July 2013

NORTHERN HUB ORDSALL CHORD UTILITIES BRIDGE

STREET LIGHTING ASSESSMENT

Final

Northern Hub Ordsall Chord Utilities Bridge

Street Lighting Assessment

Prepared for
Network Rail

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1 INTRODUCTION

This report has been prepared for Network Rail to support the planning application for the removal of Prince's Bridge and the construction of a new utilities bridge.

National Cycle Route 6 crosses the River Irwell using Prince's Bridge between the Hampson Street / Castlefield Bridge junction and Water Street. During the construction of Ordsall Chord the cycle route will be diverted along the new utility bridge and Water Street as shown in Figure 1-1. Once Ordsall Chord has been constructed a replacement bridge will be built in place of Prince's Bridge and National Cycle Route 6 will return to its original route. The Utilities Bridge and associated cycle infrastructure will remain in place to provide a lasting legacy to the Ordsall Chord construction.

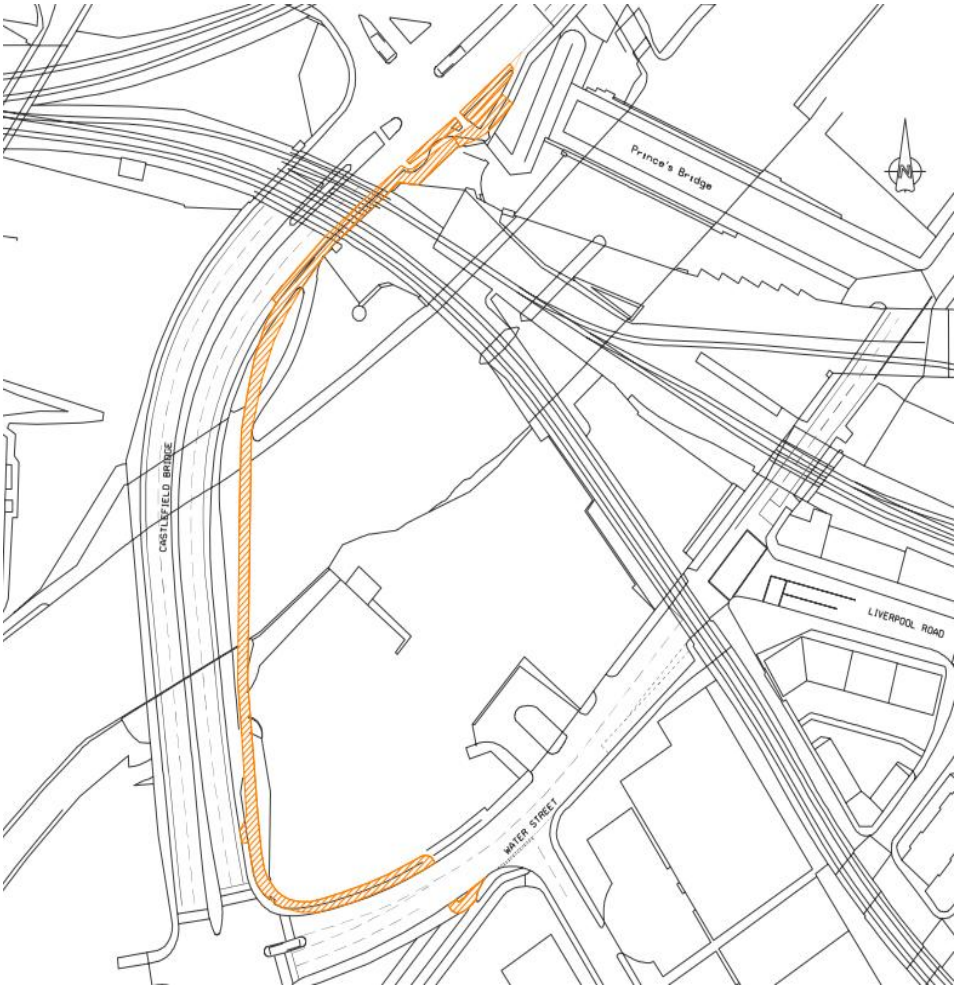


Figure 1-1: Utility Bridge Location

The proposed temporary utilities bridge will carry statutory undertaker's services across the River Irwell and provide a segregated route across the river for the diverted cyclists and pedestrians.

