Crown Estate Paving Commission

ELECTRIC VEHICLE CHARGING INVESTIGATION REPORT

001
OCTOBER 2022

CONFIDENTIAL

Crown Estate Paving Commission

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TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 70098591

OUR REF. NO. 001

DATE: OCTOBER 2022

WSP

Unit 9, The Chase
John Tate Road, Foxholes Business Park
Hertford
SG13 7NN

Phone: +44 1992 526 000

Fax: +44 1992 526 001

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Initial Issue			
Date	07/10/2022			
Prepared by	Abdul Alhomoud			
Signature	Alhomoud, Abdul (UKAHA001) Digitally signed by Alhomoud, Abdul (UKAHA001) DN: cn=Alhomoud, Abdul (UKAHA001), ou=Active, email=AbdulmajeedAlhomoud@wsp.com Reason: I am the author of this document Date: 2022.10.07 10:53:59 +01'00'			
Checked by	Daniel Scolari			
Signature	Scolari, Daniel (UKDXS068) I have reviewed this document 2022.10.07 11:02:02 +01'00'			
Authorised by	Chris Jackson			
Signature	Jackson, Chris (UKCXJ023) Digitally signed by Jackson, Chris (UKCXJ023) DN: cn=Jackson, Chris (UKCXJ023), ou=Active, email=chris.jackson@wsp.com Reason: I am approving this document Date: 2022.10.07 11:36:22 +01'00'			
Project number	70098591			
Report number	70098591-WSP-XXX-XX-RP-EE-0001-P01			
File reference				

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations WSP UK Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

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EXECUTIVE SUMMARY

The Crown Estate Paving Commission (CEPC) is a statutory body that manages and maintains the roadways, footways, private gardens, and the services that arise around The Crown's Regent's Park Estate and at Carlton House Terrace, St James's.

To cater for the needs of the residents and businesses, CEPC requires an independent consultant to conduct a high-level analysis to support Electric vehicle (EV) charging related decision making and allows the Estate to evolve over time to embrace the transition to electric vehicles.

A combination of higher-power 'rapid' and lower-power on-street chargers for different user groups has been explored to provide convenient and economical charging facilities for both residents and visitors to Regents Park and the surrounding terraces that aim to maintain the existing streetscape and are compliant with the heritage standards. Due to the age and condition of the existing street lighting electrical networks, we believe that it is highly unlikely to be suitable to support the additional EV charger requirement and either a separate feeder pillar will be required, or our recommendation would be to use this opportunity to renew the street lighting electrical networks and incorporate the EV charging into the same network to reduce the quantity of street furniture.

We recommend CEPC considers updating the existing infrastructure to bring it up to current standards will ensure the safety of anyone interfacing with street lighting columns and EV chargers, minimise street clutter, and provide maximum outlay. Various operating models have been explored to provide guidance on operational expenditure.

The implementation of the solutions provided in this report will support government transport decarbonisation legislation and local air quality around the Estate. There is already a strong EV uptake around the London boroughs fuelled by the congestion charge on conventionally fuelled vehicles. To support the continued switch to EV, residents will require convenient charging where on-street parking is available and visitors to the Crown Estate and Royal Parks will also increasingly require a facility to charge their vehicles at differing speeds according to the duration of their stay.

