Submission on publicly notified Proposed District Plan Change 74
To the Wellington City Council

DPC74

Form 5 Pursuant to CLAUSE 6 of the First Schedule to the Resource Management Act 1991

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1. Details of person making submission:

John Russell Andrews

68 Khandallah Road, Ngaio, Wellington 6035

Jandrews@clear.net.nz

04- 938 7214

021 710 102

This is a submission on behalf of the Wellington VHF Group Inc and the Wellington Amateur Radio Club, as branches of the New Zealand Association of Transmitters (NZART)

2. The specific provisions of the Proposed Change that my submission relates to are as follows:

   The Rules controlling Amateur Radio aerials and antennas, and their supporting structures, and the testing of radiation intensity fields from amateur radio stations.

   Continued on attached sheet

3. My submission is that:

   A. The proposed plan change fails to accommodate as permitted uses the reasonable requirements of amateur radio operators and the amateur radio service, through excessive limitations on the height, location and numbers of radio aerials and antennas and their supporting structures, and in appropriate definitions for these aerials for amateurs, and

   B. Imposes on amateur radio operators excessive costs from excessive and unnecessary emission testing.

   Continued on attached sheet.

4. I seek the following decision from the Council:

   the Council amends the proposed change to remove the unduly severe restrictions on the amateur radio service, so as to allow as permitted uses antennas erected to proper height and dimensions and in sufficient number for communications effectiveness and experimentation and otherwise to reasonably accommodate amateur radio service communications.

   Continued on attached sheet

5. I wish to speak at the hearing in support of my submission: ***Yes***

6. If other parties make a similar submission to mine

   I am willing to make a joint presentation with them: **Yes**

7. I have attached extra sheets : **Yes**

Signed:________________________________ Date: 30/10/2009

John Andrews

2. Continuation. The specific provisions of the Proposed Change that my submission relates to are as follows:

23.1.5
23.1.8
23.1.13
23.1.14
23.1.15
23.2.4
23.2.5
23.3.1
23.3.2
23.4.1

Of note are sections 23.1.5.1, 23.1.8.9, 23.1.8A.6, 23.1.13.1, 23.1.14.1, 23.1.15.1, 23.2.1.11, 23.1.4.2, 23.2.4A.4, 23.3.1.3c, 23.3.2.3, which all refer to NZS 2772 Part 1:1999 regarding radio frequency emission testing. As amateurs are licenced and permitted to experiment, these standards are onourous and unsutiable for amateur installations. Amateurs are not able to have an inspection for every change they may make to their operating equipement, and rules on power levels and interference are covered by the Radio Regulations monitored by the Radio Spectrum Management division of the Ministry of Economic Development.

The provisions relate to how amateurs are allowed to install home stations to carry out their hobby. Antennas and areials are key to the hobby and an area that amatuers are most likely to experiment with. Unlike any other radio user, amateurs operate on frquencies from the short wave area (really mis-nomer as these are the longest wave lenghts in use today!) to frequencies in the microwave area where dish type antennas are used to concentate the received signal onto a very small aerial.

3. Continuation. My submission is that:

Amateur Radio (commonly known as "ham radio") is a recreational and self-training activity and a communication service that is established by international treaty. It fosters cutting edge experimentation in radio-technology and related topics and provides a pool of scientific research world-wide.

Amateur Radio is not generally understood by the community at large or by community leaders and administrators. Therefore it is necessary to explain the reasons for the existence of amateur radio and provide some essential information about this service, and the reasons why the proposed plan is unacceptable in respect of antennas/aerials, their supporting structures, and emission testing.

<u>A What is the Amateur Radio Service?</u>

Amateur radio uses an international natural resource - the radio spectrum - and so the amateur radio service is regulated by international convention to which all signatory countries to the International Telecommunications Union (ITU) are bound. Amateur radio is administered in New Zealand by the Radio Spectrum Management division of the Ministry of Economic Development. At the international level, national societies throughout the world work together for the international good of amateur radio under the auspices of the International Amateur Radio Union (IARU) which then works with the ITU

In order to obtain an Amateur Radio Operators Certificate, a person must complete a technical, regulatory and safety examination. These exams are overseen by the RSM division to meet international standards.