The purpose of this report is to determine if the existing street lighting along the route of the diverted cycle route is compliant with current lighting standards and to establish if an independent lighting system would require installing on the diversions bridge.

In order to assess this, a daytime visual survey of the existing lighting installation and a night time visual survey of the existing lighting installation including light level readings were undertaken. The daytime site survey works were carried on the day of 16/07/13 and night time survey was carried out on the following night / morning of 17/07/13. The weather conditions were fine.

2 SURVEY RESULTS

2.1 Daytime Survey

Hampson Street / Castlefield Bridge junction

This junction is currently illuminated by means of 10m octagonal steel lighting columns fitted with post top mounted Phillips SGS306 'Traffic Vision' lanterns. The installations appear to be around 10 years of age. The columns and lanterns appear to be in a 'good' condition given the age of the installation.





Castlefield Bridge (under rail bridge lighting)

The section of Castlefield Bridge which runs under the existing railway bridge is currently illuminated by means of wall mounted floodlights mounted to the side wall of the bridge structure. The installation appears to be in excess of 10 years of age. The lanterns and wiring appear to be in an 'average' condition given the age of the installation. However, it is evident that these lights have not been maintained recently due to a build up of dirt.





Castlefield Bridge (adjacent to the proposed utilities bridge)

The section of Castlefield Bridge which runs over the River Irwell is currently illuminated by means of high mast lighting. The installations appear to be in excess of 15 years of age. The masts themselves appear to be in 'good' condition given the age of the installations, but it is not possible to gauge the conditions of the lanterns from ground level.



Water Street / Castlefield junction

The junction of Water Street / Castlefield Street is currently illuminated by means of high mast lighting. The installations appear to be in excess of 15 years of age. Again, the masts appear to be in 'good' condition given the age of the installations, but it is not possible to gauge the conditions of the lanterns from ground level.



Water Street

Water Street is currently illuminated by means of a mixture of differing heights of tubular steel columns fitted with varying bracket out reaches and lantern types. Each column / lantern appears to vary in age from less than 10 years to in excess of 25 years in age and style. Equipment appears to be in a 'good' to 'average' condition given the age of the installations.

