Review of Environmental Factors:

Lighting upgrade- Berrambool Sporting Field, Merimbula

Report Prepared for:

Bega Valley Shire Council

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Review of Environmental Factors: Lighting upgrade -Berambool Sporting Fields, Merimbula

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1.0 INTRODUCTION

1.1. Purpose of works

Southeast Engineering and Environmental (SOUTHEAST) was commissioned by Brendan Read of Affinity Electrical, on behalf of Bega Valley Shire Council (BVSC) to prepare a Review of Environmental Factors (REF) for the proposed installation of four lighting towers and associated infrastructure at the Berrambool Playing Fields, Merimbula (Figure 1-1).

This REF provides a detailed assessment of the potential environmental constraints and impacts related to the proposed works activities. It has been undertaken in accordance with the requirements of Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act), and the factors listed in Clause 228 of the Environmental Planning and Assessment Regulation 2000.

Figure 1-1 – Works location.

1.2. Location and extent of works

Located off Berrambool Drive, the Berrambool Sporting Complex constitutes an area of approximately 9.45ha following the line of Merimbula Creek. Bega Valley Shire Council propose to install four lighting towers approximately 20 to 25metres in height and trench electricity conduit around the edge of a large oval field approximately 2ha used for football and cricket and update the existing power supply substation close to the grandstand/children's playground at the north-western end of this oval.
The works have been made possible via a grant received by the Merimbula "Diggers" AFL club, who utilize Berrambool Oval as their home ground. The proponents are AFL ACT/NSW, and the project is located on land owned and managed by Bega Valley Shire Council who are the consent authority.

2.0 WORKS DESCRIPTION

The proposed lighting upgrade requires the installation of 4 x 30m light towers each having 7 led light fittings mounted to them . These towers will be mounted on a pad mount footing requiring excavation to approximately 1m depth..

The towers are supplied via an inground electrical infrastructure that commences from a new electrical main switchboard which will be located on the North Western side of the existing club house .

The main switchboard will be mounted on a cement pad and emerging out from this will be a 50mm electrical conduit which runs to a new electrical pit installed adjacent the oval. From this pit the conduit branches out running a 50mm conduit clock wise around the oval and anti-clockwise as well to a new electrical pit installed at the back of each pole. From each pit at a 50mm a conduit will be installed running from pit to pole. Contained within this conduit will be 2 x 3phase circuits with conductor size of 25mm^2.

The removal of four existing light poles on the north-west and western side of the oval will also be required. The area will be levelled and turfed or seeded with appropriate grasses.

Design plan is shown in Figure 2-1 highlighting the proposed works.

