Tees Valley Smart Infrastructure Pilots Programme

Project Closure Report

March 2025

1. Project Summary

Tees Valley Combined Authority (TVCA) undertook a pilot project as part of DSIT's Smart Infrastructure Pilots Programme to install multi-purpose smart columns, with the aim to trial the procurement, installation and added use cases of these smart multi-purpose columns. This project was delivered between October 2023 and March 2025. The columns have been installed across two main locations as part of this pilot, Teesside International Airport and within the Hartlepool local authority area.

The main aims and objectives of the project for each location were:

1. **Teesside International Airport –** installation of three smart columns providing smart lighting, CCTV, audio speakers, environmental monitors and 55-inch electronic display screens, providing access to smart technology for passengers and visitors as well as testing connection to an existing private 5G network.
2. **Hartlepool local authority –** installation of six smart columns, five of which lie within the Hartlepool Mayoral Development Corporation area. All columns provide smart street lighting, audio speakers and 55-inch electronic display screens, with four columns also hosting a 5G small cell, three columns hosting Vivacity traffic sensors and one column hosting an environmental monitor. The project was designed to complement the Hartlepool Waterfront Connectivity project that is being undertaken as part of Hartlepool Town Deal to deliver improvements to the route between the waterfront and railway station.

TVCA were supported by wireless network providers Dense Air in this project. Dense Air have led on several DSIT projects, developing innovative and smart 4G & 5G technology and have deployed a CoMP-O-RAN Component Test 5G Network at Teesside International Airport. This existing network will support the test and trials of smart infrastructure for this pilot and supports the Tees Valley's digital ambition to become a smart region.

2. Project Partners

Name	Role in project
Hartlepool Borough Council	• Assisting in the development of use cases • Acting in an advisory capacity to ensure this project is in keeping with their existing capital programme and waterfront connectivity project • Planning Authority • Overseeing installation of smart columns (street lighting team) • Operation of smart columns
Teesside International Airport	• Acting in an advisory capacity regarding the private land at the airport • Advising in the development of use case options • Overseeing the installation of the smart columns

	• Operation of smart columns
Dense Air	• Funding and deploying 5G small cell technology onto the smart columns • Act in an advisory capacity as to the design of the columns to enable 5G cell integration
Valmont Structures	• Valmont were procured to design and build the smart multipurpose columns and provide the additional technology including the electronic display screens, smart lighting, audio speakers and environmental monitors
LATOS Data Centres	• Procured to provide fibre backhaul to the smart columns in Hartlepool.

3. Benefits Realisation

Benedit realisation approach and methodology

TVCA worked with DSIT upon project initiation to develop a benefits realisation plan which linked benefits to relevant use cases, trials or applications. This plan was monitored and reported upon quarterly to DSIT.

Use cases description and intended purpose

The following use cases and intended purposes were agreed and monitored as benefits:

- Installation of **three large smart multi-purpose columns at Teesside International Airport** – eight metres high and compliant with the PAS 191 specification, with smart street lighting which can be operated remotely by Teesside Airport.
- Installation of **six smart multi-purpose columns within Hartlepool local authority** area – eight metres high and compliant with the PAS 191 specification and designed to be in keeping with current street furniture in the area, with smart street lighting which can be operated remotely by Hartlepool Council.
- Installation and deployment of **two 5G small cells at Teesside Airport** – expanding the existing private 5G network which exists at the airport and providing Dense Air with further testing of the capability and performance of CoMP-O-RAN Component.
- Installation and deployment of **four 5G cells at Hartlepool Council** – intended to introduce a neutral host public 5G network into Hartlepool.
- Installation and testing of **nine integrated audio speakers** – to be fully controlled and operated by Teesside Airport for the airport columns and Hartlepool Borough Council for the Hartlepool columns. Intended to be used for emergency broadcasts, providing guidance and safety information during events and not designed to be used to create day-to-day noise and disturbance.

- Installation and testing of **seven pairs of 55-inch electronic digital display screens** – six at Hartlepool and one at Teesside Airport, intended to be used to advertise local events, provide wayfinding directions and used alongside plane/train/bus timetables where available.
- Installation and testing of **three environmental monitors** – two at Teesside Airport and one within Hartlepool. These monitors, provided by Zephyr are intended to monitor air quality, providing access to real-time data via online dashboards.
- Installation and testing of **three CCTV cameras** within Teesside Airport – these cameras are intended to link to the existing CCTV system within the airport, providing additional security to the airport terminal.
- Installation and testing of **three VivaCity traffic sensors** within Hartlepool – these sensors are intended to feed extra traffic data into the Tees Valley Urban Traffic Management Control (UTMC) system. This allows traffic strategies to be invoked to control traffic and pedestrians, enhancing traffic and event management in the marina area.
- **One dissemination event** – TVCA aimed to attend at least one event to share knowledge of the learnings from the Tees Valley SIPP project
- **Industry applications –** TVCA aimed to have at least 1 industry application for the smart columns following the pilot.

