



LIGHTING IMPACT REPORT & OVERSPILL READINGS

Ref: Wide Lane Sports Ground

Wide Lane Sports Ground

REPORT BY: JS
11/03/24

Contents

1. Introduction

- 1.1 Site context
- 1.2 Local authority consultation
- 1.3 Guidance

2. Design parameters

- 2.1 Field of play
- 2.2 Footpath

3. Summery of findings

- 3.1 Floodlight type and FOP calculation
- 3.2 Footpath

4. Summery

Tables

Table 1: FOP lighting calculation summary, field of play horizontal plane (MF = 0.90) 5

Table 2: Equipment and FOP lighting calculation summary 6

Table 3: Summary of areas likely to satisfy the requirement 6

Table 4: Footpath lighting calculation summary, horizontal plane 6

Figures

Figure 1: Site context 1

Figure 2: Typical spectrum of 4,000K (left) and 3,000K (right) light sources note the lower blue peak for 3,000K 3

Figure 3: Constant Lumen Output (CLO) technology example 3

Figure 4: Floodlight photograph (note the floodlight will include cowls) 4

Figure 5: Section drawing of proposed floodlight, note the upward light limiting cowls. 4

Figure 6: Location of 10m vertical calculation planes 4

Figure 7: Footpath lighting lantern. 5

Figure 8: Footpath plan 6

Figure 9: 200lux FOP, horizontal plane A-1

Figure 10: Vertical planes, 200lux at 0m direct and indirect A-1

Figure 11: Vertical planes, 200lux at 2m direct and indirect A-1

Figure 12: Vertical planes, 200lux at 4m direct and indirect A-1

Figure 13: Vertical planes, 200lux at 6m direct and indirect A-1

Figure 14: Vertical planes, 200lux at 8m direct and indirect A-1

Figure 14: Vertical planes, 200lux at 10m direct and indirect A-1

Figure 16: Footpath illuminance and spill light A-2

Appendices

Appendix A A-1

Calculation Information A-1

A.1 Field of Play A-1

A.2 Footpath A-2

Appendix B B-1

Floodlight Masts B-1

B.1 New and Existing Elevation

Introduction

This report has been commissioned by Halliday Lighting to examine the proposed lighting installation at Wide Lane Sports Ground. The proposed lighting consists of twenty six number Siteco FL11 BLC 3 Module LED's and twelve 18m lighting columns to light the Rugby/football pitches for recreational play and general games to allow safe playing conditions in the winter months. The report has been produced by Halliday Lighting, a specialist Sports Lighting Contractor with over 60 years of experience in Sports Lighting Engineering.

Site Location

The sports pitch is located in Southampton and is indicated on the aerial view below.



Figure 1: 1.1 Site context

The site is located on the existing Wide Lane Sports Centre and is shown in Figure 1. It comprises two fields of play (FOP) perpendicular to each other and they are proposed to be floodlit to allow for evening use. The edges of the playing fields are flanked by trees on all sides. New footpaths connect the two pitches to the existing footpath to the south, which will be illuminated as part of this project.

1.2 Local Authority Consultation

In addition to the illumination guidance, see Section 1.3, the local authority, Eastleigh Borough Council (EBC), has recommended the following design guidance for the floodlighting:

- Louvres/baffles to be considered to limit light spill.
- Curfew timers floodlights would include curfew timers onto the luminaires, reducing light levels 10 minutes before the end of evening/night-time usage and switching off luminaires when the site is no longer occupied.
- Minimise light spill above the column height.

- Column height that maximise light coverage on the pitch and limit light spill.
- Luminaire colour temperature of 2,700K.
- Limit light spill into adjacent habitats to 1lux maximum.
- Maintenance factor of 1 for analysis on the ecological habitats.

A consultation meeting with the EBC Ecology officer (Paul Howe) on 15 December 2023. The anticipated performance of the scheme was demonstrated to him and it was explained that achieving the maximum 1 lux on the trees would not be possible in all modes of operation, on all trees. The officer acknowledged this and requested that all possible mitigation measures were taken to minimise the spill light as close to 1lux as possible.

1.3 Guidance

The Wide Lane FOP will be used for football and rugby. The following guidance has been referred to in the design:

- Sport England Artificial Sports Lighting Guide.
- RFU Guide to Floodlighting.
- BS EN 12193 Lighting for Sports.
- BS 5489 Road Lighting (includes footpaths).

Classes of play are identified, namely;

- Class I: National/International Competition.
- Class II: Regional Competition.
- Class III: Training.

It is not proposed that Class I performance is required for this facility due to the limited spectator capacity. Class II and Class III are more likely uses, with Class III being the most common use.

The BS EN 12193 average maintained illumination requirements on the field of play (FOP) are:

- Class II: 200lux horizontal plane with 0.6 minimum/average uniformity.
- Class III: 75lux horizontal plane with 0.5 minimum/average uniformity.

The Football Association (FA) proposes the following for training purposes:

- Class III: 120lux horizontal plane with 0.6 minimum/average uniformity.

The RFU proposes the following for training purposes for Rugby:

- Class III: 100lux horizontal plane with 0.5 minimum/average uniformity.

Data is presented in this report which describes the performance of the scheme. It assumes the worst case scenario with both FOPs simultaneously illuminated to the same lighting class.

The footpath will be illuminated to 3lux average, 0.6lux minimum (BS 5489).

2.1 Field of Play

The following describes the design parameters:

- Mast height: 18m.
- Floodlight type: Siteco FL11 Pro BLC, 117,060 lumen modules with upright restricting cowls (BLC) (Figure 4).
- Quantity: Two and Three floodlights per mast, 12 masts, floodlight bracket mounted on to mast.
- Floodlighting aiming: no aiming of floodlights above horizontal plane i.e. no direct upward light.
- Floodlight driver: Instant Lumen Output
- Colour temperature : 3,000K
- Floodlight controls: DALI or Casambi lighting control system allowing dimmed levels of 75/100/120/200lux. Automatic curfew timers to fade out light levels 10 minutes before the end of evening/night-time schedule and switching off luminaires when the site is no longer occupied. Local, temporary override control from the feeder pillar and pavilion.

The quantity of floodlights per mast and the quantity of masts has been selected to reduce the individual power/intensity and tilt angles of the floodlights to help limit light spill towards the trees.

Lower mounting heights for wide area lighting typically require higher tilt to obtain the required uniformity. The higher mounting height typically means the floodlights can be mounted with zero tilt which improves efficiency, reduces spill light and reduces contribution to sky glow.

The standard sports floodlight colour temperature is $\geq 4,000\text{K}$. However, the product is also available in $3,000\text{K}$. This features a notable reduction in blue wavelength light, which is considered to be detrimental to the nocturnal environment (Figure 2). The use of $2,700\text{K}$, suggested by EBC, is considered to be sub-optimal for sporting performance, therefore a colour temperature of $3,000\text{K}$ is proposed.

