

# Felindre to Tirley Natural Gas Pipeline Environmental Statement

## For further information:

Copies of the Environmental Statement can be viewed at relevant Local Authority planning offices and other locations, please call the freephone number below for details.

**National Grid freephone number: 0800 731 0561**

Additional free copies of this non-technical summary, copies of the Environmental Statement on DVD, and additional paper copies of the Environmental Statement can be obtained by writing to Mr Des Gelly at the address below. A nominal charge of £15 each is charged for DVD copies, and £100 each is charged for paper copies, as a contribution towards the material costs. Cheques should be enclosed for DVD and paper copies made payable to 'National Grid Gas plc'.

Comments on the Environmental Statement for the Felindre to Tirley natural gas pipeline should be returned to:

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Non-technical summary  
August 2006

Introduction



National Grid owns and operates the gas transmission pipeline system in the UK. This pipeline system is constantly being enlarged to meet increasing demand and accommodate new sources of supply. As part of this process, National Grid is planning and constructing a number of new gas pipelines and associated installations from Milford Haven in Pembrokeshire to Tirley in Gloucestershire and beyond. The pipelines will transfer natural gas from two new gas terminals at Milford Haven to both South Wales and the rest of the UK.

The UK Government has already consented to construction of the first pipeline, which runs from Milford Haven to a point to the north-east of Swansea, and work on this 1220mm diameter 120km long pipeline began in spring 2006. Consent is now being sought for the construction of the second pipeline, from the north-east of Swansea to a point near Tirley in Gloucestershire. This second pipeline,

called the Felindre to Tirley pipeline, is due to be constructed in 2007 and will be 1220mm diameter and 196km long. Both pipelines are required to be available to transport gas by the end of 2007 when the new terminals at Milford Haven become operational.

As part of the process of seeking consent to construct this second pipeline, National Grid is required to submit an application to the Secretary of State for Trade and Industry under the *Public Gas Transporter Pipe-line Works (Environmental Impact Assessment) Regulations 1999*. The application includes an Environmental Statement, which explains how National Grid has assessed the effects of the pipeline on the environment and how these will be minimised both during and after construction has been completed. This non-technical summary is a précis of that document.

The challenge – the increasing demand for gas infrastructure

Why do we need new pipelines?

Natural gas consumption in the UK is increasing and, at the same time, natural gas production from the North Sea has reached a plateau. Government analysis has shown that the UK will become increasingly dependent upon imported natural gas and the Government's Energy Review, published in July 2006, notes the importance of new gas importation projects in meeting UK energy requirements.

Consequently, a number of gas importation projects are being developed around the UK coast, including two new gas terminals at Milford Haven. The Milford Haven terminals will have the capacity to supply up to 20% of UK gas demand.

National Grid is licensed by the Government to transport gas within the UK via its pipeline network. The gas is not owned by National Grid, but the pipeline network provides the means to move it around the country to where it is needed.

As a licensed gas transporter, National Grid has a legal duty under the *Gas Act 1986* (as amended), to 'develop and maintain an efficient, co-ordinated, safe and economical gas transportation system'. As such, National Grid is legally obliged to respond to requests for new pipeline connections to its pipeline system and has received such a request from the owners of the two new terminals near Milford Haven. National Grid is also required to reinforce the pipeline system where necessary to meet its legal duty.

National Gas Transmission System

- Existing pipelines
- Interconnector
- ▲ Terminal
- Compressor
- Liquefied Natural Gas storage
- Storage
- Regulator

Milford Haven Gas Connection Projects

- Connecting and reinforcement pipelines
- Additional compressor power or modifications



*The National Gas Transmission System in Great Britain. This picture also shows the location of the two new Liquefied Natural Gas terminals at Milford Haven and the pipelines associated with the Milford Haven Gas Connection Projects.*

The solution – delivering a new pipeline

Why is a new pipeline being constructed?

To help meet the UK's future energy needs, two new gas terminals are being built at Herbrandston and Waterston near Milford Haven in Pembrokeshire. The gas will be transported in liquid form, (Liquefied Natural Gas or LNG), by ship to the UK and will then be vaporised back into natural gas at the two terminals before entering the gas pipeline system. This technology is not new to the UK and was first used in the 1960's when natural gas was imported in liquid form by ship from Algeria to Canvey in Essex and, after re-gasification, transported by pipeline to the midlands and north of England.

The existing gas transmission pipeline system from England into South Wales terminates to the

north-east of Swansea and is too small to accommodate the large volume of gas that needs to be transported from the two new gas terminals. Consequently, in line with its legal obligations, National Grid is required to build two new pipelines: a 'connecting' pipeline from Milford Haven to the existing gas transmission system to the north-east of Swansea and a 'reinforcement' pipeline from north-east of Swansea to a point near Tirley in Gloucestershire. These two pipelines will be of strategic importance to the UK economy as they will secure future gas supplies for both industrial and domestic consumers.

