



Clarification for 3G Coverage Obligation Verification Data

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Section 1

Introduction

- 1.1 The 2100 MHz Third Generation Mobile Wireless Telegraphy Act licences include an obligation to provide, by 30 June 2013, an electronic communications network:
- that is capable of providing mobile telecommunications services to an area within which at least 90% of the population of the UK lives; and
 - with a 90% probability that users in outdoor locations within that area can receive the service with a sustained downlink speed of not less than 768 kbps in a lightly loaded cell.
- 1.2 Ofcom published a statement on 9 May 2012 outlining the methodology for verifying compliance with this obligation (the 3G Coverage Verification Methodology)¹.
- 1.3 Compliance will be verified using data to be provided by each of the licensees in response to a formal information request. During early 2013 we undertook a trial verification exercise using data supplied by the licensees on a voluntary basis, which highlighted some issues regarding data formatting. This document aims to further clarify how the coverage assessment is undertaken and the required data format.
- 1.4 In this document:
- Section 2 provides some further clarification in relation to how the data will be processed by Ofcom.
 - Section 3 sets out the data that each licensee will be required to provide.
 - Section 4 sets out the data validation process that Ofcom will undertake.

Issues highlighted during the 3G coverage assessment trial

- 1.5 The following issues were encountered during the 3G coverage assessment trial.
- 1.6 Exact duplicate records.
- When a site is duplicated and selected to be included in the assessment, the signal from each sector of that site will be considered twice in the calculation of the signal to interference plus noise ratio (SINR). If the dominant sector is from that site an equal signal strength will be considered within the interference component.
- 1.7 Duplicate locations, different sector information.
- Where the site location, carrier frequency and antenna height are the same, all sectors must be recorded against the site record. If there are two entries the two sites will be considered separately and another valid site will not be included in the calculation.

¹ 3G Coverage Obligation Verification Methodology
<http://stakeholders.ofcom.org.uk/binaries/consultations/2100-MHz-Third-Generation-Mobile/annexes/methodology.pdf>

1.8 Duplicate locations, different antenna height.

- Where the site location has different antenna heights for different sectors the propagation model will calculate different path losses so it is valid that they be considered as different base stations.

1.9 Ofcom will undertake some data validation (as detailed in section 4 below) but will not edit the submitted data in any way. If the data is not supplied in a format compatible with the assessment software we will contact the operator before proceeding with processing the data.

Section 2

Data Processing

- 2.1 Data provided will be automatically read into the assessment tool therefore it is important that the data is formatted as requested in this document.
- 2.2 Site data will be split into a number of frequency networks:
 - 2100 MHz carrier frequency 1;
 - 2100 MHz carrier frequency 2;
 - 2100 MHz carrier frequency 3 (if applicable);
 - 900 MHz carrier frequency 1 (if applicable);
 - 900 MHz carrier frequency 2 (if applicable);
- 2.3 These frequency networks will be processed in turn until the coverage threshold has been reached.
- 2.4 Population points that meet the coverage criteria using the frequency network being assessed will be marked served and will not be considered in the assessment of subsequent frequency networks.
- 2.5 The population data points have been split into assessment areas. These consist of National Grid Reference (NGR) squares or portions of NGR squares which contain roughly equal numbers of population points. These areas are illustrated in Figure 2.1.
- 2.6 The population data assessment areas are processed from the highest populated NGR squares to the lowest, as shown in Table 2.1. Given the matrix nature of the simulation, this enables the process to be stopped as close as possible to 90% coverage.
- 2.7 For each population assessment area all base station sites that fall within a 50 kilometre buffer zone will be available for inclusion in the SINR calculation. An example of the buffer zone is shown in Figure 2.2.
- 2.8 For each population data point:
 - the nearest 20 base stations to the population point are identified. Where 20 base stations are not available within the NGR square buffer zone the calculation will be limited to the number of sites available.
 - For each sector of the nearest base stations identified in the previous step, the downlink power that would be received by a terminal 1.5 meters above ground level at the population point location is calculated.
 - The SINR distribution is calculated using the method outlined in the 3G Coverage Obligation Verification Methodology statement.

