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RDP 100-500 MHz  
October 1998

Spectrum Management and Telecommunications Policy

# **Redeployment Plan for Spectrum Efficient Land Mobile Equipment in the Frequency Range 100-500 MHz**

**Canada**

Aussi disponible en français - PRA 100-500 MHz

**DEPARTMENT OF INDUSTRY**

**RADIOCOMMUNICATION ACT**

**NOTICE NO. SMSE-009-98**

**REDEPLOYMENT PLAN FOR SPECTRUM EFFICIENT LAND MOBILE EQUIPMENT  
IN THE FREQUENCY RANGE 100-500 MHz (RDP 100-500 MHz)**

**Background**

In view of the limited availability of radio frequency spectrum in the land mobile bands between 100 and 500 MHz in large urban areas of the country, the Department of Industry initiated in April, 1995 a process leading to a change in the spectrum management framework. This change, referred to as redeployment, or sometimes as refarming, will facilitate the introduction of more spectrum efficient equipment and systems, leading to increased overall traffic capacity of the bands, as part of long term solutions in meeting mobile spectrum needs.

The changes to the spectrum management framework that are presented in the redeployment plan follow the guiding principles established in the Spectrum Policy 30-896 MHz, Part II, issued in April, 95 and the consultation with the Radio Advisory Board of Canada. The Department will use several spectrum management tools, including policy, equipment certification and authorization provisions, to achieve the redeployment objectives. Also, the plan provides incentives for voluntary early deployment of more spectrum efficient technologies, i.e., based on demonstrated need, applicants will be able to use a portion of the spectrum that is freed-up through early deployment. The Department also foresees that when the new licence fee model is implemented, using more spectrum efficient equipment may result in some reduction in licence fees. In addition, the plan is scheduled according to a time frame in two phases, to allow graceful migration to more spectrum efficient technologies.

The provisions of the redeployment plan will be applicable within congested areas, i.e., areas of intensive mobile use, where applicants are denied access to spectrum. These provisions may also be applied to assignments in areas surrounding the congested areas if they are expected to impact the availability of spectrum within the congested areas. The frequency bands to which this plan applies are the Land Mobile Service bands in the range 100-500 MHz. A list of the specific bands is provided in the redeployment plan.

The redeployment plan is available electronically via the Internet as follows:

**World Wide Web (WWW)**  
<http://strategis.ic.gc.ca/spectrum>

or in hard copy, for a fee, from:

**Tyrell Press Ltd.**

2714 Fenton Road  
Gloucester, Ontario  
K1T 3T7

Canada toll-free no.: 1-800-267-4862  
U.S. toll-free no. : 1-800-574-0137  
Worldwide tel. no. : (613) 822-0740  
Fax number : (613) 822-1089

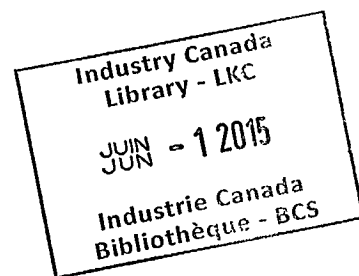
**Canada Communication Group**

45 Sacré-Coeur Blvd.  
Hull, Quebec  
K1A 0S9

Toll-free no. : 1-888-562-5561  
Fax number : (819) 779-2858  
Worldwide tel. no. : (819) 779-4335

October 21, 1998

Robert W. McCaughern  
Director General  
Spectrum Engineering Branch



## 1.0 Introduction

In view of the limited availability of radio frequency spectrum in the land mobile bands between 100 and 500 MHz in large urban areas of the country, the Department of Industry initiated in April, 1995, a process leading to a change in the spectrum management framework for these bands. This change will facilitate the introduction of more spectrum efficient equipment and systems, leading to increased overall traffic capacity of the bands, as part of long term solutions in meeting mobile spectrum needs.

The changes to the spectrum management framework that are presented in the redeployment plan follow the guiding principles established in the Spectrum Policy 30-896 MHz, Part II, issued in April, 1995 and the consultation with the Radio Advisory Board of Canada (RABC). The Department will use several spectrum management tools, including policy, equipment certification and authorization provisions, to achieve the redeployment objectives. Also, the plan provides incentives for voluntary early deployment of more spectrum efficient technologies (i.e. based on demonstrated need, applicants will be able to use a portion of the spectrum that is freed-up through early deployment).