The following extracts from the ITU regulations define the amateur service and the amateur-satellite service;

1.56 amateur service: A radiocommunication service for the purpose of self- training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest.

1.57 amateur-satellite service: A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur radio service.

New Zealand is bound by these ITU regulations as a signatory to them.

The **New Zealand Association of Radio Transmitters (Incorporated)** [NZART], is a member organisation of the IARU. An example of the IARU organisation at a national level, NZART has a responsibility to successfully interact with the agencies responsible for regulating and allocating radio frequencies and for the establishment and operation of amateur radio stations. The Society's membership stands at 2300 of the 4800 NZ amateur license holders. In Wellington city area there are around 400 licensed amateurs- many active and many more not active but retaining their licences.

In order for you to understand the role of amateur radio in the community some explanation of the reasons for the existence of amateur radio is necessary.

The amateur service uses a wide range of spectrum allocations allowing it to, among other things;

1 engage in experimentation that has advanced the radio state-of-the-art,

2 provide emergency communications in times of natural or man-made disasters,

3 provide trained radio operators in times of national emergencies,

4 encourage international cooperation and goodwill by allowing direct communications between and among people on an international basis and,

5 provide an important educational outlet for people interested in the more technical aspects of radio communications.

In further explanation of the above;

1 Experimentation is an activity in which amateurs engage in pursuit of technical knowledge and understanding, and the development of equipment. Amateurs are permitted to construct their own equipment, a privilege not available to other spectrum users, who are required to have their equipment pass rigorous approval processes.

Experimentation with antennas/aerials is probably the most frequent form of experimentation radio amateurs engage in. Antennas are frequently built, modified and replaced with alternative designs. The range of designs is very extensive.

In the mid-1920's, exploration of the "short waves" was just beginning. Through experimentation radio amateurs were well ahead of their commercial counterparts in exploiting the long-distance capabilities of this unique part of the radio spectrum. The technical contributions of the amateurs were very important to subsequent telecommunication development, and remain so today.

2 & 3 Emergency communications is an infrequent activity but one in which radio amateurs willingly engage in times of emergency. Our two local clubs are working closely with WEMO to provide technical expertise, trained and experienced operators, and in many cases our members are embedded in local Civil Defence Centres (CDCs) which report to WEMO. Over the years these clubs have trained CD volunteers and worked with WEMO managers on radio communication issues and planning.

Infrastructure-free amateur radio communications, often overlooked in favour of flashier means of communication, can maintain communications in disasters that bring more vulnerable technology to its knees.

Many emergency situations utilise amateur radio, more particularly in Search and Rescue (SAR) activities. In New Zealand, amateurs are members of an organisation, Amateur Radio Emergency Communications, which is dedicated to providing emergency communications assistance. Fortunately, massive disasters, such as Hurricane Katrina which hit Louisiana in August last year, the enormous earthquakes and tsunami of December 2004 in the Indian Ocean, and the hurricane which hit Darwin in 1974 have not occurred in New Zealand. In each of these emergencies amateur radio provided vital links saving lives and property when normal communications, even those of military and normal emergency services, were disrupted. The simplicity and portability of amateur radio communications when compared with the mainstream communications is enormously advantageous in times of emergency.

Amateurs often provide communications to public events, which provides training in portable and mobile communications and in message handling; these are skills needed in emergencies.

4. Many amateurs participate in world-wide communications from their homes as a recreational activity. International cooperation and goodwill is fostered, despite political tensions that arise across borders, through personal friendships which develop from sharing a common interest in amateur radio operation and radio technology. Strong personal relationships develop between amateurs across geographical, political, cultural and other barriers.