Figure 2: Typical spectrum of 4,000K (left) and 3,000K (right) light sources note the lower blue peak for 3,000K

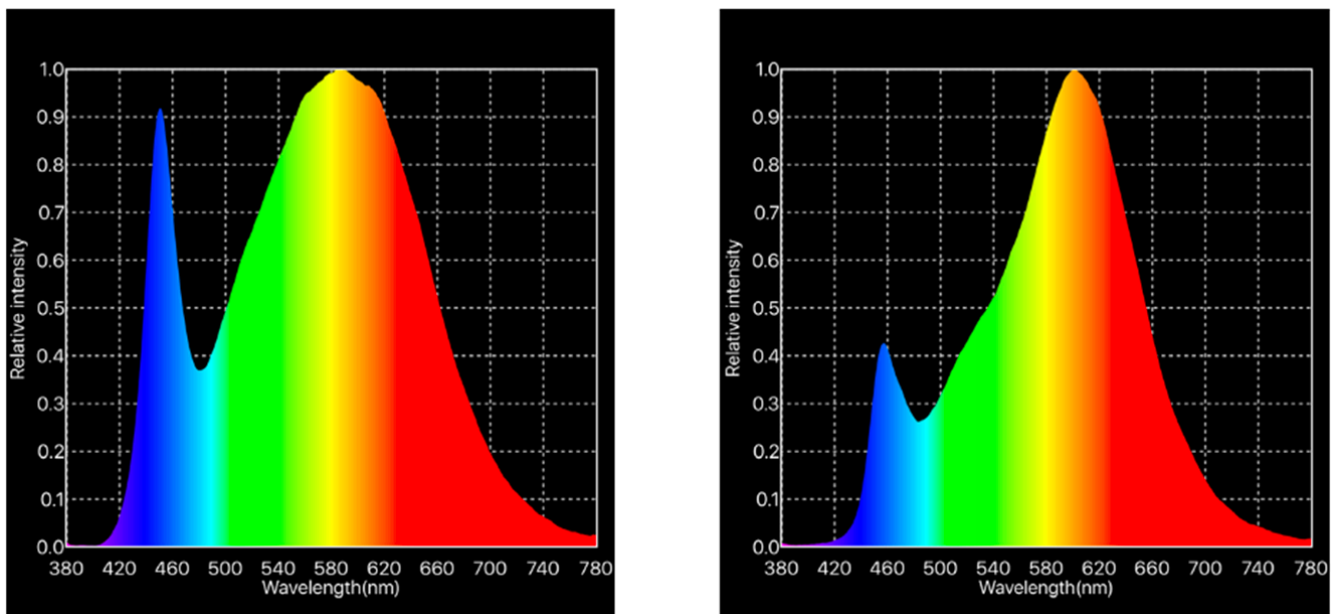
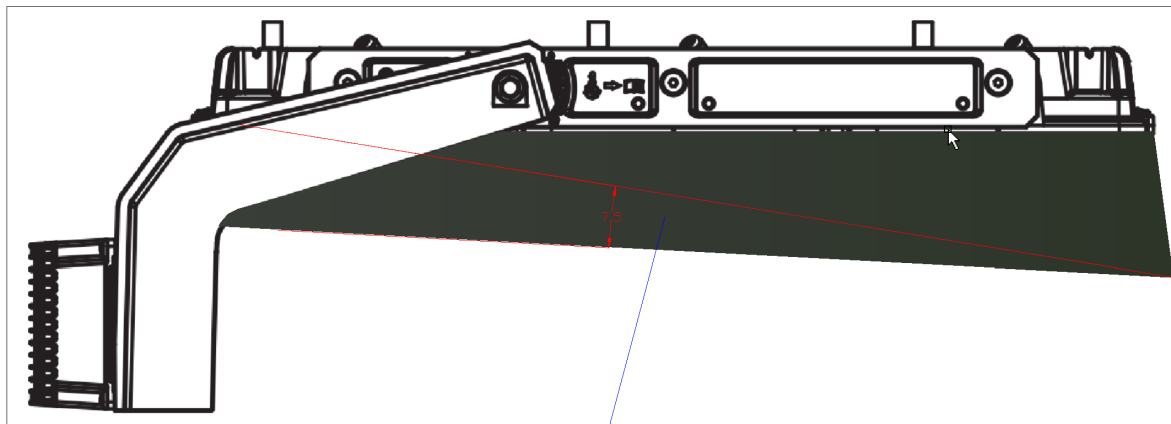
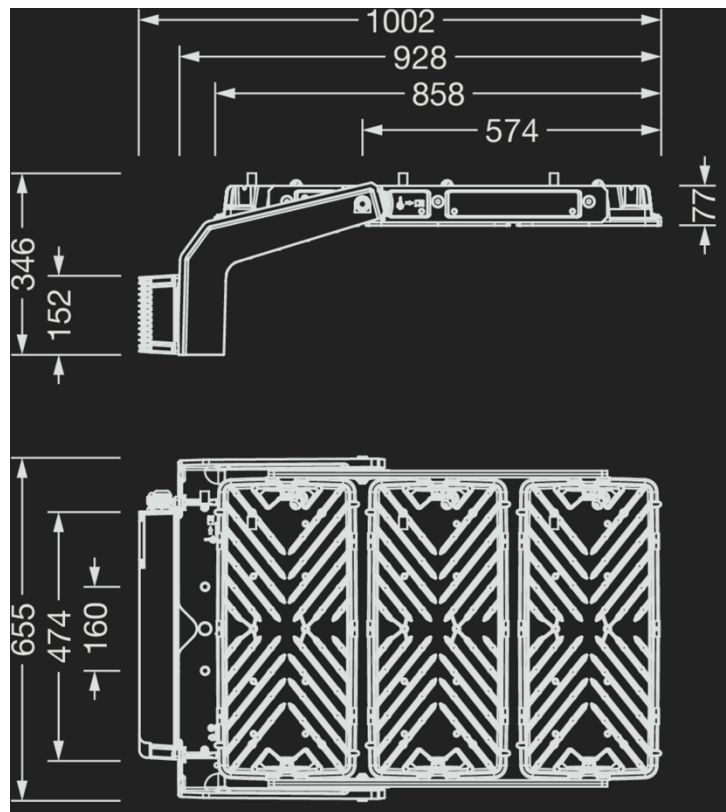


Figure 4: Floodlight photograph (note the floodlight will include cowls)



