

# Report of the Strategic Director to the meeting of Regeneration and Environment Overview and Scrutiny Committee to be held on 28<sup>th</sup> November 2023

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## Subject:

Smart Street Lighting

## Summary statement:

The purpose of this report is to advise members of the forthcoming tender for the Out-of-Scope Column Replacement Contract with a value in excess of £2 million in line with the requirements of Contracts Standing Orders (CSO 7.2.1) prior to the commencement of the procurement process.

Also, in response to a motion submitted to the Council meeting on the 17<sup>th</sup> October 2023, the report will provide information regarding the progress of the Smart Street Lighting project and the utilisation of the CMS for variable lighting levels.

## EQUALITY & DIVERSITY:

Compliance with Equality Act 2010 is embedded in the Council's procurement process and requirements. Good street lighting benefits all individuals in the District and has a positive impact on those with visual impairment.

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## Portfolio:

Regeneration, Planning and Transport

## Overview & Scrutiny Area:

Regeneration and Environment

## 1. SUMMARY

- 1.1 To consider the most efficient delivery of the Out-of-Scope column replacements by the procurement of the work using an external contractor.
- 1.2 This report will update the Committee with the progress of the Smart Street Lighting project installations and the benefits realisation.
- 1.3 It will outline how the Central Management System is being utilised for dimming the street lighting and the profiles currently in operation with consideration for future lighting levels.

## 2. BACKGROUND

- 2.1 In 2018 the Environment and Waste Management Overview and Scrutiny Committee requested a strategy for the ongoing maintenance and replacement of street lighting assets. A project was developed to address the maintenance backlog of the life expired columns and the replacement of all existing luminaires with energy efficient LED units.  
The Smart Street Lighting project is an invest to save project to deliver energy efficient LED street lighting across the District, at the time the business case was developed the energy consumed by the street lighting was 27,960,210 kWh per annum with the per unit rate at around 8.6 pence per kWh with an annual bill of £3.25m. The business case estimated around a 65% saving on the energy consumed (kWh).
- 2.2 As part of the project, the lighting is controlled by a Central Management System (CMS) which is hosted on a LoRAWAN network consisting of 34 gateways across the District providing a low power radio network facilitating communication with each street light. This network can also be utilised for connecting other Smart City applications, examples are use cases such as road surface temperature monitoring, river level sensors, air quality monitoring, even sensors to monitor humidity, temperature in buildings. The network has capacity for around 250,000 devices and the CMS will utilise around 60,000.
- 2.2 The business case for the Smart Street Lighting project was approved and funding of just under £45m made available through a mix of SALIX funding (£19,084,597) and prudential borrowing (£25,893,509). To simplify the project, it was split into two elements In-Scope which is the standard lantern and column replacements and Out of Scope for the decorative, heritage and other assets that are difficult to access.  
Due to the volume of work required a tender process provided Amey OW as the contractor for the In-Scope work. Amey OW did have the option of undertaking the Out-of-Scope work but are unable to deliver it in conjunction with the In-Scope work without affecting the programme and the end date of the project.
- 2.3 The project installations on site commenced in September 2020 after a survey which was undertaken to identify all the assets and the work type required. The In- Scope assets around 48,000 are split between 3 work types – Lantern Change (around 32,000) Column Replacement (around 15,000) and Lantern Change and Sleeve (around 1000).

- 2.4 The Out of Scope lantern changes (around 3000) will be delivered by the in house teams but the Out-of-Scope Column Replacements (around 1500) cannot be delivered by the in house teams in a timely manner and will therefore be tendered in due course with a commencement date in the new year.
- 2.5 The project was assessed over a 50 year period with modest inflation applied to the costs of energy which projected a total saving in energy of £166.5m along with a maintenance saving of £23.6m giving a total saving of £189.13m over 50 years. Based on the installations to date forecast savings are around £3.8m this financial year as outlined in Appendix 3.

### 3. REPORT ISSUES

- 3.1 Out-of-Scope Column Replacements – These units are probably the most challenging part of the project and will take longer to complete than standard columns. Many of them are in narrow back streets with limited or no vehicular access, the work also includes the disconnection of the old column and the connection of the new column to the mains which can only be completed by Northern Powergrid (NPG) or an accredited Independent Connections Provider (ICP).  
Although our in house teams could undertake the column installations and removals this would impact on maintenance operations performance, also, as we are not an ICP we would need to arrange the connection work with Northern Powergrid, experience with the In Scope works has proved that ICP’s deliver the connection work at a much lower cost than NPG.
- 3.2 For these reasons it is proposed that a separate tender is issued to deliver the work to replace 1500 columns concurrently with the In-Scope work being delivered by Amey OW to maximise the energy savings.
- 3.3 The In-Scope works are progressing well with the contractor having installed 60% of the assets, mainly in residential areas as the traffic routes require traffic management and tend to be restricted in terms of the working times permitted.

3.4 The work that has been completed on the project to date in broad terms is:-

Survey Complete	= 60,080
Design	= 54,309
Lantern Change	= 27,992
Lantern Change and Sleeve (concrete columns)	= 859
Column Replacement (including lantern)	= 9,123

Further details are in Appendix 1

- 3.5 When undertaking the designs for the new lighting, the criteria for the lighting levels has been derived from BS5489, EN13201 which recommends lighting levels based on traffic volume/pedestrian footfall, environmental factors such as urban/rural etc. When the contract specification was written the current research was considered and at that time and the majority of LED lighting schemes utilised a colour temperature of 4200 Kelvin (this value denotes where the colour of light emitted sits on the spectrum

– the higher the number the more towards the blue light end of the spectrum).  
The colour temperature chosen for the project was 3000 Kelvin – more towards the red end of the spectrum than 4200.  
All the new LED lights do not emit any light above the horizontal.

