



Parks & Landscape Services Section, Municipal Services Department

**Proposed Development of an All-Weather
Pitch at Coláiste Eoin/Íosagain
PC/PKS/01/18**

Appendix 1 – Floodlighting Design & Report

**Proposed Floodlighting at Colaiste Eoin
Blackrock, Co. Dublin**

Sports Lighting Proposal
Compiled by Neil McSherry BEng MIET

16th March 2018

Eoin O'Brien
Senior Executive Parks Superintendent, Landscape Architect, MILI
Parks and Landscape Services,
Municipal Services Department
Dún Laoghaire Rathdown County Council,
Marine Road, Dún Laoghaire, Co. Dublin, Ireland

RE: Proposed Floodlighting at Colaiste Eoin

Dear Mr O'Brien,

As instructed, Musco Lighting Europe has undertaken the sports lighting design for the proposed GAA Pitch. Our design is prepared in compliance with:

- ***Chartered Institute of Building Services Engineers Lighting Guide 4: Sports Lighting (CIBSE LG4)***
- ***Institute of Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light GN01:2011***

Terminology

In order to ensure clarity and understanding, some typical floodlighting and project specific terms have been defined/explained to assist in the reading and evaluation of this document and the design documents:

- **Horizontal Illuminance** - the level of light at a given point measured on a horizontal plane, such as the sports pitch, footpath, or a desk. Often used in sports applications as a visual and playability evaluation of light. Measured by holding the light meter horizontal to the ground, facing toward the sky.
- **Vertical Illuminance (E_v)** - the level of light at a given point measured on a vertical plane, such as a wall, the side of a building, or window. Measured by holding the light meter vertically towards the light source.
- **Lux** - unit of measure for illumination.
 - Sunny Day = 50,000 - 150,000 lux
 - Overcast Day = 5,000 - 10,000 lux
 - Major sports stadium = 2,000 - 3,000 lux
 - Office lighting = 300 - 500 lux
 - Roadway lighting = 15 - 30 lux
 - Sunset = 10 lux
- **Luminaire** - Light fitting/floodlight
- **Uniformity (E_{min}/E_{av})** - Evaluation of how well distributed the light is across a given area. Expressed as a ratio of minimum point divided by the average of all points.
- **Metal Halide (HID)** - Traditional lamp technology used in sports lighting. Combines specific gases and electricity to produce light.
- **LED** - (Light Emitting Diode) - Light is produced electronically using a semiconductor

The objective of the design was to produce a system compliant with CIBSE LG4 as follows:

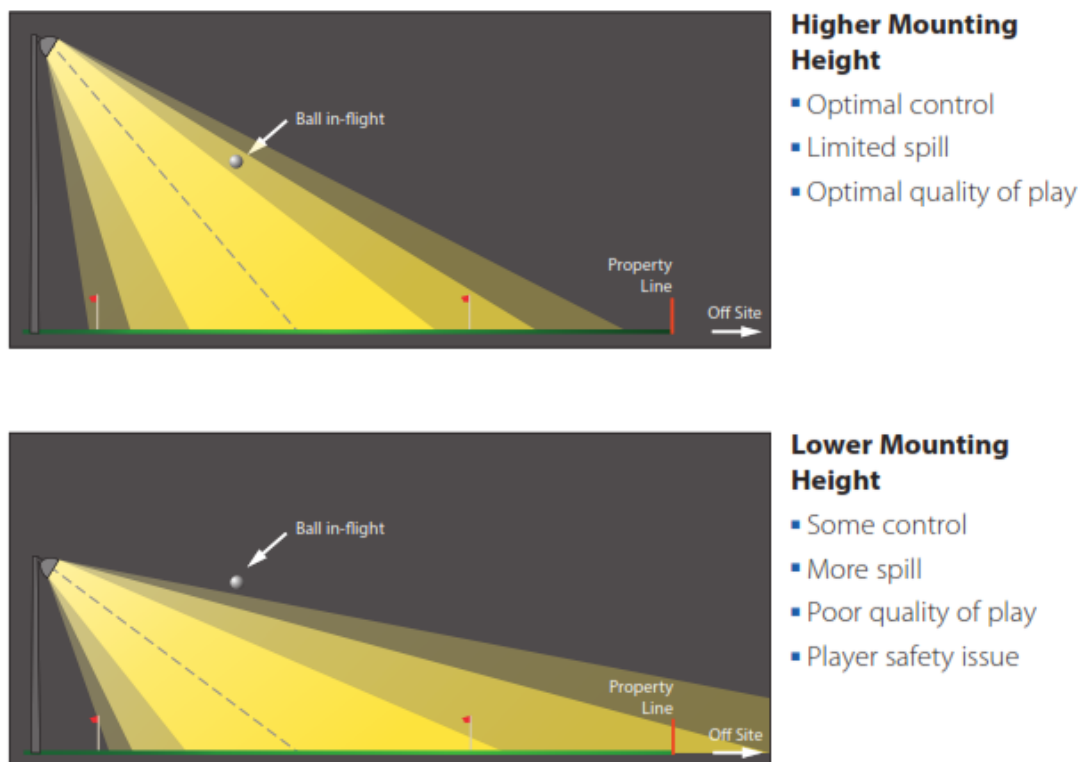
Class I GAA - 500 lux Horizontal average, 0.7 Emin/Eav uniformity

In accordance with the **ILP Guidance Notes for the Reduction of Obtrusive Light GN01:2011** the local area can be classified as a suburban environment and therefore Environmental Zone 'E3' applies. E3 areas are defined for lighting purposes as 'Medium District Brightness Areas' (Table 1) and typically include suburban locations. In accordance with Table 2, Light Intrusion into Windows is limited to 10 lux vertical (E_v). Musco's design is compliant with this requirement with a maximum Light Intrusion into Windows of 8.73 lux vertical (E_v) as demonstrated on page 7 of the lighting design document 190498D.

The developed design is optimised for compliance with **ILP Guidance Notes for the Reduction of Obtrusive Light GN01:2011** by minimising obtrusive light; Spill, sky glow and glare. This is achieved in the following ways:

1. Column height, number of columns and aiming angles

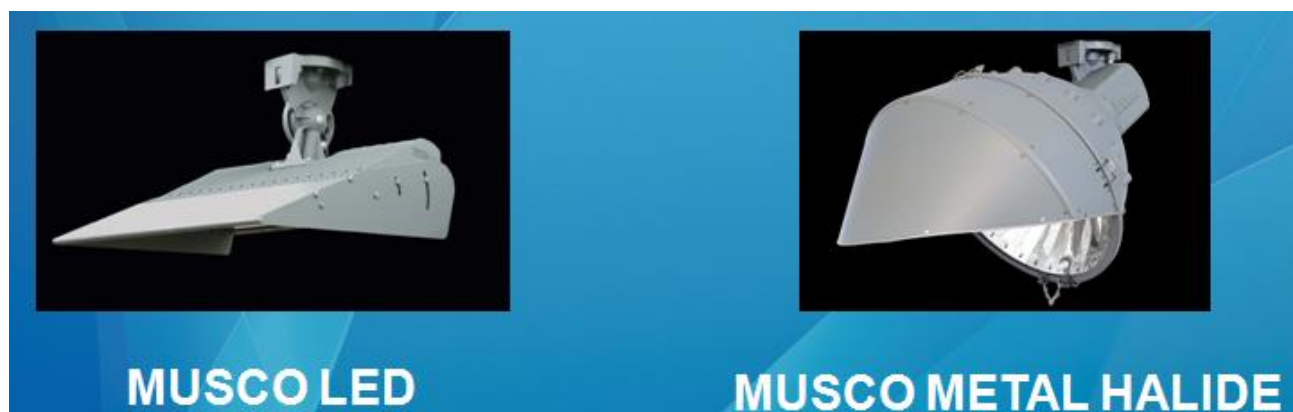
Choosing appropriate number of columns and column heights is key to the overall quality of the lighting design. Based on the size of the pitch, the sport being played, the competition level, and the use of the floodlighting system (televised or non-televised); column number and height requirements must be accurately assessed to ensure the aiming angle of the floodlight onto the pitch is at an appropriate degree to maintain good playability, control glare, and reduce spill light on adjoining landscape or properties. See the diagram below:



GAA is by its nature is an aerial sport, in particular the *sliotar* is a fast moving small object, which requires adequate levels of light both at pitch level and at height. In order to provide adequate light levels for this type of sport, correct height of column needs to be carefully considered. Shorter columns with shallow aiming angles, will not provide light for the ball in flight, will cause unplayable levels of glare and will increase spill to the adjacent roads and residences. Choosing columns at an adequate height - proposed to be 18m for the Musco design will allow the aiming of the floodlights to be at a more downward angle to the pitch, thus minimising spill and glare. This height will also facilitate the ball in flight in accordance with the ILP Guidance Notes on the Reduction of Obtrusive Light GN01:2011 (page 5). This will ensure good playability and consideration for the health and safety of the players.

2. Class Leading Light Control

The proposal uses Musco's Light Structure Green TLC-LED-1150 system. The Musco LED system luminaire is markedly different in design than Musco's metal halide system. While the traditional metal halide luminaire was efficient and provided class leading light control, the Musco LED luminaire has advanced light control even further. Note the two images below.



Musco is a leading international sports lighting company with thousands of installations worldwide. We are leaders in the development of LED technology for sports lighting applications. Some high profile installations in the UK include:

- Twickenham Stadium
- Emirates Stadium
- Wimbledon Centre Court
- Tottenham Hotspur – New Stadium Development

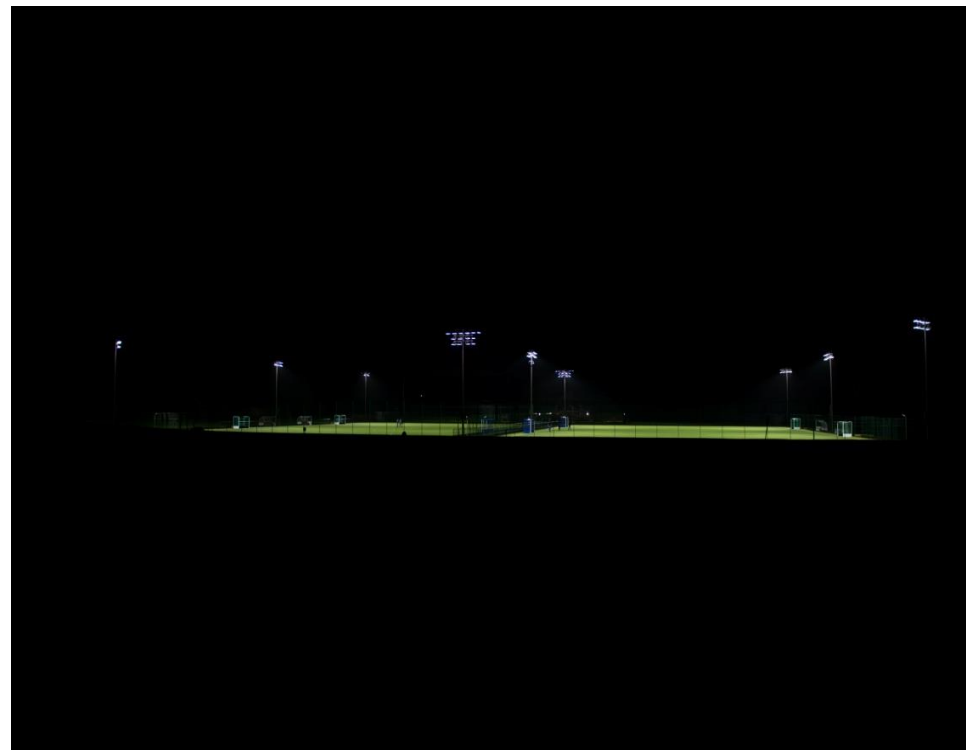
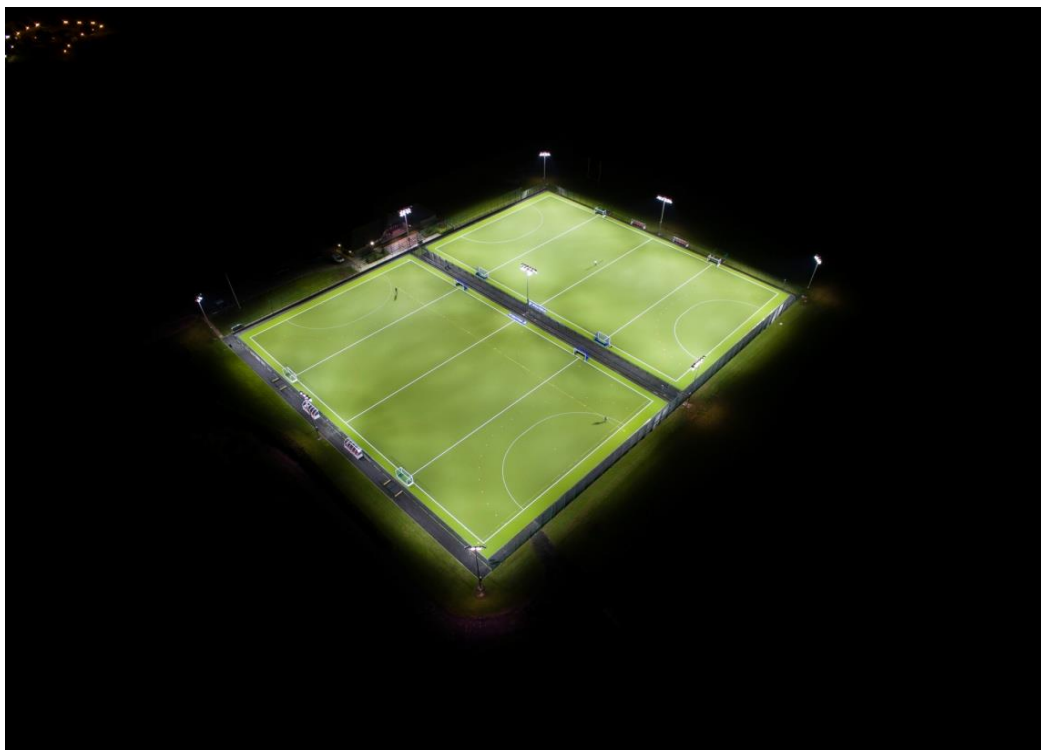
The following images of completed projects illustrate the enhanced spill control of the LED system over traditional metal halide technologies.



PHOTOS OF THE MUSCO LED SYSTEM FOR COMPARISON

MILLFIELD SCHOOL GLASTONBURY, ENGLAND

Installation of Musco LED system on two hockey pitches. Light levels are 350 lux & 500 lux.



