

RF Technical Justification Report

For proposed mobile telecommunications installation

Site ID: DU1548

Site Name: Ballyroan_Ballyboden

Address: Ballyroan Community and Youth Centre, Rathfarnham, Dublin 14

Prepared by:

Darren Humphries – Senior Radio Engineer, Three Ireland

Date: 01/08/2019



Index

1.0 Introduction	P.3
2.0 Network Planning and Performance	P.3
3.0 Coverage Requirements at Ballyroan_Ballyboden	P.5
4.0 Service Coverage Plots / Predictions	P.6
5.0 Technical Conclusion	P.10

1.0 Introduction

This section provides a technical justification for the proposed installation (radio base station) in Ballyroan/Ballyboden, Rathfarnham, Dublin 14. The installation is required to provide 2G voice, 3G and 4G data service provision in the area. The installation forms part of an integrated telecommunications network system which has been meticulously planned out to provide best possible network performance within the limitations encountered in this rural environment. The current uptake of devices has put additional pressures on the network meaning existing base stations are undergoing significant upgrades in technology to meet this demand and so are critical in maintaining current and future service provision. Failure to maintain this installation will have an immediate and negative impact on Three's network and its customers. This site is proposed to provide mobile voice and data coverage to the Ballyroan/Ballyboden area and to improve voice and broadband access to residents & business users in the area.

2.0 Network Planning and Performance

The site selection process at the network planning stages is central to creating an overall network that is efficient and meets customer expectation but also meets the regulatory systems within which the network is operating. Aside from the land-use planning and property procurement, addressed in other sections of the report, there are many external factors that affect network performance. Performance can be affected by various issues such as the technology of the devices used, the local environment the signals need to travel through, the fundamental physics behind wireless transmission and more. Some of these cannot be avoided and measures must be taken to try to minimise these negative effects. The following will briefly elaborate on some of these issues in order to understand the limitations on site choice for radio planners.

2.1 Physical Obstructions

Wireless signals can have trouble penetrating solid objects which can be any numbers of things such as hills, buildings, single walls or even people. The more obstructions you have between the transmitter and receiver, the more chance there is that the signal strength will be affected so sites are chosen with as clear a line of site to the next base station as possible.

2.2 Network Range & Distance between Devices

The further apart the networked devices that are trying to communicate with each other are, the more the signal strength drops. This is due to way that wireless signals propagate covering a wider area as they travel further and because of this, as the signal spreads more, the weaker it becomes, in general, if the distance is doubled the signal becomes 8 times weaker and so on.

2.3 Wireless Network Interference

Wireless Networking is becoming more and more common and therefore more wireless transmissions are being sent through the air. Signals operating at similar frequencies can cause interference with each other and have a significantly negative effect on the performance of the network. This means that more widely used frequency bands can be severely affected by the overcrowding of wireless signals to a point where a device will not operate at an acceptable level. Other wireless technologies can cause identical interference such as mobile phones and microwave ovens that operate within the same ranges.

2.4 Signal Sharing

Wireless Networks allow more than 1 device (Smart phone, Tablet etc.) to communicate with a base station at any one time. This sharing of connection means that the more customers accessing the network, the more devices the base station has to try and communicate with instantaneously. The point of access has to delegate its resources to each subscriber individually per the amount of transmitting radios it operates on.

2.5 Network Usage- Bandwidth / Data Speeds

With the widespread take-up of Smart Phones and other 4G internet ready mobile devices a more common problem is network usage. The more people utilising the network bandwidth, the less bandwidth there is to share between them. As bandwidth requirements increase with for example when accessing video streaming and other bandwidth intensive applications existing base station technologies need to be upgraded in or to maintain performance. The proposed 3G services provided on 900Mhz band and 4G services delivered on the 800Mhz band give a larger cell coverage area compared to older 3G on 2100Mhz band and provide better building penetration / indoor coverage. The 4G services provide data speeds far in excess of 3G services (up to 10 times faster) and can outperform fixed line broadband services in a lot of cases and especially in Rural and some Suburban areas.

2.6 Local Environment Characteristics

Particular to indoor networks or coverage, wall construction properties can be one of the biggest inhibitors of wireless signals. Construction materials used in building and offices have different levels of effect; concrete is a usual suspect in badly performing indoor network coverage. Basically the thicker the walls, the less success the signal will have penetrating through it whilst maintaining a high strength.