- 3.6 During the contract preparation the team met with Bradford Council's Biodiversity Officer and considered the impact of the lighting on flora and fauna, especially in areas of known bat roosting sites. Work has also been undertaken in some of these areas to reduce lighting levels/amend the design in consultation with the Biodiversity Officer where there are bat roosts and their activity has been monitored..
- 3.7 Variable lighting levels – As part of the project the new lighting is controlled by a CMS (Central Management System) which facilitates dynamic control of the street lights. The benefits of the CMS include
- Fault reporting for - loss of supply, various lantern failure symptoms, column not vertical i.e. hit by vehicle.
  - Programmable lighting profiles that can include dimming at varying levels, switching off/on at different times, calendar based control of lighting etc.
  - Energy consumption reporting as a pseudo meter
- 3.8 All the new lighting that has been installed has been programmed with a dimming profile based on the type of road. Traffic routes require higher lighting levels and there is less flexibility in reducing the levels to maintain a level that still meets the BS/EN recommendations. Residential roads tend to be used less especially later in the evening and therefore can be dimmed to lower levels – again, whilst still trying to achieve the levels in the BS/EN.
- 3.9 The old street lighting controlled by photo cells used a switching regime of 811 – this turned the lighting on at 55 Lux and off at 28 Lux, the burn hours (the amount of hours per annum the lights are on) for this regime were 4,125 hours per annum
- 3.10 The current switching regime/variable dimming profile for Traffic Routes is F10
- Switches on at 10 Lux (dusk) 100%  
At 22:00hrs dims to 70%  
At 06:00hrs increases back to 100%  
Switches off at 10 Lux  
This equates to burn hours of 3,105 hours per annum
- 3.11 The current switching regime/variable dimming profile for Residential Roads is F11
- Switches on at 20 Lux (dusk) 100%  
At 22:00hrs dims to 75%  
At 00:00hrs dims to 50%  
At 05:00hrs increases back to 100%  
Switches off at 20 Lux  
This equates to burn hours of 3,065 hours per annum
- 3.12 It is possible to apply for other variable dimming profiles which can be very easily implemented using the CMS to reprogramme the lighting at minimal cost, basically

officer time to create and apply the profile on the system, and different profiles can be applied to individual lights or groups of lights.

Appendix 2 details examples of the profiles in the CMS system currently in use.

- 3.13 Careful consideration must be taken when changing the lighting profiles if the proposed levels do not comply with those recommended in BS5489/EN13201, good lighting is proven to reduce crime, the fear of crime and reduce road traffic collisions.

#### **4. FINANCIAL & RESOURCE APPRAISAL**

- 4.1.1 The project funding of just under £45m was agreed by PAG in 2018 and the projected costs are on target with the budget. The procurement of the Out-of-Scope Column Replacement is anticipated to be just over £2m from the funding for the overall project. The development of this contract has been supported by Legal and Procurement officers.
- 4.1.2 Based on the work completed to date the estimated savings that will be realised once the inventory has been updated are detailed in Appendix 3. The value of the savings can only be evidenced once the revised bills have been processed following the new inventory being passed through the validation and billing process, there is a lag in this process but the bills can be backdated for 13 months, it is intended to accelerate this process to maximise in year savings.

#### **5. RISK MANAGEMENT AND GOVERNANCE ISSUES**

- 5.1 The Smart Street Lighting project reports to a Project Board on a monthly basis which includes evaluation of the risk register to reduce or mitigate risks.

#### **6. LEGAL APPRAISAL**

- 6.1.1 Legal Services have been consulted in relation to the proposed tender

#### **7. OTHER IMPLICATIONS**

##### **7.1.1 SUSTAINABILITY IMPLICATIONS**

- 7.1.1 The project is already reducing the energy requirements for the street lighting service and provide more sustainable lighting including improved energy efficiency, reduced maintenance and the need for regular lamp replacement which previously contained many elements of the lamp which were harmful to the environment.

##### **7.2.1 TACKLING THE CLIMATE EMERGENCY IMPLICATIONS**

- 7.2.1 The Smart Street Lighting project is anticipated to reduce the CO<sup>2</sup> emissions for the District by around 6000 tonnes per annum once all the lanterns have been replaced.

### **7.3 COMMUNITY SAFETY IMPLICATIONS**

- 7.3.1 It has been evidenced that good street lighting, especially white light sources provide a reduction in the fear of crime and better social observation as well as supporting CCTV coverage.

### **7.4 HUMAN RIGHTS ACT**

- 7.4.1 There are no known human rights implications.

### **7.5 TRADE UNION**

- 7.5.1 There are no Trade Union Implications

### **7.6.1 WARD IMPLICATIONS**

- 7.6.1 The project is District wide although the information on the work completed to date by Ward is detailed in Appendix 1

### **7.7 AREA COMMITTEE LOCALITY PLAN IMPLICATIONS (for reports to Area Committees only)**

- 7.7.1 N/A

### **7.8 IMPLICATIONS FOR CHILDREN AND YOUNG PEOPLE**

There are no implications for children and young people.

### **7.9 ISSUES ARISING FROM PRIVACY IMPACT ASSESMENT**

There are no issues arising.

## **8. NOT FOR PUBLICATION DOCUMENTS**

- None

## **9. OPTIONS**

- 9.1.1 That the Regeneration and Environment Overview and Scrutiny Committee note that the Strategic Director, Place progresses with the procurement of the Out-of-Scope Column Replacement work.
- 9.2.1 Or, the Committee request the Strategic Director, Place to utilise the existing contract with Away OW at additional cost and extension of the completion date.
- 9.2.2 That the Committee notes the work that has already been completed and the benefits of the project.
- 9.3.1 That the Committee consider whether the dimming profiles implemented within the CMS are the most energy efficient whilst still providing a safe environment for

vehicular and pedestrian road users.