Contact name: Chris Jackson

chris.jackson@wsp.com

Contact name: Daniel Scolari

daniel.scolari@wsp.com

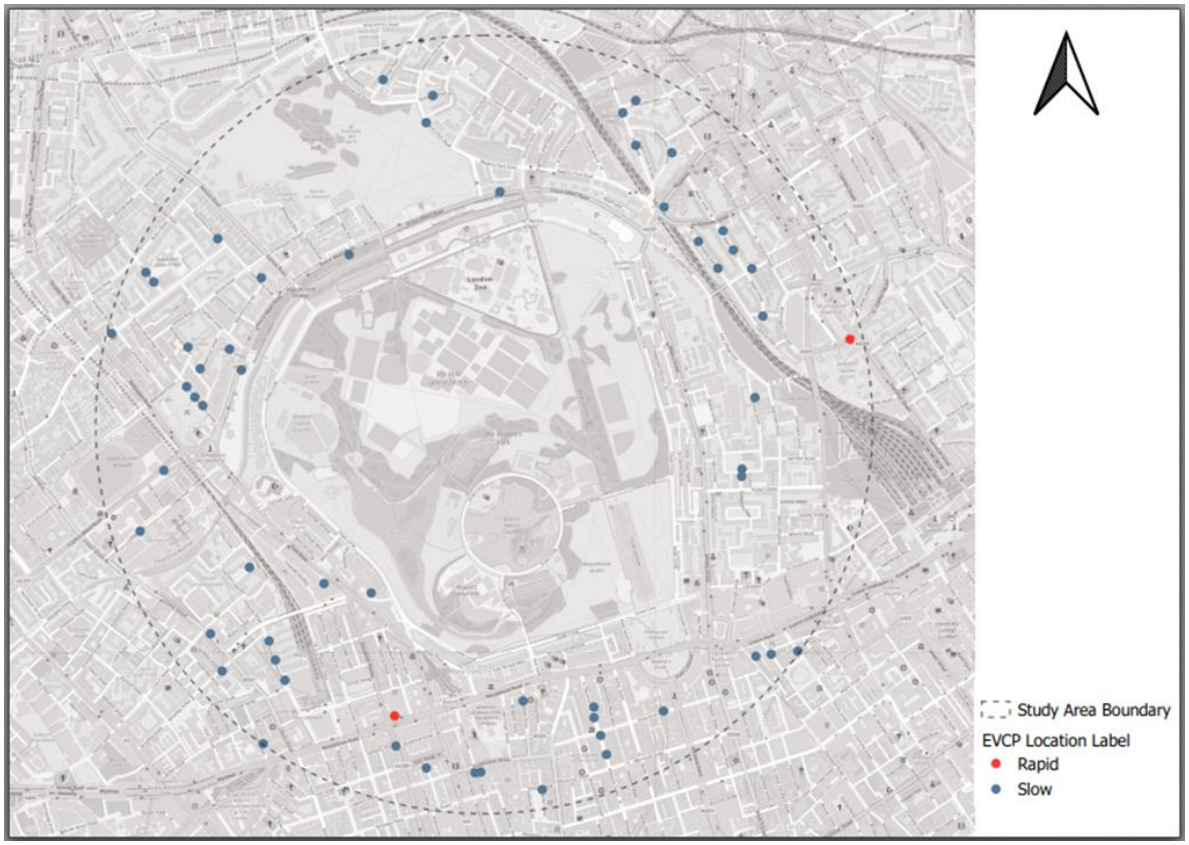
1 INTRODUCTION

CEPC have received requests from residents to explore the feasibility to have on-street EV chargers installed to support the continued uptake of EV's. CEPC have commissioned WSP to produce a high-level assessment of the costs, barriers and options to provide the residents & shorter-term parking with an EV charging provision.

A review of whether residents have a viable alternative to existing electric vehicle charging points (EVCPs) has been undertaken and is envisaged to inform the prioritisation of the future roll-out of the charging network. Figure 1-1 illustrates the study area which this report focuses on. The estate is considered to have poor access to alternative EVCPs due to the fact they are located further afield than 150m of an existing public EVCP. The inability to charge close to your property has been cited as a barrier to adoption for future EV drivers. Furthermore, the economic disadvantage of higher energy cost prices usually charged at higher speed public charge points when compared to slower overnight charging is generally perceived as a further disincentive. Many residents do not have off-street parking and therefore require a facility to charge on-street very close to their front door, or they would be reliant on the wider public charging network across the city.

On-street charge points will play an important role to democratise charging by allowing residents access to safe, reliable, convenient infrastructure.

Figure 1-1 - Existing EV charges in the local area



Regent's Park has an outstanding heritage of historic street furniture of national importance. This is an important component of its significance and character, which warrants the utmost care and conservation The estate also retains a superb legacy of historic bollards of a variety of different designs from a number of different reigns, including many which formed part of the original layout of the area, royal cyphers can be seen around the Estate particularly from the reigns of George IV and William IV.

Historic lamp columns and bollards punctuate the streetscape and form an integral, understated component of the area. Many are exceptionally rare. They are of intrinsic historic interest, and many are included individually in the statutory list of buildings of special architectural or historic interest.

Figure 1-2 - Heritage style lighting column

Figure 1-3 - Heritage style EIIR bollard

WSP understands that all such historic features should be retained in situ. This is an important aspect when it comes to the design and location of historic street furniture such as the original juxtaposition of lamp columns and bollards with granite kerbs.

2 SUMMARY OF EXISTING EV CHARGE POINT TECHNOLOGIES

2.1 CHARGE POINT TYPES

The range of charging solutions for electric vehicles is evolving rapidly and reflects the ongoing technological developments and increasing investment in this market. Charge points can take the form of a socket, which the EV driver plugs their own cable into, or include a charging cable which is tethered to the charger. Table 2-1 provides a summary of the key charge point types currently available.

Table 2-1 - Charge point types

Charge point types		Max Power Output Kilowatts	Current/ Supply Type	Input Voltage (Volts)	Maximum Current (Amps)	Socket/Plugs	Charging duration (40kWh battery)
	Domestic Socket	2.3-3kW	AC – Single Phase	230	10-13A	Standard 3 pin	Approx. 17 hours
	Slow	3.7kW	AC – Single Phase	230	16A	Type 1/2	Approx. 11 hours
	Standard	7.4kW		230	32A	Type 1/2	Approx. 6 hours
	Fast	11-22kW	AC – Three Phase	400	16-32A per phase	Type 1/2	Approx. 2-4 hours
	Rapid	43kW	AC – Three Phase	400	60A per phase	Type 2	Approx. 55 mins
		20-50kW	DC	400	100A	CHAdeMO / CCS Combo 2	Approx. 40 mins
	Tesla Super Charger	75-250kW	DC	Up to 400	Up to 800A	Tesla adapted Type 2 & CCS Combo 2	Approx. 10-20 mins
	Ultra-Rapid	50kW - 350kW	DC	Up to 920	Up to 500A	CCS Combo 2	Approx. 7-16 mins

Table 2-2 - Charge Point Types based on location type

Land use Type	Typical Use Case	Typical Dwell Time	Typical Charging Requirements	Typical EVCP Provision
Terrace areas 	Resident	Long dwell time (over 3 hrs)	Slower speeds – typically overnight charging	Slow / Standard Charger
Outer circle on-street parking 	Employee	Long dwell time (over 3 hrs)	Slower speeds – typically occasional daytime charging	Slow / Standard Charger
	Visitor	Medium dwell time (1-3 hrs)	Moderate speeds – typically occasional daytime charging	Standard/ Fast Charger
	Fleet	Medium dwell (1-3 hrs)	Moderate speeds – daytime or overnight charging	Standard/ Fast Charger
		Short dwell time (less than hour)	Higher speeds – reflecting short dwell time	Fast / Rapid Charger

Table 2-2 illustrates the suitable charge point type for each land use type. This is based on the required charging requirements, dwell time and the user. To cater for the EV needs of the CEPC residents and businesses we have made the following key assumptions that will form the basis of this report:

- 7kW standard on-street chargers are suitable for the residential terrace areas.
- 50kW high-powered rapid chargers are suitable for the Outer Circle Road short stay on-street parking.

2.2 EMERGING CHARGE POINT TECHNOLOGIES

Innovative charging technologies continue to evolve and should be monitored to identify any that may mature to serve CEPC.

There are a number of emerging developments in EVCPs technology that have potential to change and improve the experience of using an EV. These new innovations may evolve into mainstream products but are not currently mature enough to be considered for The Regent's Park Estate. It is worth maintaining a watching brief over these technologies to see if and when they will be become significant.