In addition to these incentives, the Department is currently developing a new radio licence fee model, based on spectrum consumption and relative spectrum scarcity. Under the proposed new model, licensees who adopt spectrum efficient technologies would benefit from lower licence fees. The new fee model would therefore encourage voluntary early migration to more spectrum efficient technologies.

The provisions of the present plan will be applicable within congested areas (i.e. areas of intensive mobile use, where applicants are denied access to spectrum). These provisions may also be applied to assignments in areas surrounding the congested areas if they are expected to impact on the availability of spectrum within the congested areas. The frequency bands to which this plan applies are the Land Mobile Service bands in the range 100-500 MHz. A list of the specific bands is provided in Section 3.

This plan is scheduled according to a time frame in two phases, to allow graceful migration to more spectrum efficient technologies.

## 2.0 Background

In the spectrum policy review entitled *Spectrum Utilization Policy for the Mobile, Broadcasting and Amateur Services in the Frequency Range 30-896 MHz, Part II* (SP 30-896 MHz, Part II), the Department outlined a number of principles that will be followed in implementing a redeployment plan. Certain segments of industry represented at the RABC, also provided input on a number of principles. To the extent possible, the following principles are incorporated as guidelines to the redeployment plan:

- (1) Provide a gradual transition to new technologies with a minimum of disruption to existing users.
- (2) Recognize backward and forward compatibility with existing and future mobile systems to support a smooth and graceful transition to new technologies.
- (3) Adopt transition periods that reflect the future spectrum needs of a majority of users and include appropriate periods for equipment amortization.
- (4) Provide flexibility to enhance deployment of new technologies and address the diverse communication requirements of a wide array of large and small users.
- (5) Recognize the benefits from regional and international harmonization of Land Mobile Services in easing frequency coordination in border areas, and in the economy of scale on radio products.
- (6) Recognize regional differences in policy directions related to spectrum density or congestion.
- (7) Offer first consideration to freed-up spectrum to incumbents who deploy more spectrum efficient technologies prior to their current systems becoming non-standard.

### **3.0 Implementation of Redeployment Plan**

#### **3.1 General**

The redeployment plan for spectrum efficient equipment will be applied to land mobile systems in the frequency range of 100-500 MHz. Specifically, the redeployment plan provisions will be applied to the Land Mobile Service:

for the Band 150 MHz:	138-174 MHz
and for the Band 450 MHz:	406.1-410 MHz
	410-420 MHz
	420-430 MHz
	450-470 MHz

A new channelling plan will be introduced in these bands to permit the use of spectrum efficient equipment. Stations will be authorized on the new channels based on the new radio standard system plans and full coordination to stations in the adjacent channels.

The amalgamation of a number of channels is allowed provided the equipment (or the system) meets the spectrum efficiency criteria set out in the certification section of this document.

The Department introduces a redeployment plan that will increase spectrum efficiency in the bands 150 MHz and 450 MHz through the introduction of more spectrum efficient equipment. The redeployment plan will take place in two phases that will require a transition to more spectrum efficient equipment to free-up more mobile spectrum in areas of intensive mobile use where additional mobile users cannot be accommodated.

In Phase 1, this will be accomplished through specific channel plans, certification and deployment of narrow band equipment that moves from one voice channel in a 25/30 kHz channel spacing to meet a new spectrum efficiency requirement of the equivalent of one voice channel (vc) in a 12.5/15 kHz channel spacing.

In Phase 2, there is a requirement to move from a spectrum efficiency requirement of one voice channel in a 12.5/15 kHz channel spacing to the equivalent one voice channel in a 6.25/7.5 kHz channel spacing.

Equipment that has been certified to meet the spectrum efficiency requirement of one voice channel in a 25/30 kHz channel spacing may continue to be used in areas of low spectrum congestion i.e. where spectrum availability does not preclude the entry of new applicants and there is no impact on spectrum availability in areas of intensive mobile use.

For the purpose of this document, *spectrum efficient equipment* is defined as equipment capable of using less than 12.5 kHz bandwidth per voice channel in a 12.5/15 kHz spacing, and as equipment capable of using less than 6.25 kHz bandwidth per voice channel in a 6.25/7.5 kHz spacing.