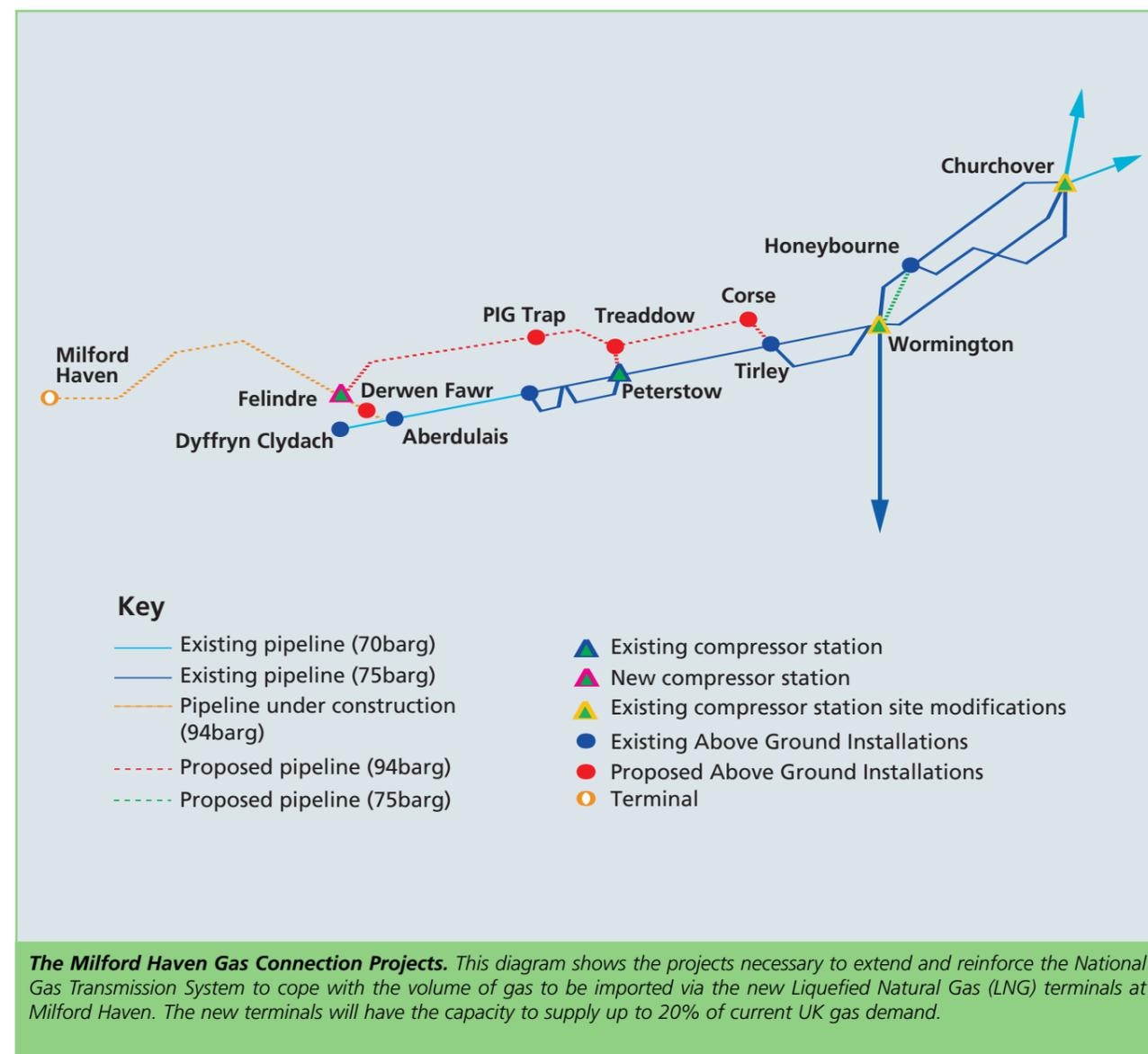
The connecting pipeline from Milford Haven is currently under construction and consent from the Secretary of State for Trade and Industry is being sought for the second (Felindre to Tirley) reinforcement pipeline.

### Milford Haven Gas Connection Projects

In addition to the Milford Haven connecting pipeline and the Felindre to Tirley reinforcement pipeline, a number of other projects are required to meet the gas transmission capacity requirements arising from the two new terminals. The scheme is shown in the diagram entitled 'The Milford Haven Gas Connection Projects'. These other projects will be designed and constructed under separate consent and planning applications.

### Is there a 'Do Nothing' option?

To 'Do Nothing' would restrict gas output from the new gas terminals and place National Grid in breach of its licence as a gas transporter. Both the connecting pipeline from Milford Haven, which is already under construction, and the Felindre to Tirley reinforcement pipeline are essential requirements in order to comply with these obligations.



### Project description

#### What type of pipeline?

The Felindre to Tirley pipeline will be constructed with high grade welded steel and will be buried at least 1.2m (4ft) below the reinstated ground surface. National Grid selected the option of a buried cross country pipeline as it provides the safest, most secure and practical method of transporting gas, with minimum, medium or long-term physical or environmental impacts. National Grid does not favour above-ground cross-country pipelines because of their visual impact, need for frequent maintenance and the fact that they sterilise the land, preventing its use for agriculture or other purposes. A marine or sub-sea

pipeline solution was also considered, but this would have involved a greater overall length of new pipeline, both on-shore and off-shore, significant environmental effects, substantially higher risks and higher cost.

### Legislation

#### Who gives permission for the pipeline?

National Grid is required to make an application to construct the pipeline to the Secretary of State for Trade & Industry under the *Public Gas Transporter Pipe-line Works (Environmental Impact Assessment) Regulations 1999*. This application is supported by the Environmental Statement summarised in this document.

### Above Ground Installations associated with the Felindre to Tirley pipeline

#### Compressor station and PIG-trap installation at Felindre, north of Swansea

A 30 megawatt (MW) compressor station and PIG-trap are proposed on a site near Felindre. The compressor station is needed to compress the gas and so maintain the gas pressure within the Felindre to Tirley pipeline, thus maintaining full flow capacity. It will contain electric and gas powered compressor units and associated plant and buildings. PIG-traps are facilities at each end of a pipeline, and at strategic intermediate points along a pipeline's length, where pipeline internal gauge devices (PIGs), which clean and allow inspection of the pipeline, are launched and received. Both the compressor station and the PIG-trap will be within a fenced area of approximately 5 hectares (ha), with a 4ha operational area.

#### Pressure reduction installation at Treadow, adjacent to the existing Peterstow compressor station, Herefordshire

A pressure reduction installation is necessary to enable a connection to be made between the new pipeline from Felindre and the existing gas pipeline system at the existing Peterstow Compressor Station. The total site area will be approximately 2ha, of which approximately half will contain equipment. It will be located in a separate fenced area immediately adjacent to the existing compressor station. Because the two pipelines operate at different pressures, the site will comprise all the equipment necessary to deal with this situation including pressure reduction valves, a boiler house to maintain the gas temperature and gas filters and meters.

#### Intermediate block valve site south of Llanwrda, Carmarthenshire

Block valves are comparatively small installations comprising a fenced area of approximately 0.3ha. The equipment consists of a number of buried valves that enable sections of the pipeline to be isolated for maintenance purposes.

#### Pressure reduction installation and PIG-trap at Corse, in the vicinity of the existing Tirley installation, Gloucestershire

As with the pressure reduction installation at Treadow, a connection to the existing gas pipeline network is required at the end of the new pipeline in the Tirley area. In addition to the equipment necessary to cope with the difference in pressures between the two systems, this installation will contain two PIG-traps to receive monitoring gauges from the Three Cocks PIG-trap installation and to send monitoring gauges into the existing gas pipeline system. The installation will comprise a fenced area of approximately 2ha, of which approximately one third will contain equipment.

#### Intermediate PIG-trap near Three Cocks, Powys

This PIG-trap installation will comprise a fenced area of approximately 0.5ha. and contain two PIG-traps; one for the receipt of gauges from the start of the pipeline at Felindre and a second to send gauges on to the end of the pipeline near Tirley.

All of these installations are subject to their own environmental assessment and planning application and will be landscaped to minimise visual impact.

### Is planning permission required?

Licensed gas transporters, such as National Grid, are not required to obtain permission from the local planning authority for the construction of underground pipelines. However, planning permission under *The Town and Country Planning Act 1990* is required for any associated installations (usually referred to as Above Ground Installations or AGIs). Planning applications for the AGIs associated with the Felindre to Tirley pipeline are in the process of being submitted and further details can be obtained from National Grid (freephone 0800 731 0561).