Amateurs frequently engage in operating contests, many of which are world-wide events, and some participate in expeditions to remote parts of the world, all of which develop and extend their communication skills, particularly in the area of weak-signal communications, which is often a feature of emergency communications.

Today there are nearly three million amateur service licensees located in nearly every country of the world. Radio amateurs continue to build and maintain personal ties in a world that is in ever greater need of mutual understanding.

Monarchs, presidents, leading politicians, Nobel laureates, eminent engineers and scientists, and many astronauts all can be counted in the ranks of amateur radio operators.

5. Amateur radio provides opportunity for technical training self-training, often leading to careers in technology. Amongst New Zealand amateurs who have achieved professional eminence is William Pickering, who led the United States (US) space exploration programme. He developed his scientific interest through participation in amateur radio operation while at secondary school in Wellington. Sir Angus Tait, founder of Tait Industries, manufacturers of high-technology radio communications systems marketed world-wide, is another prominent New Zealander whose technical interests began in amateur radio.

Ernest Rutherford conducted radio experiments whilst at Canterbury University before going to England. It is interesting to consider what would have happened had he continued in this field!

In Wellington, successful high-tech companies such as SurveyLab, 4RF Communications, Marine Air Systems (now Harris Stratex Networks and MAS-Zengrange) and many others were all started by Wellington radio hams who are members of our clubs and created both valuable exports as well as working well with the Council's Information and Technology Communications Policy which is referenced in the Section 32 Report on DPC 74.

B Amateur Radio in the Community

Amateur radio operation takes place mainly at the operator's residence. Most operators reside in urban or semi-urban areas. These amateurs are penalised by the height restrictions of the proposed plan, which are much more limiting than those of other districts which have created their rules to be more accommodating of the amateur service. Amateurs are normal members of the community. Many communities pride themselves on providing facilities for community and individual recreational activities, through the provision of halls, libraries, playgrounds, reserves and sports grounds, swimming pools, walking tracks, boat ramps and other such facilities which enable the populace to participate in their chosen recreational activities. Most of these facilities are provided by district councils at a cost borne by the ratepayers. The amateur radio operators who participate in their recreational activity of amateur radio, mainly at the place where they reside are not seeking such community-funding of their facilities, just the opportunity to install effective antennas appropriate to their technological pursuit. The community as a whole benefits through and thrives on diversity; radio amateurs create another thread to that diversity, they are responsible community members, and they offer essential communication services in times of emergency.

C The Radio Spectrum and Antenna Dimensions

The spectrum allocated to amateur radio operators by the ITU ranges from low frequency (LF) through medium frequency (MF), high frequency (HF), very high frequency (VHF), ultra high frequencies (UHF) and super-high frequency (SHF), covering the electromagnetic spectrum almost from DC (direct current) to daylight. There are 34 frequency bands allocated, with frequencies ranging from 130 kilohertz (kHz) to 1000 gigahertz (GHz), corresponding to wavelengths ranging from 1800 metres to 0.3 mm. Most amateur operation and experimentation uses the frequencies allocated between 3.5 MHz and 440 MHz, but there is strong interest and increasing use of bands outside this range.

The physical dimensions of an antenna are very much a function of the frequency of use, the available site area, the efficiency of power radiation, and the installation cost. Antennas exist in many configurations, and are constructed of wires, usually horizontal or sloping, and of metallic tubes in horizontal and vertical arrays, sometimes ground mounted, and more frequently, elevated.

For low frequencies, antennas are characterised by height and length. A single wavelength is many hundreds of metres long, and since the land area available for an amateur installation is generally limited, LF antennas are of reduced size and very inefficient. Cost and available real estate are the prime constraints. For that reason and for satisfactory long-distance propagation, many LF antennas are vertical.

