

National Research Council White Paper

CHU

Western Canada

Coverage Gap Elimination Proposal

CHU

CHU Time Station (Ottawa) is Canada's domestic shortwave time signal station.

CHU existed long before the Internet and satellite navigation systems that also provide time signals.

CHU itself provides most of the time services (but not frequency services) of equal quality to WWV & WWVB (Boulder, Colorado) and WWVH (Kauai, Hawaii).

However, the usefulness of CHU decreases as one moves farther and farther away from Ontario and Quebec.

CHU reception in the high Arctic may be as problematic as reception in Western Canada. What with other Arctic nations making new claims on Arctic resources, there is a territorial imperative to provide services to this region.

Current problems with CHU that need to be addressed

National sovereignty

- WWV, WWVB and WWVH should not be considered as viable replacements for Western Canada as there are still technological problems with their IRIG Time Signaling data structures.
- Beyond the 250 km strip of habitation in southern Canada, WWV and WWVH provide poor signals.
- Most modest geophysical storms can render WWV reception useless (on all frequencies) in approximately 30% of Canada's EEZ, and 70% of its landmass.
- Shortwave propagation studies suggest that the transmitter of 20 kw power should be able to reach the high arctic as well as provide substantial day to day redundancy with the US WWV Time Station.

Current problems with CHU that need to be addressed

Quality of Service

- The current CHU IRIG Signaling structure does not indicate the transmitter coordinates thereby making reverse VOACAP time delay calculations very complicated and ambiguous.
- CHU reception in Western Canada (West of Manitoba) and the Arctic (North of 55° Latitude) is generally poor year round on all frequencies.
- Mild to moderate geomagnetic storms make CHU inaccessible on all frequencies in Western Canada.
- Atlantic Canada has CHU reception problems similar to Western Canada.
- CHU can deliver other kinds of important scientific and governmental messaging services. With some partial reorganization of CHU's legal status it could be possible to make its services self supporting.

Current problems with CHU that need to be addressed

Broadcasting related

- Upgrading CHU's Ottawa transmitters to 10 kw or 20 kw will not universally fix coverage and reliability problems in Western Canada.
- This CHU coverage proposal is to enhance reception in the ITU CIRAF Zones: 02, 03, 06NW.
- This proposal can be optimized for Atlantic Canada (on a smaller scale) using different frequencies and lower transmitter power (~5 kw).

Current problems with CHU that need to be addressed

Propagation

- The "ionospheric path delay" that is inherent in shortwave propagation makes using CHU's time signals problematic in Western Canada.
- The NRC has openly acknowledged the 'path delay' problem for decades: *"for all distant users of CHU, the dominant source of time error comes from the radio wave path reflecting off the ionosphere as the radio signal travels from the transmitter"*.
- Having 2 or 3 separate sites dedicated to the transmission of shortwave time signals is a good idea. The sheer size of Canada's landmass and EEZ size dictate this.

Current problems with CHU that need to be addressed

Digital Audio Broadcasting

- Digital Radio Mondial (DRM) has a globally agreed upon transmission system that can already transmit time signal packets with accuracy and resolution and equal to or greater than CHU is currently able to.
- DRM offers more options, including the ability to design custom services like a higher resolution alternate time service.
- DRM can transmit geophysical alerts, NAVTEX, websites, etc. DRM is a very flexible digital transmission technology.
- DRM does not require an ultrastable transmitter frequency to operate effectively with respect to 3 hop data transmission.

