Coffey Comms
Providing practical advice and guidance to the wireless world

Working on behalf of East Devon District Council

A report analysing the mobile phone reception around the east Devon development area

19th April 2015

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About Coffey Comms Ltd

Paul Coffey, founder of Coffey Comms Limited, advises network operators, suppliers and associated partners, in both the private and public sector on all issues relating to wireless communication strategy. He is a regular speaker and trusted advisor on these topics within the industry. Before founding Coffey Comms Limited he was Head of Strategic Development for EE, advising on wireless strategy.

Coffey Comms Limited is delighted having been selected to work with East Devon District Council, with the objective of helping find a solution to improve the mobile phone reception across the West End of the District. This area is a focus for accommodating large-scale residential and commercial development over the next 20 years.

Contents

1 Background

The Exeter and East Devon Growth Point was formed in 2007 as a long term partnership for growth. Centred on Exeter and extending in to the neighbouring District of East Devon and Teignbridge it is expected to deliver around 20,000 new homes and over 25,000 additional jobs over the next 15 to 20 years.

A particular feature is a major growth corridor running east from junction 29 of the M5. This is expected to deliver 10,000 new homes and jobs over the next 20 years. There are five major freestanding strategic developments;

1.1 Exeter Science Park

A major new development for innovation and technology businesses, with the Met Office (which is so to gain a new supercomputer) and the University of Exeter among the partners behind its development. This is a 24 hectare site expected to accommodate circa 800,000 of new employment space and provide 3,000 jobs. The Science Park Centre is currently nearing completion, with first occupiers due later in 2015.

1.2 Skypark

A next generation business park which is expected to accommodate 1.4m sq.ft of new industrial, distribution and office space and accommodate up to 6,500 jobs. So far, it has provided bespoke premises, the Ambulance Special Operations Centre building and E.On Energy Centre (the hub for the district heating network into Cranbrook and Skypark) are open, and the new depot building express delivery service DPD Logistics is under construction.

1.3 Intermodal Freight site

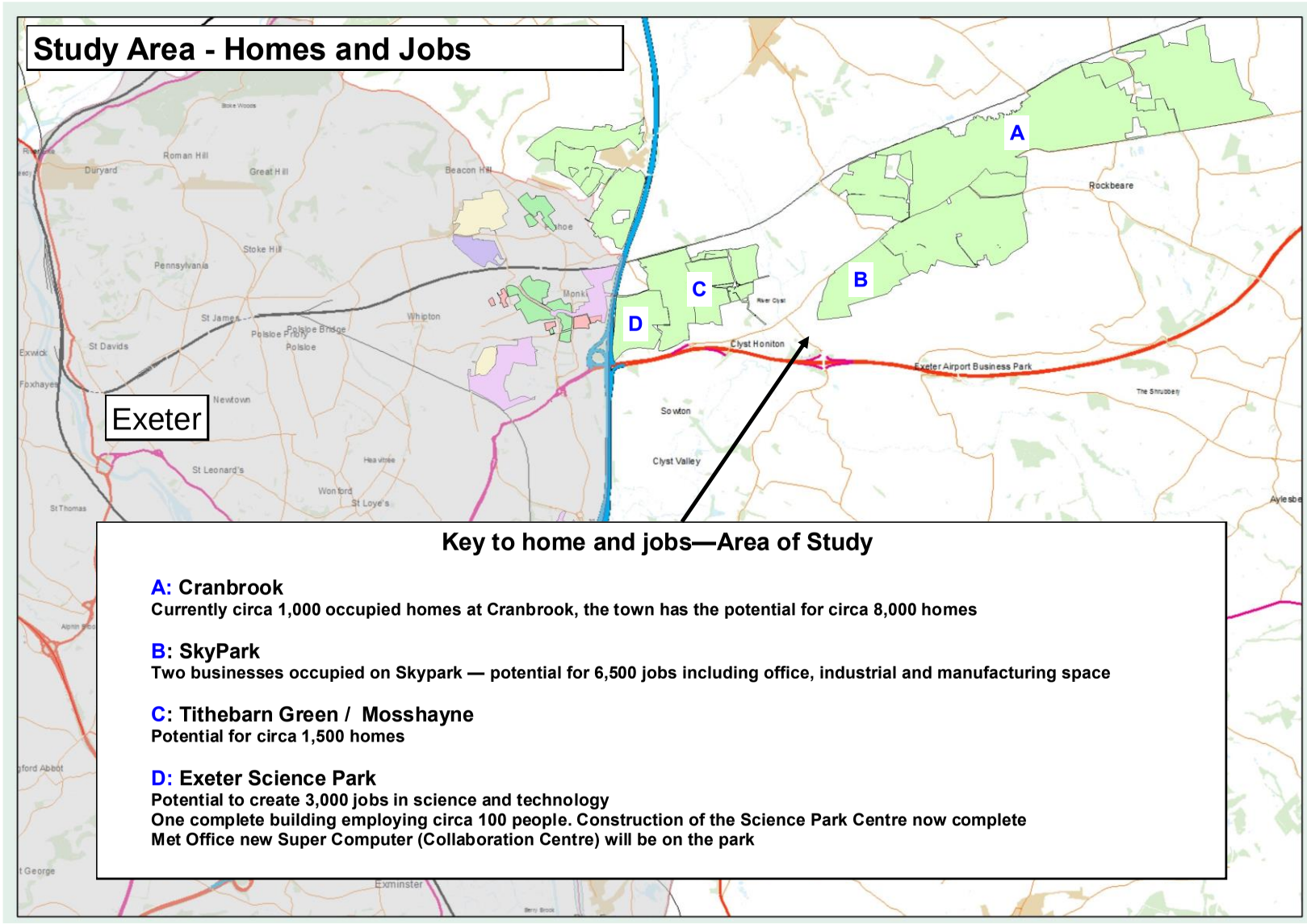
A 65ha site planned for freight interchange and distribution warehousing. Phase 1 comprises circa 700,000 sq ft of distribution space.

1.4 Cranbrook

A freestanding new community expected to grow to accommodate circa 8,000 homes and a population of around 20,000 people over the next 20 years.

1.5 Tithebarn Green/Mosshayne

Circa 1,500 new homes immediately to the east of the Science Park.


Study Area - Homes and Jobs
Exeter
A
B
C
D
Rockbeare
Clyst Honiton
Exeter Airport Business Park
Sowton
Clyst Valley
Roman Hill
Duryard
Great Hill
Beacon Hill
Stoke Hill
Pennsylvania
St James
Polsloe Bridge
Polsloe Priory
Polsloe
Whipton
St Davids
Exwick
Foxhayes
Newtown
St Leonard's
Wonford
St Loye's
St Thomas
Exminster
Key to home and jobs—Area of Study
A: Cranbrook
Currently circa 1,000 occupied homes at Cranbrook, the town has the potential for circa 8,000 homes
B: SkyPark
Two businesses occupied on Skypark — potential for 6,500 jobs including office, industrial and manufacturing space
C: Tithebarn Green / Mosshayne
Potential for circa 1,500 homes
D: Exeter Science Park
Potential to create 3,000 jobs in science and technology
One complete building employing circa 100 people. Construction of the Science Park Centre now complete
Met Office new Super Computer (Collaboration Centre) will be on the park

2 Objective

The objective of this project is to work with East Devon District council to quantify the quality of the current mobile phone service provided by all four mobile operators. – 3UK, EE, O2 and Vodafone.

The area of study will include Cranbrook, SkyPark and the Science Park and surrounding roads.

The findings from the study will be presented to the mobile operators to enable active discussion with the end objective of improving the mobile phone services for the residents and business within the study area.

3 Study Areas

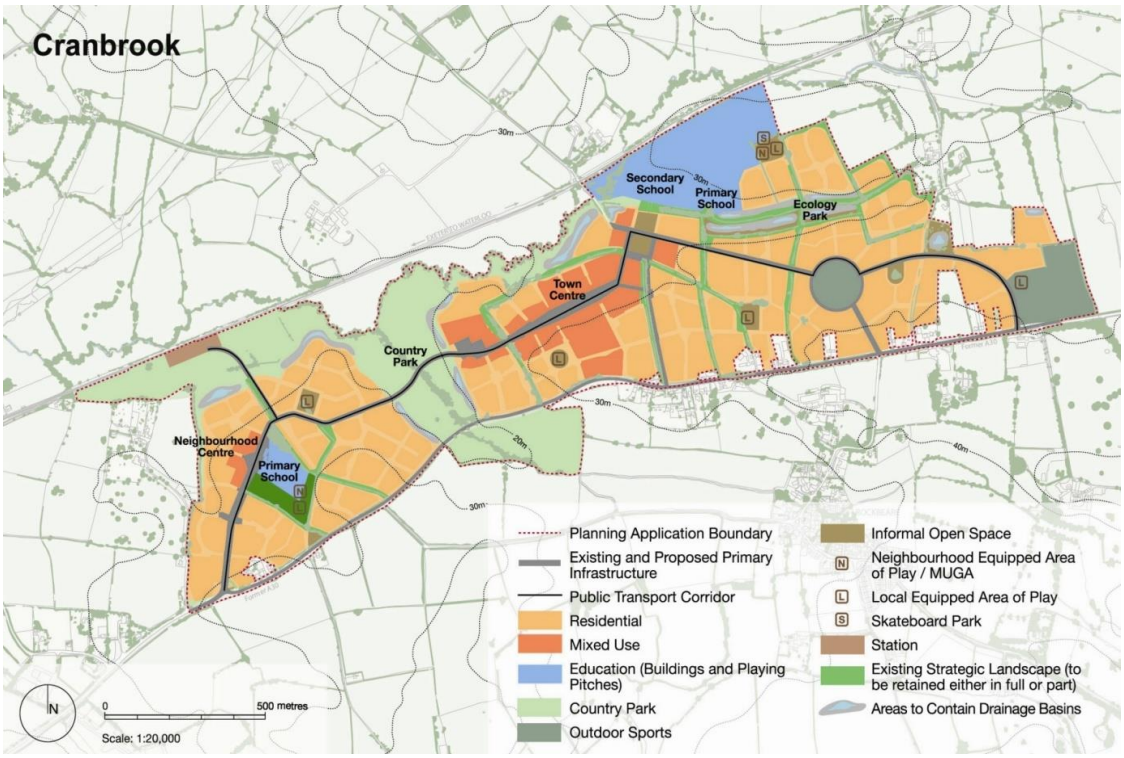
3.1 Cranbrook

The vision for Cranbrook is to create a self-sufficient, low carbon new community in close proximity to skilled employment opportunities, encouraging people to use sustainable modes of transport and to reduce the need for them to travel between work and home by car.

Cranbrook is located 7 miles to the east of Exeter City Centre in East Devon District. The town is linear in form, located between the former A30 (now the B3174) and the Exeter/Waterloo railway line.

Development started in June 2011 and the first residents moved in during July 2012. Progress has been rapid with around 450 homes being completed per annum the population increasing by circa 1,000 year on year. Over 1000 new homes currently occupied. The Local Plan anticipates Cranbrook expanding to 6,000 homes by 2026 (a population of circa 14,000) with potential expansion up to 8,000 homes (population circa 20,000) by 2031.

The master plan for the fist 3,500 homes at Cranbrook is shown below. Phase 1 is located at the western end of Cranbrook and comprises circa 1,100 homes.