For medium and high frequencies, antenna lengths are usually based on multiples of a half-wavelength. At 3.5 Megahertz (MHz) a single half-wavelength is around 40 metres, and a simple horizontal single-wire antenna of this length is frequently used. For vertically polarized antennas, masts of 40 metres or so in height are costly, and lesser heights generally up to 20 metres are more common. LF and MF antennas are generally real estate or height limited. A preferred installation could be a horizontal wire with a length of 80 metres or more, or a vertical mast element, as high as possible, say 30 - 40 metres minimum. Neither of these can normally be realised on an urban lot, but both are entirely feasible in a rural environment

The dimensions of the radiating elements are generally:

for HF - long, up to 40 metres if horizontal and 20 metres if vertical at the lower HF bands,

for MF and LF - similar, but longer where possible, otherwise operating at reduced efficiency.

for VHF - short, about 3 metres for 50 MHz, and 1 metre for 144 MHz,

for UHF - shorter, 35 centimetres (cms) for 435 MHz, 25 cms for 602 MHz,

for high UHF and SHF - even smaller, the dish reflectors used are much larger than the radiating elements

Antenna elements are often combined into an array to improve antenna performance. Physical size generally limits such arrays. The boom (element linking support) length of any beam array would seldom exceed 6 metres in length for reasons of wind loading and durability, and will often be shorter.

HF antennas can generally be reasonably accommodated on a 1000 square metre urban lot; although in most instances these would be compromised in performance through lack of height, or length.

The simplest 3.5 MHz antenna, a half-wave dipole or inverted Vee, is 40 metres in length, which for long distance communications performs poorly at limited heights (below 20 metres). At 7 MHz, the length is 20 metres, and at 10 MHz, 15 metres, but height is still necessary to obtain anything better than poor performance. Wire antennas are more common on these bands. The effectiveness of low (less than 0.5 wavelength) horizontal dipoles on these bands is compromised for effective long distance communications on these bands by lack of height, and, a vertical antenna is often preferred. A full-sized quarter-wavelength vertical antenna for the 80 metre band is 20 metres high, and for the 40 metre band is 10 metres high. Sometimes these antennas are elevated above ground. The radiation pattern of an antenna is strongly influenced by the height above ground.

For the remaining HF bands, horizontal multi-element beam arrays are more common, with element lengths spanning 10 metres at 14 MHz, reducing to 5 metres at 29 MHz. These beam arrays may have up to 6 - 8 elements on boom lengths up to 8 or more metres. Survivability under high wind loads generally limits the dimension of such beams. These beams are similar in appearance to a typical low VHF band television (TV) antenna, but of larger dimensions, in inverse proportion to the frequency.

The VHF and low UHF bands often use multiple element beam arrays, not unlike and similarly sized to a high gain terrestrial TV beam antenna. For short range communication or when using local repeaters, small whip antennas are common.

For the higher frequency UHF bands and the SHF bands the actual radiating elements are quite small but to achieve antenna performance gain reflector dishes may be used for experimental purposes, up to 4 or so metres in diameter, in an urban situation; larger dishes exist in rural situations.

There is no single feasible or practical antenna design which covers the amateur radio spectrum. Some antenna arrays are made to operate over several bands; such arrays are widely used but are confined to the higher of the HF bands, at wavelengths from 20 metres to 10 metres.

Antenna performance is critically related to dimension. Driven element dimensions cannot be reduced from the half wave-length dimensions without losses in efficiency and bandwidth, which rise rapidly with miniaturisation.

Many municipal libraries throughout New Zealand hold recent editions of the ARRL Antenna Book (the latest edition is the 20th) and the ARRL Hand Book. (Both in the Wellington City Library) I appreciate that the content is technical, however even a brief perusal will indicate both the technical complexities and the wide range of antennas and supporting structures, and will illustrate, that any attempt to codify them into a standard is totally impracticable.

D Antenna Height and Radio Wave Propagation

Amateurs have for many years erected their antennas as high as possible, knowing how important height is in achieving effective performance.

Radio waves emanating from an antenna travel in straight lines into space. Those that travel upwards are mainly absorbed by the ionosphere, and those that travel outwards, towards the horizon, may be reflected by the ionosphere.