- 9.3.2 Or, the Committee request the Strategic Director, Place to evaluate other dimming profiles although these may deem the lighting as not meeting current British Standard recommendations for the type of road.

## **10. RECOMMENDATIONS**

- 10.1.1 That the committee notes it is the intention of the Strategic Director, Place to award a new contract for 'Out-of-Scope Column Replacement' as part of the Smart Street Lighting Project to an external contractor to commence on 19<sup>th</sup> February 2024.
- 10.1.2 That the Committee notes the work that has already been completed and the benefits of the project.
- 10.1.3 That the Committee notes the dimming profiles implemented within the CMS that meet the recommended lighting levels appropriate for the road type as prescribed by the British and European Standards for Road Lighting are the most energy efficient whilst still providing a safe environment for vehicular and pedestrian road users.

## **11. APPENDICES**

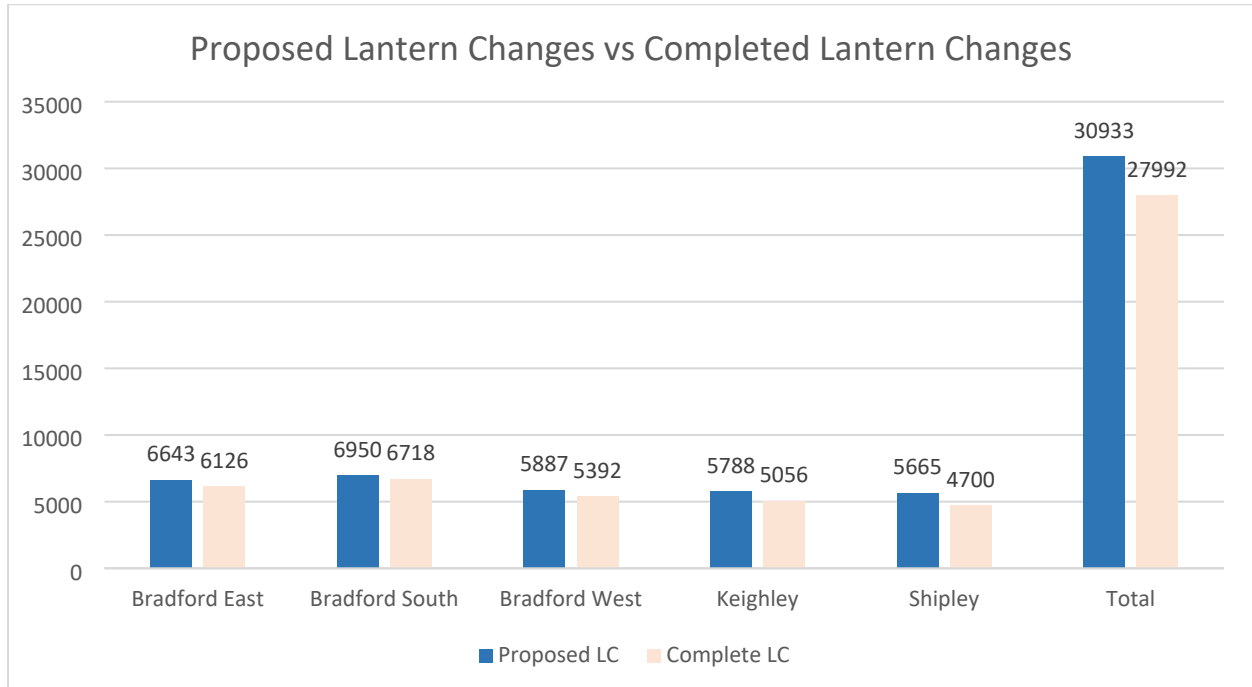
- 11.1 Appendix 1 – Planned works versus completed work for each work type for the In-Scope work completed by the contractor Amey. Also quantities of the proposed Out-of-Scope column replacement work due to go out to tender and the Out-of-Scope lantern changes to be completed by the in house teams.
- 11.2 Appendix 2 – Examples of dimming profiles currently utilised in the Central Management System and an example of a load graph.
- 11.3 Appendix 3 – Graphs highlighting the reduction in load, energy consumption, energy costs and CO<sup>2</sup> emissions for a 12 month period before and after the installation of the Smart Street Lighting project (quantities based on completed work up to October 2023)

