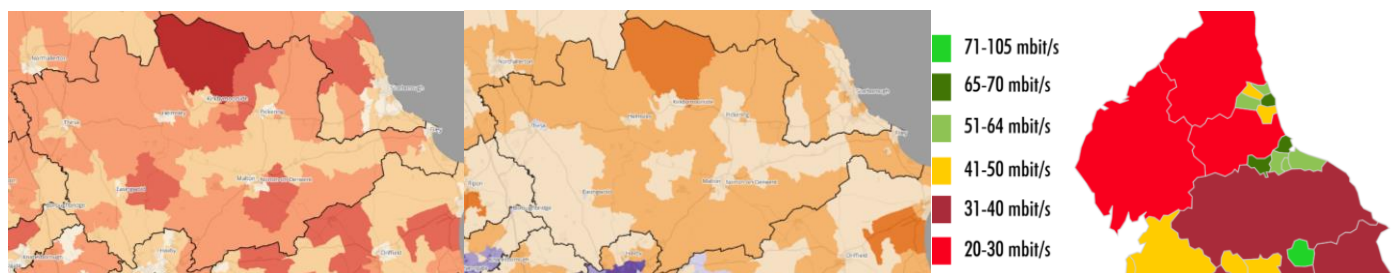


Solutions for the fifteen per cent

How to provide superfast broadband to rural residents

June 2018



Kevin Hollinrake
Member of Parliament for the Thirsk
& Malton Constituency

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Foreword



Kevin Hollinrake MP
Member of Parliament for Thirsk and Malton

In 1992, I co-founded Hunters Estate Agents with John Waterhouse and built it into the successful business that operates today; it is now a national publicly listed enterprise with over 200 offices across the nation. I have also successfully started, built and sold two significant technology businesses. I know that small businesses are the backbone of our economy and access to superfast broadband is vital; it is now as important as any other utility, such as electricity and water.

The Government delivered on its manifesto commitment to extend superfast broadband to 95 per cent of the UK by the end of 2017¹. Only 84 per cent of premises in my constituency, however, are able to benefit from superfast broadband. Phase 3 will see Superfast North Yorkshire take coverage further to approximately 95 per cent of premises by 2020, however superfast broadband remains unobtainable in the medium term for at least five per cent of my constituents. Thousands of homes and premises will remain poorly connected, if connected at all, for another three years and beyond.

The Government's Digital Strategy was published in March 2017 and sets out how we intend to make the UK the best place to establish and grow a digital business. The first pillar, which is central to everything, is infrastructure and the Government committed to building a world-class digital infrastructure for the UK. The Department for Digital, Culture, Media and Sport (DCMS) know that it must be fit for the present and developed for the future. We can and we must harness these technologies so that the benefits can be accessed by all, especially those living in the hard-to-reach, rural areas.

As the MP for one of the largest constituencies in England, by area, I understand the woes of thousands of households and businesses who are unable to access decent and reliable broadband. Internet access and poor mobile phone coverage are preventing many parts of North Yorkshire being able to compete in business with the rest of the United Kingdom, prevent households from accessing vital services and restrict students from access to learning resources. As we leave the European Union and Britain becomes a more export-driven economy, our businesses, large and small, will need to compete with companies across the globe in a digitally connected world.

A number of companies have provided fixed wireless solutions to this connectivity gap in rural areas. I am fully supportive of the Government's plan to rollout superfast broadband but I am keen to see the solutions provided by local suppliers brought to homes and businesses who will not be connected to the fibre network. I have written this report to examine fixed wireless as an alternative to fibre broadband. We must extend and improve coverage to the hard-to-reach areas in a fiscally sensible and forward-thinking way.

¹ Government delivers on promise to take superfast broadband to 95% of UK premises, January 2018
<https://www.gov.uk/government/news/superfast-broadband-now-available-to-more-than-19-out-of-20-uk-homes-and-businesses>

Executive Summary

- More than 95 per cent UK homes and businesses now have the opportunity to upgrade their internet connections to superfast speeds of 24 Mbps or faster. Broadband Delivery UK plans to extend this to 98 per cent of UK premises by 2020.
- Superfast broadband coverage is still below 85 per cent in as many as 14 per cent of English constituencies. The number of unconnected premises is estimated to be at least 1.5 million nationally².
- Average download speeds in Thirsk and Malton, for example, are 38 per cent lower than the national average. Coverage should extend further to approximately 95 per cent of premises in North Yorkshire by June 2021.
- There are a number of alternatives to broadband, including satellite, 4G and fixed wireless. There are disadvantages associated with each: satellite & 4G often have data caps, lower speeds, higher latency and a higher cost.
- Fixed wireless broadband delivers internet connections using the radio frequency spectrum, much like mobile phone networks. Although there is some funding for fixed wireless, the Government's focus on fibre means that some areas remain unconnected.
- Innovative companies such as Beeline, Boundless, Quickline, Signa and others deliver locally-based fixed wireless solutions in North Yorkshire. They have provided practical and cost-effective solutions in hard-to-reach rural areas, benefitting homes and businesses in Thirsk and Malton.
- Fixed wireless providers do not build infrastructure due to fears of build over by Openreach. Openreach do not always tell communities when to expect fibre broadband and sometimes send mixed messages when they do.
- Openreach will not offer fixed wireless solutions and will not partner with local providers who do. Local providers are therefore unable to benefit from a choice of Internet Service Providers and the range of packages they provide. Local providers also suffer from the need for separate phone lines.

Building on the success of firms in North Yorkshire, this report calls on the Government to adopt three recommendations to extend superfast and ultrafast broadband to homes and businesses in rural areas such as North Yorkshire by fixed wireless solutions.

- **Recommendation 1:** Openreach should develop a fixed wireless strategy for rural areas
- **Recommendation 2:** Openreach could work with third party suppliers to deliver holistic solutions
- **Recommendation 3:** DCMS should consider providing national funds for fixed wireless as an alternative to fibre
- **Recommendation 4:** The Gigabit Voucher Scheme should also be applied to fixed wireless solutions

² Go Compare, August 2016 <http://www.gocompare.com/broadband/satellite-broadband/>

Case study: Broadband in North Yorkshire

Average download speeds are 27 per cent slower on average in rural counties compared to London boroughs and 44 per cent slower than mainly urban English unitary authority areas. North Yorkshire residents have an average download speed of 30.2 Mbps, compared to York’s average speed of 102 Mbps.

Districts like Ryedale in Yorkshire feature in the bottom five worst regions for connectivity speed in the UK, with speeds only worse in sparsely populated regions of Scotland. The rural district of Ryedale, which includes part of the North York Moors, has average speeds of just 25.8 Mbps, less than a fifth of those experienced in the nearby York.

