
APPENDIX 11

ROUNABOUT LIGHTING RECOMMENDATIONS



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TO: Paul Yanchuk, P.Eng. (City of London) **RVA:** 205505
FROM: Mario A. Watson, P.Eng. (R.V. Anderson)
DATE: January 7, 2022
SUBJECT: Oxford Street West and Gideon Drive EA – Roundabout Lighting Recommendations

1.0 BACKGROUND

R. V. Anderson Associates Limited (RVA) is pleased to submit our lighting recommendations based on our pedestrian, roadway, and roundabout Illumination analysis at both the Oxford Street West and Gideon Drive intersection, and along Oxford St W from Gideon Drive to Westdel Bourne, in the City of London.

1.1 Roundabout Lighting

There is currently existing lighting at the Oxford Street West and Gideon Drive intersection. This lighting infrastructure will be removed as part of the Roundabout design. The purpose of this study was to determine what lighting will be required for the new roundabout along the roadway, along the approaches, at the pedestrian crosswalks, and the along the adjacent sidewalks.

1.2 Roadway Lighting

Roadway lighting exists only at the Oxford Street West and Gideon Drive intersection and the signalized Oxford St West and Westdel Bourne intersection. There is currently no continuous roadway lighting between the two (2) intersections. The purpose of this study was to determine what lighting will be required for the reconstructed roadway under two (2) conditions. The first condition is for three (3) lanes on the West approach, and the second condition is for four (4) lanes on the East approach to accommodate a dedicated S-E lane around the roundabout.

2.0 APPROACH AND METHODOLOGY

The photometric analysis was carried out following the current industry approved design standards, guidelines, and recommended practices:

- **ANSI/IESNA RP-8-18 (RP-8)** – RP-8 was used as a guideline to verify the minimum levels of illumination required for the continuous roadways, roundabout, and pedestrian facilities. This recommended practice determines the minimum levels of illumination required based on the type of study area, road classification, and pedestrian activity level. The pedestrian activity level is determined based on the anticipated volume of pedestrians in a single block (or 200-m segment) for the highest one-hour nighttime sample period.
- **International Dark-Sky Association (IDA)** – RP-8 promotes the use of Dark-Sky compliant fixtures as part of the IDA practices. This initiative was established to mitigate or eliminate the adverse impact of lighting on the views of the darkened nighttime sky. It should also be noted with regards to light trespass, current industry practices promote minimum to zero light spill on to adjacent properties.
- **Green Standards for Light Pollution & Bird-Friendly Development (GSLP)** – GSLP is an initiative for recommendations from the City of London. The City of London plans to become one of the greenest cities in Canada and this document promotes the use of fixtures that reduce its impacts on the environment. This initiative was established with a goal of minimizing bird strikes on buildings and reducing environmental impacts of light pollution.

2.1 ANSI/IESNA RP-8-18

As part of the City of London's Design Specifications & Requirements Manual (dated August 2019) Section 2.5.3 for Street Light Designs, the City of London has adopted RP-8 as part of their standard.

With this inclusion, RP-8's minimum light levels were not interpreted as only a recommended practice, but as a City standard/requirement.

2.2 International Dark-Sky Association

All light fixtures used in this recommendation were all IDA compliant with the use of fully cut-off zero uplight fixtures.

2.3 Green Standards for Light Pollution & Bird-Friendly Development

The GSLP is not applicable to this design based on the location and surrounding infrastructure. However, in meeting the IDA, all fixtures chosen for this design

recommendation were not only from the City of London's approved list of roadway fixtures (dated January 14, 2021) but includes the use of fully cut-off fixtures with zero upright.

3.0 DESIGN DETAILS

A photometric analysis was completed within the Study Area for the following:

- Roundabout roadway.
- East, West, and South Roundabout approaches. The North approach was assumed to be a part of the developer's newly introduced roadway.
- All Roundabout crosswalks.
- All adjacent pedestrian facilities.
- Road segment along Oxford St W from Gideon Drive to Westdel Bourne.
 - Lane Configuration 1 – three (3) lanes.
 - Lane Configuration 2 – four (4) lanes.

3.1 Assumptions

The photometric analysis was carried out based on the following assumptions:

- An LLF of 0.74 was used.
- An AGi32 arm reach of 3.54m was used for all proposed roadway luminaires.
- An AGi32 arm reach of 0.73m was used for all proposed pedestrian level luminaires.
- A luminaire mounting height of 10.29m was used for the luminaires mounted on dedicated 10.7m (35') concrete direct buried poles.
- A luminaire mounting height of 4.22m was used for the pedestrian level luminaires mounted on dedicated 6.1m (15') concrete direct buried poles.
- A road classification of Major was used.
- A pedestrian conflict classification of Low was used.
 - A residential density of Medium was used.

