



WHITE
ROSE

K35: Onshore Pipeline Route Plans
Technical Transport



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Key Words

Key Work	Meaning or Explanation
Carbon	An element, but used as shorthand for its gaseous oxide, CO ₂ .
Capture	Collection of CO ₂ from power station combustion process or other facilities and its process ready for transportation.
Storage	Containment in suitable pervious rock formations located under impervious rock formations usually under the sea bed.
Transport	Removing processed CO ₂ by pipeline from the capture and process unit to storage.
Dense Phase	Fluid state that has a viscosity close to a gas while having a density closer to a liquid. Achieved by maintaining the temperature of a gas within a particular range and compressing it above a critical pressure.
Route Plans	Plans of the plots of land designated as the sites of the above ground installations associated with the pipeline.

Executive Summary

This report is one of a series of reports; these “key knowledge” reports are issued here as public information. These reports were generated as part of the Front End Engineering Design (FEED) Contract agreed with the Department of Energy and Climate Change (DECC) as part of the White Rose (WR) Project. The contents of this K35 report draws on work, which was undertaken by National Grid and which was partly funded under the European Union’s European Energy Programme for Recovery (EEPR).

White Rose seeks to deliver a clean coal-fired power station using oxy-fuel technology fitted with Carbon Capture Storage (CCS), which will generate up to 448WMe (gross) while capturing at least 90% of the carbon dioxide emissions. CCS technology allows the carbon dioxide produced during combustion to be captured, processed and compressed before being transported to permanent storage in dense phase. The dense phase carbon dioxide would be kept under pressure while it is pumped through an underground pipeline to the seashore and then through an offshore pipeline to be stored in a specially chosen rock formation under the seabed of the southern North Sea.

Delivery of the full-chain project is to be provided by National Grid Carbon Limited (NGCL), which is responsible for the Transport and Storage (T&S) network, and Capture Power Limited (CPL), which is responsible for the Oxy Power Plant (OPP) and the Gas Processing Unit (GPU).

The Onshore Scheme is a Nationally Significant Infrastructure Project (NSIP) pursuant to the Planning Act 2008 and this Report includes part of the supporting documentation being provided in the application for a Development Consent Order (DCO).

The report describes the Route Corridor Study (RCS), the environmental impact assessment (EIA), route plans for the onshore transportation from power station to the low mean water mark and provides onshore route plans, which show location of the associated infrastructure, and others, which indicate the limits of deviation, permanent working areas, temporary working areas and major road, rail and river crossings.

1 Introduction

National Grid Carbon Limited (NGCL) is a wholly owned subsidiary of the National Grid group of companies. Capture Power Limited (CPL) is a special purpose vehicle company, which has been formed by a consortium consisting of General Electric (GE), Drax and BOC, to pursue the White Rose Carbon Capture and Storage (CCS) Project (the White Rose (WR) Project).

CPL have entered into an agreement (the Front End Engineering Design (FEED) Contract) with the UK Government's Department of Energy and Climate Change (DECC) pursuant to which it will carry out, among other things, the engineering, cost estimation and risk assessment required to specify the budget required to develop and operate the WR Assets. The contents of this K35 report draws on work, which was undertaken by National Grid in support of the Don Valley Power Project, which was partly funded under the European Union's European Energy Programme for Recovery (EEPR). The WR Assets comprise an end-to-end electricity generation and CCS system comprising, broadly: a coal fired power station utilising oxy-fuel technology, carbon dioxide capture, processing, compression and metering facilities; transportation pipeline and pressure boosting facilities; offshore carbon dioxide reception and processing facilities, and injection wells into an offshore storage reservoir.

CPL and NGCL have entered into an agreement (the Key Subcontract (KSC)) pursuant to which NGCL will perform a project (the WR Transport and Storage (T&S) FEED Project) which will meet that part of CPL's obligations under the FEED Contract which would be associated with the T&S Assets. The T&S Assets include, broadly: the transportation pipeline and pressure boosting facilities; offshore carbon dioxide reception and processing facilities, and injection wells into an offshore storage reservoir.

A key component of the WR T&S FEED Project is the Key Knowledge Transfer process. A major portion of this is the compilation and distribution of a set of documents termed Key Knowledge Deliverables, which this document represents.

It is proposed that NGCL constructs the pipeline transportation and storage system to support the provision of Carbon Capture and Storage (CCS) technology in the Yorkshire and Humber Region. The Project would comprise the "Onshore Scheme", which includes the construction of a Cross Country Pipeline (including the above ground installations (AGIs) such as Pipeline Internal Gauge Traps, a multi-junction, block valve sites and an onshore pumping station) to transport Carbon Dioxide (CO₂), in dense phase from electricity generation and industrial capture plants in the region and the "Offshore Scheme" which includes an offshore pipeline to transport the CO₂ to a permanent storage site beneath the North Sea. At present, only one installation for the capture of CO₂ streams, the White Rose CCS Project adjacent to Drax Power Station at Selby which is being promoted by Capture Power Limited, would require a pipeline connection into the Cross Country Pipeline. The Onshore Scheme requires a new buried high pressure Cross Country Pipeline of approximately 67km in length with an external diameter of 610mm (24 inch/600mm Nominal Diameter (ND)) for the transportation of the dense phase CO₂ to a location on the Holderness coast. The Offshore Scheme requires a new high pressure 90km sub-sea pipeline to a geological storage site. The storage site presently proposed is a saline formation located approximately 1000m below the seabed. The Onshore and Offshore Schemes would be joined at the Mean Low Water Mark using appropriate landfall techniques. The Onshore Scheme is a nationally significant infrastructure project (NSIP) pursuant to the Planning Act 2008 and this Report is part of the supporting documentation being provided as part of the application for a Development Consent Order (DCO) to the Secretary of State for Energy and Climate Change. The Offshore Scheme is subject to a separate consenting procedure under the requirements of the Petroleum Act 1998 and the Energy Act 2008 and would be subject to a separate application.

2 Purpose

The purpose of this document is to describe the Onshore Scheme and provide:

- a RCS for the onshore transportation scheme;
- the environmental impact assessment for the onshore transportation scheme;
- route plans for the onshore transportation from Drax power station to the low mean water mark, downstream of the pumping facility, to the jurisdictional boundary;
- 1:10 000 onshore route plans showing location of major plant, roads, buildings and lay-down areas; and
- detailed route plans, to 1:2500 scale, indicating the limits of deviation, all the permanent working areas, all the temporary working areas and all major road, rail and river crossings.

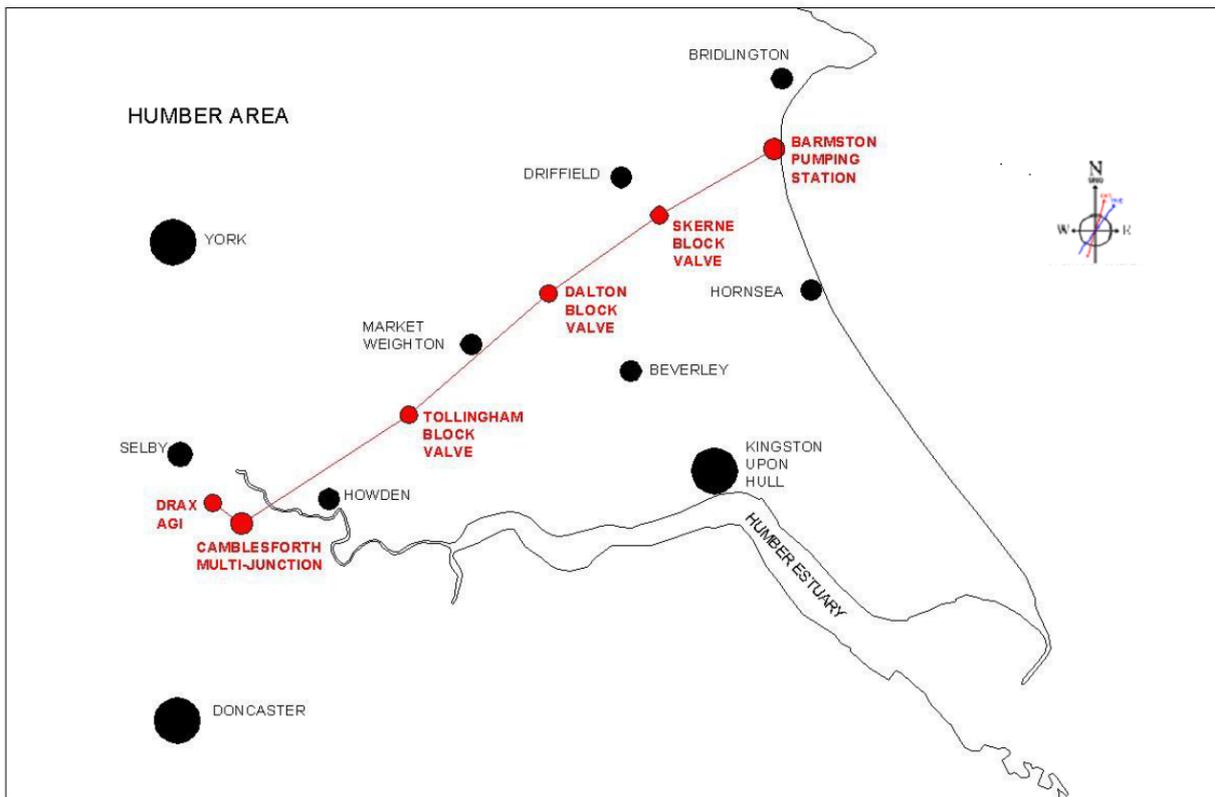
3 Onshore Transport Route Plans

3.1 Overview

The proposed dense phase transportation solution will transport the CO₂ to the offshore storage facilities. The 300mm (12in) Nominal Diameter (ND) pipeline between Drax AGI (located adjacent to the OPP) and the proposed multi-junction, near Camblesforth is approximately 6km in length. The pipeline from Camblesforth multi-junction to Barmston pumping facility would be 600mm (24in) ND, approximately 67km in length with block valve installations located near Tollingham, Dalton and Skerne. The route and installation layouts have been pre-selected as per the description in NGCL's DCO application submitted to the Planning Inspectorate.

Barmston pumping facility is located approximately 1km north of Barmston, primarily positioned to maintain separation distance from Barmston, align with the onshore and offshore constraints and to minimise visual impact through the use of Hamilton Hill as a backdrop. Barmston Pumping Facility is approximately 500m landward of the proposed landfall location.

