TORBAY COUNCIL

WIRELESS TRANSMISSION FEASIBILITY STUDY OF TORBAY COUNCIL CCTV SYSTEM (TORQUAY AREA)

Prepared by

Garry Hobbs

of

Sutton Yard
Sutton Hill Road
Bristol
Avon
BS39 5UR
Tel: 01275 332288
E-mail: garryh@globalmsc.net
Web page: www.globalmsc.net

November 2016

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

Table of Contents

APPENDICES

Appendix 1 - Initial wireless survey

Appendix 2 - JPEG static image of the Google Earth overall proposed wireless system topology for Torquay

Appendix 3 - JPEG static image of the Google Earth proposed wireless system topology for the Torre area

Appendix 4 - JPEG static image of the Google Earth proposed wireless system topology for the Paignton and Brixham areas

Appendix 5 - Budgetary costs for the wireless system

Appendix 6 – Budgetary costs for control / record equipment.

_____

1.0 Executive Summary

Global MSC Security (MSC) has, in conjunction with UK Broadband carried out CCTV Line of Sight (LOS) wireless transmission assessments around Torquay and have been able to prove LOS is possible for the majority of public space surveillance (PSS) cameras to reduce reliance on BT analogue fibre optic cabling and thus reduce the annual (c£80,000) expenditure. This would enable the council to transmit CCTV images over IP (Internet Protocol) and eventually create a migration path to change all its camera hardware from analogue to IP with numerous advantages, including the use of High Definition (HD) images and analytics together with other benefits.

Although other transmission options are possible, including improving on some 'self-provide' fibre optic cabling, we have discounted those as not being as cost effective; this can also lead to a dependency on third party providers such as BT even if the council migrated from the current analogue RS1000 service to RS1000D which is digital. This will still attract large capital sums and on-going revenue charges.

We have estimated it will cost in the region of £108,000 to migrate the Torquay CCTV system to wireless. Although we have not carried out LOS tests for Paignton and Brixham, we have worked with UKB to establish costs in the region of £68,000 and £41,000 respectively. With contingency we believe a sum in the region of £250,000 will be required to deal with the migration to wireless.

We have also made enquiries of a specialist CCTV hardware/software company who could provide a solution to replace the obsolete cameras, change the recorders and provide a software Graphical User Interface (GUI) platform across the three towns. These budgetary costs work out to be in the region of £½ million but of course there are cheaper options and this work could be carried out in stages.

2.0 Overview

The South Devon Borough of Torbay, consists broadly of three towns / districts: Brixham, Paignton, and Torquay. Similarly, the Borough CCTV system is comprised of three different areas, as above.

The Torbay Council CCTV system has been in operation since 1993. The overall system comprises c193 cameras, which are a combination of traditional 'town – centre' cameras, plus stand – alone sites (e.g. car parks), many of which have remote matrix links, with local DVR (digital video) recording.

Included in the above, are 6 x Urban Traffic Cameras (UTC) that are not currently linked with the main CCTV System.

Photo-Scan Ltd installed the original CCTV system on a lease agreement, the system ownership subsequently transferred to Torbay Council.

Over a number of years, the system has grown / developed, with various system control equipment types (as well as cameras) being added. The control system comprises a mix of Photoscan and Synectics Matrices, with Digital Video Recording utilising Bosch, Samsung, DM Net-Vu, and Siemens DVR's.

This has resulted in largely disparate system, much of which is effectively obsolete, difficult to maintain, inflexible, and highly challenging from an operational / management perspective.

Particularly in light of the above, Torbay Council have identified the need to update and upgrade its

_____
November 2016

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

CCTV system. The use of new technology will enable a flexible, streamlined, more cost efficient service, which will create opportunities for income generation to offset revenue costs.

A major part of the consideration regarding the overall Torbay CCTV system is the Transmission infrastructure, which currently (in the main) is delivered by leased BT RS1000 analogue fibre circuits.

The purpose of this report is to consider the feasibility of upgrading the existing transmission medium from BT analogue to IP (Internet Protocol) wireless transmission, (for Torquay only at this stage). We have however included within this report, Paignton and Brixham in addition, as well as proposals and options for the complete control / recording / camera system upgrade.

