TO: Worcester Township

FROM: Karen Murphy LC, IALD, LEED AP

REPORT PREPARED: April 16, 2016

DATE/TIME of Testing: April 13, 2016 Testing began at 8:15pm; Ending at 10:00pm

SUBJECT: Methacton School District Sports Fields Illumination Testing

Field measurements have confirmed calculated approved values have been provided within normal deviation standards. Where values were significantly different from calculated, they were significantly lower which is desirable for measurements taken at the property line. There was only one area of concern on the auxiliary field where light levels were below calculated. Musco is investigating potential corrective actions.

A test of the emergency lights was also performed. Emergency lights turned on 9 seconds after power failure, within the 10 second code requirement. Emergency lighting adequately illuminated egress from both fields and remained on for 15 minutes after power was restored.

AUXILIARY FIELD RESULTS

Illumination calculations for the auxiliary field were confirmed to be within acceptable tolerances, with one exception that occurred in the center of the auxiliary field. In this location, the field measurements were significantly lower than the calculated values. At the higher (50fc average) level setting, when all lights were turned on, readings taken were 55% lower than the calculated value. At the lower (30fc average) level setting, readings in the same area were 30% lower than the calculated value. Musco Lighting stated that they plan to return to the field the following night (April 14) to take supplemental measurements in order to plan corrective measures. Measurements along the sideline of the field closest to the property line were consistently 15-27% above the calculated values, however this deviation is acceptable because these points were the lowest calculated points and the illumination readings at the property line are well below permitted levels.

Vertical illumination measurements taken along the property line near the auxiliary field were all below the permitted maximum and below the calculated values. The highest measurements taken was 0.118fc (0.20fc was calculated for this location); the ordinance's maximum allowable measurement is 0.5fc. The minimum measurement was 0.053fc (0.24 was calculated for this location).

STADIUM FIELD RESULTS

Illumination calculations for the stadium field were confirmed to be within acceptable tolerances in all locations tested using both the higher (50fc average) and the lower (30fc average) level settings.

Vertical illumination measurements around the stadium field were taken along the public streets that bound the property. All values were below the permitted maximum and below the calculated values. The highest measurements taken was 0.119fc (0.23fc was calculated for this location) and occurred near the upper parking lot where the parking lot lights were also on and contributing to the measurement. The ordinance's maximum allowable measurement is 0.5fc. The minimum measurement was 0.046fc, no measurements were taken were there was not a clear view of the stadium lights.

METHODS

Testing was performed with Mr. Zoeller of Musco Lighting and representatives of Methacton School District present. Before testing began I received the certification report for Mr. Zoeller's light meter, and confirmed that the measurement readings of his meter where equivalent to those of the meter I brought. Mr Zoeller's meter was attached to a 3ft high tripod and used to take the horizontal field measurements. My light meter was held 5 ft above grade and used to take the vertical illumination field measurements at points along the property line. Methacton school district marked the property line through the brush by the auxiliary field. This string line was used to determine the property line.

Sincerely,

Karen P. Murphy LC, IALD, LEED AP

pharaohmurhy@comcast.net

(609)358-1155

Attached: Field notes showing measurements values

CalTemp	CALIBRATION REPORT for **GOSSEN-MAVOLUX 5032 C**	Test Report #: **2843** Date: **01/08/16** By: **WL**

Caltemp Instrument Inc. **1768 Whitehall Rd.** **Encinitas, CA 92024**
Tel: (760) 519-8158 **Fax: (760) 635-0004** **www.caltemp-gossen.com**