Proposed 2nd CHU Service

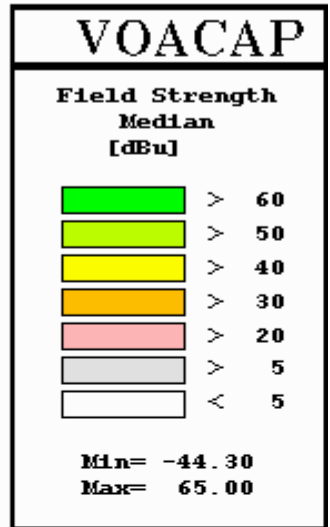
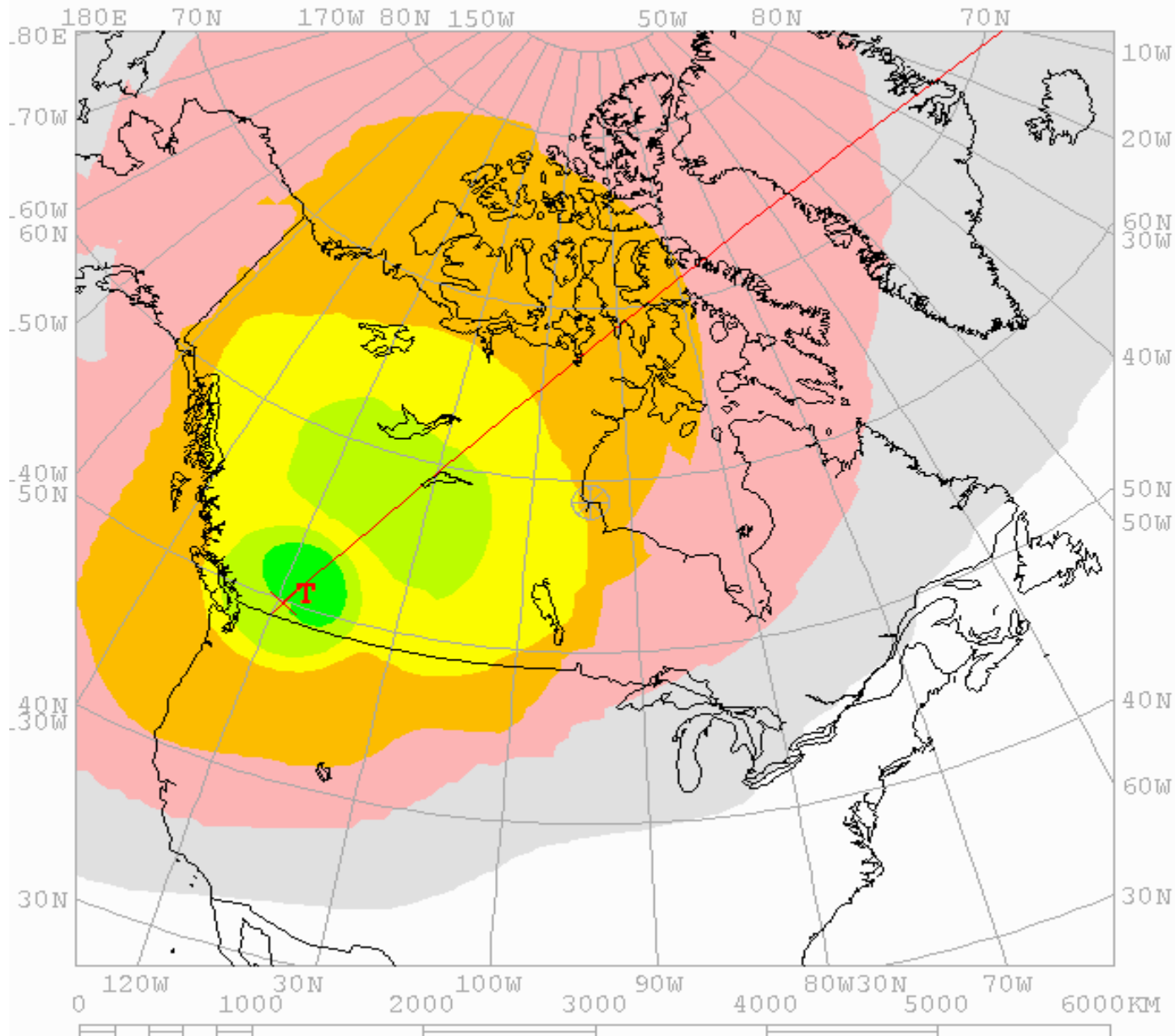
KELOWNA [LPH CHU] 20kW 26deg 18ut 7.335MHz Dec 73ssn

DBU

Tx location to grid of Rx

AREADATA\default\chu_west_01.V12

Version 05.0119W



CCIR coefficients

99x 99 gridsize

Proposed antenna type

Sanson-Flamsteed Projection

(Horiz Log-Periodic)

LPH CHU
..\antennas\custom\lph-chu.