Wireless charging

Inductive charging is a wireless system which uses the principle of electromagnetic induction to charge EVs. Electricity is transferred through an air gap from one magnetic coil in the charger to a second magnetic coil fitted to the car. The charging pads can be embedded within parking bays.

charging speeds are typically low due to limitation of wireless energy transfer but could provide a low-impact and aesthetically sympathetic solution for terrace areas.

Image Source: Car Magazine

The market is beginning to catch up with the technology in this area and in the medium-term use cases with high utilisation may emerge e.g., for off-street charging.

Mobile charging

Image Source: BP

Mobile charging units provide top-up charging whilst avoiding some challenges associated with fixed EV charging infrastructure as they avoid the need for designated EV bays and enforcement. Mobile charging units can be disconnected as soon as charging is complete and potentially require less upfront investment.

Vehicle to grid (V2G)

V2G enables EVs to feed electricity back into a home, workplace, or grid when demand is at its highest, before then charging at off-peak times during the day or night.

Image Source: Internet of business

Battery swap

With battery swapping technology, EVs exchange depleted batteries for a fully charged replacement, with the potential to dramatically reduce the time required to recharge.

Image Source: Nio Power

Co-locating EV chargers with battery storage and renewable generation

Of all the technologies summarised within this section, the co-location of charging and solar is becoming increasingly well established and has been promoted for sites with constrained grid capacity, which can limit the number or type of EVCPs provided.

Image Source: Green Car Conference

3 REVIEW OF EXISTING CEPC INFRASTRUCTURE

A non-intrusive visual survey was carried out to assess the condition of the existing road lighting/ electrical installations which helped in assessing the viability of retrofitting electric vehicle charging points onto street lighting columns. As part of the assessment, the following was considered:

- Type of power supply – DNO (metered/ unmetered) or Private.
- Capacity of supply.
- Earthing systems.
- Compliance with the latest standards/ regulations.
- Structural integrity; and
- Space within the columns/ feeder pillar

In summary, the survey outcomes highlighted the following:

- The existing lighting columns are unlikely to be suitable for EV charging conversion due to their age and structural integrity which will require an assessment by a qualified structural engineer. Additionally, the space within the column is confined and will unlikely be enough to house the additional equipment for the EV charger.

Figure 3-1 - Existing Lighting Column

Figure 3-2 - Existing Column Cut-out

- The existing feeder pillar at Cambridge gate is an old pillar that houses an unmetered TN-S single phase supply. It is unsecured and showing signs of significant water ingress and deterioration which means it does not comply with the latest standards and regulations. Therefore, it is not suitable for reuse.

Figure 3-3 - Existing supply point at Cambridge gate.

- The existing feeder pillar at Chester Terrace is a three phase TN-C-S supply however only a single phase is wired out

Figure 3-4 - Existing supply point at Chester Terrace

- All the surveyed supplies are unmetered and there is no space for a meter to be retrofitted which is another reason why the existing supplies are not fit for purpose; and
- In order meet the BS 7671 wiring regulations, there are certain earthing requirements need to be adhered to. Currently the lighting feeder pillars do not meet these requirements and the current policy of UKPN does not permit the utilisation of other protective devices to prevent a dangerous voltage to become present. Therefore, the existing supply types are deemed highly unlikely to be suitable for supplying EV chargers

4 PROPOSED EV CHARGING INFRASTRUCTURE

A feeder pillar will be required as an electrical supply point which will feed the EV chargers. The feeder pillars will be located where the District Network Operator (DNO) connections will be provided, and they would be designed in a heritage way and positioned somewhere visually discreet such as the existing feeder pillars in the garden areas.

Requirements for the EVCPs to be connected to a new DNO supply are:

- Spatial requirements will need to be investigated at the next design stage for the feeder pillar arrangement.
- An application will need to be made to the DNO on this basis. Typically, a 100A three phase DNO supply would be sufficient to provide up to nine 7kW chargers that is considered sufficient for many sites whereby a new DNO supply is recommended. Similarly, a 200A three phase will be required for the rapid chargers.
- The charge points could be provided via a lamp column solution or an existing bollard if appropriate, or alternatively, via free standing units.
- DNO and standard requirements will need to be investigated at the next stage for electrical network provision and feeder pillar arrangement.
- Active/ Dynamic Load Management systems should be used to minimise the costs associated with a new DNO supply and ensure the supply is not overloaded when electric vehicles are charging.

WSP understands the estate's high heritage value and that any visible changes to the built environment will need to be acceptable in heritage terms. Therefore, the following charge point solutions are recommended:

Retractable EV charging bollard:
A retractable EV charging bollard is a new concept that is being developed for on-street electric charging points. The problem with providing standard on-street charging solutions is that they add significant additional 'street furniture' which intrudes on the pavement. This obstruction to a public highway brings with it possible health and safety risks to pedestrians, cyclists, and residents.
This new design of deploying "pop-up" charging posts, that retract into the ground when not in use, could address this challenge and help local authorities manage the risk of increased pavement clutter while enabling electric vehicle adoption. Example product: Urban electric

Figure 4-1 - Urban electric retractable EV bollard

Non retractable EV charging bollard:
A satellite EV bollard system utilises a typical highway bollard and incorporates an EV charging socket into the structure. Products like this typically require a smart meter and payment system that is housed within their unique cable connection and communicates wirelessly between the vehicle and charge point. This satellite EV bollard system can be situated at the front of the footway or in the area where the charging unit is required. Product example: NAL x-Last bollard.

Figure 4-2 - NAL X-last EV bollard

Regent's Park has a rich heritage of historic bollards of a wide variety of designs, which are of evidential and historical significance. The most common original design was the square, striated obelisk bollard, which provided a pattern for the later EIIR royal cypher bollards introduced in the mid-twentieth century.

Some of these bollards contain halogen spotlights that we would engage the supplier to determine whether these can be replaced with an EV charger provided there is enough space in the bollard for an EV installation. Utilising this style of bollard would be innkeeping with heritage feel for the area and can also feature King Charles' new royal insigne to help mark this historic occasion.