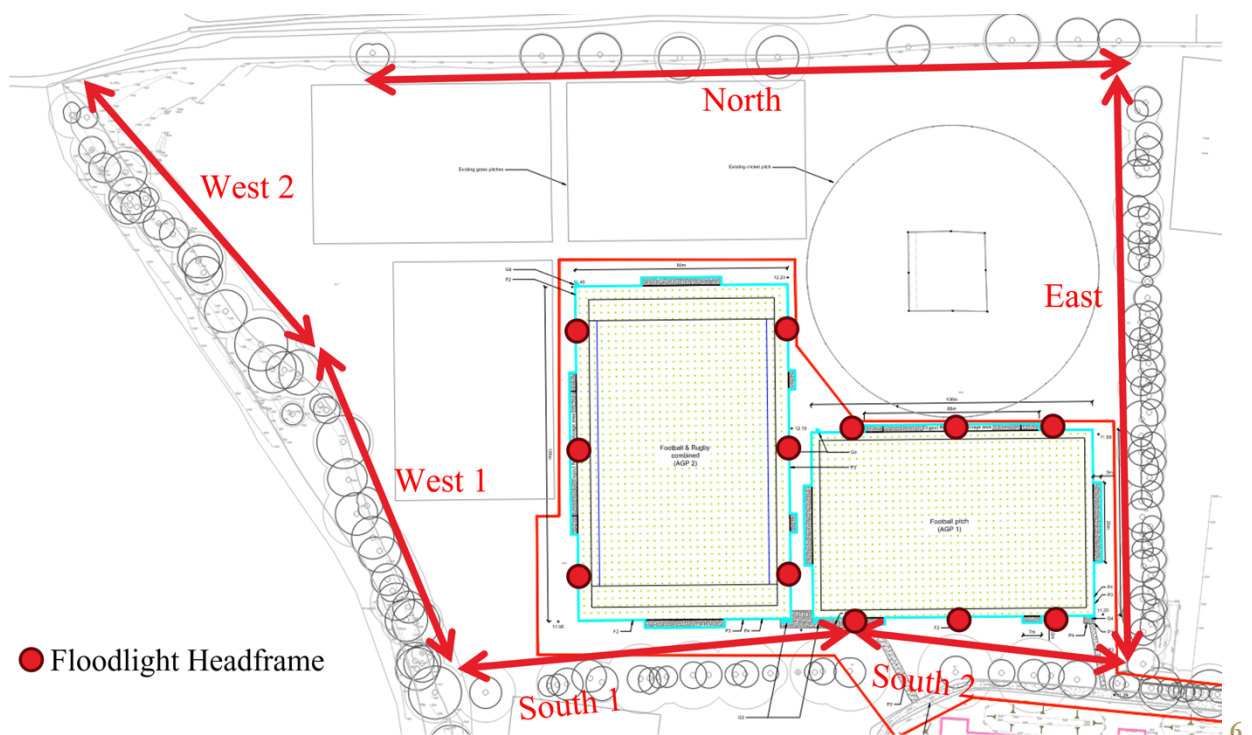
Internal Angle of Shield is 7.5 degrees.
 Maximum floodlight elevation is 7.5 degrees
 to maintain 0% ULOR

Figure 5: Section drawing of proposed floodlight.



The calculation of the vertical plane illumination on the trees assumes a maintenance factor of 0.90 (100% output on day one). 10m high vertical calculation planes facing the FOP were used to predict the illuminance on the trees. The locations are indicated in Figure 6.

Figure 6: Location of 10m vertical calculation planes



Calculations were completed with a maintenance factor of 0.90 (90% output after three years) for design of the maintained illuminance of the FOP. Operational lifetime of floodlight – L96 – 4%,
3% annual dirt depreciation / Bi-annual = 6% = 10% total

2.2 Footpath

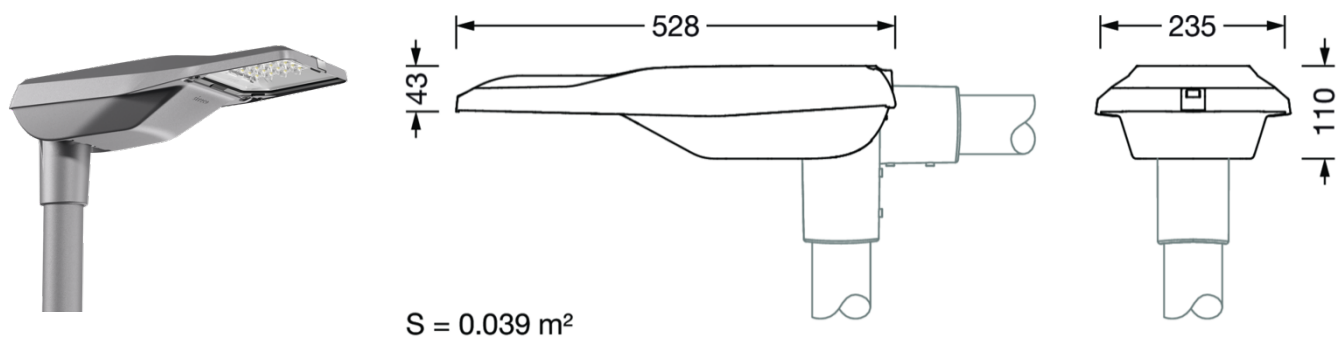
The footpath will be illuminated using 4m lighting columns with horizontal cut-off lanterns. The columns are placed on the south side of the existing footpath to avoid the root-ball of the trees on the north side. The 4m column height has been selected to keep the light at a low level and away from the tree canopy.

The lantern do not emit light above the horizontal plane and have a 2,700K colour temperature. Pathway optics have been selected which focus light along the length of the pathway and limit light spill to each side.

This lighting will be switched using the same DALI control system as the sports floodlights. They will operate via photocell switching at dusk (30lux ambient) and will switch off at the end of the evening sports session (22:00hrs).

- Power = 20W, 2753lumens
- DALI, Constant Lumen Output Driver.
- Integral Photocell

Figure 7: Footpath lighting lantern.



3. Summary of Findings

Refer also to the figures in Appendix A for graphical representation of the data.

3.1 Floodlight type and FOP calculation

Table 1 summarises the FOP calculation at MF 0.90 and the floodlight power, luminous flux and total flux for the FOP.

Table 1: FOP lighting calculation summary, field of play horizontal plane (MF = 0.90)

Rugby		Football	
Average (lux).	Min/Ave	Average (lux)	Min/Ave
205	0.66	203	0.66

Table 2 summaries the findings of the lighting performance on the tree boundaries on the vertical plane

Table 2: Equipment and FOP lighting calculation summary (worst case including reflected and direct)

Maintained (MF 0.90) FOP Illuminance (lux)	West 1 (MF 1.0) Max. (lux)	West 2 (MF 1.0) Max. (lux)	North (MF 1.0) Max. (lux)	East (MF 1.0) Max. (lux)	South 1 (MF 1.0) Max. (lux)	South 2 (MF 1.0) Max. (lux)
200	1.04	0.52	0.84	22.14	29.22	25.75

Refer also to the figures in Appendix A for graphical representation of the data.

3.1.1 Summary

In summary, the following conclusions have been made on the performance of the floodlighting.

The following table summarises the findings of the floodlight calculations and identifies where it may be possible to develop a compliant solution based on the averages presented in Table 2.

Table 3: Summary of areas likely to satisfy the requirement

Mode	Satisfies <1.0lux on all Tree Planes	Satisfies <1.0lux on >80% of the Tree Plane area	Does not satisfy <1.0lux on >80% of the Tree plane area
200lux	No	West 2/North	West 1, South 1, South 2, East

1.1 Footpath

Figure 8: Footpath plan

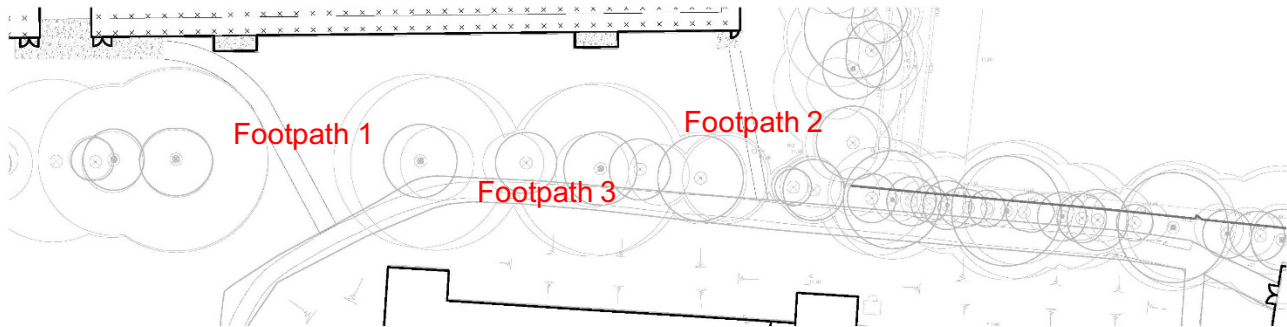


Table 4: Footpath lighting calculation summary, horizontal plane

Footpath Reference	Design Target		Footpath Design	
	Average (lux).	Minimum	Average (lux)	Minimum
1	3	0.6	4.7	0.7
2			4.1	0.6
3			4.5	0.7

4. Summary

The following table compares the requirements of EBC and the Client and identifies where they have been satisfied, and the measures taken to satisfy them, or mitigation measures.

