

Spectrum Allocations for Broadband Wireless Access

A Discussion Paper

July 2006

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Introduction

Broadband Wireless Access (BWA) is increasingly being viewed as a viable alternative to wired and cellular broadband delivery. This paper considers recent developments in BWA technology and the current allocation of spectrum suitable for its deployment. It solicits the opinions of broadband wireless vendors, operators, suppliers, users and other stakeholders on the policies and processes by which such spectrum could in future be allocated.

Invitation for Submissions

Comments on the proposals contained in this paper and on any related issues, are invited from interested parties. Written submissions should be sent no later than **4 August 2006** to:

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Glossary

BWA	Broadband Wireless Access
CMAR	Customer Multi Access Radio
CPE	Customer Premises Equipment
DMB	Digital Multimedia Broadcasting
FCC	Federal Communications Commission (FCC)
FWA	Fixed Wireless Access
GUL	General User Licence
GURL	General User Radio Licence
HSDPA	High Speed Downlink Packet Access
ICT	Information and Communications Technology
IEEE	Institute of Electrical and Electronic Engineers (USA)
ISP	Internet Service Providers
ITU-R	International Telecommunications Union – Radiocommunications Sector
LMDS	Local Multi-point Distribution Services
MDS	Multi-point Distribution Systems
NGN	Next Generation Networks
NTIA	National Telecommunication Information Administration (USA)
PAN	Personal Area Network
OECD	Organisation for Economic Cooperation and Development.
POTS	Plain Old Telephone Service
PPDR	Public Protection and Disaster Relief
PROBE	Provincial Broadband Extension
PSTN	Public Switched Telephone Network
TDD	Time Division Duplex
UNII	Unlicensed National Information Infrastructure (USA)
UWB	Ultra Wide Band

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WG	ITU-R Working Group
WiBro	Wireless Broadband – a Korean equivalent of the WiMAX standard
WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network

Background

There is increasing recognition that broadband is a key enabler of economic growth and development. It is a key component of the Government's agenda of transforming New Zealand into a high-income, knowledge-based economy, through its Digital Strategy.¹

The Government's recent regulatory stock-take of the telecommunications sector indicated that New Zealand's broadband uptake is well below that of our OECD partners. A key characteristic of the best OECD countries in terms of broadband performance is the vigour of competition in their telecommunication markets, combined with regulatory regimes which pro-actively encourage competition.

Following the stock-take, the Government announced a package of measures for the telecommunications sector, in support of its economic transformation agenda. The package aims to:

- facilitate competition by improving access at the wholesale level to the fixed local-loop telecommunications network;
- encourage investment in alternative infrastructure (such as fibre, wireless and satellite networks);
- future-proof the regulatory environment to technology change and market dynamics; and
- continue the development and implementation of the Digital Strategy to encourage the smart use of information and communications technologies (ICT).

This paper discusses the second of these objectives, the encouragement of investment in alternative infrastructure, specifically, wireless infrastructure.

Broadband Wireless Access² (BWA) is largely used for the digital transmission of data with bandwidth capacity significantly greater than that required for telephony (e.g. internet applications). The convergence of data transmission, communications and broadcasting technologies, however, means that BWA services can compete with and, under favourable conditions, replace existing internet, telephony and broadcasting networks. This is particularly true of the 'last kilometre' from network to consumer, where the ratio of infrastructure cost to usage revenue is relatively high.

Delivery of broadband in New Zealand is predominantly through Telecom's national wired network, either by Telecom itself or by Internet Service Providers (ISPs) accessing the Telecom network. In Christchurch and Wellington, TelstraClear offers telephony, broadband and television services via its proprietary cable networks, but elsewhere, there are no such alternatives. There is, however, an increasing number of regional ISPs delivering broadband and, in some areas, voice-over-Internet protocol (VOIP), in addition to the cellular broadband offerings at 800, 900 MHz and

¹ For more details on the Digital Strategy, see http://www.digitalstrategy.govt.nz/templates/Page____214.aspx.

² For the purposes of this paper, *Broadband Wireless Access* is defined as any wireless broadband service, offering data bit-rates above 256kbps

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2.1 GHz bands. These services are deployed using, variously, 'public park' spectrum under the General User Licensing Regime, management rights in the 3.5 GHz and 2 GHz spectrum bands and local fibre networks.

Under the Digital Strategy, the Government launched Project PROBE to promote regional broadband via primary and secondary schools. Although successful, further initiatives are required to build upon what has, so far, been achieved in deploying broadband, including BWA, nationwide.

This paper invites industry and other stakeholders to make submissions on identified spectrum allocation opportunities for BWA in New Zealand. It seeks their views on the optimal use of each band and the mix of technologies that would achieve this; their interest in and intentions of deploying particular technologies for each band; and their views on various spectrum management arrangements proposed in this paper.

Current usage

Diagram 1 summarises the current spectrum allocations in New Zealand between 800 MHz and 6 GHz. As the diagram and the subsequent text show, there is comparatively little BWA deployment in these bands. This could partly be due to the lack of economical BWA technology and there being profitable or desirable alternative uses for these bands (examined below). It could also be related to the dispersed nature of the New Zealand market and high network infrastructure costs outside metropolitan areas.

Diagram 1: Spectrum Allocations below 6 GHz

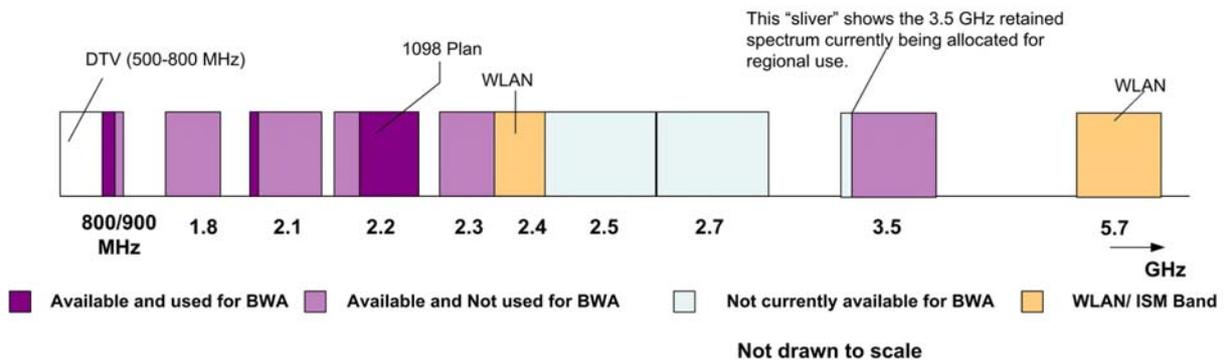


Table 1 summarises the uses for which potential ‘BWA spectrum’ has been employed. It will be noted that the bands most readily available for BWA deployment are the 2.3 GHz, 2.5 GHz and 5.4 GHz ranges. In some cases, in order to deploy BWA, incumbent users would need to be provided with alternative spectrum, to be able to continue the delivery of current services.

