Australian Government

acma

Australian Communications and Media Authority

Antenna survey report

Summary of the 2022 household TV antenna survey – New South Wales

FEBRUARY 2023

Canberra
Red Building
Benjamin Offices
Chan Street
Belconnen ACT

PO Box 78
Belconnen ACT 2616

T +61 2 6219 5555
F +61 2 6219 5353

Melbourne
Level 32
Melbourne Central Tower
360 Elizabeth Street
Melbourne VIC

PO Box 13112
Law Courts
Melbourne VIC 8010

T +61 3 9963 6800
F +61 3 9963 6899

Sydney
Level 5
The Bay Centre
65 Pirrama Road
Pyrmont NSW

PO Box Q500
Queen Victoria Building
NSW 1230

T +61 2 9334 7700 or 1800 226 667
F +61 2 9334 7799

Contents

Contents (Continued)

Executive summary

Background

Household television antenna surveys were conducted in New South Wales (NSW) between June and September 2022 by an external provider under contract to the ACMA. The surveys were conducted in the areas around local repeaters in the Sydney TV1 and Regional Northern NSW TV1 licence areas[1]. The key objective of this exercise was to identify areas where viewer households predominantly point their antennas to the local repeaters instead of the main transmitter. This would give an indication of the number and location of households using the local repeaters for the reception of terrestrial television services, which would potentially be affected by any changes to channel arrangements at those sites.

The survey areas included:

1. Central Coast area around Gosford, Bouddi and Wyong repeaters
2. Northern beaches area where Gosford, Bouddi and Wyong repeaters coverage and Main Sydney site coverage is available
3. several areas in Sydney North West around Sydney North West repeater
4. several areas in Sydney South West around Sydney South West repeater
5. Kings Cross area around where the local repeater is operating
6. Manly and Mosman area around the local Manly/Mosman repeater
7. Woronora area around where the local repeater is operating.

We determined the general size and location of the survey areas using computer modelling and the 'best server' approach, that is, identifying areas where local repeaters provide better coverage (in terms of the signal strength), compared to the main Sydney site. Detailed implementation considerations were determined by the contractor undertaking the surveys. The survey collected a large amount of data and descriptive information about viewer antenna pointing behaviour, which is presented in detail in this report.

Findings

The survey's findings were broadly consistent with the expected antenna pointing behaviour of household antennas based on our computer-generated predictions.

A key observation was that in many of the surveyed areas, households rely on signal coverage from the main high-power Sydney site, even in some areas where predictions show that the local repeater may provide a stronger signal. The proportion of antennas pointing to the local repeater was found to decrease with the distance from the repeater site, as expected.

In the Central Coast area, household antennas were predominantly directed toward one of the 3 repeater sites covering the area (Gosford, Bouddi and Wyong), where the choice of the preferred site appears to be driven by the signal strength. It can also be

[1] Details of broadcasting licence areas are available on the ACMA website. The Central Coast area around Gosford, Bouddi and Wyong is an overlap area between Sydney TV1 and Northern NSW TV1 licence areas.

observed that in the Central Coast areas where predictions show relatively patchy reception from the 3 local sites, there was an increase in the number of antennas pointing to one of the high-power sites at Sydney or Newcastle (Mt Sugarloaf).

In some cases, antenna pointing choices were possibly due to historical reasons, that is, some antennas were installed before the new repeater sites were established. In areas with known reception issues from the main sites, for example, due to terrain obstructions or tall buildings, it was observed that household antennas were pointed towards the local repeater. Household antennas in some parts of Kings Cross area were mainly pointed to the local repeater in Kings Cross, as reception from the main Sydney site is obstructed due to terrain.

In the areas closer to the local repeaters an increase in the number of antennas pointing towards local repeaters was observed. However, in these areas, antennas were still mainly pointing to the main Sydney site.

In newer developments, antennas were pointed towards the local repeaters, and this trend is expected to continue with other new developments, or as existing antenna installations are replaced due to old age and/or corrosion.

A detailed description and survey results for the above survey areas are presented in separate sections in this report.

1. Introduction

The ACMA has conducted a survey of households' television (TV) antenna type (VHF and/or UHF), orientation and height in identified areas. The aim of this work is to support the evidence base for the considerations of the potential impact to consumers under different TV channel planning scenarios that may arise from a potential future restack channel planning exercise to support terrestrial television technology transition.

This work is one component of technical research conducted under the Television Research and Policy Development Program[2]. This work was also foreshadowed in the *Five-year spectrum outlook 2022–27* and 2022-23 work program.

The work program consists of preparatory activities to ready the ACMA to undertake TV channel replanning activities, if required to support possible future government policy decisions that may require replanning of TV channels.

An approach to market for antenna surveys in Victoria, New South Wales and Queensland was advertised on 11 March 2022, with responses closing on 11 April 2022. The contractor engaged was Erkmar Australia Pty Ltd.

The surveys in Sydney and Central Coast areas commenced in June 2022 and were completed in September 2022. This report provides a summary of the results of the surveys conducted in NSW.

Purpose and scope

The purpose of this work was to survey households' TV antenna type, orientation and height in identified survey areas.

The aim was to inform a reliable estimation of:

- the number and location of the households in a particular survey area that rely on (point their antenna to) the local TV transmission (repeater) sites verses the main TV site for TV reception
- in the case of areas covered by a single frequency network (SFN), the number and location of households that rely on (point their antenna to) a particular TV transmission site (within a SFN) for TV reception.

The Sydney TV1 licence area is served by the high-power main Sydney VHF transmitter[3] as well as a number of lower power metro repeaters located around the Sydney TV1 licence area, which are used to address local coverage issues.

The survey included areas around local repeaters within the Sydney TV1 licence area, including areas around the Gosford, Bouddi and Wyong transmitter sites in the overlap[4] area with the regional Northern NSW TV1 licence area.[5] The sites which were included in the studies are shown in Figure 1. The list of the sites and the corresponding survey areas is shown in Table 1.

[2] Budget Paper No. 2, 2022-23 (p. 145) included in the Appropriation Bill (No. 3) 2021-22 (p. 61)
[3] All TV towers from which TV services are being broadcast are in Artarmon and Gore Hill and they are all referred to as the main Sydney site in this report.
[4] An overlap area in this context is an area where two TV licence areas overlap. Central Coast is in an overlap area between Sydney TV1 and Northern NSW TV1 licence areas.
[5] Details of broadcasting licence areas are available on the ACMA website.

Figure 1: TV broadcast transmission sites included in the household antenna survey in NSW (Shaded area is Sydney TV1 licence area)

Table 1: List of survey areas in NSW

Local transmission (repeater) site	TV Block	Survey areas
Bouddi	Block D and Block E (SFN with Wyong and Gosford)	As in figures 2 and 5
Wyong	Block D and Block E (SFN with Bouddi and Gosford)	
Gosford	Block D and Block E (SFN with Bouddi and Wyong)	
Sydney North West	Block B	As in figures 8 and 9
Sydney South West	Block D	As in Figure 14
Kings Cross	Block B (SFN with Manly/Mosman)	As in Figure 17
Manly / Mosman	Block B (SFN with Kings Cross)	As in Figure 20
Woronora	Block D	As in Figure 25

Methodology

Surveys were performed by the contractor visiting the identified survey areas and visually observing and collecting household antenna data. The data was obtained by counting types (that is, UHF or VHF), height and orientations of antennas across identified survey areas. Where possible the use of mast head amplifiers was also recorded. The surveys have been conducted by experienced antenna installers with detailed knowledge about the survey areas.

The original sample size (of households to observe in each survey area) was generally determined based on the estimated number of dwellings in each individual survey area individually and using 95% confidence level[6] and 5% confidence interval[7].

Individual survey areas comprised either of individual suburbs, parts of suburbs, or several suburbs grouped together. In some cases, the sample size was adjusted by the contractor in consultation with the ACMA due to a number of factors, with the most common being proportion estimate and visibility/accessibility of the antennas. Proportion estimate was generally based on prior knowledge about antenna orientation in an area, either from the surveyor's experience, or general visual observation of the area (for example, driving around the suburb before the survey was conducted). MySwitch information and the ACMA-produced coverage and best server predictions were also used to inform the survey planning. In some cases, where an area had a rather small number of dwellings (generally about a couple of hundred dwellings), the sample size was generally reduced to a number that, based on the surveyor's estimate, would be sufficient to represent the area.

Since some parts of the overall survey area were semi-rural or rural, in some instances it was difficult to observe the antennas, either due to obstructions such as trees and/or the proximity of the dwellings to the roads.

[6] This is the level of certainty with which the true population value is estimated.
[7] This is the desired level of accuracy of the estimate.

In addition to the numerical data, descriptive information was also provided for all survey areas, including a general description of the survey areas and any relevant observations, such as:

- the size of the area surveyed
- how representative the area was
- the impression about the direction the antennas were generally pointing
- the impression whether the viewers ‘try hard’ to get the reception based on the general antenna heights.

The surveys also provided other observations such as:

- geography of the area (flat, hilly, valley, etc)
- clutter (trees, type of buildings in the area, any other specifics)
- any parts of the surveyed area with arrangements different from the rest of the area
- a general impression about the survey.

All the survey results for each survey area as per Table 1 are presented in the corresponding sections of this report and they are compared with the best server computer-based predictions. Best server predictions are plots which show, for each transmitter, in which areas they provide the strongest signal (that is, they are the best server in that particular area, compared to all other transmitters that could potentially provide the coverage in that area).

In addition, the descriptive summaries about the general and specific observations are also provided for each area under survey results in each section of this report. The survey findings were based on the external observations only and, therefore, no information was obtained about whether the antennas were functional and in use.

2. Central Coast area

Overview

The Central Coast area is an overlap area between Sydney TV1 and Regional Northern NSW TV1 licence areas. The area is served from 3 sites, Gosford, Bouddi and Wyong, which operate in a SFN in UHF on Blocks D and E. Each site provides 8 services in total – 3 Sydney metro commercial, 3 regional Northern NSW commercial and 2 national services.

The survey area is represented by red pins in Figure 2, where each pin denotes a suburb. The suburbs were identified for survey using the best server approach, that is, identifying areas best served by each transmitter (in this case, the main Sydney transmitters or the Gosford, Wyong or Bouddi transmitters). Therefore, not all suburbs in the area have been identified for survey and the focus of the survey was in the areas where the predictions generally showed tentative boundaries between coverage areas of different transmitters. A total of 33 suburbs/local areas were surveyed with an overall sample size of around 6,400 antennas counted.

Figure 2: Central Coast area – survey area (red pins); repeaters (green dots): Gosford, Wyong and Bouddi

Survey results

Survey results for the Central Coast area are shown in Figure 3 and are overlayed on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 3 are presented in Figure 4.

The survey results revealed that there is good correlation between the predictions and the antenna pointing behaviour in the overall surveyed area. In addition, it can be observed that the boundaries of the areas best served by different transmitters also correlate well with the survey observations.

Households receive coverage from one of the 3 sites covering the area (Gosford, Bouddi and Wyong), where the choice of the preferred site is driven by the signal strength. It can also be observed that in the areas where predictions show relatively patchy reception from the 3 local sites, there was an increase in the number of antennas pointing to one of the high-power sites at Sydney or Newcastle (Mt Sugarloaf). This finding has been observed in the areas north of Gosford (Ourimbah, Niagara Park, Lisarow, Narara and Kariong), and southern tips of the survey area such as Kilcare and Kilcare Heights.

In the hilly areas, such as Avoca Beach and Copacabana, where the reception is expected to be problematic due to obstructions, an increase in the use of taller masts was observed. In addition, in some areas (Phegans Bay, Woy Woy, Ettalong beach, Killcare and Kincumber), while an increase in the number of VHF antennas pointing to the main Sydney sites were observed, it was noted by the surveyor that some of those were in rather poor condition, and it is questionable whether they were still in use.

In most of the surveyed Central Coast areas, antennas observed were installed at roof height (nominally at 5 m) or lower. In some areas such as Kariong, Copacabana, Avoca Beach, Narara, Niagara Park and the southern end of Umina Beach, some antennas were observed installed at 10 m above the ground level.