MAVOLUX Serial #: 5B10518

Customer: Musco Lighting , Farmingdale, NJ

Customer Reference: Meter belongs to Bob Zoeller

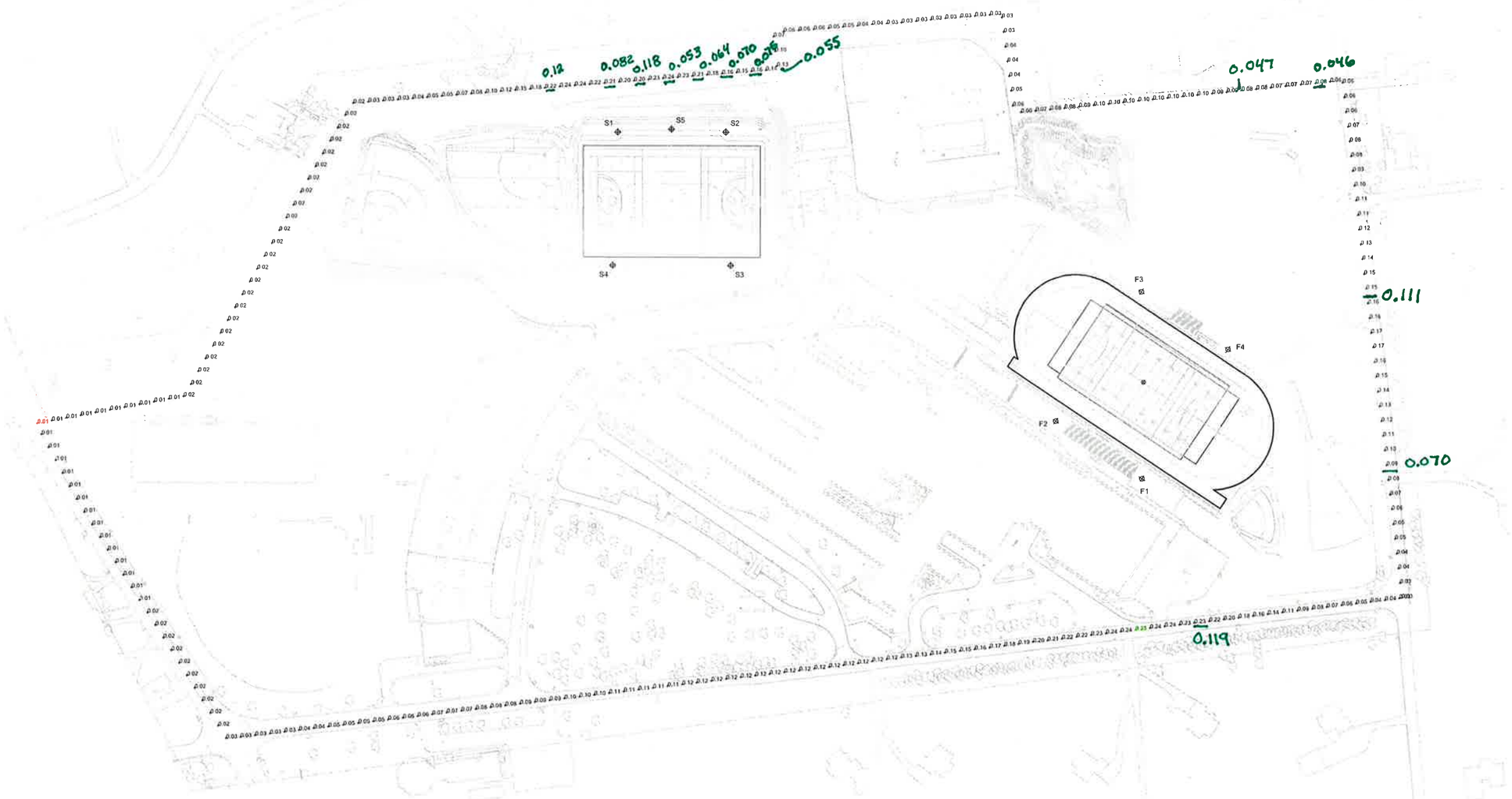
Footcandles applied to MAVOLUX under test	MAVOLUX Indicates (in Auto Range mode)
1	1.00
3	2.99
10	10.00
30	30.1
100	100.3
300	300
600	604

CERTIFICATION

- Caltemp Instrument Inc., certifies that this light meter is in compliance with all specifications shown in the Gossen published literature and operation instructions.
- Caltemp Instrument light meters are calibrated with the light sources which are traceable to the Physikalische-Technische Bundesanstalt (PTB) in Germany, the NIST of the Republic of Germany.
- NIST and the German PTB are correlating the optical measurements and standards and using the same unit of Illuminance which is measured in LUX (metric) or in foot-candle (USA).
- Ref. Journal of Research of NIST, Vol. 104, Number 1.
- Calibrated at ambient temperature of 22 ±2 deg. C