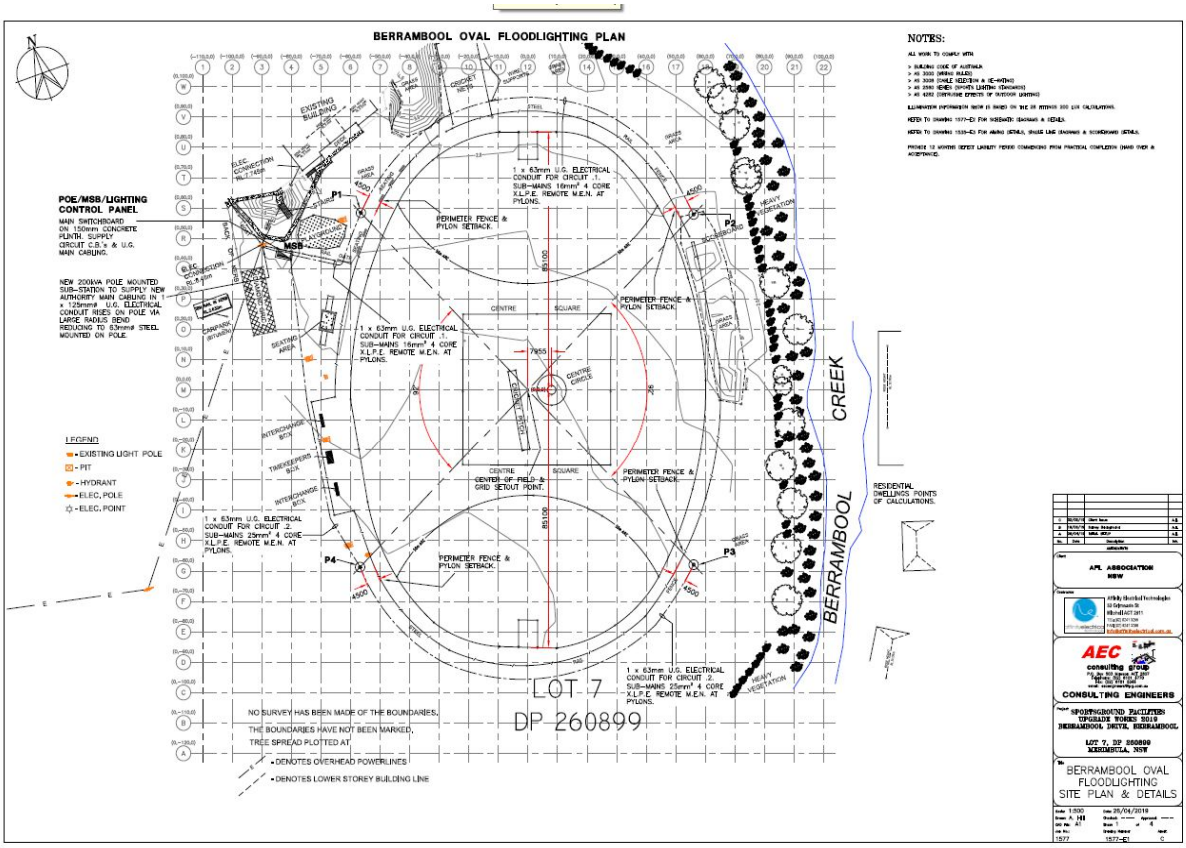

Figure 2-1 Berrambool Lighting site plan- Affinity Electrical 2019.

3.0 LEGISLATION AND PERMISSIBILITY

Table 3.1 Summary of legislation and policy relating to the proposed works

Law, Policy or Regulation	Requirement for proposal
Environmental Planning and Assessment Act 1979 The relevant state planning legislation for NSW is the Environmental Planning and Assessment Act 1979 (EP&A Act). The objects of the EP&A Act, among other things, are to encourage the proper management, development and conservation of natural and artificial resources for the purpose of promoting the social and economic welfare of the community and a better environment and the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats. Bega Valley Council is defined as a consent authority under Division 4.2 of the EP&A Act. Consent authorities are required under Part 1 Section 1.7 of the EP&A Act to consider whether a development proposal is likely to significantly affect threatened species, populations or ecological communities listed under the Schedules of the Biodiversity Conservation Act (BC Act) 2016. Refer to the BC Act heading, below, for further detail.	*This REF has been completed under Part 5 of the EP&A Act 1979 and provides an assessment of the environmental impact of the proposed activities to meet Council's obligations as the proponent and consent authority under Division 5.1, Subdivision 2 of the EP&A Act and a Clause 228 of the EP&A Regulation 2000.* *The following factors have been taken into account when considering the likely impact of an activity on the environment including:* ***(a) any environmental impact on a community,*** *The lighting upgrade will create temporary visual amenity, noise and access issues in the immediate area. These issues will be mitigated as far as possible and damage rectified where necessary. Berrambool Sporting Fields are adjacent to an area mapped as Biodiversity Value under the Biodiversity Offsets Scheme (BC Act), Merimbula Creek. The proposal will not require any clearing of native vegetation and will not impact on Merimbula Creek the requirements for a BDAR are not triggered. As the works proposed in this REF are being conducted under Part 5 of the EP&A Act, the proposal is exempt from the scheme.* ***(b) any transformation of a locality,*** *The proposed works will not create any transformation of a locality.* ***(c) any environmental impact on the ecosystems of the locality,*** *The risk of impact is low when mitigation measures are taken into consideration.* ***(d) any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality,*** *The risk of impact is low when mitigation measures are taken into consideration.* ***(e) any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations,*** *Refer to sections 4.5, 4.6 and 5.7* for *an assessment of heritage. Due Diligence has been undertaken to determine potential impacts of the works on areas of heritage importance.*