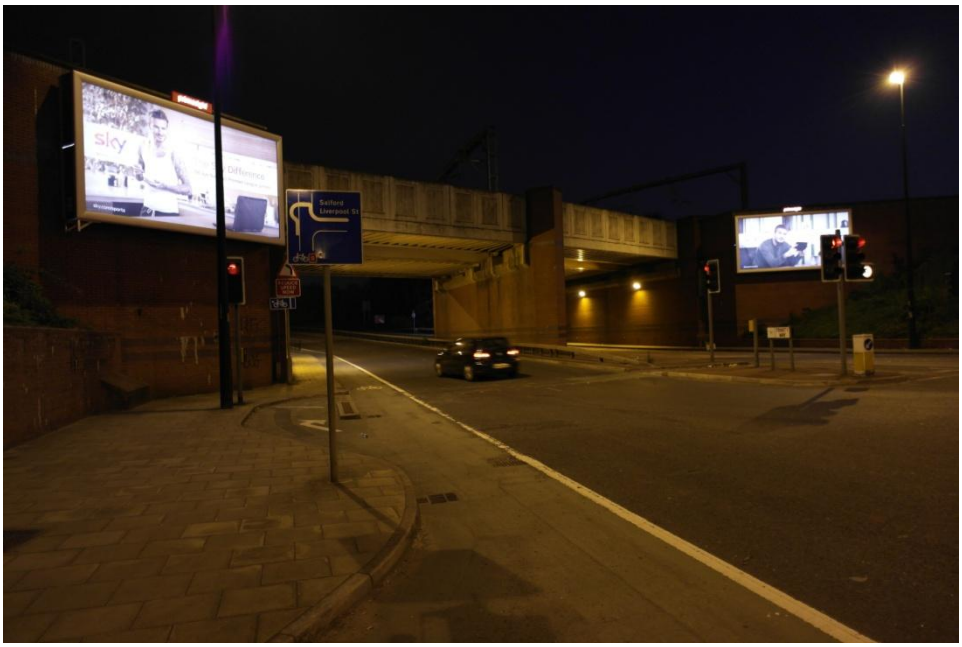


2.2 Night time Survey

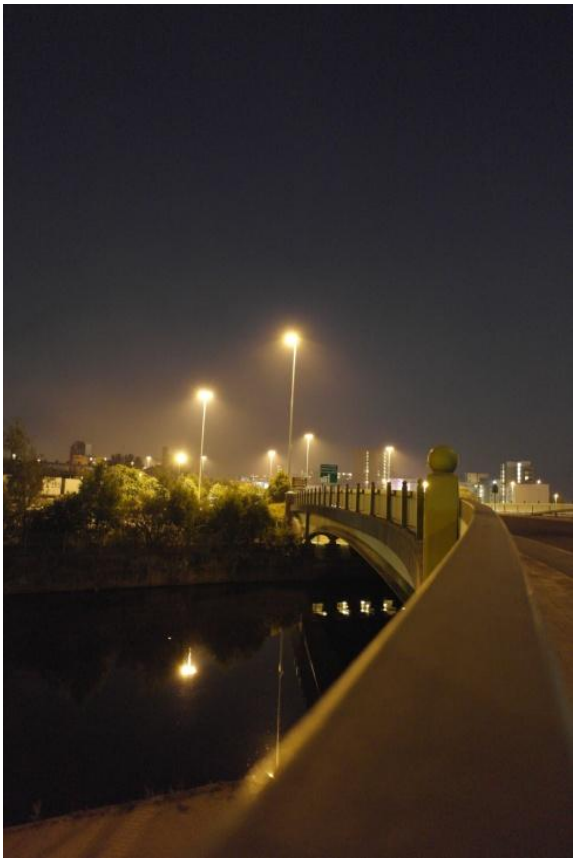
Hampson Street / Castlefield junction



Castlefield (under rail bridge lighting)



Castlefield Bridge (adjacent to the proposed utilities bridge)



Water Street / Castlefield junction



Water Street



3 STANDARDS

Associated lighting standards

The performance requirements of street lighting installations within the UK are laid out in BS5489-1:2013 'Code of practice for the design of road lighting'. This document has recently superseded BS5489-1:2003. Both documents refer to BSEN 13201:2003 'Road Lighting' which is currently under review.

The changes between the newly published British Standard and the old standard are minor in terms of traffic routes. For the purpose of this exercise the installations have been assessed against the current lighting standard, BS5489-1:2013.

Lighting of traffic routes

The ME series of lighting classes are generally applied to traffic routes. This is where the primary aim of the street lighting installation is to provide visual guidance to the driver and highlight the road ahead in particular any obstacles that may appear on that road. This is done by means of a uniform reflected level of light from the road surface towards the driver. This method of lighting is called luminance.

Lighting requirements for ME class roads are detailed within Appendix 6.2

Lighting of conflict areas

The CE Series of lighting classes are generally applied to town centre areas, junctions or other sections of highway, for example, pedestrian crossings, where there is expected to be a high level of interacting movement between vehicles in particular between vehicles and non motorised road users such as pedestrians or cyclists. The primary aim of the street lighting installation is to illuminate the road surface to an actual level of light so as all road users can see the surrounding area and any other road users that are present clearly. This method of lighting is called illuminance.

Lighting requirement for CE class roads are detailed within Appendix 6.3

Lighting of cycle paths

Extracted from BSEN5489-1:2103 *'Cycle tracks can be either adjacent to the carriageway or are segregated and remote from the carriageway. When adjacent to the carriageway the lighting design should take into account the needs of all users including the motorist. When the cycle path is segregated, a suitable lighting class should be obtained'*

When the cycle path is directly adjacent to a traffic route then the 'surround ratio' of the ME class lighting can be considered sufficient. However for traffic routes with heavily trafficked cycle paths an appropriate lighting class should be applied to the cycle path.

Further guidance regarding the design of lighting installations for cycle paths can be found in ILP technical report TR23 'Lighting of cycle paths'.

High mast lighting

The principal use of high mast lighting is to light a number of roads rather than a single road. Where roads are at differing levels and junctions are complex and column

mounting heights in excess of 12m are required, high mast lighting can offer a practical an economic solution.

When designing using high mast lighting it is usual to use CE class lighting levels i.e. illuminance rather than luminance.

4 ASSESSMENT

4.1 Methodology

Performance requirements and calculation methods for street lighting installations are detailed within BSEN 13201:2003 and BS5489-1:2013.

For the purpose of this exercise we will try and select the relevant lighting class which each of the survey areas should be illuminated to in line with current street lighting standards.

