DRAFT FREQUENCY MIGRATION REGULATION AND FREQUENCY MIGRATION PLAN

TRANSNET

delivering freight reliably

Transnet Presentation on the Draft Frequency Migration Regulation and Frequency Migration Plan to ICASA

CONTENTS

PURPOSE OF PRESENTATION

- To highlight the significant financial and operational implications of the proposed frequency migration on Transnet and on the country as a whole.

- An overview is provided to place these implications into context:
  - The extent of the Transnet telecommunication network and the purposes for which the 450-470MHz band is used;
  - The safety critical nature of Transnet's electronic communications;
  - The dependencies of other role players such as PRASA; and
  - The cost of the proposed frequency migration is discussed.

- Various options will be proposed to accommodate the release of new spectrum to IMT, whilst still accommodating Transnet's mission critical use of frequency spectrum, and a resultant saving of significant cost to Transnet and the country as a whole.

SAFETY CRITICAL NATURE OF TRANSNET'S TELECOMMUNICATIONS

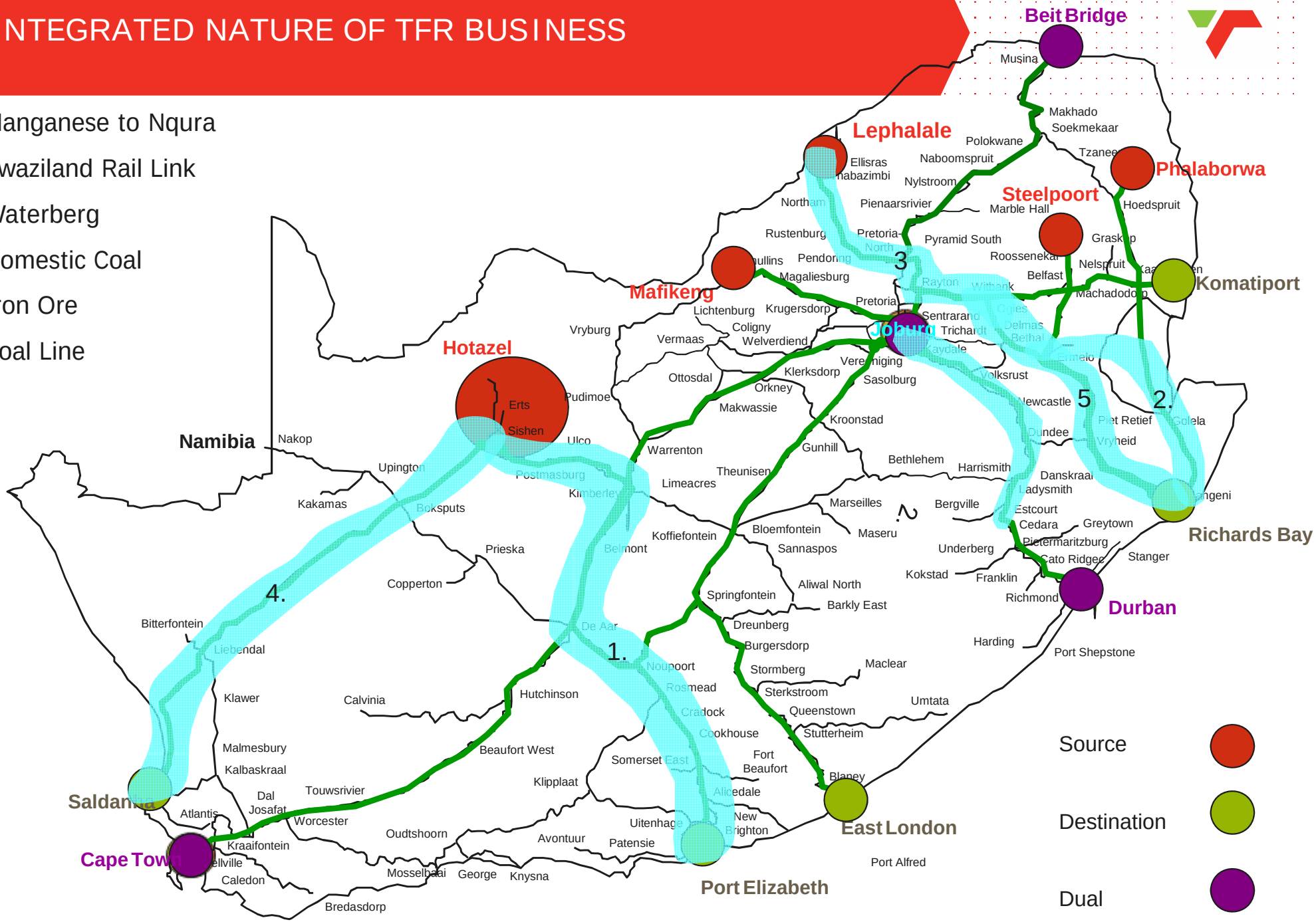
- Transnet conducts train, port and pipeline operations through various Operating Divisions. These operations are conducted in dangerous environments, which may be highlighted as follows:
  - Crane and train movements take place in a "steel-on-steel" environment;
  - Train operations and lighthouse operations take place in remote areas where radio communication is the only contact facility;
  - Working on and with high voltage overhead lines requires control and co-ordination via radio communication; and
  - A safety mind set in all aspects of railway operations is so critical, that the concept of safe railway operations is embedded even through the target slogan for Transnet Freight Rail, which reads:

"225 Million Tons SAFELY, Fo sho Noma kanjani!!"