### Is an Environmental Impact Assessment required?

As the pipeline will be over 40km in length and will have a diameter of over 800mm, it falls under Part 1 of Schedule 3 of the *Public Gas Transporter Pipeline Works (Environmental Impact Assessment) Regulations 1999*, which states that an Environmental Impact Assessment is required.

## Environmental Impact Assessment

### What is an Environmental Impact Assessment?

An Environmental Impact Assessment identifies potential environmental effects caused by the construction and operation of the pipeline in order that these can be minimised. It comprises a series of studies, surveys and consultations that enables the pipeline to be routed to minimise its effects and identifies measures to ensure successful reinstatement after construction.

The results of this assessment are summarised in the Environmental Statement.

### Who is consulted?

As part of the process of preparing the Environmental Statement, National Grid has carried out a series of consultations with numerous key bodies including the Local Authorities, the Brecon Beacons National Park Authority, the Countryside Council for Wales, English Nature, Cadw (the Welsh Assembly Government's historic environment division), English Heritage, the Environment Agency (England and Wales), the Welsh Assembly Government, the Department for Trade and Industry, affected landowners and many local countryside, farming and conservation groups.

### How is the best route selected?

Several Route Corridor Investigation Studies (RCISs) were carried out to identify, investigate and assess potential route corridors for the pipeline. These were followed by an extensive series of detailed environmental surveys and, in conjunction with landowner consultation and engineering studies, enabled a preferred route to be selected. Careful selection of a route is of prime importance in minimising adverse environmental effects.

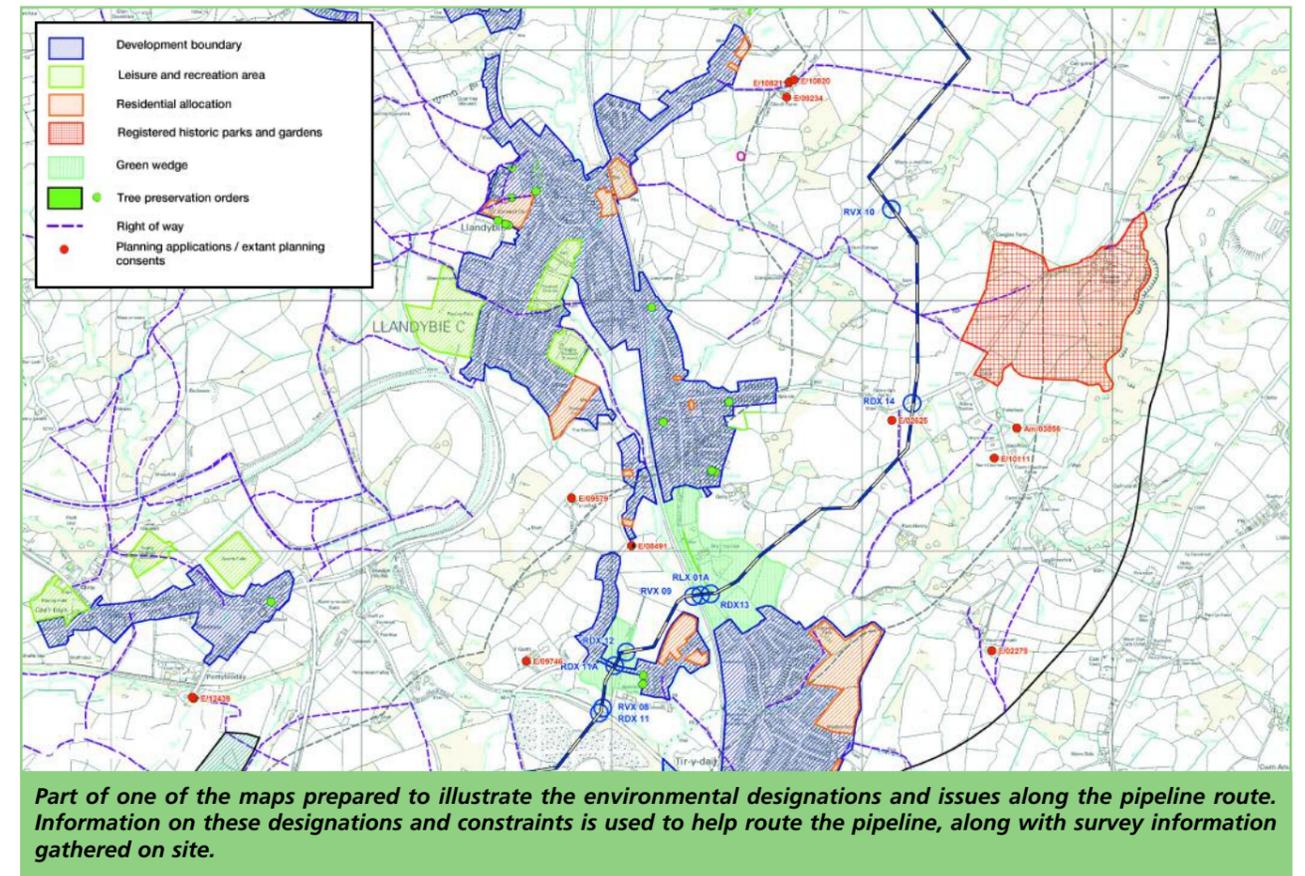
Several stages were involved in selecting the preferred route:

1. Identify an Area of Search based on the start and end points of the pipeline;
2. Identify potential route corridors (nominally 1km wide, within which the pipeline is later routed) using desk-based information;
3. Select a preferred route corridor;
4. Identify a preliminary pipeline route within the route corridor on the basis of site visits and initial assessments of available ecological and other information; and
5. Identify the final route during the Environmental Impact Assessment of the project using results from a wide range of detailed surveys and studies.

### What are the route constraints?

The major environmental and engineering constraints that have been considered when routing the pipeline have been:

- Populated areas – routing the pipeline away from areas of population;
- Engineering issues (roads, railways, rivers, cables, other pipelines);
- Construction issues (avoiding steep slopes and difficult ground conditions);
- The safety of construction personnel;
- Landscape and topography – minimisation of effects on the Brecon Beacons National Park, the Wye Valley 'Area of Outstanding Natural Beauty' and other important landscape features and designations including Registered Historic Parks and Gardens;
- Archaeology – in particular avoidance of important sites;
- Nature conservation – in particular avoidance of rare species which are both nationally and locally important, ancient woodland and upland areas that are difficult to restore such as heathland and bog; and



- Mineral extraction and known landfills (avoidance, as far as possible of previous mining areas and suspected contaminated ground).