William Loedel, QC

AREAS SHOWN					
		Luminaires			
GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	TOTAL LAMP	OTHER LAMPS
0	55'	LED 5700K - 65 CRI	2	0	2
	35'	1500W MZ	13	13	0
5	90'	1500W MZ	2	2	0
	55'	LED 5700K - 65 CRI	2	0	2
	35'	1500W MZ	13	13	0
	55'	LED 5700K - 65 CRI	2	0	2
	80'	1500W MZ	11	11	0
	55'	LED 5700K - 65 CRI	2	0	2
	80'	1500W MZ	11	11	0
	80'	1500W MZ	11	11	0
	90'	1500W MZ	4	4	0
			110	98	12



Parking Lot + Bldg. Mounted Lights were on

1 : 120

120' 240'

Pole location(s) ⊕ dimensions are relative to 0.0 reference point(s) ⊗

MY PROJECT

Name: Methacton High School
Location: Eagleville,PA

GRID SUMMARY

Name: Entire Property Line
Spacing: 30.0
Height: -15.0 above grade

CONSTANT ILLUMINATION

	Entire Grid
Scan Average:	0.085
Maximum:	0.75
Minimum:	0.01
No. of Points:	250

Luminaire Type: Green Generation
Design Usage Hours: 5,000 hours
Design Lumens: 134,000
Avg Lamp Tilt Factor: 0.997
No. of Luminaires: 98
Avg KW: 153.27 (166.6 max)

Guaranteed Performance: The CONSTANT ILLUMINATION described above is guaranteed for the design usage hours of the system.

Field Measurements: Illumination measured in accordance with IESNA LM-5-04 and CIBSE LG4. Individual values may vary. See the Warranty document for details.

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 ballast and structures located within 3 feet (1m) of design locations.

ENGINEERED DESIGN

By: Ryan A. Marsh, LC
File # / Date: 155637R8 21-Jul-15

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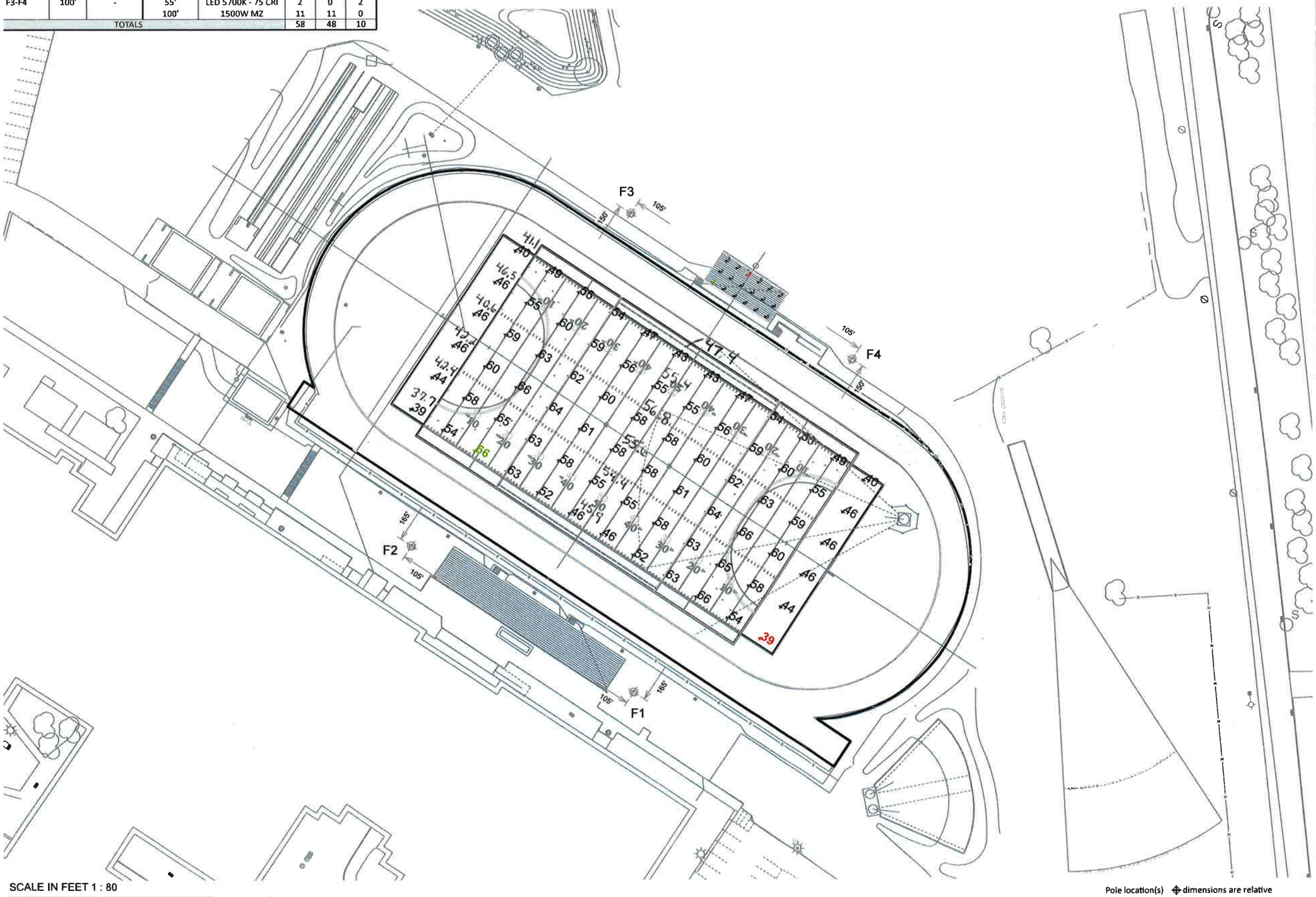
ILLUMINATION SUMMARY