Broadband coverage remains poor in Thirsk and Malton when compared to neighbouring constituencies and to the UK. Average download speeds in Thirsk and Malton are 38 per cent lower than the national average. To give some local examples, 56.9 per cent of lines in the Dales ward are unable to receive decent broadband speeds. Cropton is in the worst 10 per cent of wards in the UK on every measure; Ampleforth, Derwent, Sinnington and the Wolds do not fare much better.

As a large rural constituency, farms dominate the landscape of Thirsk and Malton in North Yorkshire. Farms are increasingly diversifying and a large number of businesses are run from home. Research shows that the total number of home businesses in the UK has grown to 2.7 million in 2017, an increase of 40 per cent since 2000³. Home-based businesses span a broad range of sectors in the economy; IT and telecommunications account for more of these enterprises than any other single industry.

Summary data	Thirsk & Malton ⁴	UK	Difference	Islington North ⁵	York Outer
Superfast availability	83.9%	91.4%	13.5%	96.9%	92.5%
Full fibre availability	2.7%	4%	1.3%	4.3%	12.3%
Average download speed	27.8 Mbps	44.6 Mbps	16.8 Mbps	55.2 Mbps	128.9 Mbps
Receiving under 2 Mbps	4.5%	2.3%	2.2%	0.6%	3.7%
Receiving under 10 Mbps	29.9%	24.0%	5.9%	15.4%	27.8%
Receiving under 30Mbps	40.7%	48.9%	-8.2%	54.2%	48.6%
Unable to receive 10 Mbps	8.8%	3.0%	5.8%	0.4%	2.3%

Superfast availability is currently unobtainable in over fifteen per cent of premises in Thirsk and Malton. Almost one in twenty premises still receive less than 2 Mbps and almost a third of residents receive under 10 Mbps. Ofcom says that this speed is required for decent broadband, since it is part of the minimum level of broadband performance required for internet access to services such as web browsing, email, online learning and certain video services. In Thirsk and Malton, 2.2 per cent of properties cannot access 2 Mbps download speed compared to 0.5 per cent of properties UK-wide.

The constituency of York Outer borders that of Thirsk and Malton and has similar challenges such as terrain and its rural and remote nature of its towns and villages. However, properties in York Outer experience an average download speed of 128.9 Mbps, five times that of Thirsk and Malton.

³ Centre for Economics and Business Research with Vonage, Unlocking the UK’s Home Business Potential, October 2017, <https://cebr.com/reports/cebr-report-with-vonage-unlocking-the-uks-home-business-potential/>

⁴ Broadband Connectivity and Speeds in Thirsk and Malton, House of Commons Library, Accessed January 2018

⁵ Broadband Coverage and Speeds Constituencies, 2017, House of Commons Library, Accessed April 2018

When compared to Islington North, a constituency in inner-city London, the contrast is even starker. 96.9 per cent of premises in the north London constituency have superfast availability and only 0.6% receive speeds under 2 Mbps.

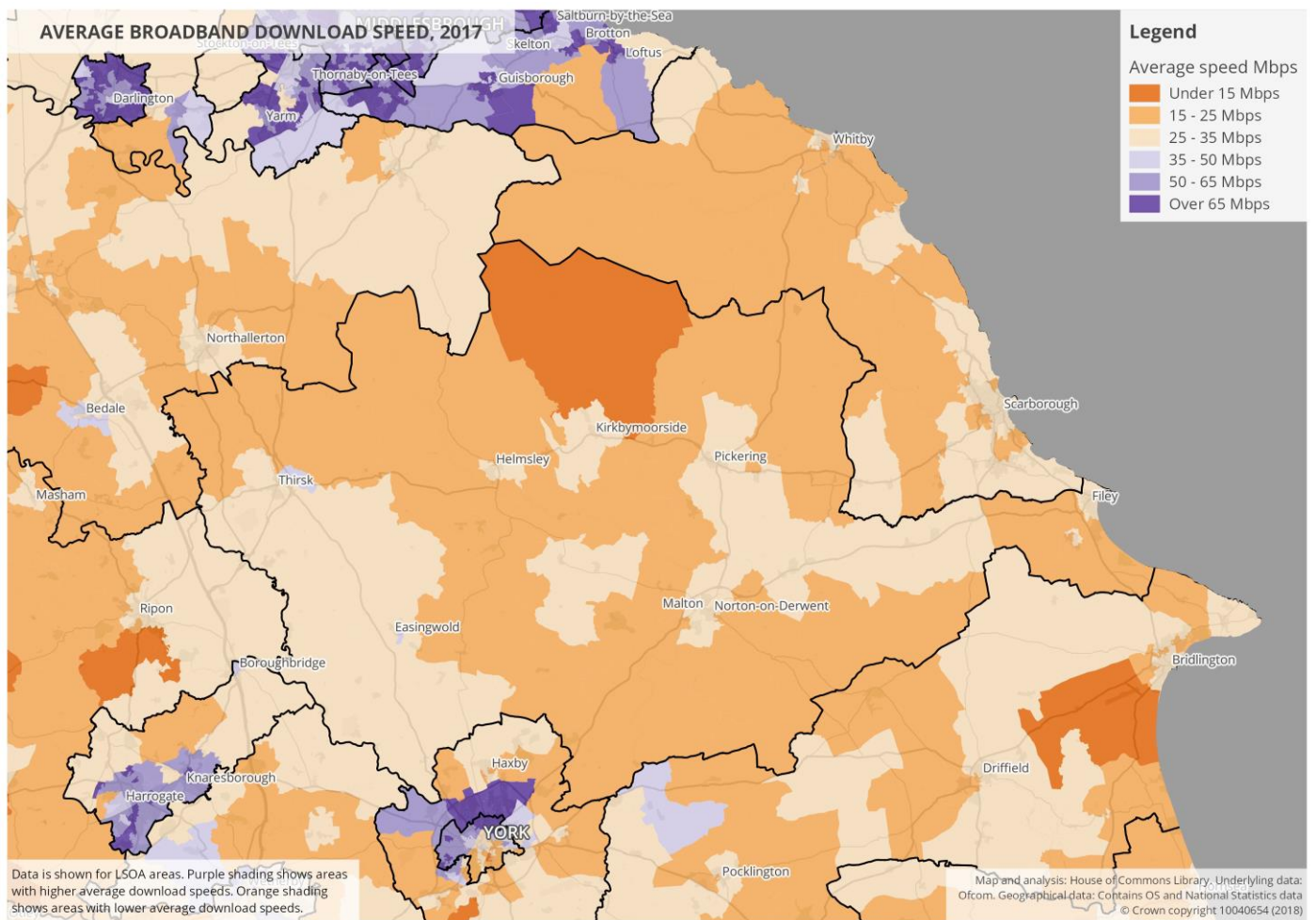
Nearby constituency comparison ⁶	Average download speed (Mbps)	Comparison: Thirsk and Malton	Unable to receive 10Mbps	Comparison: Thirsk and Malton
Thirsk and Malton	27.8	-	8.8%	-
East Yorkshire	27.0	-0.8	4.4%	4.4%
Harrogate & Knaresborough	54.6	26.8	1.0%	7.8%
Middlesbrough S & E Cleveland	62.6	34.8	3.1%	5.7%
Scarborough & Whitby	27.4	-0.4	8.8%	0%
Selby & Ainsty	26.5	-1.3	4.9%	3.9%
York Central	82.4	54.6	1.0%	7.8%
York Outer	128.9	101.1	2.3%	6.5%

The table above compares information about broadband speeds to constituencies which neighbour Thirsk and Malton. Scarborough and Whitby suffer from slow speeds but York Outer benefit from high average download speeds and fewer houses unable to receive Ofcom's minimum decent speed.