	(f) any impact on the habitat of protected fauna (within the meaning of the Biodiversity Conservation Act 2016), *The risk of impact is low when mitigation measures are taken into consideration and are justified. Refer to section 4.4 and 5.6 for detail.* ***(g) any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air,*** *The risk of impact is low when mitigation measures are taken into consideration and are justified. Refer to Sections 4.4 and 5.6 for detail.* ***(h) any long-term effects on the environment,*** *The installation process of the lights is temporary and mitigation measures are outlined in Section 5.0 to assist in protecting the existing environment. The use of lights at the oval would be on-going. However, no long-term effect on the environment is envisaged.* ***(i) any degradation of the quality of the environment,*** *When mitigation measures are considered (Section 5.0) no degradation of the quality of the environment is likely.* ***(j) any risk to the safety of the environment,*** *Safety risks are associated with:* • *pedestrian and vehicle access around the oval while installation occurs* • *use of the oval whilst installation occurs.* *These risks are temporary and manageable. Refer to section 5.9.1 for detail.* ***(k) any reduction in the range of beneficial uses of the environment,*** *There will be no permanent reduction in the beneficial uses of the environment.* ***(l) any pollution of the environment,*** *There is limited potential for pollution of the environment in the form of ASS and waste material entering the nearby Merimbula Creek. When the risk mitigation and management measures outlined in Section 5.0 of this REF are considered, the risk of pollution is acceptable and justified.* ***(m) any environmental problems associated with the disposal of waste,*** *The expected waste streams from the work can be managed appropriately.* ***(n) any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply,*** *The proposal does not require any resources that are in short supply.* ***(o) any cumulative environmental effect with other existing or likely future activities,*** *The proposal creates no cumulative effect with any other activities.*

Law, Policy or Regulation	Requirement for proposal
	(p) any impact on coastal processes and coastal hazards, including those under projected climate change conditions. *No impact on coastal processes or hazards.*
State Environmental Planning Policy (Infrastructure) 2007 The aim of this Policy is to facilitate the effective delivery of infrastructure. Under Clause 65 3(2) (iv), Council can carry out development of *lighting, if light spill and artificial sky glow is minimised in accordance with the Lighting for Roads and Public Spaces Standard,* without consent.	*Council can carry out the development without consent as long as general policies and requirements for environmental management outlined in the Bega Valley LEP are considered for this proposal and that light spill and light glow standards are met.*
Protection of the Environment Operations (POEO) Act 1997. The Act aims relating to this project are to protect, to restore and enhance the quality of the environment, reduce risks to human health and prevent degradation of the environment and to assist in the achievement of the objectives of the Waste Avoidance and Resource Recovery Act 2001 .	*The proposed work does not present a high risk to environmental or human health. Some waste generation will ensue. Key risks are associated with trenching of conduit and earthworks for pole pylon construction. These issues are addressed in Sections 4.0 and Section 5.0 of this REF.*
Biodiversity Conservation Act 2016. There are five (5) factors to be considered in relation to threatened species, populations or ecological communities listed under the BC Act. This process is known formally as the 'Assessment of Significance'. If the determination is made during the current impact assessment that there is likely to be a significant effect, then either: • A Species Impact Statement (SIS) must be prepared as per requirements set by the Environment Agency Head, or The proposal may be modified such that a significant effect on threatened entities or their habitats is downgrade to unlikely (DEC 2004).	*This report applies the Assessment of Significance to threatened entities that may potentially be impacted by the proposal (determined via initial likelihood of occurrence assessment), in order to determine the significance of the potential impact.* *Refer to Section 5.6 for detail.*
State Environmental Planning Policy (Vegetation in non-rural areas) 2017 This Act works in conjunction with BC Act to regulate clearing of native vegetation within more urban landscapes across NSW and ensure the requirements of the Biodiversity Offsets Scheme are met if clearing of native vegetation exceeds certain thresholds.	*No native vegetation will require removal for this project.*
Environment Protection & Biodiversity Conservation Act 1999	*This report provides an assessment of relevant NES matters to ascertain impacts, including whether any action would trigger referral to the Commonwealth.* *Refer to Section 5.6 and Appendix B.*