Figure 2.1. Population assessment areas.

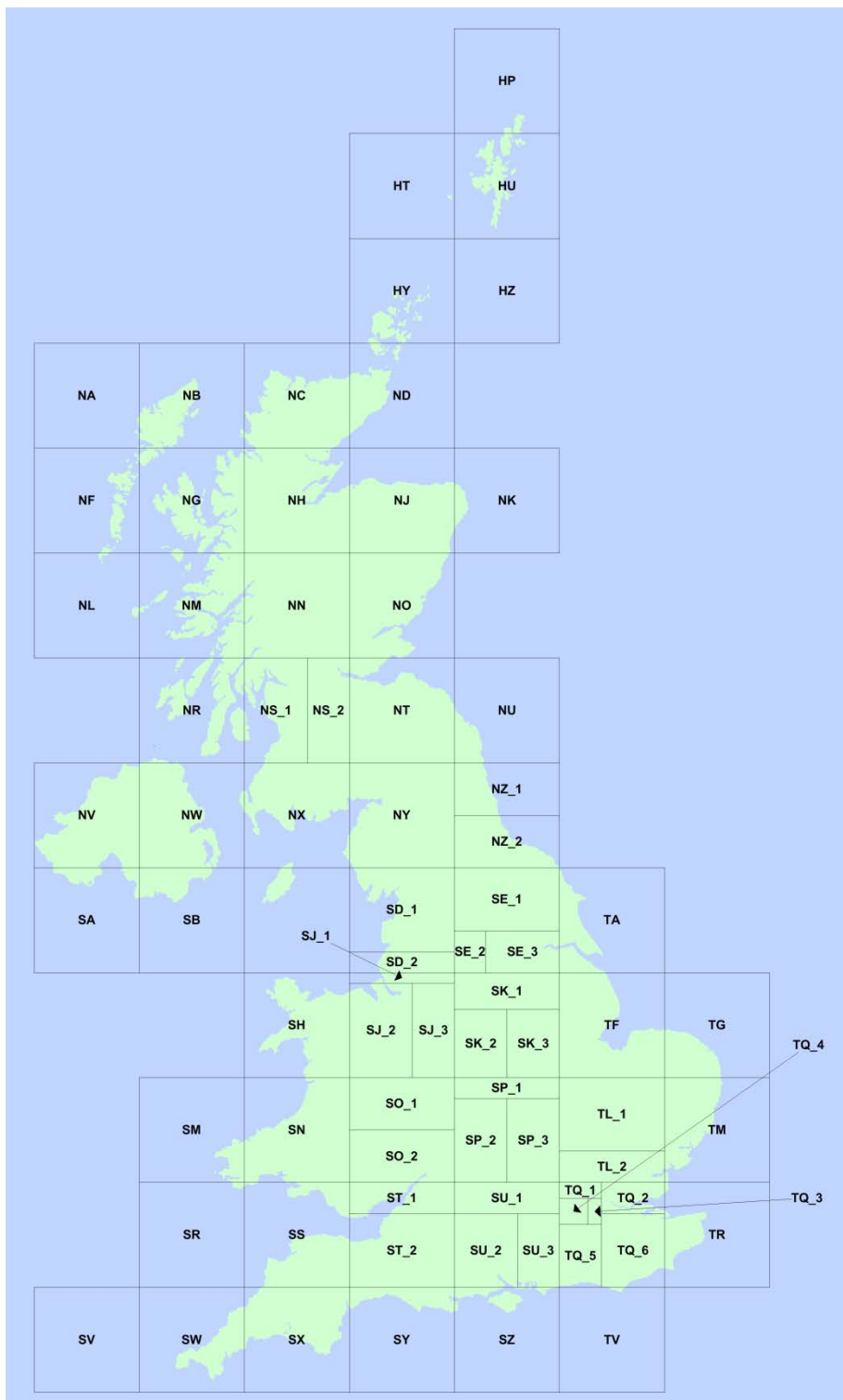
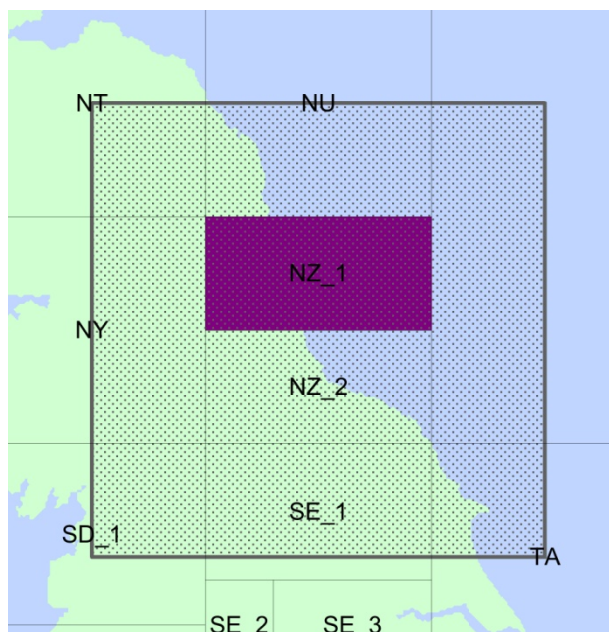