Required	Satisfied?	Delivered
Louvres/baffles to be considered to limit light spill.	Yes	Upward light spill cowls included with floodlight. Horizontal cut-off (zero upward light) lanterns used for path lighting. BLC (Back light control) lanterns proposed.
Curfew timers for floodlights and a control regime, control for non-occupancy.	Yes	Lighting control system will be provided with settings for 75/120/200lux and curfew timers. Pathway lighting will operate within the same curfews as the floodlighting.
Minimise light spill above the column height.	Yes	Upward light spill cowls included with floodlight. Horizontal cut-off (zero upward light) lanterns used for path lighting
Column height that maximise light coverage on the pitch and limit light spill.	Yes	Equal height columns provided to existing scheme. Use of asymmetric floodlights at the appropriate height reduces light spill.
Luminaire colour temperature of 2,700K.	No	Very warm white light is not preferred for athletic activity, it is considered to be less stimulating. 3,000K is proposed instead, this has a slightly cooler feel, but still with reduced blue wavelength light in comparison to the standard 4,000-5,000K used for sports lighting. 3,000K is typically 10% more efficient than 2,700K.

Limit light spill into adjacent habitats to 1lux maximum.	No	It is not possible to achieve this requirement where the floodlights/FOP are close to the trees on the south and east boundary. However, mitigation by cowls, zero tilt and column height parameters has been applied to minimise illumination to the north-west of the FOP (see Appendix A.1). This report should be read in conjunction with the ecologist's report, which indicates the anticipated activity of the bats at times of day/year when the floodlights may be operating.
Maintenance factor of 1 for analysis on the ecological habitats.	Yes	Maintenance factor of 0.90 has been used on all horizontal calculations, maintenance factor of 1 has been used on all Vertical, indirect and direct calculations.
Lighting to BS EN 12193, Sport England, RFU and FA guidance for training and regional competition (Class II and III)	Yes	All requirements for uniformity and horizontal plane illuminance are satisfied for sport. Levels appropriate to training and regional competition will be enabled by the lighting control system.
Footpath Lighting to BS 5489	Yes	Dark sky certified

Appendix A

Calculation Information

A.1 Field of Play

The figures below indicate the predicted light spill on the horizontal plane around the FOP.