Although the frequency range below 6 GHz is currently favoured for BWA because of its better propagation characteristics, some wireless technologies are already using spectrum bands well above this range. This is made possible due to the availability of radio frequency bandwidth and greater economies of scale achieved with technological advancement. For example, some satellite technologies deliver broadband at 12 GHz, 18 GHz and 27 GHz and terrestrial LMDS (Local Multi Point Distribution Services) technology uses the 24 and 27 GHz bands. Commercial equipment used for fixed linking is already being produced for the 60 and 70 GHz bands and it is likely that these bands, as well as spectrum as high as 90 GHz will also be used for BWA in the future.

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Table 1: Current use of spectrum bands suitable for BWA services

Band	Predominant use	Technology standard currently in use	Manager (holdings)	Expiry of Rights	Notes
502-806 MHz	Analogue TV		CROWN Maori Television Services (MTS) ³	2010	After analogue switch-off, BWA use may become possible subject to other uses such as Digital Terrestrial TV (DTT) already established in the band
825-960 MHz	Cellular telephony	D-AMPS, CDMA2000 (Telecom) GSM900 (Vodafone)	Telecom (2x20 MHz) Vodafone (2x21 MHz)	2012 2012/2022	Currently used for cellular broadband by Telecom. Could be used for cellular broadband by Vodafone in the future.
1710 – 1785 MHz paired with 1805 – 1880 MHz 1785 – 1805 MHz TDD	Mainly fixed linking Some cellular telephony (Vodafone)	GSM1800, GPRS, (Vodafone) TDD (CallPlus)	Econet (2x10 MHz) Telecom (2x25 MHz) TelstraClear (2x25 MHz) Vodafone (2x15 MHz) CallPlus ⁴ (1x20 MHz)	2021	Could be used for cellular broadband in the future with the exception of the CallPlus TDD spectrum block.
1920 – 1980 MHz paired with 2110 – 2170 MHz	IMT-2000 Cellular	W-CDMA (Vodafone)	Telecom (2x15 MHz) TelstraClear (2x15 MHz) Vodafone (2x15 MHz) CROWN⁵ (2x15 MHz)	2021	Currently used for cellular broadband by Vodafone.
2010 – 2025 MHz TDD	Not used	None	CallPlus (5 MHz) Vodafone (5 MHz) TelstraClear (5 MHz)	2021	Could be used for cellular broadband in the future.

³ MTS hold the Management Right used for Maori Television channel

⁴ TDD (Time Division Duplex) unpaired spectrum block.

⁵ Reserved for Te Huarahi Tika Trust

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Band	Predominant use	Technology standard currently in use	Manager (holdings)	Expiry of Rights	Notes
2025 – 2110 MHz and 2200 – 2300 MHz (“1098 Plan” Band ⁶)	BWA	TD-CDMA (Woosh) Airspan Wireless DSL (BCL)	BCL ⁷ (28 MHz, 34.5 MHz) TelstraClear (28 MHz, 36.5 MHz) Woosh Wireless (2X29 MHz)	2021	BCL (Extend) and Woosh are operating ‘last mile’ broadband wireless services.
2300 - 2396 MHz	Not used	Allocated for MDS ⁸ .	BCL (1x 8MHz) Sky TV (1 x 8MHz) Telecom (8 x 8 MHz) Woosh Wireless (2 x 8 MHz)	2010 (will not be renewed)	Has not been used for MDS Identified as suitable for WiMAX; used for WiBro in Korea. Woosh Wireless recently made an announcement on swapping of MRs with Telecom to have access to contiguous spectrum blocks.
2400 – 2450 MHz	Wireless LAN	WiFi (802.11, 802.11b, 802.11g)	Managed by the Crown as a ‘public park’ under a General User Radio Licence (GURL ⁹)	N/A	Not identified as suitable for WiMAX. 802.11g equipment can support very high data rates.
2500 - 2690 MHz	TV outside broadcast	Proprietary in support of broadcasting applications	Managed by the Crown under radio licensing regime - spectrum rights not created	N/A	Licences issued under the Radio Licence Regime (RLR). Identified as suitable for IMT-2000 and WiMAX.

⁶ As per ITU-R Rec F.1098

⁷ Broadcast Communications Ltd

⁸ Multipoint Distribution Systems, a variety of terrestrial broadcasting that proved uneconomic for NZ deployment.

⁹ General User Radio Licence – a type of licensing giving all persons operating under the Licence equal access to the spectrum on a non-interference, no protection basis (akin to unlicensed or class licensed spectrum elsewhere in the world).

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Band	Predominant use	Technology standard currently in use	Manager (holdings)	Expiry of Rights	Notes
2700 - 2900 MHz	RADAR TV outside broadcast links	Proprietary in support of broadcasting applications	Managed by the Crown under radio licensing regime - spectrum rights not created	N/A	Licences issued under RLR. Broadcasting services are operating on a shared basis with RADAR in this band. Potential transition band for 2.5 GHz TV outside broadcast links. Identified as suitable for WiMAX in the future
3410 – 3487 MHz paired with 3510 – 3587 MHz	Allocated for broadband applications but largely unused (except for TelstraClear who uses it for telephony)	Proprietary pre-WiMAX standard	BCL (2x21 MHz) Compass ¹⁰ (2x7 MHz) Telecom (2x7 MHz) TelstraClear (2x21 MHz) Vodafone (2x7 MHz) CROWN (2x14 MHz)¹¹	2022	Initial rights auctioned in 2002. Suitable for WiMAX Two Crown-retained pairs to be allocated as area licences in 2006. TelstraClear currently uses this spectrum for telephony (not broadband) in a number of centres within NZ. BCL plans to use this spectrum to augment its Extend broadband offering.
5150 – 5350 MHz, and 5470 – 5825 MHz	Wireless Local Area Networks (WLANs) and Wireless Municipal Area Networks (WMAN)	IEEE 802.11a and 802.20	Managed as a 'public park' under a GURL	N/A	Identified as suitable for WiMAX. The quality of service of transmissions operating under a GURL cannot be guaranteed.
5875 - 5925 MHz	Sparsely used for Radiolocation	N/A	CROWN	N/A	Identified internationally as a Public Protection Disaster Relief (PPDR) band.

¹⁰ Trading as Wired Country Ltd

¹¹ Area licences are expected to be assigned by 2007.

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Band	Predominant use	Technology standard currently in use	Manager (holdings)	Expiry of Rights	Notes
10.500-10.680 GHz	Sparsely used for fixed linking	Proprietary	CROWN	N/A	Suitable for FWA, point-to-point backhaul linking.
24.549 – 25.392 GHz paired with 25.557- 26.400 GHz	Sparsely used for fixed linking	Proprietary	TelstraClear (2 x 339 MHz)* Vodafone (2 x 336 MHz) BCL (2 x 168 MHz)	2022	*2 fixed links Suitable for LMDS ¹² , and WiMAX in the future.
26.400 – 28.350 GHz	Broadband voice and data Satellite links	Proprietary Alcatel LMDS	TelstraClear (1950 MHz)	2018	LMDS is used for both voice and data services. Suitable for WiMAX in future.
57 - 66 GHz	Sparsely used for fixed linking	Proprietary for fixed linking	Managed under the Radio Licensing Regime – individual radio licences	N/A	Being considered for licensing under GURL, hence, may become available for short-range high-speed BWA in the long term.
71 - 76 GHz, 81 – 86 GHz, and 92 – 95 GHz	Unused	N/A	Managed under the Radio Licensing Regime – individual radio licences	N/A	Being considered for licensing as a Managed Park (discussed later).

