Measurements of Exposures Around Vodafone New Zealand Limited Cellsites from June 2013 to May 2014

This report was prepared for:
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AUCKLAND

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Technical Report

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX

Summary

This report outlines the results from measurements of radiofrequency (RF) fields around base stations (cellsites) for the Vodafone New Zealand Limited yearly monitoring project that took place from June 2013 to May 2014.

At the time of measurement, RF exposures in the areas around the 10 cellsites ranged from less than 0.1 to 7.7 $\mu W/cm^2$. With the exception of one cellsite, all of the readings were less than 1.0% of the (900 MHz) public limit prescribed by the New Zealand Standard 2772.1:1999 *Radiofrequency Fields: Part 1 - Maximum Exposure Levels - 3 kHz to 300 GHz* (the Standard).

Based on the areas monitored, all of the Vodafone telecommunications cellsites measured in this project comply with the Standard.

On this basis, no adverse health effects are anticipated from exposure to RF fields in the areas tested.

1. Introduction

The National Centre for Radiation Science (NCRS) is a specialist unit of the Institute of Environmental Science & Research Limited (ESR). ESR, a New Zealand Government-owned Crown Research Institute, is a principal science advisor to the Ministry of Health, providing science advice and services in the field of radiofrequency (RF) magnetic and electric fields and their health effects.

The RF monitoring project was conducted at the request of Vodafone New Zealand Limited. The purpose of the project was for NCRS to select 10 telecommunication base stations (cellsites) and determine whether exposures to RF fields in the areas around the cellsites accessible by the public comply with the exposure limits in the New Zealand Standard 2772.1:1999 *Radiofrequency Fields: Part 1 - Maximum Exposure Levels - 3 kHz to 300 GHz* (the Standard).

The main report describes the procedures for measuring RF fields around the cellsites and it summarises the findings from the cellsites visited from June 2012 to May 2013. The Appendix provides more detailed descriptions of the cellsites and explains and/or shows where the RF exposures (power flux density in microwatts per centimetre squared ($\mu W/cm^2$)) were recorded.

1.1. Nature of RF fields

Radio waves and microwaves are forms of electromagnetic energy collectively described by the term radiofrequency or RF. Some common terms used when discussing RF emissions are "radiation", "fields" and "exposure."

"Electromagnetic radiation" can best be described as waves of electric and magnetic energy moving together (ie, radiating) through space. For example, the alternating movement of charge in an antenna at a cellular base station generates electromagnetic waves that radiate away from the transmitting antenna.

The term "RF field" is used to indicate the presence of electromagnetic energy at a given location. The RF field can be described in terms of the electric and/or magnetic field strength at that location.

"Electromagnetic energy" can be characterised by a wavelength and a frequency. The frequency is the number of electromagnetic waves passing a given point in one second and is usually expressed in terms of a unit called the hertz (Hz). For example, a typical radio wave transmitted by an FM radio station has a wavelength of about three meters and a frequency of about 100 million cycles (waves) per second or 100 MHz.

2. Measuring Equipment and Procedures

The instrument used to measure the RF fields was a Wandel and Goltermann EMR-300 broadband isotropic radiation meter with a type 8.2 field probe. Full specifications are presented in Table 1.

Table 1 Details of field monitor and electric probe

Manufacturer:	Wandel and Goltermann
Model:	EMR-300, Isotropic Broadband Field Strength Meter, serial number P-0021
Probe:	E-field probe type 8.2, high sensitivity electric field strength, serial number M-0086
Ranges:	0.6–800 V/m
Spectrum:	100 kHz to 100 MHz ± 1 dB, 100 MHz to 3 GHz ± 2.4 dB
Isotropicity:	±1 dB, f > 1 MHz
Calibration:	By manufacturer, March 2012 Uncertainty ± 0.5 dB Recommended interval: 2 years

Electric field strength is expressed in units of volts per metre (V/m). For ease of comparison with the limits prescribed in the Standard, measurement results are presented in terms of the equivalent power flux density of a plane wave, in units of $\mu W/cm^2$.

The estimated detection threshold of the meter is 0.6 V/m, equivalent to a power flux density of about 0.1 $\mu W/cm^2$.

The instrument measures total exposure RF fields across a wide range of frequencies, including those from cellsites, mobile radios, and TV and radio transmitters. The advantage of this approach is that the exposure recorded is from all sources in an area, not just the site being measured. Hence, for example, if a cellsite from the Telecom network is located close to a Vodafone site, the instrument measures the total exposure from both sites. However, the contribution from individual sources cannot be identified.

At each cellsite tested, the person carrying out the survey walked around the area in the vicinity of the Vodafone transmitters, concentrating on areas where maximum RF exposures might be expected and recording the signal strength on the meter. The maximum power flux density between a height of 2 m above the ground and 30 cm above the ground was recorded.

In most cases, the measurements were made in areas which are reasonably accessible to the public. If it appeared likely that exposures on private land may be greater than those on publicly accessible land, then efforts were made to access that land. The intention was to measure the greatest RF exposure at the time the survey was carried out, and also to gain an idea of "typical" exposures in the area around the cellsite.

2.1. Site selection criteria

Vodafone had no say in the choice of cellsites to be tested or when they would be tested. Selection of cellsites and testing times were entirely at NCRS's discretion. In general, cellsites were selected to ensure:

- a good geographic spread of cellsites
- a range of cellsite types (central city/urban/rural)
- coverage of cellsites known to be of community interest.