In addition to the housing Cranbrook also includes:

- St Martins School - a 420 place primary school with a 30 place nursery
- Community Centre - the Younghayes Centre is located opposite St Martin's School and includes space for a library and a doctor's surgery
- Open Space – a Country Park is a key part of the masterplan and a County Park Ranger has been appointed
- Retail facilities – planning permission has been granted for a parade of 6 neighbourhood shops and construction has recently started

- A new station on the Exeter/Waterloo railway line is key part of the overall public transport strategy for Cranbrook. An hourly service between Exeter St Davids and London Waterloo will originally be provided with the expectation that this will increase to half hourly in the future. Journey time to central Exeter is less than 10 minutes
- Phase 2 will include the main town centre (to include a new supermarket, leisure centre, library and health centre) as well as a secondary school and second primary school. The first residents moved in to phase during December 2014.

All the heating and hot water needs of Cranbrook are met through a district heating system; there is no gas on site. The network will eventually extend to include 75 KM of pipework and serve both Cranbrook and the nearby Skypark development, the largest such network in the UK.

The offsite Energy Centre is currently gas fuelled. Once 2,000 connections are made from Cranbrook, biomass will be providing the main heat load and the plant will be generating electricity as well as heat.

The network is part of a £30m investment from energy company E.On. There are plans to roll out three further networks in the locality. All houses are installed with a smart meter to monitor energy consumption and readings are automatically transferred through a GSM SIM, currently on the O2 network.

Aerial photo of Cranbrook development site (Phase1)

3.2 Exeter Science Park

The Science Park will play a key role in helping to diversify and reinforce the economy of Exeter and East Devon through the development of knowledge-based businesses and capitalising on links with the technology base provided by the University of Exeter (and explicitly including Medical School) and the Met Office.

The Science Park will act as an innovation hub, to bring together, push forward and support a range of science-based commercial activities.

The park is available for businesses ranging from 'start-ups' & 'spin-outs' through to multi-site international businesses.

- 24 hectares
- 68,700 m2
- First phase 18600 m2
- 2,000 - 3,700 jobs

The Science Park is set to be the corner stone of a knowledge-based economy, which is currently achieving unprecedented growth rates. The Exeter area is home to a number of knowledge-based businesses and has benefitted from tremendous investment in start-ups and in R&D across a range of science and technology disciplines.

The mission statement comprises four key strands:

- To drive growth in knowledge-based science, technology, engineering and medicine related enterprise in the region
- To be a prime location for successful science-based business development combined with excellent quality of life
- To promote the region's world-leading scientific capacity and international ambition
- To contribute significantly to the Government's innovation agenda by encouraging knowledge transfer between the research base and innovative business

Phase One will include provision of a business hotel and conference centre, a management suite for Eagle One (10,000 sq. ft), and a Science Park Centre (circa 30,000 sq. ft) which will act as the hub for the development. The latter two building are now complete and work has begun on a £100m project to accommodate the Met Office's next super computer.

3.3 Skypark

Skypark will be the South West's most significant Business Park development combining office, industrial and distribution space with hotel, local facilities and a combined heat and power plant in a landscaped environment of over 100 acres.

The vision for the site is to realise the full economic potential of Exeter, as a major regional centre, to provide a range of employment opportunities. Skypark will become a self-sufficient new urban business community with improved existing and new local facilities.

Over the next 20 years, this £210 million development is predicted to create up to 6,500 new jobs with a significant positive impact on the local economy as part of the wider Exeter and East Devon New Growth Point initiative.

Next to Exeter International Airport, and within easy reach of Junction 29 of the M5 motorway, Skypark has excellent transport links.

Skypark will redevelop a 100 acre disused site into a sustainable Business Park, which will accommodate more than 1.4 million sqft of office, industrial and manufacturing space when complete.

Skypark is home to E.ON's Energy Centre and district heating pipework. Supplying a low carbon heating network to serve Skypark and neighbouring residential scheme, Cranbrook.

4 Cranbrook Demographics

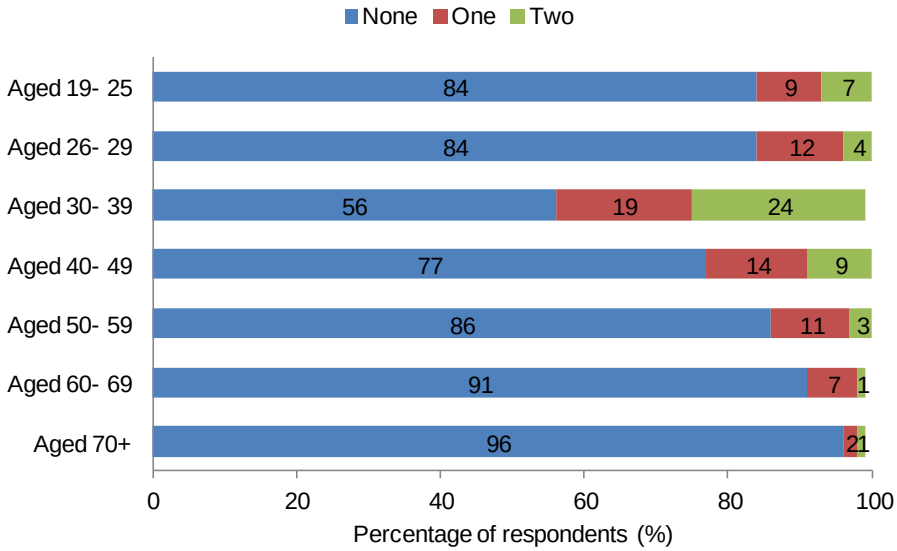
4.1 Who lives in Cranbrook?

An annual survey is undertaken of the households in Cranbrook. This is now in its second year.

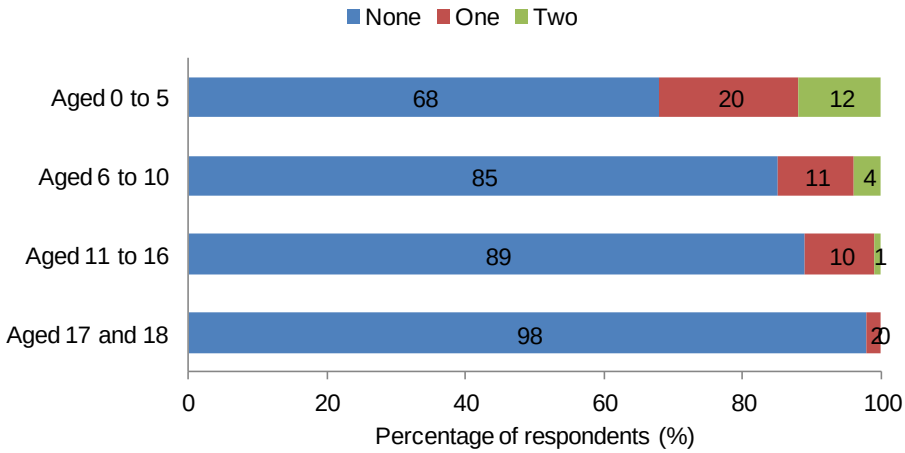
The survey reveals that Cranbrook is largely made up of young families and professionals that have moved from within the Exeter and East Devon area. Hence the importance of mobile and Internet connectivity is considered to be very high.

A large proportion of households are made up of families with parents aged under 40 with young children.

How many adults of each of the following ages live in your household?



How many children and young people of the following age groups live or stay for long periods of time in your household?



- 51% of households contain two people who are employed full or part time
- 59% of working people work in Exeter, 18% elsewhere in East Devon and 13% elsewhere in Devon
- The most common types of jobs for residents of Cranbrook were Managers, Administration/ Clerical, Teachers/ Teaching Assistant and Customer Services
- 4% of household had no cars or vans. 58% of households have one car or van, 35% have two cars or vans and 3% have three
- 14% had one or more members of the household with a disability or infirmity that limits their everyday activities

Each home is served from the district heating network. A Heat Interface Unit (HIU) transfer heat from the main network to the ordinary wet heating system. Each household is billed for the units of heat that they use. The HIU can be read remotely through a smart meter which transfers telemetry information over a mobile network. Many houses suffer from very poor mobile coverage and as a result, the smart meter fails to correctly record usage. As a result many residents suffer from various billing issues, which registers as a frustration in the survey. Some residents have not been billed at all for 12 months.

Internet and telephone	**Number of responses**
There is no choice, we can't shop around for better value for money	14
Poor hit and miss connection	10
Mobile phone signal is poor	4

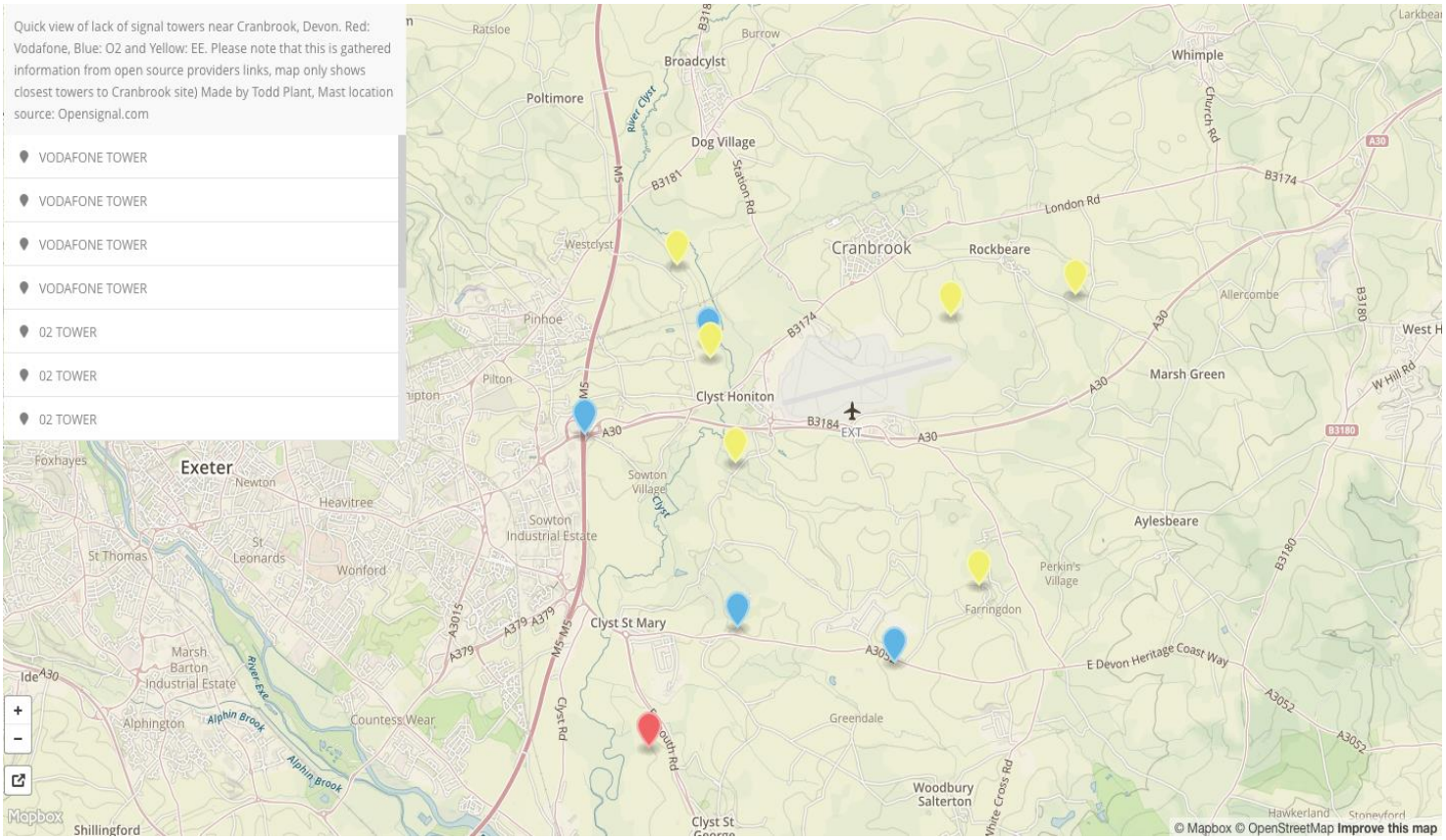
All of Phase 1 development has Internet services provided though 'See The Light' broadband that provides an FTTP service to all the houses. BT and Virgin Media are the providers for Phase 2, which is also be an FTTP service.