ILP technical report TR28 'Measurement of road lighting performance on site' details recommended methods for measuring the performance of street lighting installations. However, these methods involve carrying out computer based lighting calculations of the lighting installations and comparing these calculations with measurements that are taken on site. Although the results are accurate, the problem with this method is that it is time consuming and requires traffic management to be in place to obtain light level readings from site on a night time.

For the purpose of this exercise we have taken a sample of single point light level readings on a night time. These have been taken at various points along the proposed cycle path diversion route and are detailed within Appendix 6.1. These were generally taken mid-point between lighting columns i.e. where the lighting level should be at its lowest. These lighting levels were then compared to the illuminance levels required for the relevant lighting class.

4.2 Hampson Street / Castlefield Bridge junction

All approach roads to the Hampson Street / Castlefield Bridge junction have 30 MPH speed limits and carry a low to moderate traffic flow (ADT of between 7,000 and 40,000).

2 of the approach roads are dual carriageway and 1 of the approach roads is single carriageway. All roads have junctions spaced <3Km apart.

From table A.3 in Appendix 6.2 it can be seen that all approach roads to this junction should be illuminated to a ME4a lighting class.

At road junctions where ME class roads meet, the British Standard requires that the junction be treated as a conflict area and lighting levels should comply with an appropriate CE lighting class.

From table A.4 in Appendix 6.3 it can be seen that the appropriate lighting class for an ME4 road is CE3

From table 2 in Appendix 6.3 lighting levels for CE3 should be 15 Lux average with a uniformity of 0.4.

Light level illuminance readings taken at this junction were all in excess of 15 Lux.

Measurement point 1	36 Lux
Measurement point 2	26 Lux
Measurement point 2	23 Lux

Note: if the assessment criteria for BS5489-1:2003 were applied, the approach roads would be classified as being ME3a and the junction as being CE2.

4.3 Castlefield (under rail bridge lighting)

As already determined within section 4.2, this section of road should be illuminated to a ME4a Lighting class.

As we have taken illuminance readings on site and ME class roads are designed using luminance we need to determine what illuminance levels should be expected on site.

Appendix 6.4 table A1 shows a table that indicates equivalent lighting classes. The equivalent CE lighting class for an ME4a road is CE4.

From table 2 in Appendix 6.3 lighting levels for CE4 should be 10 Lux average with a uniformity of 0.4.

Light level illuminance readings taken were all in excess of 10 Lux.

Measurement point 4	41 Lux
Measurement point 5	21 Lux

Note: if the assessment criteria for BS5489-1:2003 were applied, the approach roads would be classified as being ME3a and the equivalent class as being CE3.

4.4 Castlefield Bridge (adjacent proposed utilities bridge)

As already determined within section 4.2 & 4.3, this section of road should be illuminated to a ME4a Lighting class.

As we have taken illuminance readings on site and ME class roads are designed using luminance we need to determine what illuminance levels should be expected on site.

Appendix 6.4 table A1 shows a table that indicates equivalent lighting classes. The equivalent CE lighting class for an ME4a road is CE4.

From table 2 in Appendix 6.3 lighting levels for CE4 should be 10 Lux average with a uniformity of 0.4.

As well as taking measurements on the road itself 2 light level readings were taken at a lower level adjacent to the river on the tow path and in the car park.

Due to a high number of lamps which were not operational on the high mast units, light level illuminance readings taken at this location varied significantly.

Measurement point 6	0 Lux
Measurement point 7	15 Lux
Measurement point 8 (lower level on tow path)	6 Lux
Measurement point 9	4 Lux
Measurement point 10	36 Lux
Measurement point 8 (lower level in car park)	6 Lux

Note: if the assessment criteria for BS5489-1:2003 were applied, the approach roads would be classified as being ME3a. and the equivalent class as being CE3.

4.5 Water Street / Castlefield junction

All approach roads to the Castlefield Bridge / Water Lane junction have 30 MPH speed limit.

2 of the approach roads are dual carriageway and have a low to moderate traffic flow (ADT of between 7,000 and 40,000). 1 of the approach roads is single carriageway and has a low traffic flow (ADT of < 7,000) All roads have junctions spaced <3Km apart.

From table A.3 in Appendix 6.2 it can be seen that 2 of the approach roads to this junction should be illuminated to a ME4a lighting class and 1 of the approach roads to a ME5 lighting class.