A greater weighting was given to monitoring cellsites in residential areas, as results from monitoring this type of cellsite are more likely to be of interest to the public.

3. Recommended Exposure Limits

The New Zealand Standard

In April 1999, New Zealand adopted NZS 2772.Part1:1999 *Radiofrequency Fields Part 1: Maximum Exposure Levels – 3 kHz to 300 GHz* (the Standard). The limits in this Standard are based on international guidelines[1], and are similar to those in many other international and national standards[2]. The validity of the international guidelines was reaffirmed in 2009. The Standard sets out limits for exposure to the RF emissions produced by all types of radio transmitters, for people exposed occupationally and for the general public. The limits are based on a careful review of the research into the health effects of exposure to RF radiation, and include wide safety margins. Reference levels for the general public are stricter than for occupational exposures, and are set at levels more than 50-times lower than the recognised threshold for established effects.

The Standard sets *basic restrictions* on the amount of RF power absorbed by the body (the *specific absorption rate*). As RF power absorption is difficult to measure, the Standard also prescribes *reference levels* in terms of the more easily measured electric and magnetic field strengths, and power flux density. Compliance with the reference levels ensures compliance with the basic restrictions, and in most applications the reference levels can be effectively regarded as "exposure limits" (although this term is not used as such in the Standard).

The amount of power absorbed by the body depends on the frequency of the radio signal, so the reference levels vary as a function of frequency to take this into account. At frequencies of around 900 MHz, 1800 MHz and 2100 MHz, as used by the Vodafone equipment, the reference levels allowed for members of the general public are approximately 450 μW/cm², 900 μW/cm² and 1000 μW/cm², respectively.

The most restrictive limit of 450 $\mu W/cm^2$ has been used in Table 2 and Figure 2 to determine the maximum measured RF exposure as a percentage of the Standard. This ensures a conservative evaluation, and means that the exposure level as a percentage of the Standard will be overestimated should the cellsite actually have transmitters operating at 1800 or 2100 MHz.

[1] International Commission on Non-Ionizing Radiation Protection. 1998. Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). *Health Physics* 74 (4), 494–522. www.icnirp.org

[2] Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Radiation Protection Series No. 3. Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz (2002). http://www.arpansa.gov.au/Publications/codes/rps3.cfm

4. Site Descriptions and RF Exposure Measurement Mythology

Cellsite locations and descriptions are shown in the Appendix.

The exposure measurements are snapshots of the RF field at the time the site survey was carried out. RF exposures vary over the day depending on the amount of calls and/or data volumes passing through the cellsite. One of the ways to determine the maximum RF exposure is to measure the RF energy of the control channels (which are transmitting continuously at a constant level), then multiply by a factor depending on the cellsite power or transmission configurations.

A Vodafone cellsite may have the capability to transmit one or more of the following signals:

- GSM (2G) signals in the Vodafone 900 and 1800 MHz frequency bands
- UMTS (3G) signals in the Vodafone 900 MHz and 2100 MHz bands
- LTE (4G) signals in Vodafone's 1800 MHz band.

The characteristics of the three Vodafone technologies (relevant to determining maximum RF exposures) are summarised below.

GSM (2G)

At each frequency where they are present, GSM components are configured to transmit on one Control (BCCH) channel and one or more Traffic (TCH) channels on each cellsite sector. The control channels transmit continuously at constant power, and the traffic channel power is adjusted as necessary to handle traffic. The maximum power of the traffic channels in each frequency band is the same as that of the control channel in the same band.

For each cellsite requiring measurements, Vodafone provides 2G information on:

- Frequencies of the control channels
- Maximum number of traffic channels envisaged
- Current power of the control and traffic channels, and the maximum power envisaged.

UMTS (3G)

UMTS carriers vary their total power depending on the amount of traffic passing through the cellsite. Each carrier includes a Primary Common Pilot Channel (P-CPICH) which is always transmitting at a constant fraction of the maximum carrier power, even if no calls are going through the cellsite.

For each cellsite requiring measurements, Vodafone provides 3G information on:

- For each frequency band, the number of UMTS carriers currently installed, and the number envisaged
- Maximum power of the UMTS carriers currently installed, and maximum power envisaged
- Ratio of the P-CPICH power to the currently installed maximum carrier power.

LTE (4G)

Like the other Vodafone technologies, the power of the LTE carriers is varied up and down to handle traffic. The Physical Broadcast Channel (PBCH), Primary Synchronising Signal (PSS) and Secondary Synchronising Signal (SSS) are transmitted regularly in the central frequency region of the LTE carrier, with a power equal to or greater than that of any other part of the signal.

For each cellsite requiring measurements, Vodafone provides 4G information on:
- Number of LTE carriers currently installed, and the number envisaged
- Maximum power of the LTE carriers currently installed, and the maximum power envisaged
- Whether implementation of Multiple-Input Multiple-Output (MIMO) technology is envisaged, and installed.

5. Measurement Results

The meter and probe used in this survey measure the total exposure from all transmitters in the frequency range 100 kHz to 3 GHz, so the measurements include all transmitters likely to make a significant contribution to the overall exposure, including other cellsites nearby and any other radio and telecommunication transmitters.

The exact power output of each cellsite at the time of measurement was not known, but was seen to vary on the meter. The output from transmitters varies according to the amount of traffic being handled.

It is assumed that each survey was conducted during a normal traffic period and hence the 2G, 3G and 4G transmitters were operating at a typical power level. The maximum power flux density recorded is shown in Table 2 and the Appendix.

