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Quality of Service Report:

KwaZulu-Natal 2013/2014

Quarter 3

Table of Contents

1 Introduction

1.1 Executive Summary

The Authority had conducted Quality of Service (QoS) monitoring of the GSM voice telephony service being offered by the mobile operators: Cell-C, MTN and Vodacom within the KwaZulu-Natal region.

KwaZulu-Natal has one Metropolitan Municipality (eThekwini Metropolitan Municipality) and 10 district municipalities, which are further subdivided into 50 local municipalities. The drive tests were conducted on three local municipalities which are: Msinga, City of uMhlathuze, Hibiscus Coast and eThekwini Metropolitan Municipality.

1.2 Drive Test Route Plan

1.2.1 Msinga Route

Msinga Local Municipality is a largely rural area, with 70% of its area being traditional authority land. Due to the rural nature of the municipality, approximately 99% of its population lives in traditional areas. Msinga is accessible via the R33 which is linking Dundee, Ladysmith, Greytown, Pietermaritzburg, Kranskop and Weenen. According to Census 2011, 87.3% of Msinga population has access to a cell phones.

Drive tests were performed along the major routes that are connecting Msinga with the neighbouring towns of Dundee, Greytown, Ladysmith and Weenen.

1.2.2 Empangeni and Richards Bay Route

Empangeni and Richards are the major towns within the City of uMhlathuze Local Municipality, which is the third-largest municipality in KwaZulu-Natal. It is a home to the country's largest deep-water port and an industrial development zone that enjoys the associated economic spin-offs. Richards Bay is considered to be the industrial and tourism hub, Empangeni the commercial hub and eSikhaleni the largest suburb. 93.4% of City of uMhlathuze population has access to a cell phone according to Census 2011.

The Drive tests were performed along the major routes around Empangeni and Richards Bay.

1.2.3 Durban North/KwaMashu Route

Durban North/KwaMashu Route is under eThekwini Metropolitan Municipality which is a Category A municipality found in KwaZulu-Natal. 90.70% of eThekwini population has access to a cell phone according to Census 2011.

Drive tests were conducted on the major routes around Durban North, Inanda, KwaMashu, Phoenix, Umhlanga and Verulam.

1.2.4 Port Shepstone route

Hibiscus Coast Local Municipality has its administrative seat in Port Shepstone and covers an area of approximately 90km of coastline comprising of 21 beaches, and extends 30km inland, covering a vast, rural area under the leadership of six tribal authorities. 87.3% of Hibiscus Coast population has access to a cell phone according to Census 2011.

Drive tests were conducted on the major routes around Port Shepstone, Uvongo, Shelly Beach, Oslo Beach and Hibberdene.

The monitoring was conducted in the areas and in the period shown below:

Municipality	**Route Name**	**Dates**	**Test Type**
Msinga Local Municipality	Msinga	• 14/10/2013 • 04/11/2013 • 04/11/2013 • 05/11/2013	• Retainability Test • Retainability Test • Accessibility Test • Accessibility Test
City of uMhlathuze Local Municipality	Empangeni	• 15/10/2013 • 05/11/2013 • 17/10/2013 • 07/11/2013	• Retainability Test • Retainability Test • Accessibility Test • Accessibility Test
	Richards Bay	• 16/10/2013 • 06/11/2013 • 18/10/2013 • 08/11/2013	• Retainability Test • Retainability Test • Accessibility Test • Accessibility Test
eThekwini Metropolitan Municipality	Durban North/KwaMashu	• 17/10/2013	• Retainability Test

		• 08/11/2013 • 18/10/2013 • 07/11/2013	• Retainability Test • Accessibility Test • Accessibility Test
Hibiscus Coast Local Municipality	Port Shepstone	• 15/10/2013 • 07/11/2013 • 18/10/2013 • 07/11/2013	• Retainability Test • Retainability Test • Accessibility Test • Accessibility Test

QoS is defined as the collective effect of service performances which determine the degree of satisfaction of a user of the service. QoS provides an indication of what the customer experiences when using the mobile network and is evaluated in terms of Retainability and Accessibility. Retainability is defined as the ability for a call to stay connected, complete through to a normal call tear down process, without abnormally disconnecting on a cell site of interest[1]. Accessibility is defined as the percentage of time a user is rejected due to the unavailability of system resources when attempting to place a call[2].

The KPI parameters used to measure Retainability and Accessibility were Drop Call Rate (DCR) and Call Setup Success Rate (CSSR), respectively.

[1] Annexure B.2 of ETSI EG 202 057-3
[2] GSM 12.04, ETS 300 615.

2 Results and Analysis

Below is the summary of the operator's overall performance arising from the specific quality of service parameters. It must be noted that no roaming across the networks was allowed during the measurements. The Drop Call Rate should be less than 3% as per the End-User and Subscriber Service charter regulations of 2009. The Call setup Success Rate should be greater than 95%. This parameter is not regulated by End-User and Subscriber Service charter regulations of 2009; however we have chosen its target based on ITU recommendations E.800 and G.1000.

2.1 KwaZulu-Natal Total Measurements Results

2.1.1 Accessibility Measurements Results

The KwaZulu-Natal region results covered: Msinga, Empangeni, Richards Bay, Durban North/KwaMashu and Port Shepstone.

Table 1: Msinga Accessibility measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	545	716	633	621	685	673	1166	1401	1306
Call Attempt Retry	144	71	54	225	71	158	369	142	212
Blocked Call	49	25	10	55	16	31	104	41	41
Call Setup	487	683	581	559	667	604	1046	1350	1185
Call Established	487	683	581	559	666	604	1046	1349	1185
Call End	493	684	622	565	669	642	1058	1353	1264
Dropped Call	2	7	2	1	0	0	3	7	2
CALL SETUP SUCCESS RATE	89.36%	95.39%	91.79%	90.02%	97.23%	89.75%	89.71%	96.29%	90.74%

Table 2: Empangeni Accessibility measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	559	574	559	438	375	445	997	949	1004
Call Attempt Retry	21	8	0	45	67	6	66	75	6
Blocked Call	11	2	5	13	30	1	24	32	6
Call Setup	548	571	483	424	357	411	972	928	894
Call Established	548	571	483	424	355	411	972	926	894
Call End	548	572	426	426	351	444	974	923	870
Dropped Call	0	0	0	0	1	0	0	1	0
CALL SETUP SUCCESS RATE	98.03%	99.48%	86.40%	96.80%	94.67%	92.36%	97.49%	97.58%	89.04%

Table 3: Richards Bay Accessibility measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	518	471	581	339	353	424	857	824	1005
Call Attempt Retry	90	14	1	46	47	3	136	61	4
Blocked Call	28	9	0	19	60	0	47	69	0
Call Setup	491	470	534	320	342	396	811	812	930
Call Established	491	470	534	320	342	396	811	812	930
Call End	489	469	581	320	338	423	809	807	1004
Dropped Call	0	0	0	0	2	0	0	2	0
CALL SETUP SUCCESS RATE	94.79%	99.79%	91.91%	94.40%	96.88%	93.40%	94.63%	98.54%	92.54%

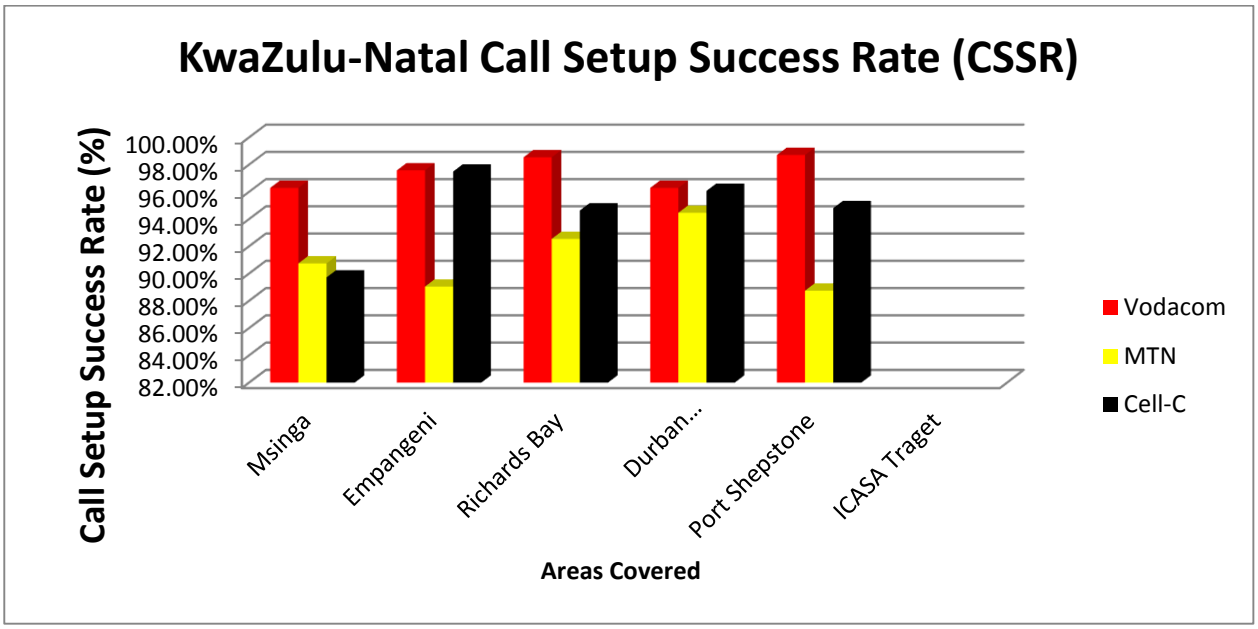
Table 4: Durban North/KwaMashu Accessibility measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	345	352	227	392	402	278	737	754	505
Call Attempt Retry	36	15	16	53	11	10	89	26	26
Blocked Call	13	12	6	16	12	7	29	24	13
Call Setup	332	339	205	376	389	252	708	728	457
Call Established	332	338	205	376	388	272	708	726	477
Call End	331	340	222	375	390	272	706	730	494
Dropped Call	2	0	0	2	0	0	4	0	0
CALL SETUP SUCCESS RATE	96.23%	96.02%	90.31%	95.92%	96.52%	97.84%	96.07%	96.29%	94.46%