4.0 ROUNABOUT LIGHTING

4.1 Design Speed and Safe Stopping Distance

Tables 12-5 and 12-6 of RP-8 establishes a safe stopping distance in Roundabouts to be used as the vehicular observer locations on the approaches to the Crosswalks.

Table 12-6. Design Speeds in Roundabouts.

Number of Lanes	Inscribed Circle diameter (m)	Radius (m)	Speed (km/h)
Single	30	11	21
Single	35	12	23
Single	40	16	25
Single	45	19	26
Double	50	17	25
Double	55	20	27
Double	60	23	28
Double	65	25	29
Double	70	28	30

Number of Lanes: Double

Inscribed Circle Diameter (m): 45.0m

Based on the Roundabout Design parameters for the Oxford St W at Gideon Dr location, the design speed for the approach minimum light levels is approximately **25km/h**.

Table 12-5. Safe Sight Stopping Distances in Roundabouts.

Design Speed (km/h)	Computed Distance (m)
10	8.1
20	18.5
30	31.2
40	46.2
50	63.4

The design layout was completed without extrapolating a mid design speed. Utilizing a design speed of 30km/h, the computed distance for the vehicular observer locations in the AGi32 simulation was **31.2m**.

4.2 Minimum Light Level Requirements

Based on the assumptions and observer locations established, the criteria to be met for the roundabout lighting as per RP-8 Table 12-4 are:

- Main Roundabout levels:
 - An average horizontal illuminance level greater than or equal to 18.0.
 - An average to minimum illuminance ratio less than or equal to 3.0.
- Crosswalk levels:
 - An average vertical illuminance level greater than or equal to 18.0.
 - An average to minimum illuminance ratio less than or equal to 3.0.

Table 12-4. Recommended Pavement Illuminance for Roundabouts, Based on Pedestrian Activity Classification

Illuminance for Roundabouts (lux/ft)				
Functional Classification	Pedestrian Activity Classification			E_{avg}/E_{min}
	High	Medium	Low	
Major/Major	34/3.2	26/2.4	18/1.7	3:1
Major/Collector	29/2.7	22/2.0	15/1.4	3:1
Major/Local	26/2.4	20/1.9	13/1.2	3:1
Collector/Collector	24/2.2	18/1.7	12/1.1	4:1
Collector/Local	21/2.0	16/1.5	10/0.9	4:1
Local/Local	18/1.7	14/1.3	8/0.7	6:1

The criteria to be met for the sidewalks as per RP-8 Table 16-3 are:

- An average horizontal illuminance level greater than or equal to 4.0 lux.
- An average to minimum horizontal illuminance ratio less than or equal to 4.0.
- A minimum vertical illuminance value of 1.0.

Table 16-3. Recommended Values for Low Pedestrian Activity Areas

Maintained Illuminance Values for Walkways/Bikeways			
	E_{avg} (lux/ft)	E_{v,min} (lux/ft)	E_{avg}/E_{min} *
Rural/Semi-Rural Areas	2/0.2	1/0.1	10.0
Low Density Residential (2 or fewer dwelling units per acre)	3/0.3	1/0.1	6.0
Medium Density Residential (2.1 to 6.0 dwelling units per acre)	4/0.4	1/0.1	4.0

Table Notes:

E_{avg}: Minimum maintained average horizontal illuminance at pavement

E_{min}: Minimum horizontal illuminance at pavement

E_{v,min}: Minimum vertical illuminance at 1.5m above the pavement in both directions and parallel to the main pedestrian flow.

Pedestrian Only areas apply to areas such as sidewalks.

* Horizontal only

4.3 Findings

All results are noted in the design submission plans for both options 1 and 2. Based on the proposed roadway lighting design, all roundabout light levels met the minimum light levels outlined in RP-8.

5.0 ROADWAY LIGHTING

5.1 Minimum Requirements

Based on the Assumptions established, the criteria to be met for the continuous roadways as per RP-8 Table 11-1 are:

- An average luminance level greater than or equal to 0.6.
- An average to minimum horizontal luminance ratio less than or equal to 3.5.
- A maximum to minimum horizontal luminance ratio less than or equal to 6.0.
- A maximum veiling luminance ratio (LV ratio) less than or equal to 0.3.

