NORTHCONNECT
CONNECTING RENEWABLES

Chapter 24: Resource Usage and Waste

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24.1 Introduction

This chapter provides an understanding of the resources required to construct and install the HVDC cables and infrastructure, both onshore and offshore. In addition, it identifies the main sources of wastes arising. The proposed material and waste management to mitigate environmental effects, as far as practicable, are also detailed.

24.2 Planning and Legislative Framework

24.2.1 Policy

In 2010 the Scottish Government published Scotland's Zero Waste Plan (Scottish Government, 2010), which sets out the government's vision for a sustainable and resource efficient future. While the sustainable resourcing aspect of the vision is still to be brought into the legislation, NorthConnect will strive to fulfil the following two components of the vision:

> *'Individuals, the public and business sectors - appreciate the environmental, social and economic value of resources, and how they can play their part in using resources efficiently.'*

And;

> *'Reduce Scotland's impact on the environment, both locally and globally, by minimising the unnecessary use of primary materials, reusing resources where possible, and recycling and recovering value from materials when they reach the end of their life.'*

The Scottish Government's general policies require the consideration of marine litter:

- **GEN11 Marine Litter**: Developers, users and those accessing the marine environment must take measures to address marine litter where appropriate. Reduction of litter must be taken into account by decision makers (Scottish Government, 2015).

In addition, the Scottish Government in 2014 developed "A Marine Litter Strategy for Scotland". The development and implementation of which is led by Marine Scotland. Consideration is given that responsibility for delivery lies across all local and national business, environmental and community groups, governments and individuals (Marine Scotland, 2014). The strategy aims to fulfil the vision of:

> *"clean, healthy, safe, productive and biologically diverse marine and costal environment that meets the long-term needs of people and nature"*

The strategy builds upon previous work and initiatives by detailing five strategic directions to assist in the delivery of the Marine Strategy Framework Directive, the first two of which are directly relevant in the context of the NorthConnect project:

1) *Improve public and business attitudes and behaviours around marine and coastal litter, in co-ordination with the national litter strategy; and*
2) *Reduce marine and coastal based sources of litter, in co-ordination with land sourced litter being reduced by the national litter strategy (Marine Scotland, 2014).*

24.2.2 Regulatory Framework

24.2.2.1 Waste management

Section 34 of the Environmental Protection Act 1990 (As Amended) (UK Parliament, 1990) lays out a duty of care for waste producers. It states that waste must be managed correctly by storing it

properly, only transferring it to the appropriate persons and ensuring that when it is transferred it is sufficiently well described to enable its safe recovery or disposal without harming the environment.

The Waste (Scotland) Regulations 2012 (Scottish Ministers, 2012) amended Section 34 of the Environment Protection Act to implement a number of actions in the Scottish Government's Zero Waste Plan. Under these amendments, holders of waste, including producers, have a duty to take reasonable steps to increase the quantity and quality of recyclable materials. This includes implementing the waste hierarchy and promoting high quality recycling.

The Special Waste Regulations 1996 (As Amended) (UK Parliament, 1996) controls the movements of hazardous or special waste. The law refers to a list of materials in the schedule of the act, including oils and alkaline solutions. Special wastes must be disposed of or treated by specifically licensed facilities and covered by separate consignment notes. Mixing of special wastes is strictly prohibited.

The Waste Management Licensing (Scotland) Regulations 2011 (Scottish Ministers, 2011) lay out licensing requirements for waste management facilities and mobile plant.

24.2.2.2 Controlled Activities Regulations

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR) (Scottish Goverment, 2011) as explained in Chapter 10: Water Quality (Onshore), are intended to control activities which have the potential to cause pollution to the water environment.

2017 amendments to CAR included the requirements for oil storage, previously provided for in the Water Environment (Oil Storage) (Scotland) Regulations (Scottish Ministers, 2006), being included as General Binding Rules (GBR).