Table 5: Port Shepstone Accessibility measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	331	315	316	381	384	421	712	699	737
Call Attempt Retry	25	1	4	22	3		47	4	4
Blocked Call	12	2	2	15	3	4	27	5	6
Call Setup	317	312	277	358	378	379	675	690	656
Call Established	317	312	275	358	378	379	675	690	654
Call End	318	310	314	358	378	416	676	688	730
Dropped Call	2	0	0	7	2	0	9	2	0
CALL SETUP SUCCESS RATE	95.77%	99.05%	87.03%	93.96%	98.44%	90.02%	94.80%	98.71%	88.74%

Figure 1: KwaZulu-Natal Call Setup Success Rate (CSSR)



2.1.2 Retainability Measurements Results

Table 6: Msinga Retainability measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	180	134	208	166	169	159	346	303	367
Call Attempt Retry	23	11	11	27	14	67	50	25	78
Blocked Call	9	25	2	7	13	37	16	38	39
Call Setup	173	131	206	161	165	136	334	296	342
Call Established	173	131	206	161	164	136	334	295	342
Call End	159	119	201	149	153	117	308	272	318
Dropped Call	13	10	5	9	8	15	22	18	20
DROP CALL RATE	7.51%	7.63%	2.43%	5.59%	4.88%	11.03%	6.59%	6.10%	5.85%

Table 7: Empangeni Retainability measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	175	180	182	163	129	162	338	309	344
Call Attempt Retry	14	6	4	7	13	1	21	19	5
Blocked Call	6	1	2	2	3	15	8	4	17
Call Setup	169	179	179	159	127	147	328	306	326
Call Established	169	178	179	159	127	147	328	305	326
Call End	162	176	177	151	113	145	313	289	322
Dropped Call	7	3	2	8	14	2	15	17	4
DROP CALL RATE	4.14%	1.69%	1.12%	5.03%	11.02%	1.36%	4.57%	5.57%	1.23%

Table 8: Richards Bay Retainability measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	145	173	170	143	165	164	288	338	334
Call Attempt Retry	13	1	1	4	9	0	17	10	1
Blocked Call	5	0	13	3	2	10	8	2	23
Call Setup	139	173	157	140	163	154	279	336	311
Call Established	139	173	157	140	163	154	279	336	311
Call End	137	173	157	132	163	154	269	336	311
Dropped Call	3	0	0	8	0	0	11	0	0
DROP CALL RATE	2.16%	0.00%	0.00%	5.71%	0.00%	0.00%	3.94%	0.00%	0.00%

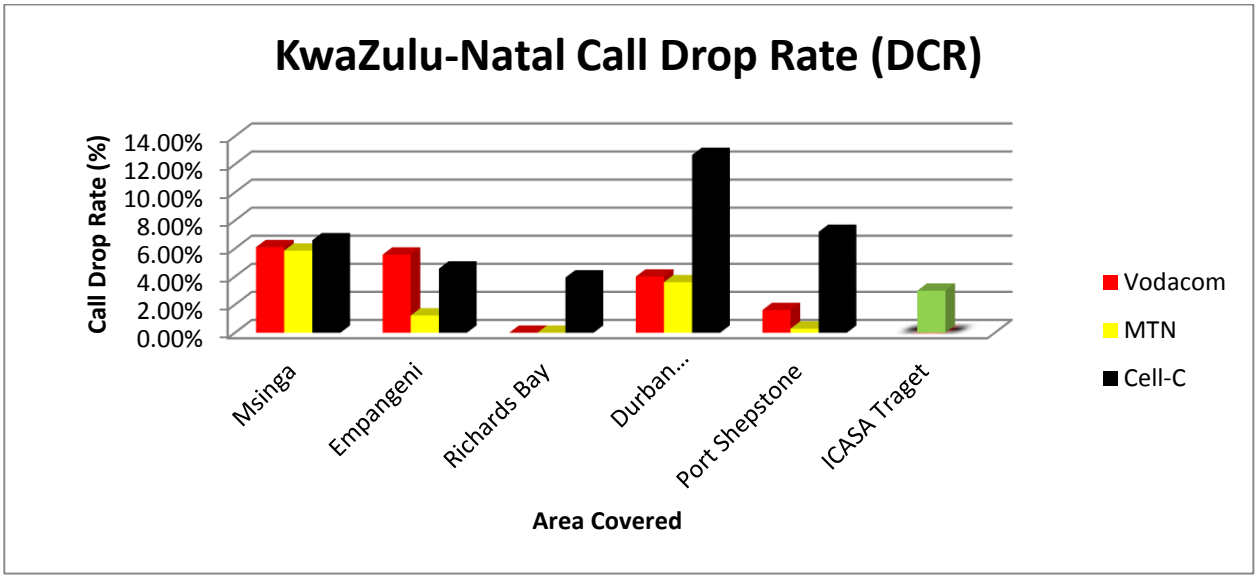
Table 9: Durban North/KwaMashu Retainability measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	161	162	163	143	147	147	304	309	310
Call Attempt Retry	8	8	6	8	8	2	16	16	8
Blocked Call	3	4	17	2	4	12	5	8	29
Call Setup	159	157	144	141	143	134	300	300	278
Call Established	159	157	144	141	143	134	300	300	278
Call End	138	149	140	117	137	126	255	286	266
Dropped Call	14	6	1	24	6	9	38	12	10
DROP CALL RATE	8.81%	3.82%	0.69%	17.02%	4.20%	6.72%	12.67%	4.00%	3.60%

Table 10: Port Shepstone Retainability measurement data

	Phase 1			Phase 2			TOTALS		
CALL EVENTS	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN	Cell-C	Vodacom	MTN
Call Attempt	173	183	183	172	130	171	345	313	354
Call Attempt Retry	11	5	0				11	5	0
Blocked Call	3	2	9	7	0	16	10	2	25
Call Setup	170	181	174	164	128	171	334	309	345
Call Established	170	181	174	164	128	171	334	309	345
Call End	164	178	173	147	127	171	311	305	344
Dropped Call	7	2	1	17	3	0	24	5	1
DROP CALL RATE	4.12%	1.10%	0.57%	10.37%	2.34%	0.00%	7.19%	1.62%	0.29%

Figure 2: KwaZulu-Natal Call Drop Rate (DCR)



2.2 KwaZulu-Natal Average Measurements Results

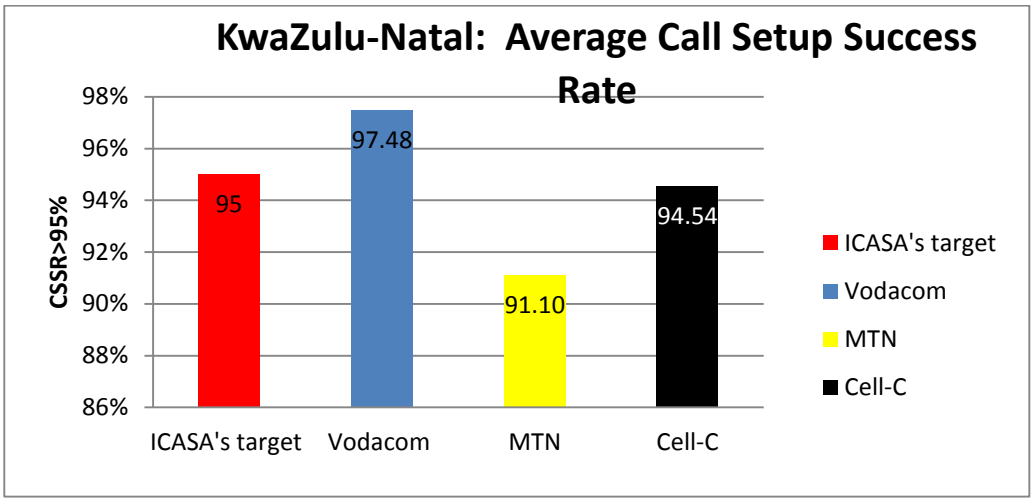
2.2.1 Average Accessibility measurement data results

The results below shows the average combination of the total Accessibility results in the tested areas within KwaZulu-Natal region: Msinga, Empangeni, Richards Bay, Port Shepstone and Durban North/KwaMashu.