Law, Policy or Regulation	Requirement for proposal
The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) enables the Australian Government to join with the states and territories in providing a national scheme of environment and heritage protection and biodiversity conservation. Under the EPBC Act, actions that have, or are likely to have a significant impact on a matter of National Environmental Significance (NES) require approval from the Australian Government Minister for the Environment, Heritage and the Arts (DEWHA 2009). The nine matters of NES that are protected under the EPBC Act are: • World heritage properties • National heritage places • Wetlands of international importance (RAMSAR) • Listed threatened species and ecological communities • Migratory species protection under international agreements • Commonwealth marine areas • The Great Barrier Reef Marine Park • Nuclear actions including uranium mines • a water resource, in relation to coal seam gas development and large coal mining development	
National Parks and Wildlife (NPW) Act 1974 Part 6 of the NPW Act aims to protect Aboriginal objects and Aboriginal places. The proposed works are not an exempt activity listed in the NPW Act or other legislation. It is a strict liability offence for harm to an Aboriginal object, regardless of whether or not the person knew it was an Aboriginal object. Harm or desecration of an Aboriginal place will also be subject to a strict liability offence upon commencement of the remaining provisions of the Amendment Act. A range of defences against strict liability are outlined in the NPW Act and Regulation.	*In order to manage the risk of disturbance to Aboriginal sites or artefacts it is proposed to follow a procedure based on the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW, 2010)* *Refer to Sections 5.7.*
Heritage Act 1977	*Refer to Section 4.6.*

Law, Policy or Regulation	Requirement for proposal	
The Heritage Act 1977 was introduced to conserve the environmental heritage of NSW. Environmental heritage is defined as including buildings, works, relics, moveable objects, places and precincts which are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the state. The investigations and recommended measures described in this REF satisfy the requirements of the Heritage Act		
State Environmental Planning Policy No. 44 - Koala Habitat Protection SEPP 44 encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure that permanent free-living populations will be maintained over their present range across 107 local government areas (LGAs). Local councils cannot approve development in an area affected by the policy without an investigation of core koala habitat. The policy provides the state-wide approach needed to enable appropriate development to continue, while ensuring there is ongoing protection of koalas and their habitat.	*The requirements of SEPP 44 are addressed in Section 5.6.3.*	
State Environmental Planning Policy 2018 (Coastal Management) The aim of SEPP 2018 (Coastal Management) is to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016.* *Under the Act, a coastal zone is defined as the area of land comprising one or more of four coastal management areas:* *• coastal wetlands and littoral rainforests area - defined as areas with particular hydrological and ecological characteristics,* *• coastal vulnerability area - defined as the area affected by any one of seven coastal hazards,* *• coastal environment area - defined as the coastal waters of the state, estuaries, coastal lakes and foreshores including beaches, dunes, headlands and rock platforms as well as surrounding land,* *• coastal use area - defined as land adjacent to the coast, where development is or may be carried out.*	*The Site is located within the Coastal Environmental Area and therefore consideration must be given to whether the proposed development is likely to cause an adverse impact on the following:*	
	(a) The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment	*Refer to Sections 4.4 and 5.6*
	(b) Coastal environmental values and natural coastal processes,	*Refer to Sections 4.4 and 5.6*
	(c) The water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014*), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,*	*Refer to Sections 4.4 and 5.6*
	(d) Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	*Refer to Sections 4.4 and 5.6*

Law, Policy or Regulation	Requirement for proposal	
	(e) Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	*Refer to Section 5.9*
	(f) Aboriginal cultural heritage, practices and places,	*Refer to Sections 4.5 and 5.7*
	(g) The use of the surf zone.	*NA*
Fisheries Management Act NSW 1994 This Act sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation and biological diversity. Further, it aims to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities. Under this Act, a permit is required for the following activities: • Dredging and reclamation; or • Harming of Marine vegetation	*This proposal does not require dredging, reclamation or the harming of the marine vegetation*	
Water Management Act 2000 The Water Management Act requires approval from the Office of Water for developments and activities carried out on 'waterfront land' (land in or within 40 metres of a river, lake or estuary). Under this Act a controlled activity means: *(a) The erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or* *(b) The removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or* *(c) The deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or* *(d) The carrying out of any other activity that affects the quantity or flow of water in a water source.*	*Under Clause 38 of the Water Management (General) Regulation 2011, public authorities and local councils are exempt from the requirements to obtain a 'controlled activity' approval. No direct impact on any river, lake or estuary is envisaged from this proposal. However, as Merimbula Creek feeds into Back Lake, and works are close to the creek banks in some areas, mitigation measures including those discussed in section 5.3 should be implemented.*	
Bega Valley Council Local Environmental Plan 2013	*The proposed work area has the following land use Zonings:* - Public Recreation- "To enable land to be used for public open space or recreational purposes. To provide a range of recreational settings and activities and compatible land uses. To protect and enhance the natural environment for recreational purpose."	