Any migration of critical train and other control systems may have significant risk implications

INTEGRATED NATURE OF TFR BUSINESS

1. Manganese to Nqura
2. Swaziland Rail Link
3. Waterberg
4. Domestic Coal
5. Iron Ore
6. Coal Line

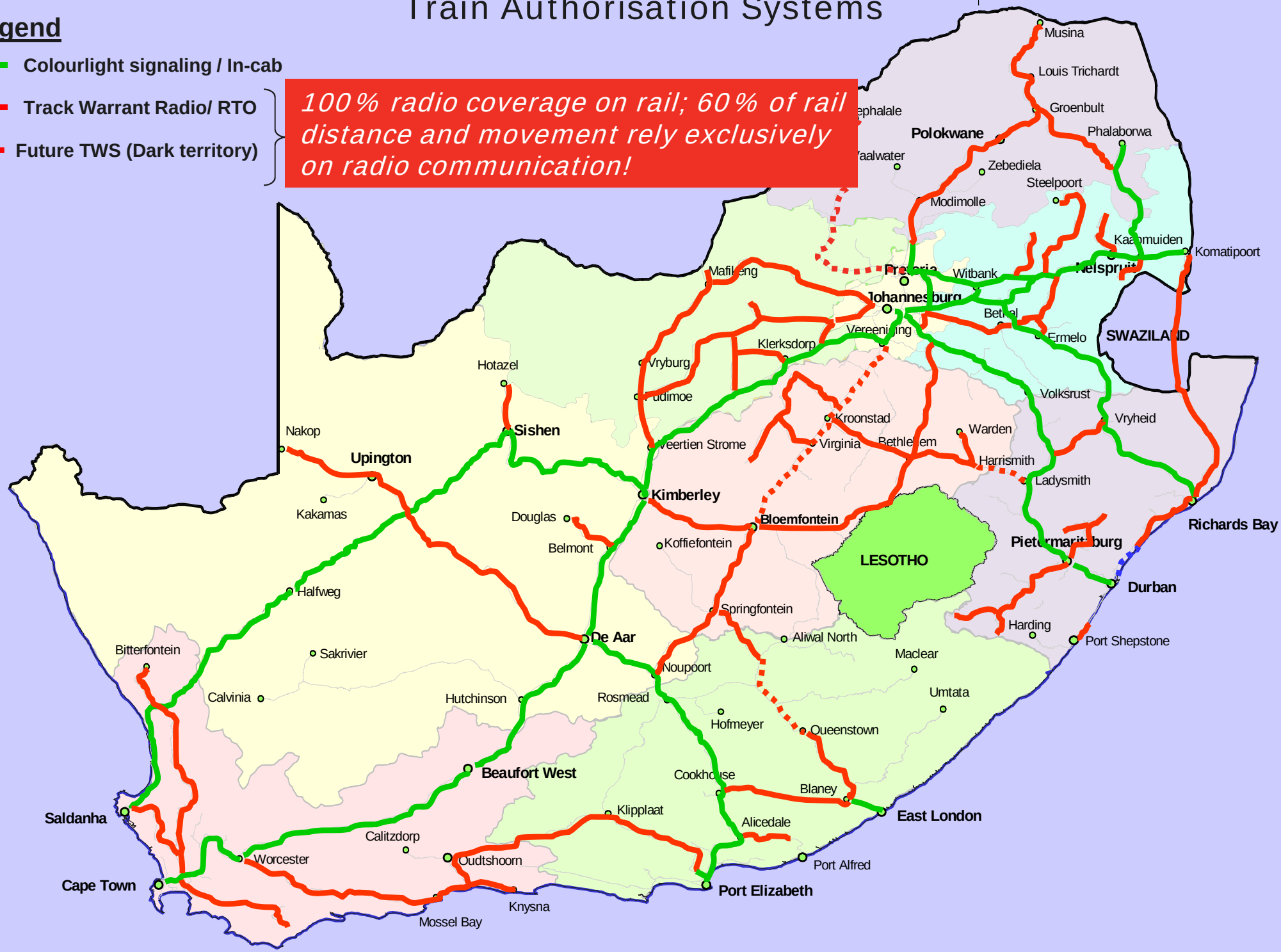


Train Authorisation Systems

Legend

- Colourlight signaling / In-cab
- Track Warrant Radio/ RTO
- Future TWS (Dark territory)

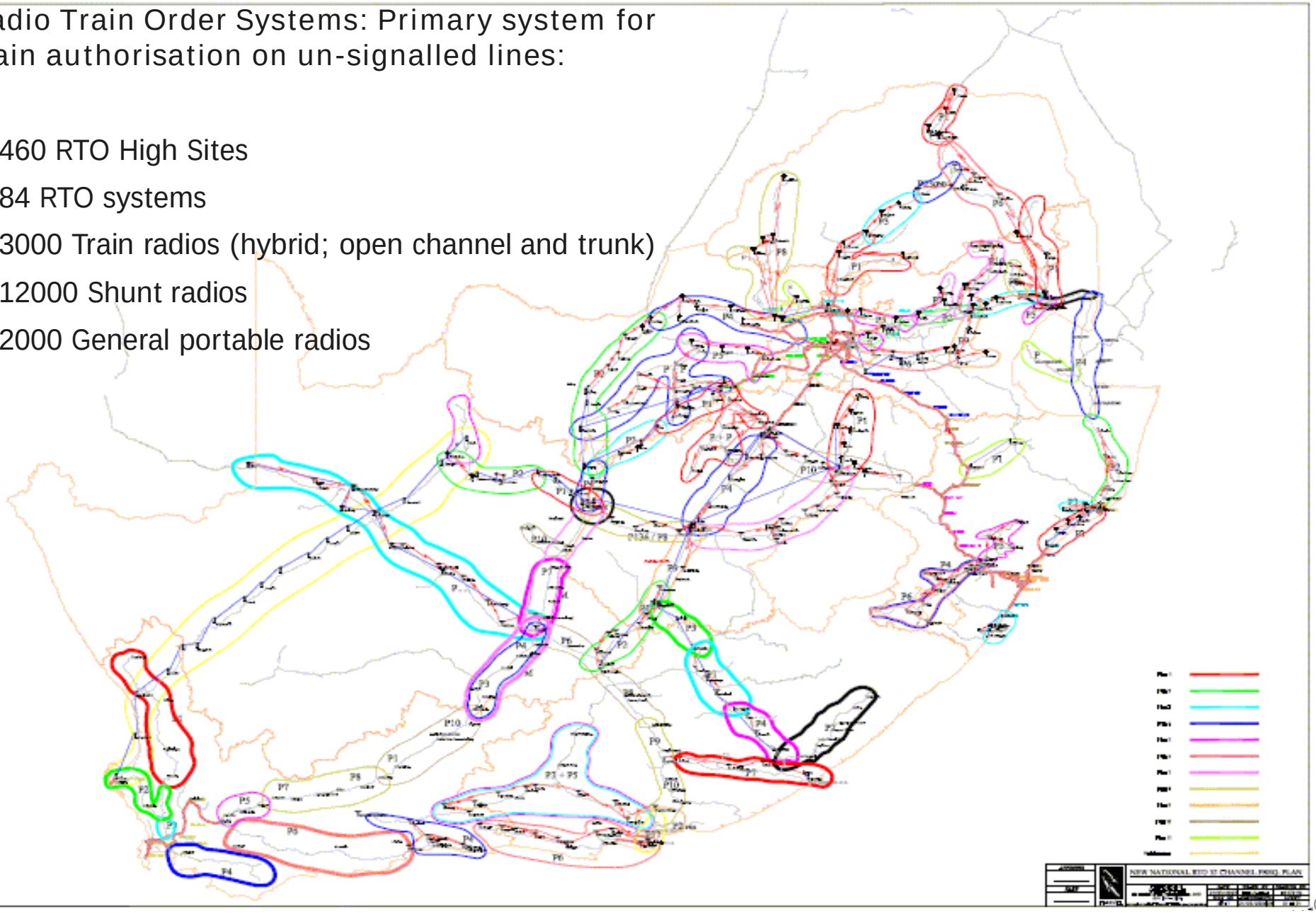
100% radio coverage on rail; 60% of rail distance and movement rely exclusively on radio communication!