Data obtained from *think broadband* place Thirsk and Malton 594th out of 650 constituencies in its ability to receive speeds over 24 Mbps.

Constituency rank/650 (over 24 Mbps)	Constituency	Superfast premises (Over 24 Mbps)	Superfast (Over 30 Mbps)	Observed Average Download Speed Q1 2018	Observed Average Upload Speed Q1 2018
594	Thirsk and Malton	86.2%	85.4%	24.2 Mbps	5.5 Mbps

⁶ *think broadband*

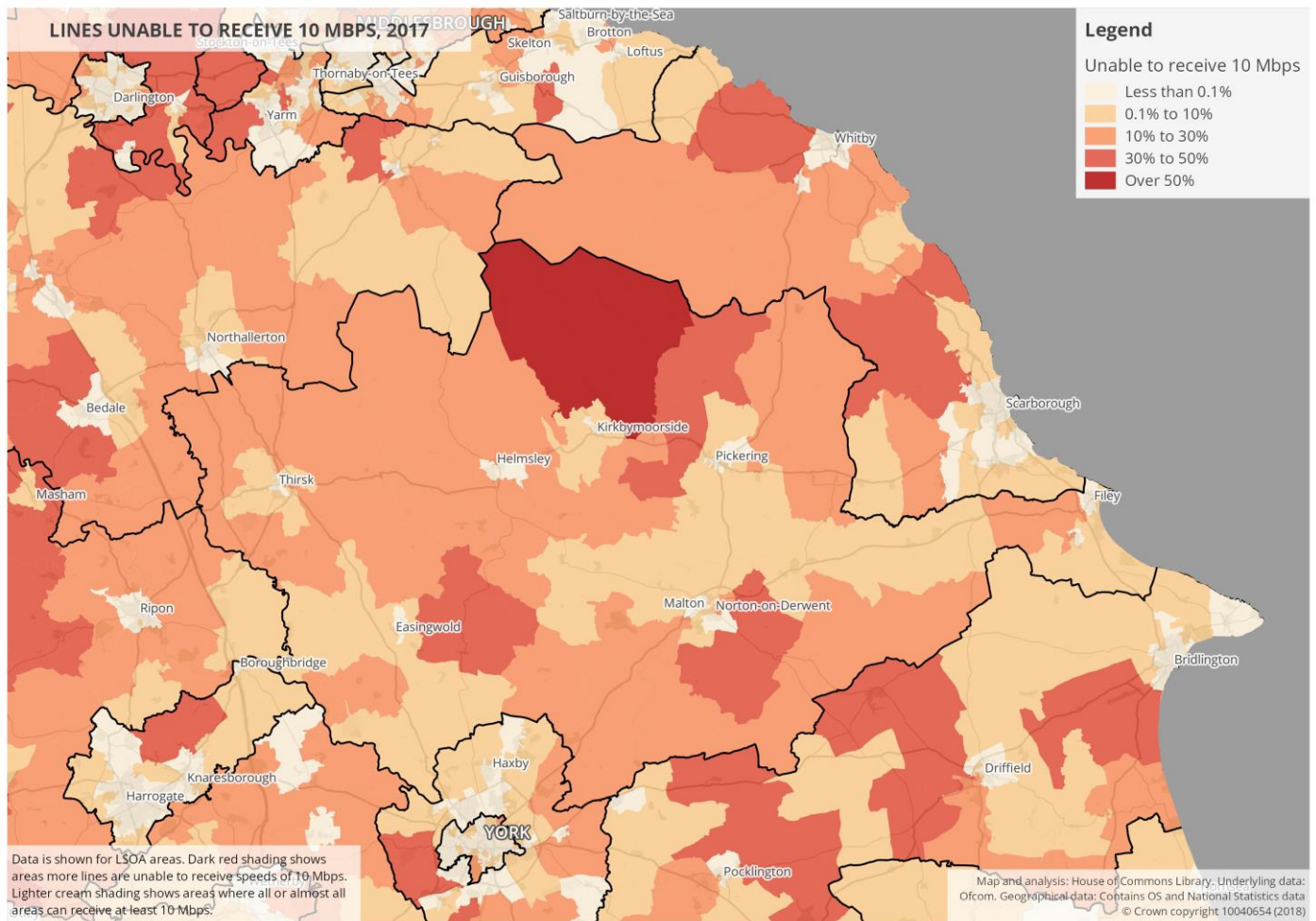


The map above shows the average broadband download speeds across the constituency of Thirsk and Malton. Only two areas, Easingwold and Thirsk, are shown to have average broadband download speeds above 35 Mbps. The map shows that the constituency is dominated by large swathes of areas unable to receive download speeds higher than 25 Mbps. The north of the constituency suffers the most as it remains unable to reach download speeds averaging less than 15 Mbps.

The table below outlines typical data usage per person per month. This is expected to increase as the digital economy develops further and the internet of things becomes more of a reality for households and businesses.

Typical data usage per month ⁷	Number of people				
	One	Two	Three	Four	Five+
Email	5GB - 10GB	10GB - 20GB	20GB - 30GB	30GB - 50GB	50GB-75GB
Internet	5GB - 20GB	10GB - 30GB	20GB - 50GB	30GB - 75GB	50GB-100GB
Social Media	10GB - 30GB	20GB - 50GB	30GB - 75GB	50GB - 100GB	75GB-125GB
Streaming	20GB - 50GB	30GB - 75GB	50GB - 100GB	75GB - 125GB	125GB-150GB
Film Downloading	30GB - 100GB	50GB - 125GB	100GB - 150GB	125GB - 150GB	125GB-150GB

⁷ Avonline Broadband <http://avonlinebroadband.com/how-much-data-do-i-need/> Accessed March 2018



The above map shows lines, in the constituency of Thirsk and Malton and surrounding areas, which are unable to receive 10 Mbps. The map illustrates that in most areas of the constituency, up to a third of all premises are unable to receive Ofcom’s minimum standard of decent broadband. In some areas, east of Easingwold, east of Kirkbymoorside and southeast of Malton, areas up to a half of premises cannot receive download speeds of 10 Mbps. The north of the constituency is very poorly connected as over 50 per cent of premises do not have access to decent broadband.