3.0 Existing Transmission

Currently, transmission of (Torquay) CCTV cameras back to the control room, is by a combination of:

- Self – Provision Copper Cabling / Duct Infrastructure direct to Town Hall
- Self – Provision Copper Cabling / Duct or (where close local system, e.g. car park), Conduit Infrastructure to collection point, BT Fibre to Town Hall
- BT Fibre to Secondary Collection Point, BT Fibre to Town Hall
- BT Fibre direct to Town Hall, with additional BT Fibre to Beacon Quay, BT Fibre to Town Hall (dual links)
- Self – Provision Copper Cabling / Duct or Conduit Infrastructure to collection point, Self – Provision Fibre Optic / Duct Infrastructure direct to Town Hall (Site 5 – Lower Union Lane Car Park)
- Self – Provision Copper Cabling / Duct Infrastructure to nearby (Torbay) Street Cabinet, Self – Provision Fibre Optic / Duct Infrastructure direct to Town Hall (S6 / C12)

All of the current BT leased fibre circuits are analogue, a high proportion of these utilise the out-dated TTL Data (telemetry) protocol type, being the protocol that the Photo-Scan equipment uses. TTL (Transistor-to-Transistor Logic), whilst being efficient, and reliable, it has many limitations, and has long since been superseded by the RS485 protocol.

RS485 is currently the standard data protocol for analogue CCTV camera telemetry, allowing a wider range of information / commands to be transmitted. This enhances the functionality of cameras and associated equipment.

Site 5 (Lower Union Lane Car Park) utilises Fibre Optic Cabling (as does S6 / C12 – single camera link); it is not known at this stage whether this is Multi – Mode or Single Mode Fibre.

4.0 Transmission Upgrade Options

It is evident that irrespective of the extent of the CCTV system upgrade, the existing transmission infrastructure is itself in need of upgrade, whether the system remains analogue, or becomes IP based. Therefore, all upgrade options should be considered.

4.1 Retention of Existing (as is)

Due to the limitations and constraints of the existing BT Fibre transmission infrastructure, where the majority is of the wholly out – dated (and indeed difficult for BT themselves to maintain) TTL type, this is

_____
November 2016

_____

not considered to be a sustainable or viable option. This transmission system architecture remaining unchanged prevents any meaningful existing (analogue platform) system upgrade, which has been identified as essential.

The current (not insubstantial) revenue costs would remain broadly as they are.

4.2 Retention of Existing (but upgrade to standard RS 1000 – RS 485 Protocol)

Whilst this is an option that has already been considered, it is our view that this is not the best, or most beneficial avenue for the longer-term system sustainability.

This option retains an overall analogue platform. It does, however, mean that the Torbay CCTV system can be upgraded, allowing for the ageing, obsolete Photo – Scan Matrix / Control systems to be upgraded to a more suitable / maintainable solution. This typically would be Synectics, on the basis that part of the Torbay system has previously already upgraded to a Synectics platform.

BT RS 1000 Fibre has historically been a very reliable transmission medium, with (in the main) a good level of support / response to defects etc., by BT. It enables a high-quality, real-time transmission link, utilising secure point-to-point circuit through a dedicated fibre connection. This provides Zero latency, uncompressed video, delivering near broadcast quality video, with associated audio (under certain conditions) and data telemetry channels.

Although this option does, as noted above, enable system upgrade to a common (analogue) platform, the overall constraints of an analogue system remain.

The current revenue costs would increase dramatically, under this option. The upgrade of circuits from TTL to RS 1000 – RS 485, would also incur substantial capital costs.

4.3 Retention of Existing (but upgrade to standard RS 1000D – 100 Mb/s Ethernet)

As an option, this would retain BT as the transmission service provider, utilising the existing BT fibre network, but upgrading to RS 1000D. This effectively overlays 10/100 Mb/s Ethernet over the existing RS 1000 circuits.

This would provide an IP platform, which would enable the system upgrade to ultimately move away from an analogue matrix system to a more flexible Digital IP architecture.

Although this option would enable, as noted above, the upgrade to a fully IP platform, it does have its limitations. It would not provide the same amount of flexibility, and would also limit the ability to create added network resilience, and capability to maximise overall bandwidth by use of multi-casting etc., which can in turn enable provision for Disaster Recovery (DR).

As a solution, once again, this would incur significant revenue cost increase, with high capital costs. It is a particularly cost – inefficient solution where the transmission circuit is single and consolidated, as opposed to grouped to a collection point (typically street cabinet). Although there are sections of the Torbay system that are grouped, there are many single circuit cameras as well. Where there are grouped cameras, this would allow a degree of circuit rationalisation, on the basis that a single RS 1000 (overlaid with RS 1000D) circuit could replace the typically 3 or 4 circuits as existing (monitor output, quad displays etc.), the costs would still be considerable.

