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Introduction

In November 2006, the Ministry of Economic Development published for consultation a paper titled, Allocation of 500 MHz Spectrum for Public Protection and Disaster Relief Services, as part of a work programme being undertaken by the Emergency Telecommunications Services Steering Committee (ETSSG) designed to optimise Public Protection and Disaster Relief (PPDR) communications systems.

Working Group Two (WG2) of the ETSSG has as its objective the allocation of radio spectrum suitable for radiocommunications within and between PPDR agencies: both in day-to-day activities (law enforcement, fires, accidents) and during natural disasters or civil emergencies (earthquakes, pandemics, regional storms).

By mid-2007, WG2 had analysed the radiocommunications profiles of the major PPDR agencies and identified spectrum suitable for the VHF and UHF land mobile radio (LMR) networks that carry the majority of PPDR traffic. They are:

‘ESB’ band (VHF) – 138 - 144 MHz; and

‘ESC’ band (UHF) – 494 - 502 MHz.

The November consultation paper sought the views of stakeholders on the appropriateness of these bands and their governance for PPDR use. A copy of that paper is appended.

The paper solicited responses to four questions.

Question 1 – Do you consider continuing the allocation of the ESB band for PPDR Services in New Zealand to be an appropriate use of the spectrum resource?

Question 2 – Do you consider allocation of the 494-502 MHz band to the Mobile Service for PPDR applications in New Zealand to be an appropriate use of the spectrum resource?

Question 3 – Are the suggested arrangements to manage interference into and from the band 494-502 MHz appropriate?

Question 4 - Do you consider that managing the 494-502 MHz band is best achieved using the administrative licensing regime, as at present?

Eight substantive responses were received:

one from the ETSSG’s Working Group Three (which is tasked with identifying a long-term strategy for state sector radiocommunications);

three from PPDR agencies;

- the Department of Conservation
- the NZ Fire Service, and
- the NZ Police);
- two from LMR service providers;
- South Island Electronics, and
Team Talk Ltd;

one from Marlborough District Council; and

one from Kordia Limited.

The majority of respondents were in favour of the proposed allocation, but a number identified issues of potential interference with the adjacent 502-510 MHz and 510-518 MHz bands, currently unused but suitable for digital and/or mobile television broadcasting. These issues are discussed in greater detail in the following sections.

Summary of Responses

Question 1

Do you consider continuing the allocation of the ESB band for PPDR Services in New Zealand to be an appropriate use of the spectrum resource?

Respondent	Respondents' Comments
ETSSG WG3	<p>Agree</p> <p>PPDR radiocommunications is the best possible use for the band, and that suitable equipment is readily available [on international markets].</p>
Dept of Conservation	<p>Agree</p> <p>There are benefits to PPDR agencies of efficient spectrum use, common equipment specifications and easy resolution of interference issues.</p> <p>There is a need for access by PPDR agencies not directly involved in spectrum management and use.</p>
NZ Fire Service	<p>Agree, with additional comment</p> <p>This band is already in use interoperably, has good propagation and supports equipment that is readily available and cover adjacent sea/air bands.</p> <p>However, the band lacks building penetration, contains a limited number of channels and is not compliant with ITU-R guidelines.</p> <p>Ministry comment: Building penetration will be assured by use of the ESC band in urban areas. Trunking will enable more efficient use of the channels available.</p>
NZ Police	<p>Agree, with additional comment</p> <p>Additional VHF spectrum would be useful.</p> <p>Ministry comment: Channel allocation will be managed collaboratively by the Public Safety Radio Frequency Management Group (PSRFMG).</p> <p>The number of existing incumbents in the band make its clearance and reconfiguration difficult.</p> <p>Ministry comment: A strategy to clear the band of incumbent uses is being progressed by the parties concerned.</p>
South Island Electronics	<p>Agree</p> <p>Additional VHF channels could be provided by reducing the adjacent aviation guard band and siting base transmitters in the CD band.</p> <p>Ministry comment: The 137-138 MHz (guard) band is used for meteorological and other Government services and is not available for PPDR use.</p> <p>Existing (PPDR) users of the CD band are to be migrated to the ESB band. The CD band is internationally allocated for satellite services</p>

Team Talk Ltd	Agree This band is well-suited to LMR services. There may be insufficient channels when all PPDR services migrate to this band. Ministry comment: Trunking will enable more efficient use of the channels available.
Marlborough District Council	Agree
Kordia Ltd	Agree

Conclusion

There is general agreement among respondents that the ESB band should be allocated to PPDR VHF LMR services.