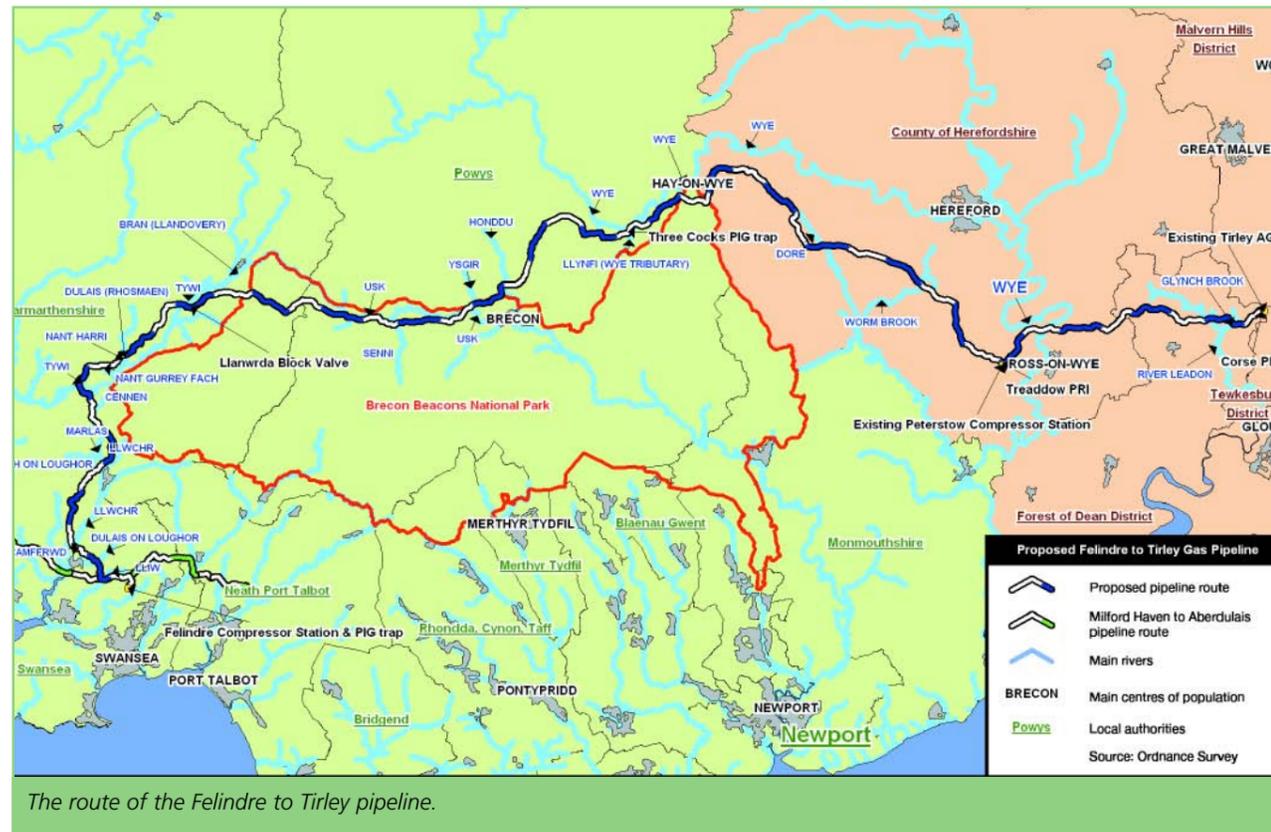
The results of an extensive range of surveys have been used to refine the pipeline route during the Environmental Impact Assessment process in order to minimise the pipeline's effect on the environment. These surveys include ecology, hydrology, geology, soils, archaeology and landscape and have resulted in the avoidance of approximately 45 woodlands, 12 unimproved/semi-improved grassland areas and 2 bog areas. Where it has not been possible to avoid notable areas, specialist engineering techniques have been introduced to minimise the pipeline's effect.

## The pipeline route

### Where will the pipeline be constructed?

The pipeline starts near Felindre, a village to the north of Swansea and the M4. The pipeline runs north, turns briefly westwards, then continues

north, passing to the east of Pontarddulais, crossing over the upland common at Cefn Drum, and passing to the west of Ammanford. It then continues northwards passing Llandeilo to the west, where the pipeline swings in an arc around the National Trust-owned Dynevor Park estate, crossing the Afon Tywi (River Towy). The route then turns north-eastwards running up the Afon Tywi valley to the west of Llangadog before turning east to climb onto the upland common at Mynydd Myddfai and Mynydd Bach-Trecastell, south-east of Llandovery. The pipeline continues east, passing just to the south of Sennybridge, crossing the Afon Wysg (River Usk) and passing to the north of Brecon. The route then turns north, then east, passing south of Llyswen and then north-east following the Afon Gwy (River Wye) before swinging around Hay-on-Wye to the south. The pipeline then turns south-eastwards, running past Dorstone and down the Golden Valley past Peterchurch and Vowchurch to Kingstone. The pipeline route then turns east to enter the Wye Valley, crossing the River Wye to the north of Ross-on-Wye, and continuing east, south of Dymock and Staunton, to reach Tirley.



## Construction

### When will the pipeline be constructed?

Construction is planned to start in spring 2007, with completion scheduled for autumn 2007. However, some preparatory works will, subject to the necessary consents, start before this date. Construction of the pipeline will be undertaken by two specialist pipeline construction companies. These companies will use a number of teams to construct the pipeline at separate geographical sections.

### Who will build the pipeline?

National Grid will project manage the pipeline construction in its entirety, with the construction itself being undertaken by the two specialist pipeline construction companies. The section between Felindre and Brecon has been awarded to the joint venture company of Nacap Land and Marine and the section from Brecon to Tirley has been awarded to Murphy Pipelines Limited. Both companies have designed and constructed major gas pipelines in the UK over many years and have a proven track record.

### What are the construction methods?

The general method of pipeline construction is outlined below:

#### Preparation of the working width

Growing crops and sections of hedge are removed, and stock or demarcation fencing erected to contain the working area. Bridges or conduits are installed at most watercourse crossings so that plant and machinery can cross. The topsoil is then removed from the working width and stored to one side of the fenced area. Existing field drainage systems are intercepted and new drains installed to maintain existing field drainage systems and minimise the need to dispose of water during construction.

The working width is nominally 44 metres wide but wider areas are required adjacent to crossings or where the terrain is particularly challenging. The width of vegetation removed at hedgelines, woodlands and along river banks is minimised by careful route planning. The actual width removed is specific to each crossing, but is generally between 15 metres and 25 metres.

#### Pipeline stringing and welding

The pipes, which are typically 12 metres or 18 metres long are transported onto the working width, offloaded and welded together on the surface to form long 'strings'.

#### Trench excavation and pipe installation

A trench is then excavated, the pipe lifted and laid into it, surrounded by soft material to protect the pipe coating from damage (this is usually material excavated from the trench that has been passed through a grader and sorter to remove stones) and backfilled.