MENT LIST FOR AREAS SHOWN

Pole			Luminaires				
LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
F1	90'	5'	55'	LED 5700K - 75 CRI	2	0	2
			95'	1500W MZ	13	13	0
F2	90'	5'	60'	1500W MZ	2	0	2
			55'	LED 5700K - 75 CRI	2	0	2
			95'	1500W MZ	13	13	0
F3-F4	100'	-	55'	LED 5700K - 75 CRI	2	0	2
			100'	1500W MZ	11	11	0
TOTALS					58	48	10



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

MY PROJECT

Name: **Methacton High School**
Location: Eagleville,PA

GRID SUMMARY

Name: **Football High**
Size: 360.0' x 160.0'
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

CONSTANT ILLUMINATION

SUMMARY	HORIZONTAL FOOTCANDLES
	Entire Grid
Guaranteed Average:	**50**
Scan Average:	55.1
Maximum:	66
Minimum:	39
Avg / Min:	1.40
Guaranteed Max / Min:	**2**
Max / Min:	1.68
UG (adjacent pts):	1.37
CU:	0.56
No. of Points:	72
LUMINAIRE INFORMATION	
Luminaire Type:	Green Generation
Design Usage Hours:	5,000 hours
Design Lumens:	134,000
Avg Lamp Tilt Factor:	1.000
No. of Luminaires:	48
Avg KW:	75.07 (81.6 max)

Guaranteed Performance: The Guaranteed Average CONSTANT ILLUMINATION described above is guaranteed for the design usage hours of the system.

Field Measurements: Illumination measured in accordance with IESNA LM-5-04 and CIBSE LG4. Individual values may vary. See the Warranty document for details.

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 ballast and structures located within 3 feet (1m) of design locations.