Companies in and around North Yorkshire, tired of waiting for funding and fibre, started developing fixed wireless solutions.

There are several local providers, including:

- Beeline Broadband – coverage in Ryedale, North Yorkshire
- Boundless Communications – coverage in Lancashire and North Yorkshire
- Bush Broadband – coverage in North Yorkshire
- Fibre Options – UK wide coverage
- Quickline – coverage in Lincolnshire, North and South Yorkshire
- Save9 Networks – coverage around Scarborough and the East Coast
- WifiBill - coverage in East Riding and the east of North Yorkshire

The Government's UK Digital Strategy

In England, each county council, unitary authority or local enterprise partnership is leading the broadband roll-out in their area. In Scotland, Wales and Northern Ireland the roll-out is led by the devolved administrations.

In March 2018, the Government introduced a Universal Service Obligation (USO) for broadband as part of its commitment in the UK Digital Strategy to ensure that the UK has world-class digital connectivity.

The new USO is a UK-wide measure, intended to fill the gap left by the UK Government's existing broadband roll-out programs, to deliver broadband connections to the hardest to reach premises in the UK. From 2020, the USO will provide a legal right to request a broadband connection of at least 10 Mbps download speed, up to a reasonable cost threshold of £3,400. Ofcom says that this speed is required for decent broadband.

A universal service provider (most likely Openreach) will be obliged to build all reasonable requests. Ofcom is now responsible for implementing the USO. For the hardest to reach areas, consumers are expected to consider other options and there are several technical details to be finalised.

The Digital Economy Act 2017 gives the UK Government the power to implement the USO via secondary legislation. The Act also allows for the Government to review the USO and to increase the minimum speed. As the digital economy grows and the internet of things increasingly becomes a part of our daily lives, minimum speeds will have to increase. In the meantime, almost a third of constituents living in Thirsk and Malton cannot expect to receive speeds up to this basic minimum.

The minimum technical standards proposed for the USO proposed are:

- Minimum download speed of 10 Mbps.
- Minimum upload speed of 1 Mbps.
- Additional quality parameters: medium response times, a minimum data cap of 100 GBs and a contention rate of 50:1 (a maximum of 50 users to share one bandwidth).

A mix of technologies that meet the minimum specifications will be used to deliver the service. Satellite connections are unlikely to fulfil the additional quality parameters for the USO as they typically have high latency and limited data capacity. They are expected to be the only option for approximately 0.2 per cent of consumers. Ofcom reported that as of May 2017, 1.1 million premises (4 per cent) in the UK would qualify for the USO based on the proposed technical specifications.

The USO is intended to be available only to those consumers that do not have broadband connections that fulfil the minimum standards available, not those who have such a connection available but choose not to subscribe to it. Due to the demand-led structure, the number of premises covered by the regulatory USO will ultimately depend on the number of consumers that register.

An indication of what you can do with different download speeds ⁸	Download speed			
	10 Mbps	30 Mbps	300 Mbps	1 Gbps
Streaming music	Yes	Yes	Yes	Yes
Downloading an album	1 – 2 min	30 – 60 sec	< 10 sec	< 5 sec
Streaming an HD movie	Yes	Yes	Yes	Yes
Downloading an HD movie	1 – 1½ hours	30 min	< 5 min	< 2 min
Streaming an ultra HD movie	No	Yes	Yes	Yes
Downloading an ultra HD movie	5 hours	1½ - 2 hours	<15 min	< 5 min

The Gigabit Voucher Scheme

With the advent of the internet of things and an ever greater demand for data, the Government has recently focused on new measures to future-proof the UK’s digital infrastructure via investment in ultrafast (300 Mbps plus) and gigabit-capable (1 Gbps) full fibre networks. While the primary focus is on supporting productivity through a concentration on business clusters, the configuration of the schemes offers good potential for rural applicability in constituencies such as Thirsk and Malton.

In late 2017, the Government began the first wave of its Gigabit Voucher Scheme (GVS) for businesses and households when £10 million was used to pay for five pilot projects. This was then extended nationally with a £67 million budget in mid-March. All small businesses, and up to six domestic properties per business, are eligible to apply for vouchers, which can be pooled and used towards the deployment of full fibre connections. Business vouchers are worth £3,000 and household vouchers are worth £500. To qualify, the recipients must at least double their broadband speeds and sign up for a 10 Mbps minimum, 1 Gbps capable connection for a minimum of one year. This means that for communities containing business premises, there is the potential to achieve chunks of £6,000 per business, (one business voucher plus six household vouchers) to contribute to the overall cost of a community broadband scheme.

The published GVS guidance is clear on the speed and availability targets that need to be met. The Government is committed to a vision of a full fibre Britain and it is unclear whether the GVS can be applied to fixed wireless broadband solutions. DCMS will not currently support wireless to the premises but might accept a wireless component of an overall fibre delivery plan. Although it is not in the spirit of the full fibre policy, it would be strategically sensible to apply the GVS to fixed wireless broadband as the two could complement each other by providing the necessary funding and impetus to deliver ultrafast speeds to the hardest to reach areas. It is also going to offer the most cost-effective solution for rural communities who fall outside the 97 per cent who are set to benefit from BDUK-led superfast coverage scheduled by 2020. There should be more flexibility within the GVS, for example, to use fixed wireless to the premises for delivery. Fixed wireless as an alternative to fibre is described in more detail below.

⁸ Ofcom, Connected Nations Report 2017, page 1, https://www.ofcom.org.uk/data/assets/pdf_file/0024/108843/summary-report-connected-nations-2017.pdf (Estimates assume exclusive use of the broadband connection. If others are using the connection at the same time, content may take longer to download or may stream at a lower quality.)

Fixed Wireless as an alternative

Fixed Wireless

This report proposes fixed wireless as an alternative to fibre or other alternatives such as satellite. Fixed wireless broadband delivers internet connections using the radio frequency spectrum, much like mobile phone networks. No physical wired infrastructure to the premises is required. The technology is proven locally and can be cost effective; fixed wireless broadband connections are generally cheaper to install than fibre connections⁹. They are more limited regarding the upper limit of download speeds that can be achieved and the ability to support many users at one time. Most wireless Internet Service Providers (WISPs) only offer limited coverage in specific areas, for example rural villages.