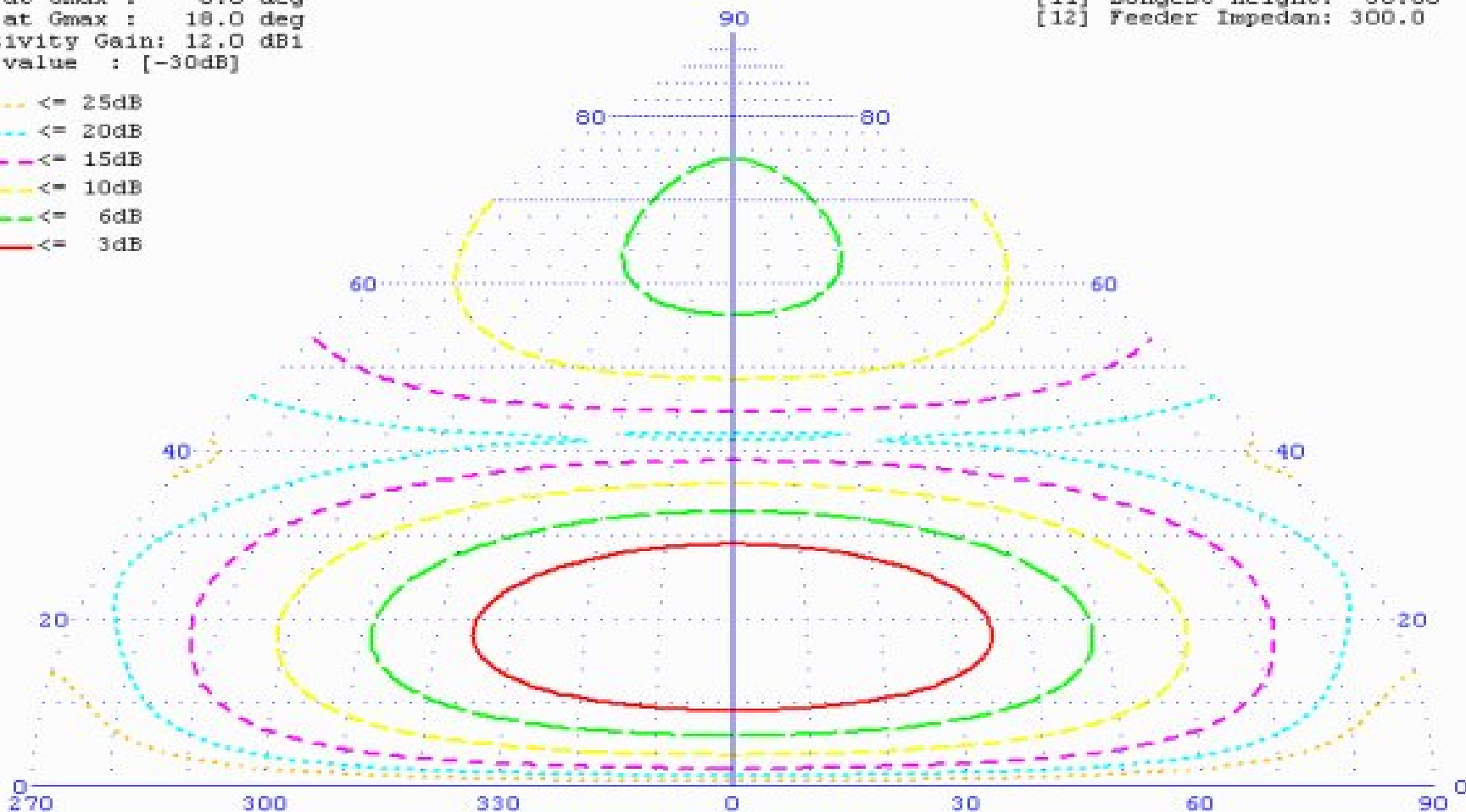
Type = 5 ITU-R Rec705
HORIZONTAL LOG-PERIODIC ARRAY

Azim at Gmax : 0.0 deg
Elev at Gmax : 18.0 deg
Directivity Gain: 12.0 dBi
Floor value : [-30dB]

Parameters:

[5] Operating Freq: 7.300
[6] # Elements....: 30
[7] Shortest Elem.: 1.0
[8] Longest Elem.: 30.0
[9] S/L Center Dis: 60.0
[10] Shortest Height: 30.00
[11] Longest Height: 30.00
[12] Feeder Impedan: 300.0

----- <= 25dB
----- <= 20dB
----- <= 15dB
----- <= 10dB
----- <= 6dB
----- <= 3dB



Forward Radiation Pattern

How can this infrastructure project be implemented?