Figure 4-3 - Existing bollard with Queen Elizabeth cypher, complete with halogen spotlight

Lighting column with incorporated EV charger:

Regent's Park retains the finest heritage of operational historic lamp columns in a street location in Britain. They make a significant contribution to the character and appearance of the area and require careful conservation.

A charge point can be incorporated into the existing lighting columns however there are a few constraints such as physical space within the column and then the structural integrity of the column and would need to be determined.

Figure 4-4 - Existing CEPC Lighting Column

Table 4-1 - Advantages & Disadvantages of the EV charging solutions

EV charge point type	Advantages	Disadvantages
Retractable EV Charging bollard	● Retracts fully underground to be 'flush and flat' when not in use so visually unobtrusive. ● Auto retracts when not in use which reduces the risk of accidental damage and vandalism of asset. ● Robust, future proofed design. ● Smart grid ready. ● Dual socket possible.	● Retractable nature of bollard could be more liable to issues with the raise/lower mechanism and water ingress, but manufacturer warranty and initial trails have been positive. ● New ducted network for electrical cables required from feeder pillar location to bollards

EV charge point type	Advantages	Disadvantages
Non-retractable satellite EV bollard	● Sympathetic to the existing street scape furniture and can retain heritage feel. ● Robust composite socket allows rapid removal and replacement for future upgrades. ● The bollard can withstand multiple impacts without any loss of strength. ● The bollard can withstand multiple impacts without any loss of strength. ● Lower unit costs.	● It may add clutter to the street scene as it is not retractable. ● Any existing bollards would require structural testing by a qualified structural engineer due to their age. Therefore, their structural integrity is unknown at this stage. ● New ducted network for electrical cables required from feeder pillar location to bollards
Heritage lighting column with incorporated EV charger	● No street clutter as the EV socket is going to be retro fitted in the existing lighting column. However, column location not always ideal. ● This solution is in line with the CEPC strategy to preserve historic street scape furniture where possible. ● Lower installation costs if can utilise existing assets & ducting (pending confirmation of suitability).	● The lighting columns will need be structurally tested by a qualified structural engineer due to their age. Therefore, their structural integrity is unknown at this stage ● It is unclear whether there is enough space in the lighting column for the installation of the EV charger equipment. ● Existing electrical supply network will require upgrade to cater for EV charging.

5 INDICATIVE CAPITAL AND OPERATING COSTS OF EV CHARGER INFRASTRUCTURE

The costs of installing charge points can be split into two broad categories; the upfront capital costs and the ongoing operating costs. Capital costs include the charge point unit, delivery, ground works and installation, and separately, the grid connection cost. Ongoing, operational costs may be covered by the Charge Point Operator (CPO), depending on the type of contractual agreement in place. Table 5-1 sets out the indicative cost ranges for capital and operating cost ranges by different charge point types.

Table 5-1 - Indicative capital and operating cost ranges for charge points by charging type

Charge/Site Type	Standard/Fast (Off-Street)		Standard/Fast (On-Street)		Rapid		Ultra-Rapid	
Cost Range:	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Charging Unit and Installation	£750	£5,000	£1,700	£5,000	£15,000	£30,000	£56,000	£88,000
Annual Subscription / Operating Cost	£50	£200	£50	£200	£200	£1,200	£200	£1,800
Annual Service Package and Maintenance	£200	£450	£200	£500	£800	£5,000	£1,100	£5,300

Source: https://www.r-e-a.net/wp-content/uploads/2020/03/Updated-UK-EVSE-Procurement-Guide.pdf

DNO connection costs for the terrace areas and outer circle road are provided in the sub-sections below. It should be noted that there is significant variability in the DNO connection costs, and this is due to factors such as the local conditions, the distance of the connection in relation to mains cable and whether any upgrades are required.

5.1 TERRACE AREAS

Figure 5-1 shows the potential locations of the supply points that will feed the on-street charging in the terrace areas.

The following tasks were carried out:

- Power/ load assessment of CEPC Terrace locations as per figure 5-1
- Liaison with UKPN to determine electrical network capacity and obtain high-level costs in procuring power to support residential on-street overnight chargers (7kW) The results are tabulated in table 5-2.