Fixed Wireless Access is used to deliver last mile service and it has been proven to work in villages and towns across North Yorkshire. A WISP, Boundless, suggest that they can pass more premises than fibre or copper wired services, 2,500 compared to 500 at a cheaper cost per connection, £72.22 to Openreach's £1,439.70. A single fixed wireless distribution point can provide access to 400 premises at Next Generation Access (NGA) speeds at a distance that is six times further than Fibre to the Cabinet (FTTC).

Ofcom does not provide data on the number of premises who use fixed wireless broadband connections. According to WISPs, fixed wireless connections are increasing to a number so large that it can no longer be ignored. They may, therefore, be included in future Ofcom reports, such as the annual Connected Nations Report. Although it has been difficult to assess, a report by Point Topic estimates that WISPs operating fixed wireless access networks cover up to two million premises¹⁰. Point Topic used an INCA survey to ask alternative broadband providers about their concerns. The top three were:

- Overbuild by Openreach and some other operators
- Access to suitable backhaul services
- Engaging with developers and/or local authorities on new build housing plans

These concerns are familiar to companies trying to offer alternative broadband solutions and extend superfast rollout to the hardest-to-reach rural areas. Overbuild has been a problem in Thirsk and Malton and the village of Hutton Le Hole provides a pertinent example; this is described in more detail as a constituency case study further below in this report. Local companies have also complained of difficulty in accessing existing infrastructure as Openreach will not work with third parties.

Mixed messages have confused residents in Tholthorpe as new properties were expected to be connected to a fibre capable cabinet in the village, leaving twelve properties who are connected to a separate cabinet some miles away without access to superfast speeds. Local authorities, developers and providers are seemingly not communicating as effectively as they should.

The Government's Better Broadband Scheme provides vouchers to subsidise the cost of wireless broadband connections. This equates to a cost reduction of around £350 for premises that are unable to access 2 Mbps download speed and for which there is no planned roll-out of superfast broadband in the next year. The cost of a fixed wireless connection depends on the area, the provider and the quality of the connection. It has always been a matter of NYnet not requiring them to use a mix of technologies hence they just use their own technology.

⁹ House of Commons Library, April 2018

¹⁰ Metrics for the UK altnet sector - Scale, coverage, ambitions, concerns, page 3, Point Topic, April 2018

Satellite

A satellite dish can be used to provide access to broadband services. The main advantage of satellite broadband is that it can be provided virtually anywhere in the world, as long as there is a clear line of sight. For some time, it has been used in rural areas where traditional fixed-line based broadband services are not available. Ofcom's 2016 assessment of the Universal Service Obligation (USO) and a DCMS consultation, which ran until 9th October 2017, made it clear that satellite's current capabilities do not meet the proposed specification to deliver universal affordable broadband. There are three major disadvantages to satellite broadband:

- **Slow speeds** - The signal must travel over 20,000 miles to the satellite before returning to Earth. These long distances result in high-latency meaning slower speeds compared to other connection methods. Real-time internet services and applications such as voice chat and online gaming do not function well and lag. The weather affects the signal to the point that wet and windy weather can result in a lost signal. Speeds vary but satellite generally offers speeds up to 30 Mbps.
- **Cost** - Satellite broadband requires installing a dish and other infrastructure to premises; this comes with a cost. The monthly cost then seems expensive considering the slower download and upload speeds, in addition to a data cap.
- **Data cap** - Users of satellite broadband are often limited by a monthly data cap. Some unlimited products are available but often expensive. Usage allowances are lower than fixed line broadband services and so downloading large files or watching catch-up television is less than suitable.

4G

4G is the fourth generation of broadband cellular network technology, which gives mobile ultra-broadband (gigabit speed) access. It follows 2G technology, which was suitable for making calls and sending text messages, and 3G which made it possible to better access the internet through a mobile phone. Download speeds of 4G networks are 5-7 times those for existing 3G networks.

Ofcom is in the process of auctioning airwave frequencies for 4G mobile and future 5G services, which should improve connectivity and access to 4G networks more widely. There are, however, disadvantages to 4G broadband and these are listed below:

- **Data cap** - Families who use lots of data streaming movies, music and playing online games will use hundreds of GB of data every month. Those who simply use the internet for emails and data low services could benefit from 4G but not save them money.
- **Limited bandwidth** - Phone networks are expensive to build and run. The networks prioritise voice calls and therefore have limited bandwidth. Most mobile phone users have a data cap and are charged for going over the cap and the same principle works for users of 4G broadband. For instance, Three's HomeFi offers 40 GB for £24 per month, which works out at £1.67 per gigabyte. However, once the allowance has been used, add-ons are available for £10 for 1 GB, or £15 for 3 GB.
- **Current problem of poor mobile phone signal in rural areas** – Rural areas already suffer from poor mobile phone signal when trying to make calls and send texts. People inside 90 per cent of UK premises can now make telephone calls on all four mobile networks, however, this falls to 57 per cent in rural areas¹¹. Relying on mobile phone infrastructure to provide superfast broadband services to rural areas would be more problematic without a huge investment in building infrastructure.

¹¹ Ofcom, Connected Nations Report 2017, page 5, https://www.ofcom.org.uk/data/assets/pdf_file/0024/108843/summary-report-connected-nations-2017.pdf

Broadband Package comparisons	Signa (formerly Moorsweb) ¹² (Fixed wireless)	Boundless ¹³ (Fixed wireless)	Quickline ¹⁴ (Fixed wireless)	Beeline ¹⁵ (Fixed wireless)	Avonline ¹⁶ (Satellite)	EE ¹⁷ (4G wireless)	Openreach Inifinity ¹⁸ (Fibre)
Installation fee (£)	£200	£150	£195	£240	Hardware £300 + £140 to install	£100	£59.99
Price (£) per month	£28.40	£29.99	£29.99	£24.00	£29.95	£35.00	£29.99-33.49
Download speed (Mbps)	20 Mbps	30 Mbps	10 Mbps	10 Mbps	30 Mbps	30 Mbps	52 Mbps
Upload speed (Mbps)	5 Mbps	10 Mbps	5 Mbps	5 Mbps	2 Mbps	6 Mbps	9.5 Mbps
Monthly Data cap (GB)	150 GB	Unlimited	Unlimited	Unlimited	10 GB	50 GB	Unlimited
Latency milliseconds (ms)	About the same latency as a cable or DSL connection	About the same latency as a cable or DSL connection	About the same latency as a cable or DSL connection	About the same latency as a cable or DSL connection	550ms	60-70ms	Negligible
Performance affected by:	<ul style="list-style-type: none"> Bandwidth – Busy network reduces speeds Location 	<ul style="list-style-type: none"> Bandwidth – Busy network reduces speeds Location 	<ul style="list-style-type: none"> Bandwidth – Busy network reduces speeds Location 	<ul style="list-style-type: none"> Bandwidth – Busy network reduces speeds Location 	Weather	<ul style="list-style-type: none"> Proximity to 4G mast Number of people on network 	<ul style="list-style-type: none"> Bandwidth – Busy network reduces speeds
Notes	Working to be Ultrafast capable (100Mbps+) by the end of 2018	Available to businesses	Available to businesses	Available to businesses	Available to businesses	<ul style="list-style-type: none"> Unlimited usage unavailable Not yet available to businesses 	Includes BT Sport & calls

The table above compares broadband packages using a mixture of local providers who offer fixed wireless solutions, a nationwide supplier for satellite services and Openreach infinity fibre.