Law, Policy or Regulation	Requirement for proposal
The LEP is the principal legal document for controlling development at the council level. The zoning provisions establish permissibility of uses and standards regulate the extent of development.	*Clause 5.12 of the LEP allows for Council infrastructure development without development consent.*
AS 4282:2019 – Control of the obtrusive effects of outdoor lighting. **And** **CASA Manual of Standards Part 139 – Aerodromes, in particular Clause 9.1.3 Lighting in the Vicinity of an Aerodrome**	*Refer to Sections 4.9 and 5.14.* *AS 4282:2019 provides guidance on the management of light impacts on residents, vehicle traffic including air traffic and traffic signalling systems. In this case, of particular note are adjacent residences and air traffic, as the lights are located within Runway zone C and the CASA Standard restricts the maximum lighting intensity emitted at 3° above the horizontal to 150 candela.*

4.0 EXISTING ENVIRONMENT

4.1. Geology, topography, flooding and coastal hazard

Geology
A geotechnical investigation of the site has been conducted by ACT Geotechnical Engineers Pty Ltd. Findings were fine to coarse sand at about 1 to 1.5m depth, sandy silt clay at higher levels with denser clay/silt sand in topsoil profiles. The groundwater table was encountered at about 1 to 1.5m below the surface at the northern end of the oval, and between 2m and deeper at the southern end.

Topography
Topographically the site is flat, having been levelled for use as sports playing fields. It is likely the area was once river flat like the area to the east of Merimbula Creek. A small grassed bank is situated just north of the existing grandstand building. This area is likely to be consequence of construction of earthworks for buildings and sporting structures at the site and provision of spectator viewing areas.

Flooding and coastal hazard
Merimbula Creek run along the south-east and eastern side of the Berrambool oval. The creek is a narrow, steep banked channel that feeds into the Back Lake and then into the Pacific Ocean. The area is identified as a flood risk as outlined in the *Merimbula Lake and Back Lake Flood Study* (Cardno 2017). The 1% AEP flood level over the oval area is about 4m AHD and the 5% AEP flood level is about 3.70m AHD. The surface levels of the oval and surrounds where the lights are to be installed range from 2.1 to 2.8m AHD.

The Berrambool Sporting Complex would not be considered at risk of hazards such as coastal erosion. Water level rises may occur as Merimbula Creek and Back Lake will be affected by future trends in sea level rise however, the playing fields themselves are above any future predicted average high tide levels to 2100.

4.2. Acid Sulfate Soils (ASS) or Potential Acid Sulfate Soils (PASS)

The area of the Berrambool Sporting Complex has been mapped as Low probability of occurrence, alluvial soils, with the potential for ASS or PASS at 2m depth or more (DLWC, 1998). ASS areas are shown in the constraints map attached at Appendix C.

Maximum excavation for the footings for the lights is approximately 1m depth and are unlikely to disturb ASS or PASS material which would exist below alluvial layers which are located down to about 3 to 4m depth (ACT Geotechnics, 2019).

4.3. Climate

The far south coast region has a cool temperate climate, with marine influence. Long term average annual rainfall in the Merimbula area is approximately 858mm per year. Rainfall distribution across the year varies slightly, being highest in early autumn with an average of 93mm, and lowest in July with 44mm.

Mean maximum/minimum temperatures for summer are around 24.6/15.4 (degrees Celsius) and around 15.8/4.4 for winter.

4.4. Flora and Fauna

4.4.1. Methods

DATABASE AND LITERATURE REVIEW

Databases used to generate a list of threatened and migratory species known or predicted within 10km of the proposed works site were:

- The BioNet Atlas of NSW Wildlife (OEH Licence CON11003).
- The Environmental Protection and Biodiversity Conservation (EPBC) Act Protected Matters Search Tool (DoEE, 2019a).

All entities recorded from the above database searches were assessed for their likelihood of occurrence in the vicinity of the proposal (Appendix B). Assessments of significance are required to be carried out for any entities with the potential to be affected by the proposal, in accordance with the NSW BC Act and the EPBC Act where applicable.

FIELD SURVEY METHODS

The following attributes were recorded in areas comprising or adjacent to native vegetation and/or fauna habitat:

- Flora species composition (for EEC determinations and condition assessment).
- Threatened flora species searches.
- Habitat features including hollow-bearing trees, feed trees, rock outcropping and scats.
- No targeted fauna surveys were undertaken due to the small-scale nature of the proposal and that it occurs within predominately cleared urban/disturbed land. The habitat surveys informed which species could use the habitat.