## **12. BACKGROUND DOCUMENTS**

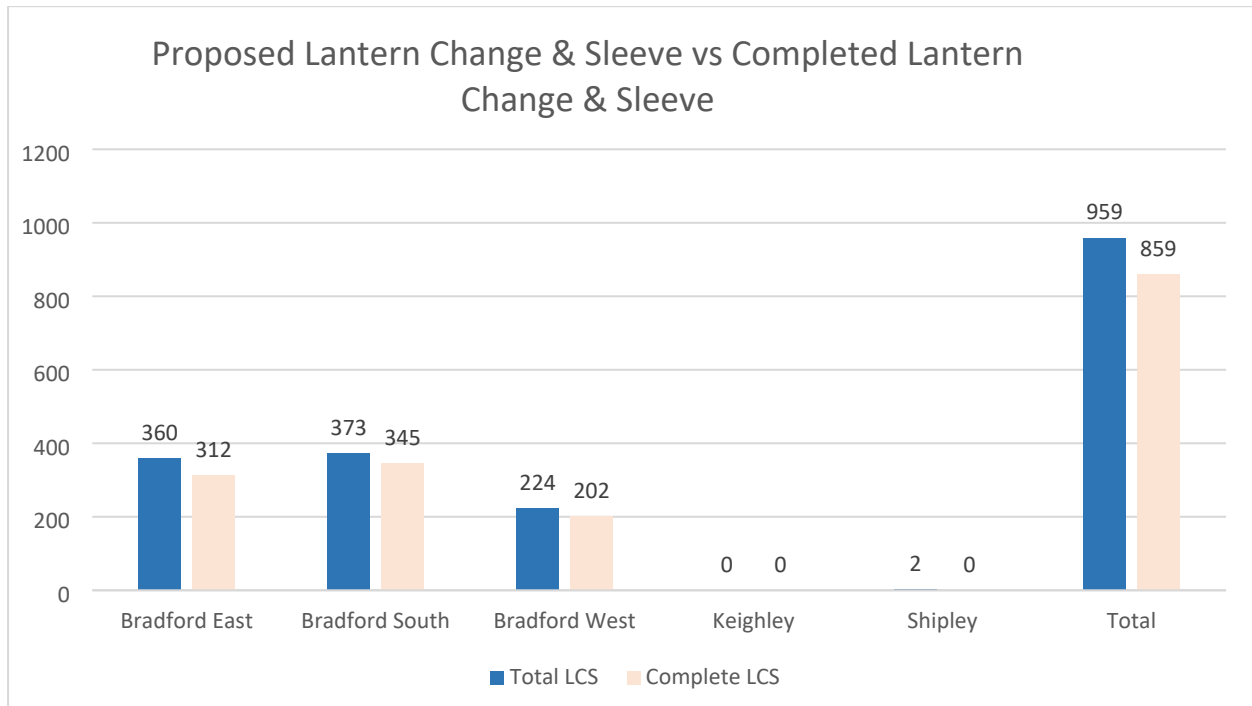
N/A

## Appendix 1

Number of Lantern Changes proposed for completion by Amey and the number already completed as at the end of October 2023



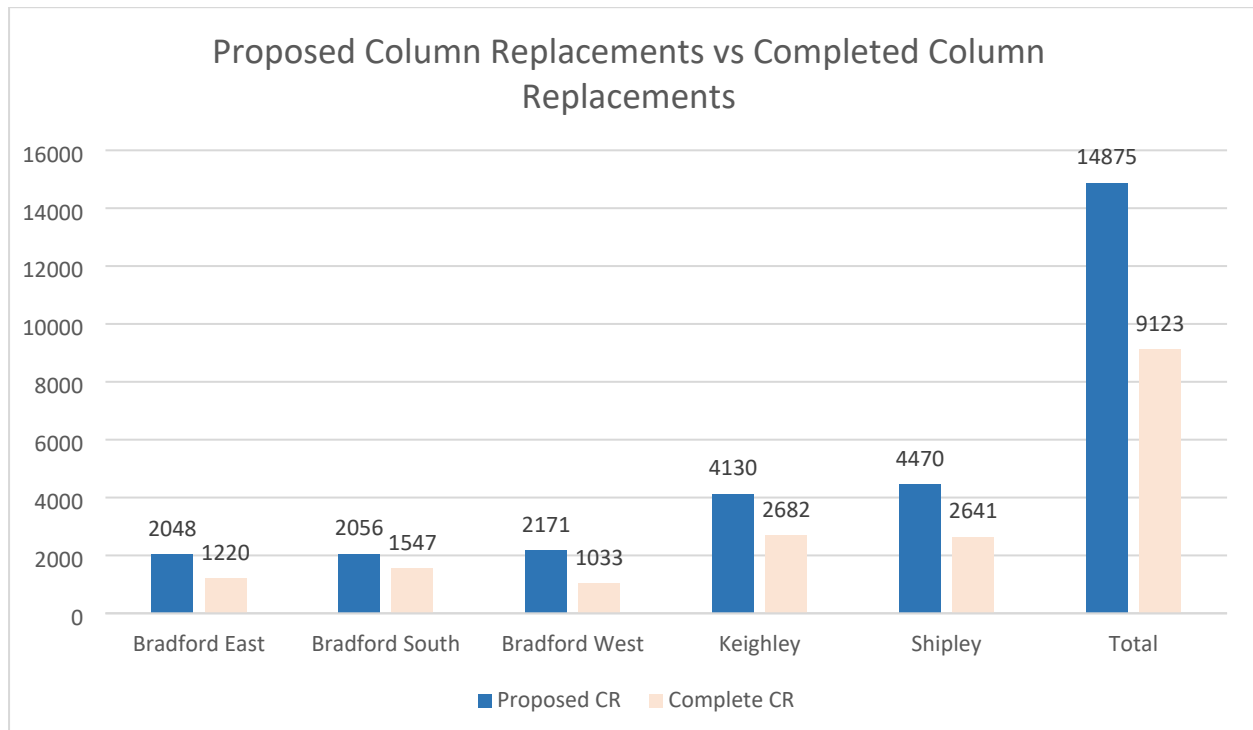
Number of Lantern Change and Sleeve proposed for completion by Amey and the number completed as at the end of October 2023 – these are where concrete columns have been retained and a steel sleeve fitted at the top to increase the height to 6 metres