Figure 3.1: Geographical overview of the onshore transportation facility



The Onshore Transport Route Plans comprises the following documents which were submitted as part of the DCO, these being:

- Part 7.8 Proposed Scheme Report including:
Route Corridor Investigation Report;

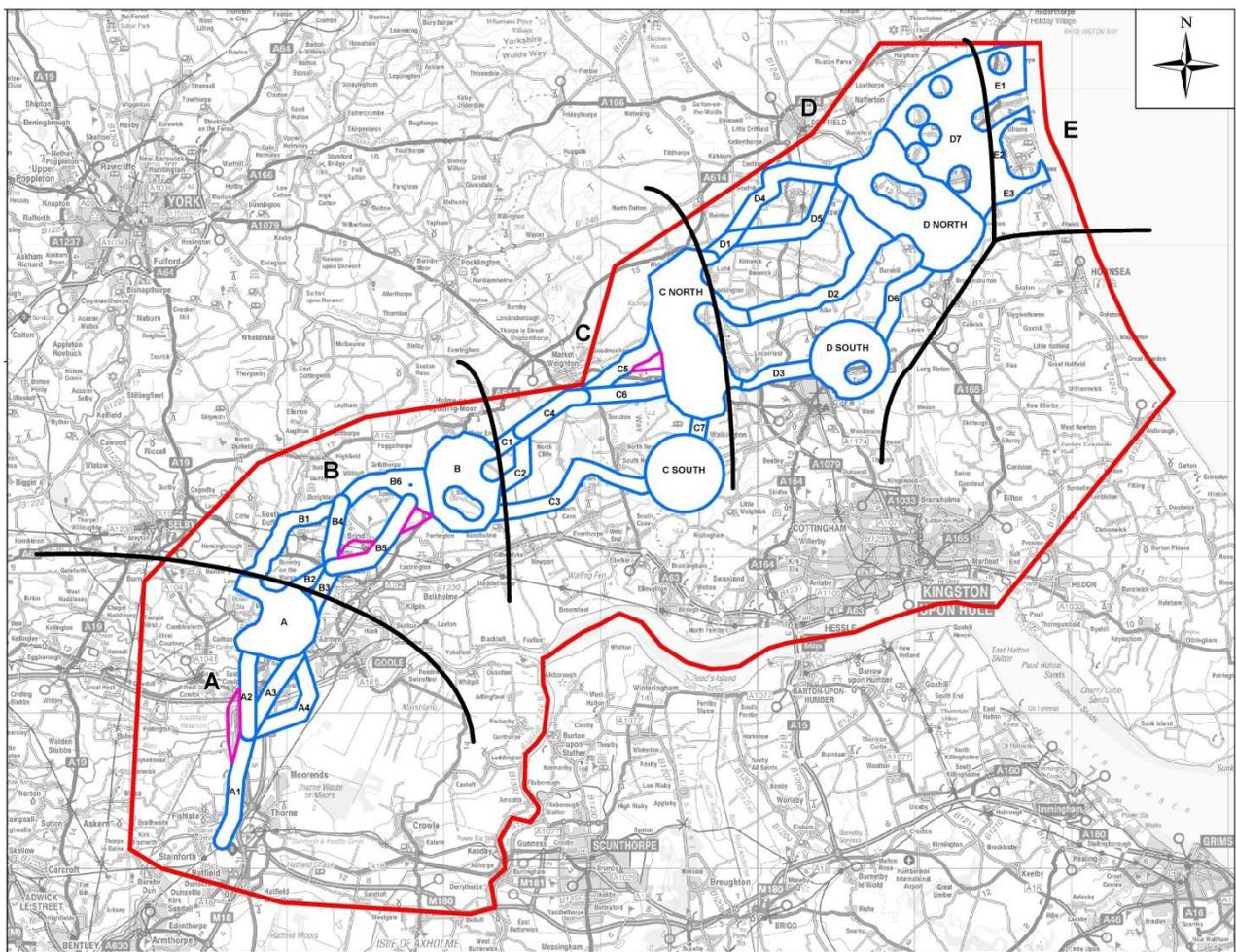
- Volume 6 Environmental including:
The Environmental Impact Assessment;
- Part 2.3 Works Plan Sheets including:
1:2500 Route Drawings;
- Part 2.72 Plans of Statutory / Non-Statutory Environmental Sites & Features Maps 0-10
1:10000 Route Drawings;
- Part 2.73 Plans of Statutory/Non-Statutory Sites & Features of the Historic Environment Maps 0-10
1:10000 Route Drawings.

3.2 Route Corridor Study (RCS)

3.2.1 Introduction

The RCS originally identified a number of route corridor options broadly divided between 5 route corridor zones (labelled A to E), between the Don Valley Power Project site and the Yorkshire / Holderness Coast as illustrated below:

Figure 3.2: Onshore Pipeline Route Corridor Options



The Zones also included areas of search for above ground infrastructure sites (referred to as AGI Option Areas A, B, C North, C South, D North and D South with the possibility of a site also being located within Corridor Zone E) that would be anticipated to be needed such as a block valve sites at approximately 15km intervals and a pumping station prior to the pipeline going offshore.

3.2.2 Route Corridor Options

Within the Zones a number of route corridor options have been defined as follows:

- Zone A – 4 route corridor options (A1 to A4);
- Zone B – 6 route corridor options (B1 to B6);
- Zone C – 7 route corridor options (C1 to C7);
- Zone D – 6 route corridor options (D1 to D611);
- Zone E – 3 route corridor options (E1 to E3). Several potential several combinations would be therefore possible and would be identified later in this report.

The Zone A corridors would principally support the Don Valley project; only the northern section would be required to support the White Rose project, but the considerations of the whole zone would be included for completeness. The initial route corridor options (Zone A) progress from Stainforth and subsequently split into three possible options near Rawcliffe Bridge under the M18 and M62 motorways, close to the Dutch River. Importantly, these options then converge north of Rawcliffe, to accommodate an area of search for a block valve site to the east of Drax, which is now the site of the proposed clean coal-fired power station using oxy-fuel technology and fitted with CCS.

The route corridor options (Zone B) then progress in an easterly direction, and broadly comprise options to cross either the River Ouse or River Derwent to the east of Selby. Route corridor options include an option to the north of Howden, an option to the north of Wressle or a combination of the two. Route corridor options then converge to the south of Holme on Spalding Moor to accommodate an area of search for a block valve site.

Route corridor options from this block valve search area then progress in an easterly direction (Zone C) and comprise a route corridor option to the south of Market Weighton and a route corridor option to the north of Hotham. The most southerly of these two route corridor options may necessitate a block valve site located to the west of Walkington. These route corridor options then converge on an area to the south of Middleton-on-the-Wolds and the north west of Bishop Burton to accommodate an area of search for a block valve site.

Route corridor options from this area then progress eastwards (Zone D) and comprise three broad alternatives: routing eastwards from Middleton-on-the- Wolds towards Hutton Cranswick and subsequently to south of Skome; routeing from the east of South Dalton towards Wilfholme; and routeing from the north of Bishop Burton towards the north of Beverley subsequently progressing in a north easterly direction to the north of Brandesburton. The most southerly of these options may have required a block valve site to the north east of Beverley. A further area of search for a block valve site is included on the area surrounding North Frodingham before the route corridor options progress (Zone E) towards the Holderness Coast.

Three broad landfall zone options for the pipeline were considered on the Holderness Coast, namely an area to the east of Fraisthorpe, an area between Barmston and Ulrome and an area to the east of Skipsea.

3.2.3 Feasible Combinations of Route Corridor Options and AGI Option Areas

Although a variety of route corridor options were identified within each zone, together with options for alternative block valve site search areas linking Zone C with Zone D and Zone D with Zone E, in practice only certain combinations of route corridor options were considered to be feasible. These combinations were:

Zone A	A1 – A2; A1 – A3; A1 – A4;
Zone B	B1 – B6; B2 – B4 – B6; B2 – B5; B3 – B4 – B6; B3 – B5;
Zone C	C1 – C4 – C5; C1 – C4 – C6; C2 – C4 – C5; C2 – C4 – C6; C3 – C7;
Zone D	D1 – D4; D1 – D5; D2; D3 – D6;
Zone E	E1; E2; E3.

The combined route corridor options, and the particular areas of search for block valve and other above ground infrastructure sites, would be reflected in the tales below.

3.2.3.1 Zone A Corridors

There was little to differentiate options in Zone A with respect to environment, it is however regarded that shorter routes generally have the potential for fewer environmental effects which would therefore favoured options A1/A2. With regard to constructability corridor option A1/A2 has several advantages: the route is shorter which potentially reduces the construction programme and limits time spent constructing in a floodplain environment. The options would also require fewer crossings of significant linear features. Consultation responses were noted, but provided limited scope to assist in corridor selection. Importantly, corridor option A1/A2 provided the opportunity to route closer to Drax and is the preferred option in Zone A.

Table 3.1: Review of Zone A Corridors

Corridor	Comments
A1 – A2	<ul style="list-style-type: none"> ▪ Corridor A1/A2 is of shorter length and therefore requires potentially a shorter construction period, its shorter length also minimises working time in a flood zone that is common to all options. It also has the least number of crossings of significant linear features and offers more readily available access. ▪ Routes the proposed pipeline closer to Drax power station, desirable as would enable Drax to connect. ▪ Good option due to proximity to the existing natural gas pipeline in the area – benefit of existing ground data. ▪ In close proximity to housing in the area. ▪ Best option to avoid traffic congestion through Airmyn. ▪ Passes close to Scurff Hall, a listed English Heritage site. ▪ Avoids a potential difficult crossing of the Dutch River.
A1 – A3	Corridor A1/A3 is of a longer length therefore would require a potentially longer construction period. Additional large crossing and access issues known as “lock outs” would be noted to be required when compared to A1/A2.

-
- A1 – A4
- Aside from designated features, it is noted that A1/A4 includes a potential planning allocation across the eastern half of the corridor, the presence of which and its extent makes this a less favourable option when considered against other options in this zone.
 - It is also noted that this option is longer than other route options; in the absence of other differentiating factors, in general terms, a shorter pipeline length is likely to present fewer potential effects.
 - In addition the combined crossing of the Aire and Calder Navigation and railway would restrict crossing techniques options and this option is therefore less preferable.
 - Passes close to wind farms and is adjacent to Asselby Island nature reserve.
 - Cuts through the Thorntree Pumping Drain.
 - Previous projects have had difficulty crossing the Dutch River and Canal due to ground conditions.
 - Badger sets would be known in proximity to the route (1 stakeholder) (A4).
 - Significant damage to land and soil structure through previous pipeline projects.
-

The proposed detailed route for the WR applicable section of the Zone A corridor is as follows:

From the Drax PIG Trap the pipeline would run north crossing Carr Dike immediately west and north of Drax Augustinian Priory Scheduled Monument. It would then turn east southeast crossing Lendall Drain to the north of Drax Abbey Farm before turning south to cross Pear Tree Avenue to the west of Old Lodge. The Pipeline Envelope continues south and crosses Carr Lane to the east of New Close Wood before turning east to cross a dismantled railway. After running to the north of Woodcock Wood, the pipeline would turn southeast to cross Main Road immediately north of Woodlands, Drax.

Deflecting south, the pipeline would run to the east of playing fields and crosses Church Dike Lane before turning southwest to cross Hales Lane track, and west to cross Brickhill Lane, keeping well to the south of Castle Hill Moated Site Scheduled Monument. The pipeline would then deflect southwest and then south southwest crossing the A645 southeast of Wade House Lane and West of Brockholes lake (a Site of Importance for Nature Conservation (SINC)) to enter the Multi-junction site at Camblesforth.

From Camblesforth Multi-junction site the pipeline would head north crossing the A645, east of Wade House Lane and west of Brock Holes Fish Pond. It would then turn east crossing Brickhill Lane (track), and passing to the south of Caste Hill moated site Scheduled Monument, before turning north eastward and crossing Hales Lane (track) and Church Dike Lane. Thereafter the pipeline would run to the northwest of Scurff Hall Scheduled Monument, before crossing the River Ouse.

3.2.3.2 Zone B Corridors

Within Zone B, with regard to environmental issues Route Corridor B1 (and therefore Option B1 / B6) were discounted due to the unavoidable SAC site. Options that included Route Corridor B4 required the crossing of an unavoidable local nature conservation site which, along with the corridor's longer length made these Route Corridor Options less preferable. In addition, access issues and the requirement for an additional special crossing within B6 limited the attractiveness of this Route Corridor Option from a constructability perspective.

Route Corridor Options B2/B5 and B3/B5 were considered similar, but the location of a wind farm in Search Area A limited routeing options to B3 meaning Route Corridor Option B2 was preferred.