There is very poor mobile phone reception throughout Cranbrook, across all mobile operators that is a major cause of frustration to all the residents. As a result residents have taken it upon themselves to use femto signal booster boxes and WiFi calling Apps. However, there are limitations to such tactical solutions. These tactical solutions should not be considered a remedy to provide mobile coverage to such a large scale area by the mobile oeprators.

5 Existing macro infrastructure in the area

The following map shows the current mobile infrastructure in use by the mobile operators to provide the current coverage levels.

To the north and northwest of Cranbrook there is plenty of open Greenfield space operators look to deploy additional masts to improve coverage and performance levels.



6 Mobile Coverage Analysis

There is a known lack of mobile phone reception across the development area. Coffey Comms, was asked to help quantify the problem and work with the mobile operators to help find a solution.

6.1 Survey Tool

The 'Signal Insight' survey tool was used to gather data from the development area that was surveyed.

The Signal Insight survey tool acts as an agent gathering information about the cellular data or Wi-Fi network to which your device is connected.

Key features from the tool

Feature	Description
Signal strength	dBm measurement of the device signal strength in RSSI or RSRP
Network carrier	Displays which carrier the device is testing and operating on
WiFi performance	Switch from cellular to WiFi to test WiFi hotspots
Cell site ID	Identify the cell site that the device is currently connected
Data connection speed	Speed measured in Megabits/second
Data connection availability	Green for high speed (LTE and HSPA) Yellow for low-speed (eHRPD, 1xRTT or GRPS) is unavailable
Network mode	Which technology is the device operating on? LTE, EV-DO, HSPA, UMTS, etc.
Signal graphs	Toggle between displays for the last 1,2,5 or 10 minutes
Current device IP address	Device IP address is determined
Network roundtrip delay	Measured in milliseconds
Throughput	• Downlink • Uplink • Latency (quality) • Loss • Jitter

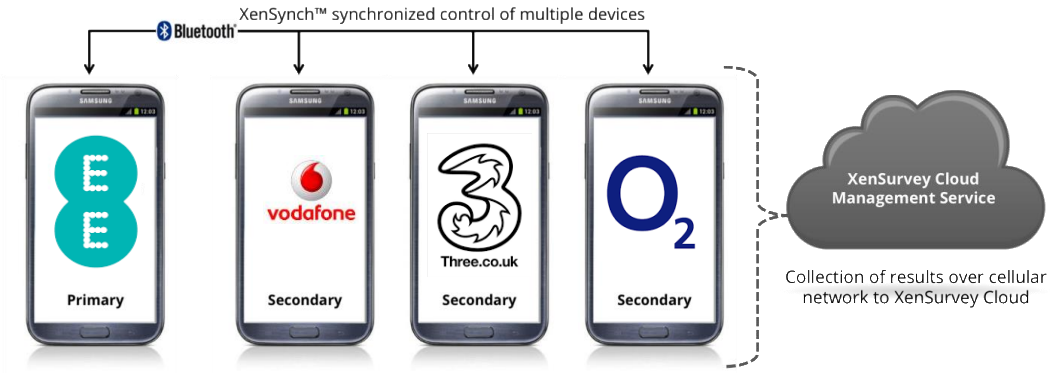
6.2 Conducting the Survey

All four networks were tested in parallel.

There was a mixture of static and mobile testing. The static testing was recorded from nine separate locations from across the area. The mobile testing that was conducted was a slow drive test (10-20mph) around the area.

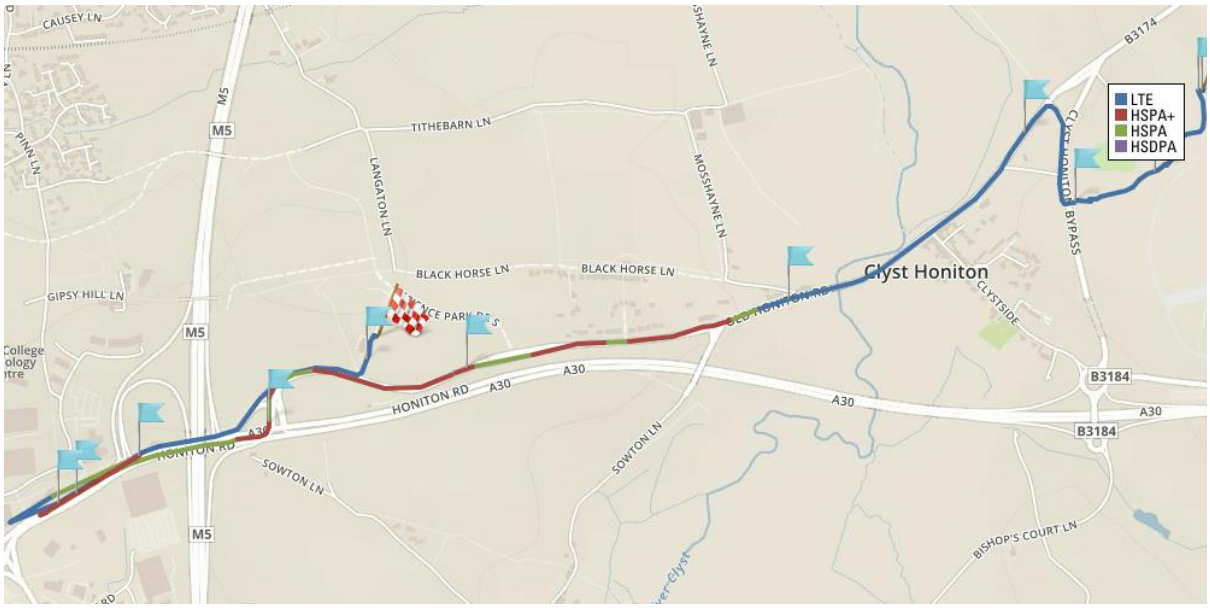
Signal strength measurements are constantly reported from the tool

Throughput tests were conducted every 60 seconds


XenSynch™ synchronized control of multiple devices
Bluetooth
Primary
vodafone
Secondary
Three.co.uk
Secondary
O2
Secondary
XenSurvey Cloud
Management Service
Collection of results over cellular
network to XenSurvey Cloud

6.3 Skypark

Skypark has the potential for 6500 jobs and is in a strategic position, close to the airport. A survey was performed from the construction site that will be the DPD distribution warehouse.



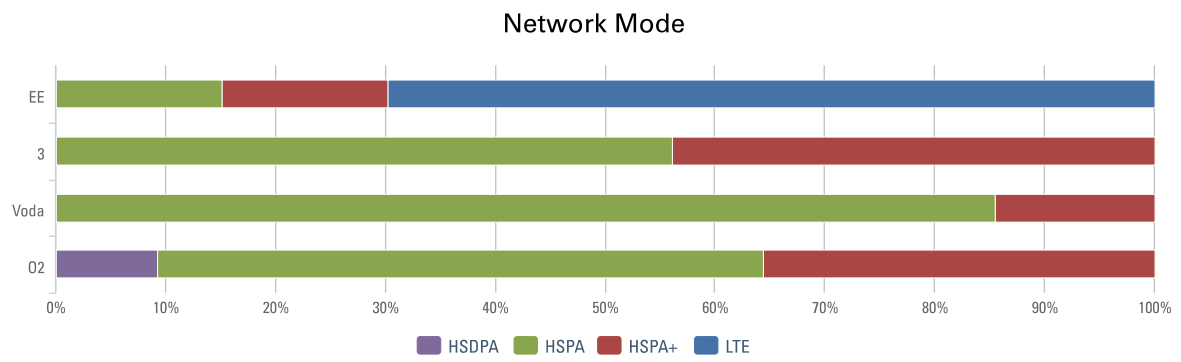
6.3.1 Summary

As the DPD building is not complete it not possible to determine what the mobile reception will be like inside the building. However, assuming it will be of similar construction to the ASOC building it can be assumed that the reception will be fine. The general performance across all mobile operators is reasonable for voice calls in this location. As with the ASOC survey, data speeds do vary with EE reporting the best performance.

6.3.2 Skypark Survey Results

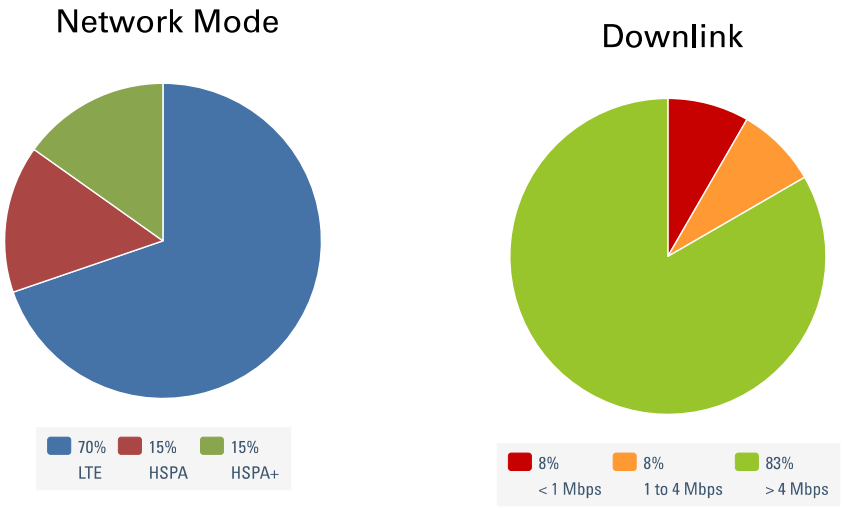
A drive survey was conducted from the DPD construction site to the Science Park, testing all networks in in parallel.