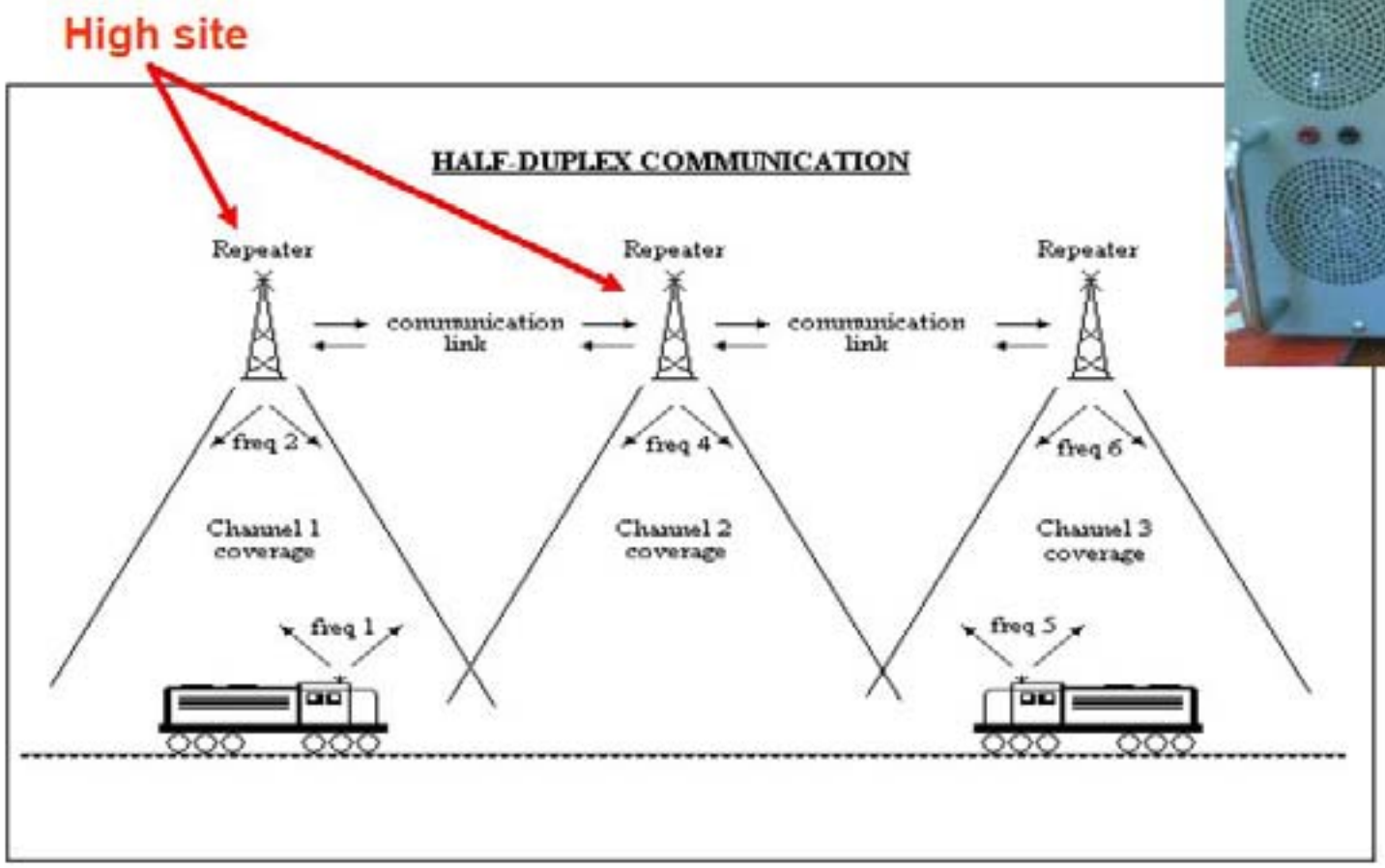
TRANSNET TELECOMMUNICATIONS NETWORK

Radio Train Order Systems: Primary system for train authorisation on un-signalled lines:

- 460 RTO High Sites
- 84 RTO systems
- 3000 Train radios (hybrid; open channel and trunk)
- 12000 Shunt radios
- 2000 General portable radios