Table 11-1. Lighting Design Criteria for Streets.

Street Classification	Pedestrian Activity Classification*	Average Luminance L_{avg} (cd/m ²)	Average Uniformity Ratio L_{avg}/L_{min}	Maximum Uniformity Ratio L_{max}/L_{min}	Maximum Veiling Luminance Ratio $L_{v,max}/L_{avg}$
Major	High	1.2	3.0	5.0	0.3
	Medium	0.9	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
Collector	High	0.8	3.0	5.0	0.4
	Medium	0.6	3.5	6.0	0.4
	Low	0.4	4.0	8.0	0.4
Local	High	0.6	6.0	10.0	0.4
	Medium	0.5	6.0	10.0	0.4
	Low	0.3	6.0	10.0	0.4

Table Notes:

* Pedestrian Activity Classifications are defined in Section 11.3.3.

L_{avg} : Maintained average pavement luminance

L_{min} : Minimum pavement luminance

$L_{v,max}$: Maximum veiling luminance

5.2 Findings

All results are noted in the design submission plans for both options 1 and 2. Based on the proposed roadway lighting design, all continuous roadway light levels met the minimum light levels outlined in RP-8.

6.0 LIGHTING RECOMMENDATIONS

To meet the minimum light levels as outlined in RP-8, the following is recommended:

- Option 1:
 - Twenty-four (24) dedicated roadway lighting poles.
 - Eight (8) dedicated pedestrian lighting poles.
- Option 2:
 - Twenty-six (26) dedicated roadway lighting poles.
 - Six (6) dedicated pedestrian lighting poles.

7.0 HIGH-LEVEL COST ESTIMATE

A high-level cost estimate for the lighting infrastructure is summarized below:

Option 1:

Item	Assumed Cost per Item	Total Cost
Roadway – Dedicated roadway lighting poles	\$10,000 per assembly, inclusive of connections	\$240,000
Pedestrian – Dedicated pedestrian lighting poles	\$7,000 per assembly, inclusive of connections	\$56,000

The total high-level cost estimate for all lighting requirements in option 1 would be \$296,000.

Option 2:

Item	Assumed Cost per Item	Total Cost
Roadway – Dedicated roadway lighting poles	\$10,000 per assembly, inclusive of connections	\$260,000
Pedestrian – Dedicated pedestrian lighting poles	\$7,000 per assembly, inclusive of connections	\$42,000

The total high-level cost estimate for all lighting requirements in option 2 would be \$302,000.

CLOSING

Thank you for providing us with the opportunity to undertake this study. If there is any query related to this report, please feel free to contact the undersigned at 289-348-1234 ext. 4217 or by email as noted below.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED

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Associate, Electrical Engineer (Transportation)
MWatson@rvanderson.com