There is some concern that there may be insufficient band-width to fully accommodate aggregate channel requirements when all relevant services have migrated to the band.

Ministry comment: The latter issue has been the subject of intensive consultation with and between PPDR agencies. While there is not unconditional agreement, the potential for services to operate more economical trunked networks in high-density areas and/or to employ advanced band management techniques has been acknowledged and is being progressed by the ETSSG's Working Group 3. It is further noted that digital LMR standards under development should eventually reduce channel bandwidth requirements and ease any potential congestion.

Question 2

Do you consider allocation of the 494-502 MHz band to the Mobile Service for PPDR applications in New Zealand to be an appropriate use of the spectrum resource?

Respondent	Respondents' comments
ETSSG WG3	Agree WG3 approves this allocation as urgently needed, and compatible with adjacent LMR bands.
Dept of Conservation	Agree, with additional comment Allocation of spectrum compatible with available [APCO P25] equipment is critical.

<p>NZ Fire Service</p>	<p>Agree, with additional comment</p> <p>NZFS supports the initiative. The band is adjacent to existing ‘PPDR’ bands and is sufficiently separated from high-power users (eg, broadcasters), has suitable propagation and coverage. Compatible equipment is readily available and there is good potential for interoperability.</p> <p>There is a need for a guard band at the upper limit, to mitigate interference with broadcasting services.</p> <p>There are insufficient channels and that the allocation is not harmonised with ITU-R guidelines for Region 3.</p> <p>Ministry comment: Based on the technical analyses in Appendix A and B of the consultation paper, the Ministry has proposed that a guard band within which transmission power is limited be created in the 502 – 510 MHz band.</p> <p>WG2 of the ETSSG performed a channel capacity analysis and concluded that there were enough channels in the 494 – 502 MHz band to meet immediate PPDR needs, and that future capacity expansion could be addressed through the use of advanced spectrum management techniques, and more efficient radio technologies e.g. trunking.</p> <p>Incumbent use makes harmonisation of the ESB and ESC bands impracticable. The ESD band (812 – 813/857 – 858 MHz) is harmonised with the Region 3 spectrum identifications given in ITU-R Recommendation 646.</p> <p>No consideration has been given to trunked vis-à-vis conventional LMR.</p> <p>Ministry comment: The use of trunking has been agreed by PSRFMG</p>
<p>NZ Police</p>	<p>Agree</p> <p>The band is currently unencumbered and is covered by the switching range of equipment already deployed</p>
<p>South Island Electronics</p>	<p>Disagree</p> <p>There is a lack of compatibility with Civil Defence radio services managed by Territorial Local Authorities (TLAs).</p> <p>Ministry comment: In the long term, most PPDR services, including those provided by TLAs, will be encouraged to migrate to the ESB and ESC bands and be APCO P25 compliant.</p>
<p>Team Talk Ltd</p>	<p>Agree</p> <p>Migration of PPDR services to the ESC band will clear the F band for commercial applications.</p> <p>There appears to be some potential for PPDR services in the ESA band to migrate to the ESC band.</p> <p>Ministry comment: Most PPDR services will be encouraged to migrate to the ESB and ESC bands. However, some PPDR services may wish to retain the use of commercial channels in the C, D and F bands.</p>
<p>Marlborough District Council</p>	<p>Agree, with additional comment</p> <p>APCO P25-compatible services only.</p>

Kordia Ltd	<p>Agree, with additional comment</p> <p>This allocation may preclude the use of the bands 502-518 MHz for broadcasting (particularly DVB-H mobile TV).</p> <p>Ministry comment: see Question 3.</p>
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Conclusion

There is general agreement that this allocation is appropriate for planned PPDR UHF LMR services.