Table 11: Average Accessibility measurement data

Area Tested	Network Operator	CSSR	Target (%)
KwaZulu-Natal	Vodacom	97.48%	95%
	MTN	91.10%	95%
	Cell-C	94.54%	95%

Figure 3: KwaZulu-Natal: Average Call Setup Success Rate



2.2.1.1 Analysis of the Results: KwaZulu-Natal

Based on the average Accessibility measurement data results for KwaZulu-Natal, MTN and Cell-C are below the target.

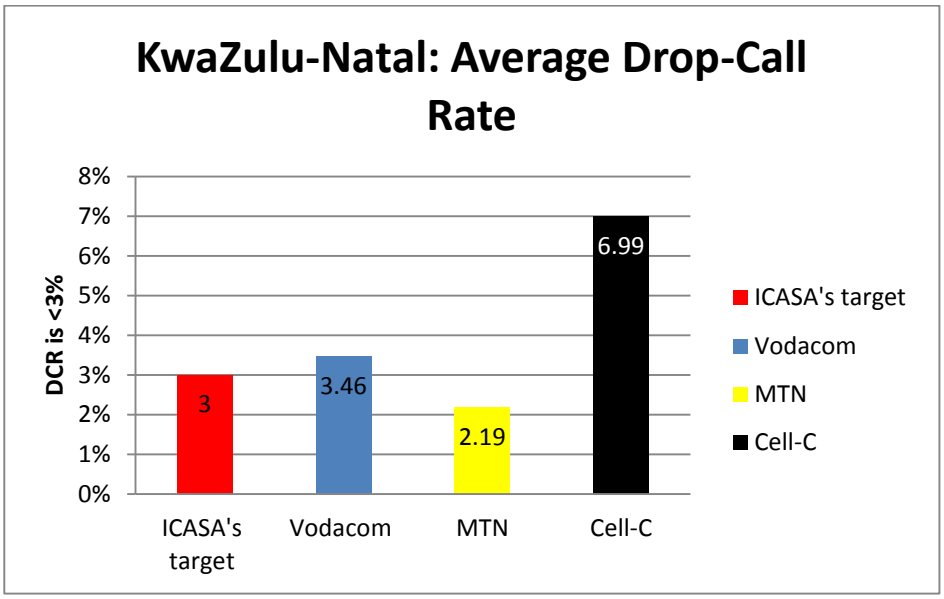
2.2.2 Average Retainability measurement data results for KwaZulu-Natal

The results below show the average combination of the total Retainability results in tested areas of KwaZulu-Natal: Msinga, Empangeni, Richards Bay, Port Shepstone and Durban North/KwaMashu are shown in the table below:

Table 12: Average Retainability measurement data

Area Tested	Network Operator	DCR	Target (%)
KwaZulu-Natal	Vodacom	3.46%	3%
	MTN	2.19%	3%
	Cell-C	6.99%	3%

Figure 4: Retainability Statistics



2.2.2.1 Analysis of the Results

Based on the average retainability results, MTN met the target, while Vodacom and Cell-C did not meet the target. Cell-C has the worst Drop-call rate of 6.99%.

3 Conclusion

The QoS monitoring report in KwaZulu-Natal focused on the following KPIs Call Set-up Success Rate (CSSR) and Dropped Call Rate (DCR) in the following test areas: Msinga, Empangeni, Richards Bay, Port Shepstone and Durban North/KwaMashu

In summary the results shows that Vodacom failed retainability test in Msinga, Empangeni, and Durban North/KwaMashu; Cell-C failed the accessibility test in Msinga, Richards Bay and Port Shepstone, retainability test in Msinga, Empangeni, Richards Bay, Durban North/KwaMashu and Port Shepstone; and MTN failed accessibility test in Msinga, Empangeni, Richards Bay, Durban North/KwaMashu and Port Shepstone, retainability measurements in Msinga and Durban North/KwaMashu.

The test methodology adopted provides a snapshot view of the operators Quality of Service, giving a realistic picture of network performance from a user's point of view. The drive test results do not represent the mobile service provider's overall network performance, and are based on the specified routes during the time of day when the measurements were carried out and using a particular type of handset.

4 Appendix A (coverage maps)

4.1 KwaZulu-Natal: Retainability Maps of Signal Level

4.1.1 Msinga Route

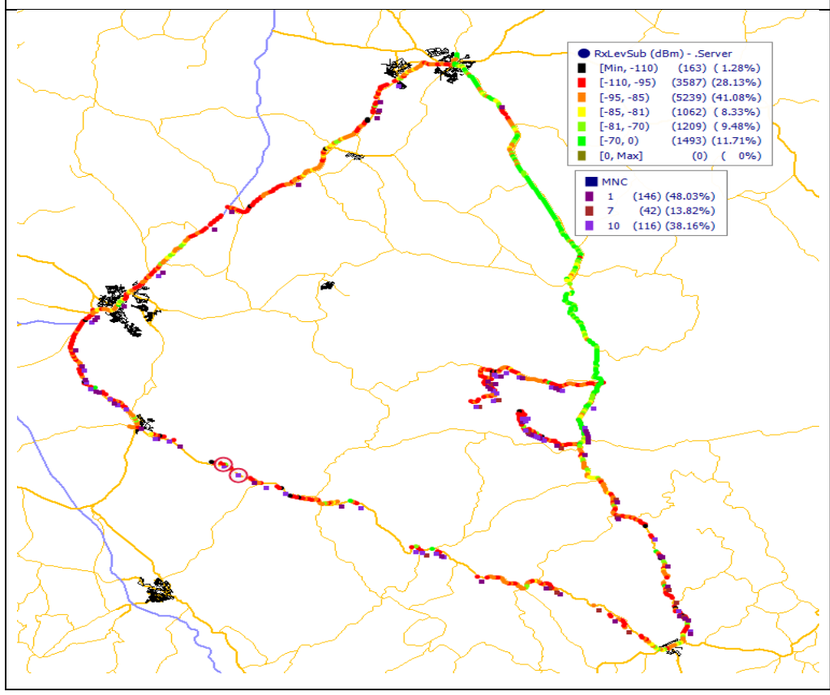
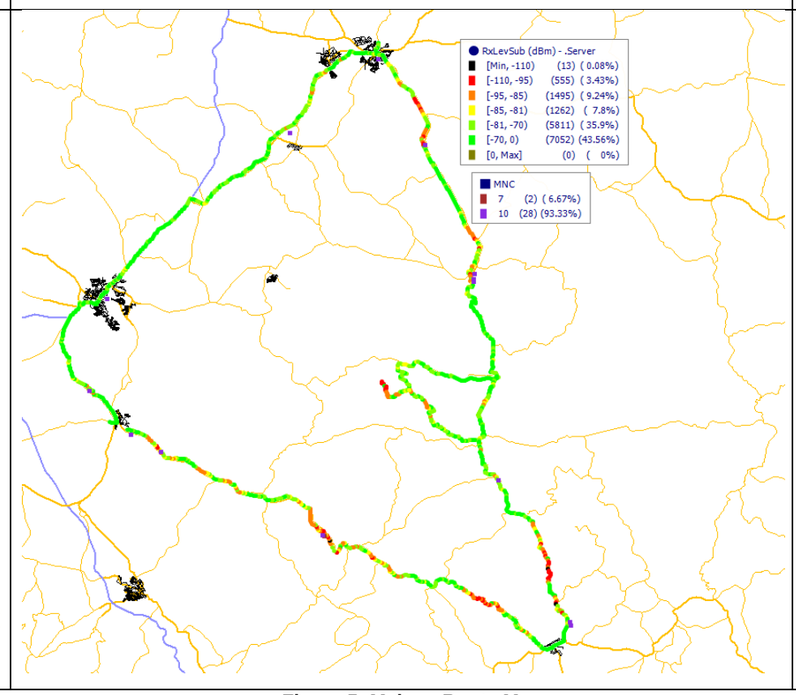
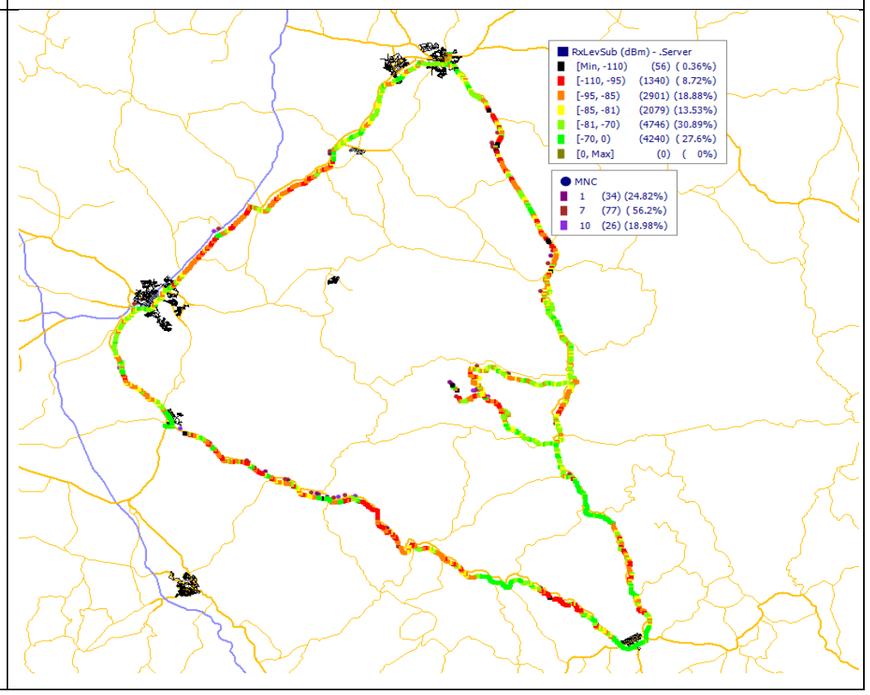
Vodacom	MTN	Cell-C
		