_____

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

4.4 Self – Provision Fibre Optic Network

Whilst as with any form of infrastructure, there are of course revenue costs, this solution would attract the least, by virtue of the fact that fibre optic cabling does not deteriorate in the ground as such. The Fibre Optic Tx / Rx equipment (switches, rack network cards, power supply units etc.) is subject to faults/failure in the same way as any electronics / hardware is. However, this type of equipment (subject to selection of proven robust manufacturer types) is very reliable.

Where there is an extensive IP fibre network, system management is a crucial part of the maintenance regime. With the correct processes in place, the whole system can be managed to provide optimum performance, minimise conditions that can cause image stream video and control problems (system jitter / latency etc.), as well as network congestion, which can cause other issues. For council CCTV systems with fibre transmission, this is often undertaken by the borough ICT department, but can equally be undertaken as part of the maintenance contract.

A potential factor though, in consideration of a whole fibre network, and something that is not widely appreciated, is "Fibre Rates". Fibre-Rates is effectively a tax levy on the use of subterranean fibre networks. This is based upon each metre of dark fibre when it is lit. Fibre rates have to be paid via the Valuation Office Agency (VOA) of Her Majesty's Revenue and Customs, as it works from the Local Government Finance Act 1988 sections relating to non-domestic rating. This is a contentious issue though, since the criteria is a little ambiguous. The introduction of this tax element was largely to provide a degree of protection to BT (presumably to ensure continued infrastructure development etc.). It could be argued that Borough CCTV does not compete with Telcos, since it is not delivering any telecoms as such. One London Borough considered this and took the view that it did apply. If it could be argued that this in fact isn't applicable, that would then restrict the network's flexibility (Council's Intranet etc.), where other such uses would in fact be deemed applicable, e.g. IP telephony.

As an option however, this is a solution that would realistically be cost – prohibitive, and in any event, to maximise the overall potential of an IP system would inevitably require a wireless element anyway.

4.5 Wireless Network

The use of radio networks for CCTV has increased dramatically. A well-designed, planned system utilising good quality equipment can provide a highly resilient, flexible transmission infrastructure in a very cost efficient manner.

Whilst radio networks can, under certain circumstances, operate well in non - line of sight (NLOS) conditions, to ensure a stable and reliable network, line of sight (LOS) (between the transmission point and receive point) should be the standard requirement (utilising intermediate links where necessary / applicable). Part of the consideration should be foliage of trees, which depending upon the time of year the system survey carried out, may mean in Spring / Summer, line of sight is compromised. Similarly, any very young trees should be evaluated as to the type, to provide advance warning if likely to be a problem a few years down the line. In planning a wireless network, consideration should also be given to any planned / proposed building works, which could potentially impede transmission line of sight.

Similar to IP Fibre optic networks, and as noted in 4.4 above, system management is crucially important, and would be an area that generally would be included within the overall system maintenance contract.

_____
November 2016

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

As part of the wireless network management, it is extremely important that all links are monitored regularly, with particular attention to frequency congestion, 'Ping times' and 'Jitter'. The contractor should regularly review, and monitor for any increase in congestion or other issues, in any area. The contractor should also, where evidence of increasing saturation becomes apparent, check for other available frequency ranges, carrying out spectrum analyses, and plan for migration accordingly. Additionally, where PTMP (Point to Multi Point), increasing congestion may be overcome by the licensing of the PTMP links (each leg being required to have a license). This however, would only be in extreme cases.

Careful traffic management and utilisation of resilient links ensures the robustness of the network. The overall network loading should be closely monitored, with due account of any additional load requirement brought about by the installation of additional cameras / sites, or other services onto the network. Where there is a requirement for additional sites / services, the contractor must evaluate the requirement, the implication to the network (address ranging / topology / loading / frequency ranges, etc.), and plan accordingly. This may include firewall provision.

Following an initial site survey (see Appendix 1 - location schedule / comments), a wireless survey was undertaken by UK Broadband / Global MSC. This has determined the suitability of the Torquay area for migration to a Wireless IP solution.

The following is a link to the interactive Google Earth proposed wireless system topology:

Google Earth Wireless Network KMZ

Appendix 2 provides a JPEG static image of the Google Earth overall proposed Wireless system topology for Torquay.

Appendix 3 provides a JPEG static image of the Google Earth proposed Wireless system topology, for the Torre section.