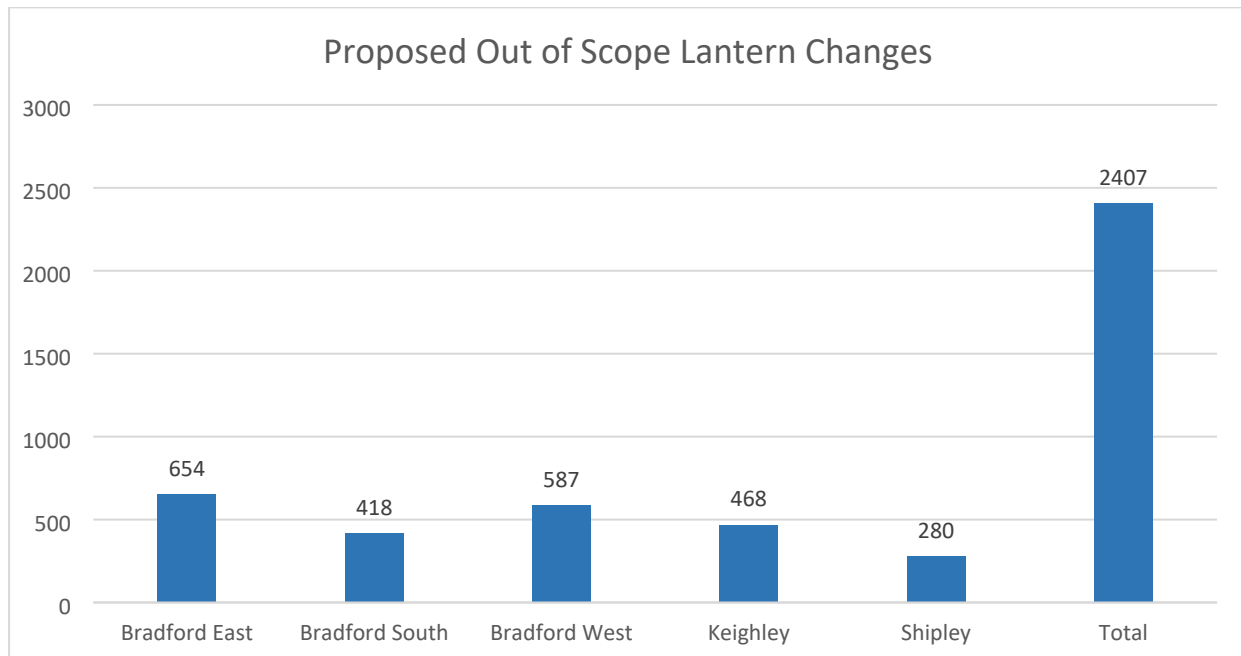


## Appendix 1 cont.

Number of Column Replacements proposed for completion by Amey and the number already completed as at the end of October 2023

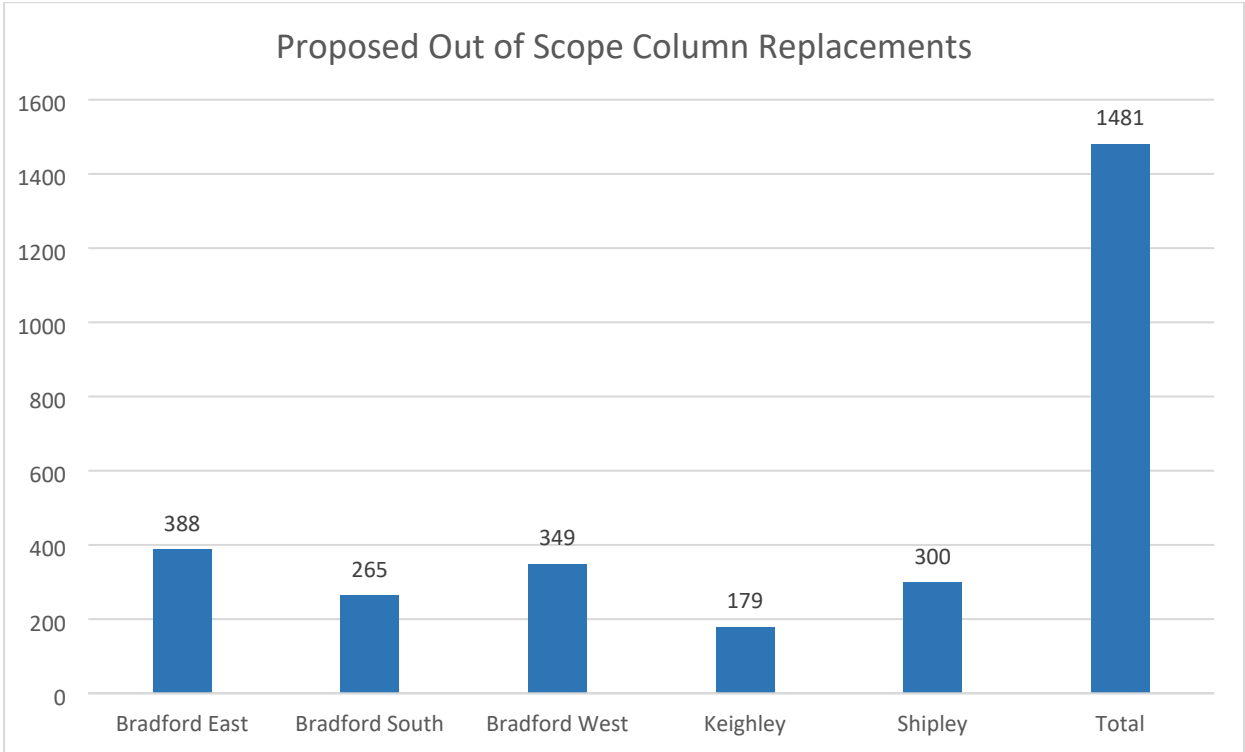


Number of proposed Out of Scope Lantern Changes – these will be completed by the Council's in house operational teams.



**Appendix 1 cont.**

Number of proposed Out of Scope Column Replacements – these will be completed by the successful external contractor following the procurement exercise.