Figure 5: Msinga Route Maps

4.1.2 Empangeni Route

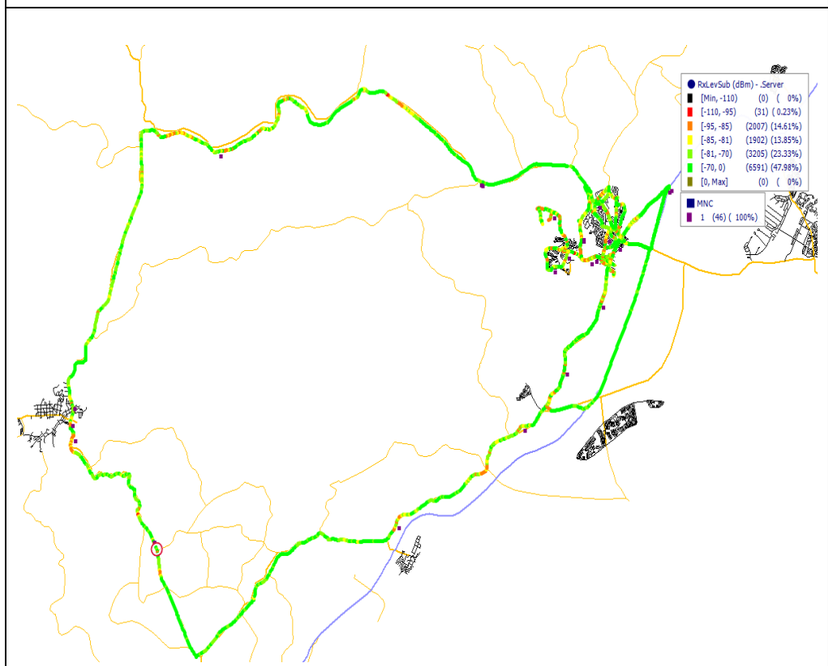
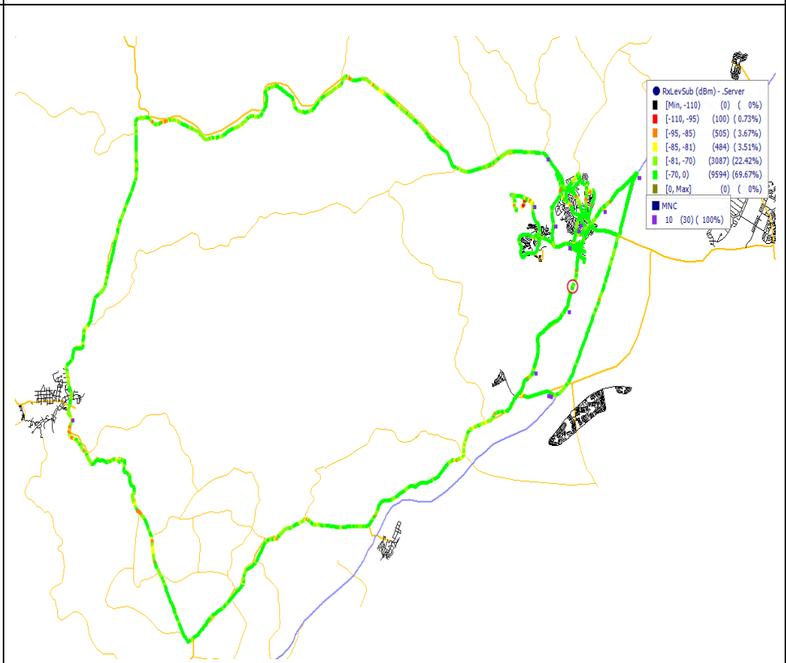
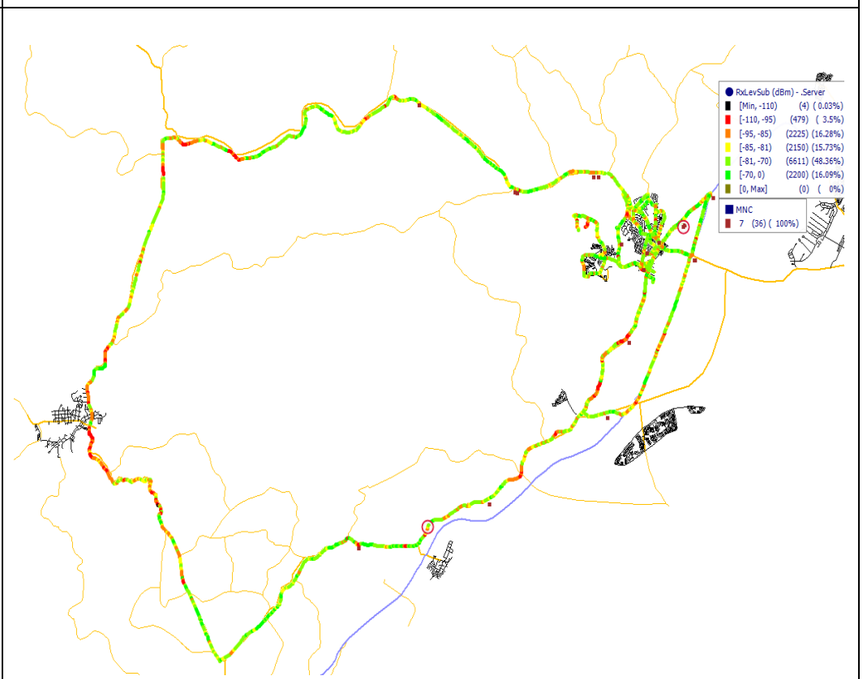
Vodacom	MTN	Cell-C
		