¹²

Local Multi Point Distribution Services *ibid.*

Technology drivers

The frequency range 800 MHz to 6 GHz represents a large proportion of the radio spectrum in common usage today, and the density of services in this frequency range exceeds that of all other radio frequency ranges combined. The reasons for such a high service density can be attributed to:

- the maturity of the technologies deployed in these bands;
- the available bandwidth, determined by the physical laws that govern radio wave propagation and available bandwidth (or data capacity);
- the availability of compatible equipment (CPE¹³);
- infrastructure costs; and
- the availability of spectrum.

Heuristically, the frequency range can be divided into:

- a lower-range frequency band (up to 2 GHz) more suitable for wide area coverage and mobile applications but the bandwidth is limited;
- a mid-range frequency band (2-3 GHz) representing a good compromise between coverage, mobility and available bandwidth; and
- a high-range frequency band (3–6GHz) providing greater bandwidth, at the expense of mobility and coverage.

The use of the lower-range is popular in areas of low-population density and/or rugged terrain. The mid-range is popular in urban areas, where the population is likely to be mobile (travelling at speeds 4–100 km/h) and of a relatively high density. The upper range is popular in localised “hot-spots” for nomadic applications such as Wireless Local Area Networks (WLANs), where high bandwidth is required.

Today’s level of technological development lends the use of bands above 6GHz to fixed service links, however, the 6 GHz limit is continually being revised upwards in light of technological advances.

Fixed Wireless Access (FWA)

Fixed Wireless Access refers to technologies that utilise Fixed Service radio links to provide access to wired telecommunications infrastructure and networks¹⁴ (such as the POTS, PSTN, Internet or NGN).

A number of NZ service providers use wireless as a means of delivering telephony, sometimes with limited data services, over the ‘last kilometre’.

¹³ CPE- Customer Premises Equipment such as receiver handsets, modems etc.

¹⁴ Such infrastructure or networks include but are not limited to the Plain Old Telephone Service (POTS), the Public Switched Telephone Network (PSTN), the Internet, and Next Generation Networks (NGN)

Telecom, for example, uses point-to-multipoint wireless links for its rural telephony network (CMAR), using legacy equipment at 1.4 GHz. Telecom and Broadcast Communications Ltd (BCL) have been collaborating recently on last-kilometre wireless service delivery to rural communities over BCL's 2.2 GHz *Extend* network.

TelstraClear provided a number of point-to-point wireless networks for customers, using proprietary microwave solutions at 3.5 GHz, and LMDS at 27 GHz.

Woosh Wireless provides limited broadband data services to some areas, using licensed spectrum around 2.2 GHz (1098 Band Plan).

- 1a Do you have an interest in deploying voice and/or data services using FWA technology?
- 1b If so, what technologies and standards would you consider and why?
- 1c Which bands do you consider to be the most suitable for this purpose and why?
- 1d In which markets or regions would you consider deploying FWA and why?
- 1e What is your timeframe for deploying FWA and why?

WLANs (WiFi)

Wireless Local Area Networks (WLANs) currently deployed are commonly configured to the IEEE 802.11 (or WiFi) technical standards. WLANs have been deployed in the 2.4 and 5.8 GHz bands in New Zealand under the General User Radio Licensing (GURL) regime. Telecom, CityLink and Reach Wireless are the key providers of WiFi-based WLAN services. Additionally, there are a significant number of private WiFi based networks in the home and office environments as well as providing wireless internet access at cafes, hotels and airports.

The World Radio Conference 2003 allocated the band 5.470 – 5.725 GHz to the Mobile service in accordance with ITU-R Resolution 229 which in-turn provide a framework for WLANs to co-exist with incumbent RADAR applications. In the USA, as market leader, provisions enabling WLAN/RADAR co-existence are close to completion. New Zealand will analyse the US provisions once they are finalised, with the view of implementing appropriate licensing arrangements if feasible.

WiFi offers relatively high data speeds (11 Mbps for 802.11b and 54 Mbps for 802.11a, and g) but with limited coverage. There is strong interest world-wide (particularly in the USA, where spectrum usage and demand is high) in standards that offer higher bit-rates with comparable bandwidths (IEEE 802.11n for example).

WiMAX

Based on the WiMAX interoperability standard, equipment is being developed worldwide that shows significant promise for the delivery of BWA services in competition with traditional wired services (e.g., ADSL) and such mobile services as IMT-2000 (sometimes referred to as 3G mobile services). It is similar to WiFi but offers enhanced range, speed and greater mobility.

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Early trials in Sweden¹⁵ indicate that, with sufficient bandwidth, WiMAX-based equipment is capable of delivering data, voice and video streaming ('triple play').

There are both 'fixed' and 'nomadic' versions of WiMax¹⁶. Spectrum bands currently identified as suitable for WIMAX are:

- 2.3 GHz (2.3 – 2.4 GHz) – Licensed NZ MDS band;
- 2.5 GHz (2.5 -2.69 GHz) – Licensed Global IMT-2000 expansion band; and
- 3.5 GHz (3.4 -3.6 GHz) – Licensed FWA/WLL band;
- 5.8 GHz (5.725 -5.850 GHz) – Public Park spectrum (Unlicensed upper UNII/ISM bands in the USA)

Certified WiMAX-based equipment is already available for use in the 3.5 GHz band. WiMAX certified equipment operating at 2.3 GHz is expected to become available in early 2007 (equipment manufactured to a Korean pre-WiMax mobile standard, WiBro, is already available in this band).

In jurisdictions with widespread cable networks, fixed WiMax is seen as a solution for wireless hot spots, rural consumers beyond the reach of viable copper pairs, cellular backhaul, and for economic 'last kilometre' wireless access extension from wire and fibre network trunks. With NZ's limited cable capacity, fixed WiMax may also offer a viable wireless local loop operating from cell-sites in suburban areas.

As WiMAX is a global interoperability standard, large scale production of equipment, similar to that for WiFi, can be expected, with economies of scale realised in the next few years.

- 2a Do you have an interest in deploying WLANs and/or WiMAX?
- 2b If so, what technologies and standards would you consider and why?
- 2c Which bands do you consider to be the most suitable for this purpose and why?
- 2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?
- 2e What is your timeframe for deploying WLANs and/or WiMAX and why?

Satellite

While satellite's relative expense (especially for uplink capacity) makes it uncompetitive for most customers with a terrestrial alternative, it is likely to remain a niche access technology with a long anticipated life. It provides a competitive alternative wireless access solution for remote localities, and is able to provide nationwide coverage from a single location.

¹⁵ <http://www.eetimes.com/news/latest/showArticle.jhtml?articleID=187003263>.

¹⁶ The two different types of WiMax are IEEE 802.16.2004 and IEEE802.16e, often referred to, respectively, as 'fixed WiMax' and 'nomadic WiMax'. The 'nomadic', or mobile, version is yet to be fully developed, and its cost structure is not yet clear.