Figure 9: 200lux FOP, horizontal plane

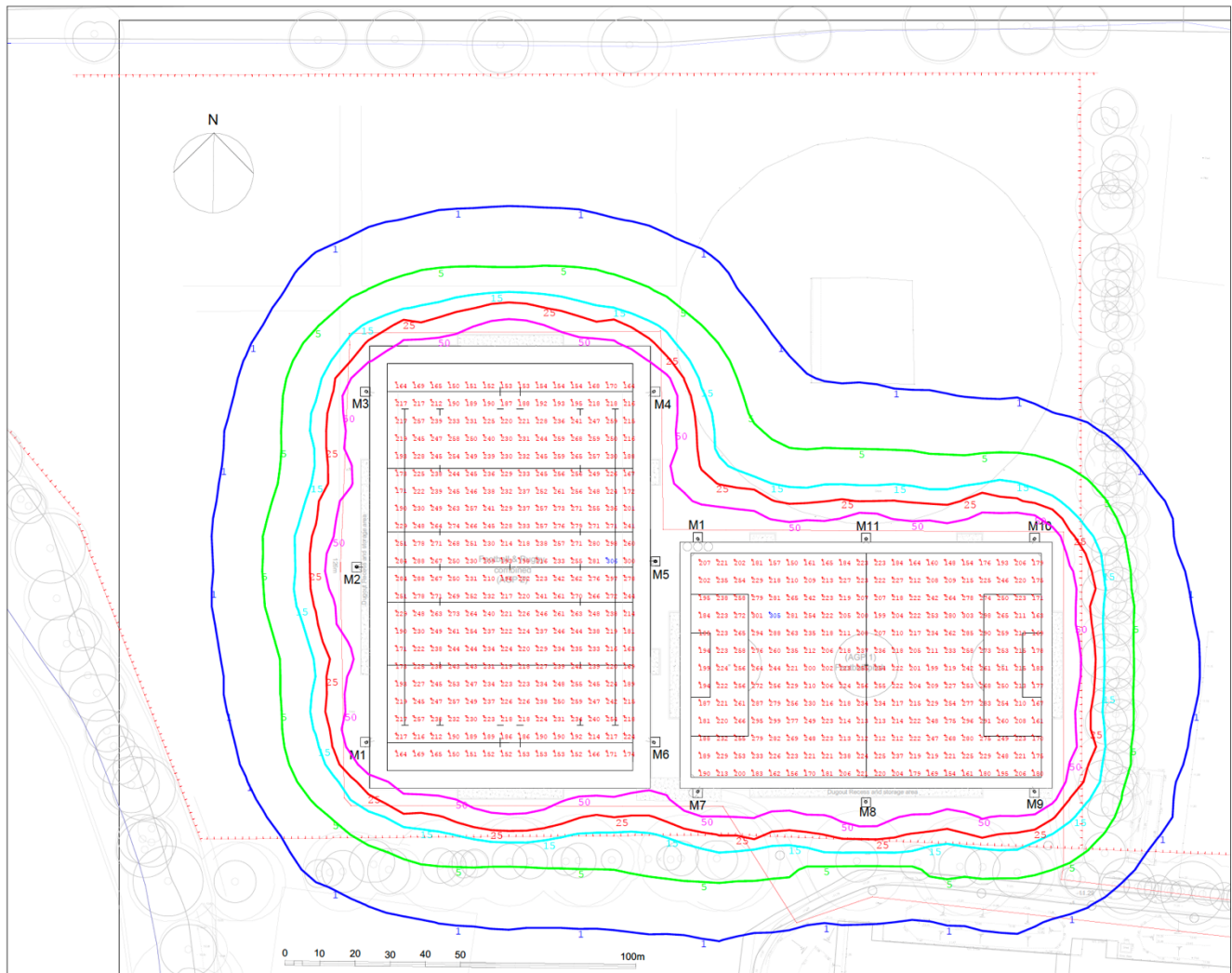


Figure 10: Vertical Planes, 200lux at 0m direct and indirect

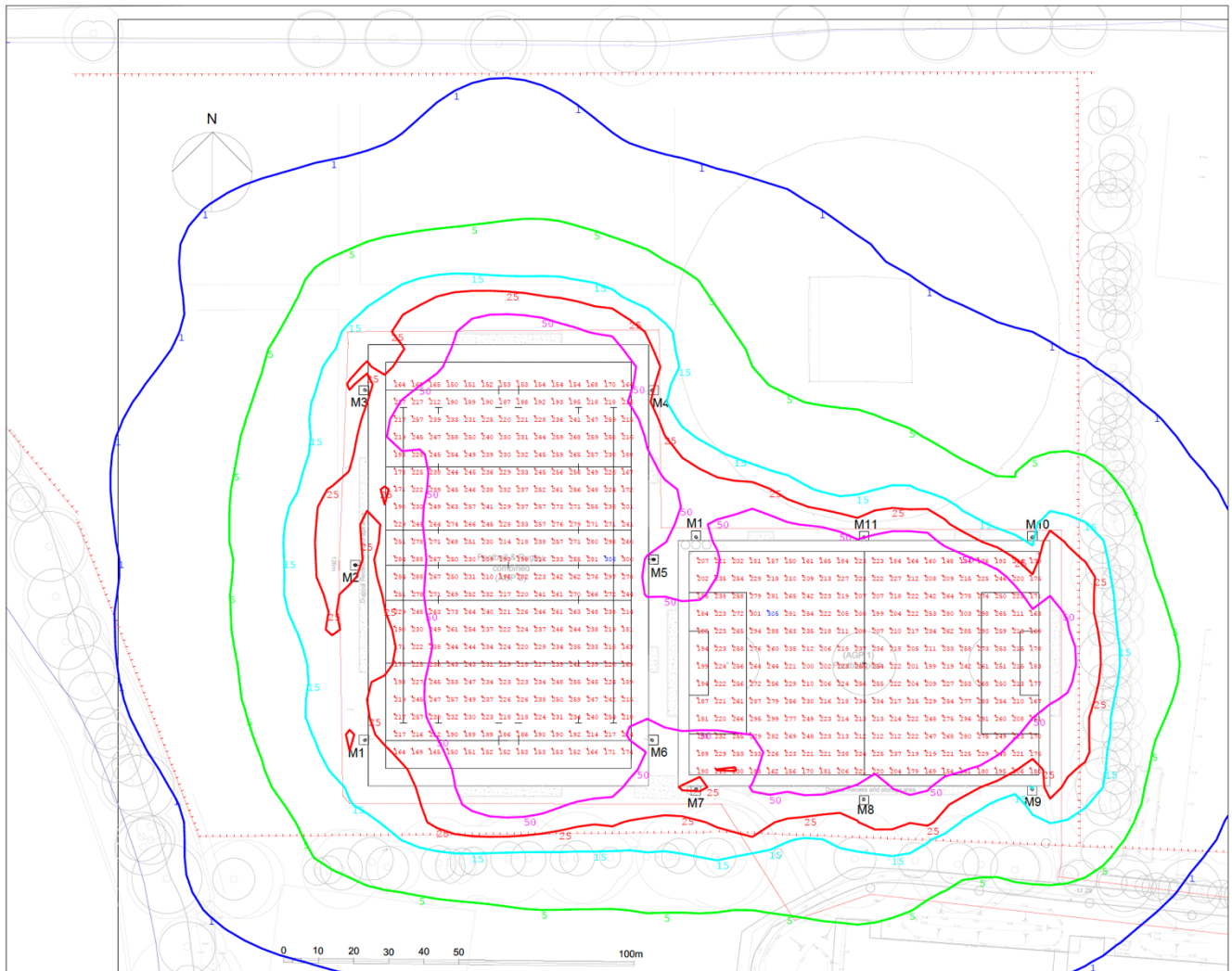