Table 2 Summary of cellsite descriptions and measurement results

City, (region) and name of the cellsite	Date measured	Type of cellsite	Maximum power flux density measured during survey ($\mu W/cm^2$)*	Typical exposure around the cellsite ($\mu W/cm^2$)	Additional comments
Palmerston North, Westend	09/09/2013	Urban, monopole	2.4 (0.53)	<0.46	
Auckland, Meadowood	17/10/2013	Commercial, monopole	2.9 (0.64)	<0.78	
Wellington, Tory Street Relocate	18/11/2013	Urban, roof-top	3.6 (0.80)	<0.86	Another telecommunication provider at the site
Wellington, Newlands Road	22/11/2013	Residential, monopole	2.7 (0.60)	<0.51	
Whangaparaoa Tindalls Bay	24/12/2013	Commercial, monopole	7.7 (1.7)	<2.6	Another telecommunication provider across the road
Motueka, Motueka Township	16/01/2014	Urban, broadcast tower	1.2 (0.27)	<0.23	Mobile radio and two other telecommunication providers at the site
Blenheim, Woodbourne	17/01/2014	Airbase, monopole	0.53 (0.12)	<0.16	
Auckland, Shackleton Road	03/02/2014	Residential, roof-top	3.0 (0.67)	<0.97	Another telecommunication provider at the site
Whangarei, Onerahi	20/02/2014	Residential, monopole	0.45 (0.10)	<0.18	
Waikato, Puketaha	26/02/2014	Rural, broadcast tower	0.31 (0.07)	<0.79	Two other telecommunication providers at the site

* Numbers in brackets represent the RF exposure as a percentage of the exposure limit at 900 MHz in the Standard.

Figure 1 and Figure 2 present the maximum exposures at the 10 cellsites, expressed as the power flux density in microwatts per square centimetre ($\mu W/cm^2$) (Figure 1), and as a percentage of the 900 MHz public limit prescribed in the Standard (Figure 2).

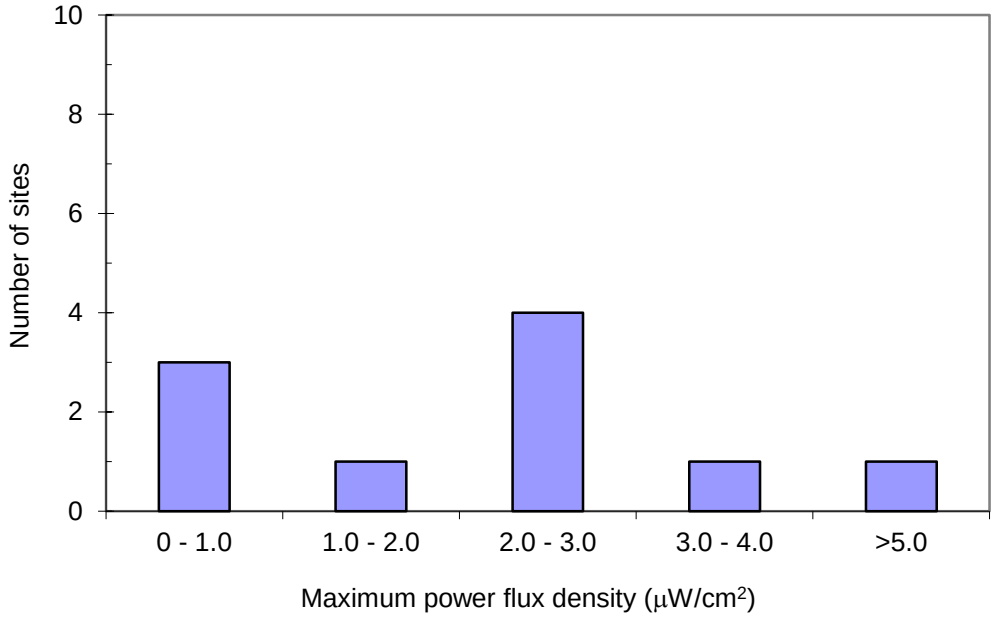

Figure 1 Maximum power flux density around the Vodafone cellsites (*No.* = 10)