This clearly shows that fixed wireless can compete not only with satellite, which is often assumed to be the sole solution to non-fibre but also with fibre packages. Monthly prices are competitive, download speeds are above the USO minimum, data is often unlimited and latency is better than both Avonline satellite and EE's 4G wireless package.

Fixed wireless packages are available to businesses and the infrastructure costs less to install than it does with satellite. However, alternative solutions and third party suppliers are unable to offer BT sport and other holistic solutions. Openreach have also refused to partner with third party WISPs in North Yorkshire.

Accessed March 2018:

¹² <http://signa-uk.com/moorsweb/>

¹³ <http://www.boundlessnetworks.co.uk>

¹⁴ <http://www.quickline.co.uk/home-connect-internet-only/>

¹⁵ <https://beelinebroadband.net/pricing>

¹⁶ <http://avonlinebroadband.com/choose-your-package/choose-av-superfast-30mbps/>

¹⁷ https://shop.ee.co.uk/dongles/pay-monthly-mobile-broadband/4gee-router/details?intcam=ts_shown

¹⁸ <https://www.broadbandchoices.co.uk/providers/bt/bt-infinity-fibre-optic-broadband>

Mobile 4G & 5G connectivity

In December 2015, the Home Office announced its decision to award the contract to provide the Emergency Services Network (ESN) communication system to EE, who are building new infrastructure. It is built using the latest technology and will deliver secure and resilient voice communication to individuals contacting the emergency services. The Emergency Services Network is also delivering broadband data services over an enhanced and more resilient commercial 4G network.

The ESN is being built on EE's commercial network, which is already the largest 4G network in Great Britain. EE are building more than 500 new 4G sites and expect customers to benefit from expanded coverage in rural areas.

Through this contract, EE have built infrastructure in some of the remotest parts of the UK. EE are utilising this opportunity by offering 4G antenna broadband to provide rural homes with superfast broadband as fast as fibre. Further study could look at third party local internet service providers being offered the chance to build on top of or alongside these cables and masts to deliver fixed wireless solutions to hard-to-reach rural areas.

Rosedale now has a mast, thanks to the ESN, however it carries no customer network service. Allowing networks to build on the infrastructure available would prove to benefit 4G & 5G users in the area.

Proposal

Building on the success of local internet service providers such as Beeline, Boundless, Moorsweb and others, this report calls on the Government to adopt three recommendations to extend superfast and ultrafast broadband to homes and businesses in rural areas such as North Yorkshire using fixed wireless solutions.

- **Recommendation 1:** Openreach should develop a fixed wireless strategy for rural areas

BT is focused on rolling out fibre to 95 per cent of premises in North Yorkshire by 2021. This report recommends that during this rollout, Openreach should develop a fixed wireless strategy to provide superfast broadband to the remaining five per cent in the hardest-to-reach areas in the same timeframe.

- **Recommendation 2:** BT could work with third-party suppliers to deliver a holistic solution

Local providers have already invested in the area and built infrastructure across North Yorkshire. They offer fast, reliable and cost-effective alternatives to fibre broadband. They are held back by a lack of information from Openreach. When Openreach announce they will provide fibre to an area, any existing fixed wireless infrastructure becomes obsolete. This prevents the rollout of wireless as third party ISPs will not invest in building the infrastructure if there is a possibility that the area will be connected to the fibre network. Businesses and consumers, likewise, will not subscribe to a wireless service if there is a vague promise of fibre. Openreach should work with these local companies to coordinate effective solutions without wasting resources through duplication.

- **Recommendation 3:** DCMS should provide national funds for fixed wireless as an alternative to fibre broadband

There are funds available via the Government's Better Broadband Scheme, which provides vouchers to subsidise the cost of wireless broadband connections; the future of this is uncertain. In the meantime, households and businesses delay investing in infrastructure as installation costs remain high and the promise of fibre broadband is forever just around the corner. Sixteen per cent of premises in Thirsk and Malton cannot currently access superfast broadband. Eleven per cent will have to wait another three years. Five per cent will wait beyond that. These delays are hurting the local economy and they slow the development of a truly digital economy and its benefits available to all. Fixed wireless is cost-effective and can often connect hundreds of homes, in the last mile, for less money. The Department for Culture, Media and Sport should provide national funds or incentives for Openreach and other network providers to offer fixed wireless as an alternative to fibre broadband.

- **Recommendation 4:** The Gigabit Voucher Scheme should be applied to fixed wireless solutions

The Gigabit Voucher Scheme is rightly designed to underpin future-proof ultrafast broadband delivery through its demand for 100 Mbps minimum, 1 Gbps capable infrastructure. There are many cases where this can be delivered most cost-effectively in dispersed communities through the use of fixed wireless. While the published guidance is unclear on this point, DCMS has indicated a willingness to accept fixed wireless backhaul in a GVS scheme while ruling out fixed wireless to the property. We believe this is counter-intuitive, and would like to request a clarification of GVS guidance that will allow full fixed wireless delivery, so long as the other scheme criteria are met.

Conclusion

Superfast broadband coverage is and will remain unobtainable for people living in the hardest-to-reach areas. Fixed wireless is a proven and competitive technology. It offers the best broadband solution for unconnected or poorly connected properties in hard-to-reach rural areas.

Innovative companies such as Beeline, Boundless, Quickline, Signa and others deliver locally-based broadband solutions in North Yorkshire. They have provided practical and cost-effective solutions in hard-to-reach rural areas, benefitting businesses in Thirsk and Malton. Companies such as Lonsdale Net in Penrith have successfully delivered solutions in Cumbria.

While some areas have seen commercial and community-led delivery of fixed wireless broadband, this has not typically been well-supported by government funding. Although fibre-based solutions may be preferable in an unconstrained world, the government needs to recognise that fixed wireless can often be the most cost-effective delivery method when funding is insufficient for universal fibre-based rollout. This should be recognised in the design of future procurement approaches, including the use of voucher-based schemes.