3.0 Coverage Requirements at Ballyroan/Ballyboden and environs

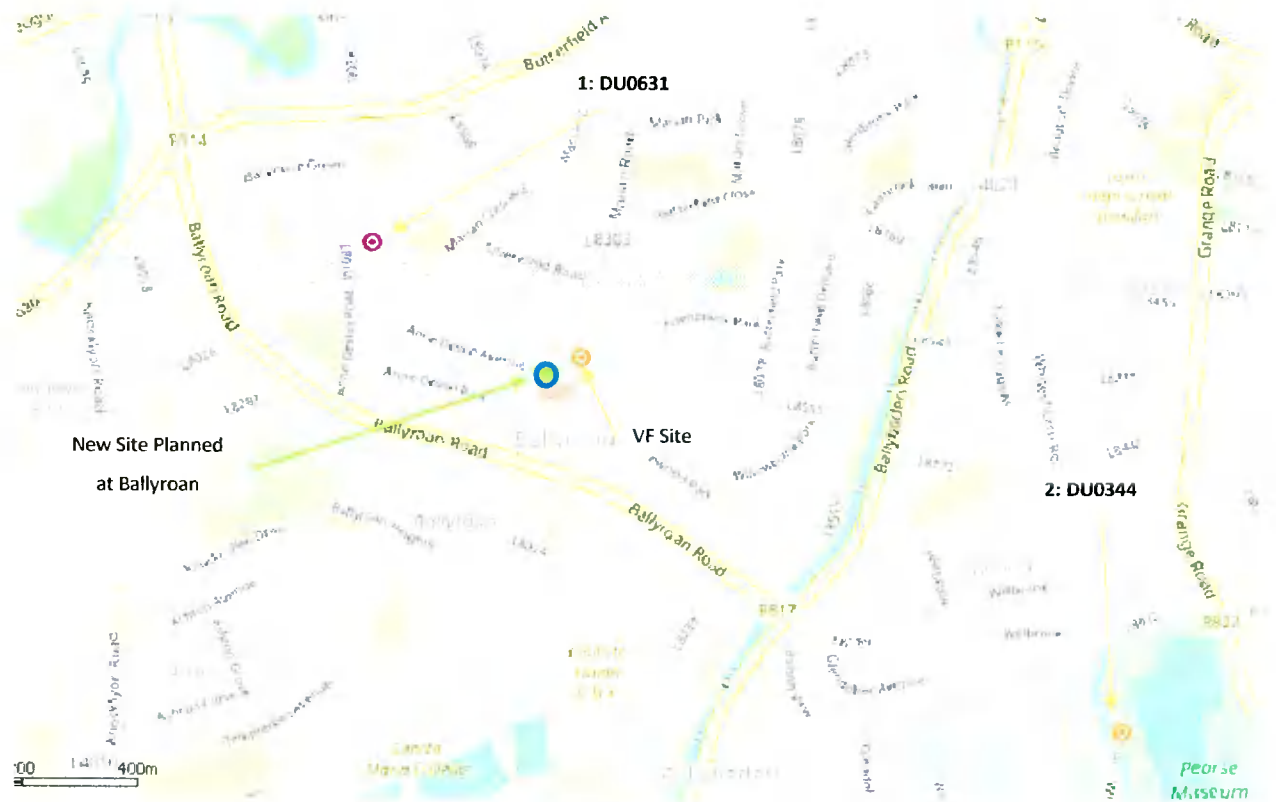
The main driver for the new site at Ballyroan/Ballyboden, Rathfarnham is to improve service to the large area of residential and commercial premises in the wider area. This site will provide voice and high speed data services to the surrounding residential areas and amenities in the Ballyroan area. By not deploying a suitable site, a coverage blackspot for all users will remain in this area leading to poor Voice and Data services. The specific location chosen for the new site will provide Three with sufficient overlap of the coverage footprint to adequately serve the town and surrounding environs. In particular the overlap will counteract the reduced cell shrinkage affect that occurs during high customer data usage at peak times as the bandwidth reduces and contention rate increases. Keeping a good dominant cell serving the area means continuous service to the residential and business customers.