24.2.3 Guidance

14.1.1.1 Waste Hierarchy

Guidance on waste management in Scotland is provided in the document Guidance on Applying the Waste Hierarchy (Scottish Government 2013). This guide sets out how to apply the waste hierarchy. The waste hierarchy identifies the prevention of waste as the highest priority, followed by reuse, recycling, recovery of other value (e.g. energy), with disposal as the least desirable option. This principal has been used throughout the design phase of NorthConnect and will continued to be implemented moving into construction, operation and, if required, decommissioning.

14.1.1.2 Pollution Prevention Guidelines

Pollution Prevention Guideline Note (PPG) 6: Work at Construction and Demolition Sites (SEPA, 2014), provides guidance on the storage of materials and oils, waste management, the use of cement and management of cement washings.

For above ground oil storage tanks, Guidance on Pollution Prevention 2 (GPP2) (NIEA, SEPA, & Natural Resources Wales, 2017) provides information on how fuel oil should be stored, including a very useful checklist for oil storage tanks.

24.3 Assessment Methodology

It is not proposed that an assessment of effect significance is undertaken in this Chapter, as per the approach detailed in Chapter 3. Instead, as discussed in the scoping report (NorthConnect, 2016), it is proposed that the construction materials are identified and quantified in terms of volume and environmental lifecycle cost, and an understanding of the environmental impacts associated with the materials given, to facilitate the minimisation of effects.

24.3.1 Resource and Waste Identification and Quantification

Resources that have been identified through the design process to date are included in this document and, where possible, initial estimates of quantities provided, with assumptions made, are detailed. It should be noted that the final routing, installation and design for the HVDC Cables and Infrastructure will be determined by the Cable Contractor and, as such, accurate detailed design figures are not all available at this stage.

Potential waste streams arising are based on the existing knowledge of the project. However, due to the lack of specific detail available at this point, it cannot be assumed to be comprehensive. Nevertheless, it gives an indication of the main waste types expected.

24.3.2 Mitigation and Management

Mitigation and management techniques proposed with regards to both resource use and waste management are based primarily on construction best practices. The waste hierarchy has been employed throughout to minimise environmental impacts.

24.4 Material and Waste Quantification

24.4.1 Construction

24.4.1.1 Materials

During construction, various types and volumes of material will be required for the installation of the HVDC cables, both onshore and in the marine environment. Materials required are detailed in Table 24.1. The majority of materials utilised are the cables themselves and then the rock associated with cable protection and temporary construction measures. The material usage has an intrinsic carbon cost, as discussed in Chapter 9: Air Quality.

The construction machinery will require onsite refuelling, hence diesel will be stored on the site for this purpose in the likely form of mobile fuel bowsers, holding approximately 1000l of diesel. A range of oils and chemicals will be required for machinery and maintenance, including hydraulic oils, are anticipated. Vessels requiring refuelling will utilise the nearby bunkering facilities at either Peterhead or Aberdeen ports. Delivery vehicles onshore are expected to refuel at local fuel stations.

The HDD operation is likely to utilise a bentonite drilling fluid, although alternatives are available and may be selected by the principal contractor. Bentonite is a silicate-based non-toxic fluid that increases drilling efficiency.

The HDD drilling operations also require a water supply of suitable quality and flow rate. A main water supply adjacent to the A90 will be utilised, by creating a temporary connection to pipe the water to the HDD site. The water will also be utilised for the welfare facilities. Generators will be utilised to provide power at the HDD entrance sites.

Cement is required for onshore cable protection, waterstops and joint pit formation, and most components will be pre-cast off site and delivered ready for installation. If elements need to be poured in-situ, ready mix will be utilised, hence, there will be no onsite cement production specifically for the HVDC cable installation.

Table 24.1 Material required for the HVDC cable installation both on and offshore.