On balance, it was considered that a combination of potentially lower environmental impact and easier access for construction activity resulted in B2/B5 being preferred.

Table 3.2: Review of Zone B Corridors

Corridors	Comments
B1 – B6	It is noted that the River Derwent SAC is unavoidable within route corridor B1/B6 which would make it less preferable when compared to other options. Corridor B1 would necessitate an additional crossing of the River Aire: a significant linear feature in a location offering limited access for construction.
B2 – B4– B6	Options which include B4 would include crossing a local nature reserve and would be of longer length.
B2 – B5	Due to their similar length there is however little to differentiate between options B2/B5 and B3/B5 in environmental terms.
B3 – B4 – B6	Options which include B4 would include crossing a local nature reserve and would be of longer length. The location of a wind farm in AGI Option Area A however would mean that access to corridor B3 would be more limited.
B3 – B5	Due to their similar length there is however little to differentiate between options B2/B5 and B3/B5 in environmental terms. The location of a wind farm in AGI Option Area A however would mean that access to corridor B3 would be more limited.

The proposed detailed route for Zone B is as follows:

From the River Ouse the pipeline would continue northeast towards Asselby crossing Gateland Field Lane (track) and Lowfield Drain and deep field ditches. It would cross three existing gas pipelines, a dismantled railway and Barmby Road to the West of Asselby. The pipeline would then continue northeast, crossing an existing gas pipeline, Asselby Marsh Drain, Old Derwent (culvert), New Drain, and an adjacent track before crossing the A63 Hull Road and Black Dyke between Newsholme and Newsholme Parks.

The pipeline would continue north eastward, crossing a multi-fuel pipeline before crossing the railway to the west of Brind Crossing and Brind Village. The pipeline would then cross Brind Lane and passes immediately to the south of Brindley's Plantation Local Wildlife Site (LWS); while it would pass outside the woodland, it would be within the current LWS boundary.

After crossing the B1228 to the north of Brind and north of Brickyard Farm the pipeline would then trend eastward. It would then run parallel to Featherbed Lane initially on the north side before crossing to the south. The pipeline would then crosses back to the north of Featherbed Lane and to the west of Rose Villa Farm.

Heading northeast then east it would cross the A614 Holme Road to the south of Ivy House and the north of Avian Pastures. The pipeline would then head northeast, crossing the River Foulness and then Burse Lane, to the north of Burse and to the south of Burse Lane Farm.

The pipeline would continue north eastward, crossing Drain Lane to the northwest of Grange Farm and Throlam Plantation, and on into the Tollingham Block Valve site.

3.2.3.3 Zone C Corridors

All Options in Zone C were within the Yorkshire Wolds Area of High Landscape Value. Route Corridor Option C3/C7 would have required an additional Block Valve site in the Area of High Landscape Value. C3/C7 also offered little attraction from a constructability perspective where greater topographical challenges, length and the requirement for an additional Block Valve meant collectively that these options were less preferable.

Corridor C2 was discounted in favour of C1 due to its additional length and increased exposure to the flood plain. Due to more challenging topographic issues in Zone C6, C5 was also considered preferable from a constructability perspective.

One observation from a respondent however did highlight that Route Corridor Options C1/C4/C5 would be most direct.

C3, C7 and C2 were discounted from an environmental and constructability perspective. With little to differentiate C5 and C6 environmentally and from a review of consultation responses it was considered that C5 should be pursued as it offered favourable topography compared with C6 and consequently was likely to be easier to construct. The preferred option was C1/C4/C5.

Table 3.3: Review of Zone C Corridors

Heading Left	Heading Right
C1 – C4 – C5	Option C1 includes an avoidable but active sand and gravel extraction site. Option C5 includes a SSSI, and local nature conservation. The topography corridor option C5 appears to offer a less challenging gradient than C6 and would require less 'benching'.
C1 – C4 – C6	Option C1 includes an avoidable but active sand and gravel extraction site. Option C6 includes scheduled monuments, a local nature conservation site, a Regionally Important Geological Sites (RIGS) site, and a proposed wind farm.
C2 – C4 – C5	Option C2 is longer than option C1 and crosses a greater extent of flood plain. Option C5 includes a SSSI, and local nature conservation. The topography corridor option C5 appears to offer a less challenging gradient than C6 and would require less 'benching'.
C2 – C4 – C6	Option C2 is longer than option C1 and crosses a greater extent of flood plain. Option C6 includes scheduled monuments, a local nature conservation site, a RIGS and a proposed wind farm.
C3 – C7	When linked with other options, due to the potential additional length, it is noted that route corridor option C3/C7 would require an additional block valve site. This option also has significant embankments, steep gradients, and access is restricted due to the location of the Market Weighton Canal.

The proposed detailed route for Zone C is as follows:

From Tollingham Block Valve site the pipeline would continue northeast and crosses Skiff Lane between Skiff Farm and Tollingham Cottages and then continue north eastward to cross Lock Lane to the east of High Garth.

It would then head east crossing Back Delfin Drain (on the alignment of the disused Market Weighton Canal) to the south of Sand Lane and then cross Sand Lane to the west of Oakwood and head northeast, towards Market Weighton.

To the south of Market Weighton the pipeline would cross Cliffe Road, to the south of Long Lane. It then would head in a north easterly direction, before crossing the A1034, Gaufer Hill and the putative line of a Roman Road.

From here the pipeline would enter the Yorkshire Wolds (an Area of High Landscape Value). It would pass between Weighton Wold House and High Wold Farm and then cross the A1079 on Arras Hill.

From the A1079 the pipeline would continue north east. Its route would cross within the boundary of a RIGS (also a Geomorphological Site). It would then cross an existing ethylene pipeline before crossing Kiplingcotes Lane.

After crossing Kiplingcotes Lane due east of Goodmanham Lodge Farm, the pipeline then would turn north to cross the Hudson Way (disused railway) to the east of Station House, Kiplingcotes Station and a disused quarry which is a RIGS. The Hudson Way is a long distance footpath, a Local Nature Reserve and LWS.

The pipeline would then head north, crossing Kiplingcotes Road, and Kiplingcotes Racecourse Road, paralleling a minor road to the west. It would then cross Holme Wold Road and then turn to run east northeast across Great West Field into the Dalton Block Valve site.

3.2.3.4 Zone D Corridors

Due to the location of a proposed wind farm, and the need for extra Block Valve within the Yorkshire Wolds Area of High Landscape Value Route Corridor Option D3 /D6 was considered to be less attractive when compared to other options.

Due to constructability considerations, including working below sea level, pumped drainage, access restrictions and potential proximity to a site of recreational value Route Corridor Option D2 was also not preferred. Discounting D2 appeared to be broadly supported by respondents to the consultation who identified nature conservation constraints as being of value in this area. D4 and D5 would have necessitated a requirement to cross two SSSI rivers when entering a Block Value in Zone D. If route D4 or D5 were to have been progressed the potential effect on this resource would have had to have been balanced against the potential construction constraints, in particular the long sections of working in a flood zone. On balance and due to the potential to cross the SSSIs using non-open-cut techniques, Route Corridor Options D1/D4 or D1/D5 were considered preferable to D2.

Route Corridor Option D1/D4 offered fewer crossings, fewer lock outs and avoided an area of flood zone when compared to D1/D5. In the absence of other clear differentiating factors option D1/D4 was preferred.

Table 3.4: Review of Zone D Corridors

Corridors	Heading Right
D1 – D4	This option is likely to necessitate the crossing of two SSSI Rivers within AGI Option Area D North. Option D1/D4 offers the requirement for fewer crossings than options D2 or D3/D6, better access provision during construction and avoids an area of flood zone 3.
D1 – D5	This option is likely to necessitate the crossing of two SSSI Rivers within AGI Option Area D North. Option D1/D5 offers the requirement for fewer crossings than options D2 or D3/D6, better access provision during construction and avoids an area of flood zone 3.
D2	Option D2 includes an extensive area of flood potential. It requires working below sea level and pumped drainage. This route would have access restrictions and off easement access requirements during the construction phase. In addition, topographical challenges on the route mean that option D2 is considered less preferable when compared against options D10/D4 or D1/D5.
D3 – D6	Option D3/D6 is notably longer than other options and could necessitate an additional block valve. It would require extensive off easement access during construction due to the limited highway network in the area. Option D3/D6 crosses a SSSI and the area for the proposed Hall Wind Farm the coverage of which would be potentially unavoidable creating a significant constraint to routeing within this corridor.

The proposed detailed route for Zone D is as follows:

From Dalton Block Valve the pipeline would head northeast, crossing Lund Wold Road to the west of Corporation Farm and Middleton Road to the northwest of Lund, then passing to the north of Lund and southeast of Middleton-on-the-Wolds and then crossing the B1248 due north of Lund and to the south of East Field. It would then continue north easterly crossing Middleton Road to the immediate southeast of Lund Chalk Quarry then crossing Bracken Beck to the east of Poultry Houses.

The pipeline would then pass to the northwest of the small settlement of Bracken, before continuing northeast through agricultural fields towards Hutton Cranswick, crossing an unnamed northward extension of Bracken Lane, due north of Bracken and Burnbutts Lane to the west of Burn Butts Farm and Cottages. It would then pass between Bustardnest Fox Covert and Bustard Nest Farm before turning east then northeast.

To the west of Hutton Cranswick the pipeline would cross Southburn Road, the A164, Beverley Road, and Jenkinson Lane between Allotment Gardens to the south and Old Gawdy Hall to the north. It would then cross Northfield Beck, due north of Hutton.

From here the pipeline would run in a more easterly direction, crossing a railway line south of Knorka Dike. It would then cross Knorka Dike itself, and Rickle Pits, west and north respectively of Rickle Pits Farm. From Rickle Pits Road the pipeline would head east, running to the south of Skerne between blocks of woodland and into Skerne Block Valve Site.

3.2.3.5 Zone E Corridors

Corridor E3 performed less favourably than other Options on environmental grounds due to the location of the offshore Draft Marine Conservation Area and SSSI in the centre of the Route Corridor Option. In addition the height of beach cliffs in this area being greater than other Route Corridor Options meant that the Route Corridor would offer less flexibility on the approaches to the construction of the landfall. Comments from the consultation were reasonably balanced with coastal erosion cited as a common concern in options E1 and E3.

As there were no strong reasons to differentiate between E1 and E2, and due to the need to consider offshore connections, at that stage of Onshore Scheme development both Route Corridor Options were retained.

Comments on corridor E3 also included the potential effect on development sites as well as all the general issues raised as listed above. Comments regarding the effect on the SSSI and habitats, and relating to coastal erosion in particular, were in greater numbers than for corridors E1 and E2.

On the basis of the responses received the preferred options in this Zone were E1 and E2, when considered against E3. E1 was the preferred options as the E2 corridor was complicated by the proximity of a route of a high voltage direct current cable to a proposed wind farm.

Table 3.5: Review of Zone E Corridors

Heading Left	Heading Right
E1	Option E1 constructability concerns include a wind farm constraint proximity issues and the offshore conditions.
E2	Corridor E2 raises potential UXO/UXB issues and proximity considerations due to the location of North Frodingham
E3	<p>Adjacent to option E3 there is a Draft Marine Conservation Zone which affects the attractiveness of this option when consideration is given to the need for an offshore pipeline. Option E3 contains a SSSI which although avoidable, is in a prominent position on the coast in the centre of the corridor option.</p> <p>This option is in close proximity of a caravan park; it has potential UXO / UXB and the cliffs (which would be higher than options E1 or E2).</p>

The proposed detailed route for Zone E is as follows:

From Skerne Block Valve would then continue north and then northeast towards Wansford where it would cross Main Drain, the River Hull and the Driffield Canal to the south of Wansford, between Wansford Bridge and Snakeholm Bridge. The land between Main Drain and the River Hull is part of a Yorkshire Wildlife Trust Nature Reserve and the River Hull is a SSSI.