Figure 5-1 - Locations of supply points for Residential Chargers

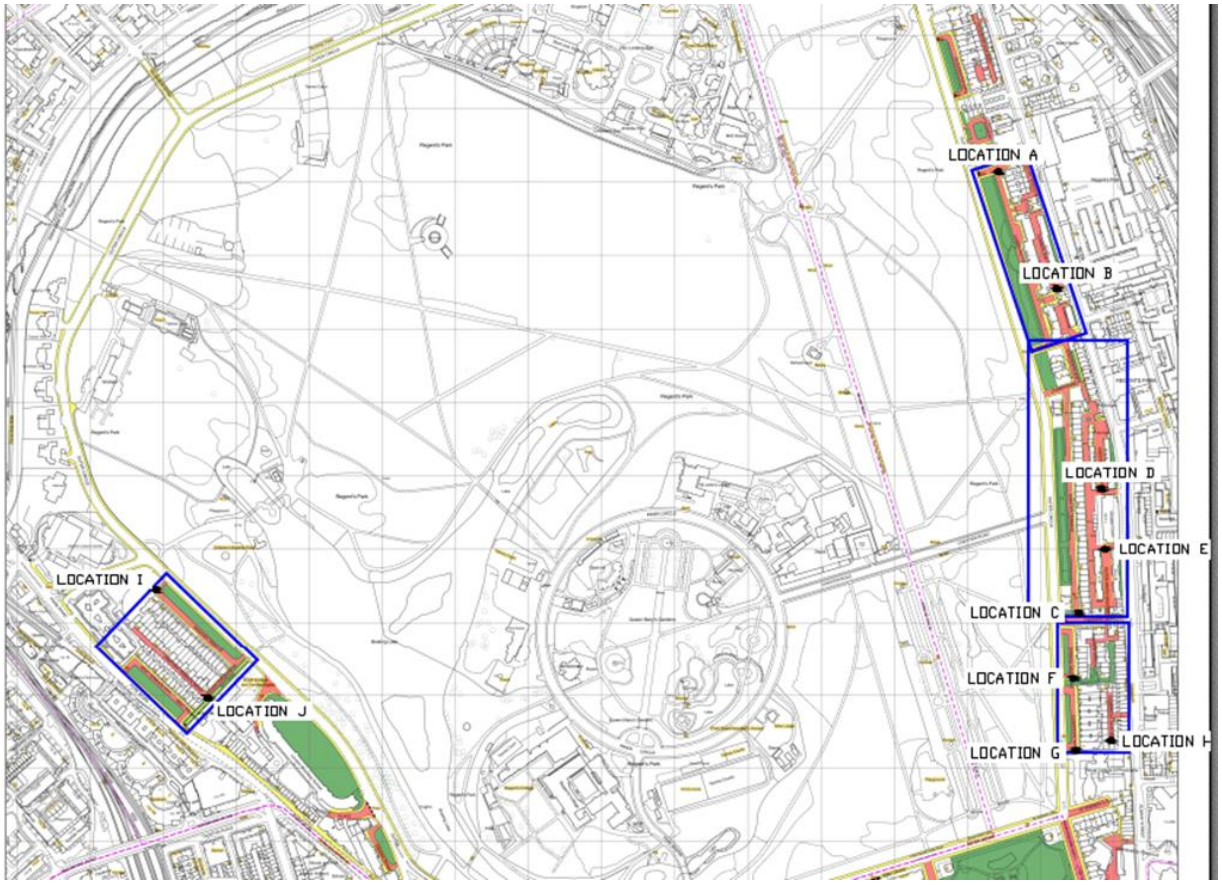


Table 5-2 - Cost of new DNO connections to supply the Residential chargers

Terrace areas - 7kW Residential chargers							
Reference	Location	EV charge point type	Max power output (kW)	Quantity	Total load (kW)	DNO Connection Cost (£)	
						100A	200A
A	Cumberland Terrace	Standard	7	6	42	11,892	N/A
B	Cumberland Terrace Mews	Standard	7	6	42	5,368	N/A
C	Chester Terrace	Standard	7	6	42	4,420	N/A
D	Chester Close North	Standard	7	6	42	4,186	N/A
E	Chester Close South	Standard	7	6	42	5,707	N/A
F	Cambridge Terrace	Standard	7	6	42	4,575	N/A
G	Cambridge Gate	Standard	7	6	42	6,499	N/A
H	Cambridge Gate Mews	Standard	7	6	42	32,100	36,100
I	Hanover Terrace	Standard	7	6	42	33,000	37,000
J	Hanover Terrace Mews	Standard	7	6	42	4,627	N/A

Table 5-2 provides high level costs of installing new DNO connections at the terrace areas. Multiple locations were chosen at each terrace to show how the choice of location can significantly impact the cost of installation. The table must be read in conjunction with Figure 5-1.

It is possible to procure a 100A supply for all the locations and this can supply up to nine 7kW on-street chargers.

It can be noticed that the costs for locations H and J are significantly higher than the rest. This is due to the LV mains cable not being available at those locations and hence the higher price as UKPN will have to make the connection to the nearest LV mains cable which is some distance away. This means additional civils works.

The DNO responsible for the area, UK Power Networks, have also provided the option of a 200A supply at locations H & I which is more than required to supply on-street chargers.

5.2 OUTER CIRCLE

Figure 5-2 shows the potential locations of the supply points that will feed the short stay high-powered chargers in the outer circle road pay & display parking locations.

The following tasks were carried out:

- Power/ load assessment of CEPC outer circle road locations as per Figure 5-2
- Liaison with DNO to determine electrical network capacity and high-level costs in procuring power to support short stay high-powered chargers (~50kW) The results are tabulated in Table 5-3.