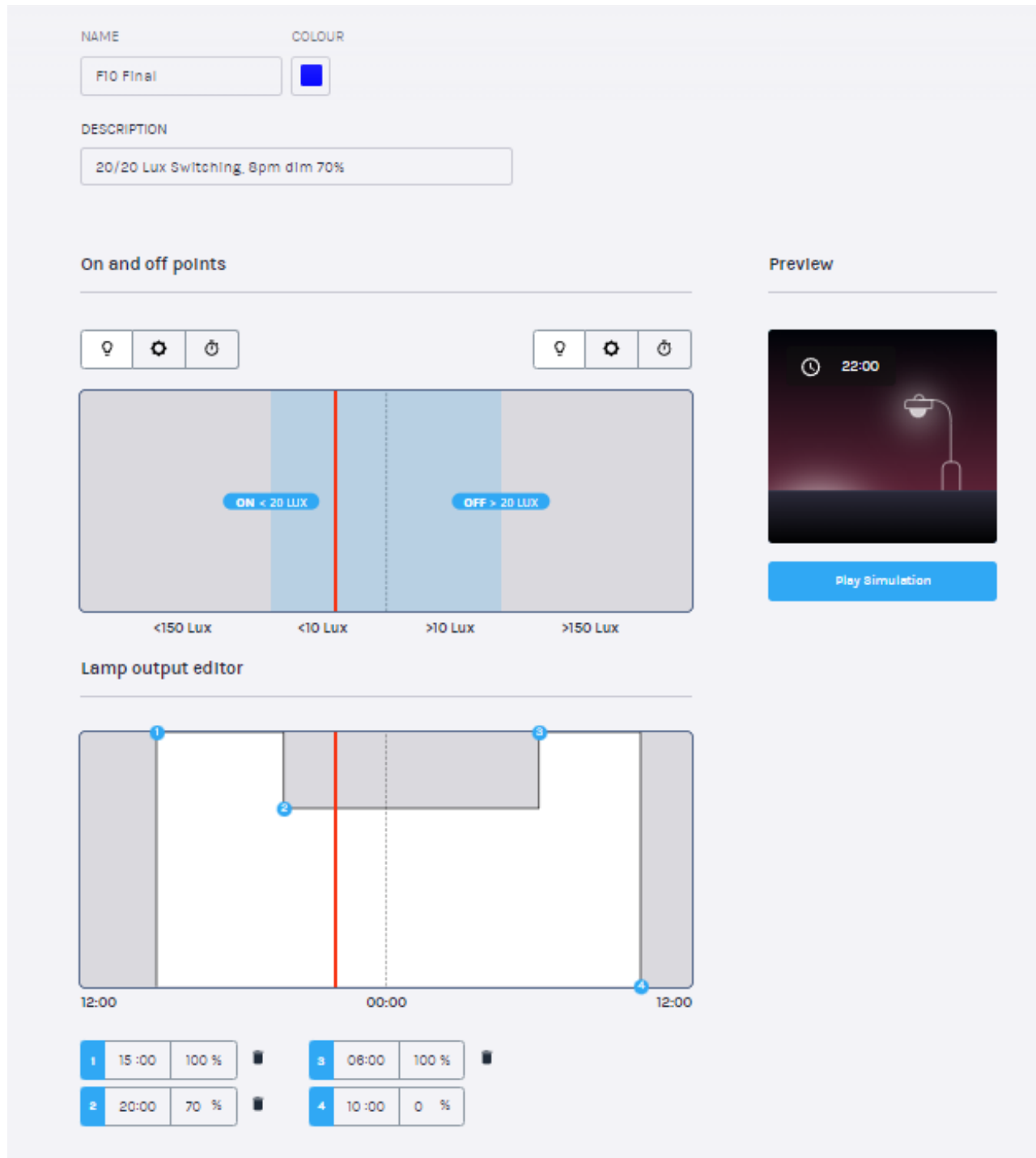
## Appendix 2

### Traffic Routes – F10 dimming profile

On at 10 lux (dusk), dim to 70% light output at 20:00hrs and back up to 100% at 08:00hrs if it is still dark and then off at 10 lux (dawn).