#### Reinstatement

Land drains are installed to reinstate pre-existing land drainage patterns. The working width is then cleared, the subsoil ripped to relieve compaction and the topsoil re-laid and cultivated. Temporary bridges at rivers are removed, hedgerow sections and woodland belts replanted and drystone walls and permanent fences rebuilt. Temporary fencing remains in place until grazing land has recovered sufficiently to withstand grazing pressures.

#### Road, rail and river crossings

The crossings of larger or ecologically valuable rivers, busy roads and railways may be constructed by tunnelling to avoid direct disturbance (known as non open-cut methods). For further information on watercourses, see the section 'What mitigation measures will be adopted? – Watercourses'.



River crossing by microtunnelling – one of the non open-cut techniques available for pipeline construction under roads, rivers and railway lines.

1



General view of the pipeline working area (the 'working width').

2



Preparation of the working width.

3



Pipeline stringing and welding.

4



Trench excavation and pipeline lowering.

Pipeline construction method

**Commissioning**

The pipe is cleaned and checked internally and then pressure tested using water (hydrostatic testing). The pipeline is then dried before being filled with natural gas.

**How is construction managed to minimise environmental effects?**

National Grid and its contractors' construction procedures are based on established good practice, the latest industry guidance and a number of British and International Standards.

Detailed construction and reinstatement procedures are prepared taking into account possible effects of the project on the surrounding environment, roads, archaeological remains, agriculture and local communities, as well as considering potential health and safety issues.

The project management teams will comprise:

- Designated engineers, who are responsible for all health, safety and environmental issues on site, including safety evaluations and risk assessments;
- Liaison officers, who will maintain communication with local communities, farmers and other groups during construction;
- Environmentalists, who ensure that the measures outlined in the Environmental Statement and Environmental Management Plan are being fully complied with;
- Ecologists, who will ensure that pre-construction surveys are carried out and ecological mitigation measures are implemented; and
- Archaeologists, who will monitor soil removal and excavations for unexpected archaeological finds.

**How will safety and security be ensured?**

Great Britain's high-pressure natural gas pipeline system has been in operation for more than 35 years and has an excellent, well-established and internationally recognised safety record. The pipelines are designed, constructed, operated and maintained in accordance with the Institution of Gas Engineers and Managers guideline: *Steel pipelines for high-pressure gas transmission (IGE/ITD1: Latest Edition)*. This is the recognised industry standard and, in addition, National Grid has a set of standards

and procedures that underpin and complement the latter guideline. These standards and procedures have been developed over many years and have been fully accepted by the Health and Safety Executive.

The pipelines will be all welded construction with 100% of the welds subjected to non-destructive testing using either radiography, ultrasonics or a combination of the two. In addition, the completed pipeline sections are subjected to hydrostatic test to approximately 150% of the maximum operating pressure to check the pipeline's integrity prior to commissioning to gas.

Once a pipeline is operational, National Grid carries out a strict and thorough programme of inspection and maintenance so that its high safety standards are upheld. The operation of the commissioned pipeline will be monitored from the National Gas Control Centre. It is also over-flown regularly to check for any potential third party infringements. Monitoring of pipe condition, including changes in pipe geometry, is carried out at pre-determined intervals using pipeline internal gauges, a sophisticated technology first developed in the UK and now used throughout the world. This allows an internal inspection device of great sensitivity to be inserted into the pipeline and be transported along by the gas velocity itself. This allows National Grid to analyse, and ultimately plan and rectify, any features which may affect the pipeline's integrity. In addition, the pipeline's highly durable protective coating is enhanced by an electrical cathodic protection system which ensures that the pipeline remains corrosion free.

**Safeguarding the environment****How will the surrounding environment be affected?**

The gas pipeline route is carefully selected to minimise its environmental effect and will be entirely buried below ground; in addition, all disturbed land will be restored after construction. An environmental assessment of the landscape, wildlife, archaeology, land-use and physical environment (soils, geology, hydrology, etc.) has been undertaken and is summarised in the Environmental Statement. The environmental assessment has assisted the development of a series of measures to safeguard the physical environment, the landscape, nature conservation, water resources, agriculture, archaeological remains and the socio-economic environment. Specialists within the pipeline management teams will continue to work

alongside the construction teams to ensure that all commitments made to protect the environment are undertaken.

**What mitigation measures will be adopted?****Physical environment**

National Grid seeks to avoid the most sensitive areas of the physical environment to limit damage and disturbance to designated geological sites and soils. Areas of mineral resources, suspected contaminated land and landfill sites are also avoided where possible.

The pipeline route avoids geological Sites of Special Scientific Interest (SSSIs) and other individually defined geological sites, with the exception of a Geological Conservation Review site at Cusop Dingle, south of Hay-on-Wye, which will be crossed by tunnelling to minimise disturbance. In addition, it has not proved feasible to avoid part of the Fforest Fawr Geopark, established within the Brecon Beacons National Park, albeit the pipeline route avoids the most geologically valuable features. In this instance, mitigation will focus on minimising effects on the broader archaeological, landscape and recreational value of the Geopark.

Particular care will be taken to limit damage to the soils along the pipeline route, through careful control of the timing of soil handling and strict adherence to good practice procedures for both handling and reinstatement in order to restore the soils and associated ecological conditions as rapidly as possible.

Some steep slopes will be crossed, particularly along the western sections of the pipeline route, and care will be taken to implement a range of measures to prevent soil erosion and sediment run-off, including the use of temporary banks, fences and ditches to restrict and limit pollution from water run off in accordance with industry good practice.

The pipeline route avoids areas of existing mineral extraction and has been routed to minimise the length within the former South Wales coalfield. The pipeline route crosses three areas safeguarded for possible future sand and gravel extraction and an assessment has been made of the implications of this.

**The visual landscape**

Whilst construction activities will have a short term visual impact, one of National Grid's top priorities is to return the visual and physical integrity of the landscape, as closely and as quickly as possible, to its previous condition. Specialist techniques for this

have evolved and improved over the past 20 years and are continually being developed. The visual landscape has been assessed from the perspective of local properties, public Rights of Way, roads, recreation and business premises and key tourist attractions. The techniques used to minimise the physical effects on the landscape are generally the same as those used to minimise effects on agriculture and nature conservation and are discussed in 'Nature conservation' and 'Agriculture'.



*The landscape of the Wye Valley 'Area of Outstanding Natural Beauty' looking south from Strangford towards Ross-on-Wye. The pipeline route is down the slope, out of view. The River Wye (in the picture) will be crossed by drilling or tunnelling under the river to avoid any direct disturbance.*

The pipeline route crosses the Wye Valley (designated as an 'Area of Outstanding Natural Beauty') at its narrowest point and avoids the main features of interest. However, it has not proved feasible to avoid routeing through the northern extremities of the Brecon Beacons National Park, from Mynydd Myddfai east past Sennybridge to Brecon, and again south of Hay-on-Wye. These sections have been the subject of extensive consultation and subsequent route refinements to minimise overall environmental effects. However, National Grid acknowledges the broader special landscape, recreational, ecological and historical value of the Park and will work with the Brecon Beacons National Park Authority to minimise effects on these values and ensure enhancement is in line with National Grid's statutory duties.