Thailand's Shin Satellite Company provides satellite access to New Zealand using its iPSTAR broadband satellite programme. Services include broadband internet access at speeds up to 11 Mbps downlink, at 27 GHz, and 4 Mbps uplink, at 18 GHz. Most other satellite reception, especially for TV, is in the 3.7- 4.2 GHz and 12.5 -12.75 GHz bands.

- 3a Do you have an interest in deploying satellite broadband services?
- 3b If so, what technologies and standards would you consider and why?
- 3c Which bands do you consider to be the most suitable for this purpose and why?
- 3d In which markets or regions would you consider deploying satellite broadband services and why?
- 3e What is your timeframe for deploying satellite broadband services and why?

Cellular

A number of cellular technologies are deployed in networks around the world today. The first used analogue technology (1G, or first generation, systems) but these have generally been superseded by digital (2G) systems.

There are two primary digital cellular standards, GSM and CDMAOne (also known as IS95a). Both were developed in the early 1990s, with later upgrades providing better quality service and improved data access, commonly referred to as 2.5G

The latest digital systems in deployment are standardised internationally as IMT-2000 and commonly referred to as 3G technologies. The two main variants are Wideband CDMA (W-CDMA) and CDMA2000. These standards extend data rates from the few tens of kilobits-per-second (kbps) available in 2.5G systems to up to 2 megabits-per-second (Mbps).

Telecom occupies the 800MHz spectrum with its IMT-2000 compliant T3G Broadband Cellular offering using the CDMA2000 EVDO standard.

Vodafone uses the 900 MHz and 1800MHz bands to deliver 2G and 2.5G cellular, and the 2.1 GHz band to deliver an IMT-2000 compliant 3G cellular broadband offering based on the W-CDMA standard.

Developments in 3G cellular technologies may address the needs of broadband users who value mobility as part of a converged package of services, although it is not yet clear if such packages will compete effectively on price.

The OECD notes that *HSDPA¹⁷ (the next technology upgrade in WCDMA) should be able to deliver 10 Mbps in a 5 MHz channel, which will be shared among users in the cell, while the total data speed available on a CDMA20001x EVDO network cell is roughly 3.1 Mbps in 1.25 MHz of spectrum.*

¹⁷ High Speed Downlink Packet Access

ITU-R Working Party 8F is currently standardizing the spectrum requirements and technology standards for the evolution of IMT-2000 and systems beyond IMT-2000, referred to as IMT-Advanced (and sometimes as 4G). The goal of this process is to provide for 100 Mbps mobile applications and 1Gbps nomadic applications. The timeframe for IMT-Advanced deployment is expected to be in the 2010 – 2020 timeframe.

NTT DoCoMo, Japan's largest mobile carrier, has been promoting a new standard called *super-3G* that could provide a lower-cost upgrade to existing W-CDMA networks, targeting 2007-2010 as the timeframe for potential roll-outs. The goal is to offer 100 Mbps downstream and 50 Mbps upstream capability. The OECD notes, however, that deployment of this technology outside Japan is likely to be many years away.

- 4a Do you have an interest in deploying cellular broadband services?
- 4b Which bands do you consider to be the most suitable for this purpose and why?
- 4c If so, what technologies and standards would you consider and why?
- 4d In which markets or regions would you consider deploying cellular broadband and why?
- 4e What is your timeframe for deploying cellular broadband and why?

Digital Broadcasting

With the convergence of telecom and broadcast media and content services, digital TV operators could become viable providers of BWA especially in downlink direction in the future, offering 'triple play' (voice, data, video) packages. In some overseas jurisdictions (for example, Korea) this is already a reality, based on such digital multimedia standards as DMB (Digital Multimedia Broadcasting).

Analogue TV services currently operate in the 502 - 806 MHz band in New Zealand. Planning is currently underway to enable the introduction of digital TV services. The Government has agreed to consult with the industry in developing criteria and a process for analogue switch off (ASO).. The Cost Benefit Analysis carried out for Digital Terrestrial Television (DTT) recognizes that a significant amount of this band could be available for other uses after ASO. Internationally, this is referred to as the "Digital Dividend". BWA could be a contender for use of the vacated spectrum, along with DTT, after analogue switch-off.

A number of new technologies such as *Cognitive Radio* e.g. using the IEEE 802.22 standard, could assist BWA deployment by allowing services to share radio-frequency bands, by dynamically and efficiently utilising unused or vacated spectrum. With the use of such new technologies, it may be possible to use UHF TV band for BWA even prior to analogue switch-off.

- 5a Do you have an interest in deploying digital broadcast or convergent services?
- 5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?

- 5c Which bands do you consider to be the most suitable for this purpose and why?
- 5d In which markets or regions would you consider deploying digital broadcast services and why?
- 5e What is your timeframe for deploying digital broadcast services and why?

Spectrum Allocation Options

New wireless broadband access technologies such as WiMAX provide additional opportunities for the competitive delivery of broadband services and can already be deployed in some existing spectrum allocations. The following allocation options can be considered for greater access to new spectrum bands for BWA.

Management rights

Spectrum management rights are analogous to property rights. A right-holder occupies the same position as a sole lessee, with exclusive use of the property for any lawful purpose, the ability to divide and amalgamate adjacent rights, the ability to sub-let (issue spectrum licences) and, for rightholders and licence-holders, the option of selling the right or licence to a third party.

With respect to commercial spectrum in the management rights regime, government policy is for it to be allocated competitively and in a technologically neutral manner: i.e., to be offered at auction or tender, with a reserve price approximating its minimum market value, usually without specifying use or technology conditions. Hence, any bands reallocated for BWA deployment would normally be offered at auction as management rights of appropriate bandwidth, for national BWA deployment.

Conditions may be imposed on the sale of rights, if Government policy requires it, to address the impact of limited competition. The two most common conditions are the *spectrum cap* and *mandatory deployment of services*.

Area spectrum licences

The Ministry is concerned that, while contiguous spectrum lots (or allocations) may be optimally configured for national service providers, these lots may not meet the needs of sub-national providers, who generally require less bandwidth and more limited coverage. Allocation options here include, among others, *area spectrum licences*.

Area spectrum licences are being assigned in the 3.5 GHz Crown-reserved bands, to intending local wireless service providers. The issue of a single area spectrum licence to cover all sites within the intended network is an attractive alternative to site-specific spectrum licensing. Its affect would be to assign the operator exclusive use of the relevant frequency in that area only.

In the recent 3.5 GHz Crown-reserved spectrum tender, for example, bidders were limited to licences in no more than ten contiguous areas initially, to encourage the

deployment of local services and to preclude 'cherry picking' of the most valuable lots.

Public Parks

Local and regional broadband wireless access services generally operate in 'public park' spectrum in the 2.4 GHz and 5.8 GHz bands.

A 'public park' is analogous to common land, with complete freedom of entry balanced by a requirement that users do not interfere with the activities of other licensees. In New Zealand, limits and conditions of use are defined by a General User Licence (GUL). A common condition of use is operation on a non-interference basis which means that a (General User Radio Licence) GURL licensee shall not cause interference to, nor claim protection from, other licensed services. As a result, issues of interference are normally resolved between users, as a matter of common interest.