In this Plan, *new systems* generally means systems that do not use existing radiocommunication infrastructure.

### **3.2 Policy Provisions to Move to Narrowband Technology**

In 1992, the Department released the *Spectrum Policy Framework for Canada* to provide guidelines on how best to respond to new spectrum requirements, to maintain the necessary flexibility to implement emerging technologies and to meet the increased demand for radiocommunication as Canada moves toward the 21st century. In the *Spectrum Policy Framework for Canada*, the Department adopted several policy guidelines to achieve this, one of which relates to spectrum conservation and efficiency and was stated as follows:

***“Policy Guideline 6 - Spectrum Conservation and Efficiency***

***To conserve spectrum in critical frequency bands, the Department may encourage appropriate radio systems to be developed in alternate frequency bands and the use of existing networks to their maximum capacity. Emphasis also will continue to be placed on efficient spectrum utilization and conservation techniques, if viable, as a requirement for existing and new services. Priority will be considered for technologies and systems which are more spectrum efficient.”***

Within the context of the *Spectrum Policy Framework for Canada*, the Department may also adopt, with appropriate notification, spectrum policies or system standards to conserve spectrum such as those envisaged in this redeployment plan, for the bands 150 MHz and 450 MHz.

The spectrum utilization policy document entitled *General Information Related to Spectrum Utilization and Radio Systems Policies* (SP Gen) classifies radio systems as either standard or non-standard. Standard systems are those that conform to the most recent issue of a Spectrum Utilization Policy (SP) and the Radio Systems Policy (RP), whichever is applicable (SP/RP), and when relevant, to the corresponding Standard Radio System Plan (SRSP). Non-standard systems are those that are already licensed and do not conform to the most recent issue of the SP/RP and the SRSP for the frequency band in question.

When the Department adopts a policy or system standard for the introduction of more spectrum efficient equipment in a particular frequency band, the SP Gen, unless determined otherwise, sets out the specific, appropriate minimum period for equipment/systems being declared non-standard and the notification time frames. In general, a minimum period of five years is provided before equipment or a system becomes non-standard as a result of a change in an SP/RP or SRSP and a minimum notification period of two years will be given by the Department for any radio system change (modification, replacement or removal) that is required.

In the context of the redeployment plan for mobile service bands in the range 100-500 MHz and the economic incentives of the new radio licence fee model, the Department will apply this five and two year rule. This will apply where non-spectrum efficient equipment blocks the entry of narrow band systems that meet the new equipment efficiency standard.

Radio systems policy RP-004, *Policy for the Licensing of Very Low Capacity Point to Point Links in the Band 30-890 MHz*, traditionally has been used to define the cities that are considered to be "Areas of Intensive Mobile Use"<sup>1</sup>. However, the Department has developed a new technique for measuring spectrum consumption, scarcity and licensed mobile spectrum below 1 GHz and it has defined spectrum saturation levels. These levels will, for the time being, replace RP-004 and the information is more current for the definition of "Areas of Intensive Mobile Use". Table 1 sets out a brief description of the saturation levels numbered 1 through 5, Level 1 being the lowest spectrum saturation level and Level 5 being the highest spectrum saturation level.

**Table 1**

<b>Cell Saturation Level</b>	<b>Areas Affected</b>
<b>Level 1 - 0 - 30%</b>	97% of the geography of Canada
<b>Level 2 - 30 - 45%</b>	2% of the geography of Canada, including: Edmonton, Calgary, Ottawa, Charlottetown, Saint John N.B.
<b>Level 3 - 45 - 60%</b>	0.6% of the geography of Canada, including: the outskirts of Vancouver, Montreal and Toronto, Halifax
<b>Level 4 - 60 - 75%</b>	0.1% of the geography of Canada - Greater Montreal area, Greater Vancouver area, Greater Toronto area excluding the core, Ottawa
<b>Level 5 - 75 - 100%</b>	less than 0.01% of the geography of Canada - the city of Toronto, and a small area near Windsor, Ontario

This technique will assist in providing an indication of the areas within which redeployment of more spectrum efficient equipment will first be required in the short term, as well as those areas that will be affected in the longer term. [refer to Annex 2 that sets out spectrum saturation level maps for the cities of Montreal, Toronto and Vancouver]<sup>2</sup>.