Whilst the pipeline has been routed to avoid all Registered Historic Parks and Gardens, it does pass through areas registered as Landscapes of Special/Outstanding Historic Interest by Cadw and through a number of unregistered historic parks and gardens. Where it passes close to the Registered

Historic Parks of Penoyre Park (near Brecon), Penpont (between Brecon and Sennybridge), Hay Castle (Hay-on-Wye) and through other noted historic parks and landscapes, the pipeline route has been selected to minimise the effects on key features underpinning the value of these parks and historic landscapes.

The assessment of landscape importance and sensitivity not only considers statutory landscape designations, such as the Brecon Beacons National Park, but also takes into account other values to society, which may be expressed by the local community or consultees, such as the scenic quality, unspoilt character, sense of place and conservation interest. For example, note has been taken of a number of landscape areas including the Llŵchwr Valley, Tywi Valley, Wye Valley (near Three Cocks) and the Golden Valley which have been designated by the local authorities for their locally important landscape character or quality.



**Golden Valley looking east from the lane to Snodhill at brook crossing.** Pipeline route runs away from viewer on right hand side of the view.

The landscape and visual assessment has also considered specific landscape elements and features such as trees, woodlands, hedgerows, meadows, landform and topographic features, river corridors and other water bodies, and built elements such as drystone walls.

Improved agricultural land (this is land which is sown with an agricultural grass seed mix and fertilized to ensure good grass productivity or is under arable cultivation) is the easiest to reinstate through restoration of existing land drainage, careful soil handling and re-seeding and cultivation.

The pipeline route in these areas is largely restored to its original visual appearance in the immediate months following pipeline construction, with the exception of the boundary hedgerows that take longer to re-establish.

Unimproved grassland, marshy grassland, heathland and bog are more difficult and time-consuming to reinstate and have been avoided by pipeline routing as far as possible. However, the pipeline does cross four areas of upland common of which the longest (4km) is within the northern limits of the Brecon Beacons National Park at Mynydd Myddfai and Mynydd Bach-Trecastell, south-east of Llandovery. The measures to be taken to ensure restoration of these sites are described in 'Nature Conservation'.



**Mynydd Myddfai and Mynydd Bach-Trecastell.** This view is looking south-east from the Waun Ddu Site of Special Scientific Interest (SSSI) towards the north-eastern corner of the forest above the Usk Reservoir. The pipeline route runs from right to left in the middle ground outside the SSSI. This area of common land, within the Brecon Beacons National Park, is of ecological, archaeological, landscape and recreational importance. The route has been subject to extensive consultation and revision in this area to minimise effects. Specific construction and reinstatement methods will be drawn up for approval by the Countryside Council for Wales, the Brecon Beacons National Park Authority and others before start of construction.

Wherever possible, the pipeline has been routed to minimise hedgerow removal including routing through gaps or weak/thin points in hedgerows. All hedgerows will be replanted afterwards using indigenous species. Drystone walls will be dismantled, stored and replaced after construction and hedgebanks reformed.

Significant effort has been made to avoid routing through woodland, particularly ancient woodland. Where this has not been feasible, the pipeline has been routed to minimise the need to remove mature trees and aligned to make use of existing gaps such as tracks and rides. In several instances, tunnelling (non open-cut methods) of watercourses or railway lines has been lengthened to cross under adjacent woodlands to limit tree removal to a strip needed for plant and machinery access. The total linear length of woodland crossed by the pipeline route is slightly less than 1.8km, of which nearly one third (0.5km) will be crossed by tunnelling. The visual and landscape effects of crossing these woodland belts has been assessed and used in the development of mitigation measures. The pipeline also crosses other areas of semi-natural vegetation including watercourses and tree-lined lanes and tracks. Such features form important visual focal points along the route and so vegetation removal will be minimised, banks reinstated and trees replanted.

Where tree removal is unavoidable, four trees will be replanted for every one removed. However, as large tree species are not planted directly over pipelines there will remain a limited visual landscape effect at some of these locations.

#### Nature conservation

The potential effects of the proposed pipeline on ecology have been identified through a comprehensive desk-based assessment, consultations, walkover surveys and an extensive programme of follow-up surveys. This has provided detailed information on potential constraints associated with important features and species of nature conservation value along the pipeline route.

The pipeline has been successfully routed to minimise effects on important species and habitats; and site-specific mitigation measures will be undertaken where valuable areas cannot be avoided. These include:

#### Watercourses

Several watercourses crossed by the pipeline are internationally recognised as important wildlife sites for their species assemblage, including their fish populations, and the presence of otters and white-clawed crayfish. These watercourses will be crossed by tunnelling (non open-cut methods) to minimise direct effects. Other large rivers will also be crossed by tunnelling. Minor watercourses will be crossed by damming or channelling the water into pipes; the pipe trench can then be excavated in dry conditions.

Where the beds and banks of watercourses are disturbed these will be carefully reinstated and protected from erosion while vegetation is re-established. The crossing methods adopted for all watercourses will be agreed with the Environment Agency (England and Wales) prior to the start of pipeline construction.

#### Valuable grasslands and bogs

Where such areas are crossed, site-specific measures are proposed to minimise damage and ensure successful restoration, these include:

- Reducing the working width;
- Special topsoil stripping techniques to maximise natural germination when soil is replaced;
- Taking seed cuts of the same or adjacent areas to re-seed the area affected;
- Cutting turves, storing and replacing them after construction;
- Maintenance of the existing drainage patterns where these are important;
- Permitting natural regeneration where specific conditions allow; and
- Leaving the temporary fencing, installed each side of the working width during construction, in place for as long as necessary to achieve the required restoration to the satisfaction of the consultees and landowners/occupiers.

The pipeline has been routed to avoid large areas of native daffodils. Small patches, mostly at field and woodland edges, may be affected by the pipeline but these will be carefully reinstated following construction.

#### Hedgerows

Measures to minimise damage to hedges crossed by the pipeline include:

- Reducing the working width;
- Replanting with indigenous, locally sourced plants;
- Planting nearby gaps in the hedges, where appropriate and with the approval of the landowner, to achieve long-term landscape and ecological improvement; and
- Translocation of the most ecologically valuable hedges (i.e. the physical removal of the hedge to a temporary holding area and its replacement following construction in its original position).

**Woodlands**

Wherever possible, the pipeline has been routed to avoid woodlands. In a small number of instances, where woodlands run perpendicular to the pipeline route, this has not been possible. In each case a site-specific package of measures is proposed to minimise damage and ensure successful restoration. The measures include:

- Special topsoil stripping techniques to maximise natural germination when soil is replaced;
- Reducing the working width;
- Minor route changes to avoid individual trees;
- Harvesting of young saplings and seedlings to use in replanting;
- Replanting with locally sourced plant material where additional plants are needed; and
- Maintenance of the existing drainage patterns where these are important.