Final project outcomes

Seven out of the nine proposed columns have been installed as part of this pilot project, including six in Hartlepool and one at Teesside International Airport. All columns are eight metres high and were procured to adhere with PAS 191 specifications. Each column has smart street lighting which is operated remotely via an online 'CityC' platform, for which staff at Hartlepool Council and Teesside Airport have received training on how to access and operate.

Image 1: TIA Column

Image 2: Hartlepool Column 1

Image 3: Hartlepool Column 2

Image 4: Hartlepool Column 3

Image 5: Hartlepool Column 4

Image 6: Hartlepool Column 5

At the time of writing the report the Hartlepool Column 6 was unable to be photographed.

The two further smart columns intended for Teesside Airport have been unable to be installed within the timeframe of the SIPP project. These columns are to be placed on the Teesside Digital Trade Testbed, a

Freeport project which was due to finish construction by 31st March 2025 allowing the installation of the two columns on site within the deadline of the SIPP project. Unfortunately, delays have been encountered with the Testbed construction build, and the smart columns are now due to be installed on the Testbed in June 2025, outside of the SIPP deadline. The columns and associated use cases have however been delivered to Teesside Airport and all payments made to column provider Valmont, with the columns ready to install once the Testbed is built.

The following use cases have been installed:

Image 7: Audio speaker

Integrated audio speakers have been installed as planned in all nine columns. Audio is controlled via the CityC platform which staff at Hartlepool Council and Teesside Airport have access to and have received training for.

Image 8: Double sided electronic display screen

55-inch double sided electronic display screens have been installed as planned on seven columns, content for each is controlled via the online platform URVE, for which staff at Hartlepool Council and Teesside Airport have access and have received training.

Image 9: Environmental Monitor

Two out of the three proposed environmental sensors have been installed and are operational. This includes one in Hartlepool and one at Teesside Airport. The other proposed for Teesside Airport was due to be installed on one of the columns at the Testbed which, as explained above, has been impacted by construction delay and is due to be installed in June 2025. The two sensors installed are gathering data which can be viewed via the online CityC platform

Image 10: CCTV camera

One out of the three proposed CCTV cameras at Teesside Airport has been installed and is operational. The two remaining cameras were due to be installed on the Digital Testbed which have been impacted by construction delays and are due to be installed in June 2025. The CCTV camera installed has successfully linked to the existing airport CCTV system providing extra security to the front of the airport terminal.

Image 11: VivaCity traffic sensor

VivaCity traffic sensors have been installed as planned on three columns in Hartlepool, and are now operational, successfully feeding traffic data into the Tees Valley UTMC system.

Image 12: 5G Cell

One out of the four planned 5G cells has been installed in Hartlepool (further details on page 7) with two further 5G cells to be installed at Teesside Airport once the smart columns on the Testbed are installed in June 2025.

Due to the inclusion of the electronic display screens and potential content plans, it was deemed that advertising planning permission would be required for the six columns being installed in Hartlepool. Legal advice was also sought over whether general planning permission was also required for the six columns within Hartlepool. It was deemed that although permitted development part 12 would allow installation, it would be good practice to adhere to full planning permission process to ensure public buy in. Therefore 12 planning applications were submitted (six for advertising permission and six for general planning permission), and approval was given for all 12 applications. This did however add around six months onto the design and installation process. The columns at Teesside Airport did not have to undergo this process as the Airport has permitted development rights.

As part of the stakeholder engagement process it became apparent that there was a history of vandalism towards street furniture in Hartlepool, and consequently discussions were held with Valmont on additional safety measures that may be developed to protect the columns and added use cases. Valmont advised the

use of 6mm tempered glass on the electronic display screens, and the screens were placed at a height of 2.6m to deter vandalism. TVCA also added an additional £8,748 match funding to insure the columns for a period of three years, after which insurance requirements will be reviewed.

There were a number of challenges and changes encountered with the initial 5G proposal in Hartlepool (the 5G cells at Teesside Airport were not impacted). The initial proposal was for Dense Air to install four 5G cells in Hartlepool as part of a RAN-as-a-Service (RaaS) program in conjunction with the Mobile Network Operators (MNOs). Dense Air would then work with all four MNOs to determine the spectrum and service that would support Dense Air, as the Neutral Host operator. This would have enabled the general public to use the 4G and 5G public network service supplied by the Dense Air small cells. In February 2024 TVCA were informed that, due to a delay in the publication of the Neutral Host Outdoor (NHOD) Specification expected by the Joint Operator Technical Specification, 5G MNO services were unable to be rolled out within the timeframes of the SIPP project. In addition, the commercial viability of NHOD MNO services were not confirmed. Consequently, the decision was made to change the network to a private 5G network, installing AS1900 cells. This meant that there would be no public MNO service being provided, but instead a Private Network service would simulate the MNO service to a limited number of devices populated with a Private Network SIM card. As soon as an MNO service is available, TVCA aim to work with a neutral host provider or MNO to provide a public network in Hartlepool using the SIPP project assets.