Table 2.1. Order of population assessment area processing.

NGR Square	NGR Square Population	Population assessment area	Population assessment area population	Cumulative Population of UK
TQ	11286323.85	TQ_2	2310105	3.92929%
TQ	11286323.85	TQ_4	2264278	7.78064%
TQ	11286323.85	TQ_3	2064096	11.29149%
TQ	11286323.85	TQ_1	2004727	14.70136%
TQ	11286323.85	TQ_6	1402053	17.08614%
TQ	11286323.85	TQ_5	1241065	19.19708%
SJ	4855020.254	SJ_3	1819165	22.29133%
SJ	4855020.254	SJ_1	1618309	25.04394%
SJ	4855020.254	SJ_2	1417546	27.45506%
SP	4144558.89	SP_1	1794448	30.50727%
SP	4144558.89	SP_3	1295375	32.71059%
SP	4144558.89	SP_2	1054736	34.50461%
SK	4141667.131	SK_1	1432117	36.94052%
SK	4141667.131	SK_3	1403886	39.32841%
SK	4141667.131	SK_2	1305664	41.54923%
SU	3575274.658	SU_3	1284378	43.73385%
SU	3575274.658	SU_1	1175382	45.73308%
SU	3575274.658	SU_2	1115515	47.63047%
SE	3313141.538	SE_2	1329013	49.89101%
SE	3313141.538	SE_3	1264300	52.04148%
SE	3313141.538	SE_1	719828.1	53.26585%
SD	3188645.259	SD_2	1706170	56.16790%
SD	3188645.259	SD_1	1482476	58.68946%
ST	2797167.619	ST_1	1621468	61.44744%
ST	2797167.619	ST_2	1175700	63.44721%
TL	2761705.813	TL_2	1501120	66.00049%
TL	2761705.813	TL_1	1260586	68.14464%
NS	2477086.112	NS_1	1286788	70.33336%
NS	2477086.112	NS_2	1190298	72.35795%
NZ	2475288.205	NZ_1	1371557	74.69086%
NZ	2475288.205	NZ_2	1103731	76.56821%
SO	2106413.932	SO_1	1198155	78.60617%
SO	2106413.932	SO_2	908259.3	80.15104%
NW	1141041.129	NW	1141041	82.09186%
NT	1065215.856	NT	1065216	83.90370%
SX	924284.9613	SX	924285	85.47583%
TM	747819.6118	TM	747819.6	86.74781%
SS	746907.8649	SS	746907.9	88.01823%
TA	729283.2737	TA	729283.3	89.25868%
TF	729123.1503	TF	729123.2	90.49886%
SZ	690817.8995	SZ	690817.9	91.67388%
TR	544019.5358	TR	544019.5	92.59921%
NO	543886.0442	NO	543886	93.52432%
TG	476228.5215	TG	476228.5	94.33434%
NJ	444422.0294	NJ	444422	95.09027%
NV	381283.7841	NV	381283.8	95.73880%
SN	374500.0001	SN	374500	96.37579%
NY	348643.8468	NY	348643.8	96.96880%
SW	308702.947	SW	308702.9	97.49388%
SH	298345.2069	SH	298345.2	98.00134%
SY	292784.3167	SY	292784.3	98.49934%
NX	153350.6277	NX	153350.6	98.76018%
NH	135626.5504	NH	135626.6	98.99087%
SB	133948.2279	SB	133948.2	99.21870%
SM	73398.89399	SM	73398.89	99.34355%
NN	68256.78353	NN	68256.78	99.45965%
TV	49919.10632	TV	49919.11	99.54456%
NU	41226.42633	NU	41226.43	99.61468%
NK	32070.39294	NK	32070.39	99.66923%
ND	27540.40722	ND	27540.41	99.71607%
SA	26655.27273	SA	26655.27	99.76141%