Appendix 4 provides a JPEG static image of the Google Earth proposed Wireless system topology, for the Paignton and Brixham sections.

The survey is based upon the retention of the existing node locations, i.e., those sites that have a single collection point (car parks, etc.). Included within the survey / design, is a link to Torquay Police Station, which will then provide direct connectivity of the Torbay system to the Police service, where they can be provided with access to live and / or recorded images, with restriction to certain cameras only, view, but not control, or full access / control, however it is required and defined in any MOU (Memorandum of Understanding)

As can be seen, the design includes the creation of Beacon Quay in Torquay as a strategic node / backhaul link. This is of real benefit, since it enables core back – bone links to be connected from Brixham and Paignton to the Torbay system. This will make it much easier to add these two locations subsequently.

Primarily, the existing columns / camera locations / buildings are utilised, with a small number of additional lighting columns where necessary for intermediate links (secondary link where direct line of sight cannot be achieved). All of the Street Furniture (that was viewed) utilised for CCTV (both lighting

_____

November 2016

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

and CCTV columns), from a visual inspection, appear sound and in good condition, with no corrosion evident or 'leaning'. However, it should be appreciated that there is a legislative requirement for Street Furniture (with power) to be tested and inspected every six years (under BS 7671). This covers electrical and structural. It should be checked and verified as to whether this has been carried out for the CCTV columns. If not, this will need to be taken into account. There will need to be liaison with Torbay Council Highways / street lighting section as regards this, and any additional load to be added. In reality, where old 'large' Photo Scan cameras are replaced, the loading will be less anyway.

Liaison should similarly take place with Torbay Council Structural Engineers in relation to buildings mounted cameras / equipment, to verify no concerns as to the structural integrity of the building, or need for spreader plates etc.

5.0   Recommendations

Having evaluated the options available, it is our opinion that migration to IP wireless provides the most cost effective, and flexible solution for Torbay Council.

The wireless survey undertaken has verified the feasibility of a wireless solution, full coverage is achievable for Torquay, and only a very small number of cameras elsewhere outside the centre of the town that cannot link.

The survey undertaken was based upon the retention of the existing system topology and existing collection points which will be retained as existing (e.g. Union Car Park). The advantage of this is that Torbay can retain the existing local duct / conduit infrastructure, creating a system node. This also means that cameras can easily be replaced with new HD (High Definition) IP cameras, with all of the existing control equipment effectively replaced by a network switch / switches, and new NVR (Network Video Recorder) recording.

As far as the remote site video recording (DVR's located at car parks etc.), is concerned, whilst the revenue cost of the BT fibre circuits has been a consideration, and taken into account, it should also be appreciated that these remote sites have additional revenue cost implications. The DVR's also have links. Details of these links are unknown at this stage, but are likely to be ADSL (Broadband) circuits. These circuits as a consequence of the proposed network will also no longer be required.

Since a (Torbay Council's) subterranean fibre – optic link already exists between Lower Union Lane Car Park, and the Town Hall, this will be incorporated within the network as a back – bone link accordingly. It is not known at this stage whether the existing fibre link is MM or SM (Multi-Mode or Single Mode), and whether it is suitable for upgrade to IP transmission. Whilst it cannot be determined without inspection / evaluation of the fibre equipment (although the system maintainer may already have the information), whether it is suitable for IP conversion, we would envisage it as being highly likely.

If this were the case, the existing link would be subject to upgrade to IP effected by the replacement of the existing analogue Tx / Rx equipment with IP equipment accordingly. If it was found that this link is not suitable, it would mean the pulling in / installing of new SM fibre optic cable.

As previously noted, the vast majority of the radio links are license free. The larger (backhaul) 80GHz, 60GHz, and XG links, however, are subject to OFCOM licensing. This will equate to:

- Torquay: £600 (£100 per link – 6 no.) in year 1, and £50 per link, per annum thereafter (£300

_____

_____

per annum).

- Paignton: £400 (£100 per link – 4 no.) in year 1, and £50 per link, per annum thereafter (£200 per annum).

- Brixham: £100 (£100 per link – 1 no.) in year 1, and £50 per link, per annum thereafter (£50 per annum).

Certain sites have a number of newer, more up to date cameras (e.g. Bosch MIC). Where this is so, the recommended option is to retain, and simply encode the analogue signal to digital IP. These can always be subsequently changed to IP HD cameras as and when an upgrade is required (age of camera / degradation, or camera failure). Similarly, in car parks where there are elevator cameras, these can also be (assuming they are working / performing as they should be) retained / encoded. This is especially useful in the elevator camera scenario, since replacing may also mean replacement of trailing flat-form cabling within the lift shaft, which of course will require joint works with the elevator maintenance company, etc.