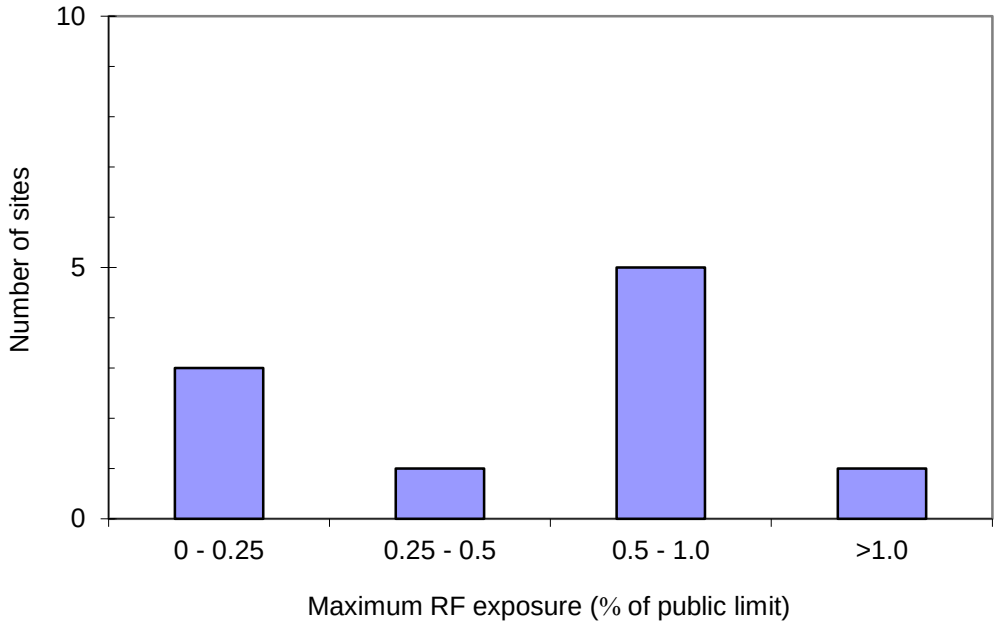

Figure 2 Maximum public exposure limits around the Vodafone cellsites (*No.* = 10), expressed as a percentage of the 900 MHz public limit prescribed in the Standard

6. Comparison with Recommended Exposure Limits

Assuming that all exposures were attributable to the Vodafone equipment, the maximum RF exposure measured was less than 1.7% (7.7 $\mu W/cm^2$) of the limit recommended for the public in the Standard. With the exception of one cellsite, the maximum RF exposures in public areas were all less than 1% of the public limit.

It is assumed that the cellsites were operating at their normal power when the measurements were taken. A worst-case estimate of the maximum exposure level that may occur when the cellsite is configured to the maximum extent, and is operating at maximum power, can be derived by scaling the measured exposure values (as described in Section 4). Even if a scaling factor calculation is performed, (with the worst case 2G, 3G or 4G scaling factor) all the calculated RF exposures would be less than the general public reference level recommended by the Standard.

7. Conclusions

The RF field levels measured in this project were all less than the general public reference level recommended by the Standard. On this basis, no adverse health effects are anticipated for people who live, work or pass by close to the cellsites.

Additional information on the Vodafone monitoring project is available at the ESR website: http://www.esr.cri.nz/competencies/ncrs/faq/Pages/ELFandRFsurveys.aspx.

Appendix Location results

Palmerston North – Westend

Survey time and date	4:15 pm 09/09/2013
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	2.4 μW/cm^2

Site description

The Westend cellsite is a three-sector, monopole-mounted cellsite in an industrial area. The cellsite is located off of West Street, Palmerston North. The sectors are oriented with one panel antenna facing approximately east, one facing southwest and another one facing approximately northwest.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Figure 3.

Figure 3 Westend cellsite layout showing measured power flux density (μW/cm^2)

Auckland – Meadowood

Survey time and date	11:30 am 17/10/2013
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	2.9 μW/cm^2

Site description

The Meadowood cellsite is a three-sector, monopole-mounted cellsite in a commercial area. The cellsite is located on Paul Matthews Road, Albany, Auckland. The sectors are oriented with one panel antenna facing approximately southeast, one facing southwest and another one facing approximately northwest.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Figure 4.

Figure 4 Meadowood cellsite layout showing measured power flux density (μW/cm^2)

Wellington – Tory Street Relocate

Survey time and date	4:15 pm 18/11/2013
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	3.6 μW/cm^2

Site description

The Tory Street Relocate cellsite is a three-sector roof-mounted cellsite in a residential/commercial area. The cellsite is located off Tory Street, Wellington. The sectors are oriented with one panel antenna facing approximately northeast, one facing south and another one facing approximately northwest.

Another telecommunications provider is co-located at 144 Tory Street.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Table 3 and Figure 5.

Table 3 Tory Street Relocate cellsite – power flux density at selected locations

Location	**Power flux density (μW/cm^2)**
Pedestrian entrance to 6/8 Hanning St	0.19
Pedestrian entrance to 12/14 Hanning St	0.62
Pedestrian entrance to 16 Hanning St	1.1
Pedestrian entrance to 18 Hanning St	2.3
Pedestrian entrance to 22 Hanning St	1.1
South side of Hanning St at Tory St	0.39
North side of Francis Place at Tory St	0.40
South side of Hanning St at Tory St	0.38

Figure 5 Tory Road Relocate cellsite layout showing measured power flux density (µW/cm^2)

Wellington – Newlands Road

Survey time and date	12:50 pm 22/11/2013
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	2.7 μW/cm^2

Site description

The Newlands Road cellsite is a three-sector, monopole-mounted cellsite in a residential area. The cellsite is located off Newlands Road, Wellington. The sectors are oriented with one panel antenna facing approximately northeast, one facing approximately southeast and another one facing approximately west.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Table 4 and Figure 6.

Table 4 Newlands Road cellsite – power flux density at selected locations

Location	**Power flux density (μW/cm^2)**
Driveway entrance to 105 Newlands Rd	0.48
Driveway entrance to 116A Newlands Rd	0.97
Driveway entrance to 114B Newlands Rd	1.2
Driveway entrance to 112B Newlands Rd	0.31
Driveway entrance to 108 Newlands Rd	0.33
Driveway entrance to 104 Newlands Rd	0.51
Driveway entrance to 94 Newlands Rd	0.14
Driveway entrance to 4 Wakely Rd	0.18