TVCA have worked with Hartlepool Borough Council to try to identify potential use cases for the private 5G network, however no use cases which would make use of this outdoor private network were identified within the timeframe of the pilot. This, alongside installation delays and additional installation costs, has resulted in the decision to install one 5G cell in Hartlepool. The installation of the cell proves the preinstalled bracketry on the smart columns is sufficient to host the cell, and proves the concept of the network, via connectivity of a device through to the server. Dense Air will install two further 5G cells at Teesside Airport once the two columns at the Digital Testbed are installed – these cells will link to the existing private network as planned.

Despite the setbacks with the 5G network, TVCA used the opportunity to work with Dense Air and column provider Valmont to future proof the columns, designing the columns to support the proposed future equipment required for both 4G and 5G public networks. This included adding a wider 273mm module to the smart column which will be used to house the 5G Smart Pod antenna as well as the relevant section to the top of the column to house the required 4G antenna.

Whilst undertaking infrastructure investigations for the 5G cells, it became apparent that around 580 metres of new fibre backhaul would be required to enable connectivity. Three quotes were obtained for fibre supply and install and Latos Data Centres were subsequently procured. The fibre installed from the Hartlepool Civil Centre provides the connectivity required for the 5G cells and also provides spare cores of fibre which could be used by TVCA or Hartlepool Development Corporation (HDC) in future projects, enabling digital infrastructure in the HDC area in readiness for future digital capability. In addition, in partnership with Hartlepool Borough Council a new leased line will be installed imminently into Hartlepool Civic Centre to provide back haul for the network.

As part of the social value of the contract with smart column provider Valmont Stainton, it was agreed that Valmont would fund the provision of a new external defibrillator, replacement pads and training equipment to D4S Community Defibrillators, a local charity dedicated to installing defibrillators in key public spaces around the Hartlepool area. The defibrillator was deployed in a suitable location in Hartlepool.

Image 13: Defibrillator donation to Hartlepool

TVCA have not attended any public events to disseminate knowledge as originally planned but instead have disseminated knowledge gathered during this project to the Tees Valley Digital Infrastructure Group, which has met quarterly throughout the project. The group contains representation from each of the five Tees Valley Local Authorities. The group will continue to be kept informed of the benefits of the use cases beyond the end of the SIPP project and lessons learnt will be fed into future procurement of smart street furniture.

TVCA are still investigating potential industry applications for similar smart columns following this pilot. Potential locations include Teesworks, which is the largest Mayoral Development in the UK and the country's largest industrial zone.

4. Procurement

Approach

As a Combined Authority, TVCA had no prior experience in procuring or installing street furniture and therefore decided to procure a smart column provider through a competitive process, procuring a supplier via an above threshold open tender to test the market.

To gather the relevant information to write a detailed specification, TVCA undertook a three-month engagement process with the primary stakeholders – Hartlepool Borough Council, Teesside International Airport and Dense Air. This engagement took place through a series of meetings in which the requirements

for use cases were gathered and the technical aspects examined. The technical requirements for the use cases were fed into the specification and brought together with the PAS 191 requirements.

Timeframes

The tender opened to applicants on 22nd January 2024 with a deadline of 20th February 2024.

TVCA received two bids into the open tender. The bids were assessed against a scoring criteria and Valmont Stainton were notified on 28th February that they were the successful applicant. There was a standstill period of two weeks as per standard practice and the contract commenced on 18th March 2024, with an initial end date of 31st July 2024 based on design and manufacturing times given by Valmont Stainton. This contract was subsequently extended to 31st March 2025 due to the design and manufacturing process taking longer than expected (including delays from planning permission requirements).

Procurement method moving forward

Traditionally the Combined Authority has had limited involvement in procuring and managing street columns, however we anticipate there may be an increased requirement moving forward through the work and remit of the Mayoral Development Corporation areas, in which case the routes available to TVCA would be driven by the estimated value of the additional units and any associated services. If below threshold, TVCA could consider an open tender, request for quotation, or a further competition via a framework or direct award if the framework allows. If above threshold, TVCA could undertake a further competition via a framework or direct award if the framework allows, an open tender, or design a competitive flexible procedure (a new procedure under the new Procurement Act 2023 which came into effect on 24th February 2025). A suitable framework has been identified as a possible future option, YPO 1259 Street Lighting Products and Services Framework, which is available from the period 28th January 2025 to 12th November 2028. The framework covers supply of exterior and internal lighting and associated electrical products and equipment.