Figure 6: Empangeni Route Maps

4.1.3 Richards Bay Route

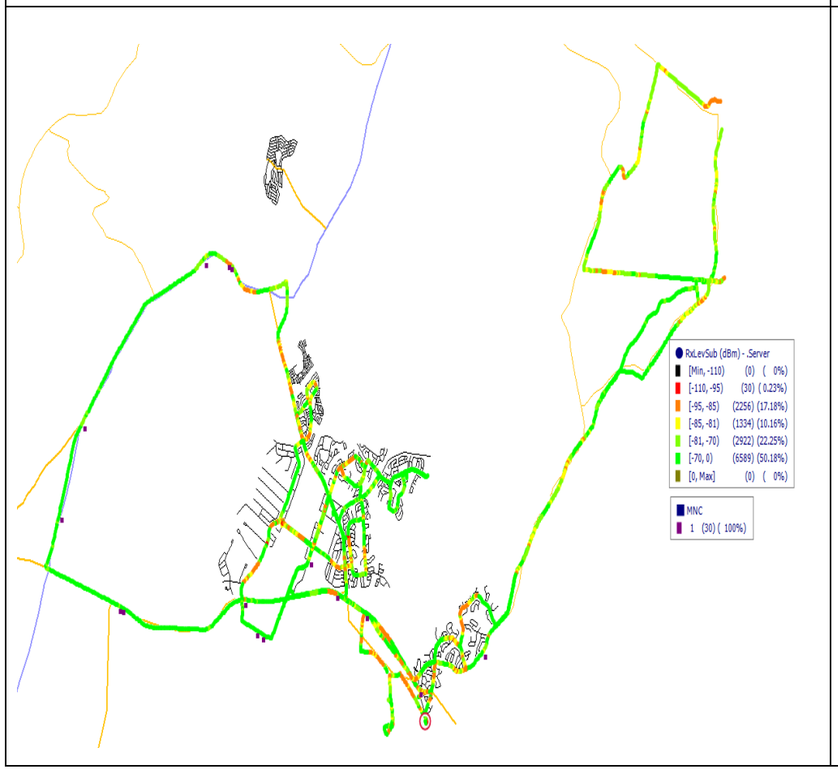
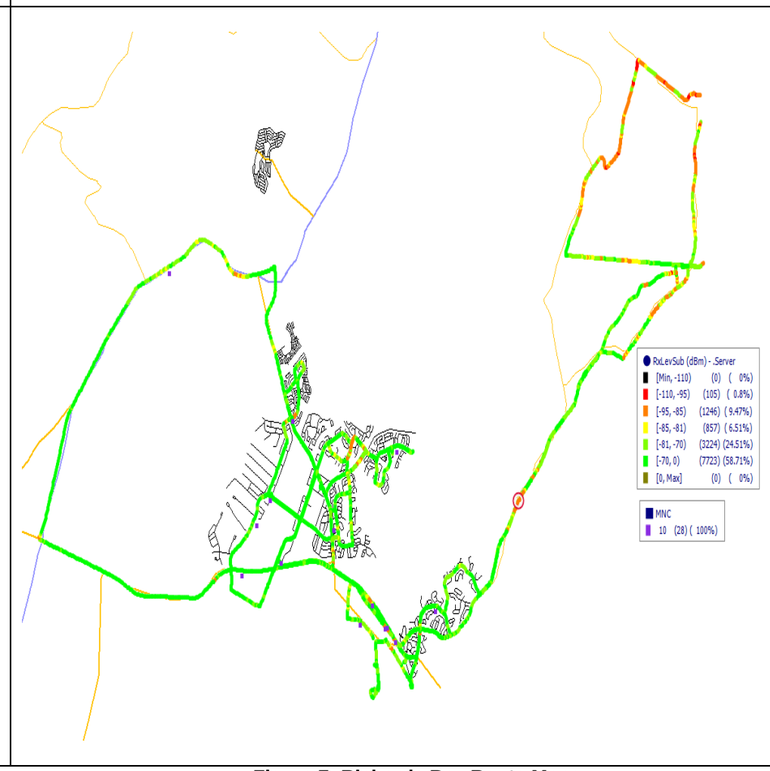
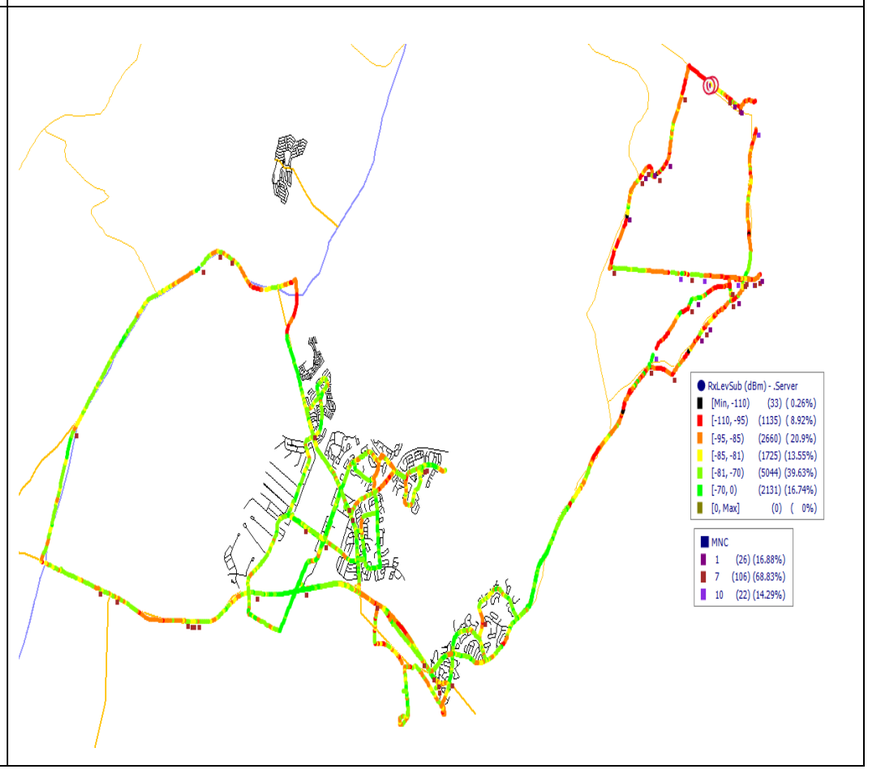
Vodacom	MTN	Cell-C
		