Fulham FC Training



Arsenal Training Academy



3. Patented Technological Advancements

The Musco LED system is designed to perform for more than ten times as long as traditional metal halide system (L90 51,000 hours). This means less maintenance required, thus less disturbance on the surrounding area. Musco offers a fully inclusive 10 year warranty with the entire system, so it will never fall into disrepair.

The environmental impact with regard to energy consumption and CO2 emissions is significantly reduced with the proposed LED system. Analysis of both technologies shows the LED system will reduce energy and CO2 emissions by around 66% over 2kW metal halide systems.

In addition metal halide systems apply a maintenance factor, typically of 0.8 to counteract light depreciation. It should be noted that this will result in initial light levels including spill being 25% higher than the average designed lighting level on metal halide solutions.

Attachments

1. 18599D Lighting Design
2. TLC-LED-1150W Luminaire Data Sheet

Colaiste Eoin School

Blackrock,LEINSTER

Lighting System

Pole / Fixture Summary						
Pole ID	Pole Height	Mtg Height	Fixture Qty	Luminaire Type	Load	Group
P1, P3-P4, P6	18.0	18.0	7	TLC-LED-1150	8.05 kW	A
P2, P5	18.0	18.0	6	TLC-LED-1150	6.90 kW	A
6			40		46.00 kW	

Group Summary			
Group	Description	Load	Fixture Qty
A	GAA Pitch	46.0 kW	40

Fixture Type Summary							
Type	Source	Wattage	Lumens	L90	L80	L70	Quantity
TLC-LED-1150	LED 5700K - 75 CRI	1150W	121,000	>51,000	>51,000	>51,000	40

Light Level Summary

Calculation Grid Summary								
Grid Name	Calculation Metric	Illumination					Groups	Fixture Qty
		Ave	Min	Max	Min/Max	Min/Ave		
100m Spill Blanket	Horizontal	3.32	0	106	0.00	0.00	A	40
100m Spill Blanket	Max Vert Illuminance (by Light Bank)	4.46	0	186	0.00	0.00	A	40
GAA Pitch	Horizontal Illuminance	510	436	676	0.65	0.86	A	40
LTW 1	Max Vertical Illuminance Metric	0	0	0	0.00	0.00	A	40
LTW 2	Max Vertical Illuminance Metric	0.14	0	0.85	0.00	0.00	A	40
LTW 3	Max Vertical Illuminance Metric	1.22	0	8.73	0.00	0.00	A	40
LTW 4	Max Vertical Illuminance Metric	0	0	0	0.00	0.00	A	40
Soccer	Horizontal Illuminance	512	436	676	0.65	0.85	A	40

From Hometown to Professional



EQUIPMENT LIST FOR AREAS SHOWN								
Pole			Luminaires					
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
4	P1, P3-P4 P6	18m	-	18m	TLC-LED-1150	7	7	0
2	P2, P5	18m	-	18m	TLC-LED-1150	6	6	0
6	TOTALS					40	40	0

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GRID SUMMARY	
Name:	GAA Pitch
Size:	120.0m x 64.0m
Spacing:	10.0m x 10.0m
Height:	1.0m above grade

ILLUMINATION SUMMARY			
MAINTAINED HORIZONTAL LUX			
	Entire Grid		
Guaranteed Average:	500		
Scan Average:	509.82		
Maximum:	676		
Minimum:	436		
Guaranteed Min / Avg:	0.7		
Min / Avg:	0.86		
Min / Max:	0.65		
UG (adjacent pts):	1.40		
CU:	0.95		
No. of Points:	91		
LUMINAIRE INFORMATION			
Color / CRI:	5700K - 75 CRI		
Luminaire Output:	121,000 lumens		
No. of Luminaires:	40		
Total Load:	46.0 kW		
Lumen Maintenance			
Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1150	>51,000	>51,000	>51,000
Reported per TM-21-11. See luminaire datasheet for details.			

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

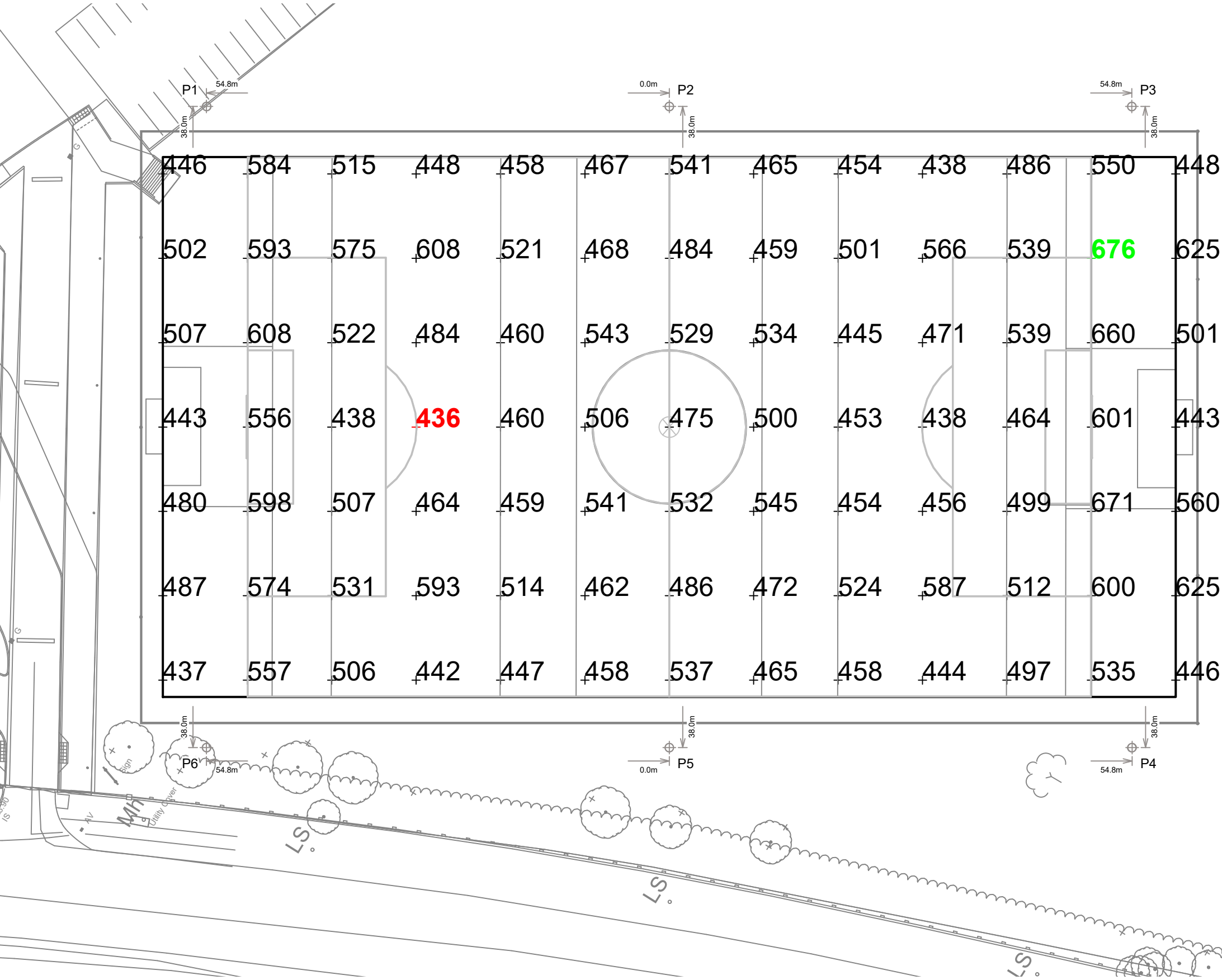
Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