**Important species**

Measures have been taken to minimise the effect of the pipeline on species which are considered to be important both nationally and locally. For example, the pipeline has been routed to avoid badger setts and otter holts, and, wherever practical, vegetation removal will take place outside of the bird nesting season.

Additional measures taken to protect the most vulnerable species that may be temporarily affected by pipeline construction include:

- Fencing the working width to prevent great crested newts and reptiles from accidental injury during construction;
- Maintaining temporary links across the working width during construction, and replanting following construction, to ensure that bats can continue to use hedges and woodland belts as 'flight corridors';
- Careful clearance of hedges and woodland where dormice may be present, encouraging them into neighbouring habitat where additional dormice tubes and boxes have been installed;

**Wet woodland of high nature conservation value.**

This photo shows one of the woodlands crossed by the pipeline route. This 100m wide area of woodland borders the railway line running north from Ammanford, which the pipeline crosses to the north of Llandybie. Prior to works taking place, a site-specific Environmental Method Statement will be agreed with the Countryside Council for Wales for this and other valuable woodlands crossed, detailing how the pipeline will be constructed and how it will be reinstated after construction. For this wet woodland site, a non-open cut method, involving drilling or boring, will be used to install the pipeline under the majority of the woodland and the adjacent railway line, thus minimising direct effects. Tree removal is likely to be needed, however, where the pipeline emerges at the eastern edge of the woodland. Mitigation measures, where tree and soil removal is required at woodlands crossed by the pipeline, are described in 'Woodlands'.

This site, along with other sites of high nature conservation value, will be monitored over the years following replanting, to assess the success of restoration. The line of tape marks one of the transects that has been surveyed in detail to provide a baseline against which the success of restoration will be assessed.

- Accelerated reinstatement of hedges used by dormice and bats;
- Providing lines of deadwood for use by dormice as pathways across hedgerow gaps made by the pipeline route while replacement hedge plants become established;
- Using non open-cut methods to cross those rivers designated as internationally important, mainly for their populations of fish, otters and white-clawed crayfish;
- Conducting fish rescues when open-cut methods are used to cross watercourses;
- Capture and transfer of white-clawed crayfish away from the immediate working area at open-cut river crossings to avoid accidental injury during construction, together with other mitigation measures;
- Careful dismantling of log piles and other potential 'refugia' (features used for resting or hibernation); moving any reptiles away from the working area, together with other mitigation measures, as appropriate;
- Retention of cut hedge material, where appropriate, to enable the caterpillars of the brown hairstreak and white-letter hairstreak butterflies to emerge and replanting of the hedge section removed with appropriate species; and
- Implementation of appropriate grassland reinstatement where potentially valuable sites for marsh fritillary butterflies have been identified, with the approval of the landowner.

Once the pipeline construction has been completed, additional surveys will be undertaken to monitor the progress of reinstatement of important habitats and species which may have been affected by the construction of the pipeline.



**A lesser horseshoe bat.** The pipeline route passes close to a number of important bat roosts and the hedgerows and woodland belts crossed by the pipeline are, in these areas, often important as flight-lines for bats. These flight-lines will be maintained during construction and vegetation reinstatement accelerated, where appropriate.



**A dormouse.** Populations of dormice occur in several areas along the pipeline route. Vegetation will be removed carefully before construction to avoid injury. Hedgerows and woodlands used by dormice will be reinstated with the needs of dormice in mind and opportunities taken to improve the habitat for them, where appropriate.



**A great crested newt.** Great crested newts are present in some ponds on the eastern half of the pipeline route. None of the ponds will be affected by pipeline construction but special fencing will be erected to prevent newts being accidentally killed during pipeline construction.

**Water resources**

A study of the hydrology and hydrogeology has been undertaken to identify potential environmental constraints such as aquifers, existing water abstraction and discharge points, flood plains, watercourses, rivers at risk of pollution from sediment run-off, habitats which are particularly sensitive to changes in groundwater levels, springs and private water supplies.

Mitigation measures will be adopted to minimise both temporary adverse effects during construction and longer-term effects on water resources. These will include:

- Constructing temporary bridges across watercourses;
- Minimising surface water and sediment run-off through use of a range of measures including temporary banks, fences, ditches, etc. to trap soil and restrict and limit pollution in accordance with the latest good practice guidance to the construction industry;
- Careful reinstatement of watercourse banks to prevent future erosion and instability;
- Preventing contamination of watercourses and groundwater through applying stringent on-site pollution control measures;
- Applying strict controls over the pumping and disposing of water from excavations;
- Careful planning of hydrostatic pressure testing;
- Implementing flood prevention measures and temporary dewatering systems in floodplains (dewatering involves the installation of temporary drainage pipes, discharging through settlement tanks, as necessary, to manage the level of water entering the pipe trench or other excavations);
- Including barriers in the pipeline trench to prevent it acting as a conduit for groundwater; and
- The monitoring of spring fed and private water supplies before, during and after construction.

The pipeline passes close to public water supplies near Vowchurch in the Golden Valley, Herefordshire. The British Geological Survey has been appointed to undertake surveys to identify and assess the effects on the aquifer and water supplies and to propose

mitigation measures. This will include production of a computer model of the hydrogeology of the aquifer and the effect of pipeline construction (if any).



**The view from Dynevor Castle over the Tywi valley.** The pipeline route runs parallel to the Tywi within the floodplain on the far bank. The location of the topsoil storage mounds needed during construction will be agreed with the Environment Agency Wales (EAW) to minimise flood risk. The design of any temporary drainage system to control groundwater during construction will also be agreed with the EAW. The topsoil will be replaced and the grassland re-established as soon as possible after pipeline construction. The pipeline route should be fully reinstated, and the route of the pipeline no longer visible, the summer after construction. The castle is open to the public. National Grid will work with the National Trust, Cadw, Tourist Offices and the National Park to ensure information for tourists, businesses and local communities is managed effectively.

**Emissions**

An assessment of the effects of emissions is provided within the Environmental Statement and includes wastes, liquid effluents, releases to air and spillages. Emissions are almost entirely confined to the construction stage and will be minimised by careful planning and management as summarised below. Close liaison with relevant parties, such as Local Authority Environmental Health/Protection Officers will be maintained throughout construction.