Figure 7: Richards Bay Route Maps

4.1.4 Durban North/KwaMashu

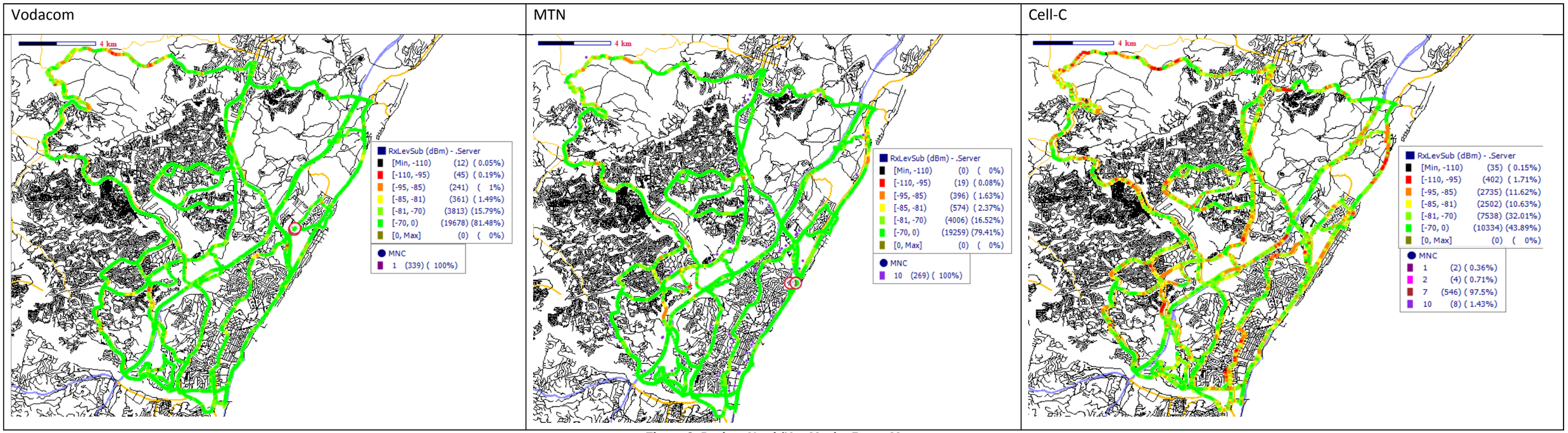


Figure 8: Durban North/KwaMashu Route Maps

4.1.5 Port Shepstone

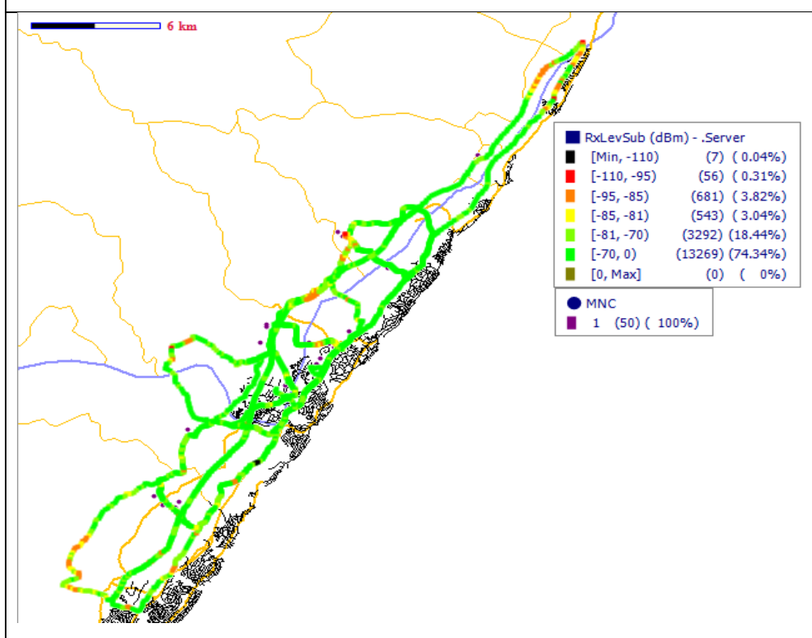
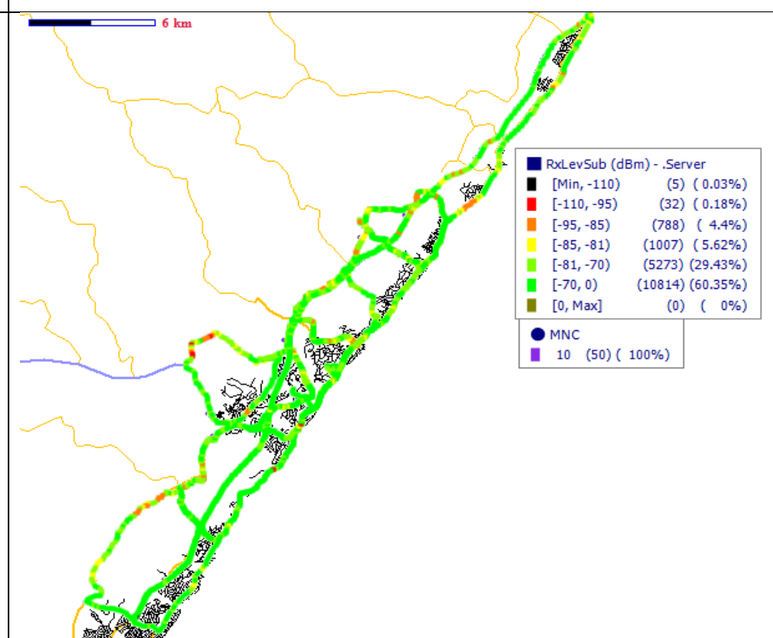
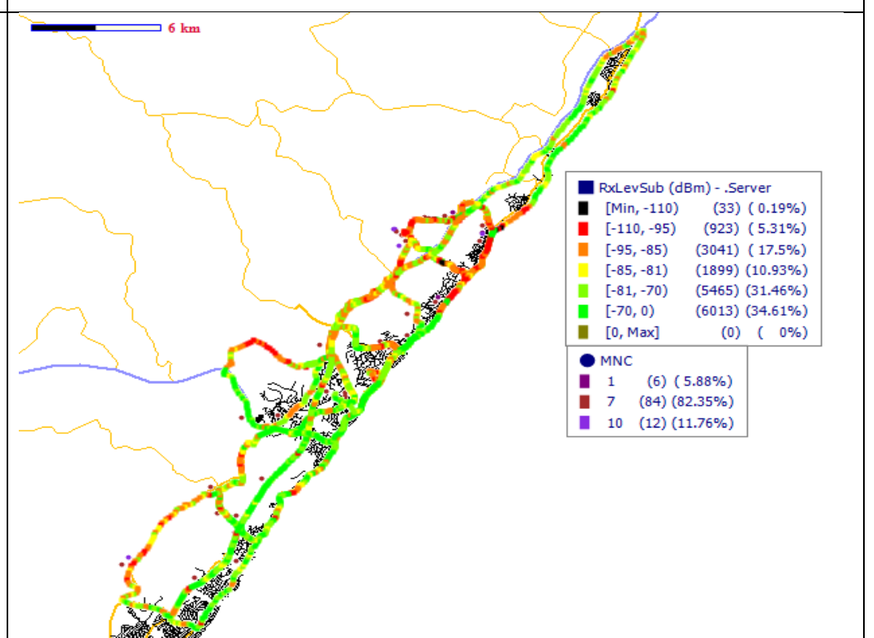
Vodacom	MTN	Cell-C
		

Figure 9: Port Shepstone Route Maps

4.2 KwaZulu-Natal: Accessibility Maps of Signal Level

4.2.1 Msinga Route

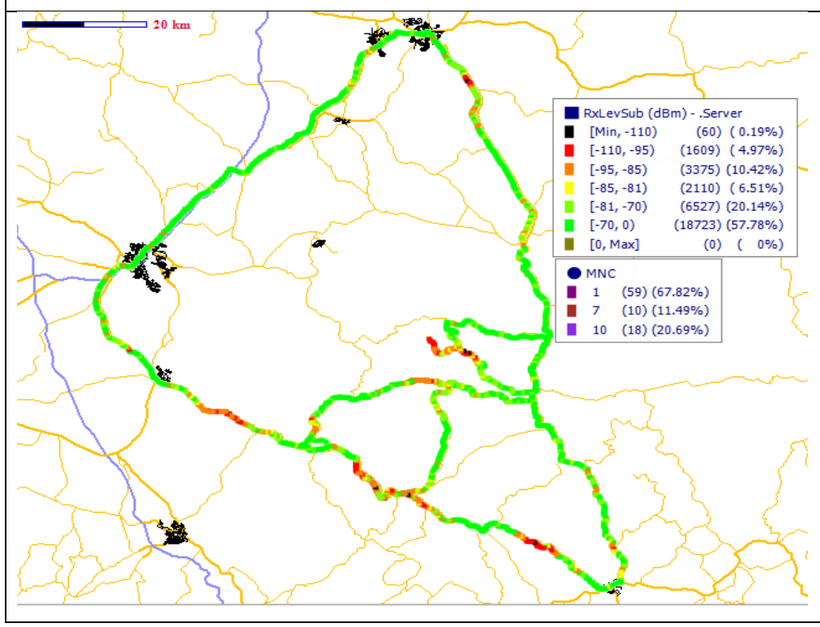
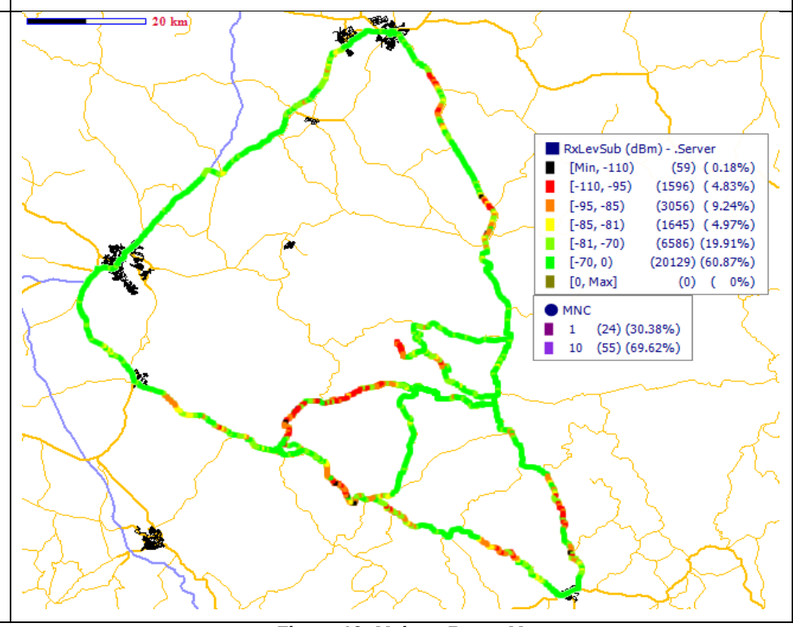
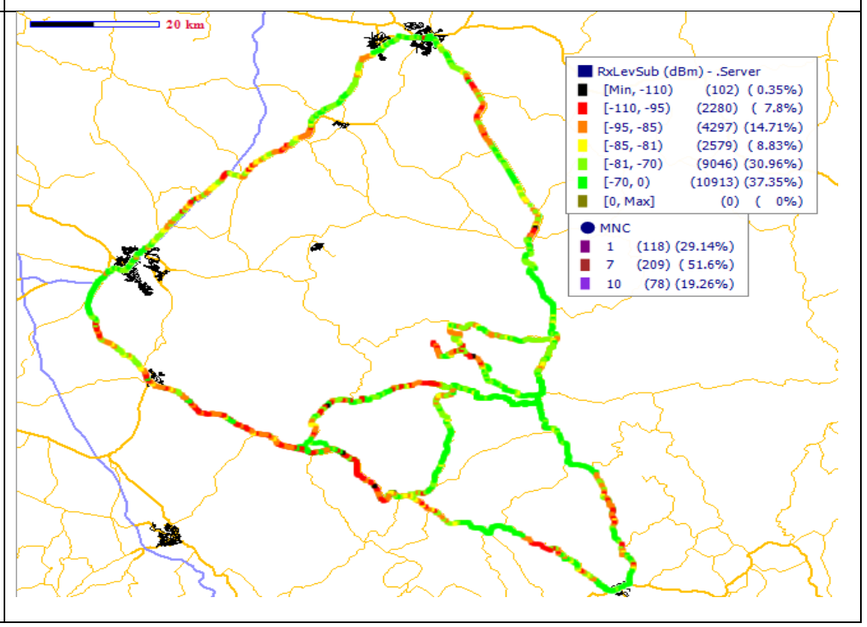
Vodacom	MTN	Cell-C
		