NR	24752.72179	NR	24752.72	99.80351%
NM	21438.96196	NM	21438.96	99.83998%
HU	21007.025	HU	21007.02	99.87571%
NB	19089.29282	NB	19089.29	99.90818%
HY	17614	HY	17614	99.93814%
NG	17219.95703	NG	17219.96	99.96743%
NC	8449.082019	NC	8449.082	99.98180%
NF	5393.866667	NF	5393.867	99.99097%
SV	2148	SV	2148	99.99463%
NL	1246.238596	NL	1246.239	99.99675%
SR	892.1346485	SR	892.1346	99.99827%
HP	861.6868687	HP	861.6869	99.99973%
HZ	69	HZ	69	99.99985%
HT	50.28813559	HT	50.28814	99.99993%
NA	38.80952381	NA	38.80952	100.00000%

Figure 2.2. Buffer Zone for population assessment areas NZ_1 and NZ_2.



Section 3

Data Formatting

Data description

The following data is to be supplied for all outdoor 3G base stations:

- 3.1 Site ID: This can be any text or number used to uniquely identify the base station site.
- 3.2 Easting: British national grid co-ordinate (OSGB36) to 1 metre resolution.
- 3.3 Northing: British national grid co-ordinate (OSGB36) to 1 metre resolution.
- 3.4 Carrier centre frequency: Carrier centre frequency in megahertz.
- 3.5 Antenna Height: Height of the antenna in metres above local ground.
- 3.6 No. Sectors Per Site: number of sectors for the stated carrier frequency.

The following information must be supplied for each sector of the base station at the stated carrier frequency:

- 3.7 Sector EIRP: The EIRP (effective isotropic radiated power) is the product of the power supplied to the antenna and the antenna gain relative to an isotropic antenna in decibels referenced to one milliwatt. This value should be less than or equal to the licensed Maximum EIRP per carrier.
- 3.8 Sector Boresight Gain: Gain of the antenna in decibels relative to an isotropic antenna.
- 3.9 Sector Azimuth: Sector antenna pointing direction in the horizontal plane in degrees east of true north. This value should be between 0 and 359 degrees.
- 3.10 Sector Downtilt: Combined electrical and mechanical downtilt of the sector antenna relative to horizontal in degrees. Where 0 degrees is horizontal, positive angles are below the horizontal and negative angles above. This value should be between -90 and +90 degrees.
- 3.11 Sector Horizontal 3dB beamwidth: The half power beamwidth of the horizontal antenna pattern in degrees. This value should be between 1 and 360 degrees.
- 3.12 Sector Vertical 3dB beamwidth: The half power beamwidth of the vertical antenna pattern in degrees. This value should be between 1 and 180 degrees.