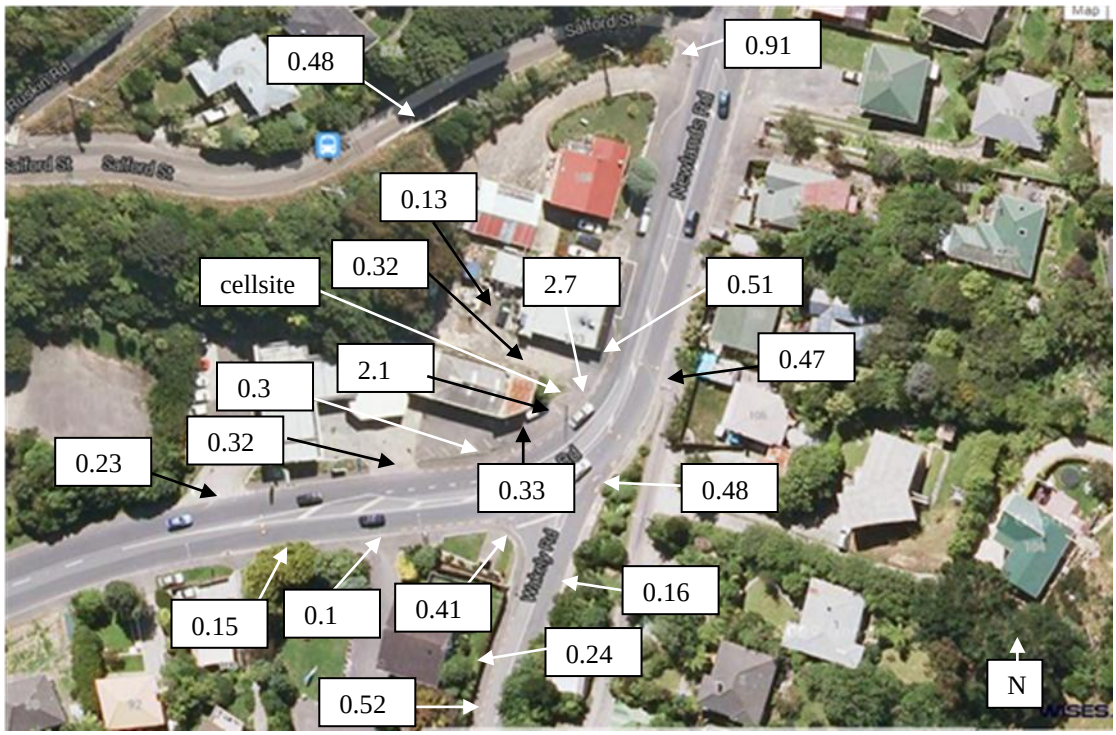

Figure 6 **Newlands Road cellsite layout showing measured power flux density (µW/cm^2)**

Whangaparaoa – Tindalls Bay

Survey time and date	12:15 pm 24/12/2013
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	7.7 μW/cm^2

Site description

The Tindalls Bay cellsite is a two-sector, monopole-mounted cellsite in a commercial area. The cellsite is located on Whangaparaoa Road, Whangaparaoa. The sectors are oriented with one panel antenna facing approximately northeast and another one facing approximately southwest.

One other telecommunications provider has a cellsite located to the east of the Tindalls Bay cellsite.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Figure 7.

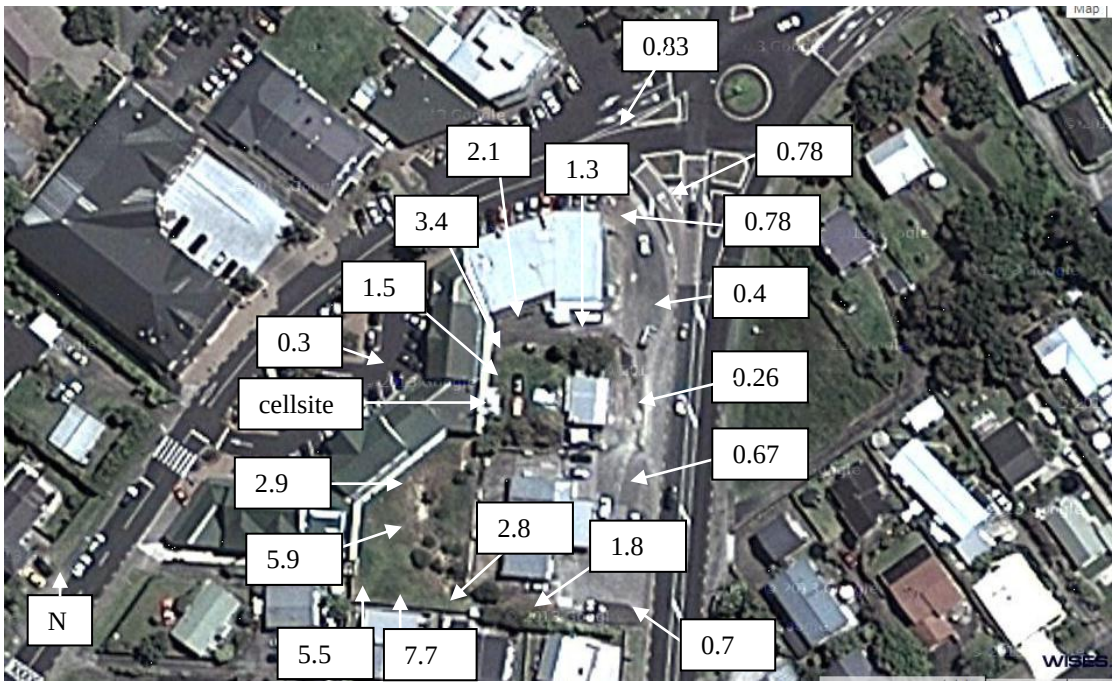

Figure 7 Tindalls Bay cellsite layout showing measured power flux density (μW/cm^2)

Motueka – Motueka Township

Survey time and date	5:30 pm 16/01/2014
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	1.2 μW/cm^2

Site description

The Motueka Township cellsite is a three-sector, tower-mounted cellsite in a residential area. The cellsite is located on Hickmott Place, Motueka. The sectors are oriented with two panel antenna facing approximately north, two facing approximately southeast and another two facing approximately southwest.