Figure 10: Msinga Route Maps

4.2.2 Empangeni Route

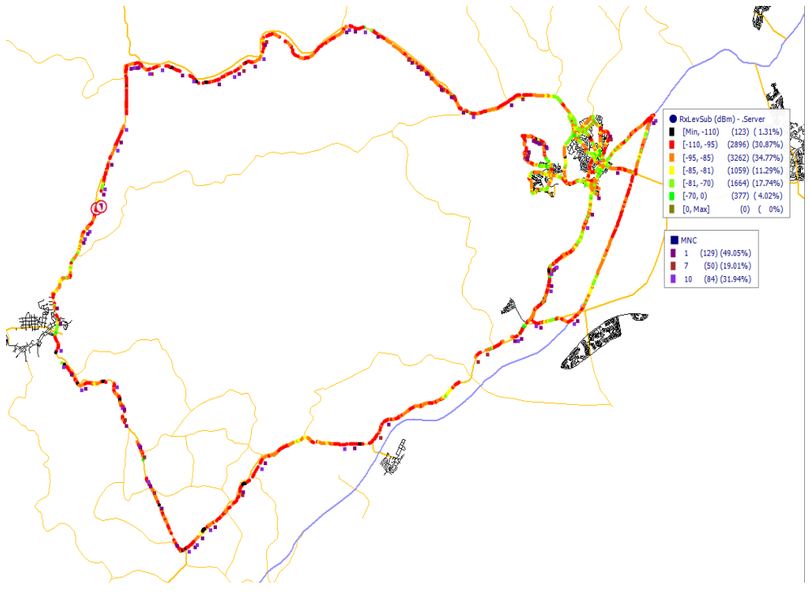
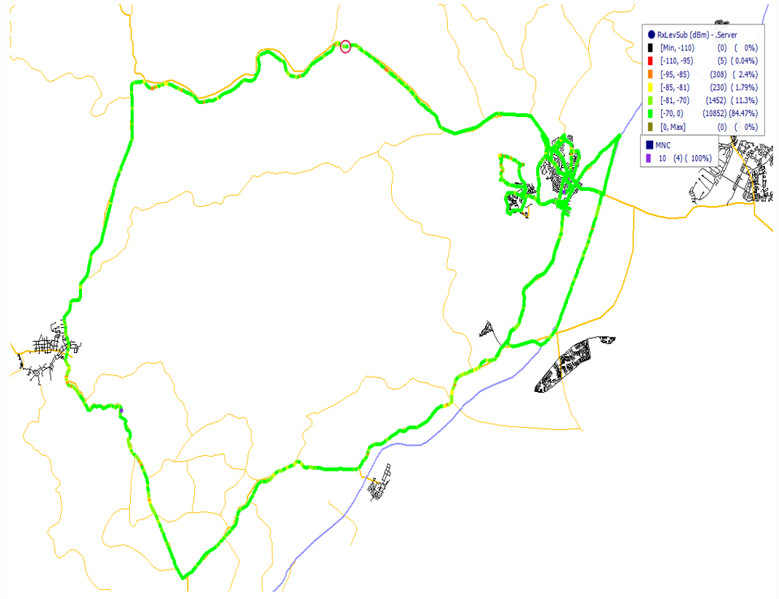
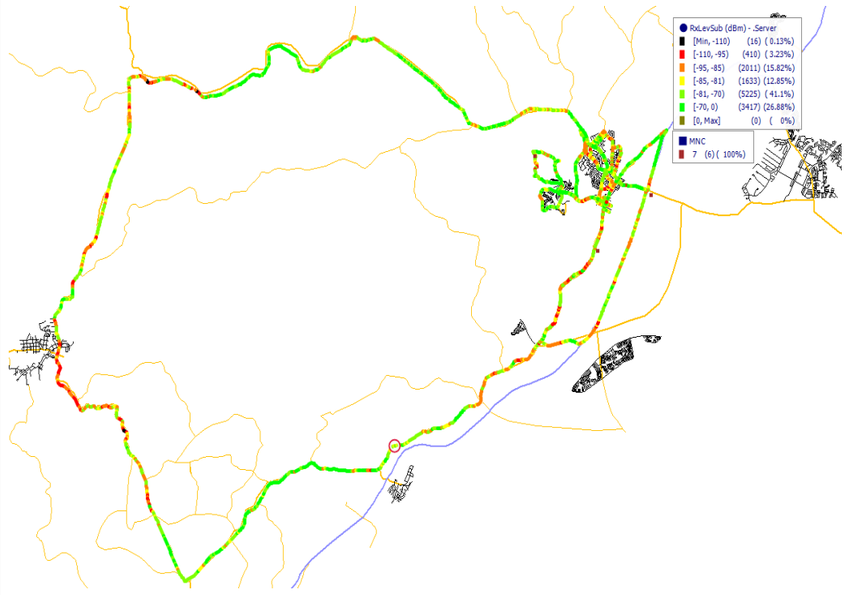
Vodacom	MTN	Cell-C
		

Figure 11: Empangeni Route Maps

4.2.3 Richards Bay

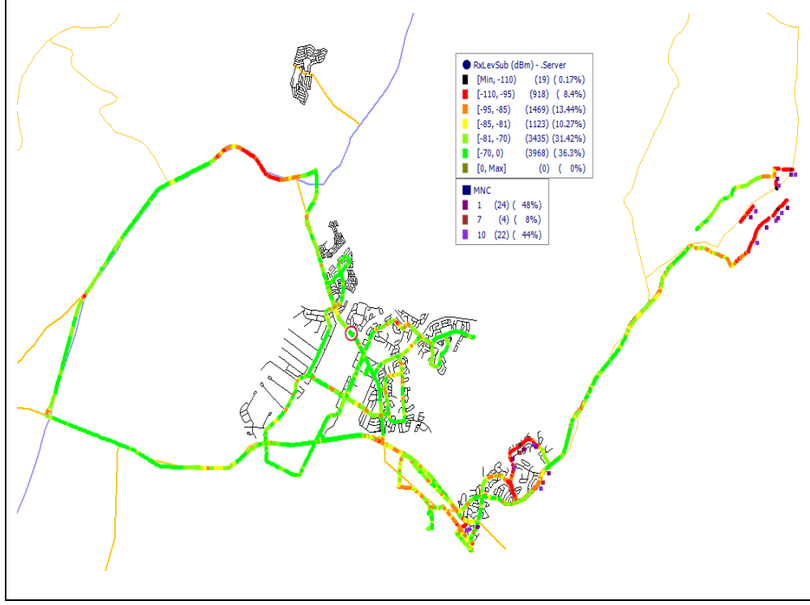
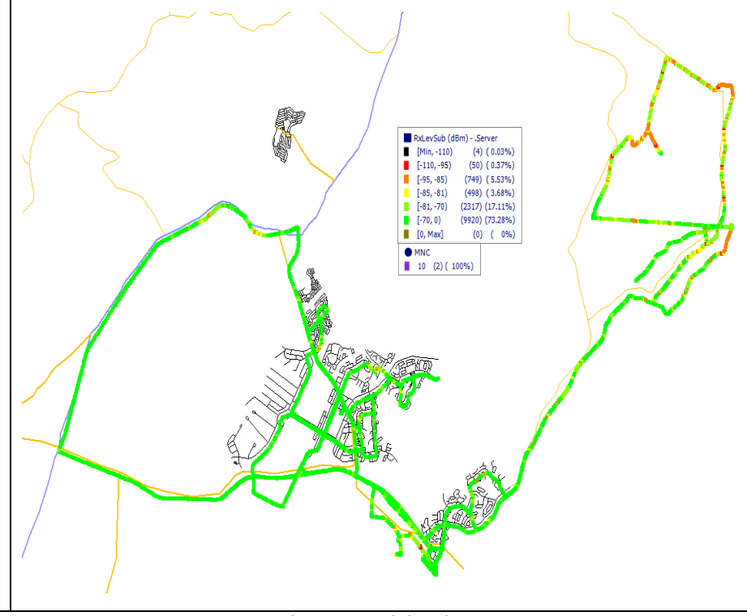
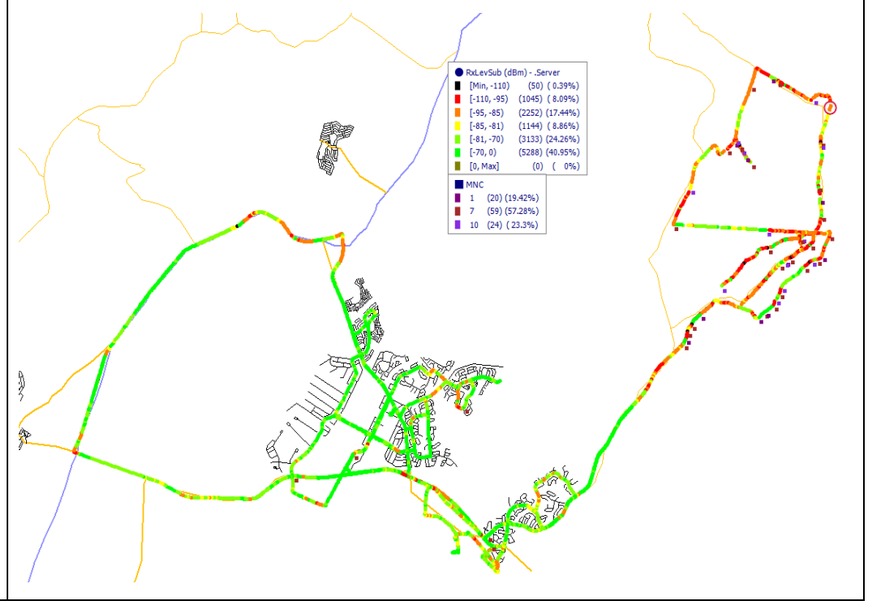
Vodacom	MTN	Cell-C
		