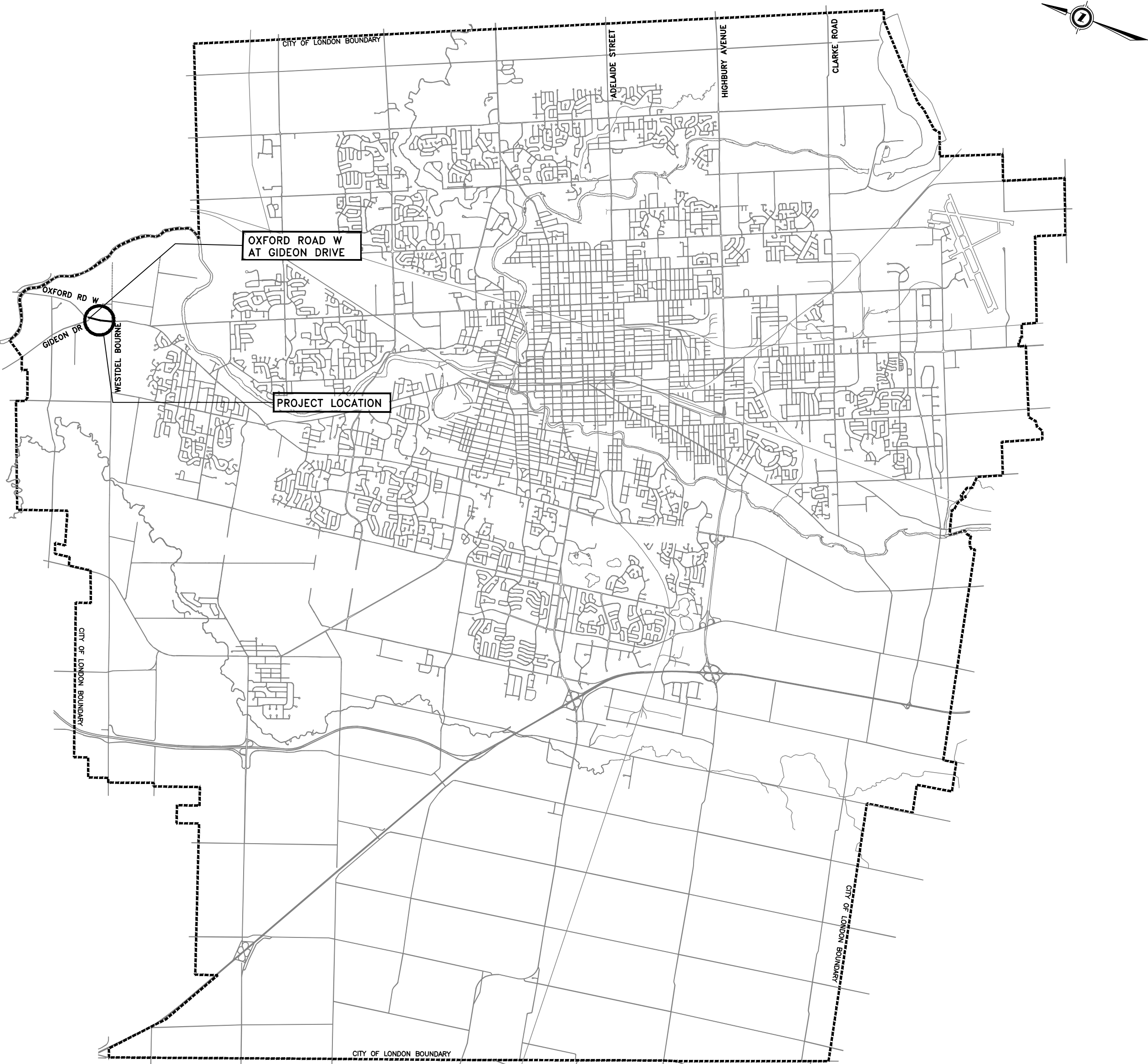
mw



CITY OF LONDON
RFT XXXX

ROUNDABOUT LIGHTING LAYOUT OXFORD STREET W AT GIDEON DRIVE

DRAWING INDEX	
SHEET NUMBER	SHEET TITLE
--	COVER SHEET
a1	PHOTOMETRIC LAYOUT – LANE CONFIGURATION 1
a2	PHOTOMETRIC LAYOUT – LANE CONFIGURATION 1
a3	LIGHTING DETAILS – LANE CONFIGURATION 1
b1	PHOTOMETRIC LAYOUT – LANE CONFIGURATION 2
b2	PHOTOMETRIC LAYOUT – LANE CONFIGURATION 2
b3	LIGHTING DETAILS – LANE CONFIGURATION 2



ISSUED FOR PRELIMINARY LAYOUT



R.V. Anderson Associates Limited
engineering • environment • infrastructure

NAME P.ENG. POSITION
ROLE



ENVIRONMENTAL & ENGINEERING SERVICES
DEPARTMENT
ROADWAY LIGHTING & TRAFFIC CONTROL
DIVISION

LOCATION: OXFORD STREET W AT GIDEON DRIVE

Plan view of Oxford St W. The road is divided into multiple lanes with various markings. Labels include ILAP03, LW3a, LE3a, ILL03a, ILL03b, ILL03c, and ROAD TYPE 2. The road is flanked by property lines and trees. The text 'OXFORD ST W' is prominently displayed in the center.

Plan view of a road layout. The horizontal road segment is labeled "ROAD TYPE 2" in two locations. The road is flanked by "OXFORD ST W" to the north and "WESTDEL BOURNE" to the south. The road is divided into three sections: a green section on the left labeled "LW3a", a grey section in the middle labeled "ILL03d", and a green section on the right labeled "LE3a". The road is also labeled "ILL03c" in the middle section. The road is flanked by "MATCHLINE" on the left and "SEE ABOVE" on the right. The road is flanked by "STA #++###" on the left and "STA #--###" on the right.

X01

PHOTOMETRIC GRID ZONE ID:

- GRID TYPE: CROSSWALK
- MEASUREMENT: REFER TO TABLE
- REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.