'Public parks' can be used for a variety of other purposes including, for example, security detectors, cordless phones, radio-controlled devices, medical monitors and RFID labels. It is possible that, at a local level, this may continue to be a satisfactory environment for some broadband service providers.

Managed Parks

The Ministry has also been considering combining the advantages of the 'public park' with features of the spectrum licence, by establishing 'Managed Parks'. If 'public park' spectrum is analogous to common land, then the Managed Park is akin to a publicly-owned sports ground, in that there is a gate-keeper, consent is required to gain admission and users can engage only in the activities for which the facility is provided.

A Managed Park for wireless broadband offering sufficient bandwidth for local services to develop in adjacent areas might be accessible only to legitimate service providers. New entrants would be accommodated, but with a requirement that they deploy a minimum level of service within a specified period. Entry could be restricted to an optimal number, to limit interference and maintain service quality. An administrative fee would cover the Ministry's management activities.

It is also possible that, in a Managed Park primarily intended for BWA deployment, other services could co-exist: for example, 'last kilometre' delivery of wired voice and data networks.

The potential benefits of Managed Parks include:

- more efficient use of spectrum through greater sharing of the resource;
- the development of new technologies and services (particularly broadband);
- local as well as national deployment of technologies and services;
- increased competition and reduced barriers to market entry;
- greater flexibility through self-management;
- increased opportunities for entrepreneurs to access spectrum to introduce innovative wireless products.

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The following table illustrates the continuum of features for different allocation techniques and shows where a Managed Park would fit:

Feature	Radio Licence Regime	Managed Park (NEW)	General User Licence or Public Park	Management Right Regime
Technology restrictions	Technology specific	Minimal technology restrictions	Few technology restrictions	No technology restrictions
Licensing	Individual radio licence	Organisation access licence	General User licences (no individual licences)	Management Right and spectrum licences
Exclusivity	Exclusive use of frequency	Non exclusive, but limited access	Non exclusive	Exclusive use of band
Fees/Rents	Annual fee	Possible administrative access fee with or without a resource charge	No fee	Market price to purchase rights for fixed period, plus annual fees for spectrum licences
Coordination to manage interference	Licences are coordinated by the Crown	Each user required to coordinate with others to minimise interference	No coordination	Right-holder responsible for coordination
Termination	Licence can be terminated at any time.	Authority can be revoked for not meeting outcomes (e.g., 'use it or lose it')	Cannot lose right to enter the band	Non revocable for the period of the Management Right

Note that any proposal to implement Managed Parks will be accompanied by an industry consultation process, which would be the subject of another discussion paper.

6a	Should spectrum for future BWA deployment, be reserved as a Managed Park? Why or why not?
6b	Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?
6c	How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?

Allocation opportunities

A number of spectrum bands were examined, as detailed in Appendix 1, and the bands 2.3 GHz, 2.5 GHz, 5.4 GHz and bands above 60 GHz appear to have the most potential at the present time for additional BWA allocations.

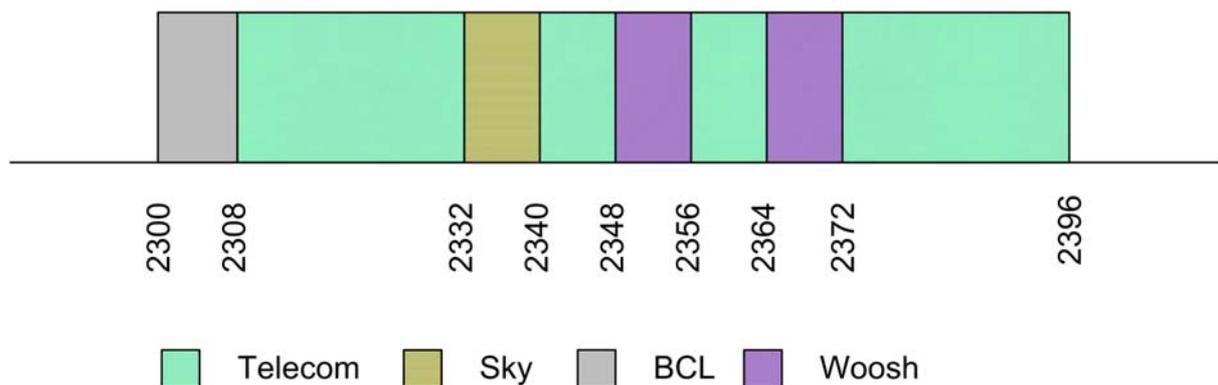
In determining the likely bands suitable for additional BWA allocations, the Ministry has considered:

- whether the spectrum is generally available and when it is likely to be available;
- where spectrum is currently used, the effects of relocating the existing users;
- whether suitable equipment is available; and
- when the spectrum could be made available for BWA operation.

2.3 GHz

Twelve lots in the 2.3 GHz band, each of 8 MHz bandwidth, were sold as management rights in 1990 for the deployment of Multipoint Distribution Systems (MDS), a networked television technology. Eight lots were purchased by Telecom, two by Woosh Wireless and one each by Broadcast Communications Ltd (BCL) and Sky TV Ltd.

Diagram 2: 2.3 GHz Spectrum Holdings



- None of these rights has been utilised. MDS proved to be too expensive to deploy and the rights are not appropriately configured for other uses.
- Commercial WiMAX (including mobile WiMAX) equipment for use in this band is expected to start becoming available in late 2006 or early 2007, but the band is not optimally configured for WiMAX.

Current policy

The rights expire in 2010 and Cabinet has determined that renewal of rights will not be offered to incumbents, as:

- there are no spectrum licences within these rights;

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- there has been no significant use; and
- new technologies (e.g., WiMAX) that can use this spectrum have channel plans (5, 10 MHz) not matching the bandwidth (8 MHz) of the current channel plan.

With WiMAX-based equipment likely to become available in 2006/2007 and the proximity of the expiry date, this band is a prime candidate for repackaging and reallocating to intending wireless broadband providers. The Ministry is proposing to repackage the band for national and local WiMAX-based BWA deployment.

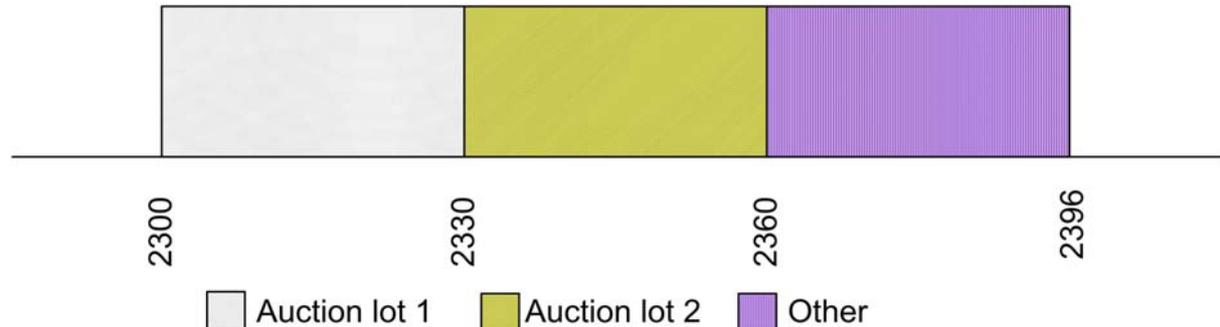
Allocation opportunities

In the 2.3 GHz spectrum, WiMAX is currently standardised for deployment in 5 or 10 MHz channels. With the currently available information on technology, the Ministry considers that exclusive access to three 10 MHz channels would be sufficient, to efficiently operate a national network using the 2.3 GHz spectrum. The Ministry is therefore, considering re-packaging the 2.3 GHz band into three lots of ± 30 MHz.