The NZ Fire Service considers that there may be insufficient channels available for all PPDR services (see the previous section for Ministry comment).

There are some reservations about the potential for interference with adjacent users. These are canvassed in detail in responses to Question 3.

Question 3

Are the suggested arrangements to manage interference into and from the band 494-502 MHz appropriate?

Respondent	Respondents' comments
ETSSG WG3	<p>Agree, with additional comment</p> <p>Power restrictions may be needed in the 502-518 MHz bands to mitigate interference.</p> <p>Ministry comment: see Conclusions below.</p>
Dept of Conservation	<p>Agree, with additional comment</p> <p>Spectrum may be compromised by digital TV services at 502-518 MHz.</p> <p>Ministry comment: see Conclusions below.</p>
NZ Fire Service	<p>Agree, with additional comment</p> <p>Power restrictions may be needed in the 502-518 MHz bands to mitigate interference.</p> <p>502-510 MHz could be used for linking.</p> <p>Ministry comment: see Conclusions below.</p>
NZ Police	<p>Agree, with additional comment</p> <p>502-510 MHz should be reserved as a guard band or services restricted to 100 dBW.</p> <p>Ministry comment: see Conclusions below.</p>
South Island Electronics	<p>Disagree</p> <p>High power TV will cause unacceptable interference.</p> <p>Ministry comment: see Conclusions below.</p>
Team Talk Ltd	<p>Agree, with additional comment</p> <p>Power restrictions may be needed in the 502-518 MHz bands to mitigate interference.</p> <p>Alternatively, extend ESC-band to the 502-510 MHz band and use 511-518 MHz as a guard band,</p> <p>Ministry comment: see Conclusions below.</p>
Marlborough District Council	No comment

Kordia Ltd	<p>Disagree</p> <p>The engineering analysis is inaccurate and LMR interference to broadcasting likely to be significant (technical analysis provided).</p> <p>Ministry comment: see Conclusions below.</p>
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Conclusions

Nearly all respondents have concerns about unwanted interference from high-power transmissions in the 502-518 MHz bands, which are nominally designated for television broadcasting (Channels 24 and 25).

Kordia, in particular, suggest that the problem is more significant than Ministry calculations suggest.

Various solutions are suggested including:

- power restrictions in the 502-518 MHz bands;
- designating 502-510 MHz as a guard band; and
- adding 502-510 MHz to the ESB band, with 511-518 MHz as a guard band

Ministry comment

The need for new PPDR spectrum has been established and the general frequency (dictated by radio propagation/bandwidth/switching range/standards requirements) has been determined as in the low UHF range.

The Government requirement for a PPDR interoperable radio network has also been established (cf, previous Cabinet decisions and the ensuing terms of reference for the Emergency Telecommunications Services Steering Group).

Some new spectrum allocation for PPDR is critical to establish a PPDR interoperable radio network in New Zealand. The candidate spectrum ranges are well utilised, however, and any new allocation will inevitably impact on current radio users.

The spectrum that provides (and will continue to provide) the minimal impact on existing services (land mobile and broadcasting in particular) is the 494 - 502 MHz band, because there are only short-term PPDR licences currently granted in this band, and there is only the frequency interface at 502 MHz that presents issues in terms of sharing with other services.

The long-term use of the 502-518 MHz bands is yet to be determined. The full implications of APCO P25 systems operating in the 494 – 502 MHz range on conventional, and of television services (analogue or digital) operating with ITU-R published receive protection criteria in the 510 – 518 MHz range, will require additional study using realistic transmitter and receiver performance information.