Figure 5-2 - Locations of supply points for the 50kW Rapid Chargers

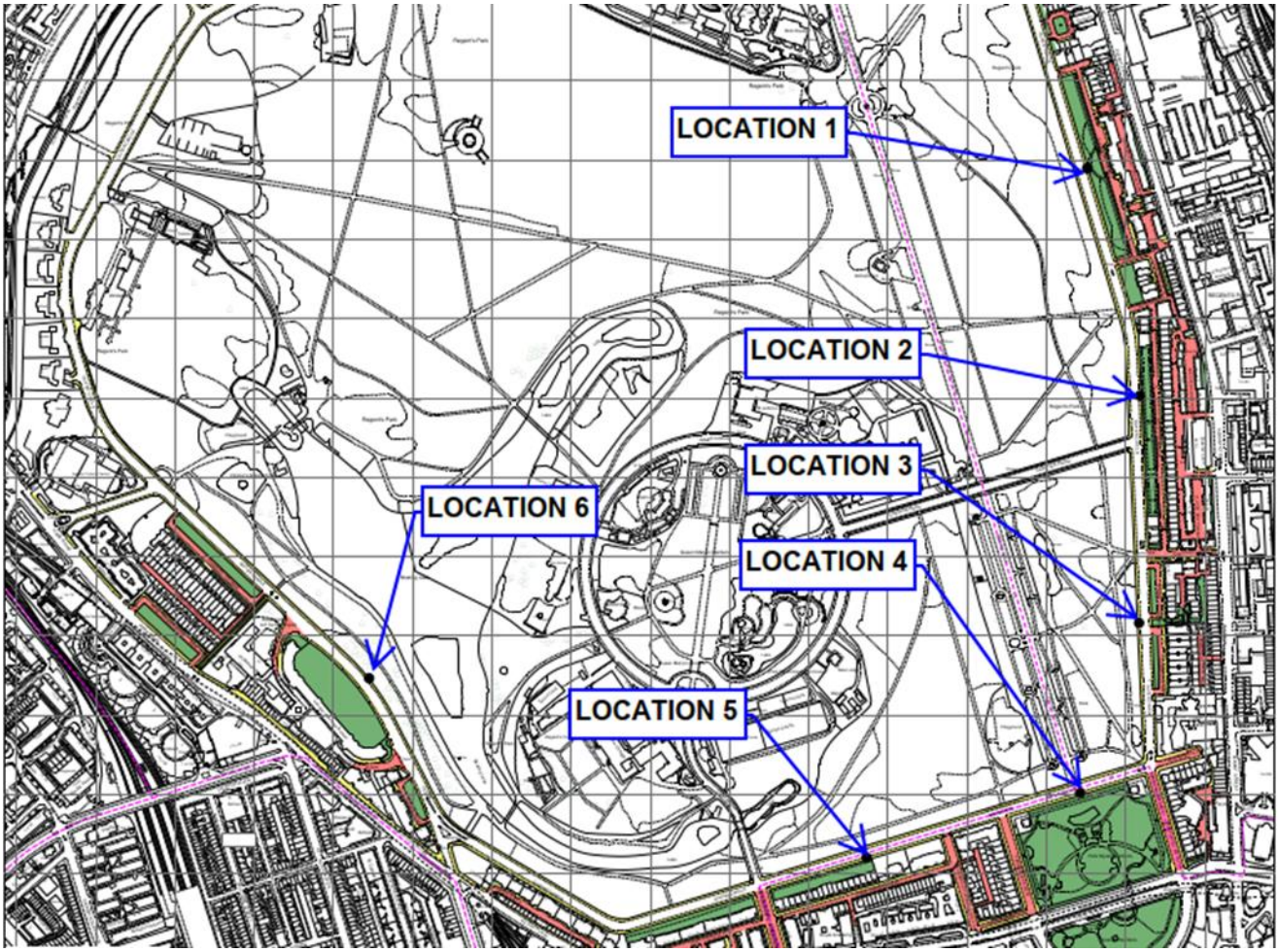


Table 5-3 – Cost of new DNO connections to supply the Rapid chargers

Outer Circle Road - 50kW Rapid chargers						
Location	**EV charge point type**	**Max Power output (kW)**	**Quantity**	**Total Load (kW)**	**Capacity of new supply (A)**	**DNO Connection Cost (£)**
Location 1	Rapid	50	2	100	200	85,000
Location 2	Rapid	50	2	100	200	81,000
Location 3	Rapid	50	2	100	200	17,000
Location 4	Rapid	50	2	100	200	61,500
Location 5	Rapid	50	2	100	200	75,000
Location 6	Rapid	50	2	100	200	18,500

Table 5-3 provides high level costs of installing new DNO connections at the Outer Ring Road. Multiple locations were chosen to show how the choice of location can significantly impact the cost of installation. The table must be read in conjunction with Figure 5-2.

It is possible to procure a 200A supply with a maximum capacity of 100kVA for all the locations and this can supply up to 2 Rapid Chargers.

It can be noticed that the costs for locations 1,2,4, and 5 are significantly higher than the rest. This is due to the low voltage (LV) mains cable not being available at those locations and hence the higher price as UKPN will have to make the connection to the nearest LV mains cable which is some distance away. This means additional civils works.

6 REVIEW OF THIRD-PARTY FINDING AND DELIVERY MODELS

There are three broad categories of funding and delivery models which can be employed to provide EV charging infrastructure; ‘own & operate’, ‘concessionary’ and ‘fully funded’.

6.1 OWN & OPERATE MODELS

The ‘own & operate model’ requires the landowner to provide all of the capital funding and to take on full responsibility for installing and managing the charge points.

The decision to choose this model can either be based on the need to retain control over the management of the chargers or the desire to retain all of the potential revenue. In some cases, there may be no appetite from the private charge point operators to invest funding under a ‘fully funded’ or ‘concessionary’ and it is the only model available.

By retaining control over the charge points there is the opportunity to choose the exact specification which best matches the needs of customers, such as quality, number and speed of chargers. As well as the tariffs charged. In the alternative models a compromise needs to be made with the charge point operator (CPO) who will have different criteria, and a focus on making a return on their investment.

Installing rapid chargers requires major capital expenditure and payback on investment can take up to 10 years or more. It is therefore not advisable to install this type of charger under the ‘own & operate’ model.

6.2 CONCESSIONARY MODELS

In a concessionary model, some of the investment is funded by the charge point supplier/ operator, with the host often funding the enabling works and electrical connection point at the sites, for the CPO to then install the charger. The CPO then operates and maintains the charge points for an agreed period under a profit share agreement.

The concessionary model is widely used in the public sector but is less common amongst private organisations. But is potentially well suited to larger organisations when taking a portfolio level approach. This model strikes a good balance of risk and control, enabling the host to leverage some third-party investment. By packaging up a number of sites and inviting a concessionaire to activate and operate the sites to agreed terms, the hosts can seek to offset the less commercially viable sites, with others that are more attractive to operators. This avoids a scenario whereby the host is left with only the hard to deliver sites, where the prospects of operating the chargers on a cost neutral basis may be limited.

A revenue sharing arrangement can be used to share the potential benefits, with a maximum concession period of 10 years allowing the host to take stock and review once the EV market has matured.

The risk with this model is that a CPO is a reluctant partner in funding and operating less profitable sites, with their interests more focused in the more lucrative sites, which can necessitate robust KPI’s, and a more complex contractual arrangement.

6.3 FULLY FUNDED MODELS

There are a growing number of CPOs that are actively looking to fund rapid (and some fast) charging solutions on retail and leisure sites. These operators will fully fund projects, offering the host a lease over several parking spaces, and some revenue share.

At present, the most common host sites for fully funded models are hotels, retail and food outlets, leisure facilities, car parks and motorway service stations.

The private sector/Independent business model is a challenging one, as its very much predicated on the charger being well utilised to recover the investment, which in many cases requires a long-term contract.

Each CPO has a slightly different approach, and tender submissions are known to vary significantly in terms of quality of submission, soundness of the business case, key lease provisions and income structures. However, for the right sites, and where the interests of the host and CPO are suitably aligned, CPOs are known to provide strong offers. Many deals prove complicated to complete or stall, which may in part be due to the opaque nature of the marketplace and associated difficulties comparing different CPO proposals.