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<sup>1</sup> These areas are generally within 120 km of the centres of: Montreal, Toronto, Hamilton, London, Windsor, Kitchener, St. Catharines/Niagara Falls, Oshawa, Edmonton, Calgary and Vancouver/Victoria.

<sup>2</sup> The Department notes that the cities of London, Oshawa, Edmonton, Calgary and Victoria that currently fall within the RP-004 definition of "Areas of Intensive Mobile Use", do not fall within the spectrum saturation levels 4 and 5. This redeployment plan seeks to address spectrum shortages in levels 4 and 5 only.



### 3.2 Time Table

In accordance with these policy provisions and spectrum saturation levels, the Department establishes the following timetable for the introduction of more spectrum efficient equipment in the bands 150 MHz and 450 MHz.

#### 3.2.1 Phase 1 - 12.5/15 kHz Channel Spacing Efficiency Standard

Existing mobile systems that operate in areas of high spectrum congestion employing 25/30 kHz channel spacing technologies and carrying a single voice channel will be deemed to be non-standard as of January 1, 2004 [refer to spectrum saturation levels 4 and 5 in Annex 2] .

This means that in the highly spectrum congested urban centres of Vancouver, Toronto and Montreal and other urban areas [refer to spectrum saturation level 5 in Annex 2], where there is a clear demand for spectrum in the frequency bands or where narrow band standard systems are being blocked from entry into these bands, non-standard systems will be first to receive such notice. In these areas, notices will be served on or before January 1, 2002 to conform to Phase 1 spectrum efficiency criteria of the equivalent of one voice channel in a 12.5/15.0 kHz channel.

#### 3.2.2 Phase 2 - 6.25/7.5 kHz Channel Spacing Efficiency Standard

Existing mobile systems that operate in areas of high spectrum congestion employing 12.5/15 kHz channel spacing technologies and carrying a single voice channel will be deemed to be non-standard as of January 1, 2010 and will need to conform to Phase 2 spectrum efficiency criteria of the equivalent of one voice channel in a 6.25/7.5 kHz channel. The Department will provide notification of the five and two year rule to non-standard systems that require change-over prior to January 1, 2010.

The Table contained in Annex 1 provides the important implementation dates for the redeployment plan and the different areas of activities.

### 3.3 Equipment Certification

The radio equipment operating in the bands listed in section 3.1 must be certified under the appropriate equipment standard. At the moment, all the relevant equipment specifications are encompassed within the Radio Standards Specification 119 (RSS-119), *Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960.0 MHz*. In 1996, a fifth issue of RSS-119 was released which provided for an increase in spectrum efficiency for all new models of equipment with an effective date of **February 24, 1997**. Since then, all new models must meet a minimum spectrum efficiency standard of one voice channel per 12.5 kHz bandwidth (RSS-119),

regardless of whether the equipment operates within a 12.5 kHz or 15 kHz radio channel spacing, according to the relevant frequency band.

The Department is not revoking the certification of equipment which was certified prior to February 24, 1997 and which does not meet the latest spectrum efficiency standard.

New models of equipment which offer both one vc per 25 kHz and two vc per 25 kHz, called dual mode equipment, will continue to be certified as they can facilitate the migration of existing networks to the required spectrum efficiency.

After **January 1, 2005**, equipment for which certification is required must meet a spectrum efficiency level of one vc per 6.25 kHz bandwidth (RSS-119), regardless of whether the equipment operates within a 6.25 kHz or 7.5 kHz radio channel spacing, according to the relevant frequency band.

The Department may incorporate in a future version of its standard, a spectrum efficiency requirement for digital equipment if a suitable definition can be established and if it can assist in achieving the redeployment objectives.

### **3.4 Authorization**

**Forty-five days** after the publication of this Plan, new systems in areas of high congestion, subject to local conditions, shall meet the one vc per 12.5 kHz efficiency standard or equivalent of Phase 1 spectrum efficiency criteria.

In certain circumstances, new systems that make use of equipment not meeting the spectrum efficiency criteria may be authorized. For example, a new system that optimizes the use of the existing spectrum environment through vertical loading may be permitted. Such systems would be considered as any other non-standard system as per the calendar of events. Furthermore, applications for the expansion of an existing network or system employing non-spectrum efficient equipment may be authorized on a case-by-case basis.