Figure 3: **Survey results overlayed on the coverage predictions plot - Central Coast area. Coverage prediction background colour legend: Yellow – Sydney, Red – Gosford, Green – Wyong and Lavender – Bouddi**

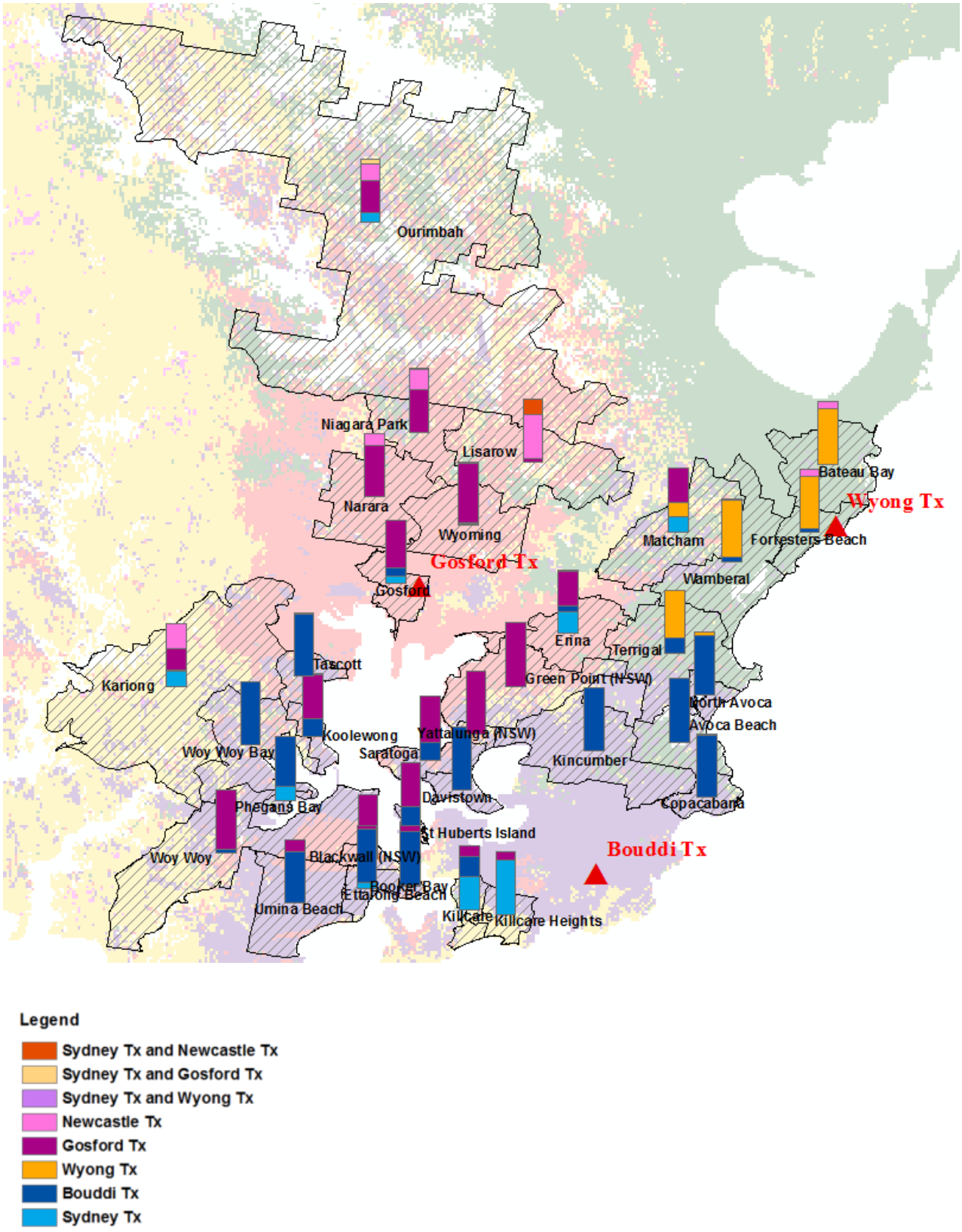
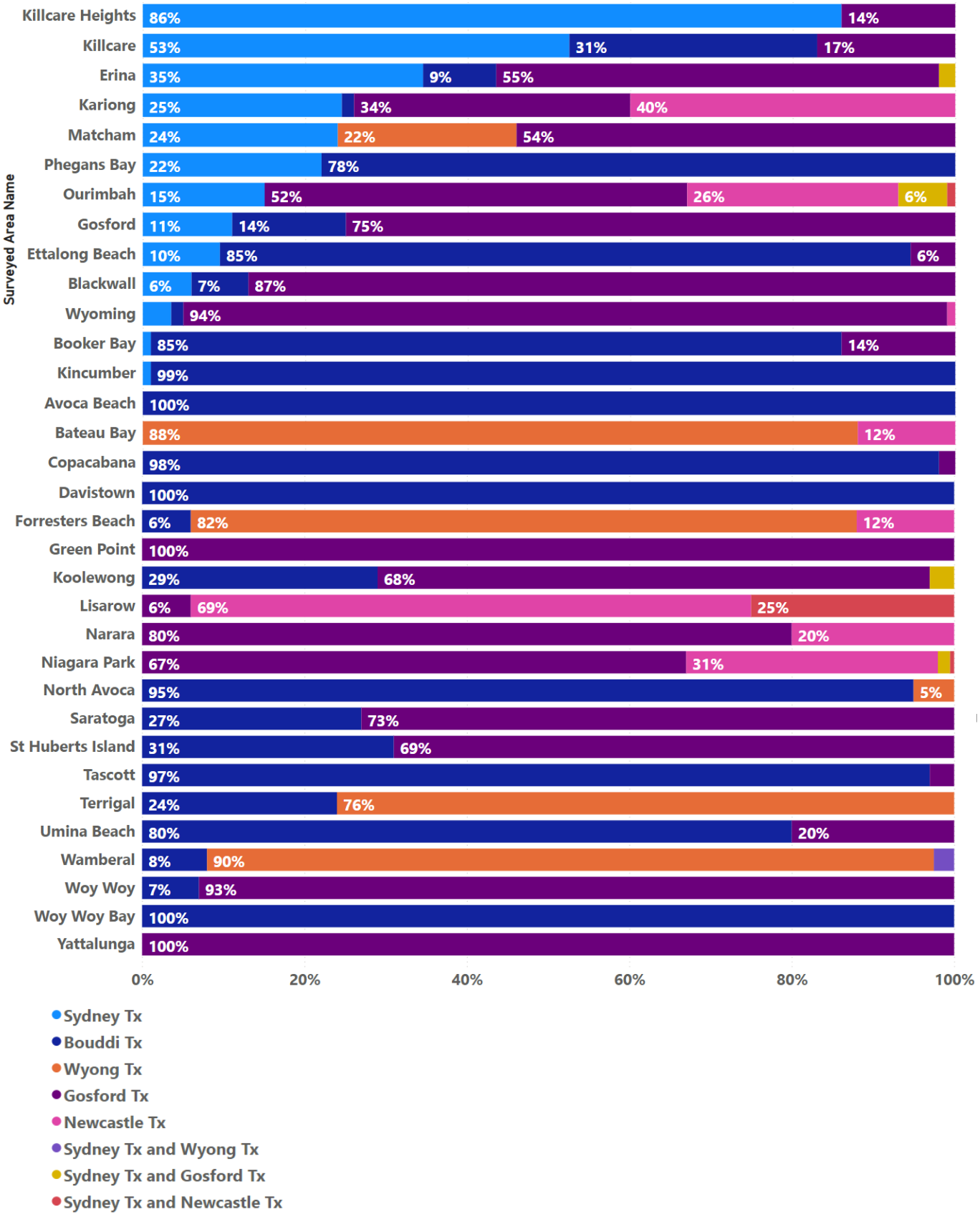


Figure 4: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Central Coast area



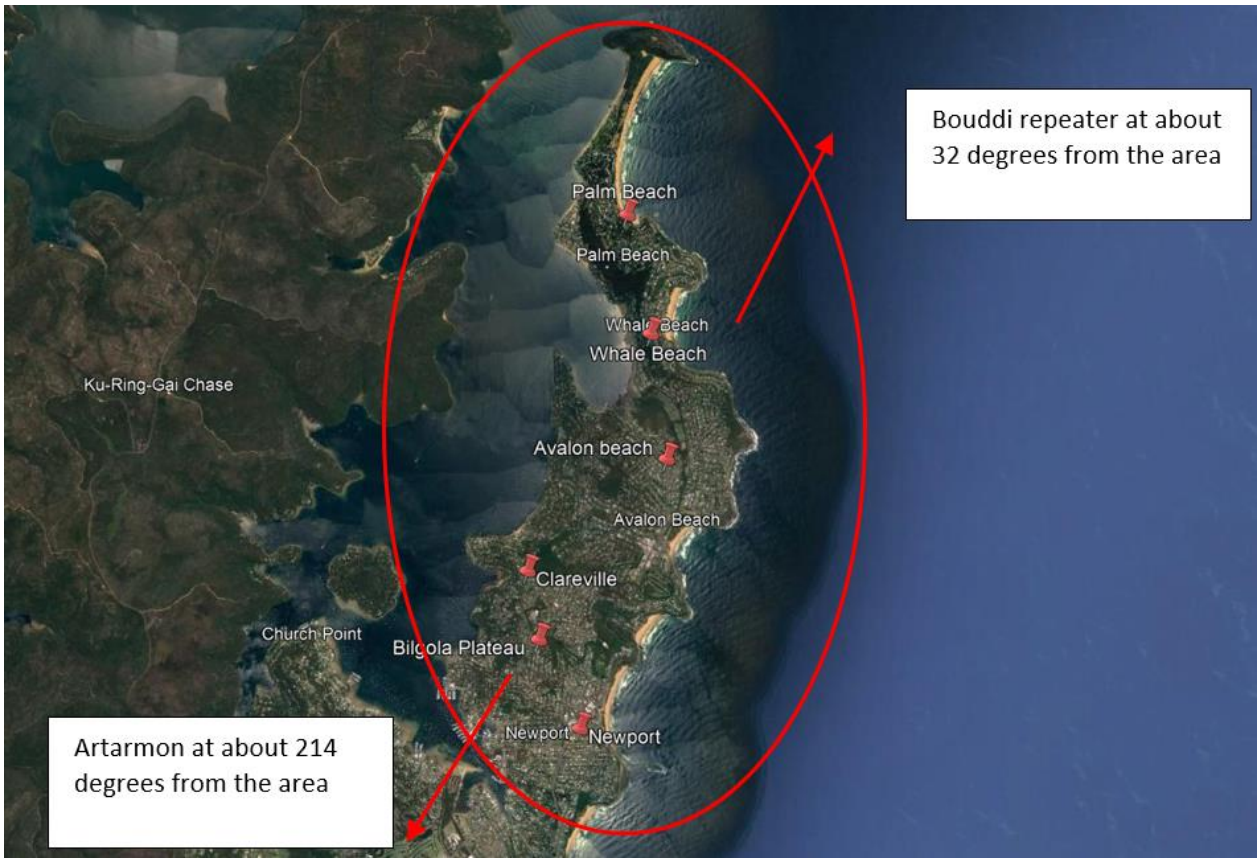
3. Northern Beaches area

Overview

The Northern Beaches area is served by the main Sydney VHF site and it is at the boundary with the Bouddi transmitters, which operate on Blocks D and E.

The survey area is represented by red pins in Figure 5, where each pin denotes a suburb. The areas were identified using the best server approach, that is, identifying areas best served by each transmitter (in this case, the main Sydney transmitters or Bouddi transmitters). Therefore, not all suburbs in the area have been identified for survey and the focus of the survey in this area was in the areas where the predictions generally showed tentative boundaries between coverage areas of different transmitters. A total of 7 suburbs/local areas were surveyed with an overall sample size of around 1,400 antennas observed/counted.

Figure 5: Survey area (red pins) – Northern Beaches area



Survey results

Survey results for the Northern Beaches area are shown in Figure 6 and are overlayed on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 6 are presented in Figure 7.

The survey results revealed that there is good correlation between the predictions and the antenna pointing behaviour in this surveyed area. In addition, it can be observed that the boundaries of the areas best served by different transmitters also correlate well with the survey observations.