From the crossing the pipeline would continue northeast, crossing fields with numerous drains (including Nafferton Highland Stream and White Dike) before passing between south Cattleholmes and Fox Covert where it would cross Kelk Beck (SSSI).

Running eastward the pipeline would cross Main Street between Great Kelk and Gembling. From Main Street it would then head east then north to Barf Hill (LWS) where it would then turn east northeast to cross Gransmoor Drain avoiding the LWS and Gransmoor Quarry to the north and the sand and gravel pits and Lissett Wind Farm to the south.

From Gransmoor Drain the pipeline would continue east northeast, crossing Gransmoor Road southeast of Manor Farm. It then would turn northeast to cross Burton Drain at Carr Hill, and east to run between Stone Hills to the north and Spring Hill, before crossing the A165, Bridlington Road, to the north of Quintin Garth. From the A165, the would run east and then northeast to the Barmston Pumping Station site, to the immediate northwest of Hamilton Hill, north of Barmston.

To the east of Barmston Pumping Station the pipeline would head southeast before heading due east to cross the cliffs to the south of Barmston Sands and extending to the Mean Low Water Mark where the onshore pipeline would effectively terminate.

3.3 The Environmental Impact Assessment

The route corridor options were reviewed in relation to their potential effects on unavoidable designated ecological sites. Within each Zone there would be corridor options which do not contain any unavoidable nature conservation features. The RCS identifies avoidable features within each corridor option.

3.3.1 Zone A Corridors

There was little to differentiate Route Corridor Options in Zone A with respect to the environment; it was however regarded that shorter routes generally have the potential for fewer environmental effect, a point which therefore favoured options A1/A2. With regard to constructability, Route Corridor Option A1/A2 had several advantages: the Route Corridor was shorter which potentially could reduce the construction programme and limit time spent constructing on a floodplain. A1/A2 would also have required fewer special crossings. It was noted that Route Corridor Option A1 / A2 provided the opportunity to route closer to Drax, a potential future emitter, and avoided a potential difficult crossing of the Dutch River.

3.3.2 Zone B Corridors

With regard to environmental issues within Zone B, Corridor B1 (and therefore Option B1/B6) has been discounted due to the unavoidable River Derwent SAC/SSSI, which due to its designations is of 'very high' concern. Options that include route corridor B4 require the crossing an unavoidable local nature conservation site which, along with its longer length would be less preferable. In addition, access issues within B6 limit the attractiveness of this corridor from a constructability perspective. Corridor options B2/B5 and B3/B5 would be considered similar but the location of a wind farm in search area A limits routeing options for B3 meaning corridor B2 is preferred. Issues raised during the consultation were largely common to all options (e.g. effect on agricultural resources) and cannot be used to influence route selection. On balance, it is considered that a combination of potentially lower environmental effect and easier access for construction activity indicated that B2/B5 to be the preferred option.

3.3.3 Zone C Corridors

All options would be within the Yorkshire Wolds Area of High Landscape Value, cross areas of archaeological potential, SPZs (Special Planning Zones) and potentially contaminated land. When linked with other options, due to the potential additional length, it is noted that route corridor option C3/C7 would require an additional block valve site and therefore the option is considered to perform less well when considered against alternatives.

Option C2 is longer than option C1 and crosses a greater extent of flood plain. On balance option C1 is considered to perform better than C2 on environmental grounds.

There is little to differentiate options C5 and C6 in terms of avoidable constraints. Where unavoidable features do not help differentiate between options it is appropriate to consider the location of avoidable features which can help identify the relative constrained nature of each corridor. With respect to avoidable features, C5 includes a SSSI, and local nature conservation, whilst C6 includes scheduled monuments, a local nature conservation site, a RIGS, and a proposed wind-farm; however these constraints offer limited opportunity to differentiate on environmental grounds.

3.3.4 Zone D Corridors

Option D3/D6 crosses a SSSI and the area for the proposed Hall Wind Farm the coverage of which would be potentially unavoidable creating a significant constraint to routeing within this corridor.

Corridor options D1/D4 and D1/D5 have few differentiators and would be of similar length; both options would be likely to necessitate the crossing of two SSSI Rivers within AGI Option Area D North.

Both option D1/D4 and D1/D5 offer the requirement for fewer crossings than options D2 or D3/D6, better access provision during construction and avoids an area of flood zone 3.

If route D4 or D5 were progressed then the potential effect on this resource must be balanced against the potential construction constraints. On balance, and since river SSSIs would be crossed using non open cut techniques thus being capable of avoiding significant harm, routes D1/D4 or D1/D5 would be considered preferable to D2.

3.3.5 Zone E Corridors

Although not indicated in the onshore considerations there is a Draft Marine Conservation Zone adjacent to the coast at E3; this affected the attractiveness of this option when consideration is given to the need for an offshore pipeline. It is also notable that Corridor E3 contains a SSSI which although avoidable, is in a prominent position on the coast in the centre of the corridor option and when considered alongside the nearby RIGS could affect routeing options.

There is little to differentiate between corridors E1 and E2, both include unavoidable mineral safeguarding areas of archaeological potential. Corridor E2 however includes an additional avoidable local nature conservation site (moderate) and Regionally Important Geological Site (moderate).

4 Environmental Considerations

4.1 Overview

4.1.1 The issues covered in the Environmental Inspection Assessment (EIA) and how they were to be assessed had been developed through consultation and the professional judgement of the specialists undertaking the assessments. The Scoping Opinion identified the information that the Secretary of State would require to be included in the Environmental Statement (ES). The following specialist assessments were undertaken:

- Water Resources and Flood Risk
- Geology and Ground Conditions
- Land Use and Agriculture
- Ecology and Nature Conservation
- Archaeology and Cultural Heritage
- Landscape and Visual Amenity
- Air Quality
- Noise and Vibration
- Traffic, Transport and Access
- Socio-Economics Including Recreation and Tourism.

4.2 Water Resource and Flood Risk

The EIA considered the effects of the Onshore Scheme on surface water resources, including commercial fisheries, drinking water abstractors, or water dependent nature conservation sites. It also considered flood risk.

There would be a total of 142 watercourses crossed by the Pipeline Envelope. These watercourses range from larger systems like the River Ouse to many small watercourses and drain into three different river catchments (Aire & Calder catchment; Yorkshire Derwent catchment; and Hull & East Riding catchment). Twelve of these would be crossings designated in line with the Water Framework Directive (WFD). The WFD commits the UK Government to achieving a good status for certain watercourses.

The potential for effects on water resources would be greatest during the construction of the Onshore Scheme. This is mainly due to the risk of pollution during the construction stage, where construction activities would be in close proximity to watercourses or at one of the 142 watercourse crossings the proposed Cross Country Pipeline is required to make, or where agricultural drains have to be re-routed. Pollution of watercourses could also result in secondary effects on commercial fisheries, water supplies and water dependent nature conservation sites.

Once operational, the effects of a Cross Country Pipeline would be reduced, although there remains the potential for adverse effects associated with the AGIs as a result of new hardstanding areas that increase surface water runoff rates.

Flood risk was assessed along the Onshore Scheme and the assessment included consideration of the existing risk of flooding from rivers and ordinary watercourses crossed by and close to the Onshore Scheme as well as temporary and permanent risk of flooding which would result from run-off from

hardstanding areas which would be needed as part of the temporary construction facilities and for the permanent footprint of the AGIs.

For surface water quality, construction work would be undertaken in accordance with the Code of Construction Practice and Requirements, appropriate method statements, and consents/ licenses would be obtained from environmental regulators including the Environment Agency. Good Practice would be implemented in accordance with the most up to date guidance at the time of construction. Mitigation measures would be implemented to:

- manage the generation of runoff containing mud and silt;
- ensure suitable storage and spillage emergency response is in place;
- control the use of herbicides during site clearance;
- manage waste water disposal;
- re-route and reinstate agricultural drainage;
- preventing debris entering temporary or permanent drainage systems;
- the storage of materials or spoil within the flood plain would be avoided where possible, or alternatively gaps would be left in linear stores.

Twelve watercourses, including all but one of the WFD watercourses (Bracken Beck), would be crossed without the need to dig a trench.

The assessment has identified potentially adverse effects as a result of the construction of the Onshore Scheme, including the risk of pollution and generation of silt laden runoff. However, through the adoption of recognised good working practices, as set out in the Code of Construction Practice which accompanied the DCO application, the risks of pollution would be managed and mitigated so that residual effects would be typically classed as Neutral or Minor Adverse (Not Significant) and not likely to occur.

In the longer term, some operational and enduring effects would be predicted to be Minor Adverse (also Not Significant). This occurs at watercourse crossings where the channel is predicted to change as a result of the crossing method used. As far as possible, techniques which limit works within watercourses, such as Horizontal Directional Drilling (HDD), would be used, but there would be some smaller watercourses where this is not feasible and open cut techniques would have to be adopted.

Operational and enduring effects on water resources occurring as a result of the AGIs would be generally Neutral (Not Significant). Whilst the permanent development of hardstanding areas will increase surface water runoff rates and the AGIs introduce a potential source of pollution, through their design a number of measures have been incorporated to mitigate potential adverse effects. This includes the use of Sustainable Urban Drainage Systems (SUDS) at the AGIs and the use of bunding and sumps to mitigate the risk of oil pollution.

The risk of flooding has been assessed for all phases of the Onshore Scheme and was determined to be Minor Adverse (Not Significant). The assessment concluded that, with the appropriate design, planning and site management proposed, these risks would be reduced to a level which is not significant.

4.3 Geology and Ground Conditions

The potential for any existing ground contamination affecting the Onshore Scheme was considered as well as the potential effects of the Onshore Scheme on the soils, geological and hydrogeological characteristics within the Onshore Scheme area.

The bedrock underlining the pipeline varies from Sherwood Sandstone near Camblesforth through Mercia Mudstone and then chalk between South Dalton and Barmston. The Sherwood Sandstone and chalk along the route would be classified as Principal Aquifers (because they usually provide a high level of water storage), while the Mercia Mudstone is classified as a Secondary B Aquifer (because it may store and yield limited amounts of water).

There would be groundwater Source Protection Zones (SPZs) around Drax and also in the Tillingham to South Dalton section of the route, and a number of groundwater abstractions. SPZs would be defined by the Environment Agency to help protect drinking water supplies from pollution.

There would be four sites close to the proposed route that would be protected for their local, national or regional importance for geology and geomorphology, which would be called Regionally Important Geological Sites (RIGS). All would be avoided, except the Goodmanham Channel RIGS, which would be crossed on its southern edge. Despite this, no negative effects would be anticipated on the underlying geology and the route would not cross any areas of exposed geology, which is the main feature of the site.

Potential effects that could occur during the construction phase would be those associated with spillages and leaks of fuel and chemicals during the operation of construction plant, degradation of soil quality during the handling and movement of soils, as well as dewatering affecting groundwater levels. Other effects may occur from the use of herbicides during site work used to inhibit the growth of vegetation.

The main mitigation measure to prevent adverse effects on soils, geology and hydrogeology during all phases of the development of the Onshore Scheme is to ensure good site practice and management. These good working practices would be set out in the Code of Construction Practice (CoCP) which accompanies the DCO application.

Effects to human health as a result of chemical spillages and leaks from plant machinery to ground and groundwater would be Neutral (Not Significant), as good working practices would be committed to in the CoCP. Effects to ground water would be predicted to be Minor Adverse (Not Significant) as although the risk of contamination would be very low, the groundwater receptors would be considered to be of high importance.