At road junctions where ME class roads meet, the British Standard requires that the junction be treated as a conflict area and lighting levels should comply with an appropriate CE lighting class. Where there are roads with differing ME classes the junction shall be illuminated in accordance with the highest class approach road.

From table A.4 in Appendix 6.3 it can be seen that the appropriate lighting class for an ME4 road is CE3

From table 2 in Appendix 6.3 lighting levels for CE3 should be 15 Lux average with a uniformity of 0.4.

Due to a high number of lamps which were not operational on the high mast units, light level illuminance readings taken at this location varied significantly.

Measurement point 12	6 Lux
Measurement point 13	9 Lux
Measurement point 14	35 Lux
Measurement point 15	74 Lux

Note: if the assessment criteria for BS5489-1:2003 were applied, the approach roads would be classified as being ME3a and the junction as being CE2.

4.6 Water Street

As already determined within section 4.5, this section road should be illuminated to a ME5 Lighting class.

As we have taken illuminance readings on site and ME class roads are designed using luminance we need to determine what illuminance levels should be expected on site.

Appendix 6.4 table A1 shows a table that indicates equivalent lighting classes. The equivalent CE lighting class for an ME5 road is CE5.

From table 2 in Appendix 6.3 lighting levels for CE4 should be 7.5 Lux with a uniformity of 0.4.

Due to a number of lamps which were not operational, light level illuminance readings taken at this location varied significantly.

Measurement point 16	1 Lux
Measurement point 17	2 Lux
Measurement point 18	13 Lux
Measurement point 19	33 Lux
Measurement point 20	15 Lux
Measurement point 21	2 Lux

Note: if the assessment criteria for BS5489-1:2003 were applied, the approach roads would be classified as being ME4 and the equivalent class as being CE4.

5 ANALYSIS AND RECOMENDATIONS

5.1 Hampson Street / Castlefield Bridge junction

It can be seen that the minimum lighting levels taken on site are in excess of the average expected within the current British Standard. The junction's illumination on a night is uniform in appearance and it is our opinion that this junction may be lit to a higher standard than that which is required by the current standard.

We do not see why any improvements to the existing street lighting infrastructure would be required at this location in association with the cycle path diversion.

5.2 Castlefield (under rail bridge lighting)

It can be seen that the minimum lighting levels taken on site are in excess of those expected in the current British Standard. The illumination on a night is uniform in appearance and It is our opinion that this road may be lit to a higher standard than that which is required by the current standard.

We do not see that any improvements to the existing street lighting infrastructure would be required at this location in association with the cycle path diversion. However the maintaining agent should be requested to carry out a routine maintenance visit to these installations.

5.3 Castlefield Bridge (adjacent proposed utilities bridge)

As there were a a high number of lamps which were not operational on the high mast units, light level illuminance readings taken at this location varied significantly.

From the measurements taken it is not possible to categorically state that the lighting installation, if fully operational would comply with current standards. However, given the readings taken at point 7 and point 9 it is fair to assume that similar levels would be present at measurement points 6 and 9 if all the luminaries were to be lit.

It should be noted that point 8 and point 11 lighting levels taken at the lower level are much lower than their corresponding high level reading namely point 7 and point 10 respectfully.

The effect of the loss of high mast lighting on the road lighting levels is significant and the maintaining agent should be contacted regarding this and we would recommend a subsequent survey is undertaken once all the high mast luminaries are working correctly.

However, even if a second survey indicated that lighting levels are sufficient to illuminate the cycle path over the utilities bridge, what this exercise has illustrated is that the high mast lighting cannot be regarded as being a reliable means of illuminating the proposed cycle path where it crosses the utilities bridge.

We would suggest that the relevant local authority street lighting engineer or their appropriate representative needs to make a final decision on whether independent bridge lighting is required.

5.4 Water Street / Castlefield junction

As there were a high number of lamps which were not operational on the high mast units, light level illuminance readings taken at this location varied significantly.

From the measurements taken it is not possible to categorically state that the lighting installation, if fully operational would comply with current standards. However, given the readings taken at point 14 and point 15 it is fair to assume that similar levels would be present at measurement points 12 and 13 if all the high mast luminaries were to be lit.

We would recommend a subsequent survey is undertaken once all the high mast luminaries are working correctly to confirm that the lighting levels at this location..