The survey results found that in the southern part of the survey area, the households mainly have antennas pointed to the main Sydney site, while in northern parts of the survey area the antennas were mainly pointed towards the Bouddi repeater. In Clareville a proportion of antennas pointing to the Gosford site were observed. The observations were generally consistent with the coverage predictions.

In the Northern Beaches survey area, similar proportion of antennas observed were installed both at roof height (nominally at 5 m) and at 10 m above the ground level.

Figure 6: Survey results overlayed on the coverage predictions plot – Northern Beaches area. Coverage prediction background colour legend: Yellow – Sydney, Red – Gosford and Purple - Bouddi

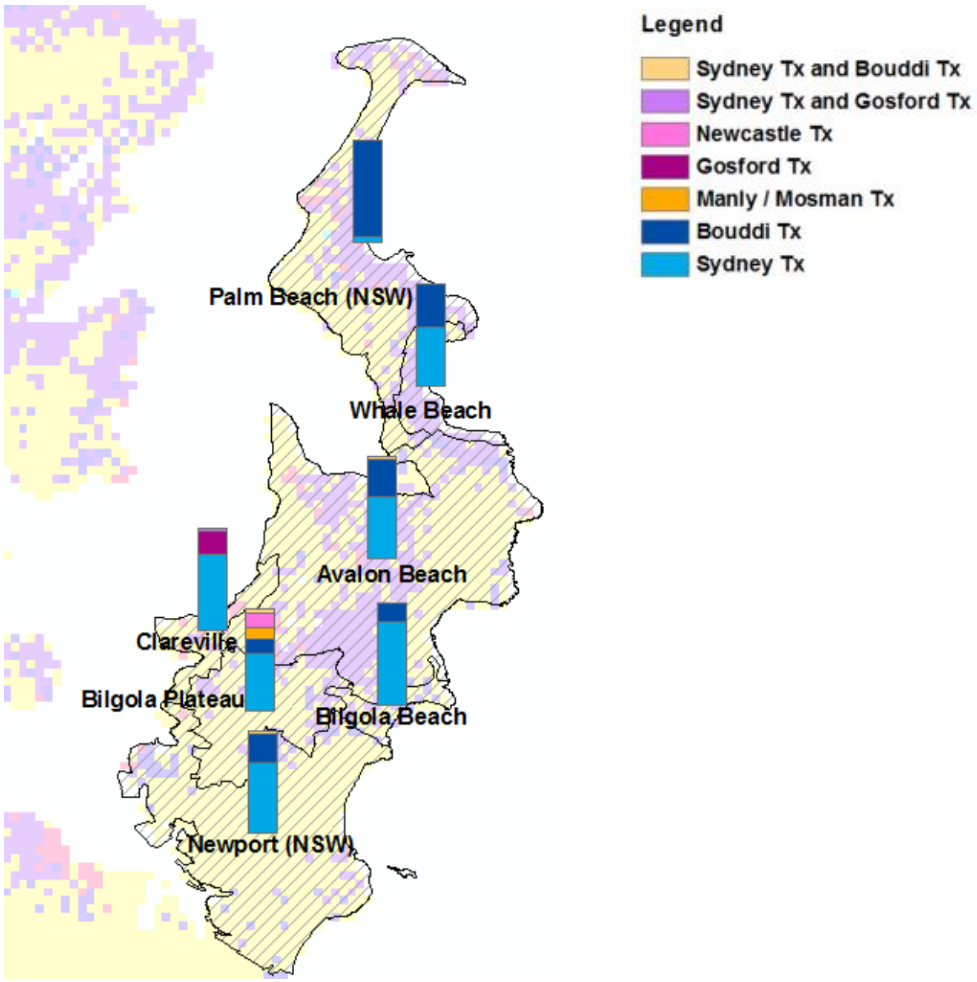
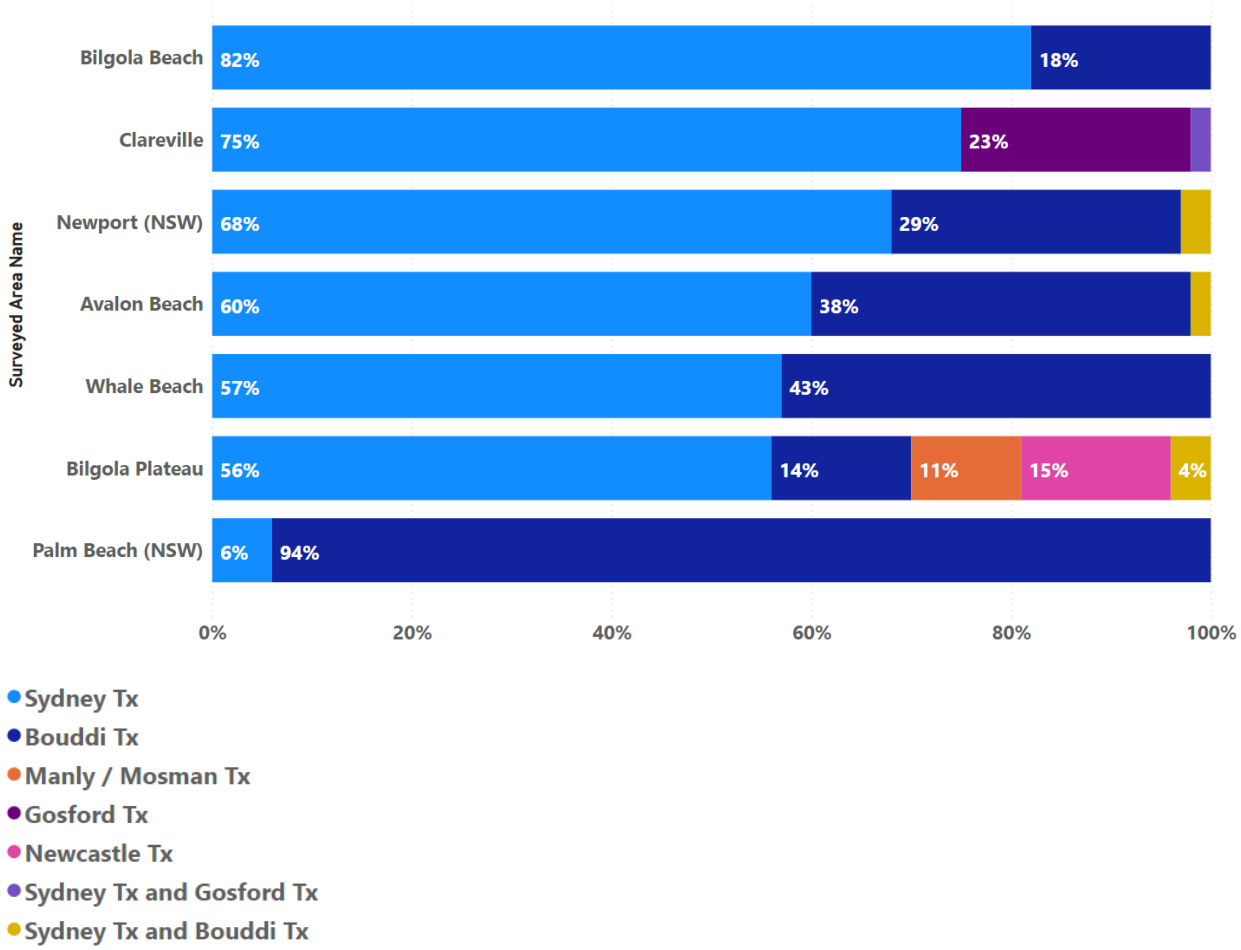


Figure 7: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Northern Beaches area



4. Sydney North West area

Overview

The Sydney North West (NW) transmitter was established during the analog switchover in 2013 (operating in UHF on Block B). It is located at Kurrajong Heights, and it serves an area in north-west Sydney which is close to the edge of coverage from the main Sydney VHF sites.

The survey areas were identified by the ACMA and are represented by red, green and yellow pins in Figures 8 and 9, where each pin denotes a suburb in the general Sydney North West area. The areas were identified using the best server approach, that is, identifying areas best served by each transmitter (in this case, the main Sydney transmitters or the Sydney NW transmitter). Red pins denoted Tier 1 areas, and the survey of these areas was required. Green pins denoted Tier 2 areas, however, not all Tier 2 areas were required to be surveyed, if any. The survey areas commenced with the red pin areas and were expanded in radial directions until it was determined that the majority of households were getting their reception from the Sydney main sites. If required, the survey was expanded further into (Tier 3) yellow pin areas in a similar fashion.

A total of 34 suburbs/local areas were surveyed with an overall sample size of around 4,100 antennas observed/counted.

Figure 8: Repeater (green dot): Sydney North West repeater, survey area (red, green and yellow pins)

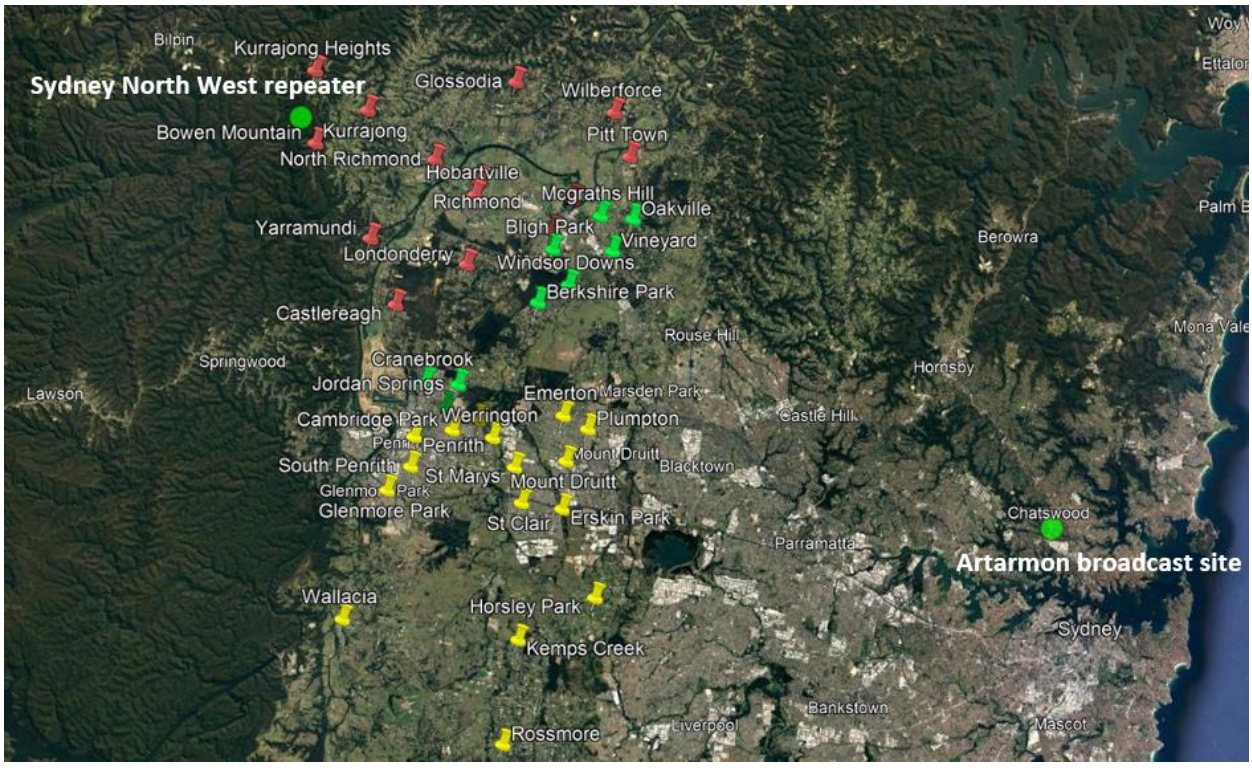


Figure 9: Survey area (red pins in the oval)

Survey results

Survey results for the Sydney North West area are shown in figures 10 and 11 and are overlayed on the best server plot. The actual percentage breakdowns corresponding to the results in figures 10 and 11 are presented in figures 12 and 13.