Device	Operator	Signal	Downlink	Uplink	Latency	Availability
EE	EE	-91 dBm	15.06 Mbps	8.88 Mbps	328 ms	100%
3	3	-72 dBm	4.43 Mbps	2.01 Mbps	589 ms	100%
Voda	vodafone UK	-88 dBm	1.07 Mbps	0.88 Mbps	502 ms	100%
O2	O2 - UK	-88 dBm	1.01 Mbps	1.20 Mbps	772 ms	100%

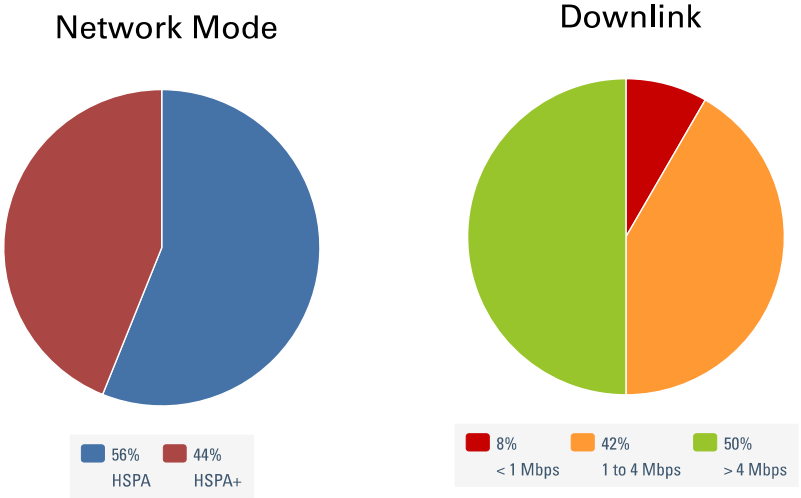


EE and Three deliver the best network performance with access to higher speed networks for more time. With EE being a step above the rest with access to their LTE network available in the area.

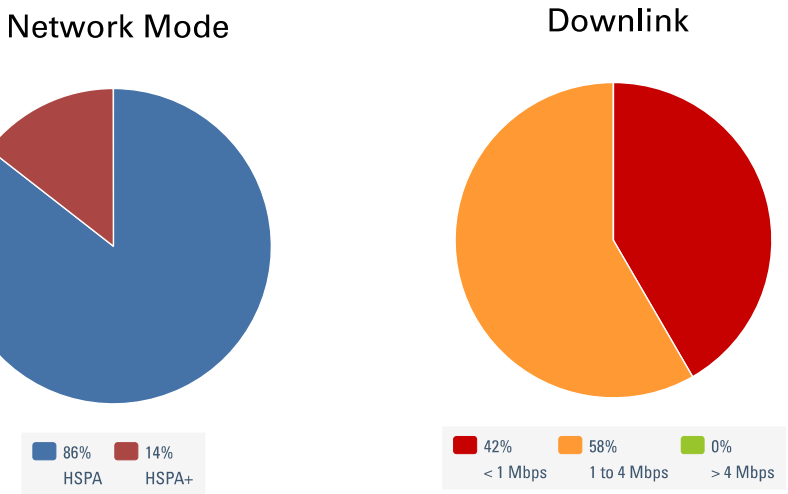
6.3.2.1 EE



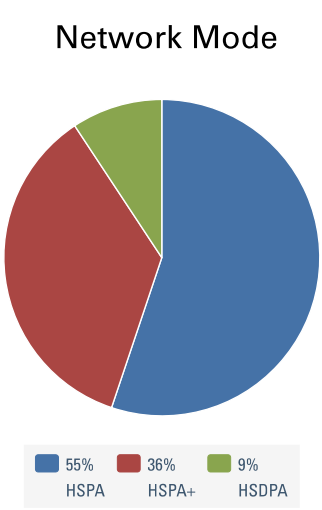
6.3.2.2 Three

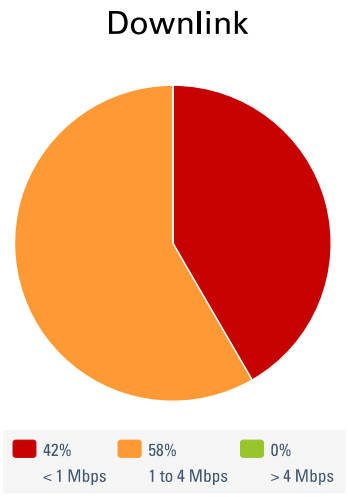


6.3.2.3 Vodafone



6.3.2.5 O2


Network Mode
55%
HSPA
36%
HSPA+
9%
HSDPA


Downlink
42%
< 1 Mbps
58%
1 to 4 Mbps
0%
> 4 Mbps

6.4 Ambulance Service Operations Centre

The ASOC is a strategic location for the southwest, being in close proximity to the M5 and Exeter Airport. The centre houses around 6 personal at any one time and is used 24x7. In the event of a large scale emergency the centre may be used to coordinate activities and more personal would be based there.

There is no coordinated procurement activity within the Ambulance Service for mobile phones. As a result all users are on different networks.

6.4.1 Summary

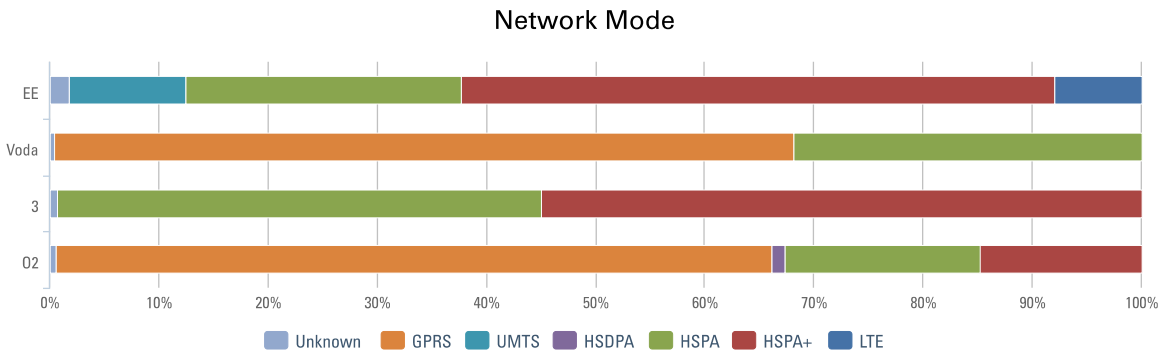
Generally there is good enough coverage across all mobile operators within the ASOC building to make and receive voice calls. The data speeds did vary across the networks, with EE coming out top, with LTE available partially and HSPA+ for majority of the time.

The centre is circa 22,000 sq. ft. and some dead spots were found in the centre of the building in areas such as stairwells on all networks. This is to be expected given the size of the building and the construction materials. If the ASOC wished to eradicate these small dead spots they would need to look to a dedicated in building coverage solution, such as an internal distributed antenna system (DAS). However, given the number of people ever located there it may not be economical to do so.

6.4.2 ASOC Survey Results

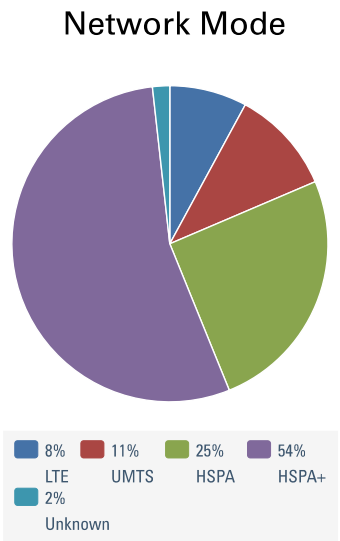
A walk survey was conducted around the building on the EE network.

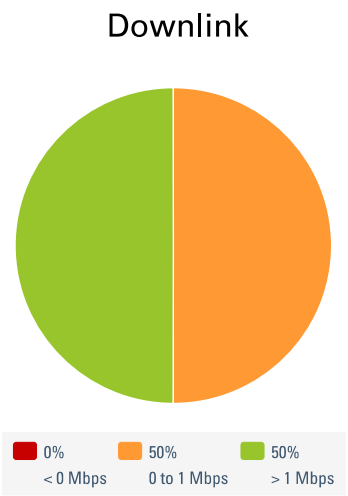
Device	Operator	Signal	Downlink	Uplink	Latency	Availability
EE	EE	-101 dBm	2.27 Mbps	0.48 Mbps	566 ms	100%
Voda	vodafone UK	-96 dBm	0.17 Mbps	0.10 Mbps	650 ms	100%
3	3	-99 dBm	1.37 Mbps	0.46 Mbps	738 ms	100%
O2	O2 - UK	-95 dBm	0.12 Mbps	0.08 Mbps	940 ms	100%



EE and Three deliver the best network performance with access to higher speed networks for more time.