To the extent possible, first consideration to vacated spectrum will be given to incumbents who deploy spectrum efficient equipment prior to their system becoming non-standard where additional frequency assignment can be justified.

#### 4.0 Implementation

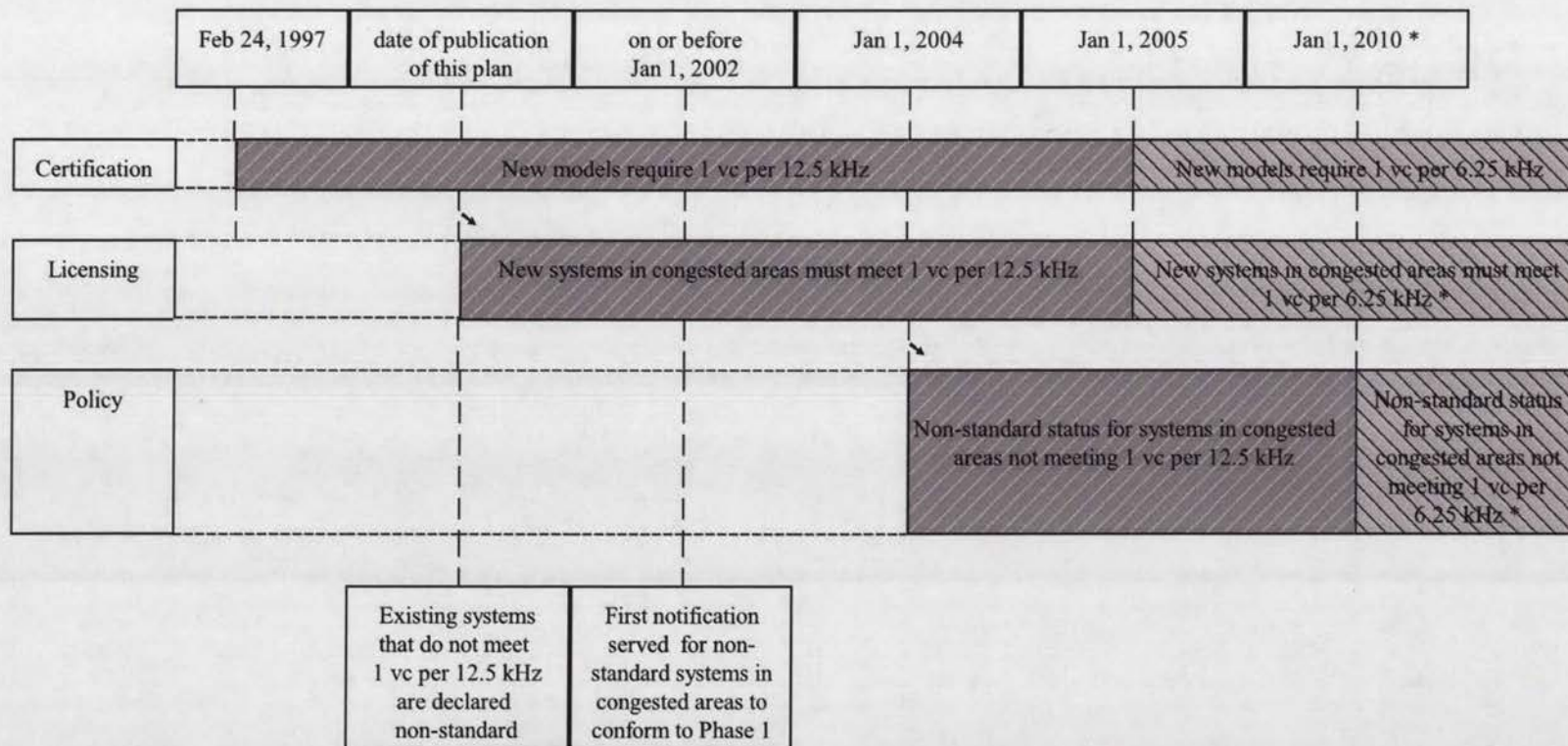
It is suggested that applicants contact the nearest office of Industry Canada regarding licensing in the bands 138-174 MHz, 406.1-430 MHz and 450-470 MHz. General inquiries about the policy provisions contained in this document may be addressed to the Terrestrial Engineering Directorate, Spectrum Engineering Branch, 300 Slater Street, Ottawa, Ontario, K1A 0C8.