Dispersed recording (effectively as already is), enables a better use of the network, reducing traffic, but in no way limiting control functionality / flexibility. A further advantage is that, longer term, the recording network can be configured so that if an NVR fails (disk failure etc.), camera images can be routed across the network and be recorded at other site NVR's. NVR's are always sized with (typically 20%) redundancy. This solution would provide an efficient cost effective failover solution.

Whilst currently functional and operational, the existing DVR's do not allow the level of integration / interfacing that a full integrating front-end system will. To take advantage of HD camera technology, and provide system flexibility, it is recommended these be replaced with an ONVIF compliant Network Video Recorder (NVR) / integrating front end solution, such as IndigoVision or similar manufacturer, which will provide a flexible, reliable and well supported system perfectly suited to this application, in preference to a cheaper DVR solution.

Adopting an (ONVIF) compliant NVR system, will afford a high degree of flexibility, with the ability (subject to bandwidth / network) to directly access a camera IP stream, with fairly simple low cost integration into third party (e.g. stakeholders – Devon and Cornwall Police, etc., other Borough Control Rooms) integrating front-end systems.

In order to ensure operational flexibility, the proposed system would take account of the diverse network, and finite capacity. The ability to automatically adjust stream bandwidth at times of heavier traffic provides a high degree of overall resilience. Utilising analytics encoding / efficient compression, equates to a lower bandwidth requirement whilst minimising latency / jitter.

For certain camera locations, where at certain times, there is very little activity, the use of Video Motion detection (VMD), particularly useful at night, can be useful. This feature can be used to maximise recording capacity. This is affected by the lower frame rate recording, which accelerates upon activity. Since there is a small element of buffer recording, where activity occurs, a degree of pre and post activity recording at the accelerated rate is also retained.

This type of system would make (subject to system training), the reviewing of recordings a more efficient and streamlined process by using advanced search functionality.

_____
November 2016

_____

The recording system should be based upon any additional planned cameras, plus the integration of the existing. Subject to available budget, the existing could be retained and effectively operate stand-alone side by side, with a subsequent upgrade programme when budget becomes available.

We have made enquires of IndigoVision (a specialist CCTV software / hardware manufacturer) in order to test the market and obtain indicative prices of their products that the council requires. These prices are shown later in this document, and at Appendix 6. Of course although we appreciate the benefits their products can bring, there are other systems on the market that may offer similar solutions. That said, should this council requirement eventually be tendered, we would compile a 'performance' tender specification in order to achieve the best solution for Torbay Council and it will be for CCTV integrators / installers to select the best, cost effective product based on the minimum criteria.

5.1   Benefits of an IP Wireless solution

Wireless technology provides a highly flexible, scalable solution for transmission networks. Deployment is relatively easy, very cost effective, and can be undertaken expediently, without the need for costly Civils (excavations, duct laying, fibre optic cabling, etc.). Wireless also means no need for N.R.S.W.A. (New Roads and Street Works Act) considerations / Section 50 Highways notices (for highways excavation), which could inevitably delay the project.

However, it is certainly worth considering liaising with Torbay Highways Department. Where any major highways / resurfacing / environmental works are undertaken (involving pedestrian walkways / footpaths), it would be beneficial for the laying of ducting (typically 2 x 100mm purple flexi-duct) as part of the works. The duct cost is very little, and these could be laid as part of these works. This may prove valuable as a means of augmenting the borough network, providing an extra layer of resilience and flexibility. This would of course be particularly useful where these works are in town centre / harbour / sea front locations.

Utilising an IP platform provides many other options and opportunities for additional services to be added to the network, which coupled with wireless transmission, means quick and easy deployment.

To aid network integrity / minimise down - time, the network can be monitored to provide alerts to any issues / problems, ensuring early notification / response to defects. System monitoring can automatically alert the control room, as well as sending e-mails / SMS text messages etc.

The ability to undertake system configuration / system interrogation remotely, makes system maintenance easier, with consequentially lower maintenance costs.