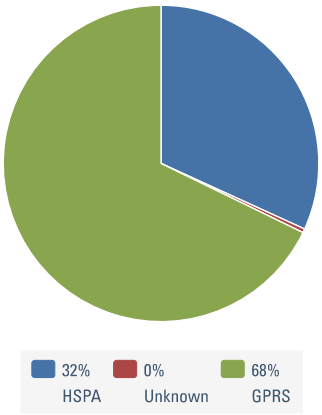
6.4.2.1 EE



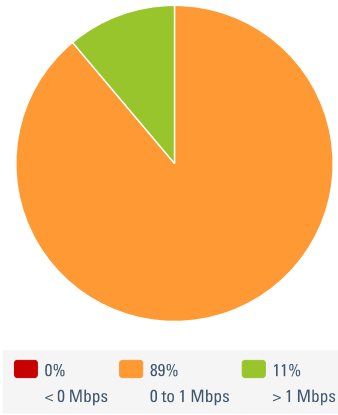


6.4.2.2 Vodaone

Network Mode

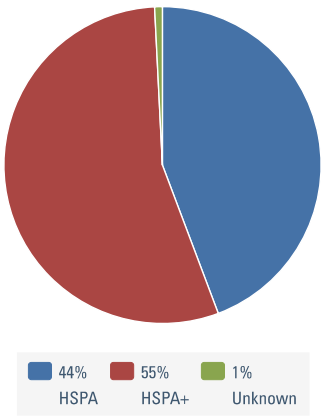


Downlink

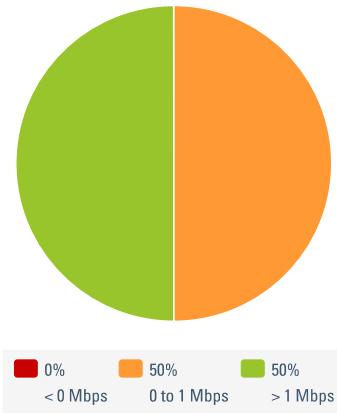


6.4.2.3 Three

Network Mode

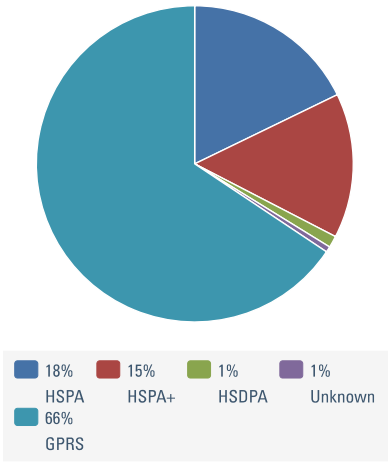


Downlink

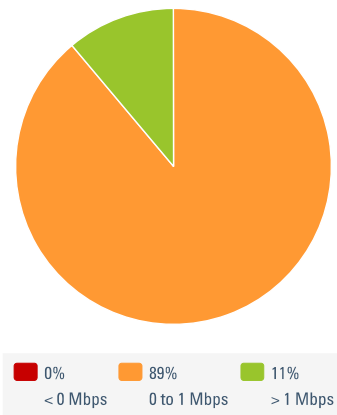


6.4.2.4 O2

Network Mode



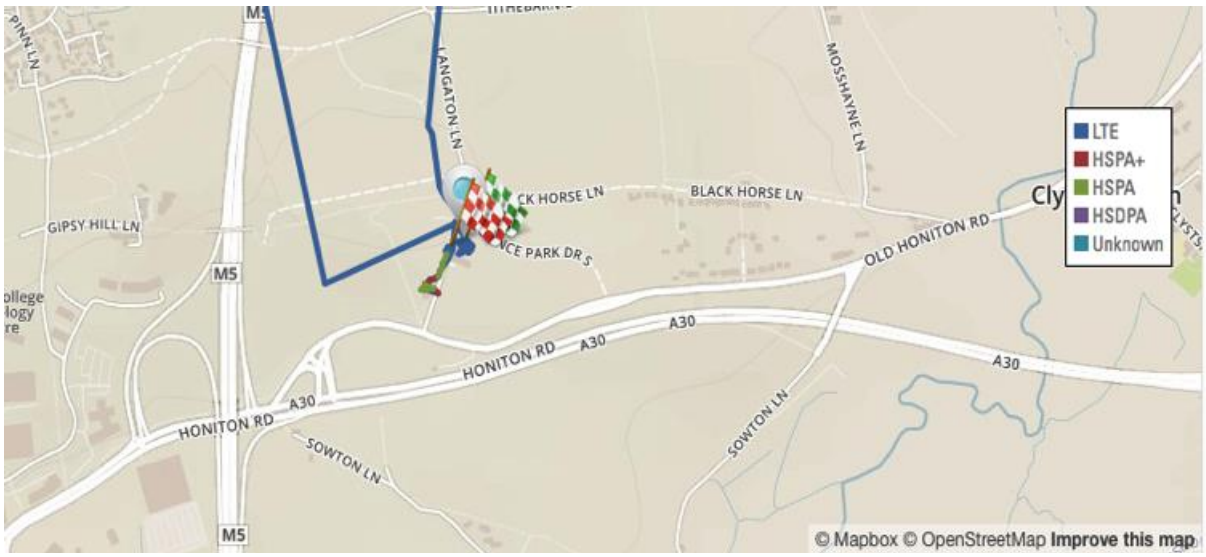
Downlink



6.5 Science Park

The Science Park will act as an innovation hub, to bring together, push forward and support a range of science-based commercial activities in the region

Note: there was an anomaly with two GPS positions during the survey, please ignore.



6.5.1 Summary

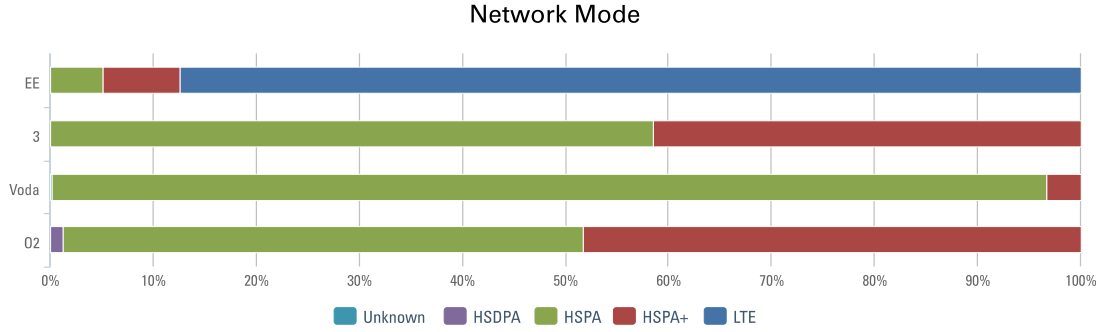
Due to the close proximity of the Science Park to the motorway, there is good coverage from all mobile operators, to make voice calls throughout the Science Park campus. However, there is quite a difference in data performance across the networks with EE coming out top with LTE available for 87% of the survey.

There is not doubt that the Science Park would benefit from LTE services from all operators, given the nature of the work and the demographic of clients that are likely to work there.

6.5.2 Science Park Survey Results

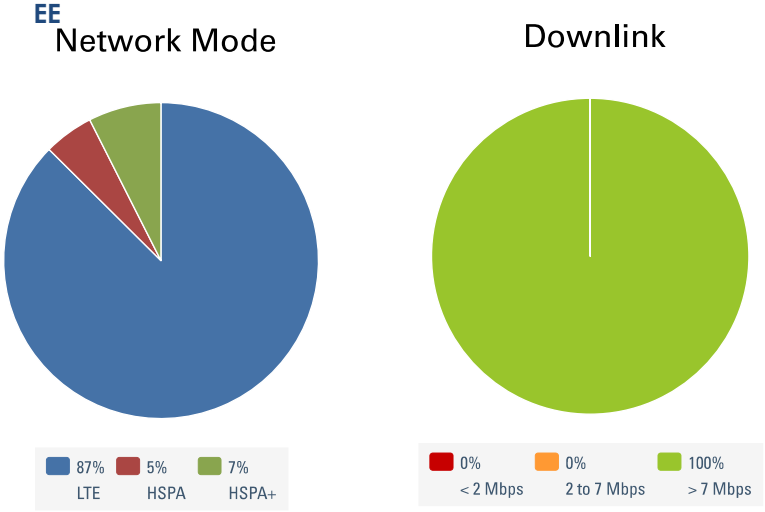
A walk survey was performed at the Science Park. Walking throughout both buildings and the surrounding site where the Met Office building will be constructed.

Device	Operator	Signal	Downlink	Uplink	Latency	Availability
EE	EE	-98 dBm	16.32 Mbps	11.25 Mbps	250 ms	100%
3	3	-64 dBm	6.28 Mbps	3.03 Mbps	537 ms	100%
Voda	vodafone UK	-82 dBm	1.68 Mbps	1.00 Mbps	482 ms	100%
O2	O2 - UK	-80 dBm	1.55 Mbps	1.68 Mbps	600 ms	100%

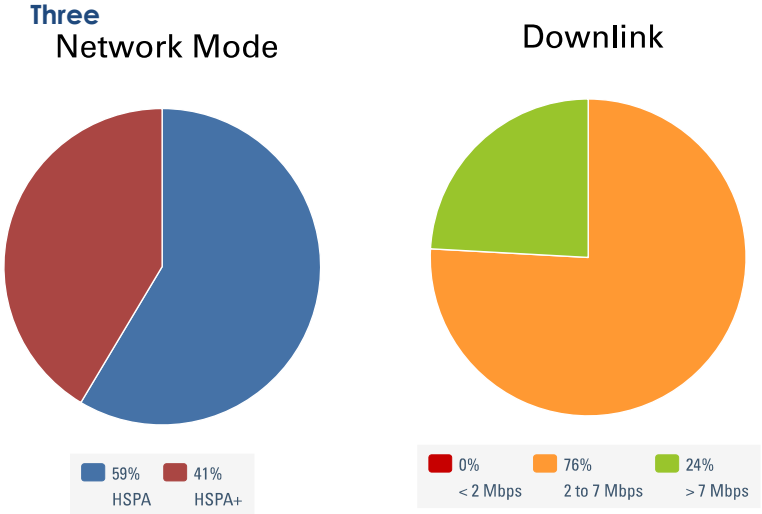


EE delivers by far the better data service due to the high availability of LTE. Given the location of the Science Park it could be expected that the other networks are already planning to upgrade their sites to LTE in time.

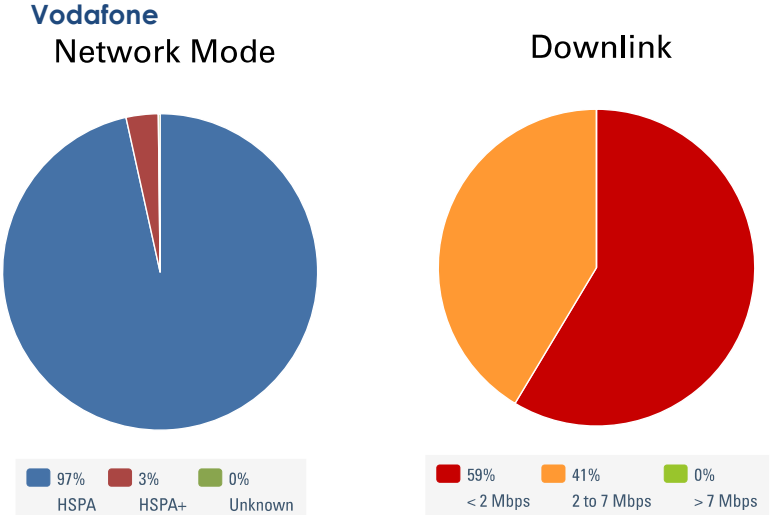
6.5.2.1 EE



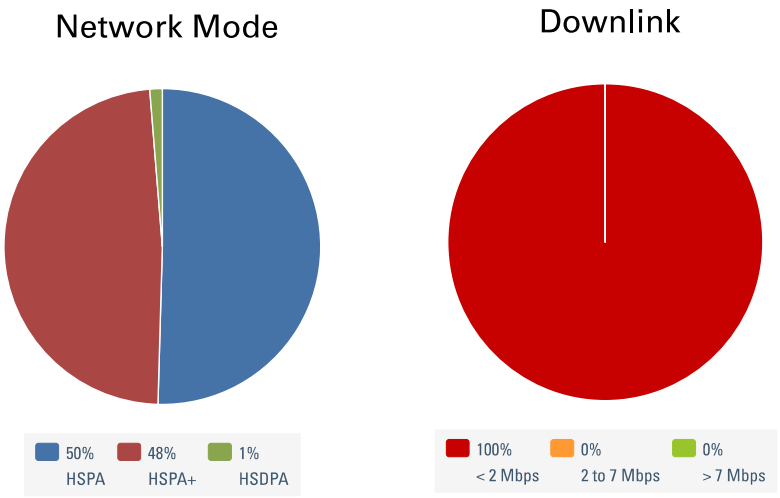
6.5.2.2 Three



6.5.2.3 Vodafone

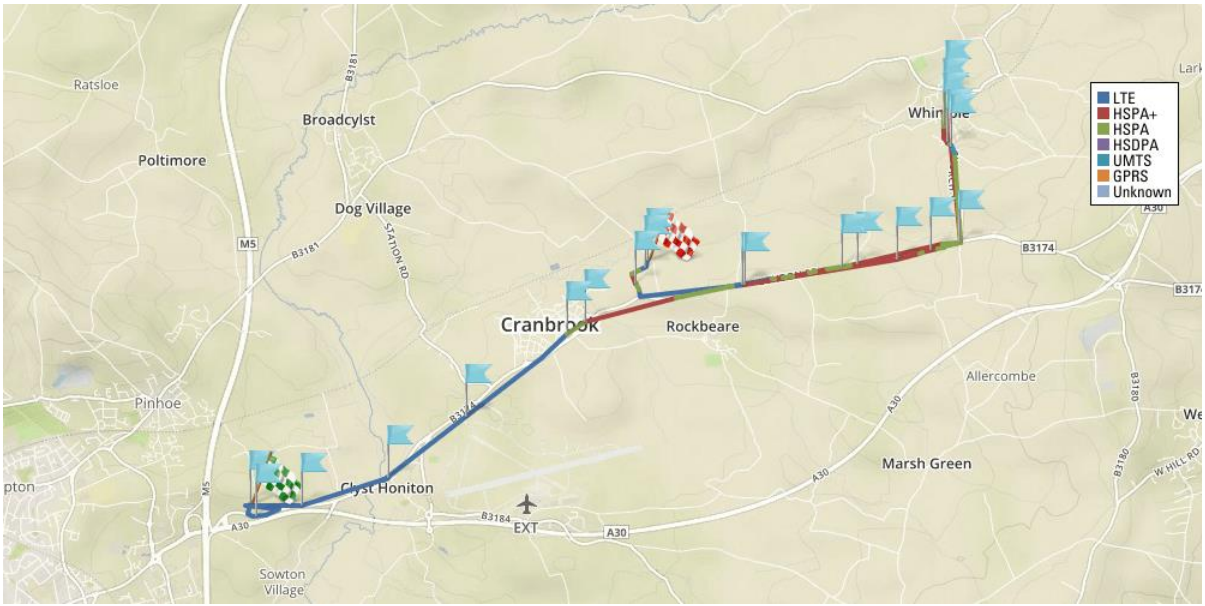


6.5.2.4 O2


Network Mode
50% HSPA
48% HSPA+
1% HSDPA
Downlink
100% < 2 Mbps
0% 2 to 7 Mbps
0% > 7 Mbps

6.6 Science Park - Whimple - Cranbrook Secondary School

Cranbrook has the potential for almost 8000 homes. There is planning permission for the first 3500 of which 1700 have detailed planning permission. There are currently just over 1100 built and occupied. The full development will potentially extend towards the village of Whimple and the survey included the most easterly point in terms of Cranbrook's anticipated future expansion.