Clarification points

- 3.13 The data should be provided in an Excel spreadsheet. An example file has been provided with this document.
- 3.14 A base station site is deemed to be a unique location, to 1 metre resolution, carrier frequency and antenna height combination.

- 3.15 Where there are sectors at different heights these should be treated as separate base stations, illustrated in the example file rows 2 and 3.
- 3.16 Where there are sectors with different locations these should be treated as separate base stations, illustrated in the example file rows 7 and 8.
- 3.17 There should be a line of data for each base station site for each carrier frequency transmitting, illustrated in the example file rows 10 to 13.
- 3.18 The spreadsheet can be extended to provide data for any number of sectors at a base station site.
- 3.19 All data within a row should be continuous. If there are gaps within a row it will not be processed correctly.

Section 4

Data Validation

- 4.1 Ofcom will perform the following data validation tasks using the data provided by the licensees:
- Plot the geographical distribution of base station sites using the Easting and Northing data.
 - Identify duplicate base station locations using the Easting and Northing data. These records will be inspected to ensure that there are different Frequency or Antenna Height parameters.
 - Verify the carrier centre frequency against licensed frequency band.
 - Verify the sector EIRP against licensed Maximum EIRP per carrier.
 - Verify that sector Azimuth values are within the range 0 to 359 degrees.
 - Verify that sector Downtilt values are within the range -90 to +90 degrees.
 - Verify that sector Horizontal 3dB beamwidth values are within the range 1 to 360 degrees.
 - Verify that sector Vertical 3dB beamwidth values are within the range 1 to 180 degrees.
- 4.2 Ofcom will not edit the submitted data in any way. If the data is not supplied a format compatible with the assessment software we will contact the operator before proceeding with processing the data.

Annex 1

Data Format Table

A1.1 Table A.1.1 below gives the example site data required and the format required for the engineering analysis. A six sector site is given in this example, but the number of sectors can be expanded to a necessary number.

Table A1.1. Spreadsheet format

Column	Parameter	Format	Units
1	SITE_ID	This should be a unique site reference	
2	Easting	British national grid co-ordinate to 1 metre resolution	Metres
3	Northing	British national grid co-ordinate to 1 metre resolution	Metres
4	Centre frequency of each carrier		MHz
5	Antenna height	Metres above local ground measured to the radiation centre of the antenna	Metres
6	No. sectors per site		
7	1st Sector EIRP		dBm
8	1st Sector boresight gain		dBi
9	1st Sector azimuth	East of true north	Degrees
10	1st Sector total downtilt	Electrical + mechanical downtilt	Degrees
11	1st Sector horizontal 3dB beamwidth		Degrees
12	1st Sector vertical 3dB beamwidth		Degrees
13	2nd Sector EIRP	Data format as above, only required if number of sectors is greater than 1	
14	2nd Sector boresight gain		
15	2nd Sector azimuth		
16	2nd Sector total downtilt		
17	2nd Sector horizontal 3dB beamwidth		
18	2nd Sector vertical 3dB beamwidth		
.	.	.	.
.	.	.	.
.	.	.	.
1+6N	Nth Sector EIRP	Data format as above, only required if number of sectors is greater than N-1	
2+6N	Nth Sector boresight gain		
3+6N	Nth Sector azimuth		
4+6N	Nth Sector total downtilt		
5+6N	Nth Sector horizontal 3dB beamwidth		
6+6N	Nth Sector vertical 3dB beamwidth		

Annex 2

Example Excel Spreadsheet

A2.1 An example file is embedded below, all data is fictional and provided only to illustrate the data formatting.



3GCOVDataTemplate
Final.xlsx