Once the wireless network is in place, and as the system develops, Strategic Nodes can be set up to utilise PTMP wireless connectivity, with deployable combined camera / radio units for extremely fast and easy deployment into transient problem areas where a permanent camera would not be justified. This could be as a result of fly – tipping, anti – social behaviour in an estate environment, etc. This will also assist in making it easier for future permanent camera expansion. Since the wireless system design is based around several node sites already, upgrade to PTMP would be relatively straightforward.

Similarly, there would also be the ability to upgrade the wireless IP network to Multi – Cast, the main system equipment already being compatible. This would effectively enable a (for instance) camera video stream to be broadcast to more than one location simultaneously, but utilising only the same bandwidth. This may be where joint access to images are required (Police, Beacon Quay, etc.) This can prove very

_____

_____

beneficial in network traffic management, and system resilience.

The lateral and imaginative approach to incorporating additional services / new services to the network provides benefits in community / tourism, revenue savings – through shared infrastructure, revenue generation for Torbay CCTV / Control Room service, as well as an ever stronger justification for the service itself. These are in addition to the operational benefits.

These include:

- **Call Help Points**: These would typically be placed at locations near to CCTV cameras, linked to the control room, and utilised as emergency communication links. Car Parks, and in particular multi-storey, are a common application, providing reassurance for customers in the event of emergency. In addition, these can be placed in elevators as a direct replacement for traditional PSTN 'Windcrest' units. As well in lift cars, they can provide full BS EN81 compliance, via call points on top of lift car, lift pits (depending on number of floors), and plant rooms.

  Call Points may be deemed useful in Town Centre / Harbour locations, again providing reassurance, and a means of direct communication to the control room to report incidents (and maybe lost children etc.). The leading manufacturer of this equipment is Commend. Commend equipment is capable of interfacing to most integrating front-end systems. This would mean that should a call point be activated, its associated camera (static, or if a PTZ – to its pre-set viewing the call point) will be displayed on the allocated spot monitor in the control room.

- **Disaster Recovery**: A secondary location can fairly easily be provisioned to enable (in the event of major problems within the Town Hall / Control Room) a secondary control room. As long as there is a network link, a system workstation / workstations could be set up to continue service operation from that location. Similarly, the same principle could enable a link / secondary operator position to Devon and Cornwall Police, where a major event or incident may require Police pro-active CCTV monitoring. Many Council Services now use IP telephony as well, which means (in the DR scenario), part of the log-in process, will include telephones – thus the Council control room phone numbers remain active.

- Stakeholder (Public or Private Sector): System management and / or recording management becomes a straightforward process. Third parties (e.g. Beacon Quay) can be provided with a terminal enabling profiled access (live viewing only) of specific cameras, which means no DPA implications for the third party who can (subject to SLA etc.) allow Torbay Council to completely manage their system, including maintenance, routine system checking, camera monitoring, evidence reviewing / evidential releasing etc.

- **Variable Digital Signage**: This is an area that can range from simple dot matrix display of scrolling messages, which could be related to today's weather in the bay, warnings to be alert at all times, event information etc., to more sophisticated video sequences, or static image displays etc.

- **Tourist Information Points**: This would provide an interactive information portal, with local business / maps information, alongside (again) information of upcoming events, weather forecast etc. It is possible this kind of technology deployment could become revenue neutral, or even profit generating by sponsorship, particularly bearing in mind the positive effect it is likely to have for visitors.

_____

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

- **Car Parks**: In addition to (as above) the use of call help points, Car Parks may equally benefit from monitoring of spaces, ticket machine monitoring of vandalism (impact sensors), service availability etc.

- **Wi-Fi provision**: Provision of free public access Wi-Fi is an area that has been adopted in some town centre locations, and would very likely benefit Torbay, and it's offering to visitors. Once again, sponsorship could prove a good opportunity (splash screen adverts, sponsored links etc.) This is an area that we envisage will become mainstream in the future.

- **Network Provision for other Council / Public Sector Buildings**: There are a large number of buildings that could be linked to the network, such as schools, libraries, etc. This would provide connectivity not just of Council Intranet, but building management / security elements additionally, e.g. (quite apart from CCTV), intruder / fire alarm monitoring, ambient temperature / water tank level monitoring, smoke vents, door monitoring, etc. There are also opportunities to work collaboratively with ICT for network sharing / revenue costs sharing.

- **Highways Traffic Cameras / Signal Monitoring**: Traffic Management cameras, Automatic Traffic Signals monitoring and interfacing allowing remote change of traffic light priorities, etc. should all be considered. Torbay can become very congested in peak holiday times, and pro-active use of technology can ease these traffic build-ups, which in turn can have a dramatically positive environmental benefit (less pollution, etc.)