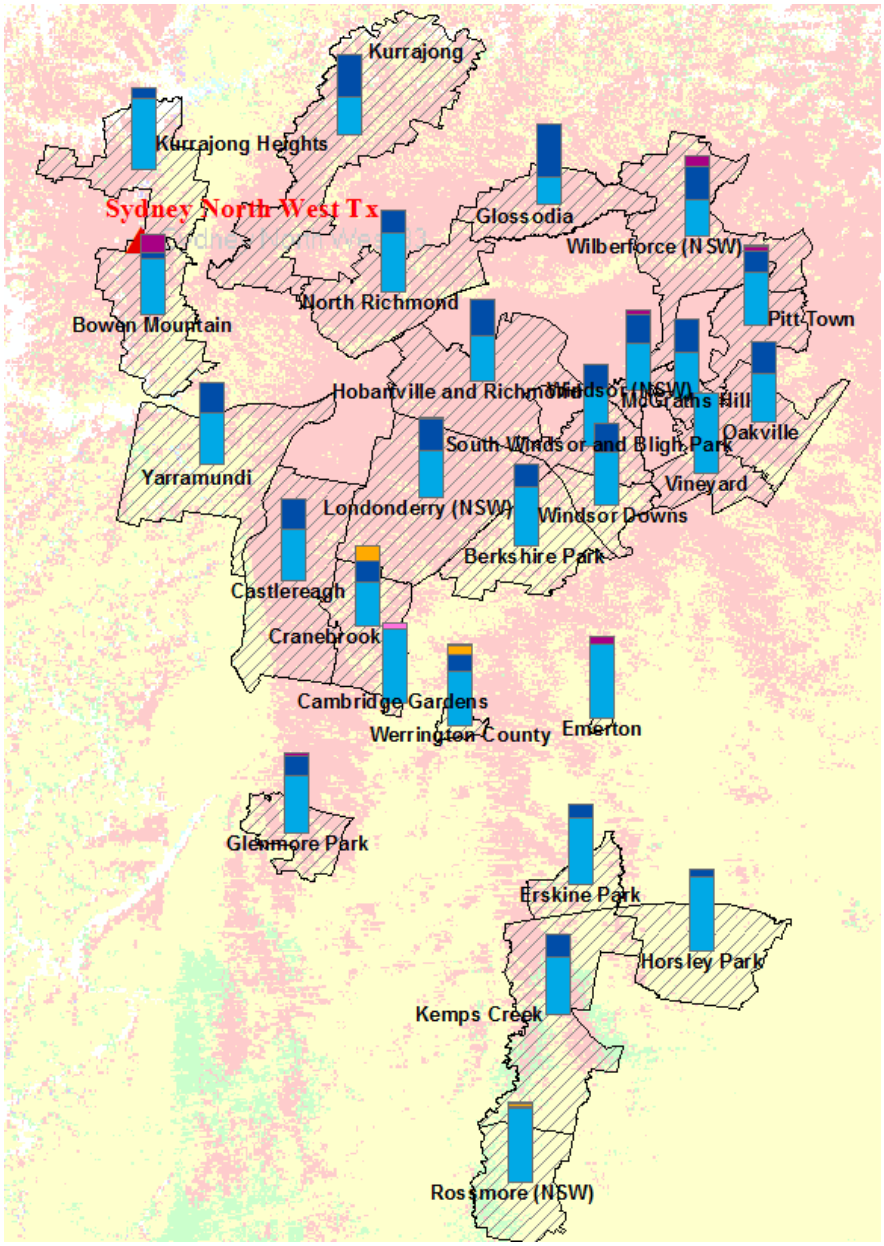
The results demonstrate that in most of the survey area, the antennas mainly point towards the main Sydney sites, even in the areas where the desktop predictions showed that stronger signal would be obtained from the local Sydney NW site. It was also observed that newer antennas were generally UHF antennas, and they were pointing towards the local repeaters. A likely reason for this trend is that the Sydney NW repeater is a relatively new site and historically the households have obtained their TV reception almost exclusively from the main Sydney sites, and to a smaller extent from the Illawarra transmitter. Therefore, unless a household had reception issues, or the dwelling was newly constructed, the household had not modified its antenna systems.

Only one area was identified (Glossodia) where the majority of antennas were pointing to the local repeater, and therefore, it was not possible to determine a clear boundary between the coverage areas of the 2 sites. Some antennas, albeit a relatively small proportion, were observed to be pointing towards the Illawarra (Knight Hill) site.

All Tier 1 (red pins) and Tier 2 (green pins), and some Tier 3 (yellow pins) areas in figures 8 and 9 were surveyed. The surveyors also noted that in the Tier 3 (yellow pin) areas which were not surveyed, a general trend similar to the surveyed Tier 3 areas was observed. Since the survey of Tier 3 areas was conditioned only to those areas where the local repeater was a predominant choice, the survey of those areas was not required.

In the Sydney North West survey area, similar proportions of antennas observed were installed both at roof height (nominally at 5 m) and at 10 m above the ground level.

Figure 10: Survey results overlayed on the coverage prediction (best server) plot. Coverage prediction background colour legend: Yellow – Sydney, Red – Sydney North West



Legend

- Sydney Tx and Illawarra Tx
- Sydney Tx and Sydney North West Tx
- Illawarra Tx
- Sydney North West Tx
- Sydney Tx

Figure 11: Survey results overlayed on the coverage prediction (best server) plot. Coverage prediction background colour legend: Yellow – Sydney, Red – Sydney North West

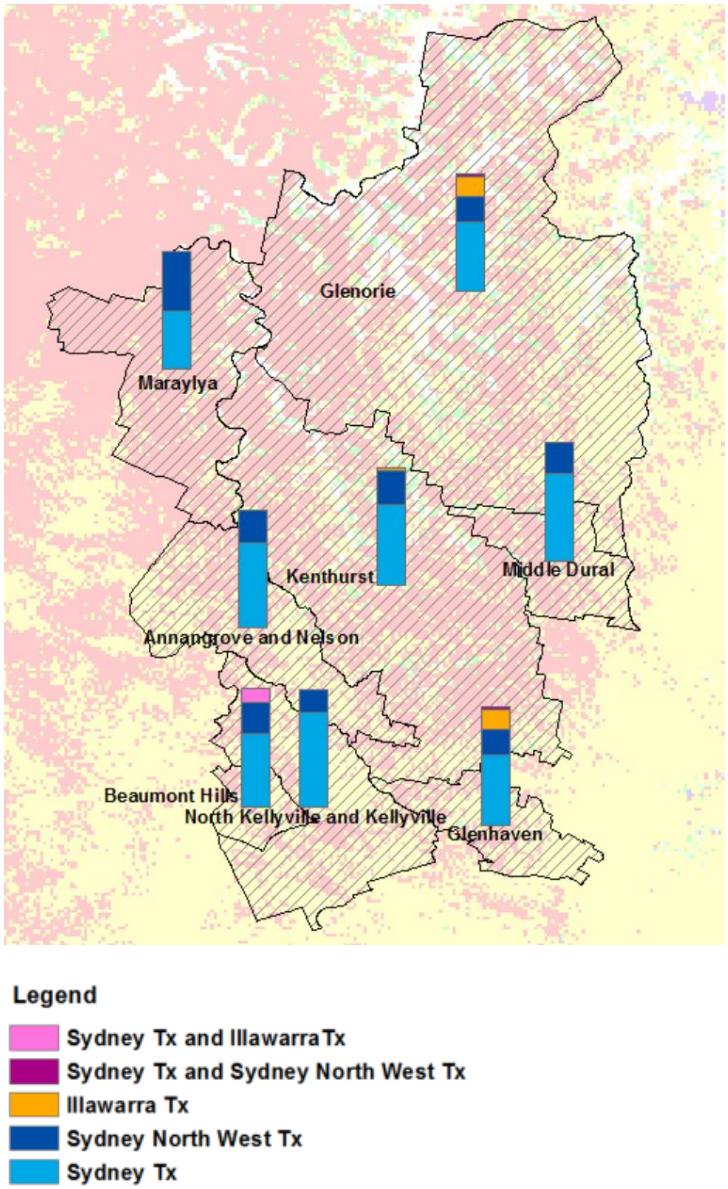


Figure 12: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Sydney North West area (from Figure 10)

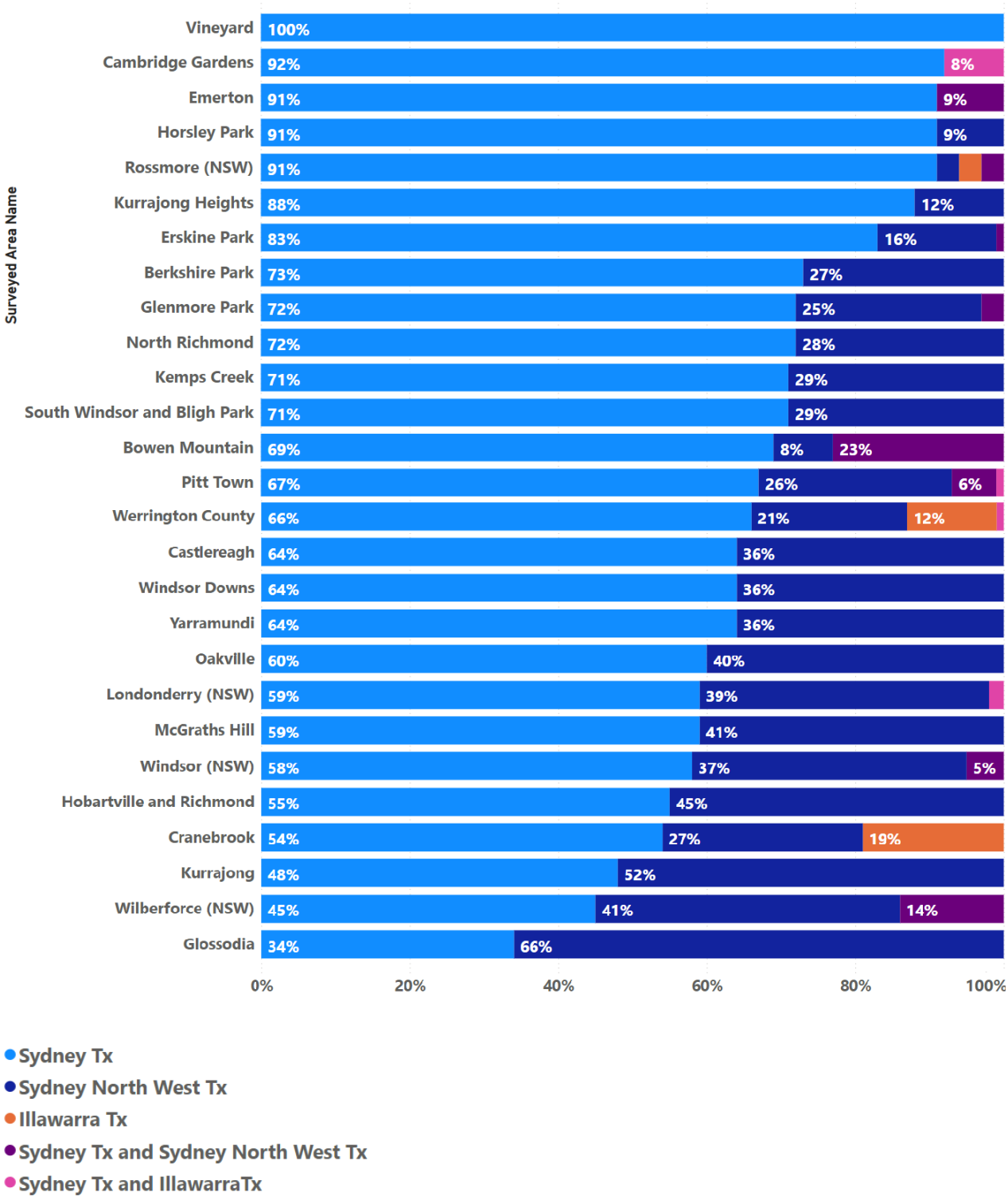
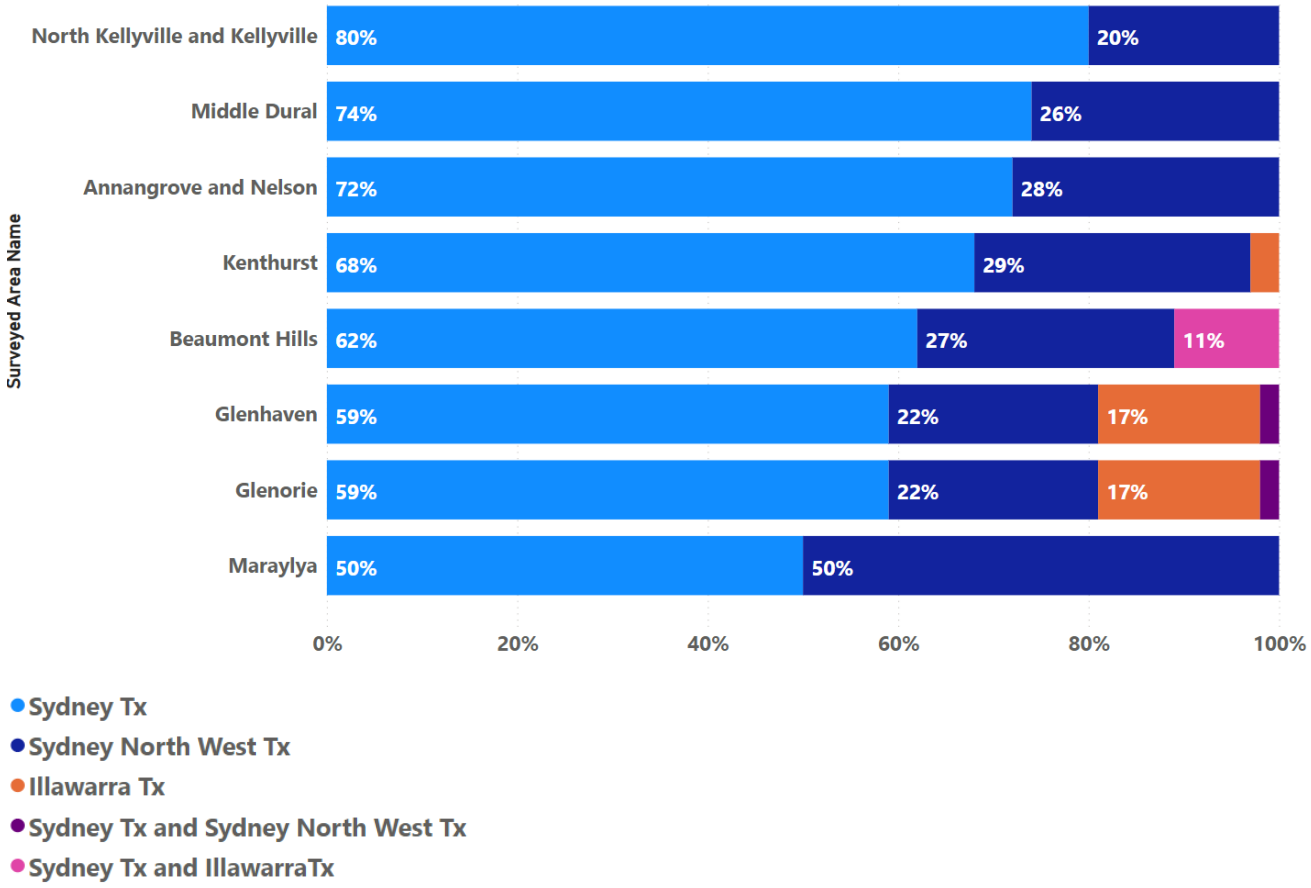