Ground pollution may occur due to the use of herbicides during site work used to inhibit the growth of vegetation on stored soils. The effect on underlying rocks and soil would be Neutral (Not Significant), as the herbicides that would be used will only be those that break down readily in the soil, such as glyphosate. Although the risk of contamination would be very low, the fact that the ground water is categorised as a sensitive receptor means the effect is considered to be Minor Adverse (Not Significant).

Effects on soil structure and reduction of soil quality through compaction or erosion during storage or movements of heavy vehicles would be predicted to be Neutral (Not Significant), as good site practice and

management would be applied in accordance Defra guidelines, including not handling topsoil in wet conditions.

There would be a need to lower groundwater levels in some areas in order to allow for the pipeline to be laid in dry ground. Groundwater levels would be locally affected and this could lead to a reduction in baseflow to watercourses (rivers and streams) in the surrounding area. With mitigation in place following good site practice and management in accordance with the CoCP the residual effects on groundwater would be Minor Adverse (Not Significant).

Effects to human health, groundwater and underlying rocks and soils from the construction and operation of AGIs would be predicted to range from Neutral to Minor Adverse (Not Significant) as long as good site practices would be complied with in accordance with the CoCP.

4.4 Land Use and Agriculture

This section summarises the potential effects of the Onshore Scheme on land use, including the agricultural land use within the Study Area.

There would be no land use allocations that conflict with the Onshore Scheme and no existing planning permissions that would be affected.

The total area of agricultural land in the East Riding of Yorkshire, within which the majority of the Onshore Scheme is located, is 205,243ha, and in the Yorkshire and Humber region as a whole the area is 1,112,382ha. Although the agricultural uses in the Yorkshire and Humber region roughly mirror those of the UK, there is a significantly higher amount of arable production in the East Riding of Yorkshire than the average for the UK. Crops and bare fallow account for 86% of the agricultural land in the East Riding of Yorkshire, whereas for the Yorkshire and Humber area is 50%; the remaining land being largely grassland (46%). Around 1,000 farm businesses manage 80% to 90% of the agricultural land in the East Riding of Yorkshire.

Published information covering the Pipeline Envelope shows that in terms of Agricultural Land Classification there is approximately 10% Grade 1, 35% Grade 2 and 55% Grade 3. This confirms that the area is higher than the national average for the presence of the best and most versatile (BMV) land.

There would be a total of 87 farms in various levels of Environmental Stewardship Schemes, where farmers would be paid to manage their land in a way that is favourable to wildlife. Most of these would be in the 'entry level', however, 20 would be in a 'higher level' scheme.

Effects on land use would occur as a result of land take during the construction and operation phases of the development. The vast majority of land take is temporary for the Cross Country Pipeline and for the temporary construction compounds and storage areas. However, there is some permanent land take associated with the AGIs, including access and landscape planting.

The likely temporary land take for the whole of the Onshore Scheme is 294.64ha, which is only around 0.23% of the agricultural land area in the East Riding of Yorkshire and 0.042% of the agricultural land in the wider Yorkshire and Humber region.

In terms of permanent land take the total area lost is 22.76ha.

Another potential effect would be where the working width could lead to difficulty moving livestock from one side of the working width to the other. However, the majority of farms would be arable and access across the working width would be maintained during construction wherever possible.

The most important mitigation measures would be the fact that construction work is relatively short term (April to September inclusive) and that there is a commitment made to stripping, storing and reinstating agricultural soils in a way that protects the physical properties of the soil necessary to return to full productivity.

Any demonstrable loss of earnings to those farm units affected directly or through severance would be compensated, meaning that economic effects on farming would be Neutral.

Within the Pipeline Envelope there is the potential for soils to be compacted and soil structure to deteriorate, especially where heavy materials or equipment would be stored. However, a commitment is made to good soil management, including storage and restoration, to ensure there is no long term soil degradation.

Whilst agricultural land is a valuable resource, the effects of temporary land take would be considered to be small as they would be likely to persist for only one pipeline construction season from April to September. The temporary nature of the land take means that only a Negligible effect (Not Significant) on agricultural land is likely.

The Onshore Scheme would affect existing Environmental Stewardship Schemes within the Pipeline Envelope. The majority of land within the Pipeline Envelope is entered into an Environmental Stewardship Scheme at some level. Environmental Stewardship provides funding to farmers and other land managers who deliver effective environmental management on their land. The main effect on Stewardship Schemes would be financial loss to the farmer during the construction phase of the Onshore Scheme, as land would not qualify for Stewardship payments during this time. However, farmers subject to financial loss would also be compensated by National Grid. Following the completion of construction, all areas subject to Environmental Stewardship agreements would be reinstated to their former condition and thus there is no reason why the same or similar agreements cannot be reinstated following construction. Therefore there would be a Neutral effect (Not Significant) on farmers signed into these agreements.

Once the Pipeline is completed, all the areas affected would be returned to agriculture therefore reversing the temporary adverse effects on agricultural activity. Through appropriate compensation methods, the effect on farming practices and the farming economy is predicted to be Neutral (Not Significant).

There would be a permanent loss of 22.76ha of land for the construction of the AGIs. The loss of this land is minor when set against the size of the resource within the East Riding of Yorkshire and Humber and Yorkshire area as a whole. The permanent land take is 0.011% of the agricultural land in the East Riding of Yorkshire, and only 0.002% of the agricultural land in Humber and Yorkshire. The land that would be lost is all classified as Grade 1, 2 or 3 and therefore is considered the best and most versatile (BMV). However, it is not possible to avoid BMV in the region and, coupled with the temporary nature of the loss, the effect is considered to be only Minor Adverse.

4.5 Ecology and Nature Conservation

This section summarises the likely significant effects that the Onshore Scheme may have on the existing ecological features including wildlife and habitats within the Study Area.

Habitat and protected species surveys of the pipeline route, AGI sites and surrounding area began in early 2012 and were completed in October 2013. The findings of the various surveys have been used to inform the final pipeline envelope, and the location, layout and design of AGIs.

Although these surveys have informed the Onshore Scheme and EIA, further surveys would be required prior to construction to allow a review of any changes to be undertaken and to allow for the application for necessary licences.

Details of statutory and non-statutory designated sites and protected or notable species records have also been gathered.

The Onshore Scheme crosses a relatively small range of habitats and avoids those of greatest value. The majority of habitats crossed by the route would be typical of farmland and include pasture, crops, hedgerows and dry or wet ditches. There would be areas of broad-leaved and plantation woodland, which would be nearby, though these would be largely avoided. Over 600 ponds and ditches have been assessed for their suitability to support great crested newt. Other habitats present along the route include disused and active quarry sites, railway line and embankments and inter-tidal sand.

Valued Ecological Receptors would be sites, habitats and species of ecological or nature conservation importance that could be significantly affected by a project. Those sites habitats, and species identified include the following:

4.5.1 Statutory Sites

Potential effects on statutory designated sites, located within 2km of the Onshore Scheme, have been assessed. Of those statutory designated sites, only two would be located within the Pipeline Envelope; River Hull Headwaters Site of Special Scientific Interest (SSSI) (which the Scheme crosses at two locations) and Hudson Way Local Nature Reserve. The two River Hull Headwater SSSI crossings would require appropriate mitigation to be put in place to prevent significant effects from occurring. Groundwater dewatering work would be necessary at the West Beck crossing. This is where groundwater is pumped out to allow dry pits to be dug either side of the crossing before microtunnelling can be undertaken. The amount of dewatering has been shown to be within acceptable levels, even if all of the flow back to the groundwater were to be from the West Beck. Irrespective, it has been agreed that water would be returned (via Main Drain) at a rate sufficient to maintain water levels. Dewatering of this type would not be required at Kelk Beck; however, a temporary bridge crossing would be required, which would span the banks of the beck. By ensuring good working practices would be implemented, as required under the Code of Construction Practice, the residual significance is considered to be Minor Adverse and therefore Not Significant.

Several non-statutory sites would be located partially within the Pipeline Envelope or adjacent to it, such as Meadow South of Drax, Brockholes Asselby Island and Barmby on the Marsh. Similar to statutory designated sites, with appropriate mitigation incorporated during and post-construction, direct and indirect

effects upon these sites would be avoided, reduced or mitigated, such that the overall significance of residual effects would be Neutral or Minor Adverse (Not Significant).

4.5.2 Habitats

The Onshore Scheme includes a variety of habitats ranging from arable and improved grassland, to hedgerows, scrub and scattered trees. Due to this diversity, the conservation value of the habitats also varies from Local to Regional. Areas of each habitat would be temporarily lost within the Onshore Scheme. However, the land required for the Cross Country Pipeline and associated temporary construction areas would be fully re-instated to their former habitats on completion of the works. A number of hedgerows would be crossed which would be considered to be important hedgerows. Again, care would be taken to reinstate these hedgerows and maintain them following construction to ensure they successfully establish. Where the AGIs would be located, arable land and small areas of other habitat (for example hedgerow) would be permanently lost. However, areas of new habitat would be created within the landscaping areas proposed at each AGI. This includes new sections of hedgerow, areas of scrub, grassland and tree planting. This is likely to lead to an overall increase in habitat diversity in time as planting establishes and matures. The residual effects on undesignated habitats would be assessed as having a significance of Neutral or Minor Adverse and therefore would be judged Not Significant.

4.5.3 Great Crested Newt

The Pipeline and AGI sites do not directly affect water bodies suitable for supporting great crested newts. Great crested newts have been found within 11 ponds located within 250m of the Onshore Scheme, suggesting some may be using the surrounding land. No individuals or populations have been identified on the AGI sites.

As no ponds would be directly affected, no alternative habitat needs to be created for great crested newt. Mitigation has been identified, which includes fencing and trapping out sections of the working width, and moving any captured newts to existing field boundaries. This will ensure great crested newts would be temporarily excluded from the construction areas and cannot come to any harm. Effects upon this species would be likely to be temporary and minor, with access to breeding sites re-instated and habitat restored once work on the pipeline is complete. There will therefore be no long-term effects on local populations of this species and the residual effect is considered to be Minor (Slight) which is Not Significant.

4.5.4 Breeding and Wintering Birds

Those birds found breeding along the route and at the AGI sites would be typical farmland birds. Barn owls would be present within the Onshore Scheme, but no features of their habitat used for breeding or roosting would be directly affected. Habitat loss to permanent infrastructure would be small, with the majority of the AGI sites continuing to provide foraging potential. Although there would be breeding barn owls close to the Pumping Station, they would be at least 100m from any potentially noisy operations and separated by a mounded landscape within which operational equipment is located. This distance is generally considered to be sufficient to ensure barn owls would not be disturbed by noise.

Wintering birds have been identified on low-lying flooded areas around the Rivers Ouse and Hull. However, construction would be restricted to the period from April to September, which will avoid the wintering bird period of October to March, when the larger winter assemblages would be reliant upon

farmland surrounding the Humber Estuary. The potential for direct effects of the construction work on nesting birds would be reduced by removing suitable nesting vegetation during the winter months or by undertaking pre-construction surveys to ensure nesting birds would not be present. Disturbance to overwintering birds would be avoided as the majority of work would be undertaken in the period from early April to late September, and through the adoption of appropriate construction methods.

4.5.5 Bats

Fifteen bat roosts are located within trees in the Pipeline Envelope. All would be non-breeding roosts of one or two individual bats. Two of these roosts may be directly affected by the Onshore Scheme. However, a commitment has been made to avoid felling any trees with evidence of bat roosts. The habitats located within the Onshore Scheme provide a feeding and commuting resource for five species of bat; however, other than at the AGIs habitats would be reinstated. At the AGIs habitats would be reinstated or improved, through landscape planting.