Flora species nomenclature was checked against the NSW Royal Botanic Gardens PlantNet website.

Plant Community Types (PCT) and Threatened Ecological Communities (TEC) were classified in accordance with the - BioNet Vegetation Classification (OEH, 2019a), with TEC also being checked against the relevant State and Federal descriptions (OEH, 2019b; DoEE, 2019b).

4.4.2. Flora survey results

The study area was the area surrounding the Berrambool Sporting Complex with reference to vegetation and habitat across Merimbula Creek to the East. Residential buildings exist to the South-East and West of the site. Much of the land in the study area is highly modified by previous building, road works and public use. A detailed flora species list was not undertaken as a previous survey for a proposed road extension on the eastern side of Merimbula Creek, undertaken in August 2019, gave habitat values and plant community type (PCT) identification (Southeast, 2019).

4.4.2.1. Vegetation

Vegetation along the banks of Merimbula Creek consists of native and exotic mid storey species with very few canopy trees occurring. The vegetation is dominated by Black Wattle and Sweet Pittosporum, both colonising species in areas with a history of disturbance. Ground cover is predominately introduced weed species. Vegetation surrounding the Berrambool Sporting Complex included some canopy trees (*Eucalyptus tereticornis- Red Gums)*.

The woody vegetation, despite its highly modified condition, possesses sufficient native species cover to be classified as native vegetation, with the best fitting Plant Community Type (PCT) being: PCT 1108 - *River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion,* based on habitat (including landscape position), surrounding vegetation and floristic composition.

(Vegetation map contained in Appendix C).

The footprint of works will not be within the area of woody vegetation along the creek banks. The playing fields and their immediate surrounds constitute exotic grasses that are regularly mown.

4.4.2.2. Threatened ecological communities

PCT 1108 is included as part of the Threatened Ecological Community (TEC) *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* listed under the BC Act. Under the Biodiversity Offset Scheme, clearing of vegetation listed as a TEC would require approval. However, as this project does not require vegetation to be cleared and is being conducted under Part 5 of the EP&A Act, Council is not obliged to participate in the Scheme.

Note: The Commonwealth Environment Protection and Biodiversity Conservation Act is currently considering the listing of an ecological community aligning with the abovementioned TEC, proposed name: *Coastal Floodplain Eucalypt Forest of Eastern Australia.* Therefore, a review of the listing should be made prior to works commencement and, should the listing be finalised, an EPBC Act significance assessment will be required.

4.4.2.3. Threatened flora species

No threatened flora species were recorded within the previous study area of the road extension or on the site visit for this proposal. The disturbed condition of the vegetation and human activities around the site (car parking around the oval, mowing, pedestrian access) make it highly unlikely that any of the more cryptic threatened flora species known from the region would be found during further surveys during other seasons. Therefore, no flora species listed under the schedules of the NSW BC Act or the Commonwealth EPBC Act are included in the threatened species significance assessments.

4.4.3. Fauna habitat survey results

Fauna habitat types identified in the vicinity of the sites include:

1. Cleared, disturbed grassland
2. Riparian land and waterway

The grassed playing fields and surrounding areas would provide grazing for native mammal species, such as macropods and wombats. Numerous wombat burrows were found on the eastern side of Merimbula Creek. Connectivity for these species into higher surrounding bushland is curtailed by residential housing and road systems to the West.

The lack of overstorey trees means seasonal foraging habitat for threatened bird species and flying foxes, mainly in nectar from flowering gums and insects, is relatively poor. No hollow-bearing trees were seen in or surrounding the site, though an extensive ground search was not undertaken as no canopy or mid storey vegetation require removal for the proposal. The area does have some connectivity to larger areas of native vegetation that would provide fauna connectivity for arboreal species, especially to the north. However, the proximity to busy roads and urban areas with breaks in canopy connectivity make it likely the area is not well utilised by arboreal or terrestrial species. One Ringtail Possum drey was seen along the banks of Merimbula Creek in surveys for the proposed road upgrade.