Material	Use	Volumes/Area/Lengths	Assumption	Specific Gravity	Tonnages
HVDC cable	Interconnector between Scotland and Norway.	2 HVDC Cables each 232km in length – total length 464km Plus test cable 0.5km long.	UK Cables only, 230km marine cables 2km onshore cables. Test Cable will be removed.	52 kg/m	Approximately 24,154 tonnes.
Fibre optic cable	Communication cable between converter station in Scotland and Norway.	232km length.	UK Cables only, 230km marine cables 2km onshore cables	1.7 kg/m	Approximately 395 tonnes.
Gravel (2mm≤ Gravel < 64mm)	Rock protection of cables	10,000m^3	Rock protection, the anticipated rock grading to be used is 1"-5" (CP45/125mm), with D10 45mm, D50 80mm, D90 125mm, with an installed bulk density of 1.5 – 1.7 tonnes/ m^3.	1.7 tonnes/m^3	17,000 tonnes
Cobbles (64mm ≤ Cobbles <256mm)		90,000m^3		1.7 tonnes/m^3	153,000 tonnes
Landfall HDD cable ducts	Cable ducts for Landfall HDD	3 times 450m	Three ducts, of 0.6m external diameter and 450m in length.		
Landfall HDD Equipment	Bellmouths and Duct Seals Bell mouths are attached to the end of the HDD Ducts to help guide the cables into the ducts. Once the cable is in place the duct seal is fitted.	3 of each.			
Concrete Matressing	Upto 2 No. concrete mattresses (18m2 each) will be placed over each of the 3 No. HDD marine exit points, to protect them prior to cable pull.	6 No. 18m^2 = 108m^2	Will be removed from seabed when cable is installed.		
Concrete	Joint pits, cable covers and waterstops.	600m^3.	Two joining pits of 20m length and 4m width.		

Material	Use	Volumes/Area/Lengths	Assumption	Specific Gravity	Tonnages
Stone fill surfacing, Type 1 grade or similar.	Temporary HDD access road, cable trench haul road and HDD sites.	Approximately 5275m^3.	4m wide, 450m length and 750mm thick access road. 1.6km of 3.5m wide haul road thickness of 400mm. HDD Compound 3370m^2 by 500mm deep.	1.9tonnes/m^3	Approximately 10,000 tonnes.
Onshore Cable Ducts	Road Crossing HDD, core path crossing and on the Fourfields site.	~ 600 to 1,200m	3 ducts total 200 to 400m in length.		
Sand	Trench bedding for cables	1,200m^3	0.5m deep, approx 2m wide approx. 1.2km long	1 tonne/m3	1,200 tonnes
Bitumen	Inital section of temporary HDD access road.	75m^3	Bellmouth plus 4m wide 50m long section 250mm deep	0.72tonnes/m3	54 tonnes
Protector Piping	Piping that acts as a sleeve on the cable to protect the cable at marine crossings.	1080m external diameter ~200mm	30m per cable per crossing, 18No. Crossing.		
Bentonite	Drilling fluid	HDD operation at landfall site - 192 tonnes of powdered bentonite HDD operation at road crossing - 30 tonnes of powdered bentonite for HDD operation at road crossing.	HDD operation landfall site - 1 tonnage bentonite with 64 tonnes per hole, 3 holes. HDD operation at road crossing 10 tonnes per hole, 3 holes.		222 tonnes
Fuel: Diesel and Marine Fuel Oil	Site Machinery and Vessels	600 to 1,000 tonnes			600 to 1,000 tonnes
Hydrocarbons: Oils, and hydraulic fluids	Site machinery maintenance and construction and guard vessels.	Small-scale for maintenance.	Utilisation during maintenance works.		
Miscellaneous consumables	Welfare facility, vessel, equipment, machinery consumables.				
Timber	Concrete shuttering, fencing etc				

24.4.1.2 Waste

A list of wastes likely to be produced during the construction works and their sources are provided in Table 24.2. It is not possible to give accurate quantities of waste at this point, but available indications have been provided. Consideration is also given as to how the waste hierarchy will be implemented for each waste stream.