The Ministry has undertaken an independent review of the interference issues raised in Appendix A and B of the discussion paper vis-à-vis the use of 494 – 502 MHz with the 502-518 MHz band, and the band of frequencies greater than 518 MHz and the results of this review are presented in brief below. The complete report is to be posted on the Ministry’s web pages.

- That using a “-50 dBW” wideband emission limit in spectrum sharing studies (in this case for frequencies less than 518 MHz) is likely to predict severe limitations for receivers in adjacent bands (in this case for potential receivers in the 494 – 502 MHz band);
- That it would be impractical for APCO 25 systems operating in the 494 – 502 MHz range to be adjacent (sharing a band edge) to television broadcasting whilst meeting the limits of relevant ITU-R recommendations;
- If the band 494 – 502 MHz is allocated as an ESC band it reduces the choice of those services and applications that could be allocated in 502 – 518 MHz; and
- If the lower band edge for television broadcasting is 518 MHz then it should be a technically safe allocation for an ESC band at 494 – 502 MHz.

Question 4

Do you consider that managing the 494-502 MHz band is best achieved using the administrative licensing regime, as at present?

Respondent	Respondents' comments
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ETSSG WG3	Agree The present system works well.
Dept of Conservation	Agree Gives PPDR services input to the allocation process.
NZ Fire Service	Agree The present system works well.
NZ Police	Agree The present system works well. There is little enthusiasm among PPDR agencies for direct management of the bands.
South Island Electronics	Agree Agrees with the current system.
Team Talk Ltd	Agree The current system is proven and stable. There could be advantages in third-party operation of PPDR LMR services. Ministry comment: Front-line PPDR agencies in general prefer to manage their own LMR networks, for reasons of security and reliability. For some PPDR agencies where security is not an issue, third party provision of services may be appropriate. A Government Public Safety Radio Communications Strategic Plan is being developed by WG3 of the ETSSG. This plan includes a treatment of network governance issues.
Marlborough District Council	Agree
Kordia Ltd	Agree

Conclusion

Respondents are unanimously in accord that the present system of frequency assignment agreed by PPDR users represented on the PSRFMG, with individual licences being granted by the Ministry, should continue.

Other issues

Respondent	Repondents' comments
Dept of Conservation	MED should Gazette those LMR digital standards appropriate for use in New Zealand (APCO, TETRA, AS/ANZ 4798). Ministry comment: At its meeting on 13 March 07, the e-GIF committee approved the inclusion of APCO P25 standards into the e-Government Interoperability Framework. At the appropriate time, pursuant to Regulation 32(1)(a), (b), (c), (d) and (j) of the Radiocommunications Regulations 2001, the Ministry will prescribe the relevant standards

Team Talk Ltd	<p>There is no mention in the consultation paper of the ESD band.</p> <p>Ministry comment: The ESD band is available immediately for PPDR use but the Ministry is unaware of any immediate demand for this band. It is expected that there will be future demand for the ESD band, perhaps to meet wideband communications requirements</p>
Marlborough District Council	<p>ESB and ESC band use may impact on aeronautical radiocommunications services.</p> <p>Ministry comment: This could happen only in the unlikely event that the ESB band were extended into the 137 – 138 MHz band, which acts as a guard band between ESB and aeronautical services. Service providers migrating to the new bands may need to re-equip.</p> <p>Ministry comment: It is anticipated that this will occur as part of the normal investment cycle, as current equipment becomes due for replacement.</p> <p>A review of ESB Band users is warranted to ensure that this band is being used solely for its intended purpose and the assignments are meeting the needs of users.</p> <p>Ministry comment: Under the current arrangement licence applications for assignments in the ESB band must be approved, by a representative of the PSRFMG, prior to being granted by the MED. This ensures a process of continuous self-review.</p> <p>The MED is represented on the ETSSG and its working groups, and on the PSRFMG; the Ministry is always receptive to feedback from users of the radio spectrum.</p>

Conclusion

Other issues raised by respondents can be resolved through existing mechanisms and do not compromise the conclusions of this report.