As a result of the avoidance of effects and the reinstatement of habitat, the effects on bats were assessed as being Slight Adverse to Negligible (Not Significant).

Further surveys would be undertaken prior to construction by a qualified ecologist to check for any changes in the location of bat roosts and should any new signs of bats be found, a licence would be applied for in advance.

4.5.6 Water Voles and Otters

Water voles would be widespread throughout the watercourses within the Onshore Scheme. A total of 32 crossings over 29 watercourses supporting water voles would be crossed by the Pipeline.

Mitigation prior to construction works will include temporary measures to exclude water voles from the sections of watercourses/ditches to be affected by works and the re-instatement of watercourses/ditches post construction. A commitment has been made to limit direct disturbance of the banks of a watercourse to only 13m sections if water voles would be present. The banks of watercourses would be reinstated and there would be no loss of water vole habitat in the long-term.

Otters would be present on the main river catchments including the Ouse, Foulness and Hull/Kelk Beck.

All main rivers which have been identified to support otter would be crossed using non-open cut methods. Where open cut crossings of watercourses would be undertaken, mature trees located on the banks of watercourses would be avoided by careful routing of the Pipeline within the Pipeline Envelope and the area of riparian habitat that would be temporarily disturbed to construct the Pipeline would be kept to an absolute minimum.

Where night time working is required at river crossings where non-open cut techniques would be used, the works would be positioned as far away from watercourses as possible. Lighting of the working area would be positioned to avoid the watercourse and bank side habitat being lit. With the application of these measures, the effects on otter would be assessed as Slight Adverse to Negligible (Not Significant).

4.5.7 Badgers

The Onshore Scheme will not directly affect any badger setts and is more than 30m away from any identified setts. This is typically taken as a distance at which effects would be very unlikely to occur. As badger populations can move, further surveys would be undertaken prior to construction to ensure either that there would be no new setts within 30m, or that appropriate mitigation is in place to protect setts.

4.5.8 Reptiles

Grass snakes were found to be present in three of the ten areas which were subject to detailed survey. Furthermore, small populations of common species of reptiles, including common lizard, could be present throughout the Onshore Scheme area. Where known reptile habitat is present, reptiles would be encouraged to move out of the working width by the use of two stage strimming of vegetation, followed by a hand search. If a grass snake is located within the working area, where possible, it would be captured and released in a suitable habitat outside of the working area. Effects on reptiles would be assessed as Negligible to Neutral (Not Significant).

4.5.9 Fish

The River Ouse supports salmon and trout and is a protected fish migratory route for a number of species of conservation concern. However, it would be drilled beneath to avoid any effects on fish.

The River Hull and Kelk Beck would be known to support breeding brook lamprey, river lamprey, bullhead and wild grayling. A number of other watercourses would be designated under the Water Framework Directive and support known populations of fish. Again, these watercourses would be drilled beneath.

In addition, measures would be included to minimise siltation, run off, pollution incidents, and effects to water flow or quality during construction.

Effects on fish would be considered to be Slight Adverse at most and therefore Not Significant.

4.5.10 Residual Effects

The Onshore Scheme will have potential effects on the following legally protected species: badger, bats, otters, great crested newt, reptiles and breeding and wintering birds. A suite of surveys has been carried out and the effects have been assessed taking into account appropriate timing of works, prompt re-instatement, landscape planting, limited night working and appropriate construction lighting. In order to re-affirm that these mitigation measures remain sufficient, pre-construction surveys would be undertaken at appropriate times.

Areas of habitat would be temporarily lost within the Application Boundary to allow the construction of the Onshore Scheme. However, the majority of these areas would be fully reinstated to their former habitats on completion of the works. Where the AGIs would be located, arable land and small areas of other habitat (for example hedgerow) would be lost. However, areas of new habitat would be created within the landscaping areas, which will include new sections of hedgerow, areas of scrub and tree planting. This will mitigate the initial habitat loss and may lead to an overall increase in habitat diversity in time.

4.6 Archaeology and Cultural Heritage

This section summarises the potential effects of the Onshore Scheme on archaeology and cultural heritage and considers previously recorded archaeological and heritage remains, as well as designated assets such as Scheduled Monuments. The assessment also considers the potential for unrecorded or unknown archaeology to be uncovered in the course of construction of the Onshore Scheme.

The Onshore Scheme passes through an area with a rich and varied history of human settlement and great care has therefore been taken to avoid known features and to identify any buried archaeological remains. Archaeological work to date includes a search of historic records, walkover survey of the route as well as a review of aerial photographs, with a number of new sites identified. This has been supplemented by a geophysical survey which has confirmed the presence of previously recorded assets, as well as identifying further potential archaeological remains.

Potential effects which have been considered in the assessment include physical effects on archaeological features as a result of construction and effects on the setting of heritage assets. Physical effects, either complete or partial loss of a feature, have been considered on all assets which lie completely and/or partly within the Pipeline Envelope. Setting effects have been assessed for those assets where the Onshore Scheme, in particular the AGIs, may affect their heritage setting.

The assessment has been based on the Pipeline Envelope, ensuring a worst case scenario in which a greater area of land is needed during construction and therefore a greater number of archaeological assets would be affected. Construction works for the Onshore Scheme would be expected to result in the partial or complete loss of assets within the Pipeline Envelope. Potentially affected assets include an Iron Age ladder settlement, two deserted/shrunken medieval villages, a Roman roadside settlement, a possible prehistoric settlement and two areas of possible Roman pottery production.

Early consultation with stakeholders such as English Heritage, close working with the design team and the completion of non-intrusive surveys (site walkover and geophysical survey of the route) have resulted in a large number of archaeological assets being avoided through careful routeing.

For those assets which remain within the Pipeline Envelope, mitigation has been proposed in the form of archaeological excavation and recording. These archaeological mitigation measures have been incorporated into the Code of Construction Practice and a commitment has been made to continue to refine the mitigation in liaison with the respective council archaeologists. The mitigation proposed includes archaeological evaluation in areas of previously recorded archaeology followed by open area excavation or archaeological watching brief as appropriate. An archaeologist would be on site during soil stripping to check for any unrecorded archaeology. Where it is appropriate this may be followed by excavation and recording of finds.

In most cases, mitigation will reduce the significance of effect to Minor Adverse or less (Not Significant). However, there would be 18 assets where the effect would be Moderate Adverse (Significant). These assets would be located in small localised sections of the Pipeline Envelope, and in most areas the effects on archaeological would be minimal or non-existent. However, the significance of effect on these assets remains Moderate Adverse and therefore the overall significance of the Onshore Scheme in terms of its effect on archaeological and cultural heritage is assessed to be Moderate Adverse.

4.7 Landscape and Visual Amenity

The Landscape and Visual Amenity assessment considered the:

- Landscape effects of the Onshore Scheme: how it could change the character and quality of the landscape resource and how it is experienced;
- Visual effects of the Onshore Scheme: how it could change views which would be experienced, people's perception and their response to changes in visual amenity.

The Study Area extended from Drax Power Station in the West to the proposed landfall north of Barmston on the North Sea coast to the north east. Although primarily rural, there would be a number of built elements such as the Drax Power Station complex and major transport routes, including two railway lines and a number of 'A' roads that influence the characteristics of the rural landscape.

The Onshore Scheme passes through a number of Landscape Character Areas (LCAs) whose characteristics largely relate to its agricultural use, differing mostly in relation to whether they would be on predominantly flat or more hilly terrain. These areas would be not a statutory designation, but would be used to inform planning decision making and planning policy. At a local level, the Yorkshire Wolds is designated as an Area of High Landscape Value (AHLV) by East Riding of Yorkshire Council.

Levels of visual amenity vary within the Study Area. The rising and falling landscape of the Yorkshire Wolds is recognised locally for its scenic value, whereas the flatter, more open landscapes of the Humberhead Levels and Holderness Plain would be less distinctive and strongly influenced by large scale urban features such as the M62 Motorway.

Receptors of between high and medium sensitivity include local residents, recognized recreational routes, and users of tourist destinations (such as caravan parks). Receptors of medium to low sensitivity include people travelling on major or minor roads and people engaged in work activities with limited opportunities to experience a view.

The presence of the AGIs in a rural landscape has the greatest potential to affect the landscape character and visual amenity of the study area. The siting of the AGIs has taken this into account where possible. The Pumping Station at Barmston is the largest AGI and for operational reasons it must be sited at the coast which tends to be more open, with fewer tall trees and limited scope to use natural landform to avoid effects. It therefore has the greatest potential to affect the landscape.

Construction works would be temporary, although a small number of mature trees would need to be removed which has some potential to cause localised landscape and visual effects.

In order to minimise effects to the landscape and visual receptors the Pipeline Envelope had been carefully routed to avoid a number of important receptors. For example, this included avoiding all areas of woodland along the Pipeline Envelope, the removal of mature trees and trees with preservation orders and locating the Pipeline away from settlements.

Reinstatement of farmland would ensure that the long-term landscape and visual effects of the Pipeline Envelope would be minimal. All reinstatement planting (hedgerows and trees) would be carefully designed to ensure it blends in with adjacent vegetation. Four trees would be planted for every mature tree removed

and smaller trees would be replaced on a one-for-one basis. All trees and hedgerows would be maintained for five years following construction to ensure they have the best chance of establishment.

Grassland, hedgerows and trees would be planted as part of the landscaping of the AGIs to minimise the visual effect on receptors.

The Pumping Station has been designed to be in keeping with the rural setting, having elements that resemble local farm buildings and barns. It will also include landscape mounds to reduce the visibility of the main operational features within the site.

The majority of landscape effects resulting from the construction of the pipeline would be temporary. Where there is hedgerow and minor tree loss, the effects will take longer to successfully mitigate and would be apparent during the early operational phase of the Onshore Scheme. In terms of trees, careful routing and commitments made to both retain certain trees and to plant four trees for every tree removed, will reduce this effect in time. Landscape effects as a result of the Pipeline Envelope have been assessed as typically Minor Adverse (Not Significant).

Unlike the pipeline, the AGIs would form permanent new features in the landscape, with the potential for longer term effects on landscape character. The potential effects associated with each of the AGIs would be broadly similar, with the introduction of semi-industrial features, such as the Block Valves or Barmston Pumping Station, into a predominantly agricultural landscape setting. However, landscape planting at each of the AGI sites would help to integrate them into the landscape setting in the medium to long-term. Landscape effects occurring as a result of the AGIs have been assessed as Negligible to Minor Adverse (Not Significant).

The AGIs could have some adverse effects on visual amenity, particularly in close proximity views during construction, and in the short term once operational. However, residual effects would be Minor Adverse or less (Not Significant). Over time, the significance of effects occurring following completion of construction would reduce as proposed planting measures establish at each site and in some cases provide some enhancement to visual amenity.

4.8 Air Quality

The assessment considers how the construction and decommissioning of the Onshore Scheme may impact on local air quality. Once operational, the Onshore Scheme would have no effects on local air quality as a result of direct emissions from the AGIs and/or from traffic associated with its operation.

The Onshore Scheme is located in a largely rural area, with no Air Quality Management Areas (AQMAs). One of the construction routes runs through the A63 AQMA, which was identified by the City of Hull Council due to high Nitrogen Dioxide levels (a pollutant associated with road traffic).

A qualitative dust assessment has been undertaken which considered the potential effects of construction activities including soil stripping, earthworks and the potential for mud and soil to be deposited on local roads by construction traffic (referred to as 'track out'). A number of potentially dust sensitive receptors, including people living close to the Pipeline Envelope and construction routes, as well as ecological receptors and recreational resources such as footpaths and Rights of Ways were identified.