Link to framework - Highways | 1259 - Street Lighting Products and Services

5. Overview of Sustainability

Financial sustainability

The smart columns will remain the property of TVCA following the end of the SIPP pilot and will remain in situ in their agreed locations, this includes the use cases of smart lighting, audio speakers, environmental sensors and electronic display screens.

The Combined Authority have insured the smart columns for an initial period of three years, after which use will be reviewed.

Valmont provides various warranties from the original delivery date for the column and its components. Beyond the warranty period, Valmont have supplied additional information on timeframes for replacement parts. Warranty and replacement timeframes for parts are shows below:

ITEM	WARRANTY	REPLACEMENT
Column	1 year	6-8 weeks
Luminaire	5 years	1-2 weeks
Camera	3 years	1-2 weeks
Display	2 years	8-10 weeks
Air Sensor	1 year	1-2 weeks
Speaker	2 years	1-2 weeks
Control box	5 years	1-2 weeks

All of the above technology utilises the City C platform which allows TVCA to remotely monitor the devices and system health to minimise and react to possible downtimes.

The contract with Valmont Stainton also includes 12 months subscription to the City C and URVE platforms for unlimited users, starting from when the columns are fully operational. The CityC platform provides remote operation of the smart lighting, audio speakers and access to data from the environmental sensors. The URVE platform is used to upload content for the electronic display screens. At the end of the subscription period, TVCA together with partners Hartlepool Council and Teesside Airport will review usage and decide whether this is to be renewed, and who will be responsible for covering the cost (estimated to be around £15,000 per annum). After 12 months the added benefits of the use cases, including potential cost savings, will be reviewed, with learnings fed into future investment decisions.

There is a potential opportunity to commercialise the electronic display screens for advertising purposes and this may be considered as a possible revenue in the future for TVCA, however initially the screens are expected to the used to promote local events and for wayfinding purposes, along with travel information.

The VivaCity traffic sensors are mounted externally. These sensors currently belong to the Tees Valley Traffic Signals Team which is currently managed by Middlesbrough Council. The sensors are covered by a seven-year maintenance contract with VivaCity from date of install, with an option to extend if required.

The two small cells to be installed as part of the SIPP project at Teesside Airport will remain in place after the end of the SIPP project, and will be included in a new tender which is due out in April 2025 for a private 5G network operator for the Teesside Airport site – this will be for an operator to take over the operation of the existing network, including network support and possible future expansion of the network across the airport site.

Due to a lack of private network use cases within Hartlepool, it is envisioned that the one small cell installed in Hartlepool will be decommissioned and removed by Dense Air. This will leave the supporting infrastructure,

including TVCA owned fibre and smart columns, ready for the rollout of a neutral host public 5G network, which was the original aim of the Tees Valley SIPP project in Hartlepool. TVCA are in talks with Dense Air about the future of neutral host private networks in the Tees Valley.

How do you envisage increasing scale of use cases deployed (within your region or widening adoption (across other LAs, regions)

In regard to increasing the scale of use cases deployed within Tees Valley in the future – it has taken longer than anticipated to procure, manufacture and install the smart columns, leaving limited time left in the SIPP project to test the use cases and prove added benefits. The use cases will continue to be monitored after the 31st March to determine whether the anticipated benefits of these use cases are realised. Lessons learnt from the project will be shared with Tees Valley Local Authorities via the Tees Valley Digital Infrastructure Group which meets quarterly and includes representation from each of the five Tees Valley Local Authorities. The group will be informed of the benefits of the use cases beyond the end of the SIPP project and lessons learnt will be fed into future procurement of smart street furniture.

6. Investment Stimulation/costs

Initial Projected Project Costs

TVCA were successful in bidding for £202,500 of Department of Science Innovation and Technology (DSIT) money to fund this project and test the procurement / added use cases of smart multi-purpose columns. This money was intended to cover the procurement and installation of nine smart columns, including integrated smart lighting, audio speakers, CCTV cameras, electronic display screens and environmental sensors.

Further match funding was committed as outlined below:

- Dense Air committed £240,000 towards the provision of six x 5G small cells to be mounted on the smart columns.
- £18,000 was also committed by the TVCA Digital Transport team to fund three VivaCity traffic counters and interface with the existing UTMC system.

The SIPP project aimed to understand efficiencies in savings from the deployment of multipurpose smart columns. As part of this, TVCA gathered baseline costs to retrofit each aspect of the current multipurpose columns broken down by each individual component (as shown below).