ILR01

PHOTOMETRIC GRID ZONE ID:

- GRID TYPE: ROUNDABOUT
- MEASUREMENT: HORIZONTAL ILLUMINANCE
- REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.

ILAP02

PHOTOMETRIC GRID ZONE ID:

- GRID TYPE: ROAD APPROACH
- MEASUREMENT: HORIZONTAL ILLUMINANCE
- REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.

ILL01

PHOTOMETRIC GRID ZONE ID:

- GRID TYPE: ROAD
ILLUMINANCE
- MEASUREMENT: HORIZONTAL
ILLUMINANCE
- REFER TO POINTER LOCATION
FOR RESPECTIVE GRID
LOCATION.

LE1

PHOTOMETRIC GRID ZONE ID:

- GRID TYPE: CONTINUOUS ROADWAY
- MEASUREMENT: HORIZONTAL LUMINANCE
- EB: REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.

LW1

PHOTOMETRIC GRID ZONE ID:

- GRID TYPE: CONTINUOUS ROADWAY
- MEASUREMENT: HORIZONTAL LUMINANCE
- WB: REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.

W1

PHOTOMETRIC GRID ZONE ID:

- GRID TYPE: CONTINUOUS ROADWAY
- MEASUREMENT: HORIZONTAL AND VERTICAL ILLUMINANCE
- REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.

SIDE-MOUNTED LED FIXTURE
- ROADWAY SIDE FIXTURE
- MOUNTING HEIGHT, ARM
LENGTH, AND DISTRIBUTION
TYPE AS PER DETAILS SHEET,

SIDE-MOUNTED LED FIXTURE
- PEDESTRIAN SIDE FIXTURE
- MOUNTING HEIGHT, ARM
LENGTH, AND DISTRIBUTION
TYPE AS PER DETAILS SHEET,

REFERENCE OBSERVER LOCATION

- REFER TO TABLE FOR PLACEMENT DETAILS
- LOCATION SET AS PER RP-8-18 REQUIREMENTS
- ASSOCIATED VERTICAL GRID POINTS ARE ANGLED TOWARD DRIVER'S SIDE SEAT.

1. PHOTOMETRIC ANALYSIS COMPLETED WITH LIGHTING ANALYSTS AGI32 LIGHTING SOFTWARE.
2. AGI32 SIMULATED RESULTS WITH AN LLF OF 0.74.
3. AGI32/37A SIMULATED MOUNTING HEIGHTS AS PER LIGHTING DETAILS SHEET. REFER TO COVER SHEET FOR DRAWING SCHEDULE.
4. ALL FIXTURES USED IN THIS ANALYSIS ARE DARK-SKY COMPLIANT WITH FULL CUT-OFF AND AN UPLIGHT RATING OF ZERO.
5. LED FIXTURES CHOSEN ARE PER CITY OF LONDON'S 2021-01-14 DRAWING LIST. LAST CHECKED MAY 2021.

LUMINANCE TABLE - ROAD - EASTBOUND (OXFORD ST. W.)			
STREET CLASSIFICATION	MAJOR		
PEDESTRIAN CLASSIFICATION	LOW		
ROAD NAME		LE3a	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	
AVERAGE LUMINANCE (cd/m ²) (MIN)	0.6	0.8	YES
MAXIMUM UNIFORMITY RATIO			
$1. L_{avg} / L_{min}$	3.5	2.1	YES
$2. L_{max} / L_{min}$	6.0	4.0	YES
MAXIMUM VEILING LUMINANCE L_{max} / L_{avg}	0.3	0.2	YES

LUMINANCE TABLE - ROAD - WESTBOUND (OXFORD ST. W.)			
STREET CLASSIFICATION	MAJOR		
PEDESTRIAN CLASSIFICATION	LOW		
ROAD NAME		LW3a	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	
AVERAGE LUMINANCE (cd/m ²) (MIN)	0.6	0.9	YES
MAXIMUM UNIFORMITY RATIO			
1. L_{avg} / L_{min}	3.5	1.7	YES
2. L_{max} / L_{min}	6.0	3.2	YES
MAXIMUM VEILING LUMINANCE $L_{avg} / L_{veiling}$	0.3	0.2	YES