The potential effects would be as a result of particulate matter or dust on human health and also to cause nuisance if dust settles on cars, windows or other property. Dust could also affect some habitats.

Consideration was given to the potential effects of emissions from construction traffic; however, the methodology used only requires detailed modelling where traffic increases would be above a set value. The traffic increases were well below this value and the effects would be not therefore likely to be significant.

As the Pumping Station would be powered by electricity, there would be no emissions of concern during the operational phase of the Onshore Scheme and this issue has therefore not been considered further in the assessment.

Minimising dust and other emissions to air during construction would be achieved by adopting the good site practices identified in the Code of Construction Practice. These include the use of road sweepers, minimising the handling of soil and dusty materials, proposed planning of the construction site layout so that machinery and dust causing activities would be located away from receptors where possible and damping down using water where appropriate.

Dust is an unavoidable result of construction works, but through the adoption of good working practices the potential for dust would be mitigated. Whilst there would be a number of different sensitive receptors in close proximity to the Onshore Scheme, through the implementation of mitigation, effects would be minimised and would be predicted to be Neutral (Not Significant).

4.9 Noise and Vibration

The assessment has considered the effects of construction noise on those living close to the Onshore Scheme and to roads that would be used by construction traffic. It has also considered the potential for noise to be generated during operation of the Onshore Scheme.

Existing noise sources within the Study Area include the Drax Power Station and various 'A' and 'B' roads. Aside from these sources, the Onshore Scheme is generally within a rural setting and noise levels would be relatively low.

Sources of noise and vibration during construction and decommissioning include construction traffic, plant and machinery. The noisiest aspects of construction would be likely to be construction traffic, piling, and earth moving and testing of the pipeline. However, as the construction crews pass along the pipeline, noise effects would mostly be an intermittent effect, rather than an effect throughout the construction period. The exception to this is at the AGI construction sites and special crossings, where works would take longer.

The assessment considered the effects of noise and vibration generated during the construction, operation and decommissioning of the Onshore Scheme. Noise and vibration effects would be primarily associated with the construction and decommissioning of the Onshore Scheme, with operational effects limited to the Barmston Pumping Station. There would be no constant operational noise and vibration effects from the Pipeline, PIG Trap, Camblesforth Multi-junction or the Block Valve sites. There would however be potential noise effects as a result of occasional venting at the AGIs, required to allow routine maintenance.

The potential effects of noise include noise levels increasing to an extent where nuisance is caused, which depends on the increase over background levels, or where protected animals would be disturbed.

Vibration can also cause nuisance, but in addition it can cause cosmetic or structural damage to property, including listed buildings.

Some areas would require working for 24 hours per day; however, these works would be of short duration.

Noise effects would be greater the nearer works would be to Noise Sensitive Receptors (NSRs) such as residential properties.

The potential effects of construction noise have been minimised by avoiding residential areas as far as possible during pipeline routeing and the careful routeing of construction traffic.

In addition, commitments would be made in the Code of Construction Practice to limit the working hours in many areas and to limit the maximum noise levels allowed over the working day at the nearest noise sensitive receptor.

Venting of the Carbon Dioxide within the AGIs would be necessary to allow for their maintenance and for pipeline inspections. Restrictions would be placed on this venting, including limits on the frequency and periods over which venting can take place.

Limitations would be also placed on venting of the Carbon Dioxide in the AGIs to allow for inspection of the pipeline. These inspections would be likely to be required every five years, and will but undertaken in line with the above restrictions, except that venting may be required a number of times within a two week pipeline inspection period.

Of the 59 construction routes assessed there would be three along which there could be significant noise effects, however these would be essential routes to access, which would be required to access the Tillingham construction compound and the Dalton and Skerne Block Valves. The significant effects occur for 98 days on Skiff Lane (the route to Tillingham Construction Compound), for 8 days on the route to the Dalton Block Valve and 42 days on the Driffield Road in the vicinity of the Skerne Block Valve. These would be the maximum predicted number of days, which in reality may be less as construction traffic flows and routeing would be further optimised). Construction traffic would be likely to have a Minor (not significant) or lower effect on most of the construction routes assessed.

With appropriate mitigation measures in place, as described above, the residual effects due to construction works during the construction of the Pipeline would be Moderate to Minor Adverse (not significant) at receptors located 50m to 150m from the works and Minor Adverse (not significant) effects at receptors located 200m from the works. These effects would only relate to some, not all, of the proposed construction activities, with the noisiest construction works lasting for a short period of time only. Within the construction phase there would be periods when there would be no construction activities taking place close to the noise sensitive receptors. Taking into account the above factors it is more likely that the residual effects would be Minor Adverse (not significant) or lower, although the assessment above does represent a worst case scenario.

A commitment has been made to limiting construction noise at noise sensitive receptors to a maximum of 70dB(A).

Typical construction working practices would be unlikely to generate levels of vibration at receptors close to the Pipeline Envelope at which cosmetic damage to structures is predicted to occur. Vibration effects would be predicted to be no worse than Minor Adverse (Not Significant) at receptors close to the Pipeline Envelope.

Once operational, there is the potential for some noise to be emitted by Barmston Pumping Station. Through careful design, including the use of noise attenuation measures, noise effects would be mitigated so that they do not exceed the existing background noise levels at nearby noise sensitive receptors (the closest of which is 625m away) and would be therefore Negligible.

The short duration and committed noise level mean that noise as a result of maintenance venting is Minor Adverse only and Not Significant.

4.10 Traffic, Motor Transport and Access

The assessment considered the potential environmental effects with regard to road users affected by construction traffic on the highway network as a result of the proposed Onshore Scheme.

The assessment focuses on understanding the potential changes in Heavy Goods Vehicle (HGV) traffic levels as a consequence of construction trips on the road network affected by all pipeline sections and the AGIs. The duration of the changes in HGV traffic levels was determined to help establish the magnitude of effect.

The Onshore Scheme lies adjacent to the A614 for much of its length from Goole to Bridlington. The A165, A63, M62 and A1035 also provide road links for HGVs transporting pipe from Goole to the Onshore Scheme.

The main road serving the Onshore Scheme is the A614 which connects with the A63 in Howden and the A165 in Bridlington. The A614 is a two-lane single carriageway road for all of its length. The other principal 'A' class roads in the area which link with the A614 would be the A1079 at Market Weighton and A166 at Driffield. The A614 provides a connection to the Strategic Road Network at the M62 near Howden.

'B' class roads which connect with the A614 would be the B1228 at Howden, the B1248 and B1246 near Bainton and B1249 at Driffield and B1253 and B1255 at Bridlington.

The A614 also intersects with a number of 'C' class, 'D' class and unclassified roads which provide access to numerous towns and villages in the East Riding of Yorkshire and further afield.

Existing traffic flow data was gathered for 69 roads which were considered to be most likely to be used for routeing construction traffic.

The road personal injury accidents on the local highway network, for the most recent five-year period available, were obtained from East Riding of Yorkshire Council and Humberside Police.

The majority of vehicle movements on the construction site would be undertaken on the temporary track within the working width, also known as the 'running track'. This minimises vehicles using the local roads, however, there is still a lot of construction traffic required to deliver materials and staff to site. The total number of traffic movements needed to construct the scheme has been estimated at 214,655, of which the Pipeline construction activities comprise 84,119 and the AGI/TCC and Pumping Station trips comprise 130,536. The percentage of these trips which would be HGVs is approximately 19% and it is these which would be the focus of the assessment of effects, as they have the most potential to cause disruption.

The assessment considers the effects on other road users. These effects include driver delays, road safety, severance and pedestrian amenity. The assessment of noise and air quality effects uses the information from the traffic assessment to identify potential effects.

An important element in ensuring the success of the construction phase of the development is effective communication with local communities before and during the construction process and in particular to inform them of the timing of construction activities and to help alleviate any concerns they may have, for example about increased severance and journey delays. To address this, National Grid will ensure that the Contractor maintains good communication with affected communities, keeping them informed about the timing and extent of activities which may affect them.

The Code of Construction Practice identifies the main principles to be applied to the management of traffic throughout the duration of the construction period, one of which would be to require the Contractor(s) to develop a Traffic Management Plan. This plan will include a strategy for traffic management and measures for informing construction traffic of local access routes, road restrictions, any timing restrictions and where access is prohibited. It will also include a mechanism for responding to traffic management issues arising during the works (including concerns raised from the public) including a joint consultation approach with relevant highways authorities.

A Construction Routes Plan has been agreed with the highway authorities and used to confirm the specific routes to be used by Large Goods Vehicles (LGV) and HGV construction traffic.

Adequate parking would be provided at the Temporary Construction Compounds, the AGI sites and at each road crossing (where the pipeline route crosses a public road and there is a site access) to ensure that the safety and efficient operation of the public highway is not reduced.

At site accesses, suitable supervision would be provided as required to ensure that traffic is controlled at access points to the pipeline and AGIs during construction, using traffic signals or stop-go boards to control road traffic as necessary.

For the majority of locations the traffic related effects would be likely to be Minor or lower (not significant), due mostly to the low overall number of construction HGVs as a proportion of the existing HGVs using the routes. There would be two exceptions. Firstly, Skiff Lane, which is an essential route to access the Tillingham Construction Compound, would have an increase in HGVs movements from four per hour to ten per hour, for a period of 98 days. This increase is considered to be likely to have a Moderate effect (Significant) on other road users. There would also be an increase in HGV traffic on Route 35 (B1248) which is required to access Dalton Block Valve. The increase would be from around 15 HGVs per hour to just over 22 per hour, resulting in a Moderate effect (Significant).

Operational traffic would be minimal, as the AGIs would be operated remotely for the most part and maintenance visits would be infrequent, involving only a small number of vehicles.

4.11 Socio-economics Including Recreation and Tourism

The potential effects of the Onshore Scheme on the socio-economic resources within the Study Area is summarised below.

There would be a number of recreational and tourist attractions and visitor facilities in the study area such as Howden Minster, Shire Hall, Driffield Showground and various nature reserves. There would be also community facilities such as golf courses, fisheries and leisure and sporting venues. The Pipeline Envelope also crosses the route of the Kiplingcotes, Derby.

Barmston Sands is located south of Bridlington, between Fraisthorpe and Barmston. There is no lifeguard and no zoning for water sport activities at this beach. There is a slipway providing access.

Fraisthorpe Sands is located north of Barmston Sands. There is no lifeguard and no zoning for water sport activities at this beach.

Beach and beach access user surveys were undertaken. Varying levels of use of beach accesses were recorded, ranging from low to high, with activity concentrated south of Barmston. The beach user survey recorded that the majority of users were adult walkers and people walking their dogs. There were also a smaller number of children using the beach.

The presence of construction traffic and the construction activity itself could potentially deter local people from using local facilities, particularly where roads would be busier than normal.

Potential effects on local businesses located along the main access routes could result from traffic disruption, which may lead to local people and visitors avoiding travelling to local amenities and community facilities including shops, restaurants and cafes and tourism and recreational facilities due to severance and increased journey times. However, this would be only a temporary, localised effect during the construction phase, rather than a permanent increase in traffic; this would mean that the overall magnitude of effects would be low. Residents could also experience increased journey times on commutes to work places and schools and nurseries. Schools and nurseries would be receptors of high sensitivity due to high socio-economic value and limited capacity to absorb change.