ENGINEERED DESIGN

By: **Ryan A. Marsh, LC**
File # / Date: 155637-prodR1 12-Jan-16

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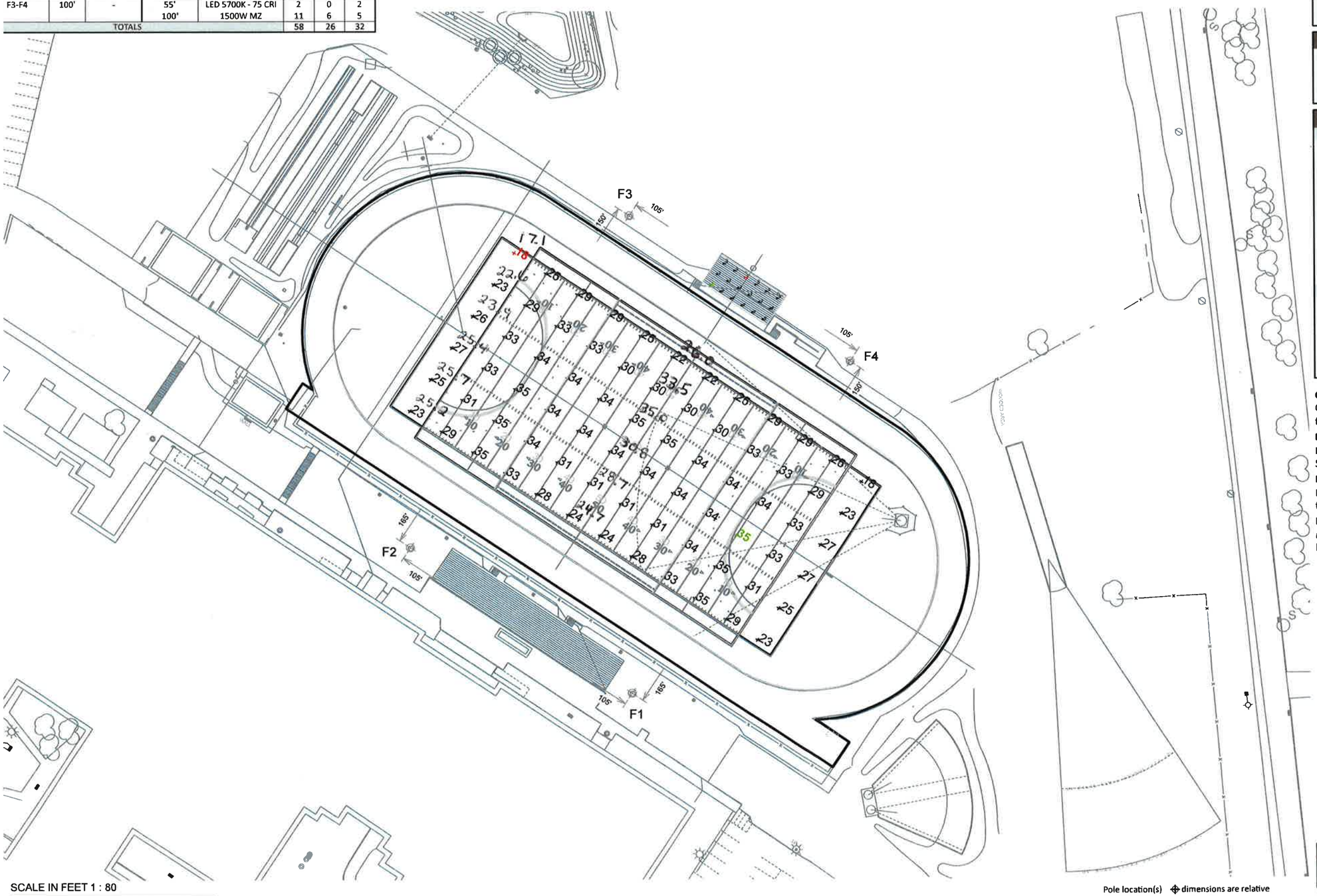
ILLUMINATION SUMMARY

MENT LIST FOR AREAS SHOWN

Pole			Luminaires				
LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
F1	90'	5'	55'	LED 5700K - 75 CRI	2	0	2
			95'	1500W MZ	13	7	6
F2	90'	5'	60'	1500W MZ	2	0	2
			55'	LED 5700K - 75 CRI	2	0	2
			95'	1500W MZ	13	7	6
F3-F4	100'	-	55'	LED 5700K - 75 CRI	2	0	2
			100'	1500W MZ	11	6	5
TOTALS					58	26	32



SCALE IN FEET 1 : 80

0' 80' 160'

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

musco Lighting

MY PROJECT

Name: **Methacton High School**
Location: Eagleville,PA

GRID SUMMARY

Name: **Football Low**
Size: 360.0' x 160.0'
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