5.5 Water Street

As there were a high number of lamps which were not operational, light level illuminance readings taken at this location varied significantly.

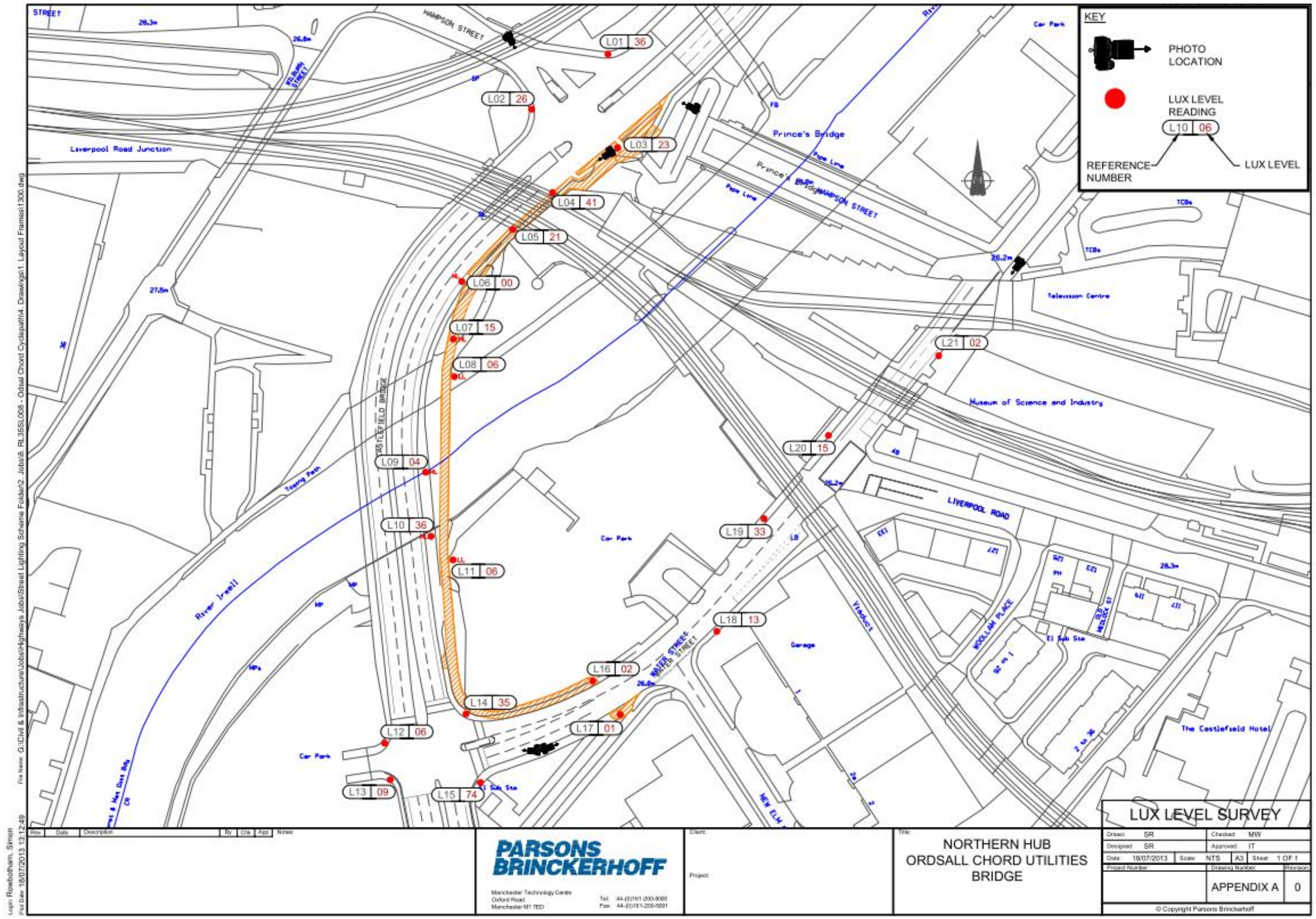
From the measurements taken it is not possible to categorically state that the lighting installation, if fully operational would comply with current standards. However, it should be noted that where lights are operational, lighting levels are in excess of those expected in the current British Standard.

Water Lane is within Manchester City Councils boundary. Manchester City Council has a 25 year street lighting PFI contract in place. This is where all lighting units are generally replaced over the lifespan of the project.