Baseline Retrofit Costs

Item	Cost per item

Smart streetlight	£150
5G small cell	£40,000
Audio Speaker	£300
Environmental Monitor	£3,000
CCTV	£2,500
VivaCity Traffic Sensor	£6,000
55” Digital Sided Display Screens	£10,300
Estimated installation costs for all use cases	£3,750
Total	**£66,000**

The above baseline retrofit costs have been compared to the actual costs delivered through the SIPP project and outlined in the table below.

Retrofit Costs Versus Actual Costs - Smart Columns and Use Cases

These costs have been broken down below by each 8m Smart.Lite column in the locations specified along with installation costs:

Location/Column	**Estimated cost to retrofit column**	**Actual cost to deploy PAS 191 compliant pole and all use cases**
TIA Location 1 (situated outside of the airport terminal entrance) This includes a double Izylum luminaire, speakers, CCTV camera, air quality sensor and 55” double sided digital display screens.	£19,100 £3,750 average install cost	£24,873 £6,500 (install cost)
Total	**£20,000**	**£31,373**
TIA Location 2 (on the Digital Testbed site) This includes a single Izylum luminaire, speakers, CCTV camera, air quality sensor and a 4G/5G small cell.	£48,800 £3,750 average install cost	£44,162 £4,000 (estimated install cost to be covered by TVCA Digital Testbed funding)
Total	**£49,700**	**£58,162**
TIA Location 3 (on the Digital Testbed site) This includes a single Izylum luminaire, speakers, CCTV camera and a 4G/5G small cell.	£45,800 £3,750 average install cost	£51,198 £4,000 (estimated install cost to be covered by TVCA Digital Testbed funding)
Total	**£46,700**	**£55,198**

Hartlepool Location 1 (the Highlight) This includes a single Izylum luminaire, speakers, air quality sensor, 55" double sided digital display screens, VivaCity traffic sensors and a 4G/5G small cell.	£62,600 £3,750 average install cost	£67,939 £4,000 (install cost)
Total	**£63,500**	**£71,939**
Hartlepool Location 2 (Maritime Avenue – Jackson Dock) This includes a single Izylum luminaire, speakers, 55" double sided digital display screens and VivaCity traffic sensors.	£19,600 £3,750 average install cost	£24,975 £4,000 (install cost)
Total	**£20,500**	**£28,975**
Hartlepool Location 3 (Maritime Avenue – Victoria Terrace) This includes a single Izylum luminaire, speakers, 55" double sided digital display screens and a 4G/5G small cell.	£53,600 £3,750 average install cost	£58,975 £4,000 (install cost)
Total	**£54,500**	**£62,975**
Hartlepool Location 4 (Church Street – Victoria Terrace) This includes a single Izylum luminaire, speakers, 55" double sided digital display screens, VivaCity traffic sensors and a 4G/5G small cell.	£59,600 £3,750 average install cost	£64,975 £4,000 (install cost)
Total	**£60,500**	**£68,975**
Hartlepool Location 5 (Church Street – Lynn Street) This includes a single Izylum luminaire, speakers and 55" double sided digital display screens.	£13,600 £3,750 average install cost	£18,975 £4,000 (install cost)
Total	**£14,500**	**£22,975**
Hartlepool Location 6 (Church Street – Station Approach) This includes a single Izylum luminaire, speakers and 55" double sided digital display screens and a 4G/5G small cell.	£53,750 £3,750 average install cost	£58,975 £4,000 (install cost)
Total	**£54,500**	**£62,975**
Grand Total	**£384,400**	**£463,547**

TVCA therefore calculate an extra cost of £79,147 required for the procurement and installation of nine smart columns at a cost of £463,547 versus the cost for retrofitted nine columns estimated a cost of £384,400. This

works out at an extra £8,794 per column on average for the procurement and installation of a PAS 191 compliant smart column and additional use cases.

Despite no monetary savings indicated from a standard street column to a smart column, there is an argument to be made for the efficiency savings from the deployment of multipurpose smart columns and those findings won't be realised until costs can be reviewed after a period of time.

Additional Match Funding

There is also the cost of the enabling infrastructure to consider when looking to procure smart columns, including the necessary power and fibre and the civil work that comes with installation of these.

As the project progressed it became apparent that additional match funding from TVCA was required to fund around 500 metres of spine fibre installation to enable the 5G small cells to operate. Quotes were obtained from three fibre network providers in the area for installation of a 96 core fibre network. As part of the fibre install there was also a requirement to purchase data centre equipment to sit inside the data centre located at Hartlepool Civic Centre, this included an aggregation switch, rack and leased line rental for three years. This equipment was required to link the Dense Air network back to the wider internet.