Figure 1 shows a screenshot of the Ki system showing the F10 dimming profile

Figure 1



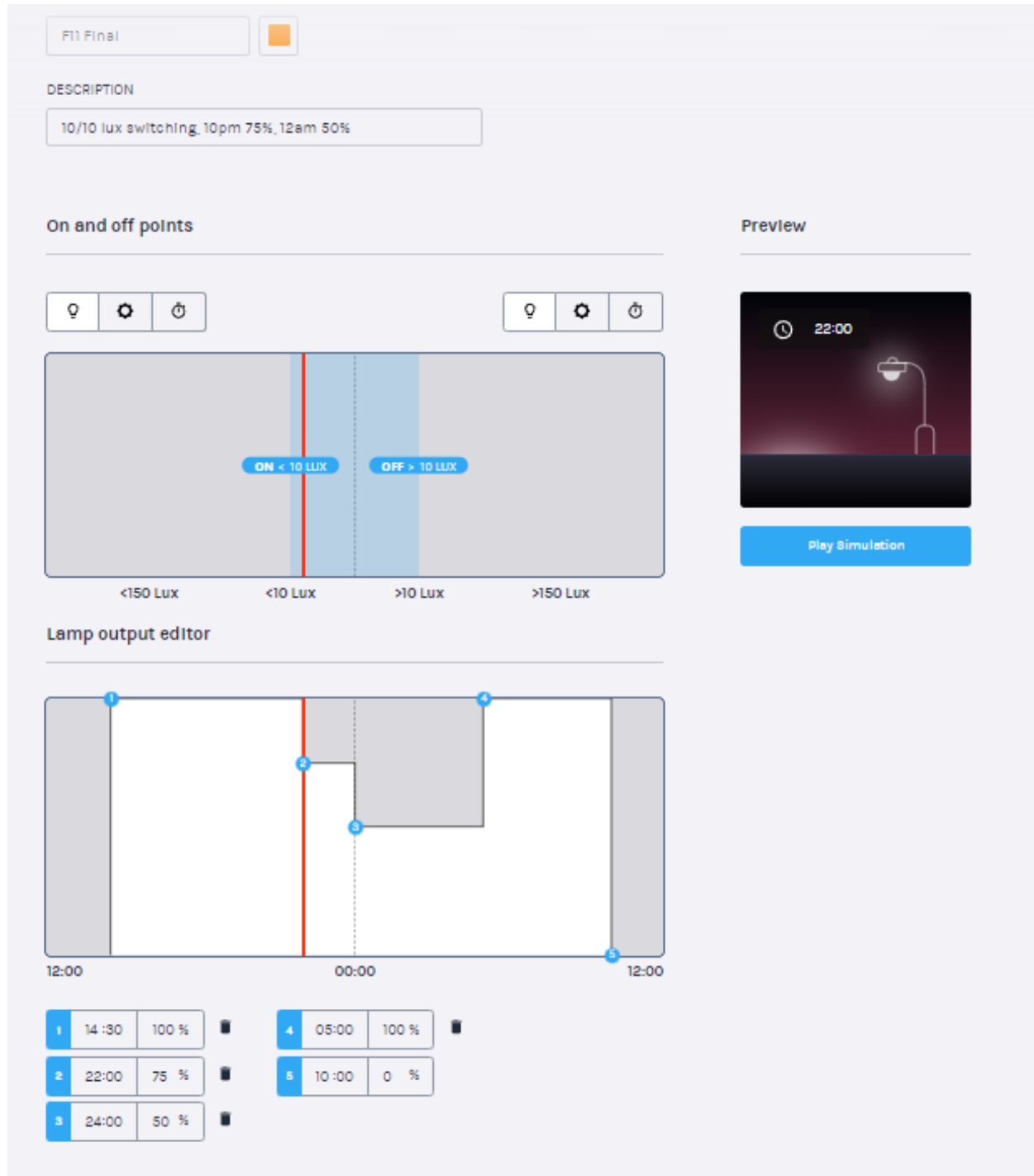
## Appendix 2 cont.

### Residential Roads – F11 dimming profile

On at 20 lux (dusk), dim to 75% light output at 22:00hrs, a further dim to 50% at midnight and back up to 100% at 05:00hrs if it is still dark and then off at 20 lux (dawn).

Figure 2 shows a screenshot of the Ki system showing the F11 dimming profile

Figure 2



## Appendix 2 cont.

### Energy Consumption

The graph below in Figure 3 shows the consumption in Watts of a typical residential street with the F11 dimming profile from the Ki system (the Central Management System -CMS) that controls the new street lighting.

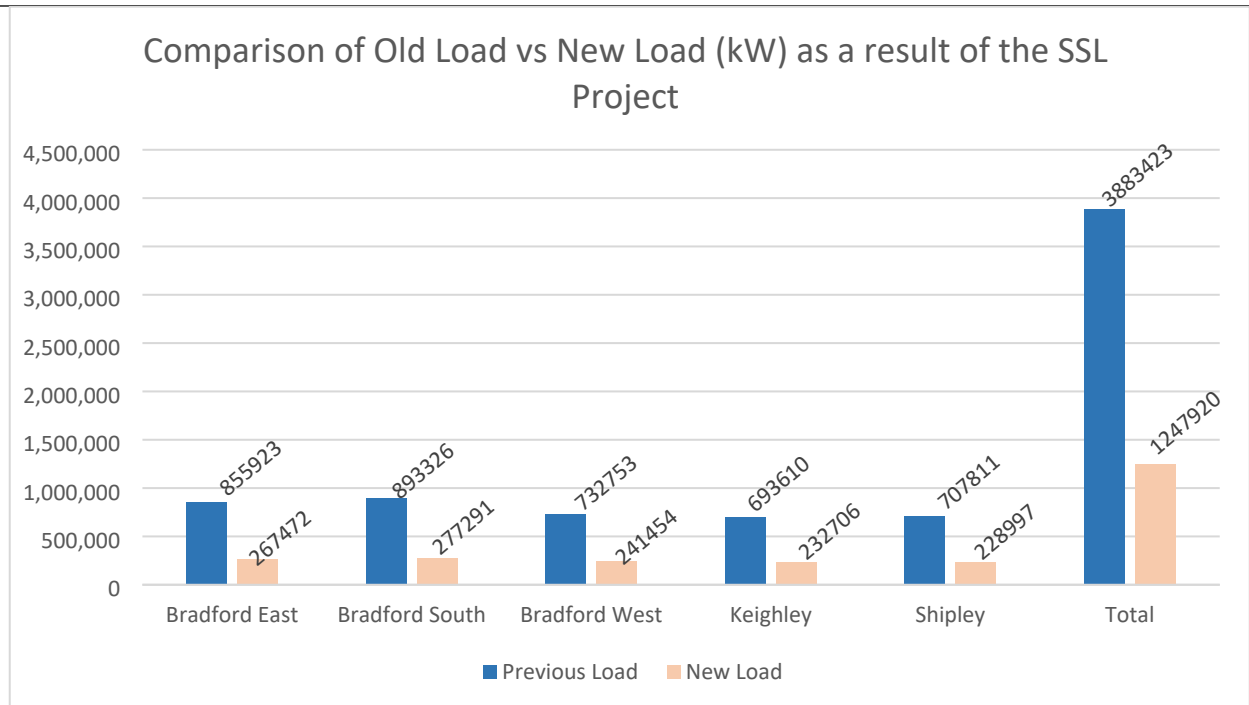
At full power the consumption is 27.7w, at 75% light output the consumption is 21w and at 50% light output the consumption is 15.6w.