This site is a rural broadband initiative site with two other telecommunication providers using the tower.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Table 5 and Figure 8.

Table 5 Motueka Township cellsite – power flux density at selected locations

Location	**Power flux density (μW/cm^2)**
Driveway entrance 5 Hickmott Place	0.19
Driveway entrance 3 Hickmott Place	0.17
Hickmott driveway entrance 25 Tudor St	0.13
Driveway entrance 27 Tudor St	0.15
Driveway entrance 28 Tudor St	0.21
Driveway entrance 2a Taylor Av	0.18
Driveway entrance 4 Taylor Av	0.26
Driveway entrance 1 Avalon Ct	0.24
Driveway entrance 3 Avalon Ct	0.17
Driveway entrance 6 Avalon Ct	0.13
Driveway entrance 8 Avalon Ct	0.11

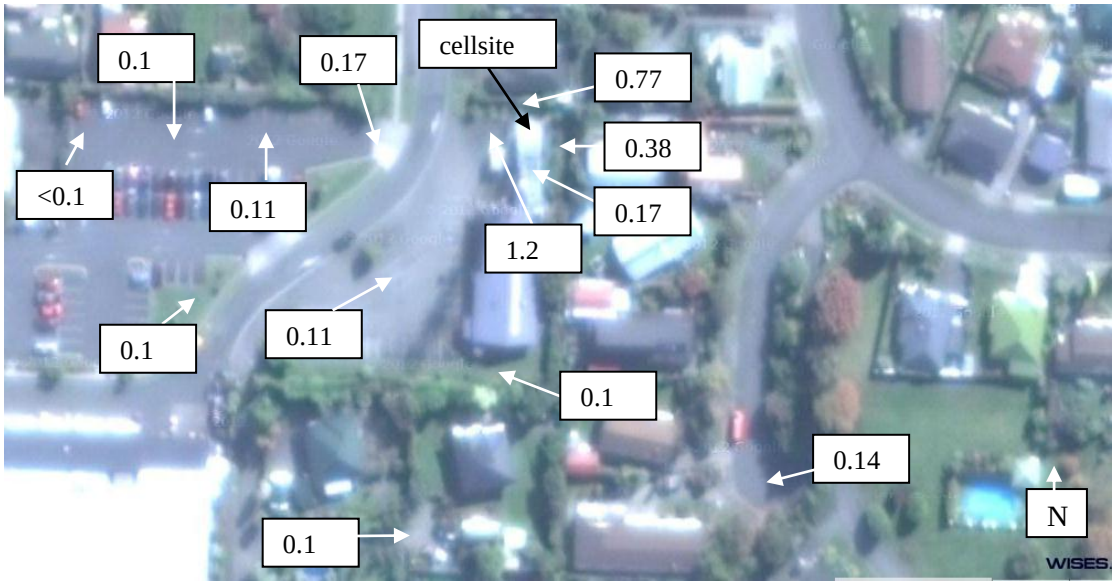

Figure 8 Motueka Township cellsite layout showing measured power flux density (µW/cm^2)

Blenheim – Woodbourne

Survey time and date	2:50 pm 17/01/2014
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	0.53 μW/cm^2

Site description

The Woodbourne cellsite is a three-sector, monopole-mounted cellsite at an airbase. The cellsite is located on Dix Street, Blenheim. The sectors are oriented with one panel antenna facing approximately northeast, one facing south and another one facing approximately northwest.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Figure 9.