This resulted in an investment of £91,702 to Latos Data Centres for the installation of fibre, in addition to £3,000 of data centre equipment and three years leased line rental at £12,000 (£4,000 per annum). The quote from Latos Data Centre was significantly cheaper than other fibre providers and covered TVCA's requirements. This included the network build, installation, three years of Physical Infrastructure Access (PIA) rental, 12 months warranty on the fibre and 24 months warranty on any street works required. The fibre installed from the Hartlepool Civil Centre provides the connectivity required for the 5G cells and also provides spare cores of fibre which could be used by TVCA or Hartlepool Development Corporation (HDC) for future projects, enabling digital infrastructure in the HDC area in readiness for future digital capability.

In addition, it also became apparent after a series of vandalism acts on street lighting in Hartlepool that funds were required for the insurance of the smart columns. £2,916 per annum has been invested by TVCA to insure all nine smart columns. Over a period of three years this totals £8,748 investment.

The total amount of additional investment added from TVCA equates to £115,450.

At the time of writing this report there has been no investment stimulated from this project. TVCA have however invested in enough fibre to enable the smart column technologies which has in turn provided 72 spare cores of fibre which could be used by TVCA or Hartlepool Development Corporation (HDC) for future projects, enabling digital infrastructure in the HDC area in readiness for future digital capability. Additionally, the fibre and aggregation switch will remain an asset of TVCA with possible revenue from rental in the future.

Rental revenue is unknown at present, however the main benefit of the excess fibre at this point is to enable future digital connectivity to the HDC area.

7. Overview of lessons learnt

Early collaboration of all partners to be involved in the procurement process is essential. As previously stated, TVCA has had no prior experience in procuring and installing street furniture. This is usually managed by the five Tees Valley local authorities who have designated street lighting teams. TVCA therefore recognised the importance of early collaboration with partners Hartlepool Borough Council (HBC), Teesside International Airport (TIA) and Dense Air (DA) and this was essential throughout the project. During the planning phase, TVCA collaborated with both TIA and HBC to agree locations for the smart columns along with use cases. TVCA consulted with Neighbourhood Services, Strategic Development and Sustainability, Development & Growth, Highways Infrastructure and Street Lighting teams to identify, map and share local data to decide the exact locations of the columns. TVCA also utilised the knowledge and expertise of HBC, TIA and DA along with traffic sensor suppliers VivaCity to pull together a comprehensive procurement specification which highlighted the technical requirements for the smart columns (including weight loading, required external and internal fixtures etc) and ensured this complied with the PAS 191 specification. This collaboration with partners was necessary and took longer than expected, therefore early collaboration is recommended to anybody looking to write a detailed smart column procurement specification. Should TVCA look to procure and install additional street furniture in the future, earlier collaboration with the LAs and stakeholders (of externally mounted technology) would be required, exact locations confirmed, and the right information would need to be shared at the beginning, prior to procurement.

Understanding of land ownership and the planning permission required for each aspect of the smart column is essential – there was a mixture of private, public and Mayoral Development Corporation land linked to the Tees Valley project, as well as some areas which were classed as 'conservation areas' to which the introduction of a smart column would undergo extra public scrutiny. TVCA worked with HBC utilising layered maps to identify public/private land alongside proposed HBC developments and existing assets to decide the location of the columns and a way forward for planning permission. This work identified that one column fell within the HBC boundary and that five columns fell within the Hartlepool Mayoral Development Corporation (HDC) boundary.

Understanding the planning requirements for smart columns earlier in the process would have resulted in fewer delays and appropriate time allocated to the planning process. TVCA sought legal advice on the planning and advertising permission requirements for each of the land ownership scenarios. The three TIA columns were contained within private TIA land and covered with permitted development rights. For the six Hartlepool columns it was advised that TVCA acquire two sets of planning permission for each column – general planning permission and advertising permission for the digital display screens. It was deemed that although permitted development part 12 would allow installation, it would be good practice to adhere to full planning permission process. Understanding these planning requirements earlier would have resulted in fewer delays as the planning application could have been started sooner. Assistance from DSIT on the

permissions generally required for 5G small cells was helpful in providing an understanding of how other SIPP projects were approaching this. TVCA recognise that a better understanding of 5G small cell planning requirements is needed for further future developments.

TVCA would recommend use of the PAS 191 specification as a guide for writing a smart column procurement specification. As part of the overarching policy for the SIPP project, TVCA understood the project was specifically designed to test and pilot the procurement and rollout of smart multi-purpose columns adopting the PAS 191 standard. With no prior knowledge of PAS 191 the specification was initially difficult to find and access online. For that reason, improvements could be made to better signpost and access PAS 191 for future use to both Combined Authorities and Local Authorities. Upon access, the document was found to be very useful. The PAS 191 specification was used as a guide throughout the creation of the smart column specification for the open tender.