**Figure 3**

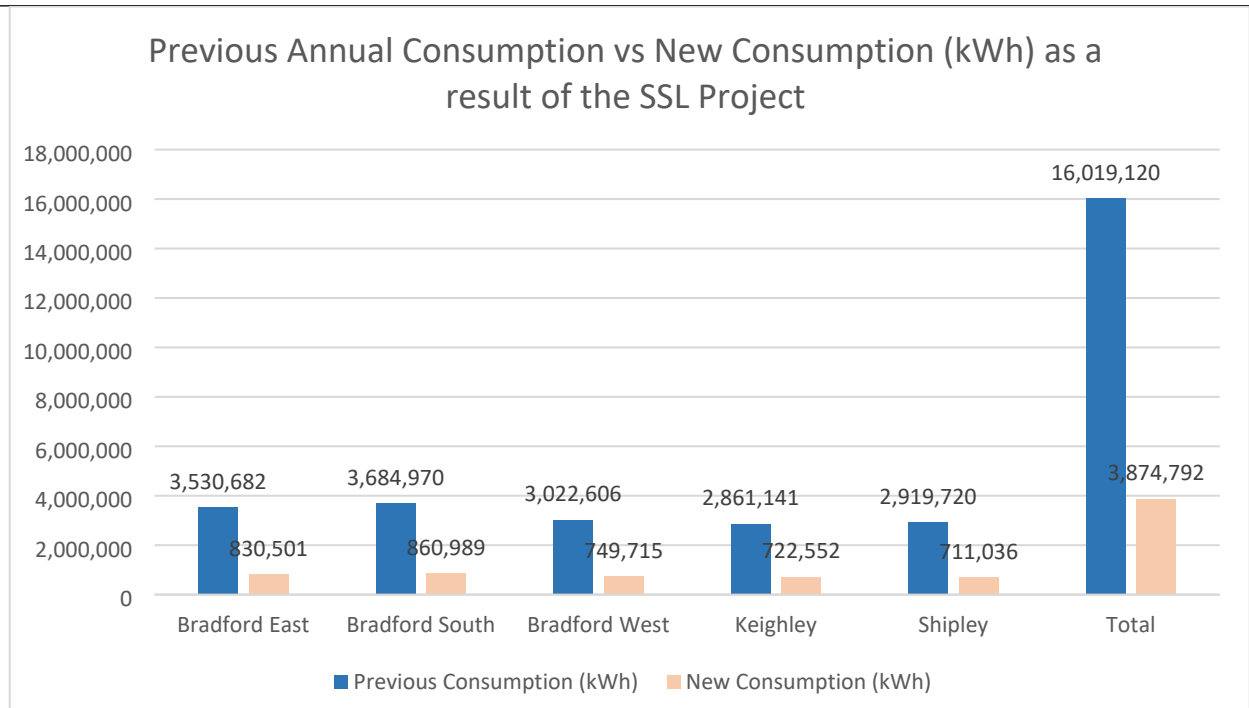


### Appendix 3

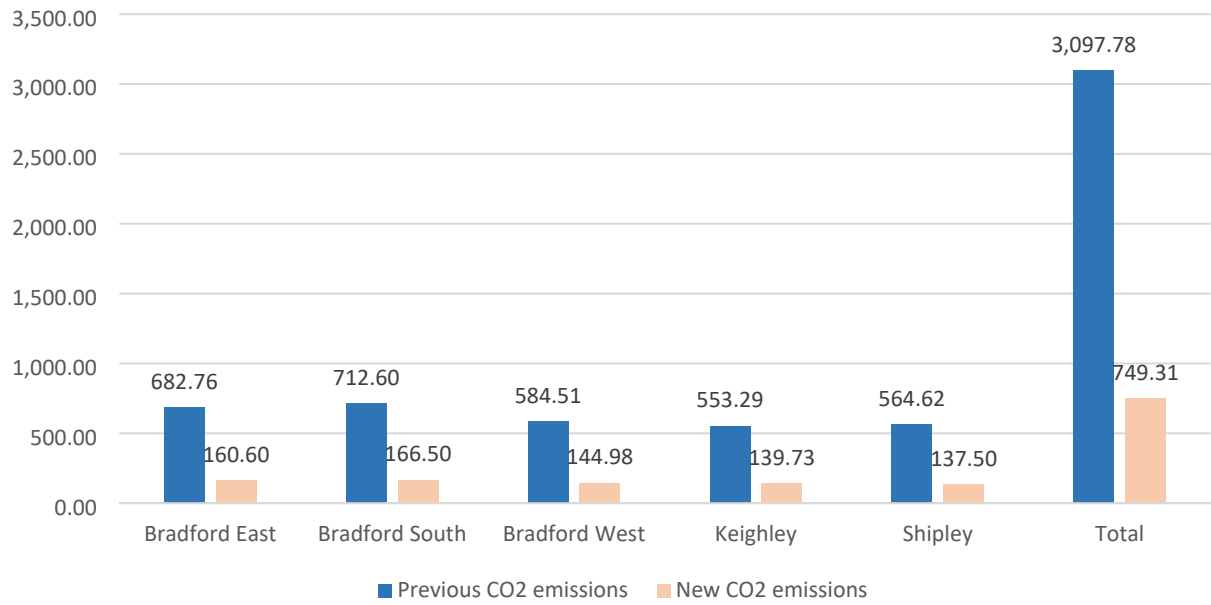
The chart below shows the load before the LED installation and the new load after LED installations – to equate this into more understandable terms, it is like replacing a 100w light bulb with a 35w light bulb.



The next chart shows the estimated annual energy consumed before the LED installations and after the



### Comparison of CO2 Emissions (Tonnes) per annum as a result of the SSL Project



### Projected Annual Energy Cost based on 31.5p per kWh as a result of the SSL Project