There are a number of funding and delivery models for delivering charge point infrastructure, broadly defined as falling into one of three types, as detailed in Table 6.1

Delivery Model		Funding required	Potential Income	Level of control	Advantages	Disadvantages	Case Study Example
Owned and operated	All charge point costs are paid for by the host, with capital and maintenance costs recouped from usage charges. Charge points are owned by the host, with back-office and operation of charge points typically contracted to a private sector CPO for a fixed fee.	Highest	Highest	Highest	• Highest potential income • Host can determine locations, irrespective of commercial viability to best cater for consumer requirements • Host determines pricing, roll-out speed, branding etc. • Can develop as a standalone business where there is sufficient scale across a portfolio to establish a network, building brand recognition and economics of scale.	• Requires significant capital funding • Highest risk in terms of ongoing liability, stranded assets, and maintenance costs • Greatest exposure to utilisation risk • Low income returns for the first few years, with revenues heavily weighted to later years • CPO is less incentivised to deliver excellent service and uptimes than in a model where they share in the benefits • Complex and highly competitive market place requiring specialist support	PodPoint on behalf of Tesco
Concession	Delivery costs are shared between the host and the CPO. The CPO then operates and maintains the charge points for an agreed period under a profit share agreement.				• Some income shared (higher levels of potential income from higher initial investment) • Host can determine deployment priorities, provide when tendered there are a sufficient number of commercially attractive sites to attracted proposals. From CPOs • CPO incentivised and responsible for maintenance of the network, leading to better end-user experience • Reduced risk for host, with the operator sharing some utilisation risk • Depending on agreement, host may maintain ongoing ownership • Enables hosts to build out their own branded network, or host recognised brands, and potentially then switch to a own and operate model at the end of the contract once the market has matured.	• Reduced income share compared to full ownership • Requires a greater understanding of what the market can offer, and tender process may be more complex than owned and operated • Requires relatively long contract commitments for CPOs to pay down their investment, though break clauses are normally included. May also need a relatively large number of sites (>25) so that CPO can balance risk across sites. • Potential for disputes over responsibility for site failures and expensive termination clauses • Less common model in the private sector, though widely used by Local Authorities • May involve exclusion agreements if the CPO also has their own public network	Osprey on behalf of Shell Recharge
Fully funded	All costs are borne by the CPO, with a long-term lease/licence over which the CPO can recover their costs.	Lowest	Lowest	Lowest	• Lowest exposure to utilisation risk and technological risks. Rental agreements can provide guaranteed income over a number of years, as well as income shares/ profit shares. • CPO heavily incentivised to provide good end user experience. • A low-cost way to deliver Rapid charging facilities and to generate income. If selling the asset in the short term, any purchaser could be expected to to capitalise that income - creating additional capital value at little expense.	• Lowest potential income to the host • Least control in terms of tariff offered, type, number and location of chargers, which are all subject to negotiation with the CPO, and is likely to mean a more limited deployment of slower chargers, though the better the sites, the more bargaining power the host has • Likely to involve long agreement periods (15-25 years), or exclusion areas, where the host must commit to not deploying any other chargers for a given period.	InstaVolt on behalf of McDonalds

7 NEXT STEPS

We offer design, advisory and assurance consultancy services to help our clients take their Electric Vehicle strategy through design, installation and into implementation.

We are ideally placed to support our clients on their journey to being 'EV ready'. By coupling our experience and technical abilities, as demonstrated by our industry standing through developing guidance like:

- Institution of Engineering and Technology (IET) Guide to Highway Electrical Street Furniture, which contains a dedicated EV chapter and;
- Institute of Lighting Professionals (ILP) GN12 Smart Columns which covers EV charging from lighting columns.

What are the next steps to move from EV strategy to implementation?

Following the completion of phase 1, we would be happy to provide a proposal to support follow-on tasks that may arise such as:

- Site surveys
- Feasibility study
- Since the street lighting electrical infrastructure is life expired and does not conform to current standards. We would be happy to provide a comprehensive preliminary and detailed electrical/ lighting designs to bring the existing street lighting electrical infrastructure up to standards and to ensure that the lighting & EV are fed from the same supply type which will minimise clutter and make the CEPC electrical infrastructure safe and maintainable.
- Tendering & procurement
- Deployment plan
- Business case
- Residents' focus groups or knowledge sharing
- Workshops for residents
- Infrastructure design & technical assurance
- Install & commissioning technical support.

All staff undertaking this work are qualified electrical/highway specialists giving our clients peace of mind their EV infrastructure is both fully compliant and safe.

How much will electrical connections cost?

We have a wealth experience in Distribution System Operator (DSO) liaison and can help ensure the correct type of safe electrical connection is provided whilst also ensuring value engineering is applied to minimise the capital expenditure. We look to lower these costs through working with the DSO and the available power by utilising intelligent load management systems to do more with less.

Are there any other considerations?

Let us guide you through the journey to being EV ready using our experience to help avoid the common pitfalls. For example, hardware specifications ensuring interoperability through open standards protocols (OCPP) to avoid stranded assets in the future, planning permission advice and Equality Act compliance etc.

What about the procurement & operational costs?

We are truly independent and are not affiliated with any charge point provider or operator. This allows us to provide independent and engineering led advice which puts our clients' needs at the top of the agenda. Working with clients in both private and public sector, our experience is across all aspects of EV providing a rounded approach to the challenges and opportunities of becoming EV Ready.

Ensuring a future ready approach?

WSP's future ready philosophy is intrinsic to all we do. We acknowledge that EV uptake forecasts are just that - forecasts, as future trends and technical advances remain uncertain. We provide scalable solutions that can offer a measured initial deployment but with the ability to grown and adapt to future demand.