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ILLUMINATION SUMMARY



EQUIPMENT LIST FOR AREAS SHOWN								
Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
4	P1, P3-P4 P6	18m	-	18m	TLC-LED-1150	7	7	0
2	P2, P5	18m	-	18m	TLC-LED-1150	6	6	0
6	TOTALS					40	40	0

Colaiste Eoin School
Blackrock, LEINSTER

GRID SUMMARY	
Name:	Soccer
Size:	100.0m x 64.0m
Spacing:	10.0m x 10.0m
Height:	1.0m above grade

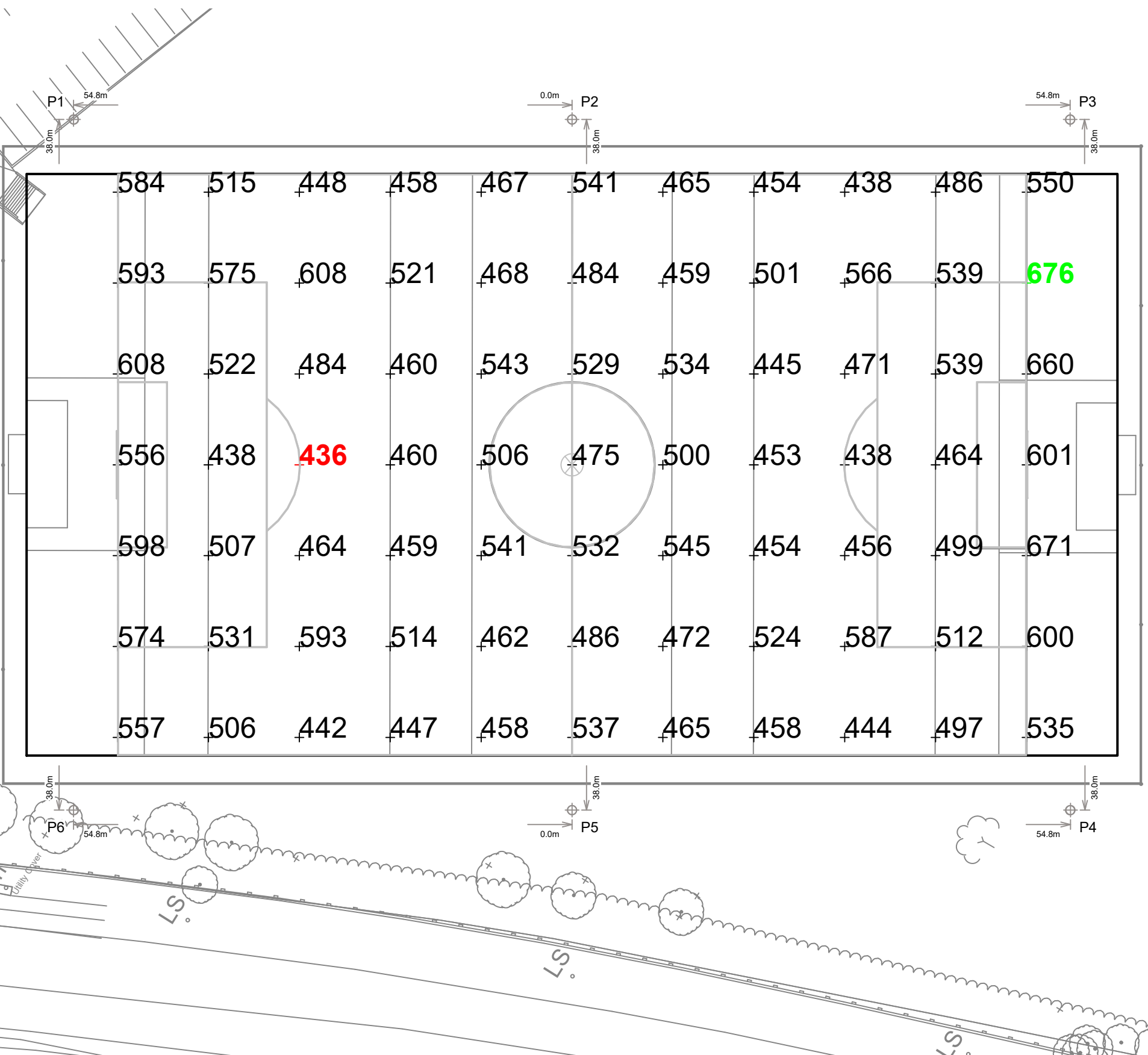
ILLUMINATION SUMMARY				
MAINTAINED HORIZONTAL LUX				
	Entire Grid			
Guaranteed Average:	500			
Scan Average:	512.25			
Maximum:	676			
Minimum:	436			
Guaranteed Min / Avg:	0.7			
Min / Avg:	0.85			
Min / Max:	0.65			
UG (adjacent pts):	1.36			
CU:	0.80			
No. of Points:	77			
LUMINAIRE INFORMATION				
Color / CRI:	5700K - 75 CRI			
Luminaire Output:	121,000 lumens			
No. of Luminaires:	40			
Total Load:	46.0 kW			
Lumen Maintenance				
Luminaire Type	L90 hrs	L80 hrs	L70 hrs	
TLC-LED-1150	>51,000	>51,000	>51,000	
Reported per TM-21-11. See luminaire datasheet for details.				

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ILLUMINATION SUMMARY

EQUIPMENT LIST FOR AREAS SHOWN							
Pole			Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID
4	P1, P3-P4 P6	18m	-	18m	TLC-LED-1150	7	7
2	P2, P5	18m	-	18m	TLC-LED-1150	6	6
6	TOTALS					40	40
						0	0

Colaiste Eoin School
Blackrock, LEINSTER

GRID SUMMARY	
Name:	100m Spill Blanket
Size:	100.0m x 64.0m
Spacing:	10.0m x 10.0m
Height:	1.0m above grade