The propagation around the world of radio waves is strongly affected by the height of the transmitting antenna, and the reception performance of an antenna is similarly affected. These effects are due to the angle of the outgoing or incoming wave and are reciprocal. The wave-angle is largely determined by the height of the antenna.

A low horizontal antenna radiates mainly upwards, and the energy is mainly lost through being absorbed by the ionosphere. Only a small amount of the radiated energy is directed outwards. The outwards propagated wave reaches the ionosphere at a shallower angle than the upwards wave, and it can be reflected by the ionosphere, to return to earth, where a radio signal can be detected. Often the wave will be re-reflected by the earth to the ionosphere in a second hop, and up to four or more hops may be required for a wave to reach its destination. At each reflection, both in the ionosphere and at the earth's surface much of the wave energy is absorbed. So for long distance communication the minimum number of hops is required to maintain an adequate signal level (the more hops – the more absorption), and the wave take-off angle should be as low as possible, directing the radiated energy towards the horizon.

The radiation take-off angle is the key factor in determining effective communications beyond line-of-sight. The angle of radiation (the take-off angle) is determined by the height of the antenna, hence the need for high antennas for effective communication.

Placing an amateur radio antenna system higher in the air enhances communication capabilities, and also reduces the chances of electromagnetic interference with neighbours.

Studies in USA have shown that for effective long-distance terrestrial communication 21 metres is the minimum necessary height for an antenna. Earlier studies on communication between Europe and South America showed that 20 metres height was required for the same reasons.

Appended to this submission is a report, prepared by the American Radio Relay League, on amateur antenna performance in relation to height entitled "**Antenna Height and Communications Effectiveness -- a Guide for City Planners and Amateur Radio Operators**" **2nd Edition 1999**

Quoting from that report, " *...In terms of safety and aesthetic considerations it might seem intuitively reasonable for a planning board to want to restrict antenna installations to low heights. However, such height restrictions often prove to be very counter-productive and frustrating to all parties involved. If an antenna is restricted to low antenna heights, say 35 feet, he will suffer from poor transmission of distant signals. In an attempt to compensate on the transmitting side (he can't do anything about the poor reception problem,, he might boost his transmitted power from say 150 watts to 1,500 watts , the maximum legal limit. This ten-fold increase in power will very significantly increase the potential for interference to telephones, televisions, VCRs and audio equipment in his neighbourhood.*

Instead, if the antenna can be moved further away from neighbouring electronic devices -- putting it higher in other words -- this will greatly reduce the likelihood of interference, which decreases at the inverse square of the distance. For example, doubling the distance reduces the potential for interference by 75%. As a further benefit, a large antenna doesn't look anywhere near as large at 120 feet as it does close-up at 35 feet.

As a not-so-inconsequential side benefit, moving an antenna higher will also greatly reduce the potential for exposure to radio-frequency fields for neighbouring human and animals...."

The same considerations apply in New Zealand, although the maximum power limit is 400 watts. Amateur antenna installations on towers exceeding 120 metres in height are not uncommon in the US, although mainly in rural communities.

The ARRL report attached as Appendix 1 uses as examples communication paths from continental United States to Australia, Europe and to Japan. The same considerations apply to world-wide communications from New Zealand. In fact the geographic isolation of New Zealand places most countries of the world at far greater distance than for Europe or the US.

It is obvious that worldwide communications from New Zealand is much more difficult than it is from the US, Europe, most of Asia, and most of Africa. (Two maps are attached- GC1 abd GC2. These show the world from Wellington and from Spain. It is clear that from NZ there are few countries within 5000KM where as in Spain, there are many countries within 5000Km).

The signal path lengths for the main communications of the network utility operators such as Telecom NZ are minute compared with the distances of world-wide radio communication, where the path lengths are up to 20,000 kilometres.