Any insurance costs should be taken into consideration from the beginning. A risk treatment action plan was created at the beginning of the project allowing TVCA to continuously monitor project improvement through the implementation of the plan. Regular meetings with TVCA's Risk Officer identified issues and delivered risks through the course of the project which were assessed and included in the project risk register, having gone through a full risk assessment process. A few months into the project, an increasing number of vandalism acts were reported against street lighting columns in Hartlepool, and it became apparent that TVCA would be required to take out insurance on the smart columns resulting in an increase in operational costs.

TVCA would recommend use of the National Underground Assets Register (NUAR) to help identify any underground assets, such as power and fibre that may be used by smart columns. TVCA approached the NUAR team to gain access to their online tool. The NUAR database provides information on existing telecommunications infrastructure, which was used to investigate the area surrounding Hartlepool Marina. The NUAR team were easy to engage with and access was set up promptly. The tool was found to be beneficial for this project and has since been used for other projects. Whilst it's felt there are benefits to using NUAR, it would appear not all telecommunications companies use it and therefore that is a limitation to the tool. It would be beneficial if it was utilised by all.

If 5G networks are to be incorporated onto street columns, TVCA recommends early and continuous engagement with the 5G provider, and facilitation of discussions between the 5G provider and smart column provider to ensure the design of the column can accommodate the technology required for the 5G cells. As part of the Tees Valley SIPP project TVCA facilitated discussions between Valmont and Dense Air, which included Dense Air sending examples of equipment and technology to Valmont for them to incorporate within their columns e.g. Dense Air Smart Pods, which resulted in Valmont including a wider 273mm module to the smart column which can be used to house the Dense Air 5G Smart Pod antenna as well as the relevant section to the top of the column to house the required 4G antenna, which will enable a potential future neutral host 5G network to be installed. Communication between HBC and Dense Air was also essential with Dense Air providing information on the requirements for rack equipment and internet backhaul required for the 5G

network. This required collaboration with HBC to understand the availability of space in their data rooms and current internet connections.

For any future Combined Authorities looking to install smart furniture, TVCA would recommend familiarisation with the street lighting installation process. TVCA undertook regular communication and collaboration with HBC and TIA street lighting teams, with different modes of installation discussed depending on the column's specifications, this was assisted by Valmont. This was fundamental to the success of the project in order for the design of the columns to be modified to accommodate different installation requirements at each location. For example, in Hartlepool there was limited space to undertake civil work, along with costs associated to decorative paving to consider, therefore an original suggestion to use NAL sockets for installation had to be revised and a more traditional install took place.

Understanding the requirement and availability of supporting infrastructure such as power and fibre for wireless connectivity should be a high priority for any authority looking to install smart furniture. Whilst undertaking infrastructure investigations for the 5G cells it became apparent that around 580 metres of new fibre backhaul would be required to enable connectivity. TVCA therefore needed to procure a supplier to install a new fibre spine along with smaller fibre optic cabling to each column. Utilising Openreach's PIA network reduced the cost substantially; however, it must be noted that only suppliers who are registered with Openreach may use this. It would therefore be recommended to use a supplier who is registered to reduce any civils and the associated costs. In addition, consideration should be given as to whether a leased line is required to enable the network, this provides a connection from the 5G network equipment to the wider internet. This is available from a number of sources, however most require a three-year term, with an installation period of 45-60 days, meaning this order should be placed early in the project to ensure it is available for network commissioning.

When installing smart columns, it's crucial to understand the power requirements, and if Northern Powergrid are required to install additional power cabling, it is essential to engage them as early as possible in the installation process. Availability of mains power is a key utility in the installation of smart columns. Engagement was required with Hartlepool Borough Council to install the power cables, from the main feed to the column, however due to the lack of space available in the smart column (which wasn't apparent on the design documents produced from Valmont) this then required the installation of feeder pillars at an extra cost. Engagement was also required with Northern Powergrid to install cabling, which had a cost implication to the project. It should be noted that Northern Powergrid require approximately two months' notice prior to installation.

When the columns were delivered by the manufacturer it became apparent that some aspects did not match the agreed design, for example, in the initial technical drawings, the columns were shown to have two lower access hatches, however the columns received had three. In addition, the initial technical drawings suggested that TVCA would be able to install the fibre enclosure below the power board on a DIN rail, however when the columns arrived it became apparent that there was not enough clearance, this required TVCA to retrofit

a solution to install the enclosure near to the black box control unit of the column. Lessons learnt from the process have been fed back to Valmont and Dense Air.

As part of the project closure TVCA invited partners to feed back any lessons learnt from the pilot. The below recommendations are taken from lessons learnt recorded by Dense Air:

- Regular communication from the smart column provider or asset owner is essential - Smart column providers delivery dates are subject to change which can result in use case providers having to reschedule provision/install and potential exposure to a new set of risks.
- Smart column provider's designs should be used to fully review the alignment, accessibility and fitness for the task at hand and add agreed changes to the project plan to ensure delivery. All implications of a design change should be studied and their impact on the project fully understood.