3.1 Restrictions on Locating on Existing Telecoms Structures

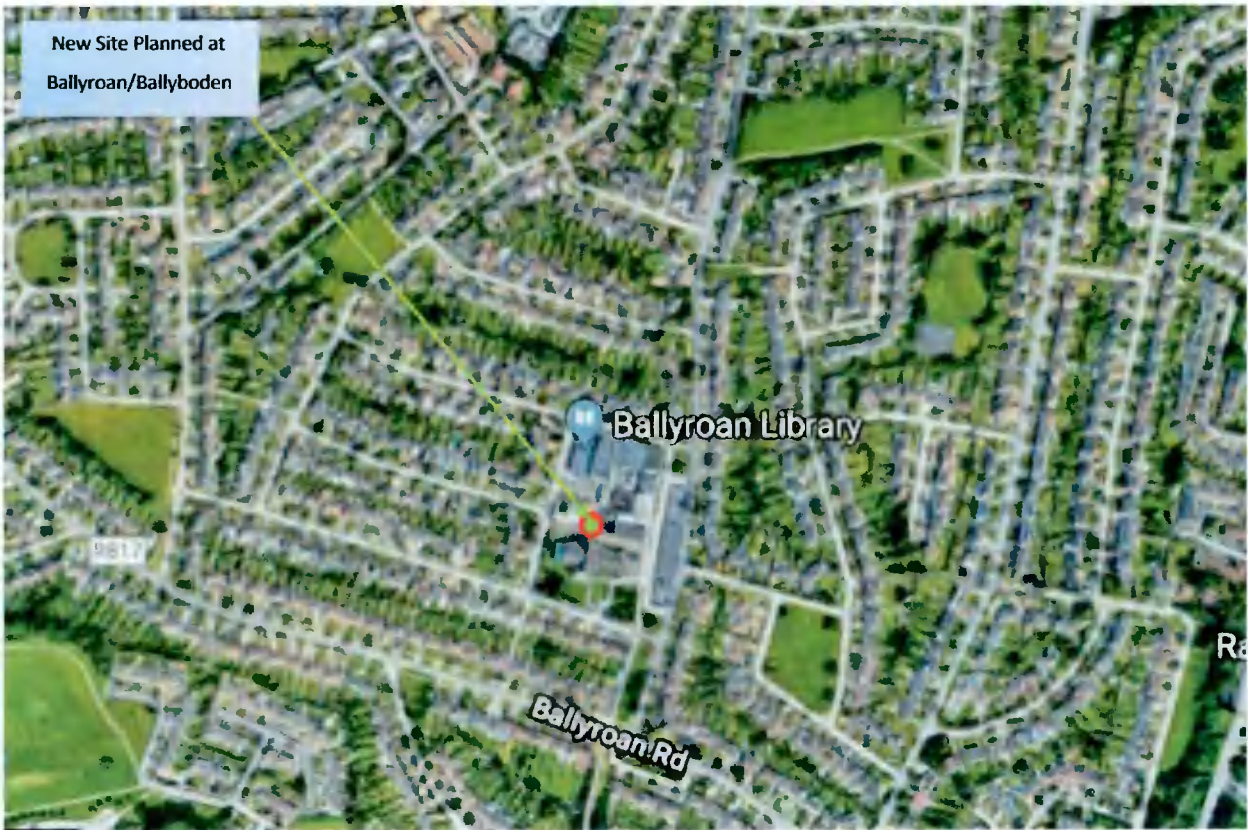
Three Ireland has a policy to co-locate into existing telecommunications structure where possible, that are located with the target area. Following compressive search of the target search area, no existing base station options were identified that could be shared or upgraded to provide the necessary coverage required. Only as a last resort have Three Ireland considered that building a new site is the only option available. The poor existing 2G/3G coverage in the area is due to the existing site being too low and far from the coverage objective for the overall area. The only way to cover this with suitable radio coverage into this location is by building a new site in the site proposed.

3.2 Existing Sites Analysed

1. H3G site DU0631 – This is over 0.7km away from coverage objective – unable to cover specific area with acceptable voice and data requirements- Note: This site is low in height also thus coverage is limited
2. H3g Site DU0344 – This is 1.0km away from coverage objective and fails to offer adequate Voice and Data services today to the area suffering from poor service (Ballyroan/Ballyboden)
3. Vodafone site in Ballyroan SC – This is a 7m high solution which fails to improve service for the desired area.