CONSTANT ILLUMINATION

SUMMARY	HORIZONTAL FOOTCANDLES
	Entire Grid
Guaranteed Average:	**30**
Scan Average:	30.0
Maximum:	35
Minimum:	18
Avg / Min:	1.69
Guaranteed Max / Min:	**2**
Max / Min:	1.98
UG (adjacent pts):	1.42
CU:	0.56
No. of Points:	72
LUMINAIRE INFORMATION	
Luminaire Type:	Green Generation
Design Usage Hours:	5,000 hours
Design Lumens:	134,000
Avg Lamp Tilt Factor:	1.000
No. of Luminaires:	26
Avg KW:	40.66 (44.2 max)

Guaranteed Performance: The Guaranteed Average CONSTANT ILLUMINATION described above is guaranteed for the design usage hours of the system.

Field Measurements: Illumination measured in accordance with IESNA LM-5-04 and CIBSE LG4. Individual values may vary. See the Warranty document for details.

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 ballast and structures located within 3 feet (1m) of design locations.

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File # / Date: 155637-prodR1 12-Jan-16

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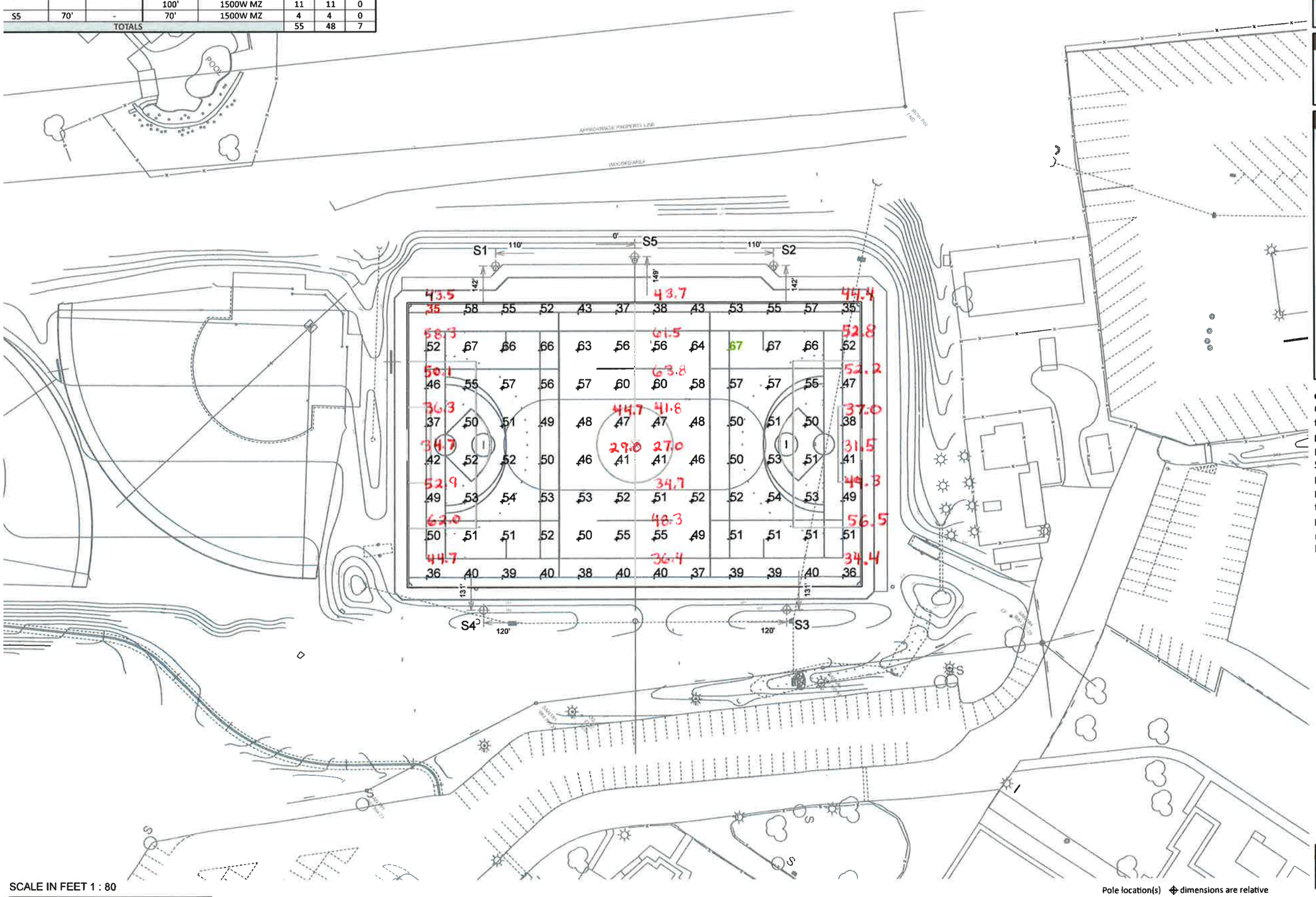
ILLUMINATION SUMMARY