During the marine works, there is a potential that abandoned or lost fishing nets and other man-made items will be encountered, especially during seabed preparation works. These will be removed from the sea and taken onboard the vessel for appropriate disposal upon return to port.

Table 24.2: Potential Construction Waste Arisings.

Waste	Source	Waste Hierarchy	Comments
Soils	Excess material arising from onshore cable installation activities.	Soils will be reused where practicable onsite, where	1,200m^3 of sand is being utilised in the trenches this will displace soils, however compaction of placed materials will determine the actual waste volumes (tonnages arising).
Stone fill surfacing, Type 1 grade or similar.	Temporary HDD access road, cable trench haul road and HDD sites.	Aggregate can be reused for other construction works.	5275m^3 (10,000 tonnes)
Bitumen	Temporary access road removal	Bitumen can be recycled for reuse in construction products.	75m^3 (55 tonnes)
Concrete Mattresses	Concrete mattresses removed from the HDD marine exit points.	Concrete mattresses, if in a suitable condition could be reused on another project. Alternatively, they can be broken up and recycled as aggregate.	6 mattresses.
Welfare Wastes	Welfare facilities onshore and onboard vessels	Wastes appropriately segregated to facilitate recycling where practicable.	
HDD Drilling Fluids	From Landfall and Road Crossing HDD works.	Fluids treated and reused on site, to minimise volumes of waste arising. Waste will be tankered off site for treatment, liquids will probably be removed allowing solids to be landfilled.	
Consumables including: packaging wastes and waste oils.	Vessel and equipment maintenance activities will give rise to wastes.	Wastes appropriately segregated to facilitate recycling where practicable.	
Cement Washings	Cleaning of tools and equipment which have been in contact with cement.	Washings collected, settled and if required pH corrected to allow resultant waters to be discharges appropriately. Solids if suitable may be recycled as aggregate.	
Telecommunication Cables	Out of service cables removed from seabed prior to cable lay.	If suitable the cables will be recycled.	2 lengths of cable up to 2km each.
Timber	Cement shutterings, pallets from packaging etc.	Wood can be reused, recycled, mulched, for burned with heat recovery depending on its form.	

24.4.2 Operation

24.4.2.1 Maintenance

Over time, maintenance activities for the HVDC cable may be required. During these activities, it is likely that similar consumable material, such as fuel and maintenance oils as detailed in Table 24.1, will be required, but in much smaller volumes. Sections of cable could be replaced, the lengths of which will be determined by the nature of the damage, but it will be a fraction of that required for the original installation, e.g. 0.5 – 1km lengths. Similarly, areas of rock protection may need to be augmented leading to small volume of additional rock placement.

Waste arising from maintenance will primarily involve small volumes of consumables.

24.4.3 Decommissioning

During decommissioning it is likely that the majority of the cables will be removed. As detailed in Table 24.1 there will be 24,154 Tonnes of HVDC Cabling and 395 Tonnes of fibre optic cable which will become waste at the point of decommissioning. One of the drivers for removing the cables is to recover the materials due to their value. Cables recovered during decommissioning, will be stripped, and materials recycled where practicable.

24.5 Mitigation Measures

Mitigation measures associated with the storage and management of materials and waste are laid out below.

24.5.1 Procurement

The procurement strategy for NorthConnect will be rolled down through the principal contractor and their supply chain. It will include the need for due consideration to sustainability, consideration of components and materials lifecycle cost, including their ability to be recycled. Where possible, materials should be sourced locally to minimise impacts associated with transport to site and to maximise the projects benefits to the local economy.