Radio Train Order Principles



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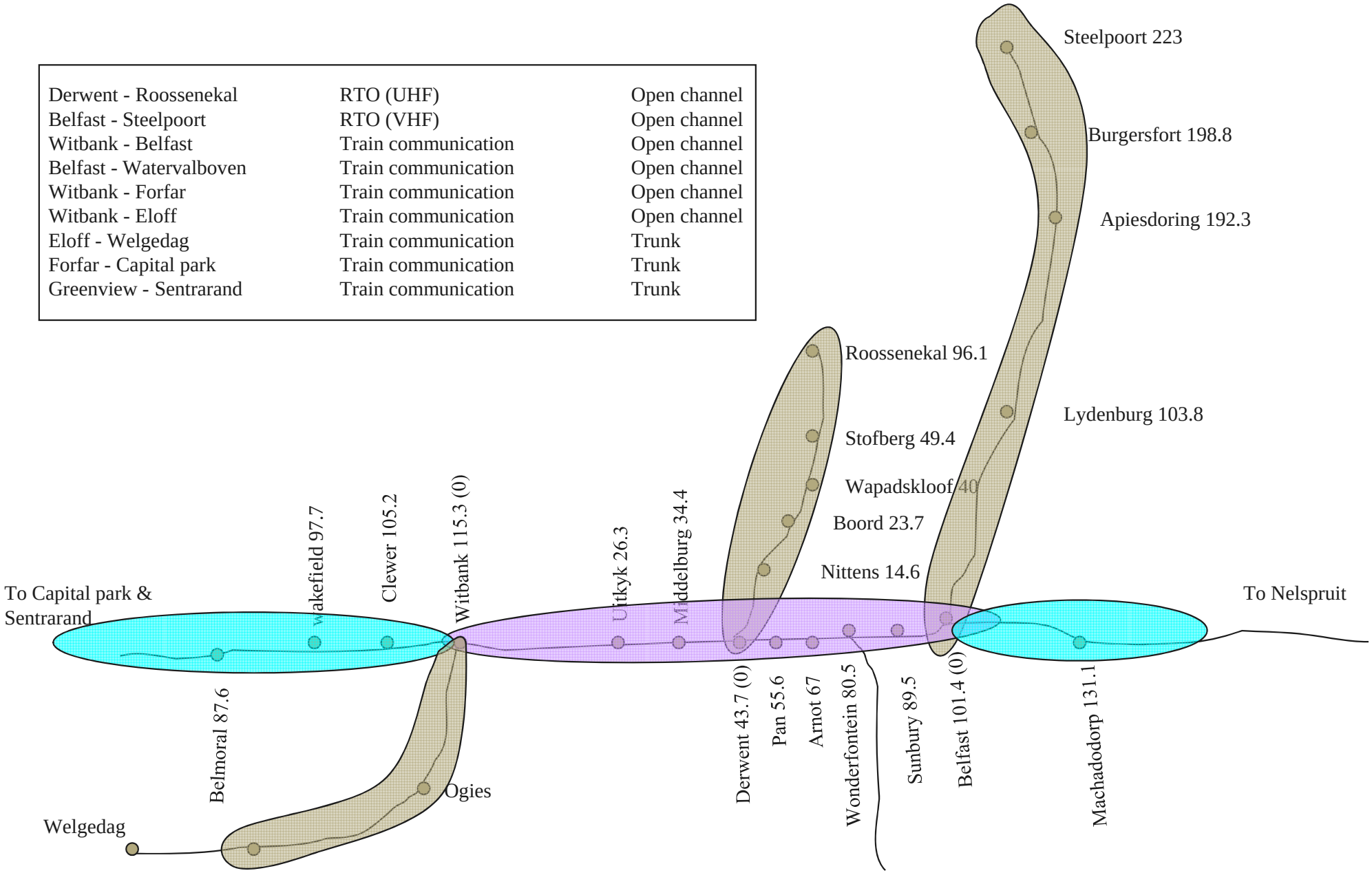
TRANSNET TELECOMMUNICATIONS NETWORK

Derwent - Roossenekal	RTO (UHF)	Open channel
Belfast - Steelpoort	RTO (VHF)	Open channel
Witbank - Belfast	Train communication	Open channel
Belfast - Watervalboven	Train communication	Open channel
Witbank - Forfar	Train communication	Open channel
Witbank - Eloff	Train communication	Open channel
Eloff - Welgedag	Train communication	Trunk
Forfar - Capital park	Train communication	Trunk
Greenview - Sentrarand	Train communication	Trunk