We would recommend that the PFI service provider is contacted to establish where Water Lane is in their programme of replacement works. We would also recommend that when the lighting along Water Lane is replaced, specific consideration is given to the uncontrolled cycle crossing point adjacent to New Elm Road.

6 APPENDICES

6.1 Lighting levels layout drawing



6.2 ME Lighting class series

Table 1a Extract from BSEN13201-2:2003 ME series of lighting classes

Table 1a — ME-series of lighting classes

Class	Luminance of the road surface of the carriageway for the dry road surface condition			Disability glare	Lighting of surroundings
	$\overline{L}$ in cd/m^2 [minimum maintained]	U_o [minimum]	U_l [minimum]	TI in %[a] [maximum]	SR[2b] [minimum]
ME1	2,0	0,4	0,7	10	0,5
ME2	1,5	0,4	0,7	10	0,5
ME3a	1,0	0,4	0,7	15	0,5
ME3b	1,0	0,4	0,6	15	0,5
ME3c	1,0	0,4	0,5	15	0,5
ME4a	0,75	0,4	0,6	15	0,5
ME4b	0,75	0,4	0,5	15	0,5
ME5	0,5	0,35	0,4	15	0,5
ME6	0,3	0,35	0,4	15	no requirement

[a] An increase of 5 percentage points in TI can be permitted where low luminance light sources are used. (see note 6)
[b] This criterion can be applied only where there are no traffic areas with their own requirements adjacent to the carriageway.

Table A.3 Extract from BS5489-1:2013 Lighting Classes for traffic routes <40mph

Table A.3 **Lighting classes for traffic routes ($v \leq 40$ mph)**

Traffic flow	Lighting class		
	Dual carriageway		Single carriageway
	Junction density: high	Junction density: low	
High to very high [A)]	ME3b or M3	ME4a or M4	ME3b or M3
Low to moderate [B)]	ME4a or M4	ME5 or M5	ME4a or M4
Very low [C)]	ME5 or M5	ME6 or M6	ME5 or M5

*NOTE 1 High junction density would be junction centres spaced <3 km apart. A risk assessment can determine whether some of the junctions constitute conflict areas (see **A.3.2**).*

NOTE 2 Grey highlighting indicates situations that would not usually occur in the UK.

A) High to very high traffic flow might be defined as either having an ADT > 40 000, or where the flow exceeds 65% of the lane maximum capacity for dual or multi-lane carriageways or 45% for single carriageways.
B) Low to moderate traffic flow might be defined as either having an ADT of between 7 000 and 40 000, or where the flow is between 35% and 65% for dual or multi-lane carriageways or between 15% and 45% for single carriageways.
C) Very low traffic flow might be defined as either having an ADT of <7 000, or where the flow is <35% for dual or multi-lane carriageways or <15% for single carriageways.

6.3 CE Lighting class series

Table 2 Extract from BSEN13201-2:2003 CE series of lighting classes

Table 2 — CE-series of lighting classes

Class	Horizontal illuminance	
	$\overline{E}$ in lx [minimum maintained]	U_o [minimum]
CE0	50	0,4
CE1	30	0,4
CE2	20	0,4
CE3	15	0,4
CE4	10	0,4
CE5	7,5	0,4

Table A.4 Extract from BS5489-1:2013 Lighting Classes for conflict areas

Table A.4 **Lighting classes for conflict areas**

Traffic route lighting class	Conflict area lighting class
ME1 or M1	CE0 or C0
ME2 or M2	CE1 or C1
ME3 or M3	CE2 or C2
ME4 or M4	CE3 or C3
ME5 or M5	CE4 or C4
ME6 or M6	CE5 or C5

6.4 Comparable lighting Classes

Table A.1 Extract from BS5489-1:2013 Lighting classes of comparable levels.

Table A.1 **Lighting classes of comparable level**

ME or M class	CE or C class	S or P class
—	CE0 or C0	—
ME1 or M1	CE1 or C1	—
ME2 or M2	CE2 or C2	–
ME3 or M3	CE3 or C3	S1 or P1
ME4 or M4	CE4 or C4	S2 or P2
ME5 or M5	CE5 or C5	S3 or P3
ME6 or M6	—	S4 or P4
—	—	S5 or P5
—	—	S6 or P6

NOTE The data in this table is extrapolated from PD CEN/TR 13201-1:2004 (undergoing revision).