Figure 13: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Sydney North West area (from Figure 11)



5. Sydney South West area

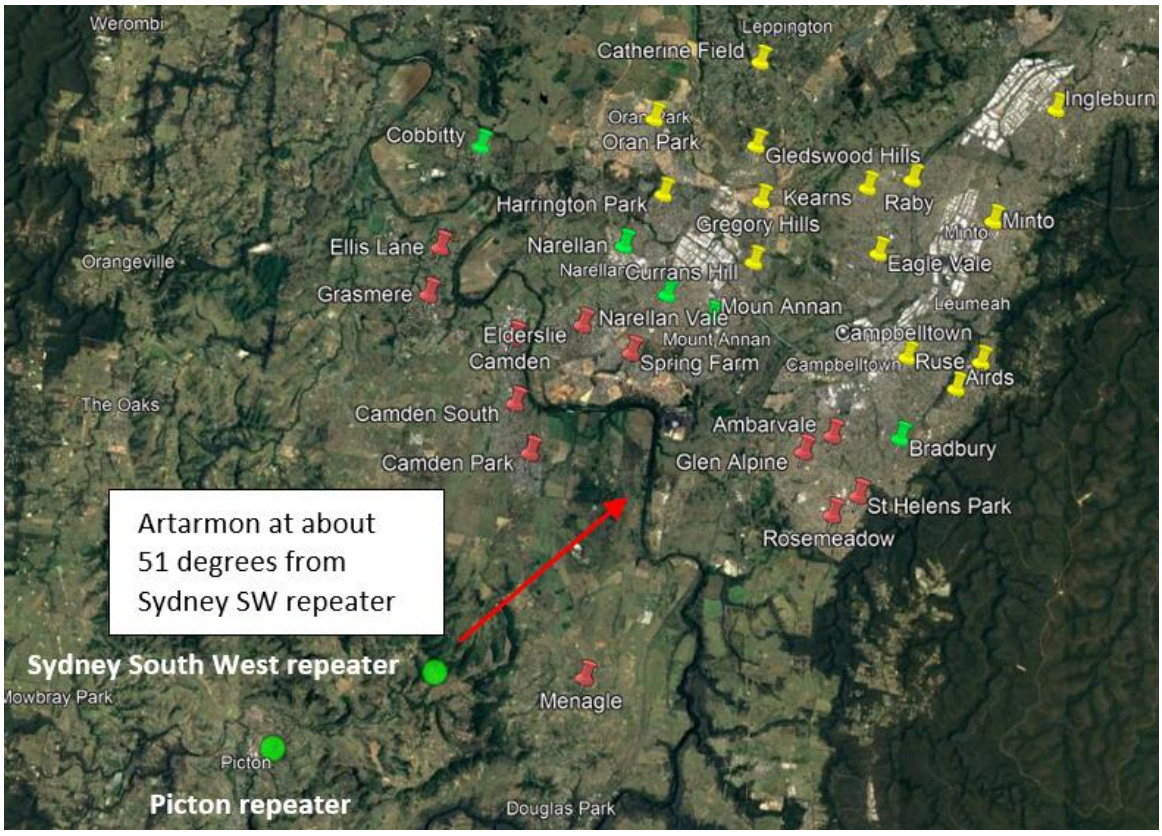
Overview

The Sydney South West (SW) transmitter was established during the analog switchover and it operates in UHF on Block D. It is located at Mt Razorback, and it serves an area in south-west Sydney which is close to the edge of the main Sydney VHF sites coverage. It should be noted that some parts of the survey area are likely to receive fortuitous coverage from the high-power Illawarra (Knights Hill) site in the Regional Southern NSW TV licence area, and it is understood that some households historically watched this licence area services.

The survey area for this repeater was identified by the ACMA and is represented by red, green and yellow pins in Figure 14 Figure 14: where each pin denotes a suburb in the general Sydney South West area. The areas were identified using the best server approach, that is, identifying areas best served by each transmitter (in this case, the main Sydney transmitters or the Sydney SW transmitter). Red pins denoted Tier 1 areas, and the survey of these areas was required. Grin pins denoted Tier 2 areas, however, not all Tier 2 areas were required to be surveyed, if any. The survey areas commenced with the red pin areas and were expanded in radial directions until it was determined that the majority of households in an area were receiving their reception from the Sydney main sites. If required, the survey was expanded further into (Tier 3) yellow pin areas in a similar fashion.

A total of 22 suburbs/local areas were surveyed with an overall sample size of around 5700 antennas observed/counted.

Figure 14: Repeater (green dot): Sydney South West repeater; survey area: red, green and yellow pins.



Survey results

Survey results for the Sydney SW area are shown in Figure 15 and are overlayed on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 15 are presented in Figure 16.

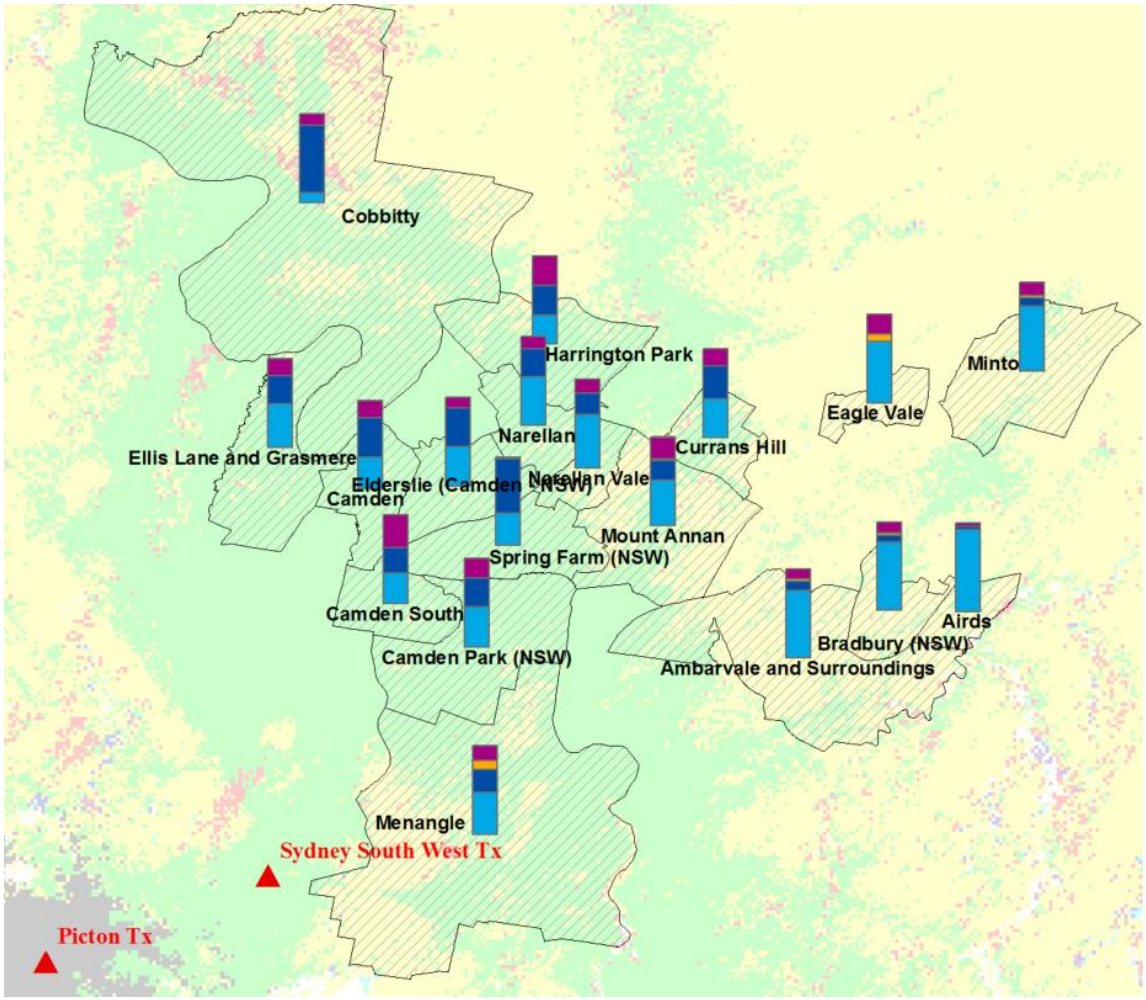
The results of the survey revealed that in most of the survey area, a significant number of the antennas point towards the main Sydney sites. In suburbs in the western part of the survey area, the majority of the antennas were identified as UHF antennas pointing south. However, since the Illawarra (Knights Hill) site is also in the similar general direction, it was difficult to determine which transmitter the household was tuned into, that is, Sydney SW and/or Illawarra.

In suburbs closer to the main Sydney sites, that is, those in the eastern part of the Sydney SW survey area, the antennas were predominantly pointing towards the main Sydney sites.

It was also observed that newer antennas were generally UHF antennas, and they were pointing towards the local repeaters. A likely reason for this trend is that the Sydney SW repeater is a relatively new site and historically households would have obtained their TV reception almost exclusively from the main Sydney sites, and to some extent from the Illawarra transmitter. Therefore, unless a household had reception issues, or the dwelling was newly constructed, the household had not modified its antenna system.

