platform. The infrastructure materials would be sourced from appropriate cost effective sources which would depend on the final chosen contractor. The contract will seek to encourage a sustainable approach to construction. Energy on site would be sourced from the network but opportunities to for heat recovery & solar panel solutions will be investigated during detailed design (see Section 4.2.14).
• *Use renewable, recycled or sustainably managed sourced materials for construction*	Chapter 4: The Project Proposals	Building materials will be sourced locally wherever possible. Excavated material will be re-use where practicable.
• *Choose materials that are non-toxic in manufacture, construction and use*	Chapter 4: The Project Proposals	The contractor will be required to demonstrate the approach to sustainable construction and the sourcing of building materials sustainably and from sources with minimal environmental impact where practicable will be encouraged by SHETL.
• *Ability to recycle construction materials at a later stage*	Chapter 4: The Project Proposals	Materials removed following decommissioning would be appropriately segregated to help in recycling and reuse (see Section 4.6).
• *Maintain finite non-renewable resources*	Chapter 4: The Project Proposals	Use of finite resources will be minimised where possible by re-use of excavated materials etc. (see Section 4.3.3.
Energy efficiency and carbon emissions reduction		
• *Measures to reduce energy use during the construction and operation of the converter station*	Chapter 4: The Project Proposals	The contractor will be encouraged to follow sustainable practices wherever possible during construction. In operation the converter station will be connected to the local electricity network which will be supplied by adjacent wind farms supported by the grid as required and as part of the detailed design opportunities to include heat recovery, solar panels etc will be researched (See Section 4.2.14).
• *Insulate well*	Chapter 4: The Project Proposals	Insulation will conform to industry standard.
• *Use of efficient heat, lighting and ventilation systems*	Chapter 4: The Project Proposals	In operation the converter station will be connected to the local electricity network which will be supplied by adjacent wind farms supported by the grid as required and as part of the detailed design opportunities to include heat recovery, solar panels etc will be researched (Section 4.2.14).

Principle	ES Text Reference (if relevant)	Comment
• *Easy to use control systems*	Chapter 4: The Project Proposals	Control systems installed will conform to SHETL standards and all staff trained to industry standards in their use.
• *Consider employing alternative energy sources to fossil fuels*	Chapter 4: The Project Proposals	Project design will incorporate renewable energy resources where possible.
• *Demonstrate ability of project to withstand local weather conditions*	Chapter 4: The Project Proposals	The converter station, buildings and all associated infrastructure have been designed to withstand local weather conditions and to have a design life of at least 40 years.
Use of renewables		
• *Use natural shelter and passive solar techniques in building design and siting*	Chapter 4: The Project Proposals	In operation the converter station will be connected to the local electricity network which will be supplied by adjacent wind farms supported by the grid as required and as part of the detailed design opportunities to include heat recovery, solar panels etc will be researched.
Waste minimisation		
• *Minimise waste*	Chapter 4: The Project Proposals	During construction, site waste will be kept to a minimum, with recycling implemented where practicable. It is not envisaged that any excess waste will be generated during operation (see Section 4.3.5).
• *Design for effective waste management during operation*	Chapter 4: The Project Proposals	Domestic wastes will be dealt with by requiring removal from site by each worker and visitor. It is not envisaged that any excess waste will be generated during operation (see Section 4.3.5).
Water use and pollution prevention		
• *Demonstrate how effects on water resources are minimised* ○ *reduce demand for water;* ○ *consider using grey water and collecting rainwater; and* ○ *install sustainable drainage systems*	Chapter 8: Hydrology, Drainage and Water Quality Appendix 8-A: Drainage Statement	Flooding and Drainage Statements have been collated as part of project proposals (see Appendix 8-A). Significant quantities of water would not be consumed during operation of the converter station. Effects on nearby water bodies, for example Achanarras Burn, have been minimised during the design process. A fire pond would be fed by rainwater and drainage water collected through the drainage system. This fire pond would also act as a buffer between the site drainage and the nearby Achanarras Burn (see Section 8.11.5).
• *Design site drainage to reduce flood risk and pollution*	Chapter 4: The Project Proposals Chapter 8: Hydrology, Drainage and Water Quality Appendix 8-A: Drainage Statement	A Flood Risk Assessment has been undertaken to ensure that the design is not at risk of flooding or causing flooding and is part of the planning application. Drainage proposals have been designed to control pollution (see Section 8.11 and Appendix 8-A).

Principle	ES Text Reference (if relevant)	Comment
• *Treat sewage sustainably*	Chapter 4: The Project Proposals Chapter 8: Hydrology, Drainage and Water Quality	Sewage produced on site would be small in quantity and would be treated through a septic tank. This tank would be sized to provide capacity during the construction and operational phases of the project and treated effluent (see Section 8.10).
• *Ensure construction activities do not cause pollution*	Chapter 4: The Project Proposals ; Chapter 8: Hydrology, Drainage and Water Quality; Chapter 14: Air Quality; Annex II: Summary of Environmental Mitigation Measures	Mitigation measures have been agreed to reduce potential for pollution and will be included in the CEMD (see Annex II). The successful implementation of these would be audited by SHETL and by an environmental clerk of works (see Section 4.9).
Traffic and transport		
• *Use of public transport during construction*	Chapter 12: Traffic and Transport	The use of public transport by construction staff would be encouraged (see Mitigation Measure T2).
• *Avoid conflict with local traffic and pedestrians*	Chapter 12: Traffic and Transport	Traffic movements, particularly HGVs, would be managed during construction to avoid conflicts with other users of local roads. Traffic and Transport impacts have been investigated and mitigation for adverse impacts detailed (see Section 12.11). The contractor would be required to develop a traffic management plan as part of the CEMD and agree this with THS Road Service (see Section 12.11).
Natural and cultural heritage protection		
• *Avoid designated sites*	Chapter 4: The Project Proposals Chapter 9: Ecology and Nature Conservation Chapter 11: Archaeology and Cultural Heritage	No designated sites of ecological value would be directly affected by the proposals. The Thurso River SAC would be protected by the design proposals for drainage and the agreed mitigation measures to protect water quality (see Annex II). The St. Magnus' church, burial ground and hospital SAM is located south of the proposed development and measures have been agreed with Historic Scotland to reduce impacts on its setting, although impacts have been assessed to be moderate and therefore significant.
• *Conserve local biodiversity*	Chapter 9: Ecology and Nature Conservation	The development is located in farmland, avoiding habitats of significant nature conservation importance. There will be no significant impacts on protected species in the location of the development. Comprehensive mitigation has been detailed to avoid impact on local species (see Chapter 9).
• *Enhance local biodiversity*	Chapter 9: Ecology and Nature Conservation	Increased maintenance of the existing shelterbelt, the planting proposals and potentially naturalising drainage would contribute to promoting local biodiversity.

Principle	ES Text Reference (if relevant)	Comment
• *Protect cultural heritage*	Chapter 3: Project Design and Comparison of Alternatives; Chapter 11: Archaeology and Cultural Heritage; Optioneering Report for the Moray Firth Hub and Caithness HVDC Project (October 2010)	The St. Magnus' church, burial ground and hospital SAM is located south of the proposed development and measures have been agreed with Historic Scotland to reduce impacts on its setting (see Section 11.11), although impacts have been assessed to remain moderate and therefore significant.