- **Hazardous and non-hazardous waste generation:** a waste management plan will be prepared to control waste production, storage and disposal. Materials will be recycled or re-used where possible and waste needing disposal will be stored in suitable containers and removed off site;
- **Water discharges:** see 'Water resources';

- **Air emissions:** emissions from diesel engines will be kept to a minimum by turning them off when not in use and by correct maintenance;
- **Dust and mud generation:** dust and mud are largely weather dependent and vary in frequency and location. Water bowsers, sweepers and speed limits will be used to minimise nuisance or hazards;
- **Light:** the construction site will generally be unlit. Some tunnelling and commissioning activities may require 24-hour operation. Where this occurs, lighting will be shrouded to minimise disturbance;
- **Unplanned emissions and spillage:** stringent site control measures will be put in place as part of the pollution prevention and emergency response plans, including trained emergency crews, spill kits and staff training;
- **Noise and vibration:** noise sensitive areas will be identified and additional measures taken to reduce noise levels and to maintain communication with local residents.

**Agriculture**

National Grid has national agreements with UK farming and landowner organisations. These detail operational methods and minimum standards of workmanship for the construction and operation of pipelines and the reinstatement of land.

National Grid is committed to:

- Consult with landowners and commoners to help resolve any problems;
- Take precautions to prevent damage and injury to land, buildings, fences, stock, crops and the general environment;
- Make good any loss or damage;
- Take precautions to prevent the spread of animal and plant diseases;
- Protect and repair land drainage;
- Protect water supplies; and
- Ensure that reinstatement is in accordance with the objectives of any agri-environment scheme. These are schemes designed to enhance the ecological value of agricultural land, such as Tir Gofal in Wales and Environmental Stewardship in England.

Particular care will be taken to ensure that reinstatement of land in agri-environment schemes is in accordance with the objectives of that scheme.

Where replacement land drainage schemes are required and the existing drainage pattern has helped create valuable ecological habitats, both on and off the pipeline route, care will be taken to ensure that existing groundwater drainage patterns are maintained.

**Archaeology**

National Grid has conducted an extensive programme of archaeological surveys to identify known and potential archaeology along the pipeline route. The surveys undertaken consist of:

- Archaeological Desk-based Assessment;
- Archaeological Field Reconnaissance Survey (including archaeological line walking to allow for specialist advice in the field when determining the pipeline route);
- Archaeological Earthwork Survey;
- Archaeological Field Walking Survey;
- Archaeological Geophysical Survey;
- Archaeological Metal Detection Survey; and
- Archaeological Trial Trenching.

These surveys have been used to develop the mitigation measures described within the Environmental Statement. These measures are in accordance with nationally recognised standards and will be further developed and approved by the relevant Local Authority Archaeological Officers and the Welsh Archaeological Trusts. The mitigation measures include:

- Preservation *in-situ* of sensitive archaeological remains through a combination of localised variations to the route, reducing the working width, protective matting and careful reinstatement procedures;
- Excavating the site where preservation *in-situ* is not desirable or feasible. The findings are reported fully to preserve, by record, the archaeological value of the site; and
- Employing qualified archaeologists to monitor topsoil and sub-soil removal to identify and record any previously unrecorded archaeology discovered during construction.



A full programme of archaeological surveys is undertaken before the commencement of pipeline construction. One of the surveys carried out is geophysical survey using magnetometry. This method detects possible archaeological remains through analysis of local changes in the earth's magnetic field. Potential archaeological remains were identified along a section of the pipeline route to the west of Llangadog and this area was targeted for investigation. A trial trench (one of over 250 such trenches along the pipeline route) was excavated as shown in the photograph. In this case, an archaeological feature, believed to be a 15th/16th century brick kiln, has been identified and is visible in the photograph. Mitigation measures for this site and others identified will be discussed and agreed with the relevant Archaeological Trust or Local Authority Archaeologist before start of construction.

### Traffic and transport

Significant traffic will only be generated during the construction phase and good practice mitigation measures will be applied to minimise effects. These include:

- Production of traffic management plans, in consultation with local Highways Authorities and local Police;
- Crossing under main roads by tunnelling to minimise disruption;
- Minimising the distance travelled by road using local sources of equipment and materials;
- Minimising the generation of waste by reusing and recycling;
- Using the pipeline working width to move equipment along the route;
- Avoiding narrow and restricted roads for traffic movements;
- Plans to minimise impacts on tourist traffic, especially during holidays and when events such as the Hay-on-Wye festival are taking place; and
- Imposing local time restrictions on construction pipe and plant movements where necessary.

The level of temporary effects on communities, businesses and tourism will be carefully assessed along the pipeline route and used to identify where additional liaison and communication is needed. National Grid will liaise with the Brecon Beacons National Park Authority and Local Authority tourism officers to ensure that effects on promoted routes are minimised.

### Socio-economic environment

The pipeline is an important element in securing the UK's future energy supplies. It will also help the UK meet its commitments to reduce greenhouse gas emissions as part of efforts to minimise climate change. At a regional level, increased availability and security of gas supply will enhance the potential for growth in the Welsh economy. At a local level, the demand for goods, services and staff during construction will have a beneficial effect on the local economy.

National Grid is mindful of the need to minimise temporary negative impacts on local communities from traffic and to minimise impacts on tourism and recreation both during and after pipeline construction. This is particularly important in the National Park, where there may be both direct effects, for example on walkers, and indirect effects from the perception that the special qualities of the area have been affected.

During pipeline construction, public Rights of Way will be kept open wherever practical and all will be fully reinstated upon completion. Informal rights of way and patterns of access, e.g. on common land, will be identified with the help of local groups and used to plan temporary access points across the pipeline construction area. Public Rights of Way and other important paths may be diverted and signed where necessary.

A project communications plan will ensure that, through timely communications, communities, businesses and local residents will be informed of construction works and associated activities that may affect them throughout the lifetime of the project. The communications may include site signage, targeted letter-drops, individual meetings, local exhibitions and information provided to the local press and media. A freephone telephone information line (0800 731 0561) has been established and will be maintained to provide further access to project information.

Through consultation with the Brecon Beacons National Park Authority, Local Authorities, the Environment Agency (England and Wales) and others, the communications plan will identify where effects on tourism may occur to ensure that appropriate and timely information can be provided on pipeline construction and restoration. This will aim to provide reassurance about the effects that the pipeline may have and how these effects will be minimised.

## Conclusion

National Grid recognises that, in order to minimise the effect of the Felindre to Tirley natural gas pipeline, there are a significant number of mitigation measures that need to be implemented across all aspects of the project. To achieve this, National Grid will ensure that the mitigation measures are developed into achievable working practices and, most importantly, that these working practices are undertaken at the appropriate times in conjunction with the construction programme. These mitigation measures and working practices will be disseminated to all staff working on the project.

The result will be that the environmental effects of the pipeline are minimised. The majority of the pipeline route will be restored to its pre-existing visual appearance within the immediate months following pipeline construction. Other areas such as marshy grassland, upland grassland and heathland, newly replanted hedgerow sections and woodland belts, will take longer to merge with the existing vegetation. A programme of post-construction ecological management will be implemented to ensure successful restoration throughout the pipeline length.