In the Sydney SW survey areas, antennas observed were mostly installed at roof height (nominally at 5 m) with some antennas pointing towards the main Sydney site installed at 10 m above the ground level.

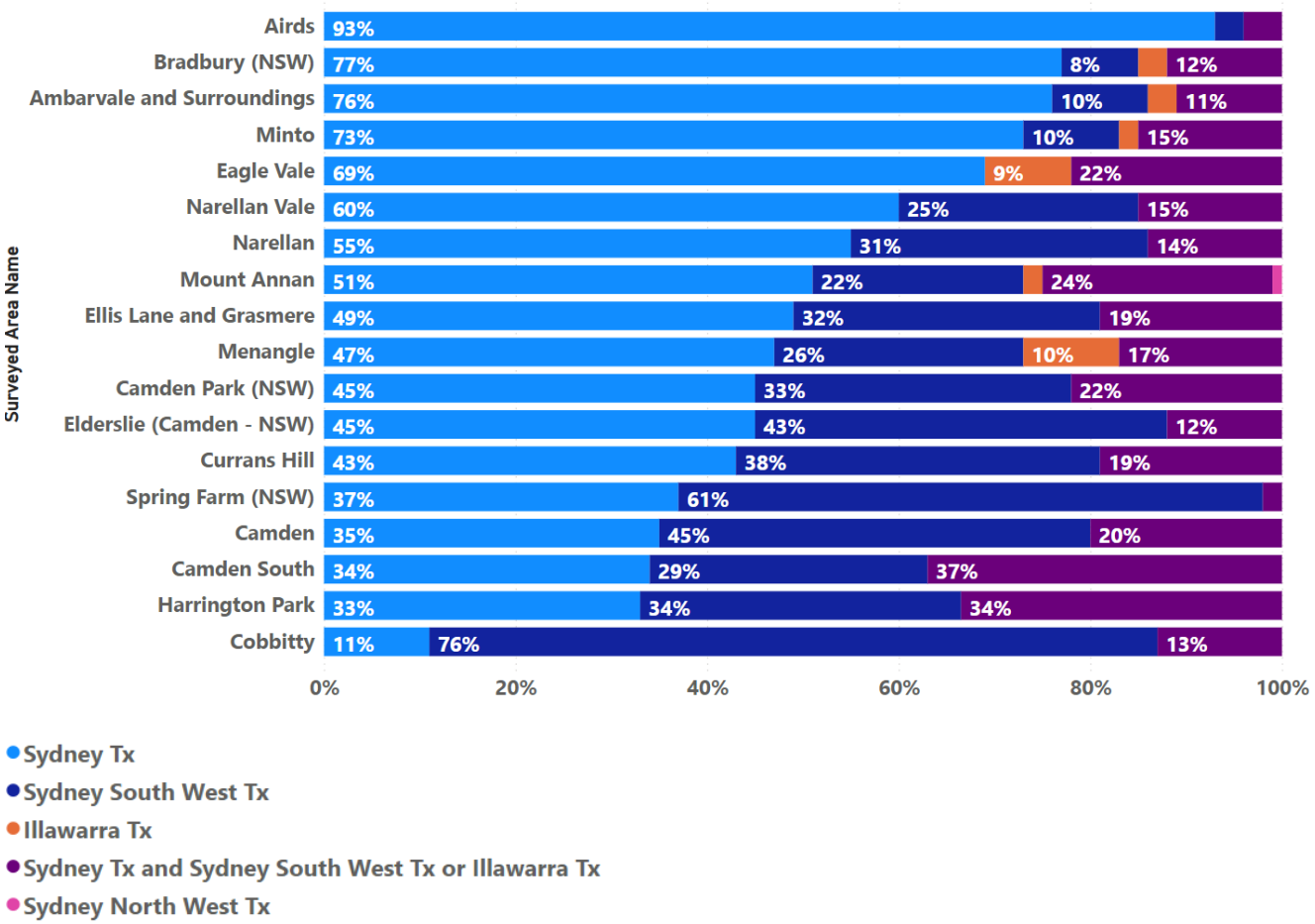
Figure 15: Survey results overlayed on the coverage predictions – Sydney South West. Coverage prediction background colour legend: Yellow – Sydney, Green – Sydney South West



Legend

- Sydney North West Tx
- Sydney Tx and Sydney South West Tx or Illawarra Tx
- Illawarra Tx
- Sydney South West Tx
- Sydney Tx

Figure 16: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Sydney South West area



6. Kings Cross area

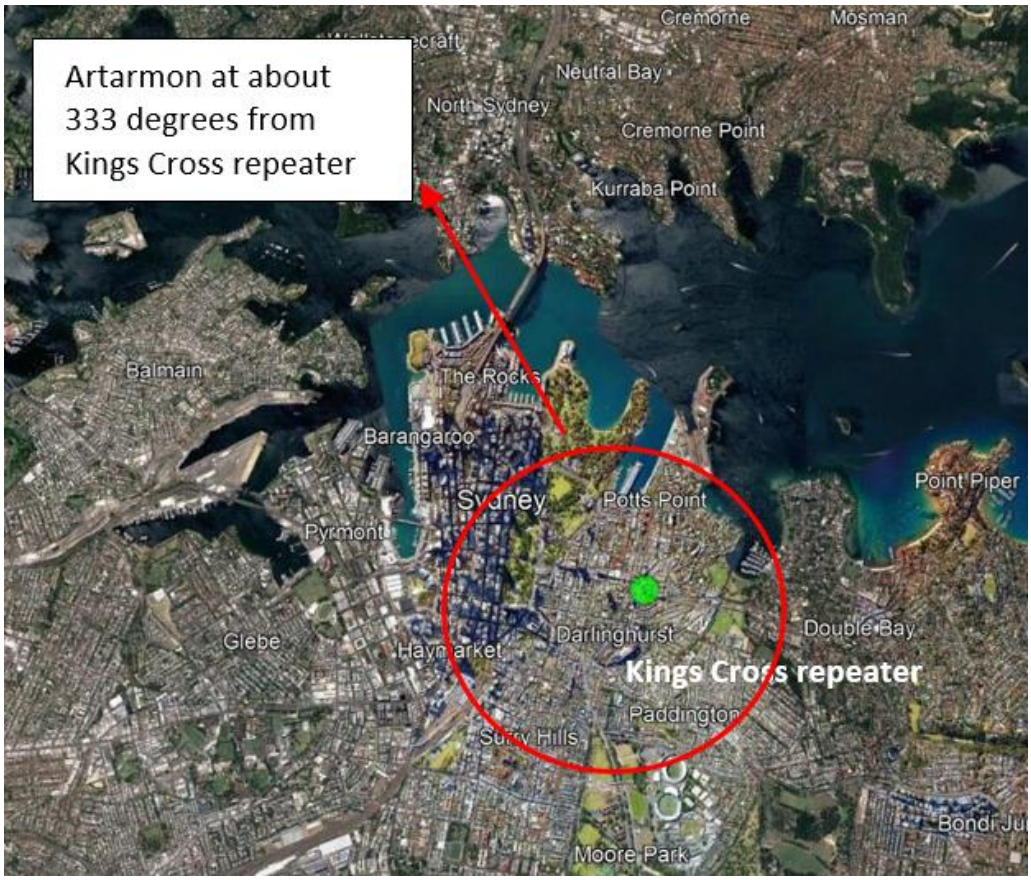
Overview

The Kings Cross transmitter is located on the Elan Building in Kings Cross, and its purpose is to provide coverage to areas in and around Sydney CBD, especially where the coverage from the main Sydney VHF sites may be obstructed due to tall buildings in the CBD. Kings Cross operates on Block B and in SFN with the Manly/Mosman repeater. The Kings Cross services were planned on the basis that they would be protected to within suburban level reception against interference from other broadcasting services.

The survey area for this repeater was identified by the ACMA and is shown as a red circle in Figure 17. The area was identified using the best server approach, that is, identifying areas where the Kings Cross transmitter provided a stronger signal compared to the main Sydney transmitter. Some areas such as Paddington and parts of Surry Hills were relatively easy to survey, with predominantly residential type dwellings and antennas which are easily observed. However, some parts were more difficult to observe particularly in the areas with tall buildings.

A total of 7 suburbs/local areas in the inner Sydney city area were surveyed, with an overall sample size of around 2,200 antennas counted.

Figure 17: Repeater (green dot): Sydney South West repeater, survey area: red circle – Kings Cross area



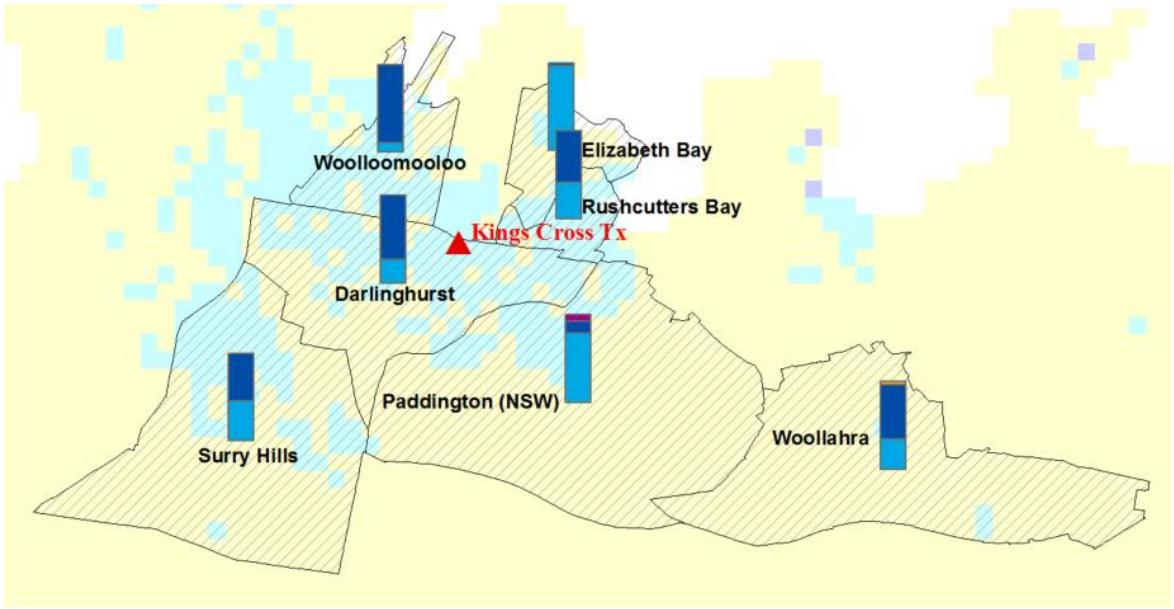
Survey results

Survey results for the Kings Cross area are shown in Figure 18 and are overlayed on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 18 are presented in Figure 19.

The results of the survey were mixed, revealing that in some areas UHF antennas pointing to the Kings Cross repeater were the main choice, such as in Darlinghurst, Woolloomooloo, Rushcutters Bay and Surry Hills. Antennas in Elizabeth Bay and Paddington were almost exclusively VHF antennas pointing to the main Sydney site. In Woollahra, the observations were made mostly on the western part of the suburb, bordering Paddington. A number of combination UHF/VHF antennas were observed in this area; however, it was unclear which site those were pointing to since both the main Sydney site and the Kings Cross repeater are in a very similar direction. A small proportion of antennas pointing to Manly/Mosman repeater were also observed in the Paddington area.

In the Kings Cross survey areas, antennas observed were mostly installed at roof height (nominally at 5 m).