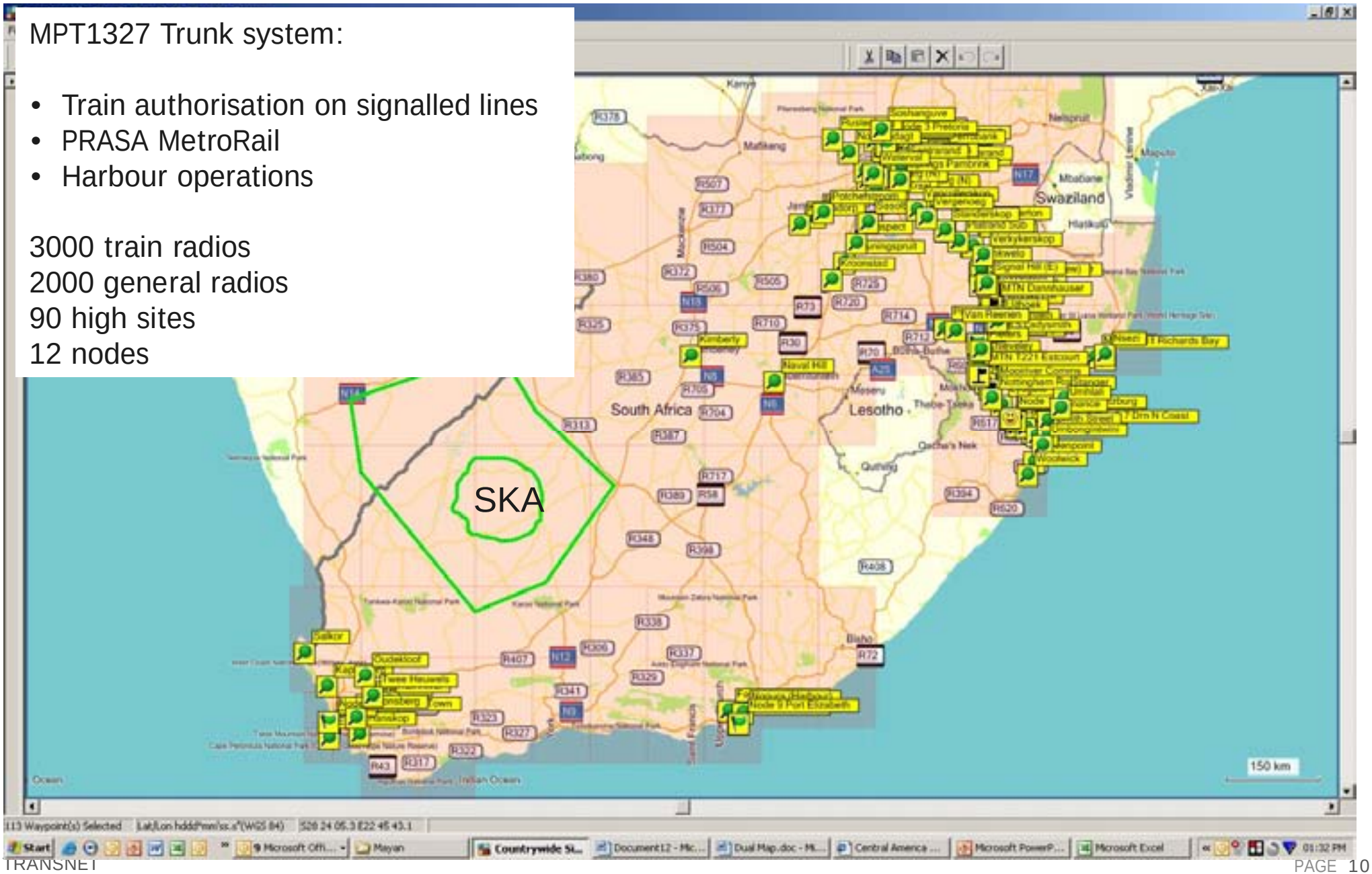


TRANSNET TELECOMMUNICATIONS NETWORK
Trunked Radio Systems

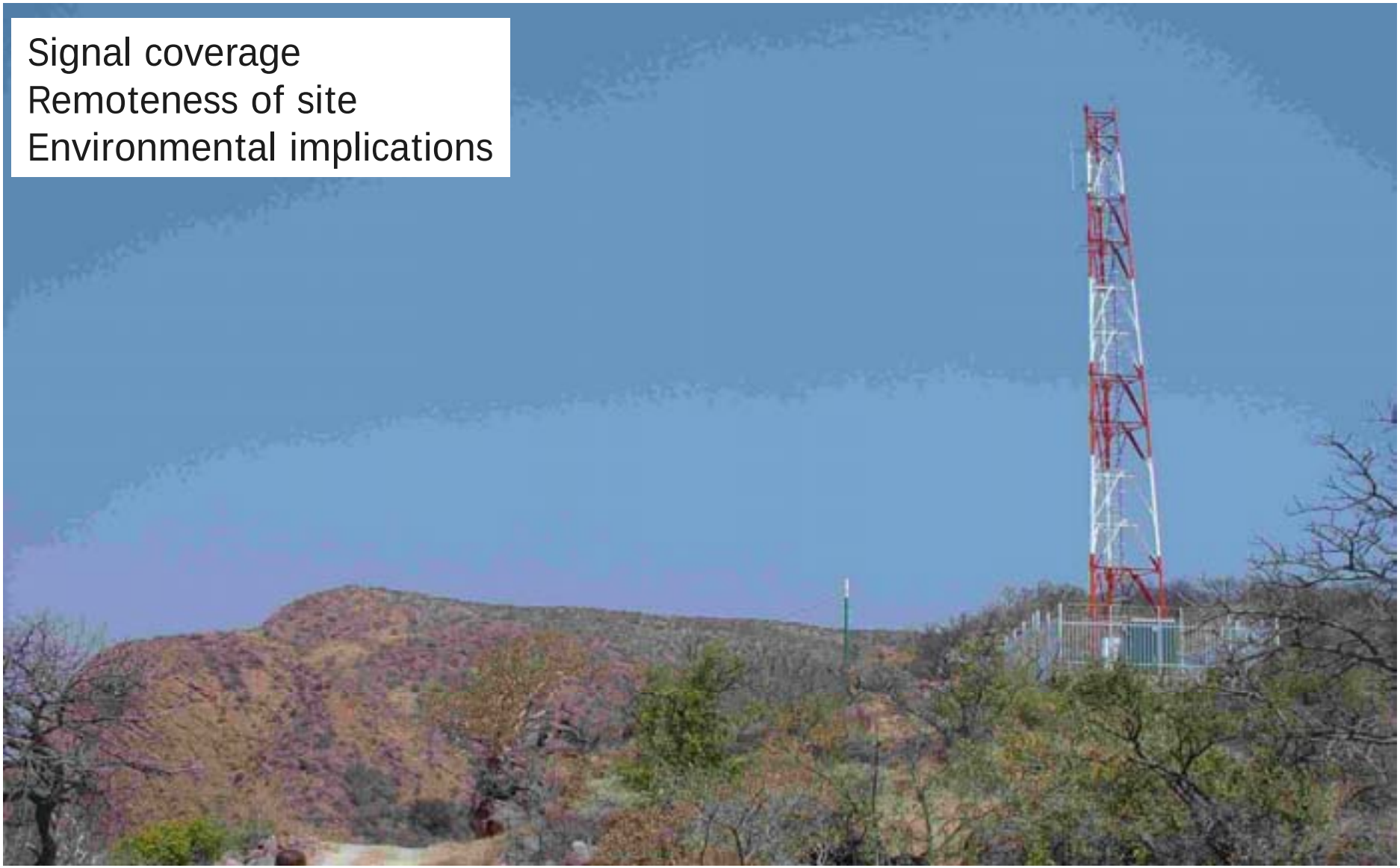
MPT1327 Trunk system:

- Train authorisation on signalled lines
- PRASA MetroRail
- Harbour operations

3000 train radios
2000 general radios
90 high sites
12 nodes



TRANSNET TELECOMMUNICATIONS NETWORK
Typical High Site (Van Collerspas)



TRANSNET TELECOMMUNICATIONS NETWORK

- A brief overview of the components of the RTO and trunk radio networks:
- Radio Train Order, for primary train control:
  - 455-465 MHz; 1,8MHz total block frequency;
  - 460 repeater high sites;
  - 3000 Hybrid train radios; allow for open channel and trunk;
  - 12000 Shunt radios; and
  - 2000 General portable/ mobile radios.
- MPT 1327 Trunk Radio systems:
  - 90 repeater high sites;
  - 12 Nodes;
  - Sophisticated network management platform; and
  - 3000 Trunk and 2000 general radios.
- 2200 locomotives equipped with 3 to 5 DC-ground low profile antennas:
  - Specially designed for optimum RF performance whilst ensuring safe operations under traction voltages of up to 50KV (design period >3 years).