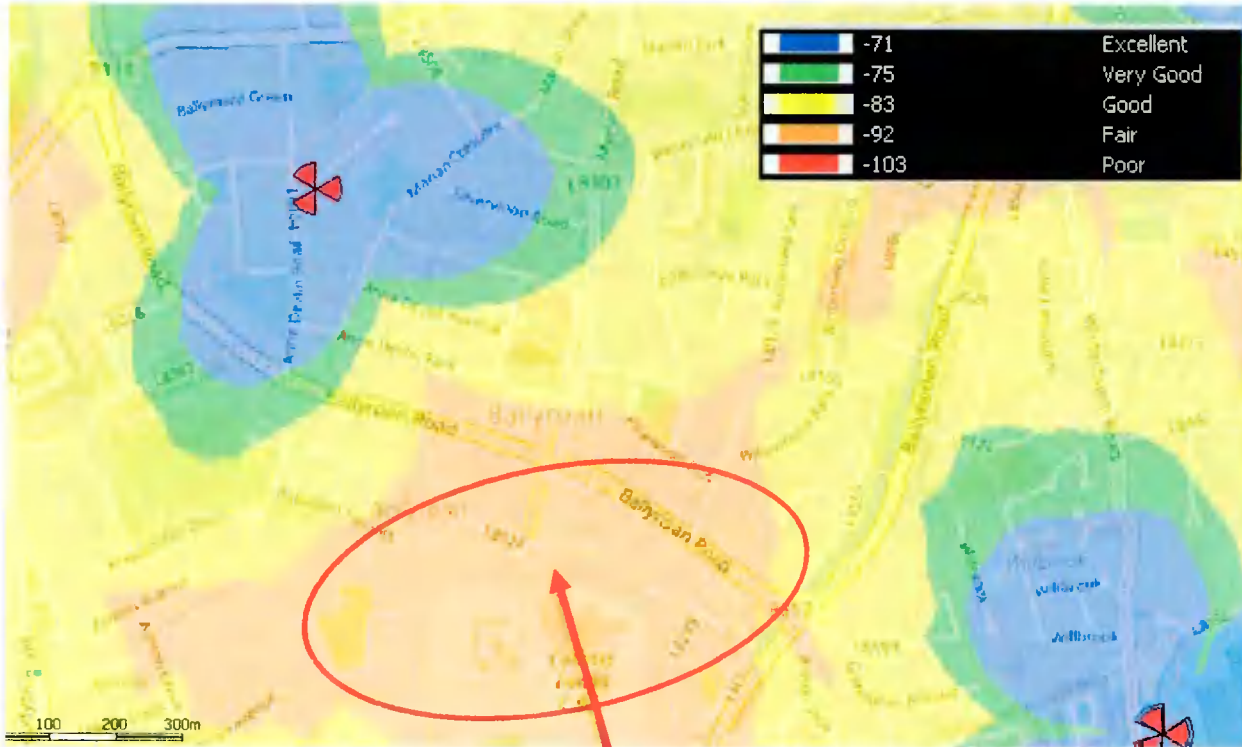
Please note that the coverage maps provided illustrate optimal coverage with all other sites in the vicinity operating at maximum efficiency. Should one or more of these sites experience a technical fault, require maintenance or upgrading works which would result in equipment power down, the adjacent sites act as a back-up system to maintain a consistent level of service in the area. This explains the importance of each base station in the overall network and ensures network resilience in network operations.



4.0 Service Coverage Plots / Predictions

The coverage maps on the following page illustrate the service coverage from the proposed installation at Ballyroan_Ballyboden.