Figure 11: Vertical Planes, 200lux at 2m direct and indirect

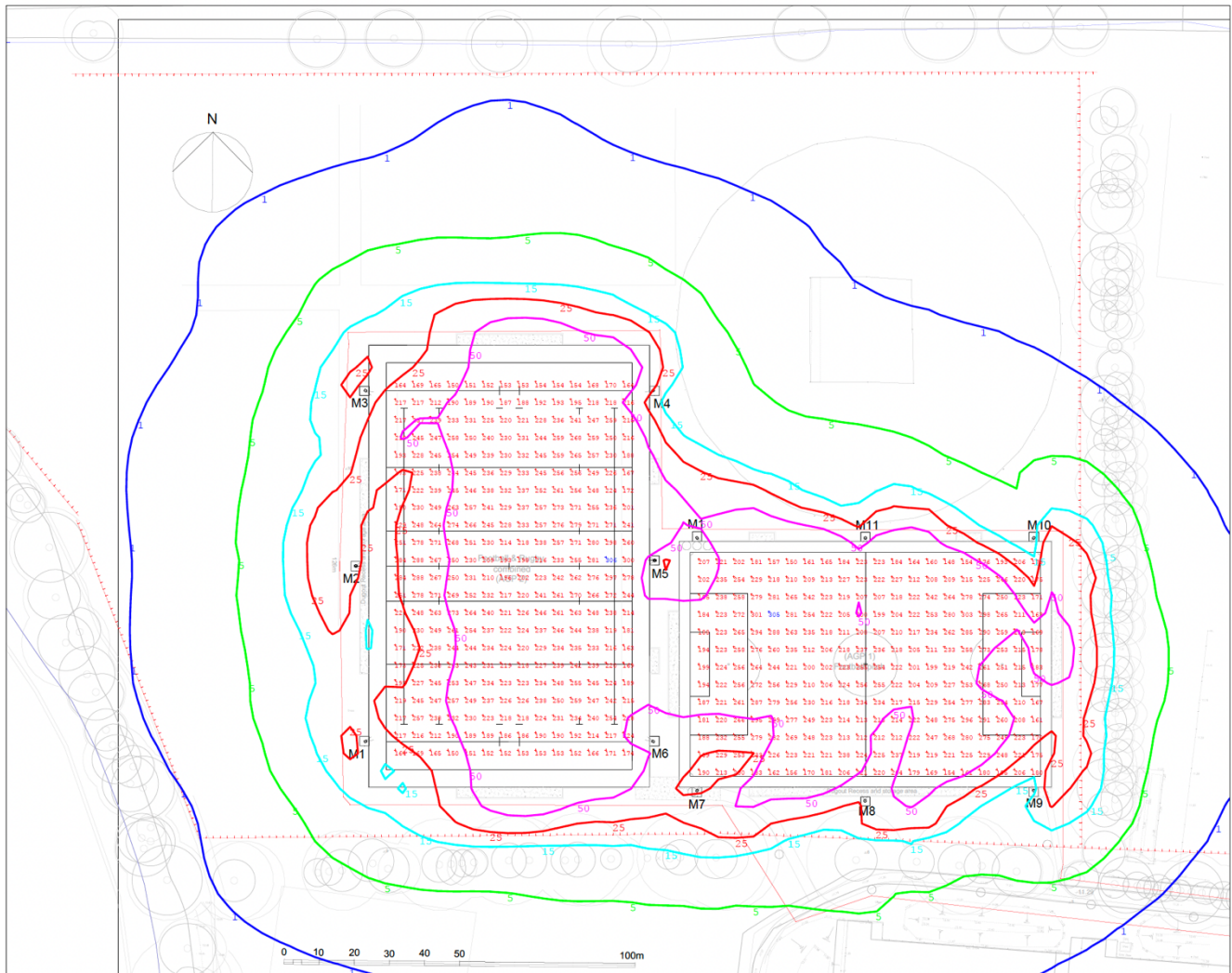


Figure 12: Vertical Planes, 200lux at 4m direct and indirect

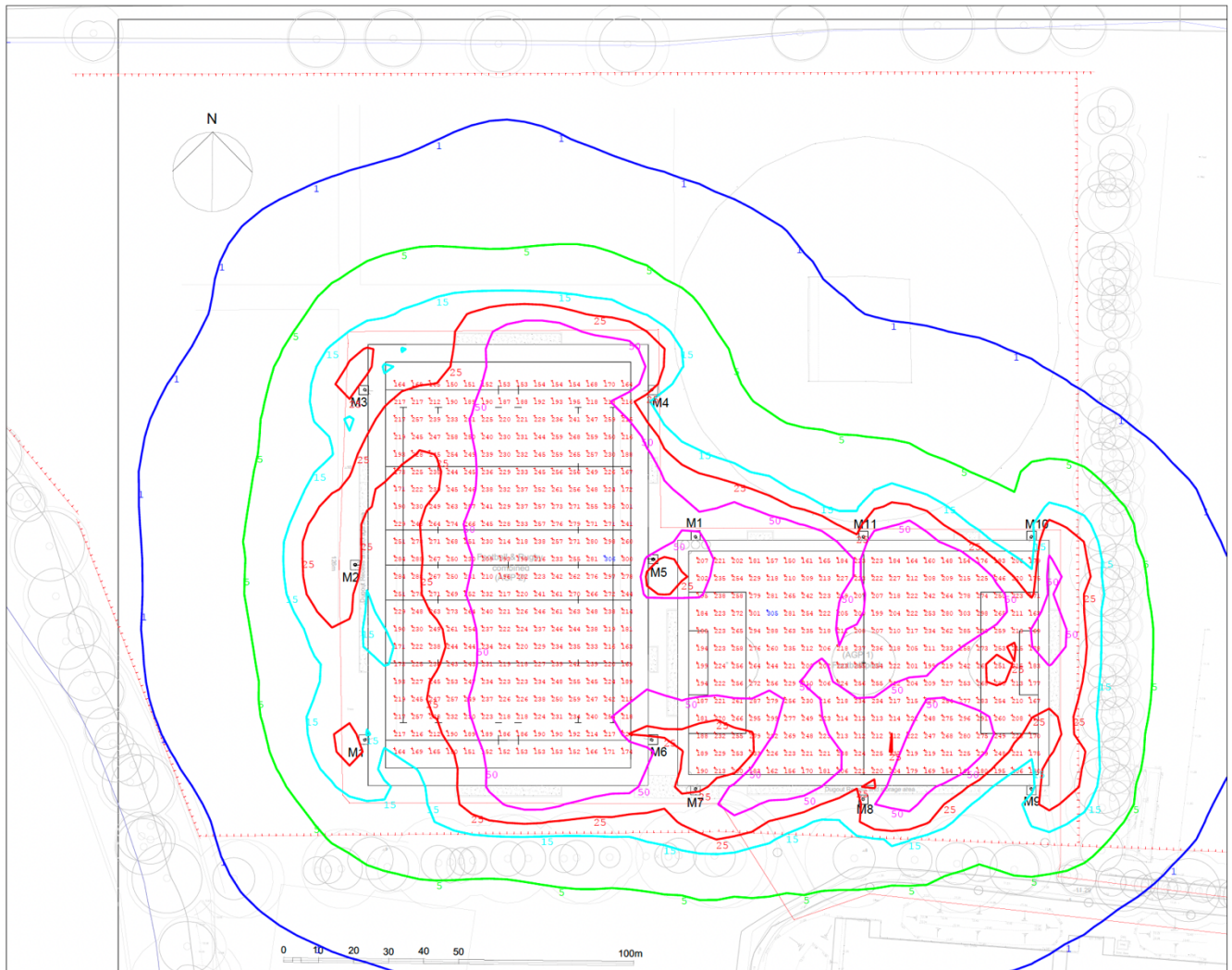


Figure 13: Vertical Planes, 200lux at 6m direct and indirect