MENT LIST FOR AREAS SHOWN

Pole			Luminaires				
LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
S1-S2	70'	-	55'	LED 5700K - 75 CRI	2	0	2
			70'	1500W MZ	11	11	0
S3	100'	-	55'	LED 5700K - 75 CRI	2	0	2
			100'	1500W MZ	11	11	0
S4	100'	-	55'	LED 5700K - 75 CRI	1	0	1
			100'	1500W MZ	11	11	0
S5	70'	-	70'	1500W MZ	4	4	0
TOTALS					55	48	7



SCALE IN FEET 1 : 80

0' 80' 160'

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

musco Lighting

MY PROJECT

Name: **Methacton High School**
Location: Eagleville,PA

GRID SUMMARY

Name: **Soccer High**
Size: 360.0' x 225.0'
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

CONSTANT ILLUMINATION

SUMMARY	HORIZONTAL FOOTCANDLES
	Entire Grid
Guaranteed Average:	**50**
Scan Average:	50.1
Maximum:	67
Minimum:	35
Avg / Min:	1.42
Guaranteed Max / Min:	**2**
Max / Min:	1.91
UG (adjacent pts):	1.64
CU:	0.67
No. of Points:	96

LUMINAIRE INFORMATION	
Luminaire Type:	Green Generation
Design Usage Hours:	5,000 hours
Design Lumens:	134,000
Avg Lamp Tilt Factor:	0.994
No. of Luminaires:	48
Avg KW:	75.07 (81.6 max)

Guaranteed Performance: The Guaranteed Average CONSTANT ILLUMINATION described above is guaranteed for the design usage hours of the system.

Field Measurements: Illumination measured in accordance with IESNA LM-5-04 and CIBSE LG4. Individual values may vary. See the Warranty document for details.

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 ballast and structures located within 3 feet (1m) of design locations.