ILLUMINANCE TABLE - ROUNDABOUT - CROSSWALK (AS PER REF "A01" AND "A02")													
STREET CLASSIFICATION	MAJOR / MAJOR												
PEDESTRIAN CLASSIFICATION	LOW												
ROAD NAME		X01a	X01b		X02a	X02b	X03a		X03b	X04a	X04b	X04b	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 2 OBSERVER)	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 2 OBSERVER)	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 1 OBSERVER)	DESIGN RESULTS (LANE 2 OBSERVER)	
AVERAGE VERTICAL ILLUMINANCE (lux) (MIN)	18.0	19.5	21.1	20.8	21.7	24.8	21.6	21.5	20.7	20.3	30.6	29.1	YES
MAXIMUM UNIFORMITY RATIO													
1. E_{avg} / E_{min}	3.0	1.2	1.2	1.2	1.3	1.1	1.2	1.2	1.2	1.2	1.2	1.1	YES

ILLUMINANCE TABLE - SIDEWALKS / WALKWAYS (SW CORNER)						
PEDESTRIAN CLASSIFICATION	LOW					
RESIDENTIAL DENSITY	MEDIUM DENSITY (2.1 TO 6.0 DWELLING UNITS PER ACRE)					
ROAD NAME		W01-a	W01-b	W01-c	MEETING CRITERIA (YES / NO)	
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	DESIGN RESULTS	DESIGN RESULTS		
AVERAGE HORIZONTAL ILLUMINANCE (lux) (MIN)	4.0	13.3	7.8	10.8	YES	
AVERAGE VERTICAL ILLUMINANCE (lux) (MIN) – (NB / EB)	1.0	1.6	2.3	1.1	YES	
AVERAGE VERTICAL ILLUMINANCE (lux) (MIN) – (SB / WB)	1.0	1.0	1.2	2.2	YES	
MAXIMUM UNIFORMITY RATIO						
1. E_{avg} / E_{min}	4.0	2.1	1.5	1.8	YES	

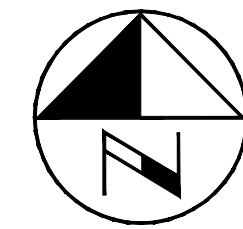
ILLUMINANCE TABLE - SIDEWALKS / WALKWAYS (NE CORNER)				
PEDESTRIAN CLASSIFICATION	LOW			
RESIDENTIAL DENSITY	MEDIUM DENSITY (2.1 TO 6.0 DWELLING UNITS PER ACRE)			
ROAD NAME		W03-a	W03-b	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	DESIGN RESULTS	
AVERAGE HORIZONTAL ILLUMINANCE (lux) (MIN)	4.0	20.7	9.6	YES
AVERAGE VERTICAL ILLUMINANCE (lux) (MIN) -- (NB / EB)	1.0	1.3	1.8	YES
AVERAGE VERTICAL ILLUMINANCE (lux) (MIN) -- (SB / WB)	1.0	3.5	4.0	YES
MAXIMUM UNIFORMITY RATIO				
	1. E_{avg} / E_{min}	4.0	2.6	1.5
				YES

ILLUMINANCE TABLE - SIDEWALKS / WALKWAYS (NW CORNER)					
PEDESTRIAN CLASSIFICATION		LOW			
RESIDENTIAL DENSITY	MEDIUM DENSITY (2.1 TO 6.0 DWELLING UNITS PER ACRE)				
ROAD NAME		W04-a	W04-b	MEETING CRITERIA (YES / NO)	
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	DESIGN RESULTS		
AVERAGE HORIZONTAL ILLUMINANCE (lux) (MIN)	4.0	5.2	12.6	YES	
AVERAGE VERTICAL ILLUMINANCE (lux) (MIN) ~ (NB / EB)	1.0	1.1	1.6	YES	
AVERAGE VERTICAL ILLUMINANCE (lux) (MIN) ~ (SB / WB)	1.0	1.2	1.0	YES	
MAXIMUM UNIFORMITY RATIO					
	1. E_{avg} / E_{min}	4.0	1.7	2.5	YES

ILLUMINANCE TABLE - ROUNDABOUT - APPROACHES (OXFORD ST. W. AND GIDEON DR.)					
STREET CLASSIFICATION	MAJOR				
PEDESTRIAN CLASSIFICATION	LOW				
ROAD NAME		ILAP01	ILAP02	ILAP03	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	DESIGN RESULTS	DESIGN RESULTS	
AVERAGE ILLUMINANCE (lx) (MIN)	9.0	18.2	22.6	15.6	YES
MAXIMUM UNIFORMITY RATIO					
1. E_{avg} / E_{min}	3.0	2.0	2.5	2.7	YES