Issued under the authority  
of the *Radiocommunication Act*

Robert W. McCaughern  
Director General  
Spectrum Engineering Branch

Annex 1

Table 2 - Calendar of events



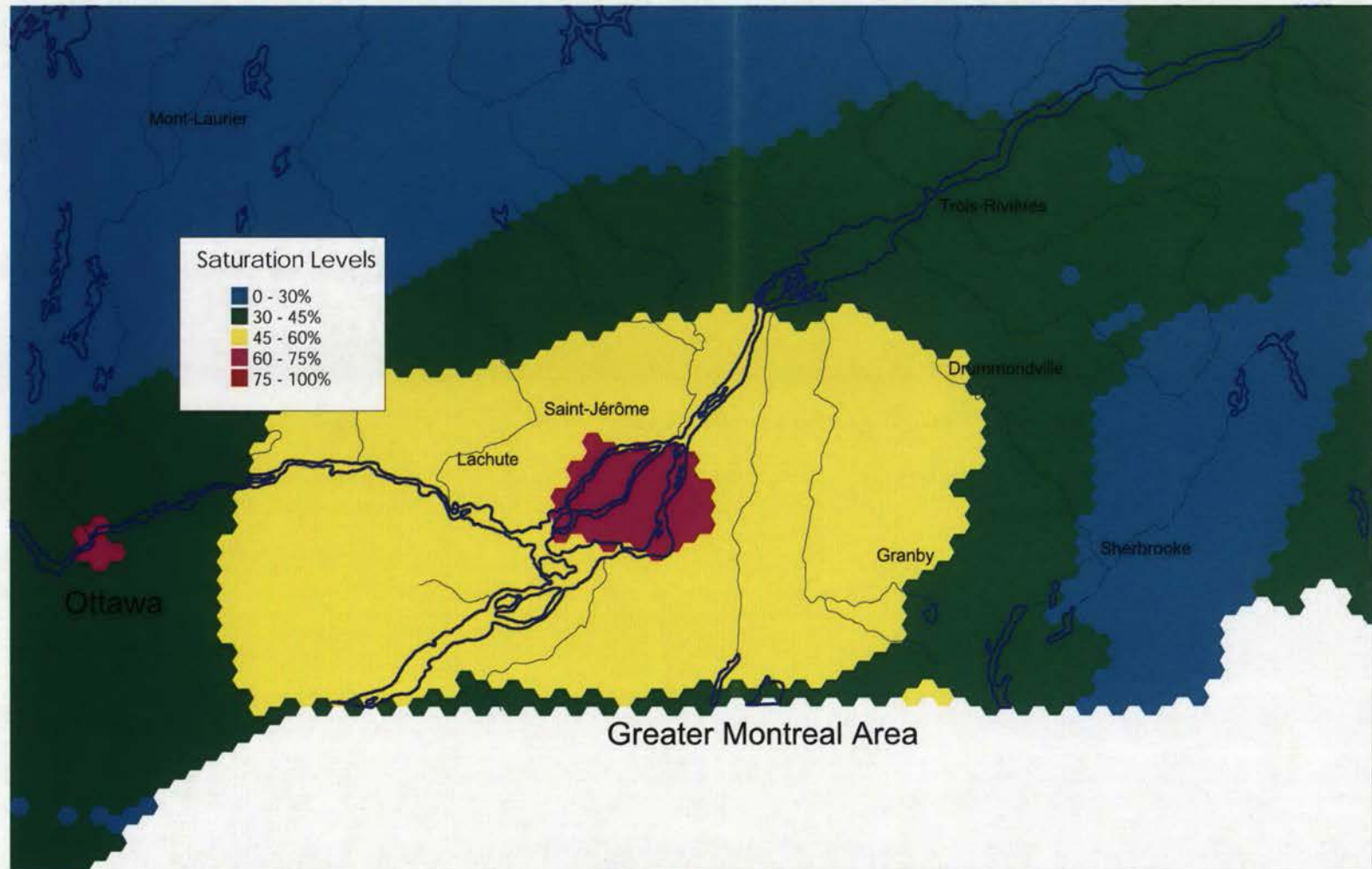
\* The Department will provide notification to systems requiring change-over before January 1, 2010 for Phase 2 spectrum efficient criteria.