In order to be able to build and maintain this infrastructure project a series of Public-Private Partnerships (PPP) are needed.

All NRC Time Stations (be they on shortwave, longwave or via any other delivery medium) should all be converted to "Public Trust" entities.

As Public Trust entities they would be better protected from closure due to "Year-to-Year" Federal Government funding issues. This legal status should be viewed as separate from their existence as entities that are either directly government funded or PPP funded.

Here is how a PPP could be constructed for this kind of project

- Project design : University of British Columbia (UBC)
 - All work could easily be done by Graduate or Undergraduate students were appropriate, with departmental oversight and certification. Technically this is the construction of a scientific instrument.
 - Antennas: UBC Electrical Engineering (EE)
 - Transmitter Buildings & Facilities : UBC Architecture
 - Non-transmitter Equipment : UBC EE or Physics
- Project daily maintenance : Thompson Rivers University
- Project seasonal maintenance : University of British Columbia & National Research Council
- Project regulatory issues : National Research Council (ITU Frequency, ITU Status, Electricity 50%, Plant & Equipment 50%)

The following Digital Radio Mondiale (DRM) features can be used by CHU in either their existing form or in a slightly modified form from what you will see

The DRM standard is very flexible, and CHU should use its research capabilities to increase the accuracy and overall reliability of the time signals deliverable by DRM

DRM Programme Guide

Programme Guide

BBCWorld Service

1 3 2006

Programme Guide

Guide Basic Profile Data Advanced Profile Data

Time [U]	Name	Genre	Description
00:00	World News	News	The latest news updates from around the world.
00:05	Outlook	Consumer advice	The weekday magazine featuring ordinary people and
00:45	Off the Shelf	FICTION	7/8. J M Coetzee's novel is set in post-apartheid Sout
01:00	World News	News	The latest news updates from around the world.
01:05	Masterpiece	Arts & Media	Latin Takeover: Harlem-based broadcaster Harry Alle
01:30	White Label	Pop-rock	The latest from the world of popular music, featuring a
02:00	World News	News	The latest news updates from around the world.
02:05	Go Digital	Sciences	An update on how technology is changing our lives. f
02:30	Everywoman	Current affairs	A weekly magazine programme for and about women
03:00	World News	News	The latest news updates from around the world.
03:05	The World Today	News	News and analysis from around the world.
04:00	World News	News	The latest news updates from around the world.
04:05	Outlook	Consumer advice	The weekday magazine featuring ordinary people and
04:45	Off the Shelf	FICTION	8/8. J M Coetzee's novel is set in post-apartheid Sout
05:00	World News	News	The latest news updates from around the world.
05:05	World Briefing	News	World news and dispatches.
05:20	World Business Report	Economic	Analysis of the key business issues of the day, with up
05:30	The World Today	News	News and analysis from around the world.
06:00	World News	News	The latest news updates from around the world.
06:05	The World Today	News	News and analysis from around the world.

Close

DRM Alternate Frequency Service

Frequency [kHz]	System	Time [UTC]	Target	Days
3995	DRM	16:00-10:00	Scandinavia, west Russia northwest, northwest ...	daily
3995	AM	00:00-01:00	Scandinavia, west Russia northwest, northwest ...	daily
5810	DRM	19:00-23:00	northwest Europe, central east south Europe	daily
6130	DRM	07:00-10:00	northwest Europe, central east south Europe	daily
6130	DRM	14:00-16:00	northwest Europe, central east south Europe	daily
6140	DRM	10:00-13:00	northwest Europe, central east south Europe	daily
6140	DRM	16:00-19:00	northwest Europe, central east south Europe	daily
7265	DRM	06:30-12:00	northwest Europe, central east south Europe	daily
9655	DRM	12:00-13:59	northwest Europe, central east south Europe	daily
9800	DRM	23:00-23:30	central USA, east USA	daily
15440	DRM	09:00-11:59	northwest Europe, central east south Europe	daily
15440	DRM	13:00-13:59	northwest Europe, central east south Europe	daily
17800	DRM	14:00-16:00	northwest Europe, central east south Europe	daily
21820	DRM	08:00-10:25	central east south Europe, Egypt, Libya, Middle E...	daily