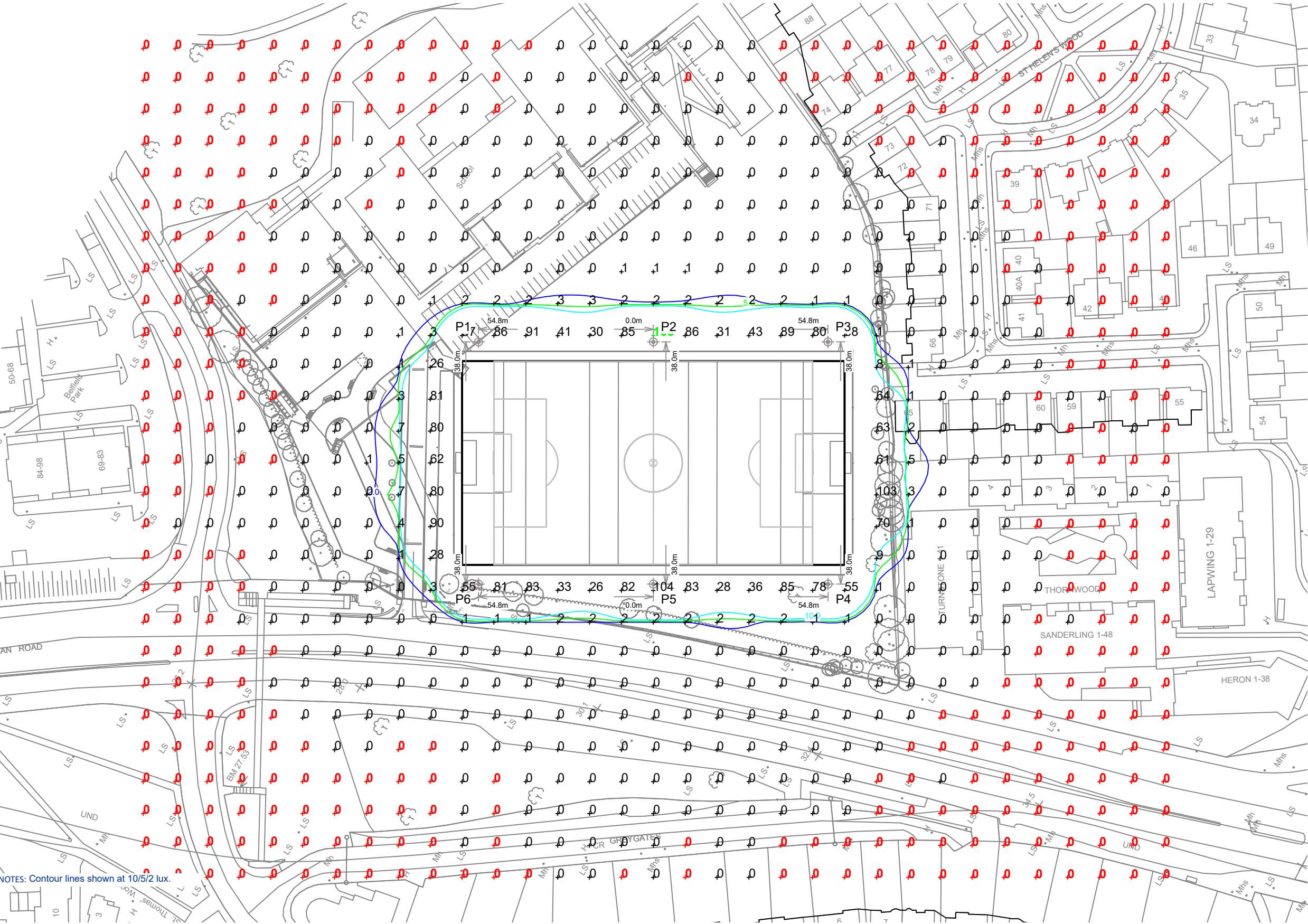
ILLUMINATION SUMMARY				
MAINTAINED HORIZONTAL LUX				
		Entire Grid		
Scan Average:		3.32		
Maximum:		106		
Minimum:		0		
No. of Points:		800		
LUMINAIRE INFORMATION				
Color / CRI:		5700K - 75 CRI		
Luminaire Output:		121,000 lumens		
No. of Luminaires:		40		
Total Load:		46.0 kW		
Lumen Maintenance				
Luminaire Type	L90 hrs	L80 hrs	L70 hrs	
TLC-LED-1150	>51,000	>51,000	>51,000	
Reported per TM-21-11. See luminaire datasheet for details.				

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

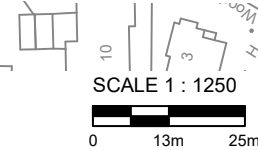
Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume $\pm 3\%$ nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



NOTES: Contour lines shown at 10/5/2 lux.



Pole location(s) \oplus dimensions are relative to 0,0 reference point(s) \otimes



EQUIPMENT LIST FOR AREAS SHOWN							
Pole			Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID
4	P1, P3-P4	18m	-	18m	TLC-LED-1150	7	7
2	P2, P5	18m	-	18m	TLC-LED-1150	6	6
6	TOTALS					40	40
							0

Colaiste Eoin School

Blackrock, LEINSTER

GRID SUMMARY	
Name:	100m Spill Blanket
Size:	100.0m x 64.0m
Spacing:	10.0m x 10.0m
Height:	1.0m above grade

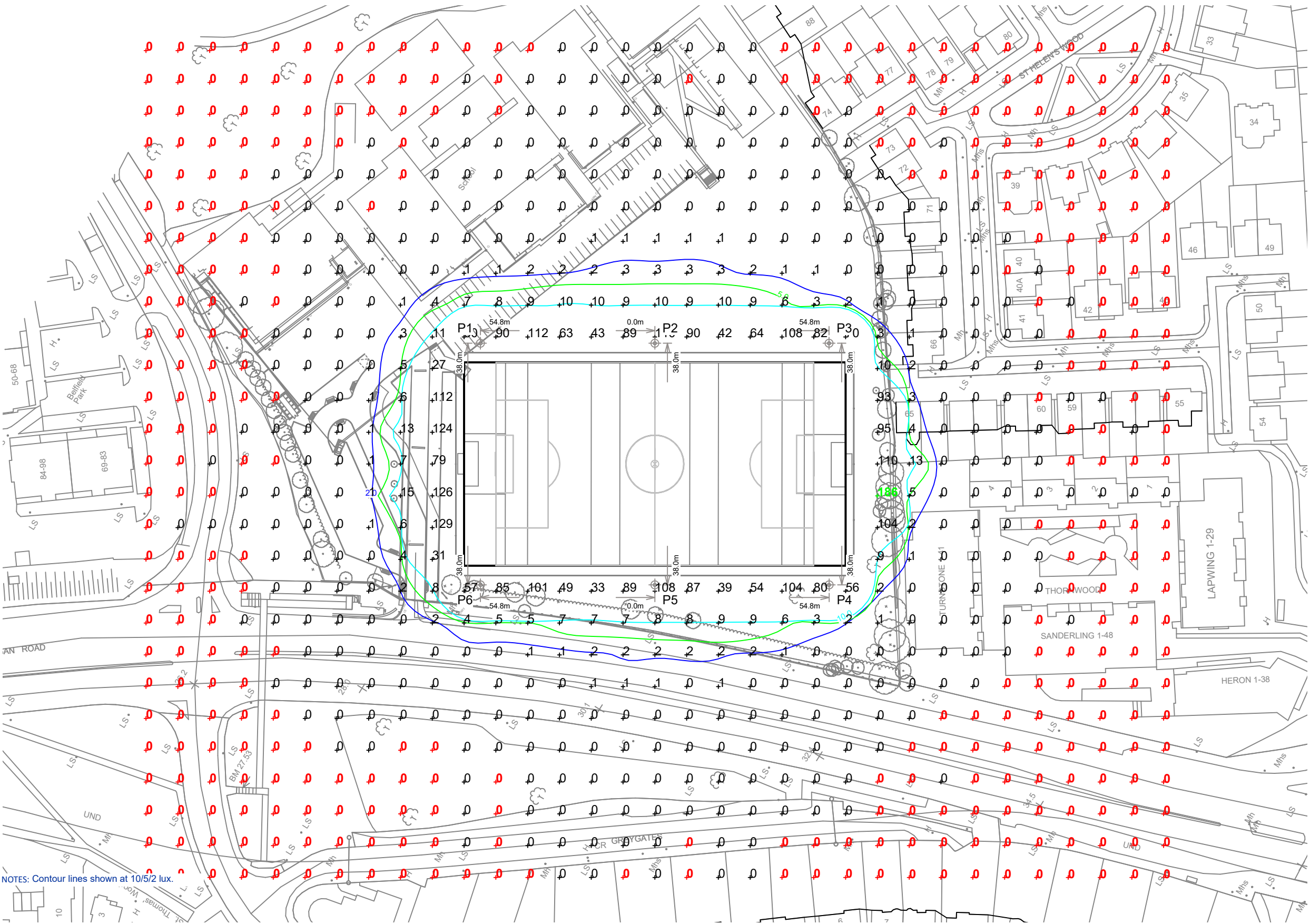
ILLUMINATION SUMMARY				
MAINTAINED MAX VERTICAL LUX				
		Entire Grid		
Scan Average:	4.46			
Maximum:	186			
Minimum:	0			
No. of Points:	800			
LUMINAIRE INFORMATION				
Color / CRI:	5700K - 75 CRI			
Luminaire Output:	121,000 lumens			
No. of Luminaires:	40			
Total Load:	46.0 kW			
Lumen Maintenance				
Luminaire Type	L90 hrs	L80 hrs	L70 hrs	
TLC-LED-1150	>51,000	>51,000	>51,000	
Reported per TM-21-11. See luminaire datasheet for details.				