Appendix A

PREVIOUS PROJECT EXAMPLES

WESTMINSTER ESTATES EV CHARGING SITE FEASIBILITY ASSESSMENT & INFRASTRUCTURE PLANNING, WESTMINSTER CITY COUNCIL:

Delivered a feasibility assessment and planning of EV charging infrastructure across over 90 sites making up Westminster estate, including residential sites, public amenities such as schools and leased offices, as part of a wider objective to make the borough carbon neutral by 2030. The project entailed:

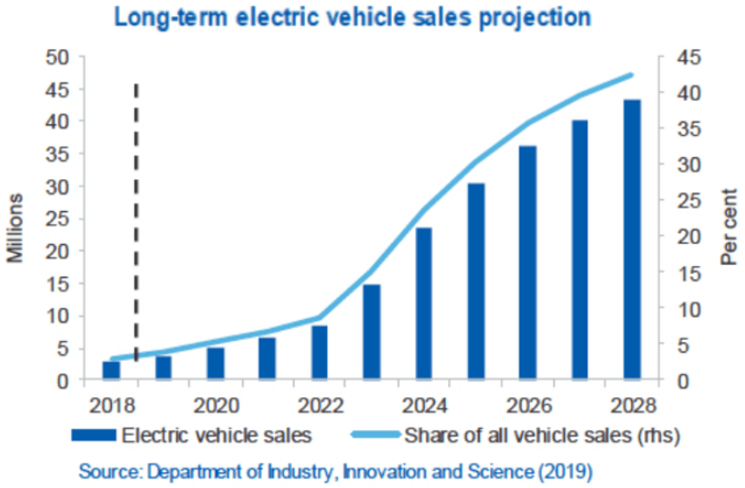
City of Westminster

- Site assessment and desktop reviews
- Summary of charge point types and EV types, including how these may change in the future, and localised EV uptake forecasts
- Soft market testing with charge points suppliers and operators.
- Site charging pattern, power supply and charging demand
- Multi-criteria assessment to prioritise sites and thereby identify the potential implementation phasing and timescales.

ELECTRIC VEHICLE STRATEGY FOR CHARGING EXPANSION ACROSS A RETAIL AND BUSINESS PARK PORTFOLIO

THE CROWN ESTATE

- Assessed the key characteristics of the portfolio likely to influence EV charging requirements, and in turn the possible delivery options.
- An evidential approach was taken to understanding the Consumer, including forecasts of local EV uptake amongst existing consumers and future users.
- Routes to market and procurement were then outlined, with a strategic level business case assessment for charge point deployment. A series of next steps were identified to help in taking the strategy forward to implementation.
- Contribution of the EV charging infrastructure to TCE's Net Zero targets was assessed.



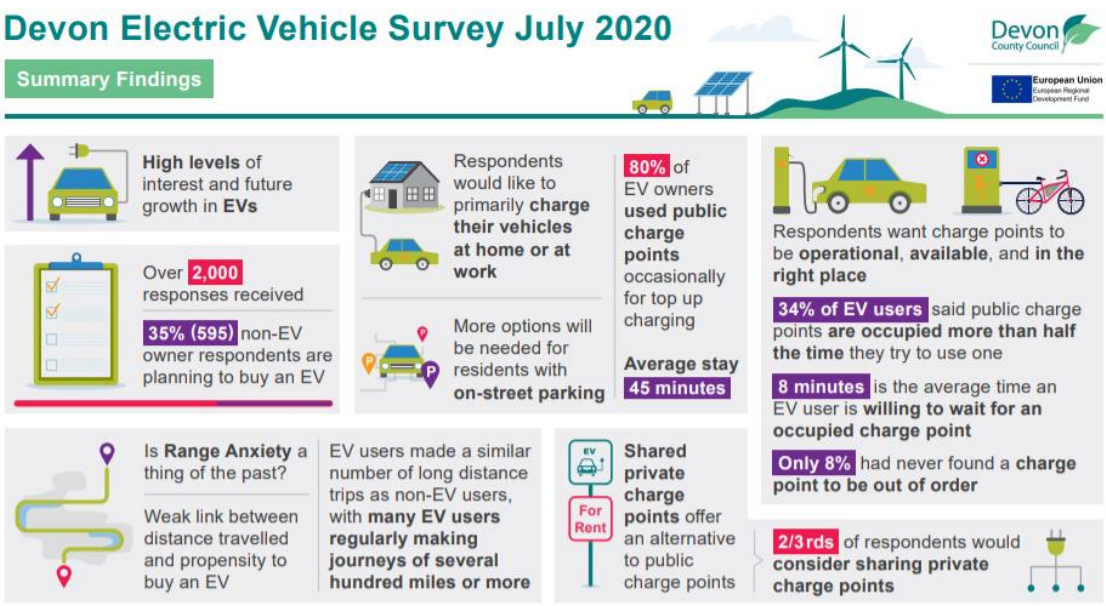
CHARGE POINT SPECIFICATION, PLANNING AND DELIVERY SUPPORT AT BUSINESS PARKS, BLACKROCK

Planning and advisory support in delivering electric vehicle charge across a number of Business Park. The project entailed:

- Site survey and reviews of the electrical supply, as well as initial observations on supply capacity and estimate of available capacity.
- Electrical designs were developed for EV charger electrical supply distribution, including additional capacity for futureproofing, and the design of protection systems for electrical safety and surge protection.
- Reviews of suitable charge points were undertaken to meet client and tenant requirements, support was provided, including the development of an appropriate technical specification to ensure capital and operating costs were fully accounted for and competitive quotations were secured.

CHARGE POINT PLANNING AND DELIVERY SUPPORT

- DELETTI is a £1.5m+ project partly funded by the European Regional Development Fund. It is delivering Electric Vehicle charge points, 0.6MW of solar car ports, and local energy markets across Devon and South Somerset.
- An exit strategy combining marketing, events, and toolkits will help ensure the project enables wider changes to energy and transport.
- A total of 67 dual 22kW charge points will be delivered in public car parks in the first phase of the project through a concessions agreement. A further 45 off-street sites have been identified, with work to identify potential on-street locations in progress.
- WSP staff were seconded to Devon County Council to project manage the scheme, working with 14 County, District, Unitary, and Parish Council partners, and other stakeholders to deliver the project.



Unit 9, The Chase
John Tate Road, Foxholes Business Park
Hertford
SG13 7NN

wsp.com