EXISTING 3G INDOOR COVERAGE

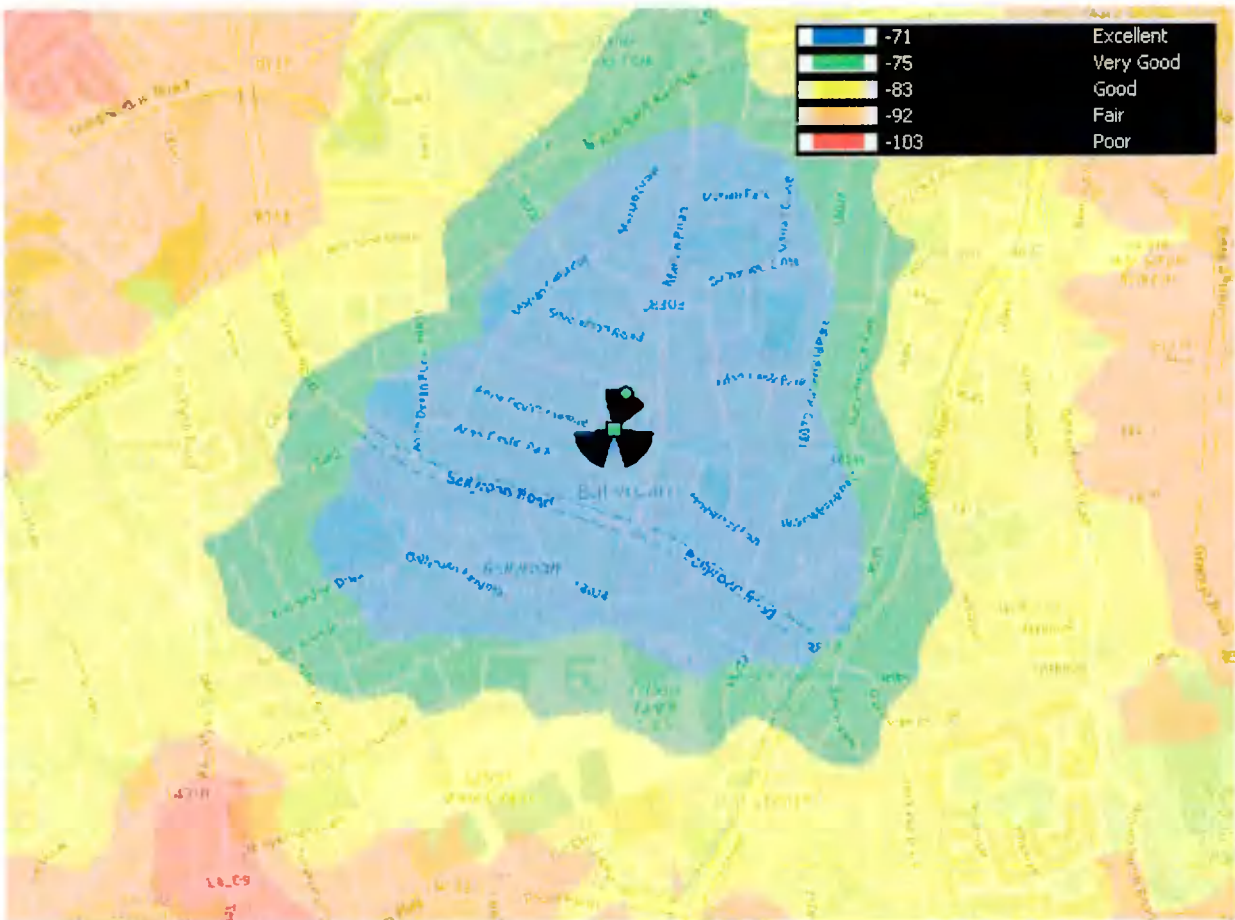


Comment: Fair to Poor Coverage reflects poor Voice and Data experience

PROPOSED 3G INDOOR COVERAGE WITH ADDITION OF NEW SITE



Zoom In of Predicated Coverage with New Site



5.0 Technical Conclusion

The evidence provided within this Technical Justification demonstrates the technical need for an installation site at Ballyroan/Ballyboden, Rathfarnham to maintain a high quality network coverage for 2G/3G/4G and deliver good customer experience to the large number of residential dwellings, commercial and retail units in the area.

The proposed installation will form part of an established telecommunications network system that Three operates in the area and has been carefully chosen to ensure performance levels are maintained. The site is considered the best possible solution to meet both the existing and future demands of its customers in this area. Failure to progress this installation in its current location as can be seen in the plot provided has a negative impact on Three's network by leaving customers in the Ballyroan/Ballyboden area with limited services.