This report has made four recommendations to promote the use of fixed wireless broadband in hard-to-reach rural areas:

- **Recommendation 1:** Openreach should develop a fixed wireless strategy for rural areas
- **Recommendation 2:** Openreach could work with third-party suppliers to deliver holistic solutions
- **Recommendation 3:** DCMS should consider providing national funds for fixed wireless as an alternative to fibre
- **Recommendation 4:** The Gigabit Voucher Scheme should also be applied to fixed wireless solutions

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Appendices

Company focus in North Yorkshire

Beeline Broadband

Beeline is a community-focused Brawby-based broadband provider who specialise in providing high-speed wireless internet connections to people living and working in Ryedale. They have been successful in supplying a fast and reliable service to areas which suffer from slow and non-existent broadband. Beeline Broadband is a registered supplier under the Government's Better Broadband Scheme.

Beeline always conduct a signal survey prior to equipment installation and if the signal strength is lower than required then they cancel the installation at no cost to the customer. For a connection to be effective the signal must be between -45 and -75 dBm and a capacity of approximately 140+ Mbps. The latency is usually in single figures and they aim to keep it less than 20ms. Many customers cancel their BT landline.

Nearly a quarter of Beeline's users are businesses. Although business connections can obtain more than 50 Mbps depending on needs and budget, the average business connection is just over 24 Mbps up/download. Residential users average 17 Mbps download with 8 Mbps (approx) upload. These speeds are larger than the USO minimums. Beeline's network of nearly 1,000 users is maintained constantly using Ubiquiti Network Management System (UNMS) and airControl 2 which allows them to monitor, configure, upgrade and manage all UBNT devices; configurable notifications for outages and alerts to make it easy to stay on top of the network.

The cost of a basic installation is £180 including a router and VAT, with the basic Bronze subscription connection offering 10 Mbps (download) and an uncapped allowance for £24.00 a month including VAT. Beeline have no minimum contract period so customers can cancel anytime with only a month's notice if they haven't benefited from a BDUK Better Broadband Voucher; Beeline is an approved supplier for the BDUK Voucher scheme.

Broadband in Ryedale South West	Average speed Mbps	Receiving under 2 Mbps	Receiving under 10 Mbps	Unable to receive 10 Mbps	Receiving over 30 Mbps	Superfast available
	20.3	6.2%	52.0%	21.9%	26.9%	63.0%

Boundless

Boundless is a specialist high speed internet provider covering Lancashire and Yorkshire, with reach across the UK. They deliver both Fixed 5G wireless internet access as well as full fibre optic connections to customers at speeds up to 1 Gbps. Boundless is currently working to provide ultrafast coverage across the North of England. It plans to connect rural users at 100 Mbps or faster.

Boundless currently deliver speeds in excess of 160 Mbps to selected properties in Lancashire, West Yorkshire and North Yorkshire; they will be piloting services in excess of 1 Gbps in 2018. Boundless suggest that Fixed Wireless technology has recently leapfrogged most fibre services in terms of speeds and costs.

Boundless	Overall Site Cost	Number of premises passed	Cost per premises passed	Number of connections (max)	Cost per connection
Boundless Build (Ribble Valley)	£13,000	2,500	£5.20	180	£72.22

Case studies in North Yorkshire

Hutton Le Hole

December 2015

In early 2016, the community in Hutton Le Hole got together and approached (on the advice of Superfast North Yorkshire) Moorsweb, a local provider, who offered a fixed wireless solution. They applied, successfully, for planning permission to erect a mast and asked the local provider to carry out exploratory and feasibility work; all of this at the community's expense. They were subsequently led to believe that there was a financial contribution available, from Superfast North Yorkshire, towards the final cost. Their application for the financial subsidy was turned down on the basis that, since Openreach was going to deliver superfast broadband to Hutton le Hole by May/June 2017, they were within a year of that delivery date and therefore not eligible.

June 2017 passed and they were no further forward. There was a delay and superfast broadband was not delivered to Hutton le Hole; they are only now close to receiving superfast speeds. It has always been of huge importance that the community know what Openreach's projections are but these were never forthcoming and contact with Openreach proved almost impossible. Moorsweb and the community wasted time and resources coming up with a solution only to find that they were eventually built over by Openreach.

Tholthorpe

March 2016

A cabinet has been enabled in Tholthorpe for a number of years, which serves 95 per cent of the village. Twelve properties, the remaining five per cent, have their telephone lines linked to a neighbouring village of Tollerton rather than the Superfast cabinet enabled in the village, just yards from their properties. Openreach have offered the community fibre scheme, which is not financially suitable as it would cost thousands of pounds to service just twelve properties. Openreach will not put down new lines to these properties and will not offer a wireless solution. These properties remain without access to a cabinet.

85 per cent of premises set to benefit from Phase 3 rollout were announced in May and Tholthorpe was not included, which would conceivably have provided a solution.

Recently, Openreach have connected three new dwellings in Tholthorpe to the cabinet in Tollerton. There are now three more premises in Tholthorpe without access to Superfast broadband and no solution in sight.

Settrington

July 2016

There are two cabinets in Settrington. One is superfast enabled yet the other is not due to a £60,000 cost to enable a power supply. Openreach pulled out due to this cost and they will not look at fixed wireless, which could have been deployed. Settrington is also not included in Phase 3 and there remains no solution in place to the power supply issue.

Rosedale

2012

Ryedale District Council helped fund Moorsweb to provide fixed wireless and a solution has been in place since 2012. An international lighting company now operate successfully from the area.

Local Authorities in Thirsk and Malton

Hambleton District Council ¹⁹	Superfast (Over 30 Mbps)	Ultrafast (Over 100 Mbps)	Download Q1 2018 (Mbps)				Upload Q1 2018 (Mbps)			
	87.1%	2.8%	Bottom 20%	Median	Mean	Top 20%	Bottom 20%	Median	Mean	Top 20%
			3.0	14.3	22.1	33.9	0.4	3.0	4.6	8.0

Ryedale District Council ¹⁹	Superfast (Over 30 Mbps)	Ultrafast (Over 100 Mbps)	Download Q1 2018 (Mbps)				Upload Q1 2018 (Mbps)			
	84.3%	5.4%	Bottom 20%	Median	Mean	Top 20%	Bottom 20%	Median	Mean	Top 20%
			5.4	19.2	25.5	41.5	0.7	4.2	5.9	9.9

Scarborough District Council ¹⁹	Superfast (Over 30 Mbps)	Ultrafast (Over 100 Mbps)	Download Q1 2018 (Mbps)				Upload Q1 2018 (Mbps)			
	92.8%	0.7%	Bottom 20%	Median	Mean	Top 20%	Bottom 20%	Median	Mean	Top 20%
			8.1	17.9	22.4	35.2	0.7	3.8	5.4	8.4

North Yorkshire County Council ¹⁹	Superfast (Over 30 Mbps)	Ultrafast (Over 100 Mbps)	Download Q1 2018 (Mbps)				Upload Q1 2018 (Mbps)			
	89.9%	16.1%	Bottom 20%	Median	Mean	Top 20%	Bottom 20%	Median	Mean	Top 20%
			5.8	18.3	25.1	37.7	0.6	3.8	5.8	8.7

¹⁹ Local Broadband Information by thinkbroadband <https://labs.thinkbroadband.com/local/councils> Accessed April 2018

Case studies & Company Focus in Cumbria

The vast majority of the expansion in superfast broadband coverage achieved in Cumbria over the last five years has been implemented via Openreach Fibre-To-The-Cabinet (FTTC) extensions to over 600 local cabinets, with property-level delivery achieved over the existing Openreach copper telephone networks, sometimes after the implementation of copper-gain upgrades. However, there are a range of examples of commercial providers and community schemes using fixed wireless links as a key element of delivery. An overview is provided below.