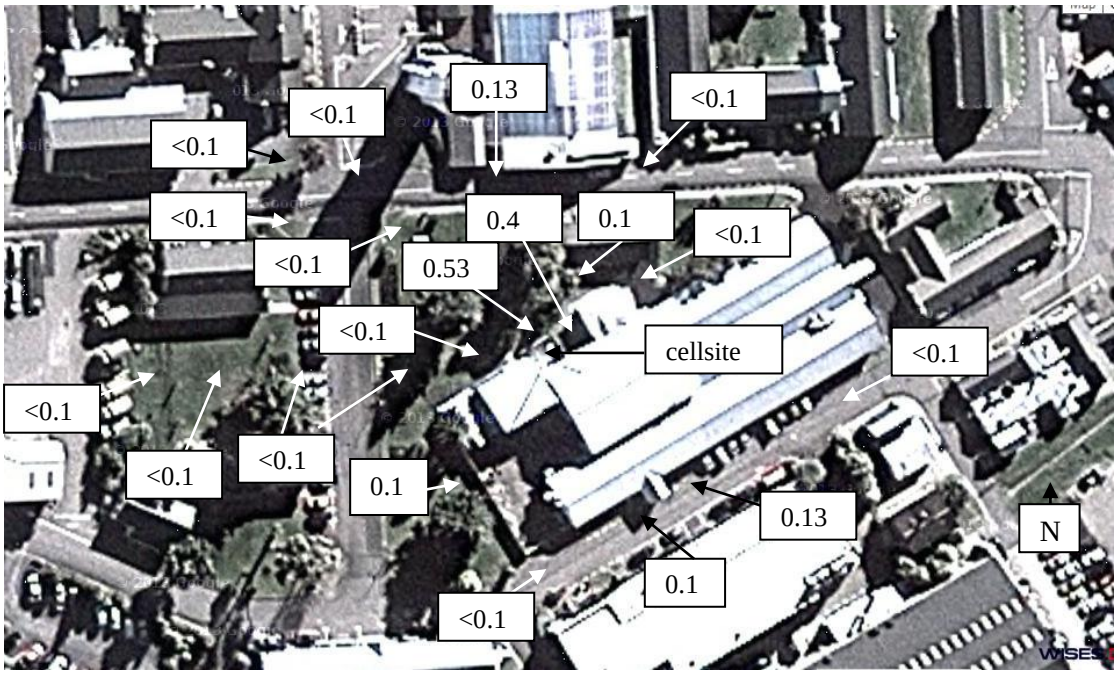

Figure 9 Woodbourne Avenue cellsite layout showing measured power flux density (μW/cm^2)

Auckland – Shackleton Road

Survey time and date	12:10 pm 03/02/2014
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	3.0 μW/cm^2

Site description

The Shackleton Road cellsite is a three-sector, roof-mounted cellsite in a residential area. The cellsite is located off Dominion Road, Mt Eden, Auckland. The sectors are oriented with two panel antennas facing approximately north, two facing southeast and another two facing approximately southwest.

Another telecommunications provider is co-located at 711 Dominion Road.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Table 6 and Figure 10.

Table 6 Shackleton Road cellsite – maximum power flux density at selected locations

Location	Power flux density (μW/cm^2)
Pedestrian entrance 771 Dominion Rd	0.22
Pedestrian entrance 767 Dominion Rd	0.26
Pedestrian entrance 745 Dominion Rd	0.47
Pedestrian entrance 731 Dominion Rd	0.75
Pedestrian entrance 836 Dominion Rd	3.0
Driveway entrance 144 Peary Rd	4.3
Southside of Peary Rd at Dominion Rd	2.1
Driveway entrance 842 Dominion Rd	0.55
Driveway entrance 846 Dominion Rd	0.46
Pedestrian entrance 854 Dominion Rd	1.4
North side of Shackleton Rd at Dominion Rd	2.9
South side of Shackleton Rd at Dominion Rd	2.6
Driveway entrance 791 Dominion Rd	3.0
South side of Calgary Rd at Dominion Rd	0.36
Driveway entrance 91 Calgary St	0.22
Driveway entrance 89 Calgary St	0.30
Driveway entrance 87 Calgary St	0.52
Driveway entrance 85 Calgary St	0.90
Driveway entrance 94 Calgary St	0.12

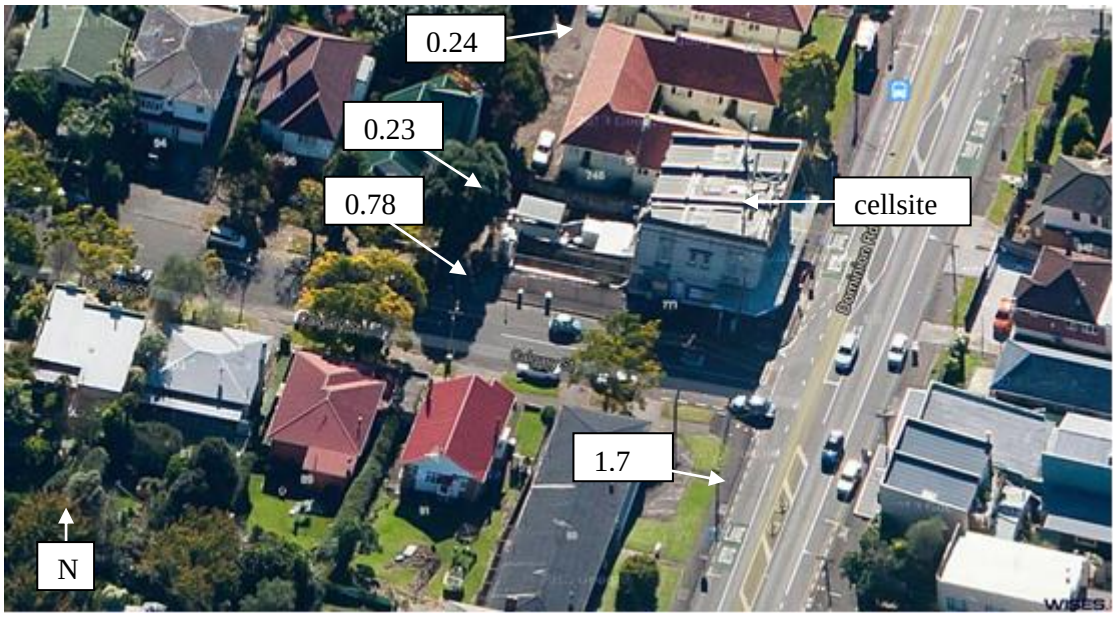

Figure 10 Shackleton Road cellsite layout showing measured power flux density ($\mu W/cm^2$)

Whangarei – Onerahi

Survey time and date	12:15 pm 20/02/2014
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	0.45 μW/cm^2

Site description

The Onerahi cellsite is a three-sector, monopole-mounted cellsite in a residential area. The cellsite is located on Onerahi Road, Whangarei. The sectors are oriented with one panel antenna facing approximately east, one facing south and another one facing approximately northwest.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Figure 11.