  The connectivity and flexibility of a wireless IP network means that as well as other highways applications, the use of CCTV can be utilised as part of the Borough Parking and Moving Traffic Contravention enforcement system, where, as well as conventional pro–active CCTV operator monitoring for parking contraventions, unattended system type cameras can be adopted for detection of certain types of contravention – e.g., banned turns, yellow box enforcement, bus lanes, etc.

- **Third Party Monitoring**: Since there would be a common IP platform, with an integrating front-end system, with the ability to control other systems seamlessly, this makes it far easier to manage / monitor third party systems. This could be another Borough control room, shopping centre, etc.

- **Web Portal**: Provision of a web portal showing live images of tourist interest areas – promenade, harbour, etc., can be created, utilising relatively inexpensive third party hosting, or direct via Torbay Council. There is also the possibility of sponsorship to offset these costs.

- **Local Authority / Housing Association**: Access Control system management is often undertaken by local housing officers, and it is often found that strict control of fobs (for Door Entry access systems) is not consistent. This results in an effectively unmanaged system, with no accurate record of who has fobs, with some even not recorded at all. This also makes it far more difficult to detect sub–letting etc. Centralisation of Access Control management, with central server, enabling a more focused control of fob issue and control overcomes these issues, and is a service that could be offered. This equally applies to other council buildings / public sector areas. Management can include (where corporate systems), the taking of staff photos / production of access cards.

November 2016

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

There are various other services that can be offered, such as lone worker monitoring, and of course Housing CCTV and recording management.

The potential for revenue generation can be enhanced further, by the upgrade of the existing control room, to the minimum British Standard, BS EN 50518-1:2013 standard for Monitoring and Alarm Receiving Centre's (ARC's); location and construction requirements (previously BS EN 50518-1:2010 and BS 5979:2007. There are two categories of ARC. This decision is critical to the way in which the facility may be shared which could make the ARC vulnerable to 'outside' risk from fire, vandalism, etc.

- **Category I** is "a remote centre handling signals from fire alarm systems and/or from social alarm systems, and/or from remote CCTV systems in non-security applications (e.g. traffic flow)".

- **Category II** is "a remote centre handling signals from Intruder Alarm Systems, and/or from remote CCTV systems in security applications that require an emergency response (e.g. loss prevention) and/or fire alarm systems and/or from social alarm systems".

Torbay Council would require a Category II construction if this type of facility was adopted.

Also, for category II, "a remote centre should be located in a building with low risk of fire, explosion, flooding, vandalism and exposure hazards from other buildings".

It is recommended that consideration be given to the control room upgrade to obtain ARC Category II compliance. Whilst it is not always a requirement for this accreditation for alarm monitoring (by a Council) of Council buildings, it is for external third party clients, and is invariably a condition of the client's insurance policy. This is a valuable potential source of further income generation.

6.0   Budget Costs

As well as a detailed survey and budgetary costings for the wireless system itself, we have considered the wider implications of the overall Torbay Council CCTV system, primarily with regards to an integrating front-end system.

6.1   Budget Costs (Wireless System)

The budget costs for the wireless system are inclusive of year 1 OFCOM license (for the back – bone links), and are based upon all required equipment, and a number of strategic component spares.

Also included within the budget costs are:

- Site surveys and radio planning works (but excludes cherry picker rental)
- Pre – staging
- Project management
- Installation (budgetary £500 per link end)
- Configuration
- Commissioning

These costs also include 12 months' remote technical support, as well as 12 months' advance replacement for all radio units (except the smaller Ubiquity units).

_____

November 2016

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

It was identified that there will be a requirement for a 10m column at Beacon Quay Car Park, for which budget costs are also included for the column, Civils, erection, and associated steel works.

Whilst this feasibility study was primarily intended to be based only upon Torquay, we have included Paignton and Brixham in addition in these budgetary costs. However, it should be appreciated that, unlike Torquay, we have not undertaken a ground-based survey for Brixham and Paignton. The outline design / topology is based upon a desktop survey, and therefore the budget costs are likely to be a little less accurate than for Torquay. Subject to project progression, a wireless survey for these areas (as was undertaken for Torquay) would be advisable / beneficial.

With regards to Paignton and Brixham, a central hub for each of the areas is proposed, which is likely to be Victoria Car Park (Paignton), and the New Fish Quay (Brixham), subject to further evaluation / survey.