The matter of antenna heights has been of much concern to the amateur radio service in the USA, where, due to undue restrictions imposed by planning authorities, a federal pre-emption was issued by the US government overriding local planning laws. This federal pre-emption, called PRB-1, generally prevents planning authorities limiting antenna heights to below 70 feet (21 metres), but does not apply to restrictions arising from land use covenants or private contracts. PRB-1 is the result of the strong concerns of the US government in response to overly restrictive planning. Regrettably no such pre-emption exists in this country.

One further reason for requiring reasonable antenna requirements is the increasing pollution of the electromagnetic spectrum. This pollution, and its consequences, which are the subject of intense scientific investigation can be likened to an electronic smog. It has dramatically increased over recent years with the proliferation of electronic devices, which taken singly are of no great consequence, but which now number many millions. The cumulative effect of these devices is to raise the noise floor (the background noise) of the electromagnetic spectrum. Efficient antennas are required to discern the wanted signals over proliferous background noise, and efficient **antennas demand height and appropriate dimensions. They cannot be miniaturized**. Amateur communications are only as effective as the antennas they employ.

Note - the way urban city lighting has effected the ability of astronomical telescopes to see distant celestial bodies is analogous to the way cruciferous electronic background noise has reduced the ability of radio users to detect weak signals.

Heights of less than 21 metres (a soft conversion from the 70 feet referred to in the ARRL report) for horizontal antennas on the HF bands will compromise performance, as evidenced in the reports referenced above.

Antenna height is the most significant factor in obtaining effective antenna performance

A typical urban amateur antenna installation would provide antennas for operation on HF, VHF and UHF.

Operation in the 80 metre and 40 metre bands is often through a single simple wire antenna. 30 metre operation is often through a separate wire antenna, which may be supported on the same structures – mast or poles.

For the 20 metres, 15 metres and 10 metres operation is usually through a multi-element beam array (sometimes called a Yagi antenna), and usually through a similar multi-band beam for 17 metres and

12 metres.

For the antennas used on VHF and UHF bands are usually multi-beam antennas, often supported on the same structure.

Vertical antennas, which are normally omni-directional are also used for all of these bands, ranging from tall poles for 80 metres and 40 metres to shorter antennas seldom exceeding 6 meters in height for the vhf and uhf bands. Shorter whips, often eaves or chimney mounted are useful for VHF and UHF local simplex and repeater coverage, the beam arrays are used for greater communication range.

Other types of antennas are also in use, sometimes wire arrays, sometimes using dish reflectors. Elevated dishes seldom exceed 1.2 metres in diameter, since survival under wind-loads becomes important. Smaller dishes may be required at greater heights. Larger dish antennas are generally ground-mounted.

Steerable antennas, including steerable dishes, are often used for amateur satellite communications to track moving satellites, such dishes are generally small (less than 1.5 metres in diameter) and not elevated above 5 metres.

The bands in use at any particular station will represent the interests of this station's operator. The antennas described above are not necessarily representative of the requirements of any or all operators, since they may need to use other bands, depending on the personal interests of the station operator, and the existing HF propagation conditions (which are affected by the 11-year sunspot cycle).

E Antennas and Planning Rules

Our members are very concerned about the erosion of property rights - in particular the imposition of antenna restrictions - and the consequences to the amateur services of inappropriate and excessive restrictions. Such restrictions will have significant effects on entry to the amateur service, and will reduce the availability of emergency communications assistance in times of emergency.

Some amateur antenna communications require more substantial installations than others if they are to provide the amateur operator with the communications he/she desires to engage in. The height sought in our submission, 18 metres for permitted uses, is seen as the height to which any operator must be able to erect an antenna supporting structure. Heights above that minimum are seen to be attainable in circumstances set by the Council following submission of an application. For instance, heights exceeding the minimum should be permitted in most circumstances except, perhaps, in intensely subdivided urban development. The minimum height should not become the de facto norm.