24.5.2 Fuels, Oils and Chemicals

The fuel bowsers will be under strict management controls to prevent pollution incidents, secured to protect against oil thefts and tampering and to comply with the CAR General Binding Rules (GBR) 26 and 28 for oil storage. The fuel bowsers will be double skinned with a level site gauge and stored in an appropriate area away from aquatic environments where it is protected from vehicle damage. They will be locked when not in use, with the keys under management control to ensure appropriate use and accountability. Refuelling will be carried out away from watercourses, by trained operatives following site refuelling procedures. The refuelling procedure will take into account the CAR GBR's and best practice laid out in GPP2 (NIEA et al., 2017) and PPG6 (Environmental Agency, NIEA, & SEPA, 2012).

Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction. All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments under the COSHH Regulations (UK Government, 2002). All COSHH assessments will include a section on the environment to highlight any particular precaution or mitigation requirements. Oils and chemicals will be appropriately stored and managed.

Appropriately bunded oil and chemical storage cabinets will be utilised. These will be kept locked, with the keys under management control to ensure appropriate use and accountability.

Bentonite utilised for the HDD drilling activity is expected to arrive at site in a powder form in 1 tonne bags. The dry bentonite is required to be mixed with water to produce the drilling fluid for the HDD operation. Significant disturbance to large volumes of powdered bentonite may give rise to dust, causing potential environmental and human harm as detailed in Chapter 9: Air Quality. Therefore, volumes of bentonite stored at site will be minimised to those required for the operation and, when not in use, bentonite bags will be covered to prevent loss of the powder.

24.5.3 Waste Management

The waste hierarchy shall be utilised throughout the project. To facilitate this, waste shall be appropriately sorted and segregated. In Scotland, The Waste (Scotland) Regulations 2012 include specific requirements regarding the segregation of waste. NorthConnect will have developed an overarching Site Waste Management Plan for the UK elements of the project as part of the Construction Environmental Management Plan (CEMP). The Cable Contractor will be responsible for the preparation of a detailed Site Waste Management Plan specific to their scope of works. This shall align with the overarching Site Waste Management Plan (SWMP). Through the preparation of this plan, the design and construction works will seek to minimise the creation of waste throughout the project lifecycle.

The Cable Contractor will maximise opportunities for reducing, segregating and recycling of waste. The Cable Contractor will also ensure waste storage is safely maintained and managed, such that waste segregation is ensured, and escape of waste materials prevented.

Compliance with all relevant waste regulations will be ensured, including the retention of waste transfer notes and copies of licences. Under duty of care, it will be ensured that all wastes are dispatched to an appropriately licenced facility.

The use of single-use plastics will not be permitted wherever reasonable alternatives are available and, if they have to be utilised, then recycling arrangements shall be in place.

Cement washings will be carried out in a dedicated area. Washing arisings will be collected for onsite treatment. This will include settlement and, if required, pH correction. The liquids will be reused on site as grey water, if suitable, or disposed of via a consented waste route. The solids will be disposed of as solid waste potentially to be recycled as aggregate.

24.5.4 Litter

The close proximity of the onshore cable site to the marine environment makes it likely that any litter left could enter the marine environment. Similarly, loose materials or littering on the vessels could lead to litter entering the marine environment.

All personnel working on the project will need to undertake site induction. This will include a section on waste management and the use of the waste receptacles provided. It will be made clear that littering will not be tolerated. The use of single use plastics will be discouraged, and reusable crockery and cutlery will be provided in the welfare facilities.

Environmental walk rounds or Health & Safety inspections will identify if littering is becoming an issue on the construction site, or vessels, allowing corrective action to be taken. Similarly, appropriate storage of materials and waste, and regular checks of arrangements on the vessels, will aid in ensuring marine litter is not created.

Following the completion of the onshore works, a full litter sweep will be conducted.

24.6 Summary

The construction phase of the HVDC cable will utilise multiple raw materials, the largest of which are the cables and associated rock protection. Appropriate materials storage arrangements will be put in place with relevant legislation and best practice. The waste hierarchy and good waste management practices will be employed to manage waste arising. During operation, minimal resource usage and waste generation is expected during maintenance works.

24.7 References

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