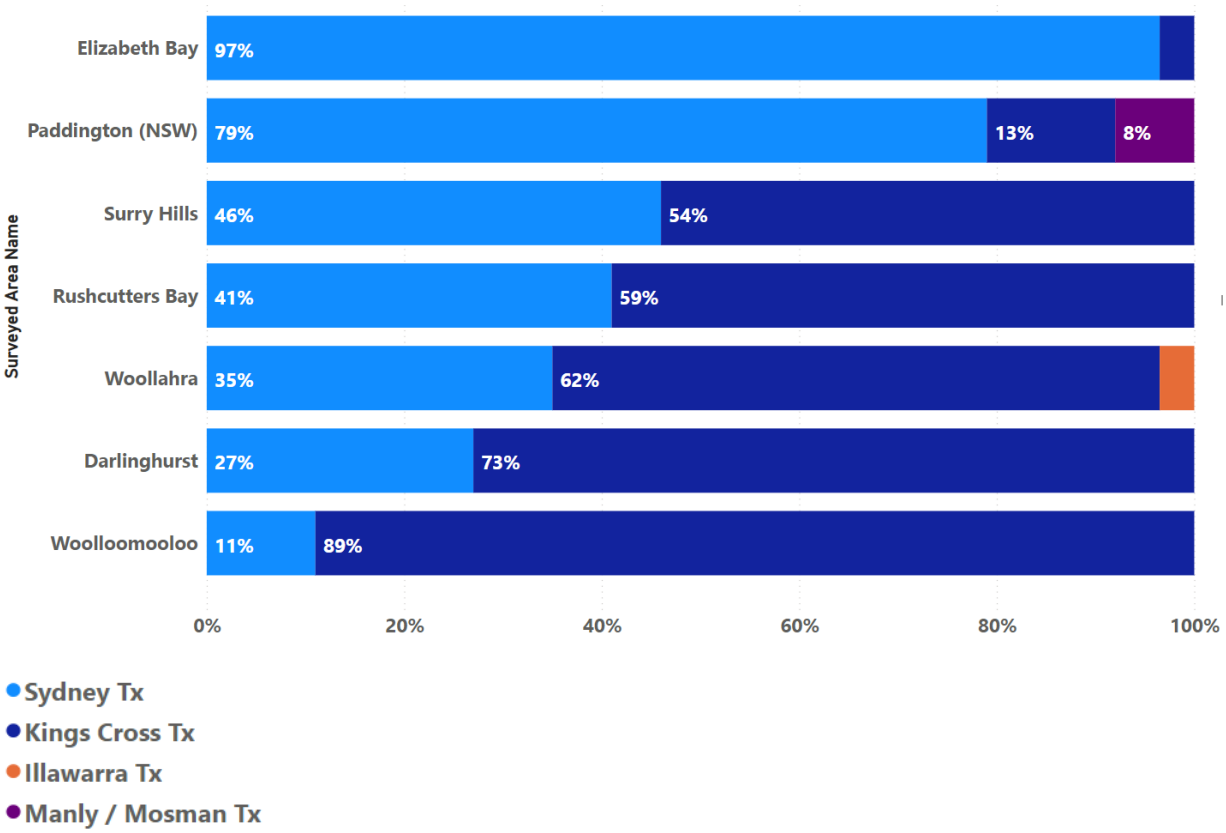
Figure 18: Survey results overlayed on the coverage predictions – Kings Cross. Coverage prediction background colour legend: Yellow – Sydney, Blue – Kings Cross



Legend

- Manly / Mosman Tx
- Illawarra Tx
- Kings Cross Tx
- Sydney Tx

Figure 19: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Kings Cross area



7. Manly/Mosman area

Overview

The Manly/Mosman repeater is located at Broadcast Site Sewage Treatment Plant in Manly, and its purpose is to provide coverage to areas in and around Manly and Mosman, especially where the reception from the main Sydney VHF sites may be obstructed due to hills. The Manly/Mosman services were planned on the basis that they would be protected to within suburban level coverage. Manly/Mosman operates in a SFN with the Kings Cross repeater on Block B.

The survey area for this repeater was identified by the ACMA and is showed as red circles in Figure 20. The area was identified using the best server approach, that is, identifying areas were the Manly/Mosman transmitter provided a stronger signal compared to the main Sydney transmitter.

The surveys comprise the Manly area as part of the Northern Beaches region, and Mosman on the opposite side of Middle Harbour, south-west of Manly and part of the Lower North Shore area. All survey areas of interest are generally undulating and hilly, typical of the general region. Overall, the area was relatively easy to survey although in some parts the antenna visibility was obstructed due to large multistorey apartment complexes and buildings.

A total of 11 suburbs/local areas were surveyed with an overall sample size of around 1,600 antennas counted.

Figure 20: Repeater (green dot): Manly/Mosman repeater; survey area: red oval

Survey results

Survey results for the Manly/Mosman area are shown in figures 21 and 22 and are overlayed on the best server plot. The actual percentage breakdowns corresponding to the results in figures 21 and 22 are presented in figures 23 and 24. The results of the survey revealed that in most of the survey area, a significant number of the antennas point towards the main Sydney VHF site. In Manly, Mosman and Beauty

Point an increase in proportion of UHF antennas pointing towards the Manly/Mosman repeater was observed, although the antennas were still predominantly pointing towards the main Sydney VHF site. In Manly, it was only possible to collect data on the standard residential dwellings and smaller unit blocks in the area and UHF antennas were generally seen mixed with VHF through the suburb, but with the majority of antennas being VHF in the north closer to Queenscliff. Areas such as Seaforth, Balgowlah and Balgowlah Heights, which generally have a good view of the main Sydney VHF transmitter, the main type of antennas were those pointing towards the main Sydney site, although an increase in the UHF antennas pointing towards the local Manly/Mosman site was observed south of Sydney Road.

In Mosman, although VHF and UHF antennas were observed across the area, east of Military Road UHF antennas looking to the Manly/Mosman repeater were predominantly observed. Moving west towards Cremorne from Military Road the majority of antennas observed were pointing to the Sydney VHF transmitter. In Balmoral, antennas pointing towards the Manly/Mosman repeater were the predominant choice, which is expected due to terrain obstructing coverage from the main Sydney VHF site. In Clifton Gardens, antennas pointing towards the Kings Cross repeater were observed, noting that the Kings Cross repeater is predicted to provide good coverage in parts of the general Mosman area.

In some cases, local variations in terrain and building clutter meant that transmitter choice was made at a very local level.

In the Manly/Mosman survey areas, antennas observed were mostly installed at roof height (nominally at 5 m) with some antennas pointing towards the main Sydney site installed at 10 m above the ground level in Manly, Mosman and Spit Junction.

Figure 21: Survey results overlayed on the coverage predictions plot – Manly area. Coverage prediction background colour code: Yellow – Sydney, Purple – Manly/Mosman

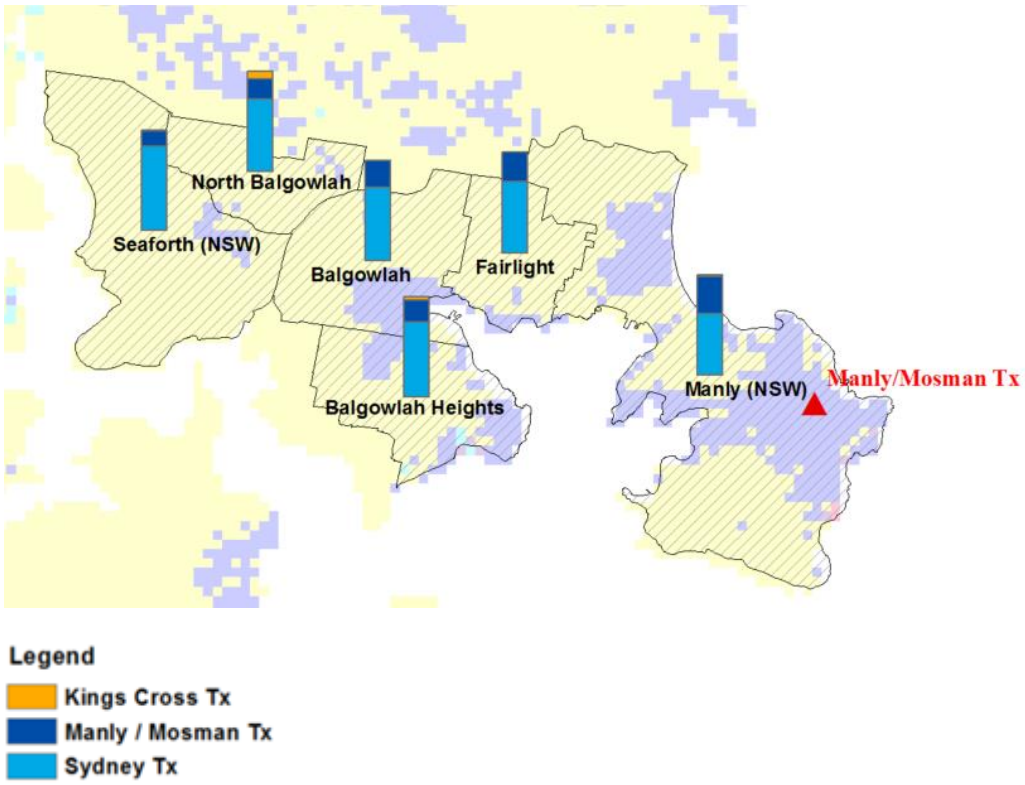


Figure 22: Survey results overlayed on the coverage predictions plot – Mosman area. Coverage prediction background colour code: Yellow – Sydney, Purple – Manly/Mosman, Blue – Kings Cross.