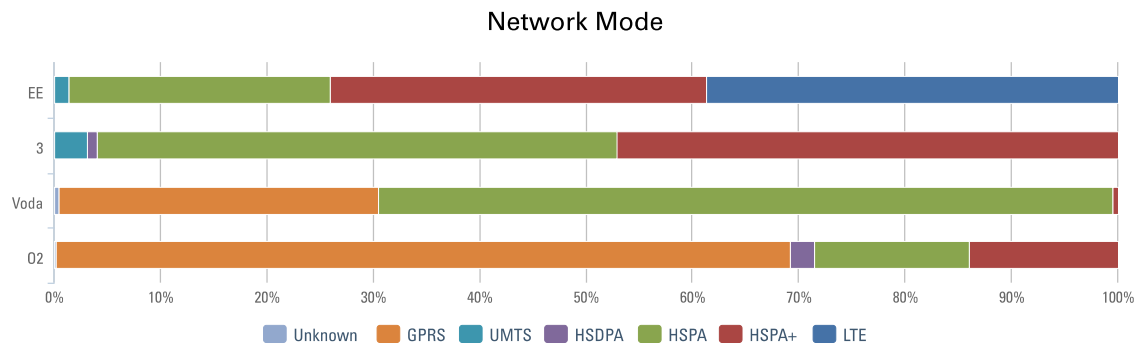
6.6.1 Summary

There was coverage from all operators along the majority of the route. Most networks struggled for connectivity in the village of Whimple at the bottom of the dip.

6.6.2 Science Park - Whimple - Cranbrook Secondary School Survey Results

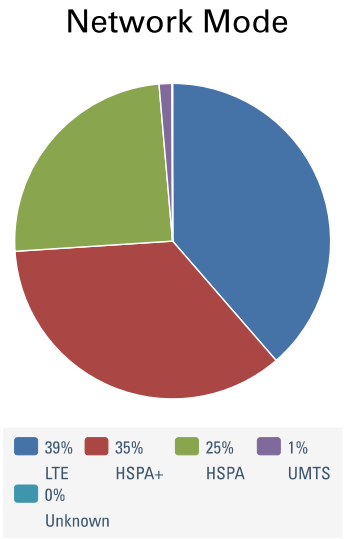
A drive survey was conducted from the Science Park to Whimple, returning to Cranbrook near the construction site of the secondary high school.

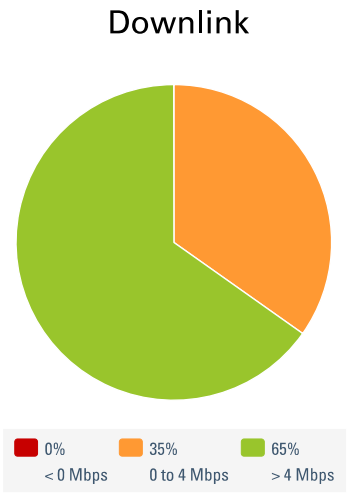
Device	Operator	Signal	Downlink	Uplink	Latency	Availability
EE	EE	-97 dBm	8.77 Mbps	3.32 Mbps	426 ms	100%
3	3	-87 dBm	4.94 Mbps	1.56 Mbps	577 ms	100%
Voda	vodafone UK	-92 dBm	0.70 Mbps	0.39 Mbps	606 ms	100%
O2	O2 - UK	-79 dBm	0.37 Mbps	0.25 Mbps	1167 ms	100%



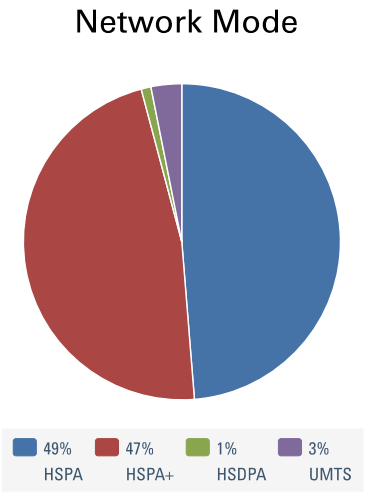
Once again EE and Three outperformed the other networks. LTE was available for 39% of the route on the EE network with HSPA/+ being available for the remainder.

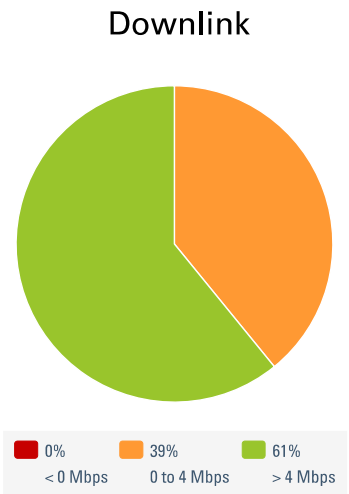
6.6.2.1 EE



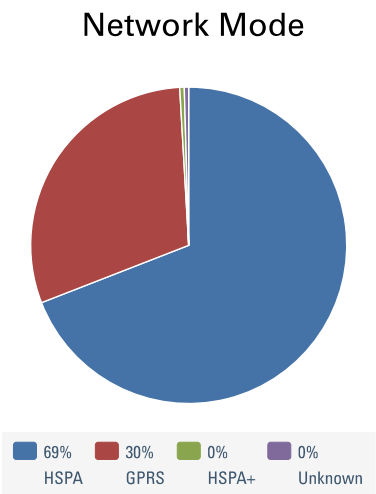


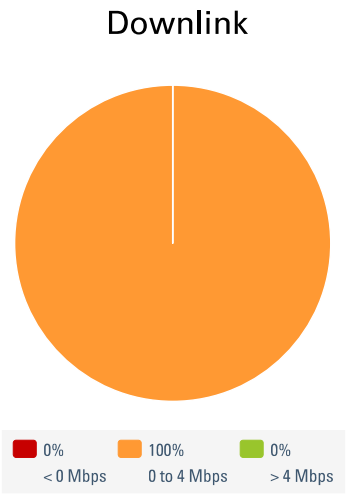
6.6.2.2 Three



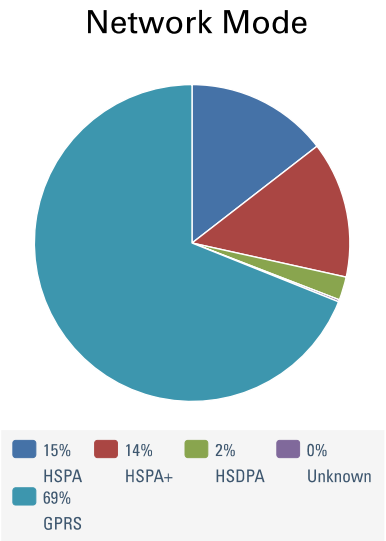


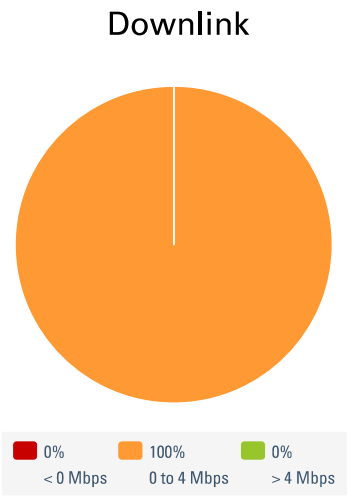
6.6.2.3 Vodafone





6.6.2.4 O2

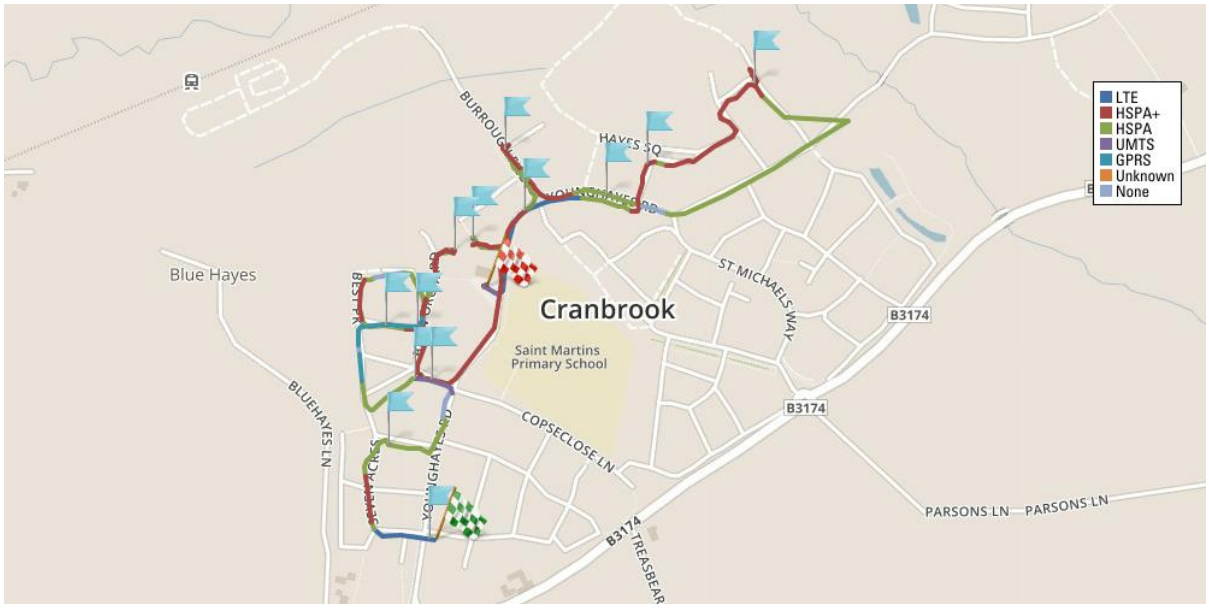

Network Mode
15%
HSPA
14%
HSPA+
2%
HSDPA
0%
Unknown
69%
GPRS


Downlink
0%
< 0 Mbps
100%
0 to 4 Mbps
0%
> 4 Mbps

6.7 Cranbrook: Phase 1 & 2 (North)

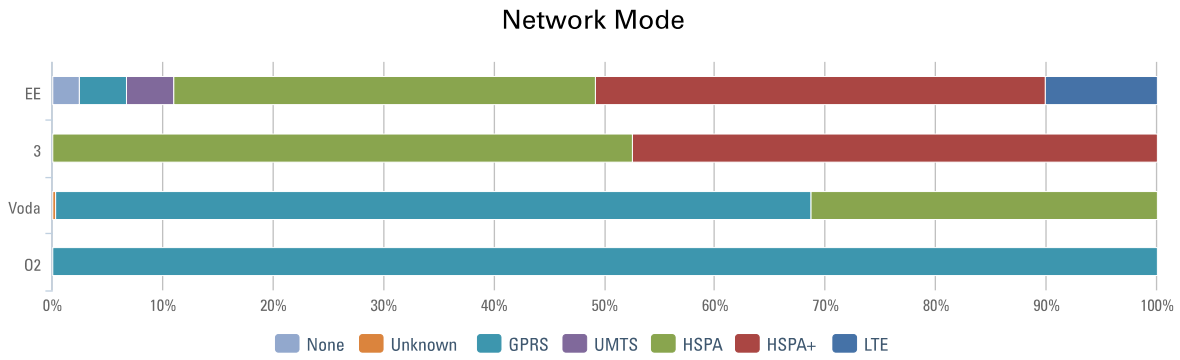
Drive survey throughout Cranbrook residential areas of phase 1 and 2.