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Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume $\pm 3\%$ nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



NOTES: Contour lines shown at 10/5/2 lux.

SCALE 1 : 1250
0 13m 25m

Pole location(s) \oplus dimensions are relative to 0,0 reference point(s) \otimes



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ILLUMINATION SUMMARY

EQUIPMENT LIST FOR AREAS SHOWN								
Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
4	P1, P3-P4 P6	18m	-	18m	TLC-LED-1150	7	7	0
2	P2, P5	18m	-	18m	TLC-LED-1150	6	6	0
6	TOTALS					40	40	0



Colaiste Eoin School

Blackrock, LEINSTER

GRID SUMMARY		
Name:	LTW 1	
Spacing:	5.0m	
Height:	1.5m above grade	

ILLUMINATION SUMMARY			
MAINTAINED MAX VERTICAL LUX			
		Entire Grid	
Scan Average:	0.0000		
Maximum:	0.00		
Minimum:	0.00		
No. of Points:	23		
LUMINAIRE INFORMATION			
Color / CRI:	5700K - 75 CRI		
Luminaire Output:	121,000 lumens		
No. of Luminaires:	40		
Total Load:	46.0 kW		
Lumen Maintenance			
Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1150	>51,000	>51,000	>51,000
Reported per TM-21-11. See luminaire datasheet for details.			

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

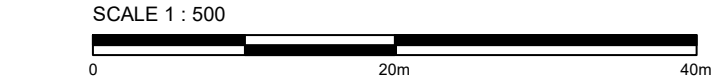
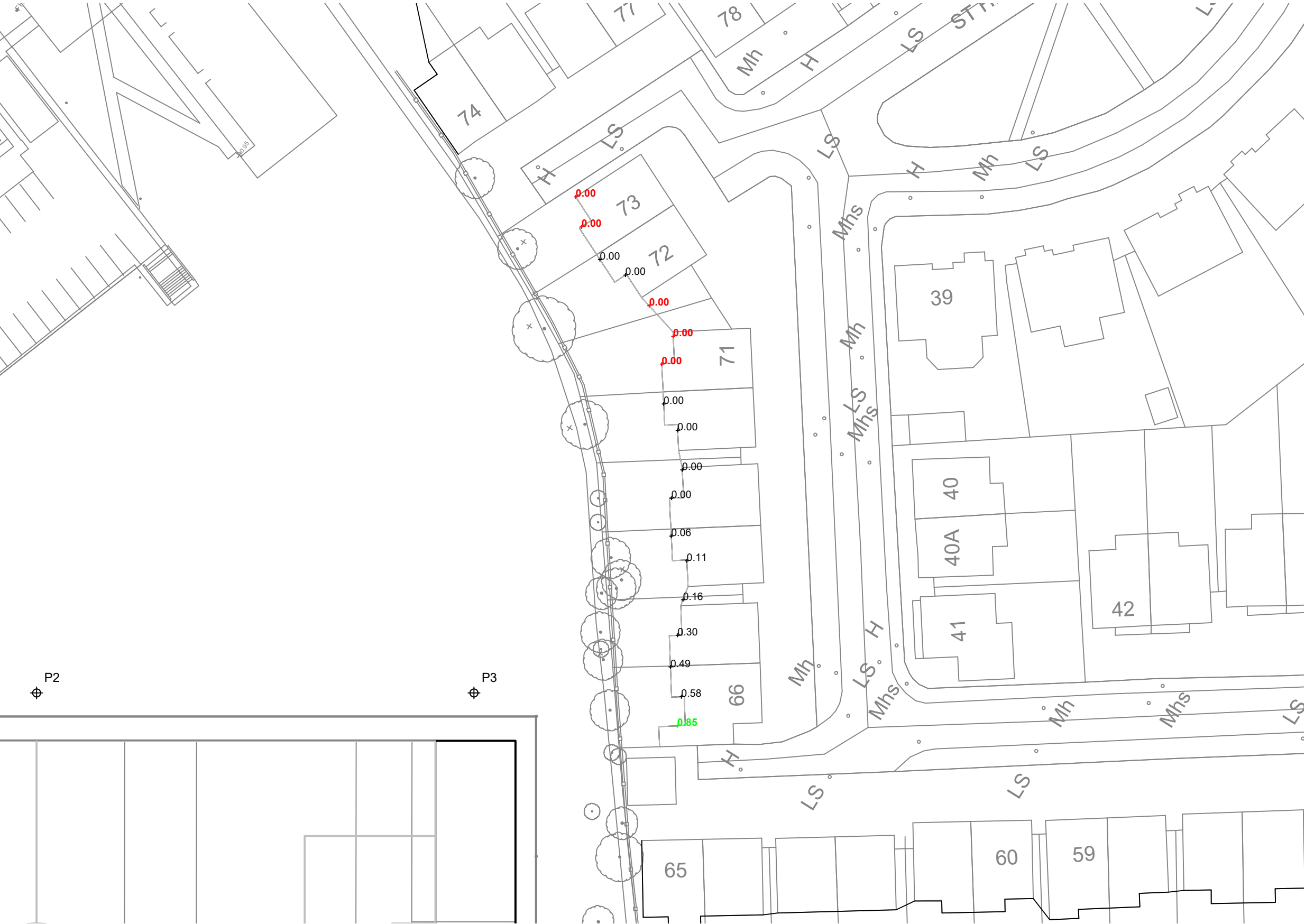
Installation Requirements: Results assume $\pm 3\%$ nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



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ILLUMINATION SUMMARY

EQUIPMENT LIST FOR AREAS SHOWN								
Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
4	P1, P3-P4 P6	18m	-	18m	TLC-LED-1150	7	7	0
2	P2, P5	18m	-	18m	TLC-LED-1150	6	6	0
6	TOTALS					40	40	0



Colaiste Eoin School
Blackrock, LEINSTER

GRID SUMMARY	
Name:	LTW 2
Spacing:	5.0m
Height:	1.5m above grade

ILLUMINATION SUMMARY			
MAINTAINED MAX VERTICAL LUX			
		Entire Grid	
Scan Average:		0.1422	
Maximum:		0.85	
Minimum:		0.00	
No. of Points:		18	
LUMINAIRE INFORMATION			
Color / CRI:		5700K - 75 CRI	
Luminaire Output:		121,000 lumens	
No. of Luminaires:		40	
Total Load:		46.0 kW	
Lumen Maintenance			
Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1150	>51,000	>51,000	>51,000
Reported per TM-21-11. See luminaire datasheet for details.			