From your considerations you should be aware that there are many territorial authorities in New Zealand which allow antennas to be erected at greater heights than allowed for in your proposed plan. This Association will strongly defend the rights of the amateur service to erect effective antennas, and considers that your Council must effect a reasonable accommodation in the matter of amateur antennas and their supporting structures, based on technical considerations, and the role of amateur radio in the community. Planning rules which involve placement, screening, or height of antennas based on health, safety or aesthetic grounds must be crafted to accommodate reasonably practicable regulation to accomplish the Council's legitimate purpose, without frustrating the legitimate purpose of the amateur radio service.

Examples of Councils which have more reasonable permitted use height limits for amateur radio antennas are:

North Shore District	15 metres
Tauranga City	20 metres
Selwyn District	20 metres.
Christchurch City	17 metres
Napier City	17 metres (T&CP Tribunal decision carried through to current plan)
Wanganui District	15 metres

Some Councils, on becoming aware of the impediment their rules create to efficient amateur antenna installations, to provide relief for the amateur stations are using the less restrictive antenna height limitations applying to their utility network operators, rather than the lesser heights in building rules which have not considered the amateur antenna needs. The pragmatic approach of these Councils is applauded.

The North Shore District Council has added provisions for Amateurs to their plan, and allowed them to have a large number of antennas, wire aerials and supports. This is a very prescriptive addition to the plan in response to a particular issue that was raised in their district. The change had intended to reduce antennas on a home to TV use only, so the amateur provision was made to exclude amateurs from this very tight new plan. The schedule of the North Shore District plan is attached.

Any planning rules must give reasonable consideration to the needs of the amateur radio service. The proposed rules do not show such consideration has, so far, been given, and in short, will act as an severe impediment to amateur operation and future recruitment.

Around 1982, an appeal was taken to the Town and Country Planning Tribunal relating to the then Napier City Council District Plan, and the decision of that appeal was to allow greater antenna support heights than the plan allowed. You are referred to the Tribunal decision.

The types of communication systems used by network utility operators such as Telecom are radically different to those for the amateur service. While Telecom and the other utility operators operate of necessity at an extremely high level of service, pursuant to the reliability of the essential services they supply, the lengths of the propagation paths they use are limited and much less than amateur operators use. Telecom and the other utility operators frequently have their major installations in the industrial zones where by virtue of higher building heights, the antennas are much more efficient. Amateur radio operators operate mainly in the residential zones, where the building heights are less, and are so considerably disadvantaged by comparison with utility operators such as Telecom NZ and others.

I reiterate three statements made earlier

Antenna performance is critically related to dimension

Efficient antennas demand height and appropriate dimensions. They cannot be miniaturized and relate to the radio frequency band being used by the amateur.

Antenna height is the most significant factor in obtaining effective antenna performance.

F Radio Frequency Emissions Testing

Sections 23.1.5.1, 23.1.8.9, 23.1.8A.6, 23.1.13.1, 23.1.14.1, 23.1.15.1, 23.2.1.11, 23.1.4.2, 23.2.4A.4, 23.3.1.3c, 23.3.2.3 require that all installations are designed and operated in compliance with standard NZS 2772: Part 1: 1999 Radio frequency Fields part 1 Maximum exposure levels.

This standard is not wholly applicable to amateur operations as amateur operations have a very low transmit to receive ratio (hams listen more than they transmit, and only operate at all when they are at home and performing their hobby). This is very different than cellular, land mobile and broadcast transmitters which are transmitting either continuously or for large parts of the day.

Amateur power levels are determined by the MED Radio Spectrum Management Division, and amateurs are well aware and qualified to manage exposure levels and durations, as well as always being present at all times that the station is in operation, so are not inclined to ignore any safely issues!