8. Future Plans

Forward plan

The smart columns and all use cases, except for the 5G cells, will remain under the ownership of TVCA following the end of the SIPP pilot and will remain in situ in their agreed locations. The operation of the street lighting, audio speakers and environmental sensors on the columns in Hartlepool will be undertaken by the Hartlepool Street Lighting team via access to the online CityC platform. At Teesside Airport the smart columns will be managed by the Operations team via the CityC platform. The relevant staff at Hartlepool and Teesside Airport have been provided with 12 months access to the CityC platform and have undertaken training. The Marketing teams at both Hartlepool Council and Teesside Airport will be responsible for managing the content on the electronic display screens. This will be managed via access to the online platform URVE, for which the relevant staff have been provided with 12 months access and have undertaken training. At the end of the 12 months (March 2026) TVCA will undertake a review with Hartlepool Council and Teesside Airport and establish whether access to these platforms and management of the use cases has been beneficial, agreements will then be made on whether to renew subscriptions and discussions held on who will be responsible for covering ongoing costs – estimated to be around £15,000 per annum.

Capturing of outputs and learnings to ensure future informed decisions on use of PAS 191-compliant poles

The lessons learnt from the project have been captured in a lessons learnt log and shared with DSIT at quarterly reviews. These lessons will be shared with all partners involved in the project. In addition, lessons learnt alongside any outputs from the project will be shared with the Tees Valley Digital Infrastructure Group. This group contains representation from each of the five Tees Valley Local Authorities and lessons learnt will be fed into future procurement of smart street furniture. The added benefits of the use cases will be reviewed after the first 12 months to determine whether TVCA, Hartlepool Council or Teesside Airport will consider deploying these use cases on other street furniture.

Potential updates to street lighting/digital strategies

As a Combined Authority, TVCA has no existing street lighting strategy, or plans to create one. However, TVCA published the Tees Valley Digital Strategy in 2022, which is a high-level strategic document setting out Tees Valley's ambition to be a Smart Region by 2032, using world-leading digital infrastructure and innovation to create opportunities for all residents and businesses. TVCA are currently drafting a delivery plan for this strategy, and the use of smart street furniture and their associated use cases, including digital connectivity will be fed into this plan, taking into consideration the learnings of this pilot.

Documenting understanding / business case / decision tree on when it is appropriate to deploy PAS 191 poles

As a Combined Authority, procuring and installing street furniture is a new area of investment, however this may be a potential further area of investment as Mayoral Development Corporation areas are developed in the future. If investment in smart street furniture is taken forward, the learnings of the pilot will be applied, and on a case-by-case basis consideration will be taken on the added benefits of smart columns and their associated use cases, over the use of traditional street lighting columns. TVCA will also encourage the five Tees Valley local authorities to do the same. The costs from this pilot to deploy smart columns will be fed into the commercial sections of future business cases relating to smart PAS 191 columns, as well as any potential recovery costs e.g. energy savings, screen advertisement income, asset rental for 4G/5G cells etc.

Applying logic to future deployment of PAS 191 poles and any replacements

Taking learnings from this project, TVCA will use the following logic when ascertaining what street furniture/replacements to deploy in the future:

- Is the area of strategic importance – e.g. is it an MDC area or similar, such as an Investment Zone, and is it an area where there has been interest from a neutral host provider or MNO
- Who owns the area, does it fall under private or public ownership, and if public, does it fall under the ownership of the local authority or MDC area?
- What are the associated planning requirements with the proposed location and specific use cases proposed? E.g. does it fall within a conservation area, is advertising proposed?
- Does it have the required supporting infrastructure e.g. Power and Fibre? Consult the NUAR to check what is available. Does costs of adding infrastructure need to be considered?
- Are the proposed added use cases of the smart column beneficial to the local area? E.g. traffic sensor, EV charging etc
- If wireless communications form part of the offer, is there any proximity to a railway line or air traffic? Experience gathered on a separate project has shown that Network Rail and the Aviation Authority will need to approve any nearby plans for 5G – these partners will need to be engaged early in the process.

- Compare costs to deploy smart columns versus cost recovered – and compare this to costs to roll out traditional street lighting against benefits.

Updating T&Cs to account for multiple stakeholders working on a single piece of hardware

As a Combined Authority, TVCA have no T&Cs relating to street lighting – however as these assets are now CA owned it is anticipated that any issues will be flagged with TVCA by either Hartlepool Council or Teesside Airport. Moving forward, operation of assets such as these will be considered by the TVCA Operations Director.