Figure 12: Richards Bay Maps

4.2.4 Durban North/KwaMashu

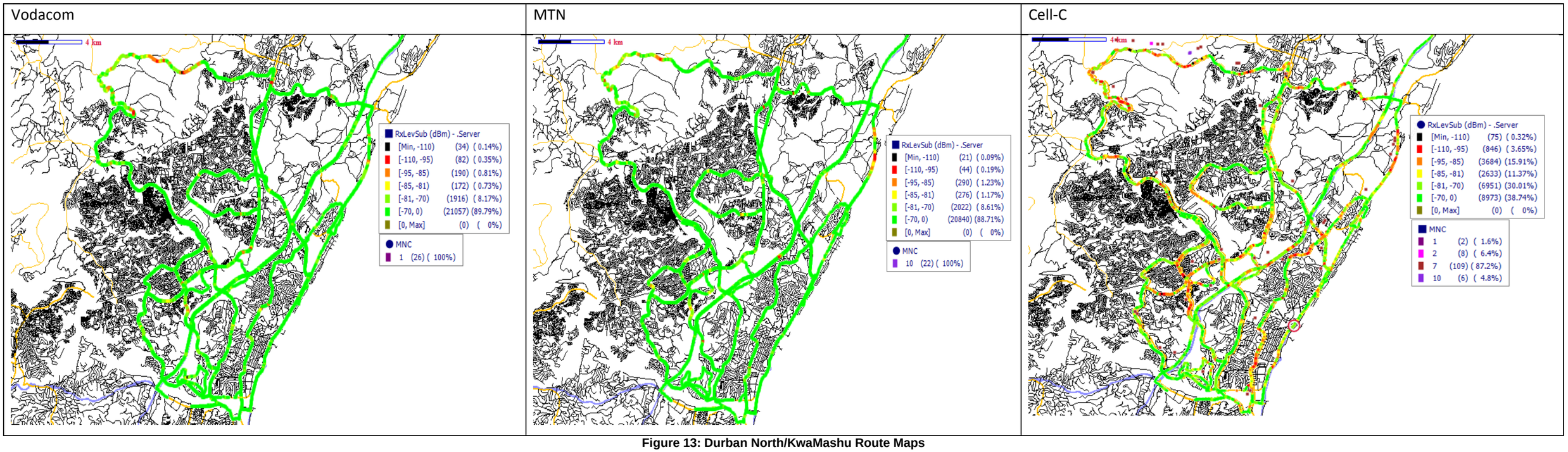


Figure 13: Durban North/KwaMashu Route Maps

4.2.5 Port Shepstone

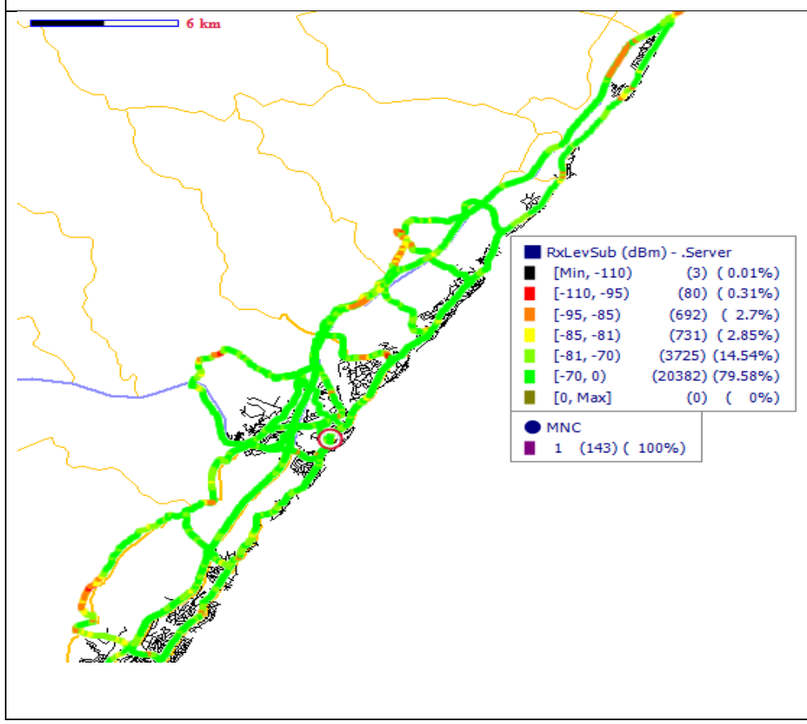
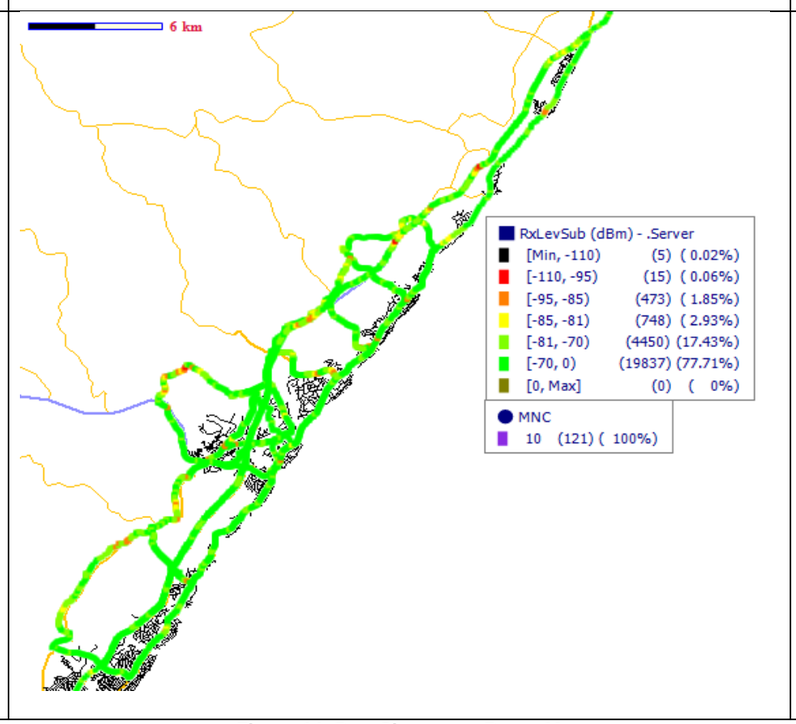
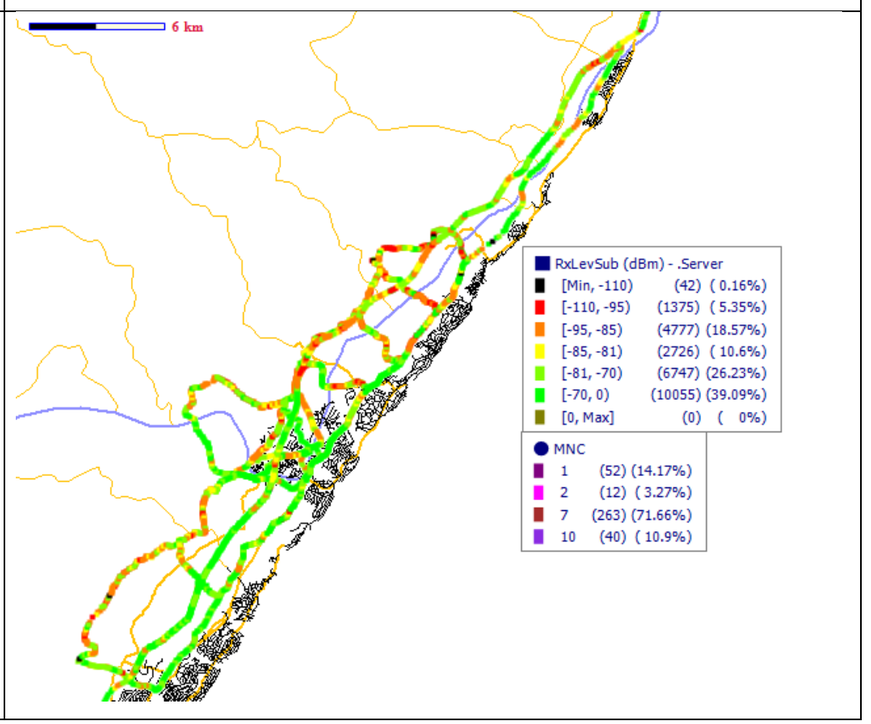
Vodacom	MTN	Cell-C
		

Figure 14: Port Shepstone Route Maps