Two surveys were conducted across the estate. One, north and one south of Younghayes Road up to the secondary school



6.7.1 Cranbrook Phase 1 & 2 (North) Results

Device	Operator	Signal	Downlink	Uplink	Latency	Availability
EE	EE	-103 dBm	3.21 Mbps	0.31 Mbps	555 ms	100%
3	3	-99 dBm	2.01 Mbps	0.44 Mbps	668 ms	100%
Voda	vodafone UK	-97 dBm	0.11 Mbps	0.03 Mbps	613 ms	100%
O2	O2 - UK	-85 dBm	0.00 Mbps	0.00 Mbps	1564 ms	100%

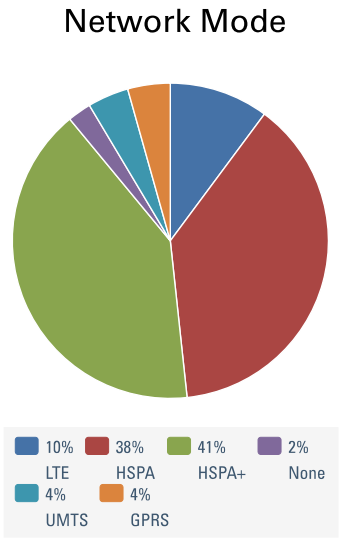


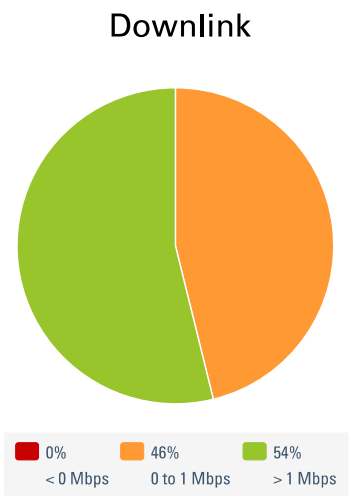
The EE network performed the best; however signal levels were much lower than other sample areas, which would lead to challenging conditions for indoor use, when factoring in- building propagation losses. The Vodafone and O2 network were primarily GPRS access, resulting in poor data performance.

Whilst it wasn't possible to test around the proposed site for the railway station, a test at the start of the access road gave an indication of the likely mobile performance around the

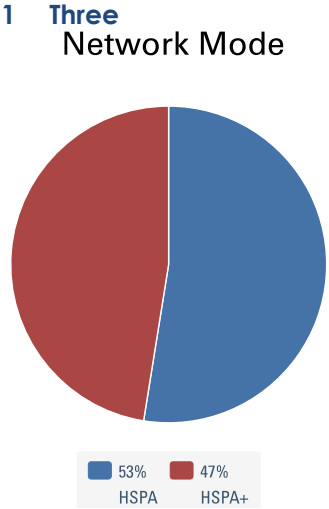
station. Both EE and the Three network performed well, whilst Vodafone and O2 experienced very low data throughput. The O2 network did show quite strong signal levels in this area, however no data throughput was possible. This may have been caused by a problem on the O2 network at the time of the survey.

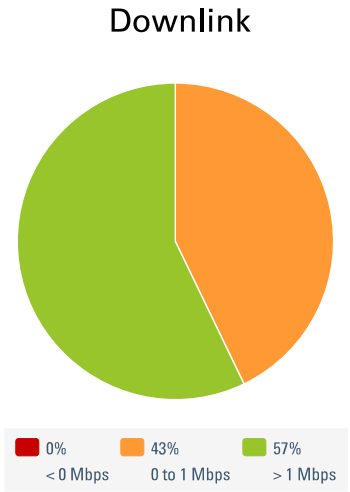
6.7.2 EE





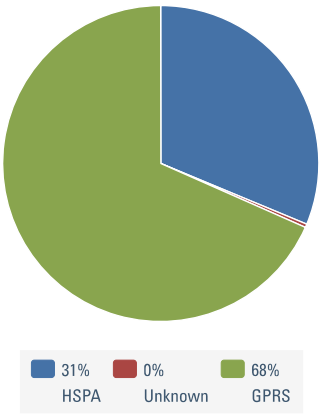
6.7.2.1 Three



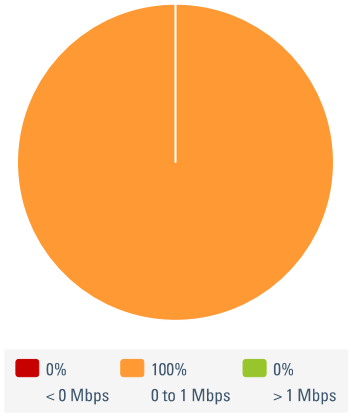


6.7.2.2 Vodaone

Network Mode

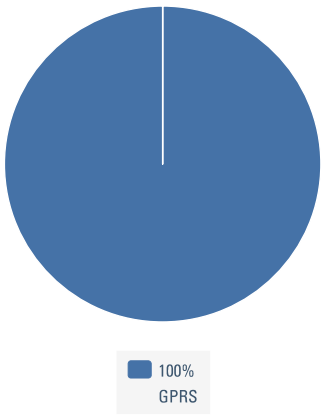


Downlink

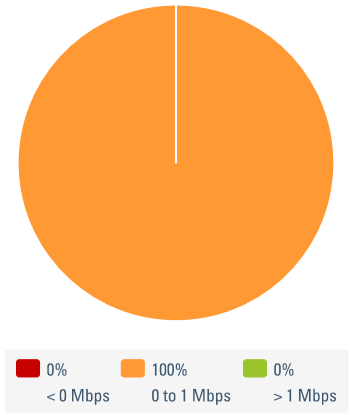


6.7.2.3 O2

Network Mode



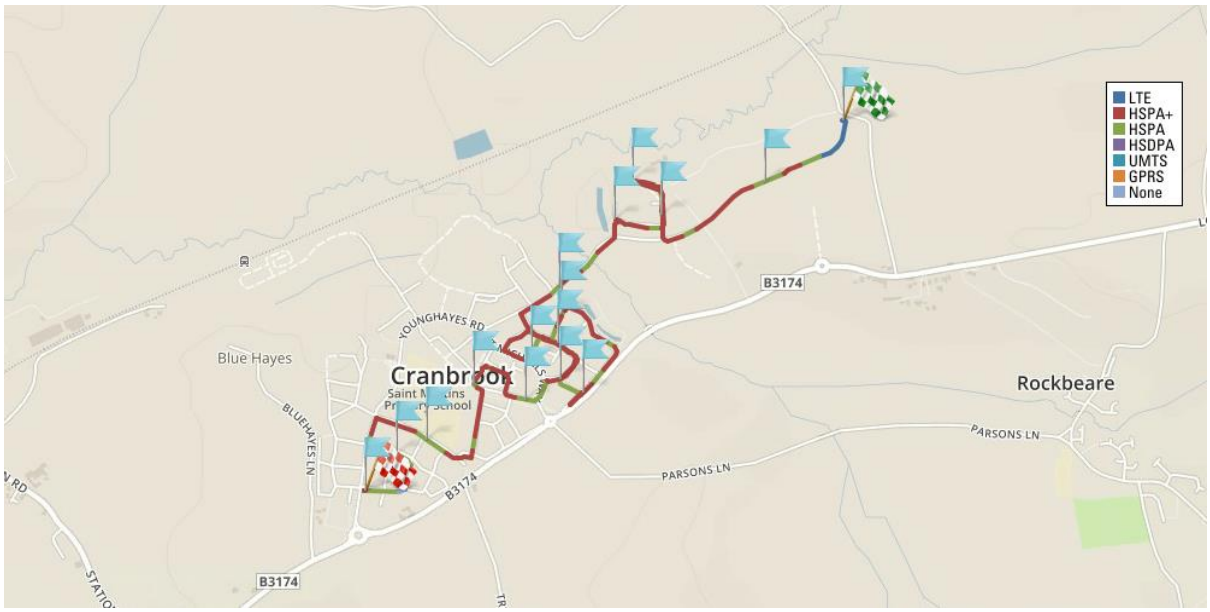
Downlink



6.8 Cranbrook: Phase 1 & 2 (South)

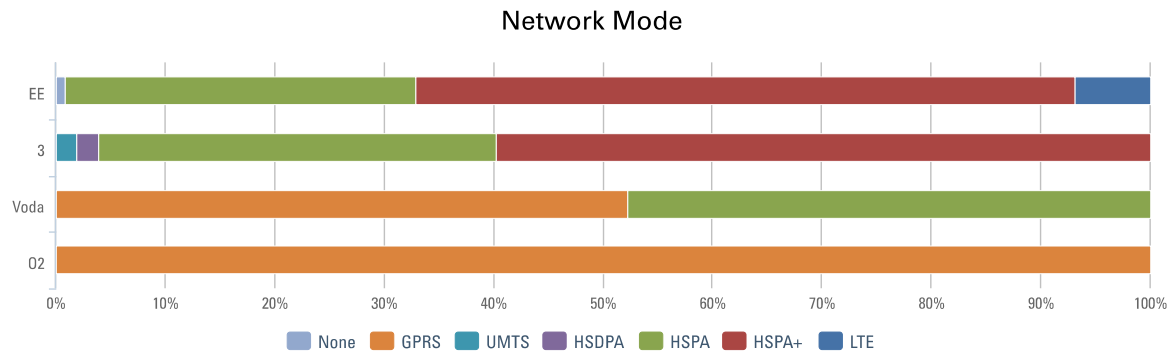
Drive survey throughout Cranbrook residential areas of phase 1 and 2.

Two surveys were conducted across the development. One, north and one south of Younghayes Road.