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



EQUIPMENT LIST FOR AREAS SHOWN								
Pole				Luminaires				
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
4	P1, P3-P4 P6	18m	-	18m	TLC-LED-1150	7	7	0
2	P2, P5	18m	-	18m	TLC-LED-1150	6	6	0
6	TOTALS					40	40	0



Colaiste Eoin School
Blackrock, LEINSTER

GRID SUMMARY	
Name:	LTW 3
Spacing:	5.0m
Height:	1.5m above grade

ILLUMINATION SUMMARY				
MAINTAINED MAX VERTICAL LUX				
		Entire Grid		
Scan Average:		1.2238		
Maximum:		8.73		
Minimum:		0.00		
No. of Points:		26		
LUMINAIRE INFORMATION				
Color / CRI:		5700K - 75 CRI		
Luminaire Output:		121,000 lumens		
No. of Luminaires:		40		
Total Load:		46.0 kW		
Lumen Maintenance				
Luminaire Type	L90 hrs	L80 hrs	L70 hrs	
TLC-LED-1150	>51,000	>51,000	>51,000	
Reported per TM-21-11. See luminaire datasheet for details.				

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Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.



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ILLUMINATION SUMMARY

Colaiste Eoin School
Blackrock, LEINSTER

EQUIPMENT LAYOUT

INCLUDES:

- GAA Pitch
- Soccer

Electrical System Requirements: Refer to Amperage Draw Chart and/or the "Musco Control System Summary" for electrical sizing.

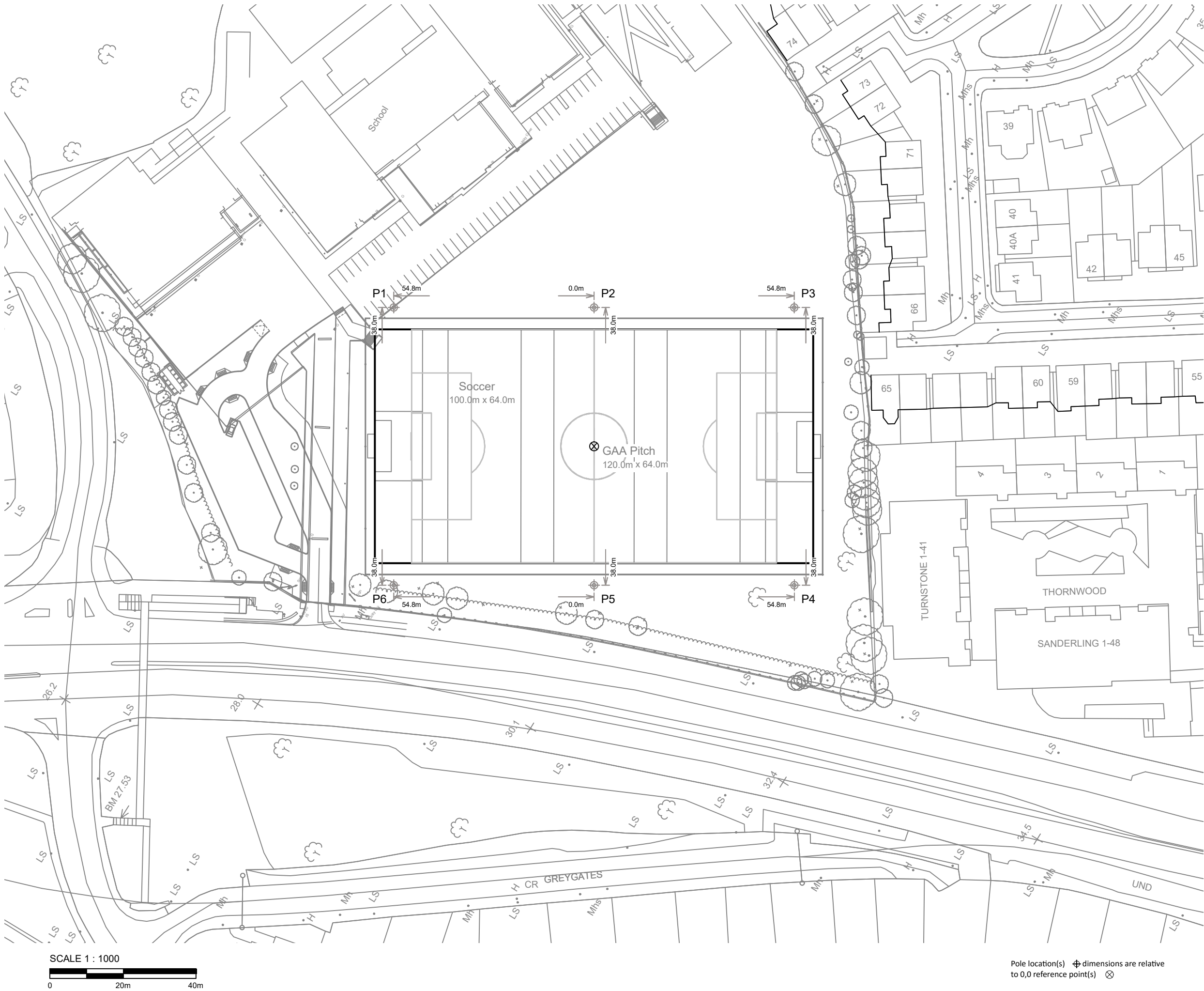
Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

EQUIPMENT LIST FOR AREAS SHOWN

Pole				Luminaires		
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE
4	P1, P3-P4 P6	18m	-	18m	TLC-LED-1150	7
2	P2, P5	18m	-	18m	TLC-LED-1150	6
6	TOTALS					40

SINGLE LUMINAIRE AMPERAGE DRAW CHART

Ballast Specifications (.90 min power factor)	Line Amperage Per Luminaire (max draw)						
	208 (60)	220 (60)	240 (60)	277 (60)	347 (60)	380 (60)	480 (60)
TLC-LED-1150	6.8	6.5	5.9	5.1	4.1	3.7	3.0