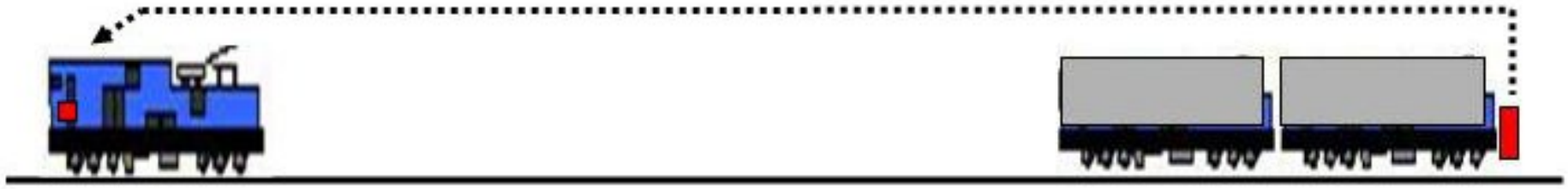
TRANSNET TELECOMMUNICATIONS NETWORK
Antennas on 43D Diesel loco

TRANSNET TELECOMMUNICATIONS NETWORK
Other Critical Safety Equipment

Example: Telemeter -

- Proves integrity of brakes;
- Provide “train complete” function;
- Fully AAR (Assoc of American Rail) compliant; and
- Can perform RBA (Rear Brake Application).

Up to 342 wagons moving at 50km/h > 3km in length



Durban Port: Integrated utilisation of Trunk network

POTENTIAL COST OF MIGRATION

- The previous migration from the VHF band (138-142MHz) to current UHF band (450-470MHz) during the period 1999 to 2005 was done at a cost of more than R160m.
- Since 2005 train communications, including tunnel coverage, became mandatory and Transnet amongst others developed a number of specialised antennas for use on train locomotives.
- ICASA not clear on the destination band; therefore it is assumed that migration will be to a destination band which will require (worst case) the duplication of all networks and peripherals.
- Dual illumination period of 3-7 years which will enable Transnet to operate seamlessly.
- A major cost element will be the redevelopment and reconfiguration of the locomotive antenna system (2200 locomotives) the locomotive (average cost of a loco is R30m) will be withdrawn from service during this conversion period. This will also have a significant impact on Transnet Operations.
- A Quantum of this migration cost is > R500 Million.

MATURITY AND AVAILABILITY OF DIGITAL TECHNOLOGY

- Transnet currently uses analogue MPT1327 technology and will migrate to a suitable digital technology once these have stabilised at Tier 3 level.
- This MPT 1327 technology, which was recently also the choice for the GAUTRAIN and other international railways, is stable and is extremely well suited to the Transnet Operational requirement.
- In this regard it should also be noted that there are at least five different competing digital technologies, (e.g. TETRA2, GSM-R, DMR, dPMR, P25 and NextEdge) , some of which are still in the development stage (for example, Tier 3 working is currently not available from many of the major suppliers).

TRANSNET FREQUENCY MIGRATION:

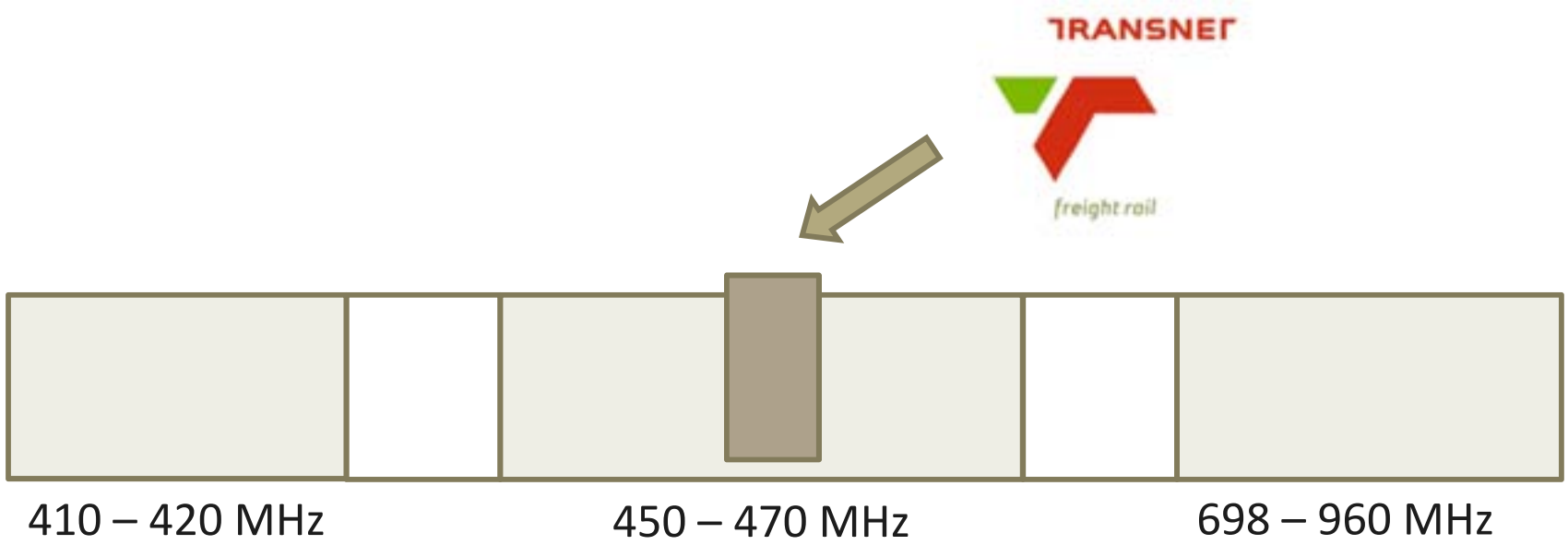
Preferred Option

- Transnet is of the view that the allocation of the 692-960 MHz to IMT (“digital dividend”) will address the need for additional spectrum.
- The cost to Transnet of migration out of the 450-470 MHz, and similar cost to thousands of current other users, raise the question of the cost/benefit of this migration for South Africa.
- It is strongly suggested that such analysis be done to determine the benefit to the Region, if any.