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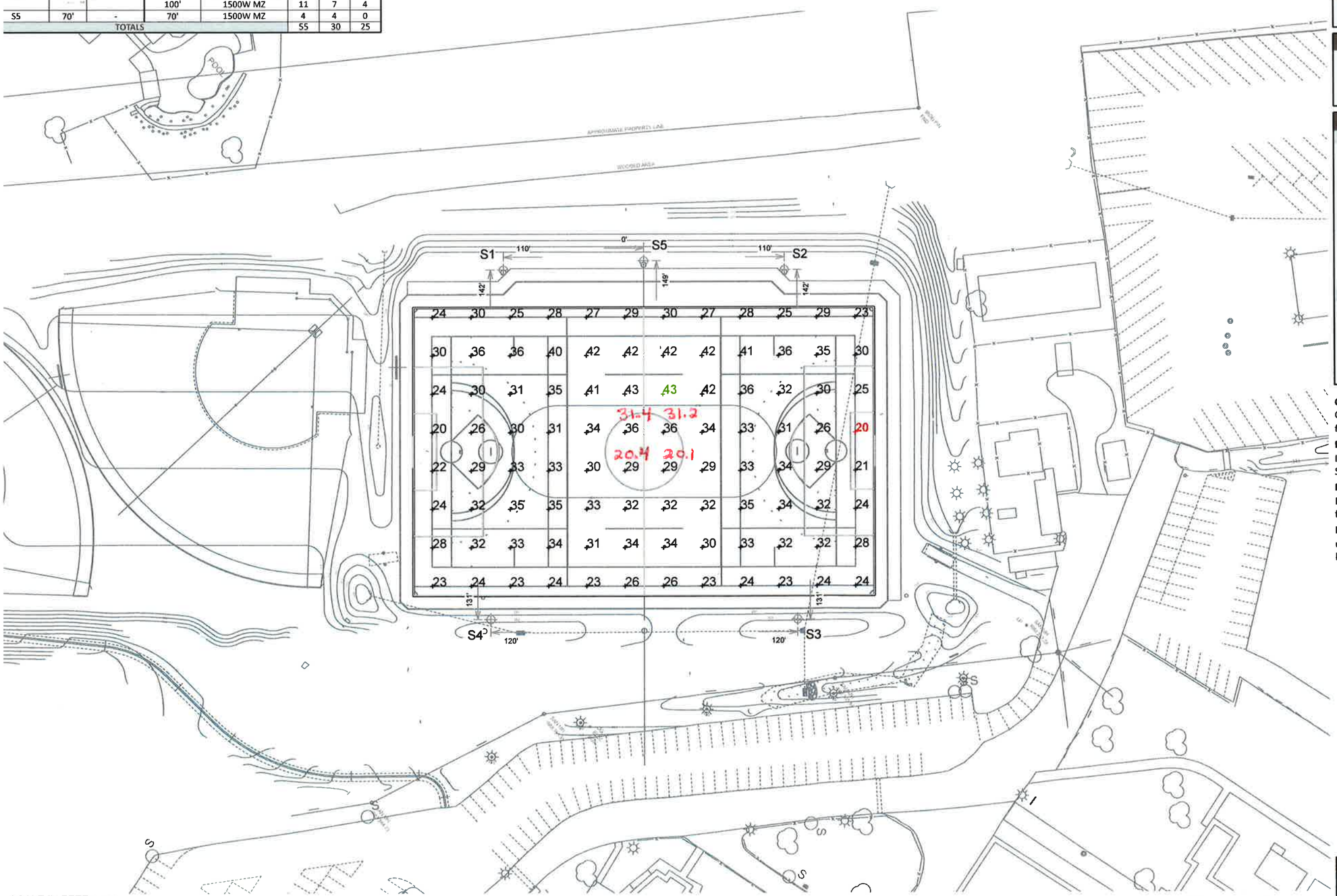
ILLUMINATION SUMMARY

MENT LIST FOR AREAS SHOWN

Pole			Luminaires				
LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LAMP TYPE	QTY / POLE	THIS GRID	OTHER GRIDS
S1-S2	70'	-	55'	LED 5700K - 75 CRI	2	0	2
			70'	1500W MZ	11	6	5
S3	100'	-	55'	LED 5700K - 75 CRI	2	0	2
			100'	1500W MZ	11	7	4
S4	100'	-	55'	LED 5700K - 75 CRI	1	0	1
			100'	1500W MZ	11	7	4
S5	70'	-	70'	1500W MZ	4	4	0
TOTALS					55	30	25



SCALE IN FEET 1 : 80

0' 80' 160'

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

MY PROJECT

Name: **Methacton High School**
Location: Eagleville,PA

GRID SUMMARY

Name: **Soccer Low**
Size: 360.0' x 225.0'
Spacing: 30.0' x 30.0'
Height: 3.0' above grade

CONSTANT ILLUMINATION

SUMMARY	HORIZONTAL FOOTCANDLES
	Entire Grid
Guaranteed Average:	**30**
Scan Average:	30.7
Maximum:	43
Minimum:	20
Avg / Min:	1.56
Guaranteed Max / Min:	**2.5**
Max / Min:	2.20
UG (adjacent pts):	1.54
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION	
Luminaire Type:	Green Generation
Design Usage Hours:	5,000 hours
Design Lumens:	134,000
Avg Lamp Tilt Factor:	0.990
No. of Luminaires:	30
Avg KW:	46.92 (51.0 max)

Guaranteed Performance: The Guaranteed Average CONSTANT ILLUMINATION described above is guaranteed for the design usage hours of the system.

Field Measurements: Illumination measured in accordance with IESNA LM-5-04 and CIBSE LG4. Individual values may vary. See the Warranty document for details.

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

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ILLUMINATION SUMMARY