17:04 UTC

Close

CHU DRM time station possibilities

Defense Forces Messaging

DRM Multimedia Player

VT Digital Military Messaging System MMS

MMS Inbox

Current Messages HMS Coventry

Message ID	Sent Date	Received Date	Read Date	Archive
HMS Coventry 22644FB5-5463-11D7-98F90080D02098E5	21-Oct-104	21-Oct-104		
HMS Coventry 22644FB5-5463-11D7-98F90080D02098E8	20-Oct-104	21-Oct-104		
All Ships GBXZ 22644FB5-5463-11D7-98F90080D0209853	20-Oct-104	21-Oct-104		
All Ships GBXZ 22644FB5-5463-11D7-98F90080D02098D8	20-Oct-104	21-Oct-104		
All Ships GBXZ 22644FB5-5463-11D7-98F90080D02098X4	20-Oct-104	21-Oct-104	21-Oct-104	
HMS Coventry 22644FB5-5463-11D7-98F90080D0209859	20-Oct-104	21-Oct-104	21-Oct-104	
HMS Coventry 22644FB5-5463-11D7-98F90080D02098C4	20-Oct-104	21-Oct-104	21-Oct-104	
HMS Coventry 22644FB5-5463-11D7-98F90080D02098P9	18-Oct-104	19-Oct-104	21-Oct-104	
All Ships GBXZ 22644FB5-5463-11D7-98F90080D02098R7	18-Oct-104	19-Oct-104	19-Oct-104	




= Message waiting = Message read = Archive message






©SMART Web Designs 2004 - Company Restricted

Ready

DRM time station possibilities

NAVTEX Data Stream

Address  C:\DREAM\drm\windows\Debug\MOTCache\index.html  Go  Links

  Search   3 blocked 

Niton

ISSUED BY THE MET OFFICE AT 121900 UTC
GALE WARNINGS: NONE
THE GENERAL SITUATION AT MIDDAY
LOW 50 MILES NORTHEAST OF ICELAND 989 MOVING STEADILY NORTH AND
DEEPENING 982 BY MIDDAY TOMORROW. NEW LOWS EXPECTED BAILEY 992 AND
SOUTHEAST ICELAND 991 BY SAME TIME
24-HR FORECASTS
THAMES DOVER WIGHT PORTLAND
SOUTHEAST 4 OR 5, OCCASIONALLY 6 IN WIGHT AND PORTLAND. MAINLY FAIR.
MAINLY GOOD
PLYMOUTH BISCAY
SOUTHEAST 5 OR 6, OCCASIONALLY 7 IN PLYMOUTH, BUT VARIABLE 3 OR 4 AT
FIRST IN SOUTHWEST BISCAY. OCCASIONAL RAIN. MODERATE OR POOR
FITZROY SOLE
SOUTH OR SOUTHWEST 5 TO 7, BUT VARIABLE 3 OR 4 IN SOUTH FITZROY.
OCCASIONAL RAIN. MODERATE OR GOOD
LUNDY FASTNET
SOUTH OR SOUTHEAST 5 TO 7, PERHAPS GALE 8 LATER. RAIN AT TIMES.
MODERATE OR POOR
OUTLOOK FOLLOWING 24 HOURS:
STRONG SOUTHERLY WINDS AT FIRST IN PLYMOUTH, SOLE, LUNDY AND FASTNET

CHU DRM time station WEFAX ...



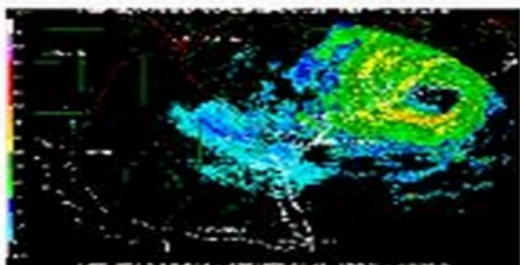
Demonstration Broadcast Web Site
For HF Weather Data

[Home](#) [Satellite Images](#) [Shipping Forecast](#) [MMS Inbox](#)

Welcome to HF Weather Data

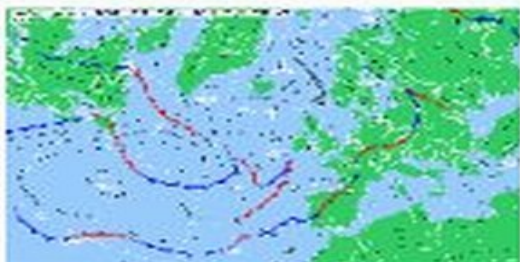
This is a Demonstration Broadcast Web Site showing how weather and satellite images can be broadcast on HF using the latest Digital techniques.