Transnet preferred option: ⇒

- Transnet remains within its current allocation and do not incur any additional costs or disruptions to its services: vital for the RSA Economy.
- Transnet continues to utilise analogue technology until digital technologies become stable, at which stage Transnet will migrate to digital technology.
- A timeframe of 7 to 10 years is allowed for digital migration with dual illumination for 3 years to allow for construction of the new network.
- Transnet will be in a position to fully implement the Market Demand Strategy to the benefit of the whole of the South African economy.

ALTERNATIVE 1



ALTERNATIVE 1 (CONT.)

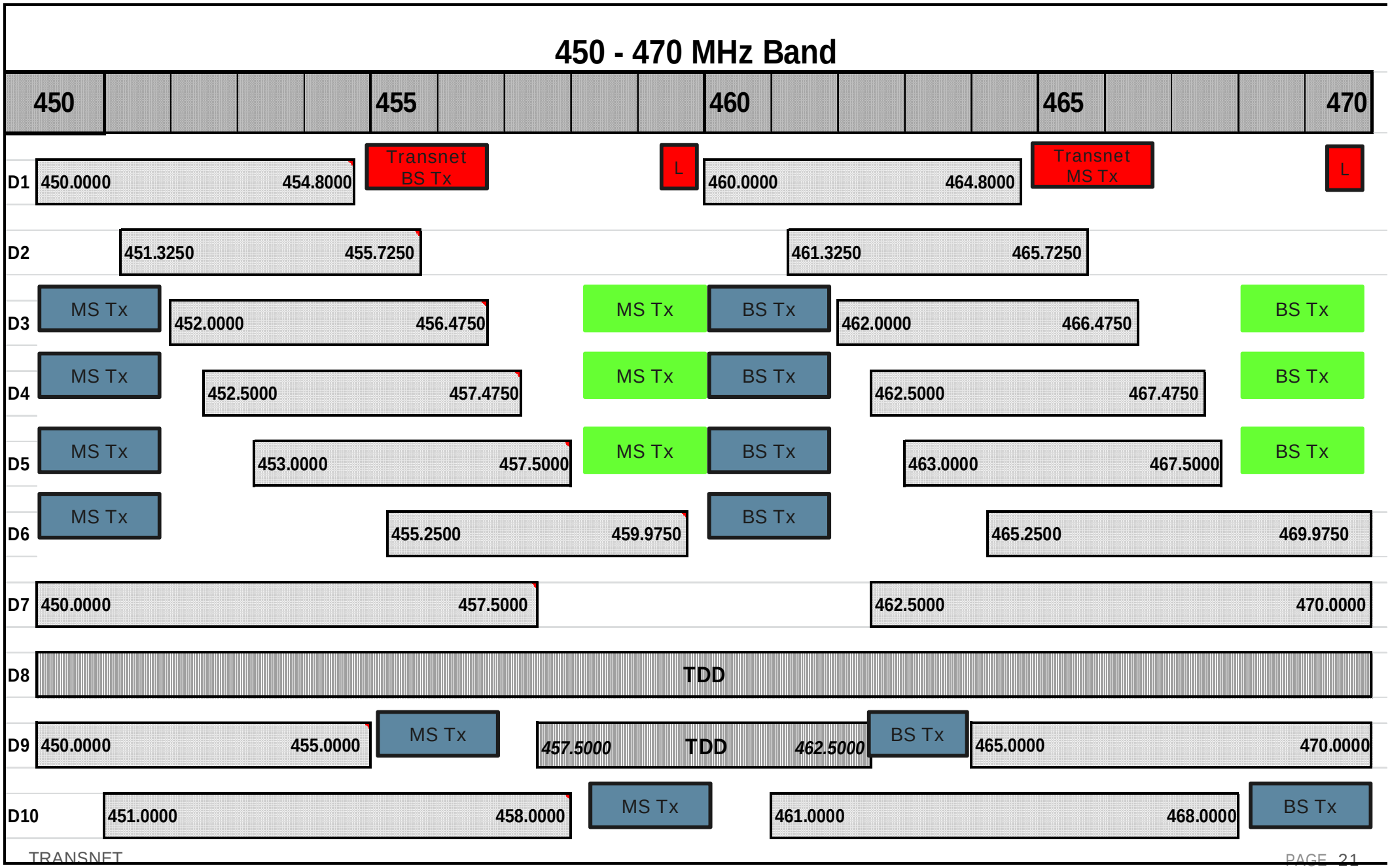
Transnet retains its current assignment and is migrated to the side of the 450-470 MHz band to allow contiguous re-allocation of the rest of the band to IMT.

This option supports ITU – R M.1036-4 options D3; D4; D5; D6 and D10

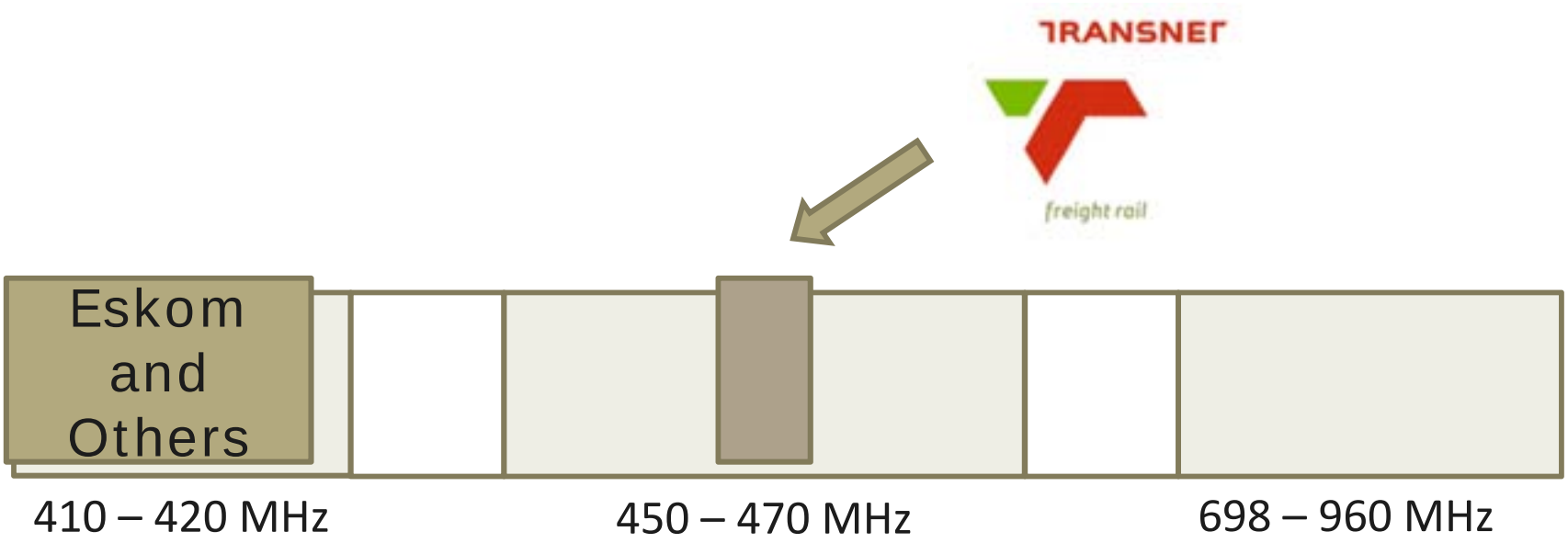
The benefits of this option are:

- A significant portion of current radio peripheral and infrastructure equipment can be re-used in this band and will mitigate migration cost;
- Mitigation of risk to Transnet Operations on Rail and in the Ports;
- A timeframe of 5 to 7 years must be allowed for sideway migration within the 450-470 MHz band as the destination channels become available;
- Transnet continues to utilise analogue technology until such time that digital technologies become stable; and
- A timeframe of 7 to 10 years is allowed for digital migration with dual illumination for 3 years to allow for construction of the new network.

ALTERNATIVE 1: ITU – R M.1036 RECOMMENDED FREQUENCY ARRANGEMENTS



ALTERNATIVE 2



IMT

ALTERNATIVE 2 (CONT.)

- ICASA allocates full spectrum (1,8 MHz block) to Transnet in the 410 - 420 MHz band.
- This will have major cost for Transnet and could > R 500m. A significant period will be required for dual illumination to allow:
  - ICASA must reclassify the band to allow initially for analogue technology;
  - Transnet continues to utilise analogue technology until such time that digital technologies become stable, at which stage Transnet will move to digital technology;
  - A timeframe of 7 to 10 years is allowed for digital migration with dual illumination for 3 years to allow for construction of the new network;
  - This destination band is currently in use by SAPS, Eskom and others, which means that the band must be cleared before the Transnet migrations starts; and
  - A timeframe of 7 to 10 years is allowed for this option to allow for the maximum life of existing assets and the reduction in operational risk. This period may run concurrent with the digital migration plan time frame.

ALTERNATIVE 2 (CONT.)

- This option is premised on the fact that TFR Operations must allow for the ring fencing of locomotives to operate on only certain sections of a route where the migration has been done.
- It should be noted that changeover of locomotives during a journey from, for example Hotazel to Nqura for the Manganese export line, will incur significant additional costs and lead to lower utilisation of very expensive assets (i.e. locomotives). (This is but one example of many.)
- The time frame of 3-5 years as suggested in the draft migration plan is not feasible for this option as it will have major operational and cost implications.
- The impact of this option on Transnet National Ports Authority and Transnet Port Terminals needs to be assessed in terms of the requirements for National Key Points, as well as the disruptive impact this change in frequencies will have on port operations and associated imports and exports.

FREQUENCY MANAGEMENT: A SCARCE RESOURCE!

Frequency Spectrum HF to 1.4GHz

	HF		VHF			UHF						1.4GHz	
Frequencies			138 / 142	148 / 155	157 / 159	413 / 423	440 / 445	440 / 445	450 / 470			1.4	1.4
Bandwidth	308 kHz	100 kHz	25 kHz	62.5 kHz	412.5 kHz	12.5 kHz	50 kHz	62.5 kHz	1.8 MHz		15 kHz	100 kHz	500 kHz
Channels	11 x	4 x	2 x	5 x	33 x	1 x	4 x	5 x	133 x	10 x	12 x	4 x	1 x
Users	TFR	TNPA	TFR	TNPA	TNPA	TPT - PRASA	TFR	TPT	TFR - TPT - PRASA	TFR	SAA	TFR	TFR
Services	SSB Channels	(DGPS)	Train Telemeter	Light house	Marine (RSA)	Link - Telecontrol	Telecontrol Point to Multipoint	HRDT's	Bulk Trunk, RTO, Shunt, Frequencies	UHF Duplex Links	Additional channels	1.4 GHz Links 25 kHz	1.4 GHz Links 500 kHz

REGULATORY COMMENTS

- The Regulations and the Frequency Migration Plan should be aligned to avoid inconsistent overlaps. Appropriate cross referencing would eliminate interpretation challenges.
- The Regulations should reflect dependencies, such as the required consultation with the Minister of Communications, the legitimate expectations licensees may have that their licences would be renewed, the involvement of other regulators such as the Department of Environmental Affairs and the Railway Safety Regulator, and the SA footnotes that qualify Resolution 224.
- Transnet disputes the statement under item 4.11.13 of the Migration Plan that spectrum audit findings indicated low spectrum usage. Apart from the fact that the method of measurement is questionable and the fact that the geographic areas where these audits were conducted are not representative, it must be emphasised that the Transnet frequencies are used for mission critical communication where guaranteed availability of a radio channel is vital for safe railway operations.
- The correctness of the statement in item 4.11.25 of the Migration Plan that Transnet is a user in the indicated band must be disputed, and ICASA is requested to rectify its records and the Migration Plan in this regard.

REGULATORY COMMENTS (cont.)

- It is suggested that more comprehensive parameters are set for the cost considerations of frequency migration, which parameters should account for all relevant cost drivers such as the knock-on effect to other spectrum users that must also be migrated as a result of a particular migration initiative.

- The Frequency Migration Plan does not adequately address the “knock-on effect” of migration. The following aspects of the “knock-on effect” should be addressed:

  - Destination bands should be indicated in order for the impact on current equipment and operations to be assessed;
  - The requirements for and management of dual illumination;
  - The synchronisation of vacating and occupation where destination band space must be created; and
  - Added time required for ancillary processes such as the application for environmental authorisations (which is not guaranteed).