There is the potential for disruption of access to or use of, Barmston Beach during the landfall works. A section of the beach at Barmston Sands of up to 200m in length would be closed for around six months to allow the construction of the landfall, joining the Cross Country Pipeline with the Offshore Pipeline. A non-open-cut technique would be used to cross the cliff; however, on the beach it may be necessary to lay the pipe in an open trench.

The main approach to minimising any effects is the short duration of the construction period, which would endure for one pipeline construction season (April to September inclusive). The increases in construction traffic will not be constant for the whole of this period, as construction activities will move up the pipeline route.

Reducing traffic disruption, through the proposed Traffic Management Plan and other measures identified in the Code of Construction Practice and in the section above on Traffic Transport and Access, would also be of benefit for socio-economic receptors, as the receptors would be the same: local residents and visitors. These measures would include effective communication with communities prior to and during construction, so they could plan recreational activity and visits to amenities/facilities to avoid the busier construction periods, or take alternative routes not used for construction of the Onshore Scheme.

Access up and down the coast, at Barmston Sands, would be maintained where possible for the majority of the time the construction works would be ongoing.

There would be beneficial effects with regard to local and national employment during the construction and decommissioning phases of the Onshore Scheme. It is expected that approximately 100-200 local people could be employed during construction to undertake the non-specialised tasks including labouring and plant and machinery operation. Due to the temporary nature the effect would be Minor Beneficial (Not Significant).

Due to the specialised nature of some parts of the construction of the Onshore Scheme it is expected that a proportion of the workforce will come from outside of the local area. This has the potential to contribute to the local economy through a requirement for temporary accommodation and increased use of services. These effects would be predicted to be Minor Beneficial (Not Significant).

During the construction and decommissioning phases for the Onshore Scheme there would be an increase in traffic flows (see section 4.10), particularly for construction work vehicles transporting construction equipment and materials. The presence of construction traffic could temporarily deter people from using local amenities, community facilities and local businesses located along the main access routes. However, this would be temporary and localised and, as the magnitude of the effect is low, the overall effect would be Minor Adverse (Not Significant).

Attractions deemed to be of regional importance, such as Barmston Sands and Fraisthorpe Sands, would be considered to be of medium value and would experience effects of Minor Adverse significance (Not Significant). The effects on attractions of local importance affected temporarily during construction would be predicted to be of Neutral (Not Significant).

Footpaths and Public Rights of Way (PRoW) crossed by the Onshore Scheme would be temporarily closed during construction, limiting their amenity and recreational value. However, once construction is complete, all PRoW and permissive routes would be re-opened and fully accessible. There would be no permanent closures or diversions required for the AGIs. The effects of temporary closures would be therefore considered to be Neutral (local paths low value) or Minor Adverse (national routes of medium value) (Not Significant).

Although there would be some disruption for users of Barmston Sands, it will only be temporary and limited to a small section of the beach. Once complete the beach would be fully restored and, given the naturally dynamic nature of the beach materials in this location, it is likely that within a short amount of time it will not be possible to see any evidence that the works took place.

4.12 Cumulative Effects

Cumulative effects would be often considered in two categories:

- 'Intra-scheme' effects which occur due to different aspects of the scheme affecting a single receptor, for example a household experiencing noise, dust, and loss of visual amenity, which could create more overall nuisance than the individual effects alone;
- 'Inter-scheme' effects which occur as a result of the Onshore Scheme and other developments affecting the same receptor and resulting in an increased effect, for example the construction of a wind farm adding to construction traffic on access routes used for the construction of the Onshore Scheme.

There would be relatively few receptors that could be affected by more than one environmental effect. The main receptors of multiple effects would be residents local to the access routes or working areas. However, no receptors would be considered to be affected to a greater degree of significance as a result of the intra-scheme effects.

In addition there would be often interrelationships between the technical areas considered. However, the effects would be reported for each stage of the effect. An example is the potential direct effects of dewatering on groundwater, then the secondary effect on water levels and quality in groundwater fed watercourses and finally the tertiary effects on plants and animals using these watercourses. The assessment has reported each of these effects in their appropriate chapters and, as each deals with a different receptor, it is not necessary to consider the effects together.

Relevant projects in the vicinity of the Onshore Scheme have been considered as part of the cumulative assessment of 'inter-scheme' effects, in particular where projects would be likely to include associated infrastructure of a similar scale and style to that proposed as part of the Onshore Scheme.

Schemes which have been considered as part of the 'inter-scheme' assessment would be as follows:

- The Don Valley Power Project in Stainforth and associated pipeline;
- The White Rose CCS Project at Drax;
- Dogger Bank Offshore Wind Farm;
- Hornsea Offshore Wind Farm;
- Fraisthorpe Onshore Wind Farm;
- River Humber Pipeline Replacement Project; and
- Thorpe Marsh Gas Pipeline.

For the majority of these projects, the main potential for cumulative effects relates to construction traffic sharing access routes.

4.13 Combined Effects

Information on the likely effects of the Onshore Scheme and the Offshore Schemes both individually and in combination would be considered in a Statement of Combined Effects, (SoCE) which forms part of the Environmental Statement.

Few combined effects were identified due to the fact that the point, at which the two Schemes meet, at Mean Low Water, is also the point at which there would be changes in the type of environmental receptors

present, and their sensitivities. Receptors identified as having potential to be affected by a combination of onshore and offshore sources of effect were coastal water quality, coastal geomorphology, coastal birds and marine mammals, commercial bass net fishing interests and those visiting the coast for recreation or holiday making. Subsequent detailed screening of the potential effects of the Offshore Scheme has been undertaken which concluded that there would be no likely effects relating to the features of “Natura 2000” sites, which would be sites designated at a European level for Nature conservation, and include areas such as the Humber Estuary.

The principal sources of potential combined effects relate to noise and visual intrusion (which could affect tourism and recreation at the coast, cause disturbance to foraging birds and marine mammals) and sediment disturbance leading to increased turbidity and sediment flux (with potential to affect water quality and coastal geomorphology).

Important factors considered in the assessment of combined effects on each of the receptors identified include the relatively isolated location of the landfall point, the naturally dynamic nature of this coast and the short duration of the effects. The fact that no likely effects have been identified which extend beyond the construction phase has limited the potential for any effects to be significant, as the magnitude of effects is typically small.

Mitigation measures identified for the Onshore and Offshore works separately do not need to be increased in scale or duration in order to remain effective in addressing combined effects. The effects remain as Minor or Negligible and would be therefore (Not Significant).

The SoCE also considers the effects offshore that may result from the Offshore Scheme. Potential issues include:

- the presence of drill rigs, pipe-laying vessels and a permanent platform could potentially affect marine mammals, seabirds and migrating birds. However, activities would be localised and short-term and will also avoid the peak migration periods in spring and autumn;
- the presence of the pipeline, subsea facilities and platform could affect other users of the sea. However, a 500m exclusion would be maintained around the platform and the pipeline and subsea infrastructure would be designed to prevent snagging by towed fishing gear;
- disturbance of the seabed has the potential to lead to smothering or direct loss of animals on the sea bed, and plankton could be affected by disturbed silt and mud. However, the area affected is very small and already has high amounts of sediment in the water;
- there would be strict controls on chemical use and discharge offshore, as well as a very large dilution potential. The risks of effects from chemical discharge would be therefore very small;
- drilling, pipe-laying and other construction vessels and venting noise would be not generally considered to have effects on marine mammals. Piling work has more potential for effects; however, if required piling would be undertaken following best practice guidelines including the use of marine mammal observers who can stop work if marine mammals would be spotted in the vicinity;
- noise could also occur as a result of seismic surveys during the operation of the Carbon Dioxide store, which could affect fish hearing or behaviour. However, best practice guidelines would be followed and the surveys would be timed to avoid fish spawning periods. Marine mammal observers will also be used during surveys; and
- decommissioning of the scheme will involve similar processes and potential for effects as listed above.

5 Route Drawings and Plans

5.1 Works Plan Drawings (Route Drawings)

A set of twenty-five drawings detail the route of the pipeline from the power station to the shore (the onshore transportation route drawings) is provided in the K35 Appendix: Supporting Documents for Onshore Pipeline Route Plan. A Location Key Plan is also provided: this presents an overview of the whole of the onshore route and shows location of each Works Plan sheet. These drawings were drawn on A0 size paper using a scale of 1 : 2,500.

5.2 Map Plans of Historic Environment and Environmental Sites and Features

Two sets, each of ten Maps, would be provided in the K35 Appendix: Supporting Documents for Onshore Pipeline Route Plan. One of the map sets is titled, "Plans of Statutory/Non-Statutory Sites and Features of the Historic Environment" and the other as, "Plans of Statutory/Non-Statutory Environmental Sites and Features". Each of the maps is co-located with one from the other set (covering the same geographical area). A Key Plan is also provided: this presents an overview of the whole of the onshore route and shows location of each Map sheet. These drawings were drawn on A1 size paper using a scale of 1 : 10,000.

6 Glossary

Abbreviations	Meaning or Explanation
AGI	Above Ground Installations
CCS	Carbon Capture and Storage
CPL	Capture Power Limited
DCO	Development Consent Order
DECC	the UK Government's Department of Energy and Climate Change
EBD	National Grid's European Business Development group.
EEPR	European Energy Programme for Recovery
EIA	Environmental Inspection Assessment
EPC	Engineer, Procure and Construct
ES	Environmental Statement
FEED	Front End Engineering Design
FEED Contract	Contract made between DECC and CPL pursuant to which WR Project FEED (as defined) would be performed.
HGV	Heavy Goods Vehicle
in	inch
KKD	Key Knowledge Deliverable
KSC	Key Sub-Contract
ND	Nominal diameter
NGCL	National Grid Carbon Limited
NGCL KSC	Contract made between CPL and NGC pursuant to which that part of the WR Project FEED (as defined) which appertains to the WR T&S assets would be performed.
NGCL KSC Deliverables	A number of documents and services, the delivery of which is a contractual obligation under the KSC.
NGCL EPC Sub-contractors	Contractors providing an offer to develop a part of the WR T&S Assets in pursuance of the WR Development Project.
NGCL FEED Sub-contractors	Contractors entering into a contract with NGCL to carry out a part of the obligations under the KSC.
NGCL Technical Assurance Team	EBD team responsible for providing independent technical auditing and peer review services to the WR T&S FEED Project.
NGCL WR Team	The NGCL team established to meet the obligations in the KSC.
PIG	Pipeline Inspection Gauge: a unit, which is inserted into the pipeline, to clean and/or monitor the inner bore surface of the pipe.
PIG Trap	A facility to allow PIGs to be inserted into and removed from the pipeline.
Plot Plans	Drawings outlining the arrangement of plant items and associated features including vehicle parking, materials storage, cabins and welfare facilities and any soft landscaping.
WFD	Water Framework Directive
WR	White Rose
WR Assets	All those assets that would be developed pursuant to the WR Project
WR Development Project	A project to develop, operate and decommission the WR Assets which may transpire following the completion of the WR FEED Project.
WR FEED Project	Project to carry out a FEED (as defined in the FEED Contract) with regard to the WR Assets.
WR Project	White Rose CCS Project
WR T&S Assets	That part of the WR Assets which would carry out the carbon dioxide transportation and storage functions of the WR Project and to which the KSC Contract relates.
WR T&S FEED Project	The project to be pursued by NGCL in order to meet its obligations under the NGCL KSC.

Abbreviations	Meaning or Explanation
RIGS	Regionally Important Geological Sites
RCS	Route Corridor Study
SAC	Special Area of Conservation
SPZ	Simplified Planning Zone (SPZ)
SSSI	Sites of Special Scientific Interest
T&S	Transport and Storage
UXO/UXB	Unexploded Ordnance/Unexploded Bomb