CROSSWALK DESIGN CRITERIA --- (REF "A01")	
INSCRIBED CIRCLE DIAMETER	45.0 m
NUMBER OF LANES	DOUBLE
	CRITERIA PER IES RP-8-18
DESIGN SPEED (TABLE 12-6)	25 km/h
SAFE STOPPING DISTANCE (TABLE 12-5)	31.2 m

ILLUMINANCE TABLE - ROUNDABOUT - MAIN (REF "A02")			
STREET CLASSIFICATION	MAJOR / MAJOR		
PEDESTRIAN CLASSIFICATION	LOW		
ROAD NAME		ILR01	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	
AVERAGE ILLUMINANCE (lux) (MIN)	18.0	22.6	YES
MAXIMUM UNIFORMITY RATIO			
1. E_{avg} / E_{min}	3.0	2.7	YES



**CORPORATION OF THE
CITY OF LONDON**

ENVIRONMENTAL & ENGINEERING SERVICES
DEPARTMENT
ROADWAY LIGHTING & TRAFFIC CONTROL
DIVISION

PHOTOMETRIC LAYOUT – LANE CONFIGURATION 12

LOCATION: OXFORD STREET W AT GIDEON DRIVE

HORIZONTAL-1:500
5.0 0 10m

[illegible]

LEGEND

(X01)	PHOTOMETRIC GRID ZONE ID: – GRID TYPE: CROSSWALK – MEASUREMENT: REFER TO TABLE – REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.	(LE1)	PHOTOMETRIC GRID ZONE ID: – GRID TYPE: CONTINUOUS ROADWAY – MEASUREMENT: HORIZONTAL LUMINANCE – EB: REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.
(ILR01)	PHOTOMETRIC GRID ZONE ID: – GRID TYPE: ROUNDABOUT – MEASUREMENT: HORIZONTAL ILLUMINANCE – REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.	(LW1)	PHOTOMETRIC GRID ZONE ID: – GRID TYPE: CONTINUOUS ROADWAY – MEASUREMENT: HORIZONTAL LUMINANCE – WB: REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.
(ILAP01)	PHOTOMETRIC GRID ZONE ID: – GRID TYPE: ROAD APPROACH – MEASUREMENT: HORIZONTAL ILLUMINANCE – REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.	(W1)	PHOTOMETRIC GRID ZONE ID: – GRID TYPE: CONTINUOUS ROADWAY – MEASUREMENT: HORIZONTAL AND VERTICAL ILLUMINANCE – REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.
(ILL01)	PHOTOMETRIC GRID ZONE ID: – GRID TYPE: ROAD ILLUMINANCE – MEASUREMENT: HORIZONTAL ILLUMINANCE – REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.		 SIDE-MOUNTED LED FIXTURE – ROADWAY SIDE FIXTURE – MOUNTING HEIGHT, ARM LENGTH, AND DISTRIBUTION TYPE AS PER DETAILS SHEET,  SIDE-MOUNTED LED FIXTURE – PEDESTRIAN SIDE FIXTURE – MOUNTING HEIGHT, ARM LENGTH, AND DISTRIBUTION TYPE AS PER DETAILS SHEET.

REFERENCE OBSERVER LOCATION

- REFER TO TABLE FOR PLACEMENT DETAILS
- LOCATION SET AS PER RP-8-18 REQUIREMENTS
- ASSOCIATED VERTICAL GRID POINTS ARE ANGLED TOWARD DRIVER'S SIDE SEAT.

NOTES:

1. PHOTOMETRIC ANALYSIS COMPLETED WITH LIGHTING ANALYSTS AGI32 LIGHTING SOFTWARE.
2. AGI32 SIMULATED RESULTS WITH AN LLF OF 0.74.
3. AGI3232 SIMULATED MOUNTING HEIGHTS AS PER LIGHTING DETAILS SHEET. REFER TO COVER SHEET DRAWING INDEX.
4. ALL FIXTURES USED IN THIS ANALYSIS ARE DARK-SKY COMPLIANT WITH FULL CUT-OFF AND AN UPLIGHT RATING OF ZERO.
5. LED FIXTURES CHOSEN ARE PER CITY OF LONDON'S 2021-01-14 DRAWING LIST. LAST CHECKED MAY 2021.