Hurricane Data



[▶ Hurricane Claudette, 16 colours, 33KB, png file](#)

Weather Maps

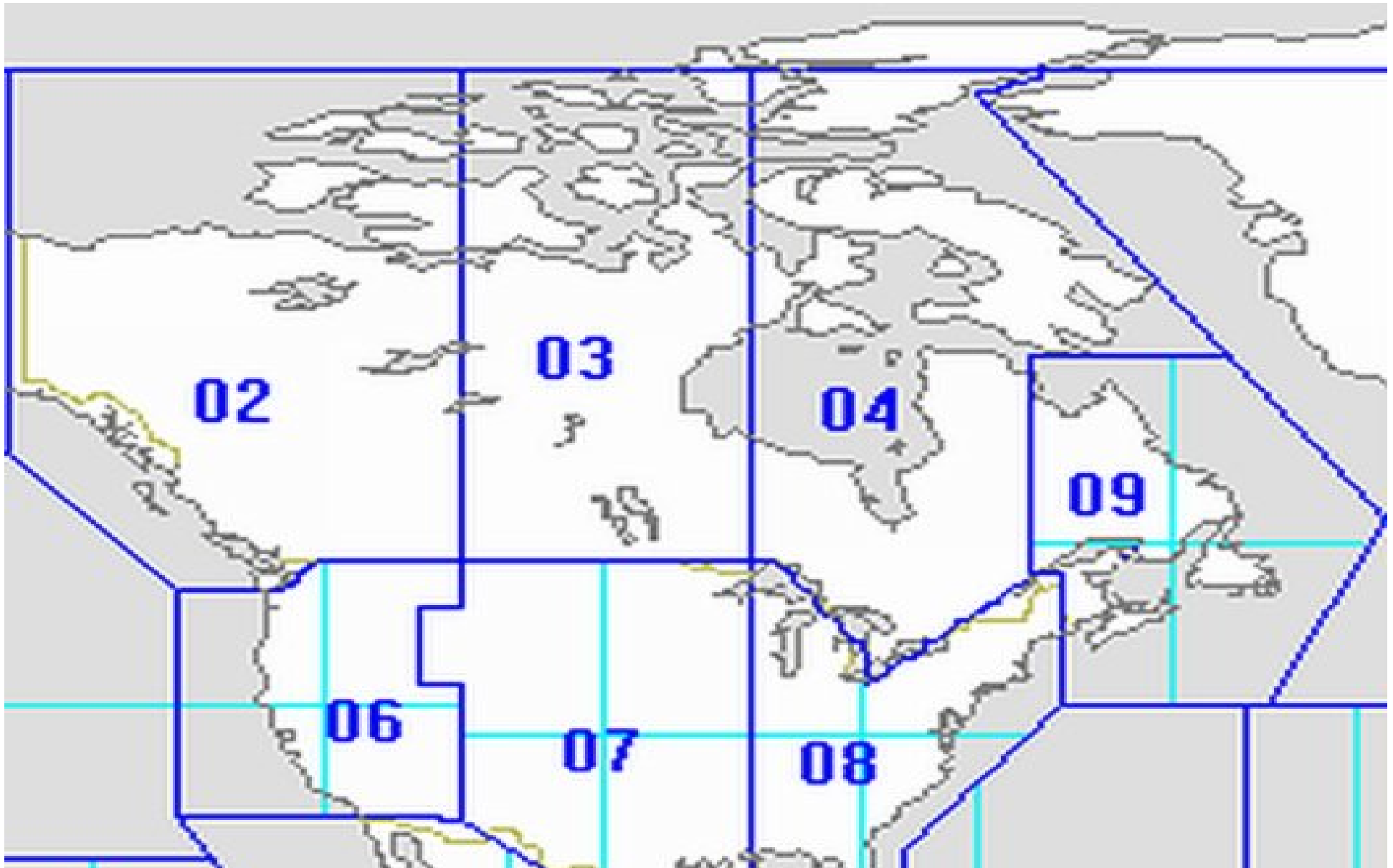


[▶ Surface Prognosis 6 colours png](#)

Latest Infra Red

Regulatory References

Canada's ITU CIRAF Zones



Technical acknowledgements

Max Power, CEO
Power Broadcasting
Adelaide / Wellington / Vancouver