Lonsdale Net

Lonsdale Net is a Penrith-based company founded in 2012, providing fixed wireless services in the central Eden valley area. They offer the best available broadband service for a range of rural communities who lie outside the effective reach of current fibre-copper networks.

Kencomp

Kencomp (established 2001) is another local fixed wireless provider targeting rural communities in South Lakeland. Its turnover was £444k in the year to March 2017.

Fellnet

Fellnet is a trading arm of Milburn Community Co-operative, targeting high-speed broadband for all households and businesses in the parish. Catalysed by a £33k Big Lottery Fund grant in 2012, service commenced in December 2015 and now has over 50 subscribers, with 15 Mbps maximum delivery via fixed wireless off a Vodafone backhaul. Along with Dufton (see below), Fellnet was one of two community broadband schemes singled out by Rory Stewart MP for particular praise in September 2017.

Dufton Digital

Dufton Digital (founded 2012) is another community-led broadband project, serving the village of Dufton. It operates fixed wireless delivery off a 30 Mbps fibre backhaul. Its turnover was £6k in the year to June 2017.

Cybermoor

Cybermoor Networks is a ground-breaking co-operative founded in 2011 (building on the earlier work of Cybermoor Ltd) to provide broadband to the area around Alston, Nenthead and South Tyne Valley. It was one of seven companies chosen to deliver a pilot project for BDUK connecting isolated properties using social investment. After installation of the network, operation and support was handled by Briskona Ltd (part of Eurona) from 2014-2016, and then transferred to Hull-based Quickline Ltd (another BDUK pilot). The network now covers around 500 properties using a hybrid FTTP / fixed wireless approach, and the lessons learned from the process have been summarised in Cybermoor's useful Broadband in a Box guide to rural broadband (May 2016).

Great Asby

Great Asby Broadband CIC was incorporated in 2007 and created a network based on a 100 Mbps leased line to the village hall plus six fixed wireless nodes delivering 15 Mbps, increased to 18 Mbps after a backhaul upgrade in 2012-2013. The network operated successfully as a stop-gap, but in December 2015 Openreach delivered a FTTP service to the village, while by 2017 Lonsdale Net (see above) had delivered fixed wireless connectivity to Little Asby. Consequently, the GAB network was switched off in September 2017, and the CIC is now in the process of being dissolved.

Glossary

ADSL

ADSL technology delivers broadband using the standard copper telephone line—the connection speed will depend on which type of ADSL is being used; and the quality and length of the line from the telephone exchange to the premises.

Cable Broadband

A combination of fibre optic cables to street cabinets and high-grade co-axial cables from cabinets to premises. The latest standard allows for speeds of around 1 Gbps (1000 Mbps)

Fibre to the Cabinet (FTTC)

The main technology used for the superfast broadband roll-out and most common fibre connection. Works in the same way as FTTN but the cabinet is nearer, typically on the same street as the property, so faster speeds are possible.

Fibre optic cables, made of glass or plastic, are used from the telephone exchange to street cabinets and then existing copper lines are used from the cabinet to premises. This technology can provide speeds of up to 80 Mbps. However, the maximum speed a premises can receive reduces the further away it is from a cabinet, with superfast speeds (above 24 Mbps) available up to approximately 1000m from the cabinet.

Fibre to the home (FTTH)

Delivers the fastest download speeds (up to 1 Gbps) because cables go directly to individual properties. Very few households are connected.

Fibre to the node (FTTN)

Fibre cables run to a cabinet and copper wires take the connection from there to individual homes.

Fibre to the Premises (FTTP)

A technology where the fibre optic cable runs all the way to the premises, a block of flats or an office. This means that there is no change in speed based on distance from the cabinet. This services can be more than double the speed of FTTC.

FTTP can provide download speeds of 1 Gbps (1000 Mbps). This is also referred to by the Government as full fibre.

Fixed Wireless

Specific frequencies of the radio spectrum are used to transmit signals through the air in a similar way to mobile phone networks, doing away with wires. Most wireless ISPs only offer limited coverage in specific areas, for example rural villages.

Gigabit Voucher Scheme (GVS)

These can be used by small businesses and the local communities surrounding them to contribute to the installation cost of a gigabit capable connection. Businesses can claim up to £3,000 against the cost of connection either individually or as part of a group project. Residents can benefit from the scheme as part of a group project which also includes businesses, and can claim for a voucher of up to a value of £500.

Mbps (megabits per second)

A unit of measurement for bandwidth and throughput on a network. Bandwidth is a measurement of network capacity; the maximum volume of data that can be transferred in one second. Factors like congestion and latency can reduce a connection speed or cause it to fluctuate. Internet service providers and network equipment vendors often advertise "up to" a certain number of Mbps.

Each megabit is equal to 1 million bits. Mbps belongs to a family of metrics used to measure the capacity and speed of data transfer.

Satellite broadband

A satellite dish is used to provide access to broadband services. The main advantage of satellite broadband is that it can be provided virtually anywhere in the world, as long as there is a clear line of sight to the south. Often used in rural areas where traditional fixed-line based broadband services are not available.

Superfast broadband

The Government defines it as speeds greater than 24 Mbps, whereas Ofcom and the European Commission define it as speeds greater than 30 Mbps.

Ultrafast broadband

The Government defines it as speeds of 100 Mbps and higher, whereas Ofcom defines it as speeds greater than 300 Mbps.

Unable to Receive 10 Mbps

The percentage of lines that aren't capable of receiving speeds over 10 Mbps. Ofcom says that this speed is required for decent broadband, since it is part of "the minimum level of broadband performance required for internet access to services such as web browsing, email and certain video services."

Premises unable to receive 10 Mbps may be eligible for the UK Government's proposed Universal Service Obligation.

Universal Service Obligation (USO)

The USO will provide a legal right to request a broadband connection of at least 10 Mbps download speed, up to a reasonable cost threshold of £3,400.