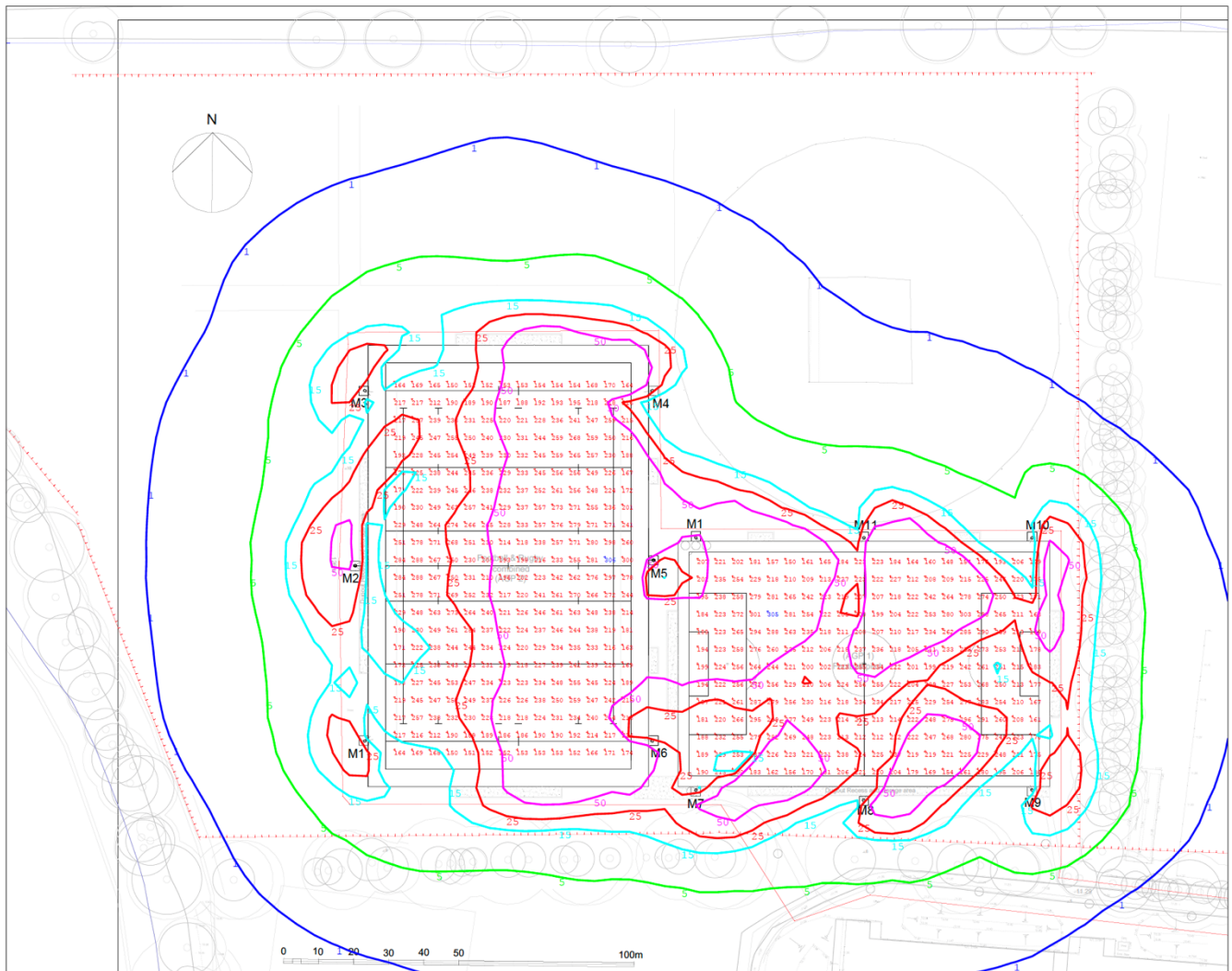
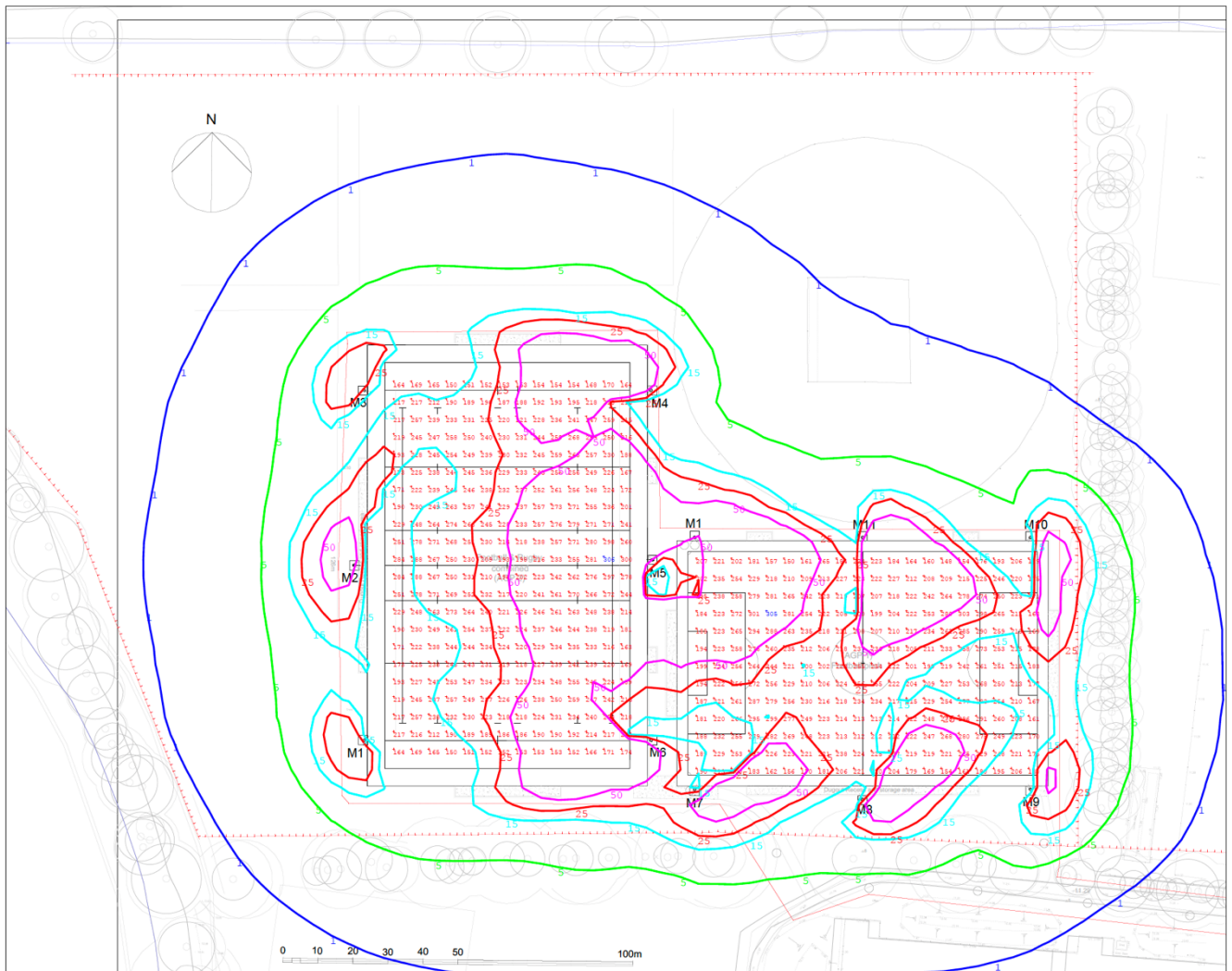


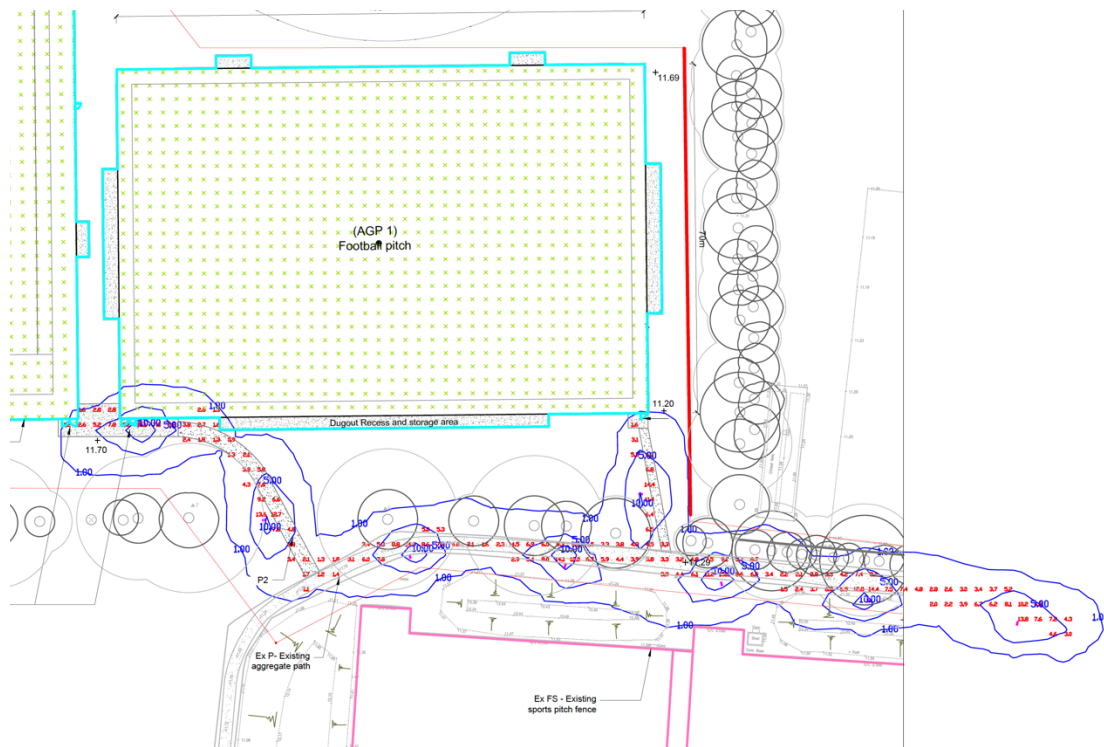
Figure 14: Vertical Planes, 200lux at 8m direct and indirect