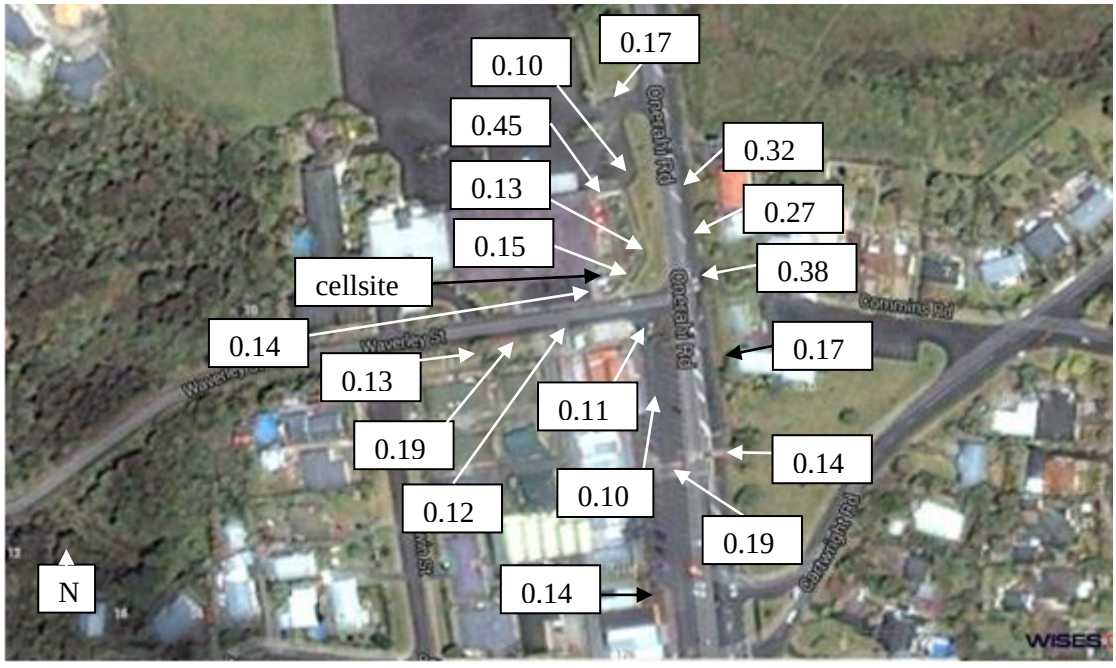

Figure 11 Onerahi cellsite layout showing measured power flux density (μW/cm^2)

Waikato – Puketaha

Survey time and date	3:45 pm 26/02/2014
Survey carried out by	Mark Dirksen
Meter used	Wandel and Goltermann EMR300 Type 8.2 probe
Maximum power flux density	0.31 μW/cm^2

Site description

The Puketaha cellsite is a three-sector, tower-mounted cellsite in a rural area. The cellsite is located off Puketaha Road, Waikato. The sectors are oriented with two panel antennas facing approximately northeast, two facing approximately southeast and another two facing approximately west.

This site is a rural broadband initiative site with two other telecommunication providers using the tower.

Measurement results

Measurements were made in the area surrounding the cellsite to determine maximum RF exposures in publicly accessible locations and are shown in Table 7 and Figure 12.

Table 7 Puketaha cellsite – maximum power flux density at selected locations

Location	**Power flux density (μW/cm^2)**
Directly in line with the west sector, 5 m from the mast	0.31
Directly in line with the west sector, 10 m from the mast	0.19
Directly in line with the northeast sector, 5 m from the mast	0.25
Directly in line with the northeast sector, 10 m from the mast	0.14
Directly in line with the northeast sector, 15 m from the mast	0.18
Directly in line with the northeast sector, 20m from the mast	0.20

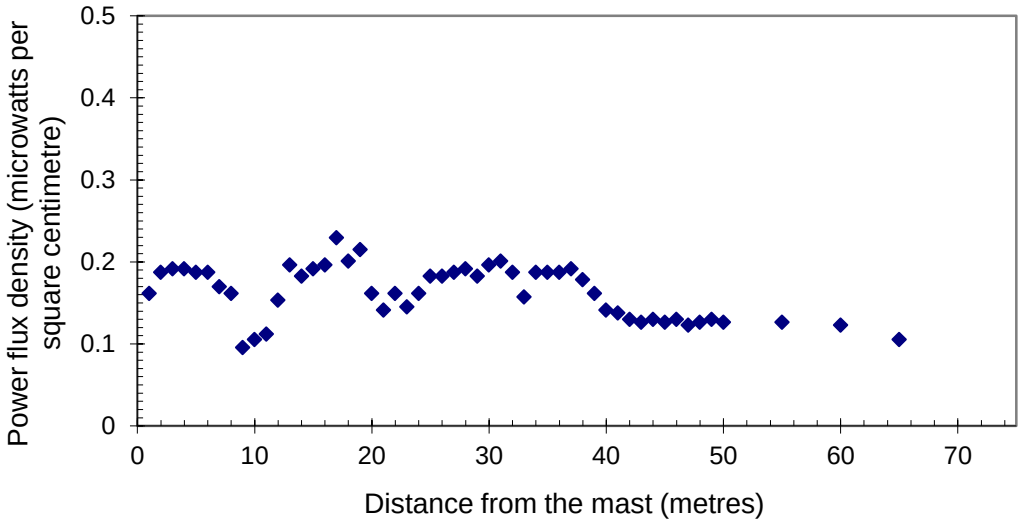

Figure 12 Puketaha cellsite showing measured power flux density as a function of distance (directly in line with the southeast sector)