A considerable number of smaller broadband providers may be interested in spectrum at a local and regional level, however. To provide these more modest enterprises with access to the 2.3 GHz band, the Ministry is considering reserving one lot at the high end of the band for an alternative allocation

The resulting configuration of the band is shown in Diagram 3.

Diagram 3: 2.3 GHz Spectrum Lots



Lots 1 and 2 – 30 MHz lots could be offered at auction as twenty-year management rights for national wireless broadband deployment.

Lot 3 - 36 MHz block be offered as an alternative allocation option such as a Managed Park with access available to local and regional wireless broadband providers, and other users to be negotiated with the Ministry.

- | | |
|----|--|
| 7a | Do you have an interest in using the 2.3 GHz band? |
| 7b | Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band? |
| 7c | What do you consider to be the optimum use for this band? |
| 7d | Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; Area Licences or a combination thereof? |

2.5 GHz

The 2.5 GHz band is currently used for TV outside broadcast links, operating under radio licences issued by the Crown. Access to the spectrum is on a user co-ordinated basis limited to services in support of Television Broadcasting. On occasion it has been used to trial new technologies (e.g. TDD-CDMA) on a secondary basis to TV outside broadcast operations. It has been identified as being suitable in the future for WiMAX-based BWA deployment, IMT-2000 expansion, and recently is being suggested as a potential candidate band for IMT-Advanced. Mobile (nomadic) WiMAX-based equipment is currently being developed for this band.

The band is well utilised during events requiring TV broadcast coverage and discussions with licence-holders to clear the band would be required, however, in anticipation of IMT-2000 expansion a replacement band (2.7 – 2.9 GHz) has already been allocated for TVOB purposes.

Current policy

The Ministry is exploring options for the future allocation of this band.

Allocation opportunities

The band is suitable for use as an IMT-2000 extension band, for WiMAX operation and potentially for IMT-Advanced deployment or a combination of these applications.

- 8a Do you have an interest in using the 2.5 GHz band?
- 8b What do you consider to be the optimum packaging for this band?
- 8c What do you consider to be the optimum use for this band?
- 8d Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?

5.4 GHz

The 5.470 -5.725 GHz band was allocated to the Mobile Service at the World Radio Conference 2003. Moreover, access to the band must be achieved in accordance with ITU-R Resolution 229. Resolution 229 provides the framework for sharing the band in question for mobile WLAN use with incumbent stations in the Radiolocation service.

In 2004 and 2005, the technical work required to satisfy the Res. 229 framework was led by the US National Telecommunication and Information Agency (NTIA) for rulemaking and adoption by the US Federal Communications Commission (FCC), and this work is approaching completion.

In order to protect the operation of incumbent meteorological RADAR in New Zealand the Ministry of Economic Development is expected to adopt the FCC rules

pertaining to the 5.47 – 5.725 GHz band once published by the FCC (anticipated to be by third quarter 2006).

Current policy

Current policy is to use the radio licensing regime to provide access to the 5.47 – 5.725 GHz for Radiolocation and Radionavigation services.

Allocation Opportunities

It is expected that access to the 5.47 – 5.725 GHz band for WLAN use will be achieved in the third quarter of 2006 under a GURL with appropriate provisions to protect existing and future licensed meteorological RADAR.

- 9a Do you have an interest in using the 5.4 GHz band?
- 9b What do you consider to be the optimum use for this band?
- 9c Which form of management would you consider to be optimal for this band; radio licensing, public parks or Managed Parks?

60 GHz

The 57 – 66 GHz band is currently allocated (*inter alia*) to the Mobile and Fixed service in New Zealand, and band access is achieved via individual licences under the radio licensing regime. In New Zealand the band is used for short-range broadband linking around the Wellington CBD. Radio transmissions in this band are attenuated by the absorption of energy by the molecular bonds between oxygen atoms. Presently, equipment is being manufactured for use in this band, to provide for wireless extension of fibre optic and cable networks.

In Australia and the USA, access to the band is available using the equivalent to a GURL (i.e. a class licence, and FCC Part 15 rules respectively). In Europe and the United Kingdom access to the lower part of the band is unlicensed and the upper half of the band is via a “light licensing”¹⁸ regime in accordance with ECC/REC (05)02.

Some demand to use the 60 GHz band for short range broadband access has been demonstrated in New Zealand.

Current policy

Current policy is to provide access to the band for fixed point-to-point links via the Radio Licensing Regime

Allocation opportunities

The Ministry is currently planning for the potential introduction of a GURL to enable easier access to the bands for short range broadband (greater than 1Gbps) services.

- 10a Do you have an interest in using the 60 GHz band?

¹⁸ A “light licensing” regime can be considered as similar in concept to a Managed Spectrum Park.

10b What do you consider to be the optimum use for this band?

10c Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?

70, 80 & 90 GHz

The bands 71 – 76, 81 – 86 and 92 – 95 GHz have a global primary allocation to the Fixed Service. These bands have similar propagation characteristics to that experienced at 60 GHz except the oxygen bond absorption characteristic. As a result they have a greater range and some degree of technical co-ordination may be desirable.

In the US, the FCC has made all 3 bands available for fixed services under a “light licensing”¹⁹ regime. It is noted that the original FCC ruling did not require co-ordination prior to registration but a submission from industry resulted in such a provision being introduced.

OfCom, the spectrum regulator of UK is considering a “light licensing” regime for these bands²⁰. In Europe an ECC Recommendation (05)07 has been issued which provides band plans for the Fixed Service in the bands 71 – 76 and 81 – 86 GHz bands. It is noted that the introduction to this Recommendation states that a feature of operating in this band is the “Possibility of multiple channel frequency re-use, thanks to the unique propagation conditions, highly directional pencil-sized beams; this will also enable implementation of multiple services and applications without interference concerns, obviating the need for coordination”.

By providing the industry with the choice of an “unlicensed” band at 60 GHz and light licensed bands at 70, 80 and 90 GHz the FCC have stimulated the market for a number of differing applications. However just how these bands will be used in the market place is still uncertain because of the evolving state of the technology.

Current policy

The Ministry has not mandated any channel plans or licensing policies for the 70, 80, and 90 GHz bands as a demand to utilise these bands has not been demonstrated in the past.

Allocation opportunities

Recently, some demand to use the 60, and 70 – 90 GHz bands has been demonstrated and the Ministry is considering the most appropriate method of enabling access to each of these bands. Current thinking is to follow the US and European lead to enable GURL access to some parts of the band (60 GHz) and to

¹⁹ Wireless Telecommunications Bureau Announces Permanent Process For Registering Links In The 71-76 GHz, 81-86 GHz, And 92-95 GHz Bands
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-311A1.pdf

²⁰ <http://www.ofcom.org.uk/consult/condocs/71-86ghz/>

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use a form of Managed Spectrum Park to enable access to the 70 – 90 GHz bands. It is anticipated that the allocation of the 70 – 90 GHz bands will form the basis of another discussion paper aimed at delivering pilot experience in the operation of Managed Spectrum Parks.