6.8.1 Cranbrook Phase 1 & 2 (South) Results

Device	Operator	Signal	Downlink	Uplink	Latency	Availability
EE	EE	-97 dBm	3.37 Mbps	1.03 Mbps	388 ms	100%
3	3	-94 dBm	2.36 Mbps	0.85 Mbps	597 ms	100%
Voda	vodafone UK	-96 dBm	0.26 Mbps	0.18 Mbps	543 ms	100%
O2	O2 - UK	-82 dBm	0.00 Mbps	0.00 Mbps	1119 ms	100%

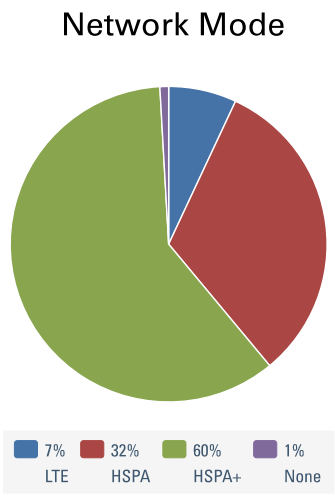


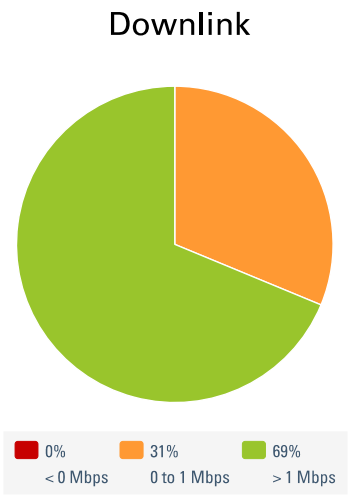
The EE network performed the best; however signal levels were much lower than other sample areas, which would lead to challenging conditions for indoor use, when factoring in- building propagation losses. The Vodafone and O2 network were primarily GPRS access, resulting in poor data performance.

With the exception of O2, all network performed better at the start of the survey, near the site for the secondary school. This may be due to the reduced amount of building clutter in the area. Therefore, it can be expected that performance may drop off, as building levels increase towards this end of the Phase 2 development over time.

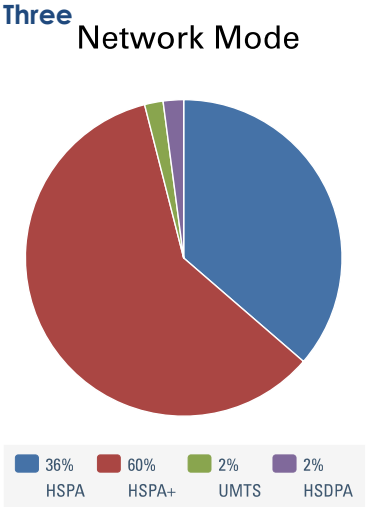
The O2 network did show quite strong signal levels in this area, however no data throughput was possible. This may have been caused by a problem on the O2 network at the time of the survey.

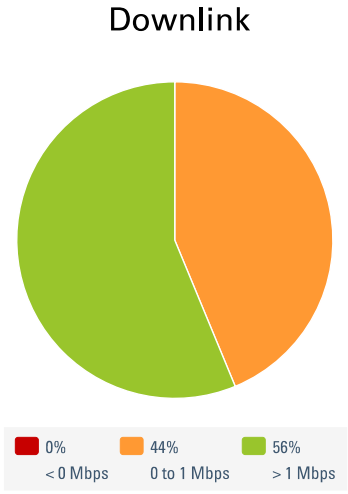
6.8.2 EE



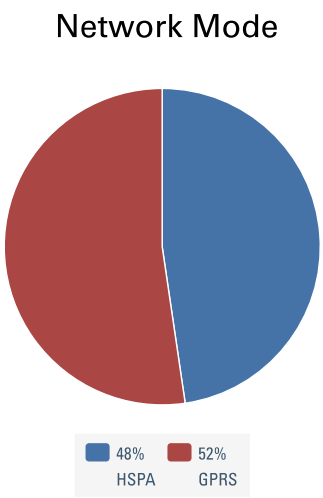


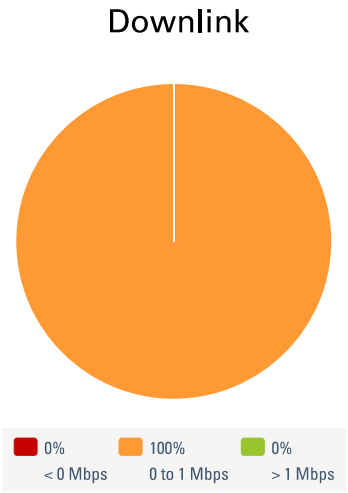
6.8.3 Three



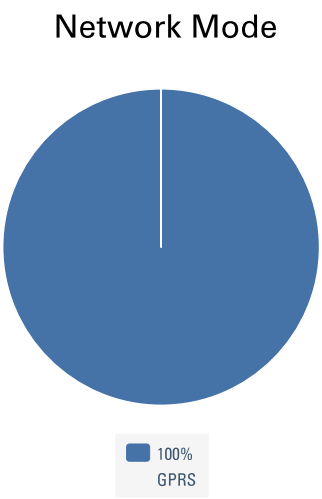


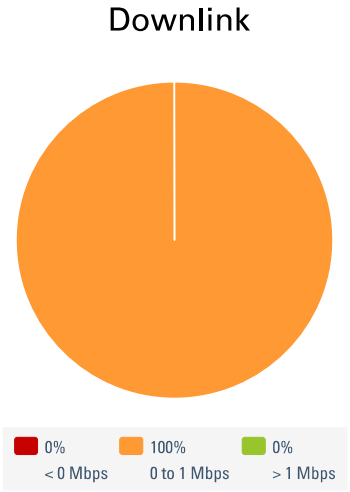
6.8.3.1 Vodafone





6.8.3.2 O2





6.8.4 Cranbrook Static Testing – Inbuilding

A number of indoor static tests were performed throughout Cranbrook to test the in-building performance across all four network operators.

No.1	Address	EE				Voda				3				O2			
		Cell ID	Signal dBm	Speedtest	Notes	Cell ID	Signal dBm	Speedtest	Notes	Cell ID	Signal dBm	Speedtest	Notes	Cell ID	Signal dBm	Speedtest	Notes
1	YHC 1st Floor	15962205	-99 dBm	Ping 106ms D/L 3.73Mbps U/L 0.65Mbps	HSPA+	58660	-92 dBm	Insufficient signal	GPRS	15948238	-102 dBm	275ms D/L 3.39Mbps U/L 0.85Mbps	Cell ID Fluctuating	20194	-88 dBm	Insufficient signal	GPRS
2	Pharmacist 3 Gnd Floor				No Service	419			No Service				No Service	10204	-102 dBm		No Service
3	32 Best Park				No Service	419	-97 dBm	Insufficient signal	GPRS				No Service	20194	-95 dBm	Insufficient signal	GPRS
4	38 Younghayes Rd				No Service	419	-103 dBm	Insufficient signal	GPRS				No Service	20194	-97 dBm	Insufficient signal	GPRS
5	162 Younghayes Rd	15981185 15962205 15950620	-100 dBm	1148ms D/L 1.97Mbps U/L 0.26Mbps	HSPA+	58660	-91 dBm	1407ms D/L 0.02Mbps U/L 0.01Mbps	GPRS	15948238 15948238	-106 dBm	269ms D/L 4.37Mbps U/L 0.24Mbps	HSPA+	20194	-92 dBm	Insuficient Signal	GPRS
6	2 Post Coach Way	15962205	-98 dBm	130ms D/L 6.58Mbps U/L 0.7Mbps	HSPA	58660	-96 dBm	415ms D/L 0.03Mbps U/L 0.02Mbps	GPRS	15948238	-107 dBm	238ms D/L 4.04Mbps U/L 2.18Mbps	HSPA	32704	-89 dBm	Insufficient signal	GPRS
7	6 Barleycorn	15969460	-87 dBm	120ms D/L 2.21Mbps U/L 1.49Mbps	HSPA	58660	-92 dBm	423ms D/L 0.01Mbps U/L Failed	GPRS	15952112	-86 dBm	238ms D/L 4.03Mbps U/L 2.18Mbps	HSPA	32704	-87dBm	Insufficient signal	GPRS
8	37 Tillhouse Rd				No Service	22606	-94 dBm	655ms D/L 0.04Mbps U/L 0.02Mbps	GPRS				No Service	19627	-99 dBm	No Service	GPRS
9	12 Great Meadow	15931526	-105 dBm	No Service	No Service	37901	-102 dBm	375ms D/L 0.03Mbps U/L 0.02Mbps	GPRS	15948580	-102 dBm	314ms Failed	HSPA	20194	-92 dBm	No Service	GPRS

Table1: Indoor static test results

6.8.4.1 Static Testing Summary

As can be seen from the results table the network performance was poor across all operators. EE and Three provided the better service however, there are still significant reception challenges across the entire development for all operators.

From all the households that were tested, all the owners had issues with their mobile phone service, to varying degrees. Many had been forced to explore alternative solutions to ensure that had a service such as:

- EE Signal Boost Box – A number of residents are using the EE signal boost box, although not all residents were able to get one. EE appear to limiting the distribution of these. Some residents are also experiencing issues where the broadband router is interfering with the Signal Boost box, and reducing its effectiveness
- WiFi calling Apps – Three and O2 both has WiFi calling Apps. There were mixed response on how successful these are.

7 Conclusion

In conclusion, the mobile reception in the Cranbrook area is sub standard. This is materially impacting the user's ability to make and receive phone calls and use data services through their mobile provider.

This poor coverage is resulting in data transfer issues from the energy smart meters in the Cranbrook homes, leading to billing issues and general frustration amongst the many residents.

Other areas, that were analysed – Skypark, Science Park and ASOC generally performed well. Providing good levels of coverage to allow voice calls. However, EE were the only operator where 4G services were accessible, so data services on the majority of operators were limited.

Given the strategic importance of this major new development and the ethos behind the plan being one of innovation, technology advanced and environmentally friendly; there is case to ensure the mobile communication services are future proofed and appropriate for the residents, business and visitors that make use of the facilities within the area.

8 Next Steps & Solutions

A report will be sent to each of the mobile operators that show their own network performance in details across the Development Area.

The output and next steps will be discussed with the operators to ascertain their appetite to address the coverage shortfall in the region.

The standard approach to address these coverage spots would be for the operators to find a new macro site and install the necessary equipment. This would provide a scalable solution for the area. However, installing new macro sites does take time and requires support from local councils to assist in planning applications etc. A typical new site install can take around 18 months.

A more innovative solution as an alterative to deploying additional macro sites would be to install small cells on the lampposts and street furniture in those areas requiring improved service levels.

Small cells are a new solution in the operator's tool kit to enable additional coverage or capacity to be installed in a low cost agile manner. Specifically targeting the area in demand. Given the availability of high capacity fibre deployed across the entire development (Cranbrook, Skypark and the Science Park are all pre-installed with fibre transmission to the premise) a future proofed deployment of WiFi, 3G and 4G small cells really lends itself to this area.

Whilst Cranbrook's immediate requirement is for 3G services to enable voice calls, the entire development area would benefit from an innovative deployment of community WiFi, 3G & 4G services.

There are a number of approaches that can be taken to deploy small cells across the area. From a single MNO deployment to a 'neutral host' deployment by a third party, who wholesale the service back to the mobile operators. Given the willingness of the developers, council and fibre providers a more innovative neutral host solution will be interesting to explore further with the mobile operators.

As the Government has a major shortfall of new housing across the county, much more housing is gaining agreement to be built on Greenfield sites. These new areas have previously never been the target of mobile operators due to the low population density, hence they could also have a coverage shortfall. Thus, a deployment of this nature will not be unique and could be a blueprint for the future of mobile communication deployment going forward.

This strategy will be discussed with the mobile operators as well as the transmission providers and potential partners to provide such a service.