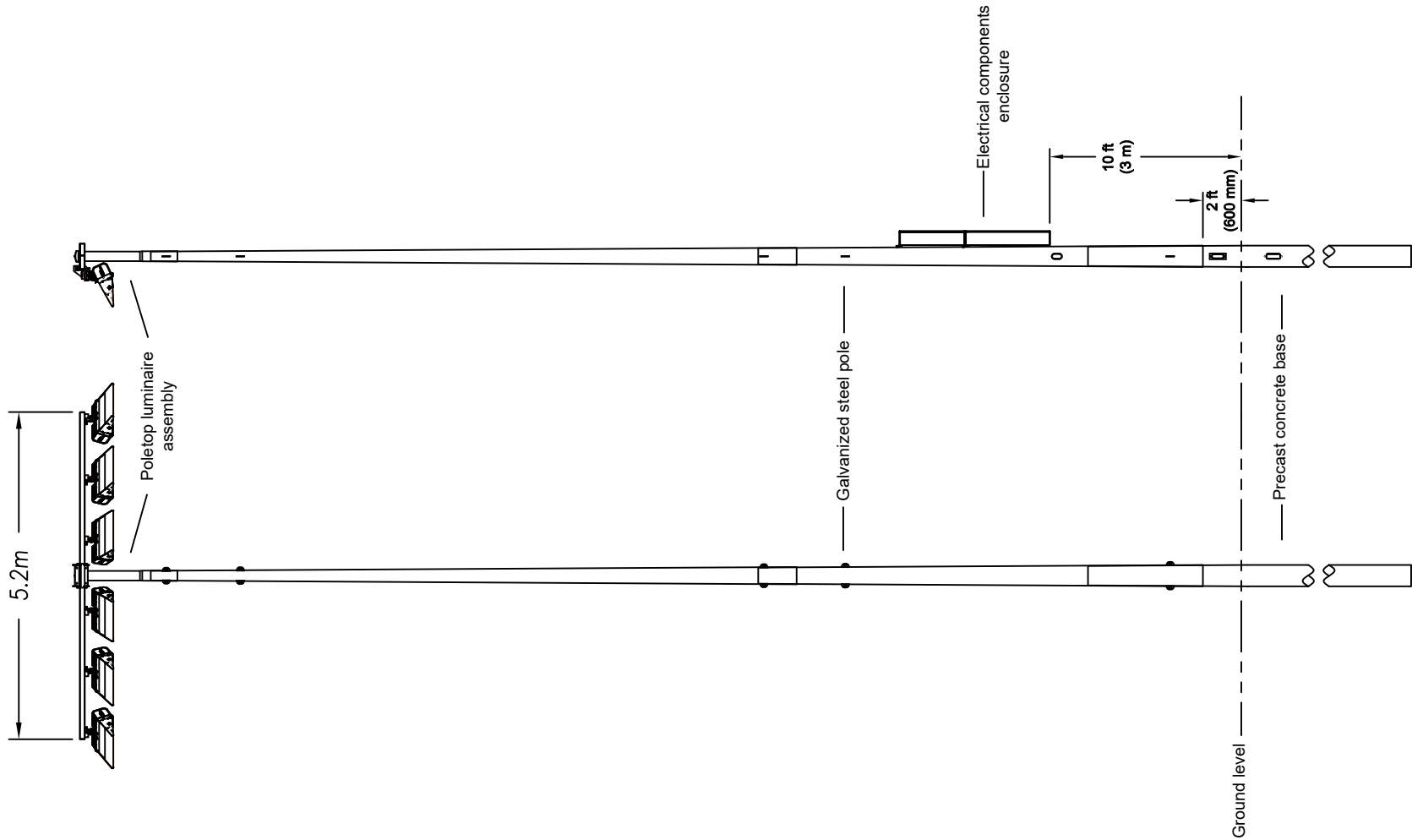
Pole location(s) ⚡ dimensions are relative to 0,0 reference point(s) ⊗



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POLE(S): P1, P3, P4, P6
Musco 60FT Light-Structure System™ pole
TLC for LED™ luminaires



SCALE: 1:100

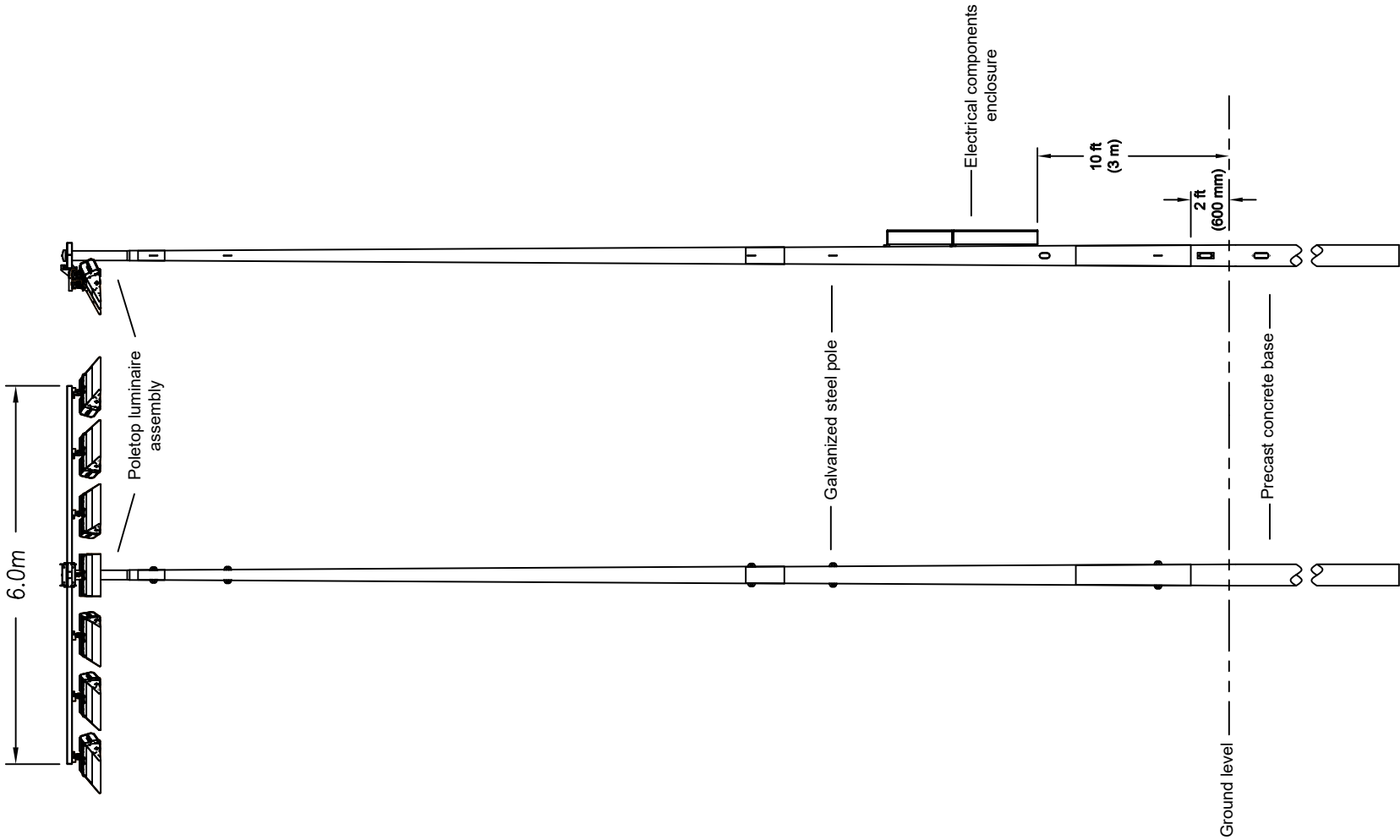
REVISIONS:	
DATE:	BY: R.L.

JOB NUMBER:	190498
DRAWN BY:	N.KEROLOS
CHECK BY:	NK
REPRESENTATIVE:	N.Mcsherry
SCALE:	1:100
DATE:	3/15/18
DRAWING NUMBER:	190498P1
1 OF 1 SHEETS	

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Blackrock, LEINSTER
Pole Configuration Drawing

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POLE(S): P2, P5
Musco 60FT Light-Structure System™ pole
TLC for LED™ luminaires



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