- 11a Do you have an interest in using the 70, 80 and 90 GHz bands?
- 11b What do you consider to be the optimum use for these bands?
- 11c Which form of management would you consider to be optimal for these bands: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?

Other bands not considered in this paper

- 12a Are there any other bands that you consider to be future candidates for BWA?
- 12b If so, which ones, why and when?
- 12c How do you think they should be allocated, taking into account current allocations and usage?

Summary of questions

- | | |
|----------|--|
| 1 | 1a Do you have an interest in deploying voice and/or data services using FWA technology? |
| | 1b If so, what technologies and standards would you consider and why? |
| | 1c Which bands do you consider to be the most suitable for this purpose and why? |
| | 1d In which markets or regions would you consider deploying FWA and why? |
| | 1e What is your timeframe for deploying FWA and why? |
- | | |
|----------|---|
| 2 | 2a Do you have an interest in deploying WLANs and/or WiMAX? |
| | 2b If so, what technologies and standards would you consider and why? |
| | 2c Which bands do you consider to be the most suitable for this purpose and why? |
| | 2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why? |
| | 2e What is your timeframe for deploying WLANs and/or WiMAX and why? |
- | | |
|----------|---|
| 3 | 3a Do you have an interest in deploying satellite broadband services? |
| | 3b If so, what technologies and standards would you consider and why? |
| | 3c Which bands do you consider to be the most suitable for this purpose and why? |
| | 3d In which markets or regions would you consider deploying satellite broadband services and why? |
| | 3e What is your timeframe for deploying satellite broadband services and why? |
- | | |
|----------|---|
| 4 | 4a Do you have an interest in deploying cellular broadband services? |
| | 4b Which bands do you consider to be the most suitable for this purpose and why? |
| | 4c If so, what technologies and standards would you consider and why? |
| | 4d In which markets or regions would you consider deploying cellular broadband and why? |
| | 4e What is your timeframe for deploying cellular broadband and why? |
- | | |
|----------|--|
| 5 | 5a Do you have an interest in deploying digital broadcast or convergent services? |
| | 5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why? |
| | 5c Which bands do you consider to be the most suitable for this purpose |

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- and why?
- 5d In which markets or regions would you consider deploying digital broadcast services and why?
- 5e What is your timeframe for deploying digital broadcast services and why?
-
- 6**
- 6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?
- 6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?
- 6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?
-
- 7**
- 7a Do you have an interest in using the 2.3 GHz band?
- 7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?
- 7c What do you consider to be the optimum use for this band?
-
- 8**
- 8a Do you have an interest in using the 2.5 GHz band?
- 8b What do you consider to be the optimum packaging for this band?
- 8c What do you consider to be the optimum use for this band?
- 8d Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?
-
- 9**
- 9a Do you have an interest in using the 5.4 GHz band?
- 9b What do you consider to be the optimum use for this band?
- 9c Which form of management would you consider to be optimal for this band: radio licensing, public parks or Managed Parks?
-
- 10**
- 10a Do you have an interest in using the 60 GHz band?
- 10b What do you consider to be the optimum use for this band?
- 10c Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?
-
- 11**
- 11a Do you have an interest in using the 70, 80 and 90 GHz bands?
- 11b What do you consider to be the optimum use for these bands?
- 11c Which form of management would you consider to be optimal for these bands: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?
-
- 12**
- 12a Are there any other bands that you consider to be future candidates for

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BWA?

12b If so, which ones, why and when?

12c How do you think they should be allocated, taking into account current allocations and usage?

Appendix 1: Other Spectrum Bands that may be suitable for BWA

502 - 806 MHz (UHF TV)

Analogue TV services currently operate in the 502 - 806 MHz band in New Zealand.

Current policy

While rights expire in 2010, agreements have been entered in to for renewal of analogue rights for a further 10 years. Planning is currently underway to enable the introduction of digital TV services and the Government is arranging the creation of Digital Terrestrial Television (DTT) licences in this band. The Government has agreed to consult with the industry in developing criteria and a process for analogue switch off (ASO).

Allocation opportunities

The Cost Benefit Analysis carried out for DTT recognizes that a significant amount of this band could be available for other uses after ASO. Internationally, this is referred to as the "Digital Dividend". BWA could be a contender for use of the vacated spectrum, along with DTT, after analogue switch-off.

With the use of such new technologies as Cognitive Radio, it may be possible to use UHF TV band for BWA even prior to analogue switch-off.

800-900 MHz

This part of the spectrum is under private band management and is used for 2G and 3G cellular services.

Current policy

Replacement rights will be offered to incumbent rightholders five years before expiry, as per existing renewal of rights policy. A process is now under way for determining an appropriate methodology to calculate a renewal price for these rights that expire in 2011, that would approximate a fair market value and produce a fair return to the Crown.

If the renewal offer is not accepted, the rights will be auctioned.

Allocation opportunities

Current band managers have the opportunity to utilise this band to continue to deliver mobile broadband.

1.8 GHz

This part of the spectrum is under private band management and is used for fixed wireless linking, with some additional 2.5 G cellular use.

Alternative uses include 2G and 3G cellular telephony and WiMAX-based BWA services.

WiMAX-based equipment for use in this band is currently being considered in Korea.

Current policy

This band is under private ownership as Management Rights. Renewal arrangements are to be finalised five years before expiry, as per existing renewal of rights policy.

Allocation opportunities

Some spectrum in this band is unused and there is opportunity for greater use. As the Management Rights do not come up for renewal until 2021, current band managers have the opportunity to use this band for the delivery of broadband in the future, either via entering into commercial arrangements with other interested parties or by themselves.

2.1 GHz

This band is the primary band used for 3G cellular employing the W-CDMA standard. A part of this spectrum is used for 3G cellular in New Zealand.

Current policy

This band is under private ownership as Management Rights. Renewal arrangements are to be finalised five years before expiry, as per existing renewal of rights policy.

Allocation opportunities

Some spectrum is unused and there is opportunity for greater use. As the Management Rights do not come up for renewal until 2021, current band managers have the opportunity to use this band for the delivery of broadband in the future, either via entering into commercial arrangements with other interested parties or by themselves.

2.2 GHz (1098 plan)

In 2000, in addition to the spectrum suitable for 3G cellular applications, the Government sold a number of management rights based on ITU-R Recommendation F.1098 Fixed Service (point-to-point) channel plan. Fortuitously this channel plan accommodates BWA applications around 2 GHz (Please refer to Table 2 above) with two (out of the three) private band managers deploying BWA services in this spectrum.

Current policy

This band is under private ownership as Management Rights. Renewal arrangements are to be finalised five years before expiry, as per existing renewal of rights policy.

Allocation opportunities

Current band managers are already using this band for the delivery of wireless broadband and Management Rights do not come up for renewal until 2021.

2.4 GHz

The 2.400-2.4835 GHz band is currently operated as a 'public park' in New Zealand under a GURL, and is largely used for local wireless LANs (WiFi). It is also used for household and industrial microwave ovens and such short-range devices as garage door openers and cordless phones.