No major steelwork costs have been included for Paignton or Brixham (which may or may not be required), but there is included a nominal amount for extension columns, etc.

With regards to the system design, and equipment proposed, the radio unit / antenna types are all tried, trusted, and will provide a robust and resilient network. The radio unit manufacturers are:

- Ubiquity (small single point to point). Relatively inexpensive, lightweight yet robust, perfect for lighter bandwidth links

- InfiNET (larger point to point / point to multi – point). A highly robust, reliable solution for multiple links, higher bandwidth links, with very sophisticated configuration / network management capabilities. Similar to Motorola, but less expensive.

- Siklu Main Backhaul links. Widely used, powerful / robust and resilient. Utilised for licensed main back - haul links.

There is an important feature that InfiNET offers, which is iDFS (instant Dynamic Frequency Selection), that results in the radio switching immediately there is a potential interference / DFS event.

The following are comments / exclusions relating to Paignton / Brixham:

- Cameras 189 & 190 are between Paignton and Brixham, and would be difficult to connect wirelessly, and have been excluded from the budget costs.

- Camera 191 (Windy Corner), similarly, would be difficult to connect wirelessly, and has been excluded from the budget costs.

- Paignton Site 1, Camera 37, is shown as being subject to relocation, and has therefore been excluded at this stage.

- Camera 192. We were unable to locate this camera, which is shown as being "planned". It therefore may not exist yet, and has been excluded at this stage.

- Paignton Site 11 (Connections Office). This looks to be a purely local system, for which it is

_____

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

assumed, all cameras will be linked by containment (duct / conduit / trunking). A single connection has been included within the design / costs.

- Brixham Site 12. (Connections Office). Similar to Paignton Site 11 above. A single connection has been included within design / costs to Camera 174 (car park)

Budget Cost for (Torquay) - Wireless: £107,651 (Exclusive of VAT and delivery charges).

Budget Cost for (Paignton) - Wireless: £ 68,263 (Exclusive of VAT and delivery charges).

Budget Cost for (Brixham) - Wireless: £ 41,056 (Exclusive of VAT and delivery charges).

Total Budget Costs (including installation) for all 3 areas – Wireless: £216,969 (Exclusive of VAT and Delivery Charges)

These costs are based upon, and take into account, the direct to partner costs plus partner margin, thereby commensurate with end – user costs.

The costs for Paignton and Brixham are inclusive of their respective back–haul links to Torquay.

Some of the installation costs will effectively be mitigated by the camera upgrade elements, which will be undertaken simultaneously.

It is recommended that an additional overall contingency sum of £20,000 be added to the combined overall cost.

Appendix 5 details budgetary costs for the Wireless system.

6.2   Budget Costs (Integrating Front End / Recording System / Cameras)

The recording system should be based upon the integration of the existing plus the additional planned cameras, subject to the available budget. The existing cameras could be retained and effectively operate 'stand-alone' side by side, with a subsequent upgrade programme when budget becomes available.

Appendix 6 - Provides detail of budgetary costs from IndigoVision for the potential solution for Torbay. This details a complete and full new recording / integrating front end control system, that could provide access to all sites, camera control and configuration, including recording access and review, etc., from a single platform. Of course other providers could provide a solution but this gives a guide as to the potential costs to be aware of.

This document has 2 x fields, one of which lists equipment as existing, with the proposed upgrade options. This includes for all cameras that are effectively now obsolete / unsuitable, whilst retaining newer types that can be integrated into the upgraded system (utilising encoders where applicable).

As aforementioned, subject to available budgets, this project can be undertaken in stages, perhaps

_____

November 2016

CONFIDENTIAL

Torbay Council CCTV Wireless Transmission Feasibility Study
_____

retaining and interfacing the Synectics matrices / analogue platform / DVR recording pending a staged migration.

It should also be appreciated that the budget costs / Proposals include all listed sites, some of which possibly will not be required (e.g. File Store etc.), in which case, the costs will reduce commensurately.

These costs are inclusive of installation, and as already mentioned, some of which the installation cost element could be mitigated by being undertaken at the same time as the transmission works.

The Total Budget Costs (including installation) for all 3 areas of Torquay, Paignton and Brixham – New Control and Recording System and Camera replacement: £481,916 (Exclusive of VAT)

These costs are based upon Manufacturer list prices, which would of course be subject to system integrator partner discounts, which would therefore offset / balance out partner margins.

The costs include all applicable (one–off) licenses, as well as year 1 Support Licenses.