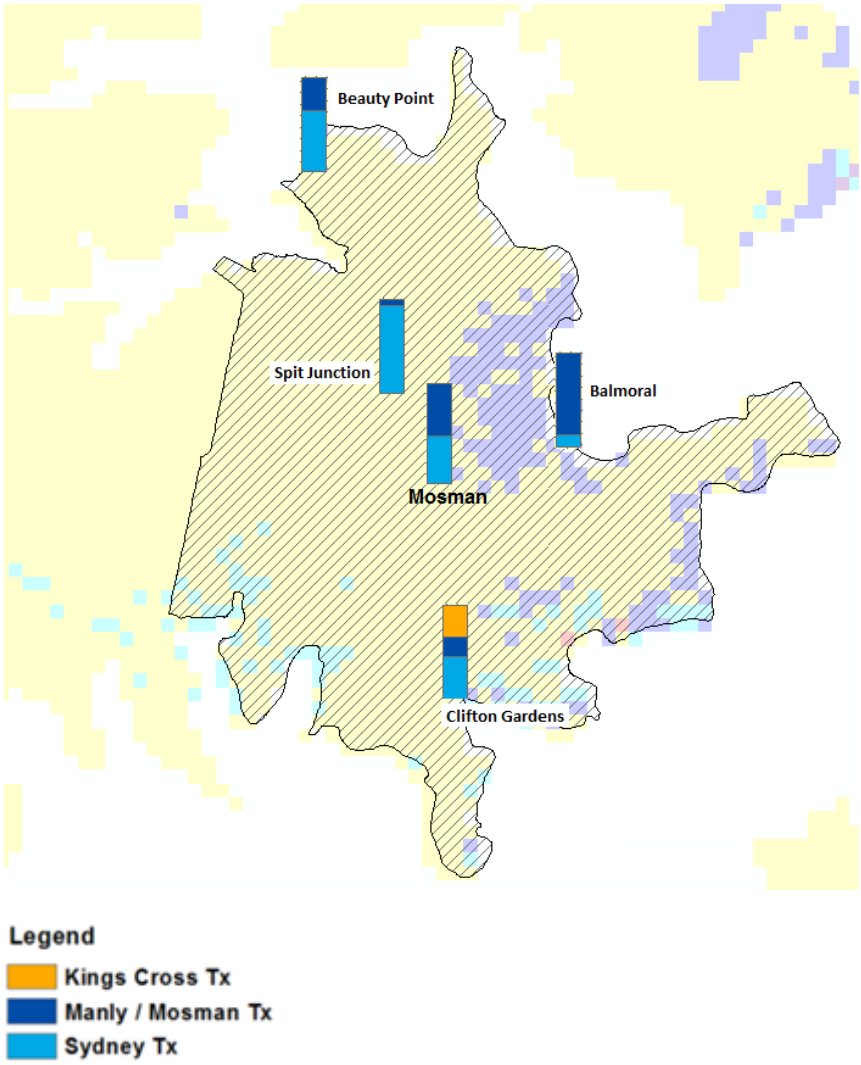


Figure 23: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Manly area

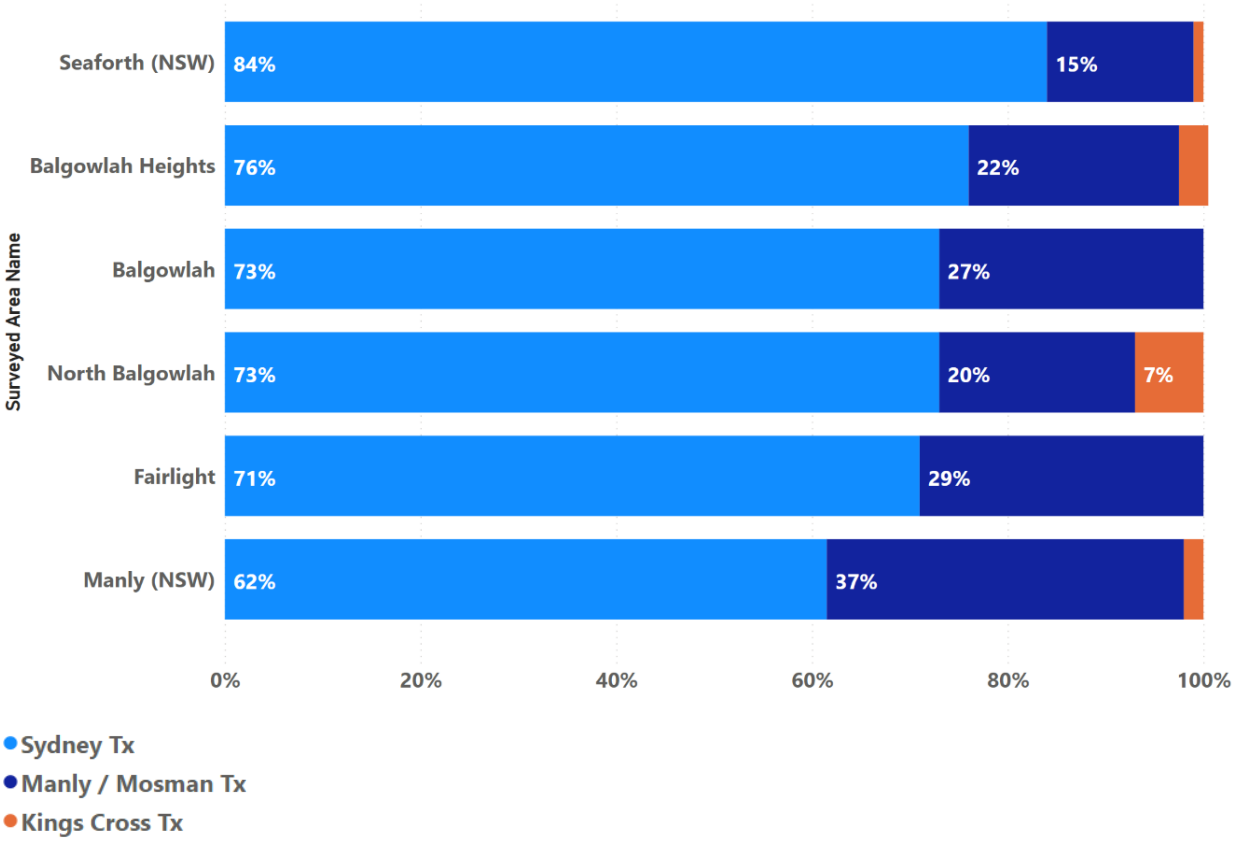
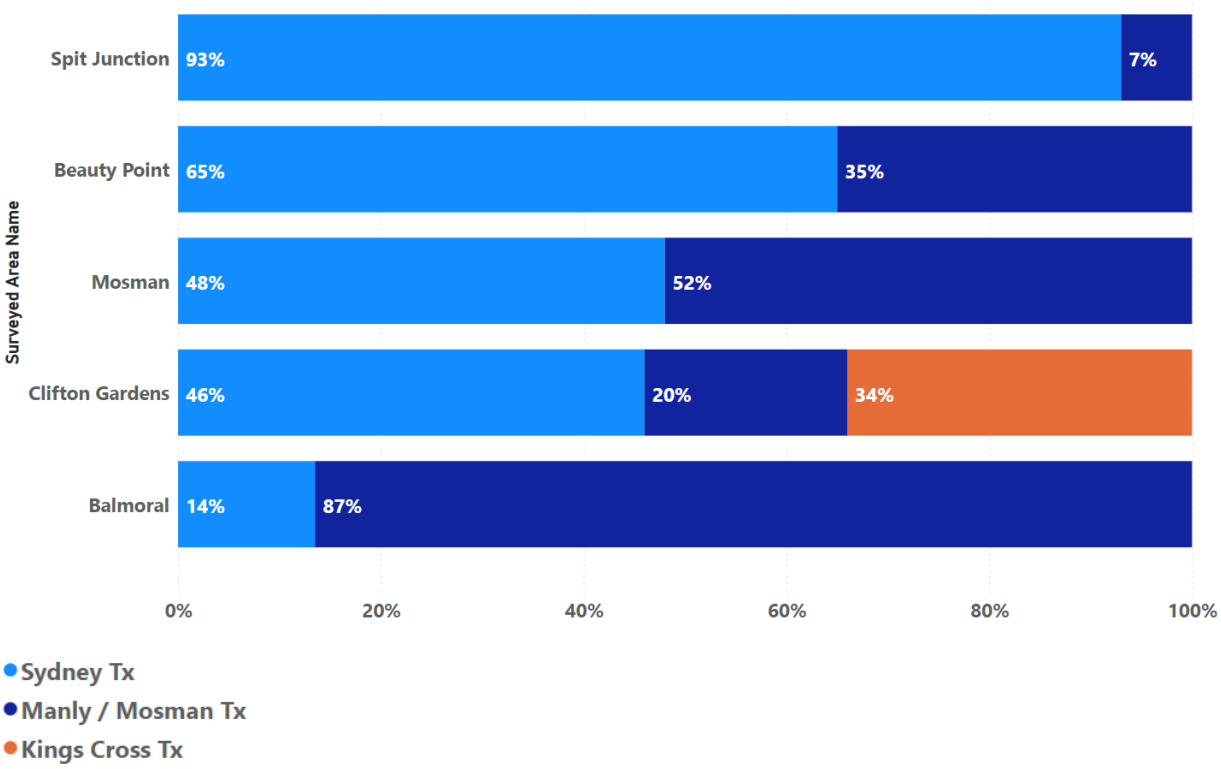


Figure 24: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Mosman area



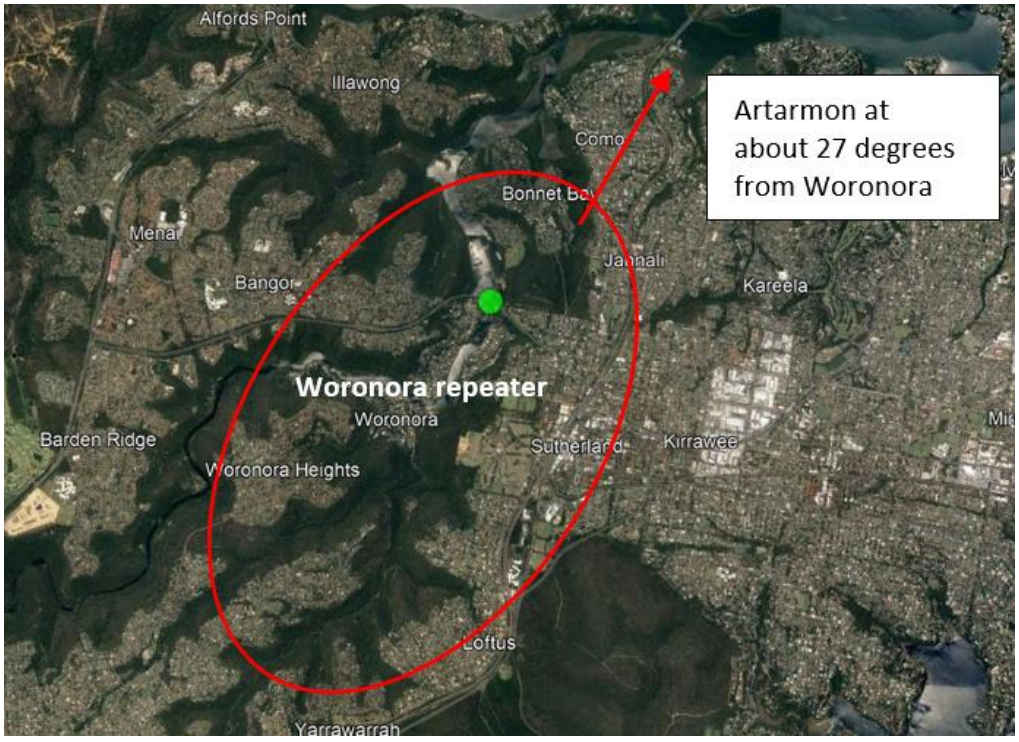
8. Woronora area

Overview

The Woronora repeater is located on the bridge over the Woronora River. This is a low-lying area, and the repeater provides reception over a small area comprising Woronora itself and part of Bonnet Bay. The suburbs around Woronora are generally located on higher ground and look to alternative transmitters, in particular the main Sydney VHF site. The Woronora services operate on Block D and were planned on the basis that they would be protected to within suburban level coverage.

The survey area for this repeater was identified by the ACMA and is showed as a red oval in Figure 25. The area was identified using the best server approach, that is, identifying areas where the local Woronora repeater provide strongest signal compared to the main Sydney transmitters. A total of 7 suburbs/local areas were surveyed with an overall sample size of around 1,900 antennas counted.

Figure 25: Repeater (green dot): Sydney Woronora repeater; survey area: red oval



Survey results

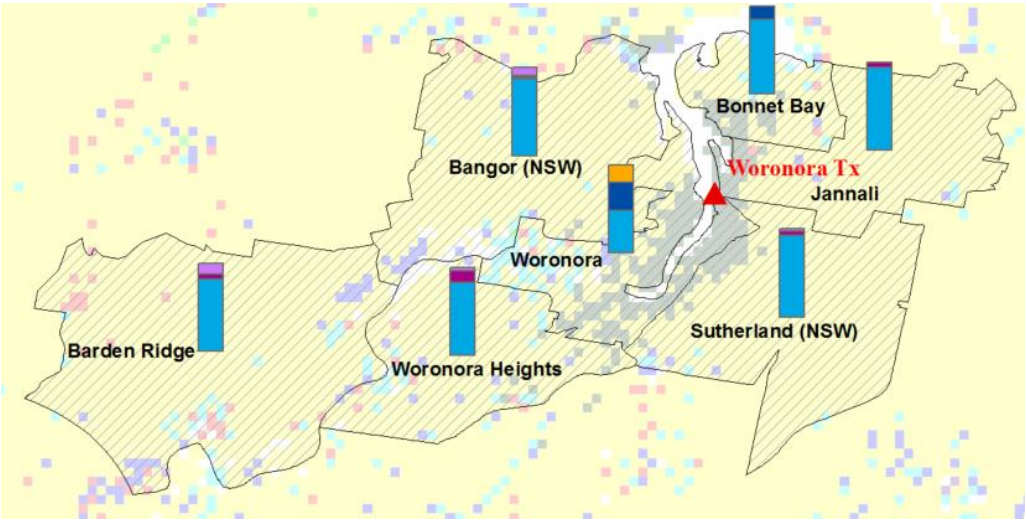
Survey results for the Woronora area are shown in Figure 26 and are overlayed on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 26 are presented in Figure 27.

The results of the survey revealed that in most of the survey area, a significant number of the antennas still pointed towards the main Sydney sites. A proportion of the UHF antennas pointing to the local Woronora repeater was observed in suburbs of Woronora (32%) and Bonnet Bay (15%). In the overall survey area, UHF antenna pointing to the Kings Cross repeater and the Illawarra (Knight Hill) transmitter were

also observed. During the survey it was considered that there are historic reasons and consumer preferences which inform the choice of transmitter across the survey area.

In the Woronora survey areas, in low lying areas, antennas observed were installed at 10 m above the ground level and in all other areas antennas were installed at roof height (nominally at 5 m).

Figure 26: Survey results overlayed on the coverage predictions plot – Woronora area. Coverage prediction background colour legend: Yellow – Sydney, Grey – Woronora.



Legend

- Sydney Tx and Illawarra Tx
- Sydney Tx and Manly Mosman Tx
- Sydney Tx and Kings Cross Tx
- Sydney Tx and Woronora Tx
- Woronora Tx
- Sydney Tx

Figure 27: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Woronora