**Note:** 'Equivalent' spectrum efficiency is also acceptable, for example, 2 voice channels in 25 kHz is considered equivalent to 1 v.c. per 12.5 kHz.

 Phase 1

 Phase 2

Annex 2



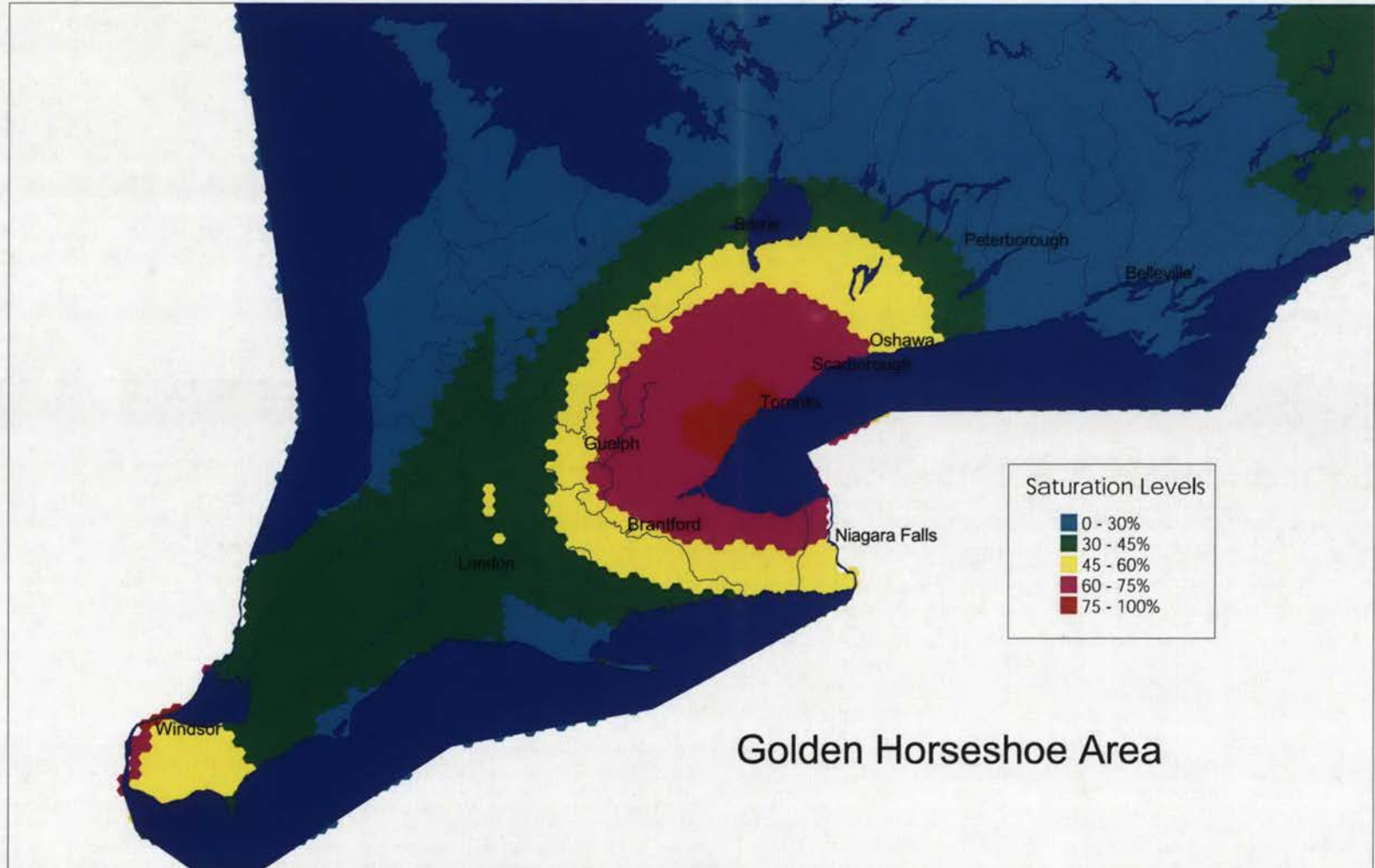
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