Current policy

Current policy is to maintain the allocation to the Mobile Service, and maintain band access for WLAN use via a GURL under the Radio Licensing Regime.

2.7 GHz

This band is currently used for Aeronautical Navigation, Radiolocation (including RADAR) and TV outside broadcast linking, operating under radio licences issued by the Crown. Services in support of Television Broadcasting are on a user co-ordinated basis. Sharing with the Aeronautical Navigation and Radiolocation service is possible due to the offshore use within NZ territorial waters.

Although this band has been identified as suitable for WiMAX and IMT-Advanced in the future, it has been earmarked as a potential transition band for 2.5 GHz TV outside broadcast links in NZ. It should be noted that this band does not contain an international allocation to the Fixed or Mobile service, and its use in New Zealand for Television Outside Broadcast is by exception using Article 4.4 of the International Radio Regulations.

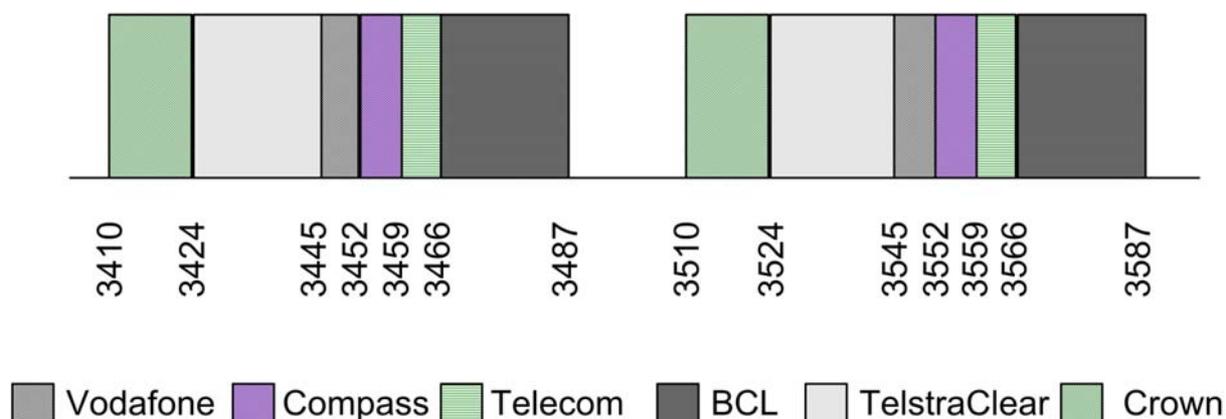
Current policy

The Ministry has no plans to change the current allocation.

3.5 GHz

Nine paired lots in the 3.5 GHz band, each of 2x7 MHz bandwidth, were sold by auction as nationwide management rights in 2002 for the deployment of wireless voice and data networks as an alternative to the copper local loop infrastructure. Three lots each were purchased by TelstraClear and BCL, two by Counties Power and one by Vodafone. Two lots were retained by the Crown for later release, to support the deployment of local and regional wireless networks, and these are currently (mid-2006) being allocated as area spectrum licences. The rights expire in 2022.

Diagram 4: 3.5 GHz Spectrum Holdings



In November 2005 the two management rights owned by Counties Power were sold privately to Compass Communications and Telecom respectively.

To date little use has been made of this spectrum. TelstraClear operates telephony links in this spectrum in eleven urban centres, and the Wired Country subsidiary of Compass Communications is operating an Auckland-based wireless network in this band for Project PROBE.

Fixed WiMAX-based equipment for use in this band is currently available and is being trialled in New Zealand. Additionally a number of proprietary radio systems are available for use e.g. Airspan Wireless DSL.

The three individually owned spectrum blocks may not be adequate to deploy a nationwide WiMAX network with ubiquitous coverage, however may be sufficient for regional and local deployment of WiMAX in specific areas.

Current policy

This band is under private ownership as Management Rights, some as Spectrum Licences (first to support project PROBE, second on regional TLA basis). Renewal arrangements are to be finalised five years before expiry, as per existing renewal of rights policy.

Allocation opportunities

Rights in this spectrum band do not come up for renewal until 2022. Current band managers have the opportunity to use this band for the delivery of broadband either via entering into commercial arrangements with other interested parties or by themselves.

5.8 GHz

The 5.725 -5.875 GHz band is currently operated as a 'public park' in New Zealand under a GURL, and is largely used for local wireless LANs²¹ and longer distance

²¹ Additionally, the band 5.15-5.25 GHz is designated for Indoor WLANs under a GURL in NZ and the band 5.25-5.35 GHz designated for WLANs with predominantly indoor use.

fixed point-to-point linking based on the US unlicensed national information infrastructure (UNII) initiative.

The band has been identified as suitable for future WiMAX-based deployments. Trials are proceeding in Ireland, in this and the 3.5 GHz bands.

Current policy

Current policy is to maintain the allocation to the Mobile Service, and maintain band access for WLAN use via a GURL under the Radio Licensing Regime.

5.9 GHz

The 5.875 -5.925 GHz band is allocated for the Fixed and Mobile Services and identified internationally as a Public Protection and Disaster Relief (PPDR)²² band.

Allocation opportunities

Although this band may be suitable for BWA applications, it is presently regarded as more suitable for PPDR. Close proximity of other bands such as the 5.4 and 5.7 GHz bands already identified for BWA applications, makes it unlikely that this band will be considered for allocation for BWA in the short term. This may need to be re-considered once more information is available in the future.

10.5 GHz

The 10.500 -10.680 GHz band is allocated to the Fixed Service in New Zealand and is currently used sparsely for fixed point-to-point linking in New Zealand.

Allocation opportunities

There has been some recent demand for this band to be made available for high capacity point-to-multi point backhaul linking. The Ministry is reviewing future options for this band.

24 GHz

The band 24.549 – 25.392 GHz is in very little use with two fixed links in operation with four licences.

Current policy

This band is under private ownership as Management Rights. Renewal arrangements are to be finalised five years before expiry, as per existing renewal of rights policy.

Allocation opportunities

Most of the spectrum is unused and there is opportunity for greater use. As the Management Rights do not come up for renewal until 2022, current band managers have the opportunity to use this band for the delivery of broadband in the future,

²² Under International Radio Regulation Resolution 646.

either via entering into commercial arrangements with other interested parties or by themselves.

27 GHz

The band 25.555 – 28.35 GHz is used for the satellite uplinking, and for the delivery of telephony and data in NZ.

Current policy

This band is under private ownership as Management Rights. Renewal arrangements are to be finalised five years before expiry, as per existing renewal of rights policy.

Allocation opportunities

Some of the spectrum is unused and there is opportunity for greater use. As the Management Rights do not come up for renewal until 2018, current band manager have the opportunity to use this band for the delivery of broadband in the future, either via entering into commercial arrangements with other interested parties or by themselves.

Appendix 2: Submissions

It would be appreciated if submissions were made in the following format.

Name

Position in organisation

Organisation

Contact details

Nature of organisation's business

Responses to questions

1....

2....

3....

....etc.

Other issues

A....

B....

....etc.

Date / Signature