PHOTOMETRIC LAYOUT – LANE CONFIGURATION 2

HORIZONTAL-1:500

5.0 0 10m

A horizontal scale bar with a black and white checkered pattern on the left side, indicating a scale of 1:500. The bar is marked with '5.0', '0', and '10m'.[illegible]

X01 PHOTOMETRIC GRID ZONE ID: - GRID TYPE: CROSSWALK - MEASUREMENT: REFER TO TABLE - REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.	LE1 PHOTOMETRIC GRID ZONE ID: - GRID TYPE: CONTINUOUS ROADWAY - MEASUREMENT: HORIZONTAL LUMINANCE - EB: REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.
ILR01 PHOTOMETRIC GRID ZONE ID: - GRID TYPE: ROUNDABOUT - MEASUREMENT: HORIZONTAL ILLUMINANCE - REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.	LW1 PHOTOMETRIC GRID ZONE ID: - GRID TYPE: CONTINUOUS ROADWAY - MEASUREMENT: HORIZONTAL LUMINANCE - WB: REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.
ILAP01 PHOTOMETRIC GRID ZONE ID: - GRID TYPE: ROAD APPROACH - MEASUREMENT: HORIZONTAL ILLUMINANCE - REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.	W1 PHOTOMETRIC GRID ZONE ID: - GRID TYPE: CONTINUOUS ROADWAY - MEASUREMENT: HORIZONTAL AND VERTICAL ILLUMINANCE - REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.
ILL01 PHOTOMETRIC GRID ZONE ID: - GRID TYPE: ROAD ILLUMINANCE - MEASUREMENT: HORIZONTAL ILLUMINANCE - REFER TO POINTER LOCATION FOR RESPECTIVE GRID LOCATION.	SIDE-MOUNTED LED FIXTURE - ROADWAY SIDE FIXTURE - MOUNTING HEIGHT, ARM LENGTH, AND DISTRIBUTION TYPE AS PER DETAILS SHEET.
SIDE-MOUNTED LED FIXTURE - PEDESTRIAN SIDE FIXTURE - MOUNTING HEIGHT, ARM LENGTH, AND DISTRIBUTION TYPE AS PER DETAILS SHEET.	

REFERENCE OBSERVER LOCATION

- REFER TO TABLE FOR PLACEMENT DETAILS
- LOCATION SET AS PER RP-8-18 REQUIREMENTS
- ASSOCIATED VERTICAL GRID POINTS ARE ANGLED TOWARD DRIVER'S SIDE SEAT.

1. PHOTOMETRIC ANALYSIS COMPLETED WITH LIGHTING ANALYSTS AG32 LIGHTING SOFTWARE.
2. AG32 SIMULATED RESULTS WITH AN LLF OF 0.74.
3. AG3232 SIMULATED MOUNTING HEIGHTS AS PER LIGHTING DETAILS SHEET. REFER TO COVER SHEET DRAWING FOR MOUNTING HEIGHTS.
4. ALL FIXTURES USED IN THIS ANALYSIS ARE DARK-SKY COMPLIANT WITH FULL CUT-OFF AND AN UPLIGHT RATING OF ZERO.
5. LED FIXTURES CHOSEN ARE PER CITY OF LONDON'S 2021-01-14 DRAWING LIST. LAST CHECKED, MAY 2021.

LUMINANCE TABLE - ROAD - EASTBOUND (OXFORD ST. W.)			
STREET CLASSIFICATION	MAJOR		
PEDESTRIAN CLASSIFICATION	LOW		
ROAD NAME		LE-1	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	
AVERAGE LUMINANCE (cd/m ²) (MIN)	0.6	0.7	YES
MAXIMUM UNIFORMITY RATIO			
1. L_{avg} / L_{min}	3.5	2.5	YES
2. L_{max} / L_{avg}	6.0	5.3	YES
MAXIMUM VEILING LUMINANCE $L_{avg} / L_{veiling}$	0.3	0.3	YES

LUMINANCE TABLE - ROAD - WESTBOUND (OXFORD ST. W.)			
STREET CLASSIFICATION	MAJOR		
PEDESTRIAN CLASSIFICATION	LOW		
ROAD NAME		LW-1	MEETING CRITERIA (YES / NO)
	REQUIREMENT PER IES RP-8-18	DESIGN RESULTS	
AVERAGE LUMINANCE (cd/m ²) (MIN)	0.6	0.8	YES
MAXIMUM UNIFORMITY RATIO			
1. L_{avg} / L_{min}	3.5	2.1	YES
2. L_{max} / L_{avg}	6.0	4.0	YES
MAXIMUM VEILING LUMINANCE $L_{avg} / L_{veiling}$	0.3	0.2	YES