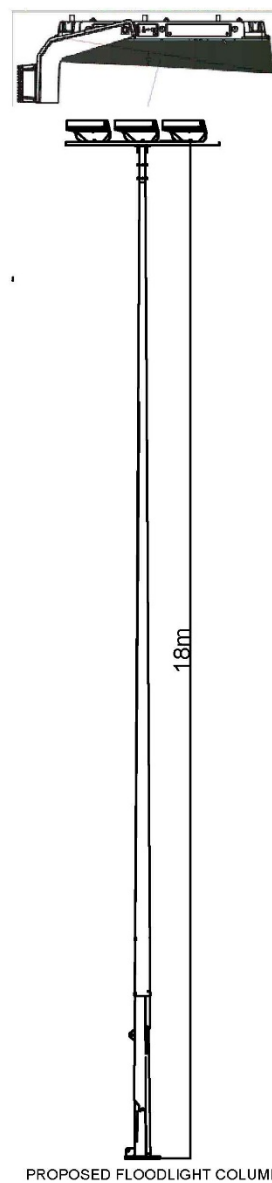
A.2 Footpath

The following figures indicate the horizontal plane light spill at ground level. The 1lux contour is identified for each footpath

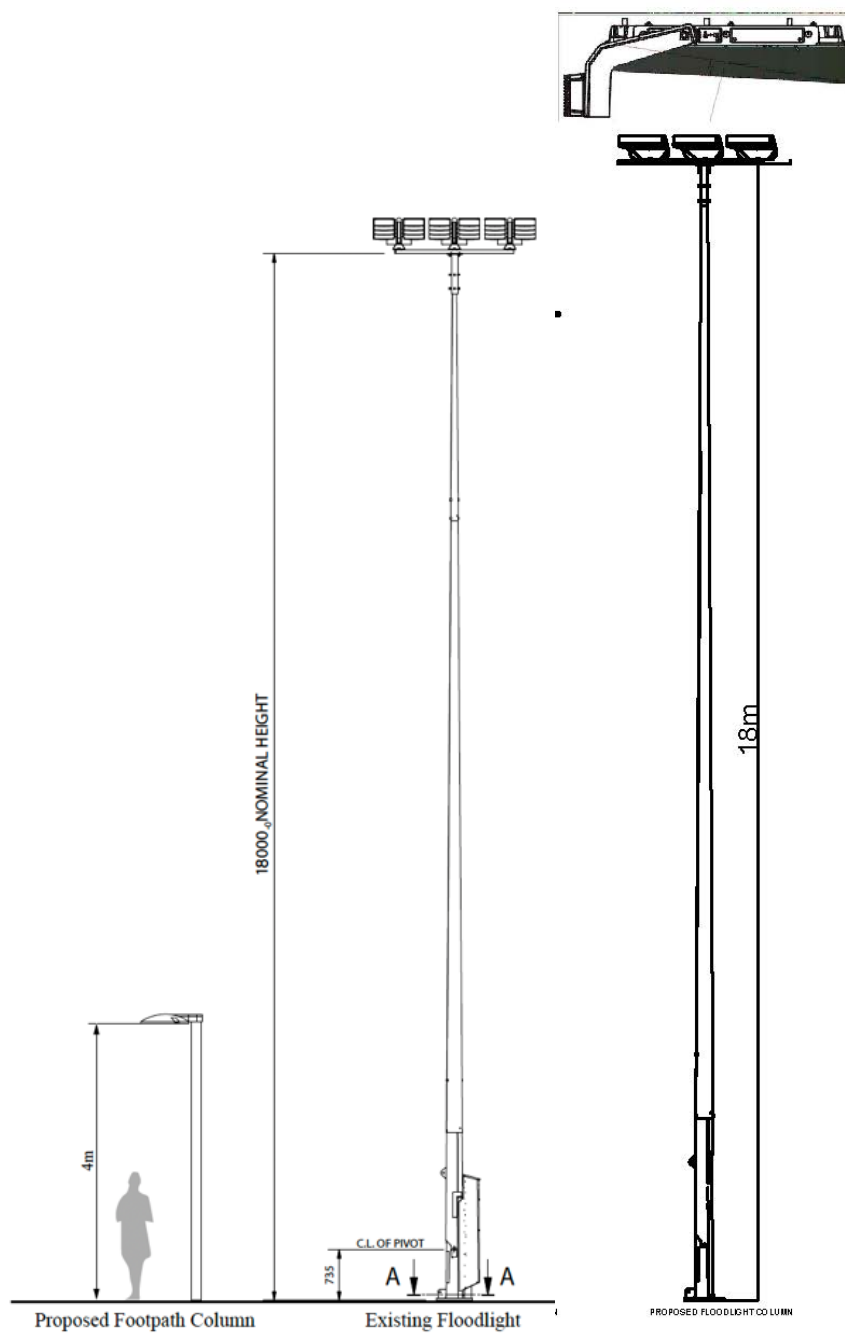
Figure 16: Footpath illuminance and spill light



Appendix B
Floodlight Masts



B.1 New and Existing Elevation



Glossary

Lumen

The standard unit of light (luminous flux) used in describing light emitted by a source or received by a surface.

Illuminance and Maintained Illuminance (lumens/m² or lux)

Illuminance is the term used to describe the level of light on a surface in lumens/square metre or lux. Maintained illuminance is the term used to describe the average illuminance on a reference surface e.g. desktop, at the time maintenance has to be carried out.

Horizontal Illuminance

The level of light falling on to a horizontal plane (ie The Ground).

Vertical Illuminance

The level of light falling on to a vertical plane (ie The walls of a house).

Light Output Ratio (LOR)

This is the ratio of the total light output of a luminaire, relative to the total light output of the lamp/s under reference conditions. Total LOR can be divided into downward (DLOR) and upward (ULOR) light output ratios if appropriate.

Light Intrusion (Overspill, Light into windows)

The flow of light spilling outside the location boundary. With inadequate control intrusive light may be sufficiently great as to provide a serious nuisance and disturbance to adjacent areas.

Glare

Glare may be divided into 2 types known as disability and discomfort glare. In a Sports Lighting context it relates primarily to direct viewing of the light fittings. Only in severe situations would disability glare be experienced. In most instances it is discomfort glare that may result, causing annoyance to the viewer if adequate screening of light fittings is not provided.

Sky glow

The general term for the Halo-effect caused by upwardly directed light, forming a glow in the night sky. It can cause diminished contrast of stars against their dark background making astronomical observations difficult and often impossible. The upwardly directed light can be caused by direct waste light from light fittings or indirect redirected light from the sports surface.

ILP

The Institution of Lighting Professionals.

ILP 'Guidance notes for the reduction of light pollution'

A booklet produced by the ILP providing advice on reducing the impact of exterior lighting installations on the environment. The degree of permissible overspill & ULOR varies depending on the environmental zone as categorized in the guidance notes. Due to the higher ambient lighting levels in built up areas the restrictions are not as stringent in city centres, where as dark landscapes & rural areas require tighter control