The amateur radio operator is an experimenter and is able to construct, modify and operate transmitters, perhaps several times in one day. This same applies to antennas, and an operator may have a number of different antennas, ranging in size from mere centimetres to more lengthy and elaborate constructions. These antennas likewise frequently undergo modification and adjustment, sometimes perhaps as many as a dozen times in a day. Any proposed Rule must allow amateur operators to use antennas and transmitters in a large number of combinations, giving rise to many different patterns for radiofrequency emissions. Obtaining approval for antennas in a large number of configurations varying in height above ground, antenna dimension and orientation, and transmitting mode, from independent testing laboratories is a very expensive process, and beyond the resources of the amateur radio operator. This process is entirely unsuitable to the amateur radio experimenter.

Amateur radio operators are able to carry out computer simulations on their antennas which provide information on the radiated energy fields, and to use technical information published by NZART and based on the New Zealand Standard 2772, and so determine whether their station emissions fall within the NZSS 2772.1 permissible levels. Additionally, if required, amateur operators are able to carry out their own field testing.

For amateur radio installations, there is therefore no need for the Council to require tests by any person other than a licensed amateur radio operator. The cost of external (to the amateur radio service) monitoring is quite beyond the means of the licensed amateur radio operator, who is unable to recover any costs. The amateur radio service is a self-regulating service, and has amongst its members, scientists and radiofrequency engineers who are competent to advise the Council and carry out field tests in the event of any disputed or potentially excessive radiofrequency emission levels.

The NZART Self Assessment Guide for NZS 2272 is attached and shows how amateurs work to ensure they can meet the standard by self assessment.

G Antennas and their supporting structures

Antennas are generally supported on structures such as poles and masts. Antenna supports may be guyed poles and lattice masts or self-supporting masts, often lattice in form. Some masts are made to telescope or to tilt over, to enable easy access to the antennas for experimentation, adjustment and maintenance.

Any proposed rules must allow for supporting structures of the types described briefly above.

Guyed poles and masts are more slender than self-supporting structures, but need sufficient surrounding space for guy anchors to be installed. They often need to be safely climbable, for access to antennas. This requirement means that a pole or mast must have either climbing steps, or if a lattice structure is used, a horizontal dimension between legs of at least 250 mm.

Self-supporting masts and telescopic or tilt-over lattice masts need to be up to 800 mm in horizontal dimension between legs across each face up to a height of 8 metres, but can reduce to 650 mm for the next 6 metres of height, and further reduce to 450 mm up to the desired maximum height of 18 metres.

I oppose the proposed plan change since it fails to reasonably accommodate the reasonable requirements of amateur radio operators, and the amateur radio service, through excessive limitation on the height, location, dimension and type of radio antennas and their supporting structures, onerous and costly testing and monitoring.

4 Continuation: I seek the following decision from the Council:

In all residential, rural and business zones as permitted uses for amateur radio operators

- Allow antennas supporting structures to a height of 18 metres
- Height limitations are not applied to directly to antennas
- Allow the use of guyed pole antenna supporting structures without bulk dimension constraint.
- Allow self-supporting lattice mast supporting structures with maximum horizontal dimensions of
  800mm to a maximum height of 8 metres
  650 mm to a maximum height of 14 metres
  450 mm to a maximum height of 18 metres
- Allow antennas and their support structures mounted on buildings to a maximum height of 18 metres
- Remove the application of height control planes to amateur radio antennas and their supporting structures
- Reduce the set-backs for simple pole structures to 0.5 metres on all boundaries
- Reduce the set-backs for mast structures to 1.5 metres on all boundaries,
- Allow amateur radio satellite communication dish antennas to a maximum diameter of 4 metres, provided they do not exceed 5 metres in height
- Allow amateur radio communication dish antennas to a maximum height of 12 metres, provided they do not exceed 1.2 metres in diameter
- No limit to the number of antennas installed on any site

- Allow self assessment and emission field testing by amateur radio operators

7 Continuation. Attachments:

1. **NZART Self Assessment Guide for NZS 2272**
2. **Antenna Height and Communications Effectiveness -- a Guide for City Planners and Amateur Radio Operators**
3. **Great Circle Maps 1 and 2**