Microbat species would utilise the site for foraging, drinking from the creek line. Roosting opportunities were however poor within and surrounding the proposed works area. It is likely these species would come to the site from further afield. Microbat species such as the Large-footed Myotis and the Large-eared Pied Bat would utilise habitat such as that found in/along Merimbula Creek. The Large-footed Myotis was not identified in desktop searches however habitat on the site was suitable for the species to forage. The lack of hollow-bearing trees in the area make it unlikely that either species roosts in the immediate vicinity of the Berrambool Sporting Complex. As the creek line is not intended to be directly impacted by the development, and mitigation measures are outlined to protect indirect impacts, a significant threat to either species is not predicted. Many microbat species will actively feed around tower lights, attracted to the insects that congregate to the light sources.

Merimbula Creek provides habitat for waterbirds, fish and amphibian species. The creek banks are littered with fallen vegetation that rests in the water (snags) that would give hiding spots and breeding opportunities to fish and frog species. Water quality was not assessed, but whilst the creek was also noted to have human rubbish within and around it, numerous fish species were seen along with birds fishing in the deeper parts of the creek line.

Reptiles wold also utilise the creek line which provides ample basking, foraging and hiding places in fallen timbers and vegetation. The open playing fields provide less habitat for these species.

The Bega Valley Vegetation and Corridor Strategy - Draft May 2000 states the importance of riparian areas as fauna links and aquatic ecosystem protectors. Merimbula Creek vegetation would provide a corridor for wildlife to larger stands of intact forest north and west of the Merimbula Township. However, as some sections of the creek are only narrow strips of tall shrub stands and with the proximity of urban and commercial development, it is not likely that the site would be a prime corridor link for threatened species. The habitat characteristics of the site are common in the area, and as no impact on Merimbula Creek is proposed, the installation of the four lighting towers and electricity conduit would not stop most species already utilising the site from continuing to do so. Mitigation measures discussed in Section 0 are proposed to ensure impact to the aquatic environment is managed from the construction works.

Given (a) the limited habitat resources in the study area for threatened species that often require distinct habitat characteristics; (b) that proposed mitigation measures will manage risks to threatened species, there is deemed to be no risk to any threatened fauna species associated with the proposed activity. Therefore, no fauna species listed under the schedules of the NSW BC Act or the Commonwealth EPBC Act are included in the threatened/migratory species significance assessments.

4.5. Indigenous cultural heritage

A review of the Aboriginal Heritage Information Management System (AHIMS) database showed no recorded sites within 30-300m of proposed works sites. The proximity of the works areas to estuaries and watercourses suggests the possible likelihood of Aboriginal heritage items in the area.

The area where works are proposed are highly disturbed areas around and within the sports field area. Over time, significant surface and sub surface disturbance has been carried out over and around the playing field areas associated with infrastructure construction and surface reshaping, preparation of field vegetation and top dressing.

The lighting tower and electrical conduit works and excavations for the light tower footings extend to a maximum of 1m depth for the tower footings with the majority of excavation to 0.4m or less associated with trenching.

Although the area presents a possibility of containing Aboriginal heritage items, the current extent and depth of disturbance over the works area suggests that the works zone is disturbed land and disturbance of any items is unlikely.

Refer to section 5.7 for assessment of potential impact, mitigation measures and proposed due diligence for the site.

4.6. Non-Aboriginal heritage

NSW HERITAGE ACT LISTED SITES AND LOCALLY SIGNIFICANT HERITAGE SITES

The proximity of works sites to state significant and locally significant heritage sites listed under the draft Bega Valley Local Environmental Plan 2013 and State heritage Register was investigated by overlaying Council's heritage maps onto work site maps. The site is close to two listed Heritage sites: *1054 - 85-87 Main Street* (Old School Museum building) and *1734- Trolley Way/Mirador Tram Way/Pages Creek Dam* area. The proposed works at the Berrambool Sporting Complex would not impact on these sites directly or indirectly.

4.7. Asbestos

No asbestos is predicted to occur at the work site as no existing buildings require removal for the lighting towers. The four existing lights to be removed are timber/metal construction so would not contain asbestos.

4.8. Waste Management

The following major waste streams are identified and methods for their management provided below. During construction the following waste will be produced:

- Earth material – Some areas may require levelling and some earth removed from the site for concrete pad construction for each lighting tower. Each concrete pad will be

slightly battered down to current ground level to avoid water pooling around the bae of the towers. No major earthworks will be required.

- General construction waste – construction at the site will generate general construction waste such as paper, plastics and metal.

There is not expected to be any onsite maintenance of construction equipment. The Protection of the Environment Operations Act 1997 (POEO Act) makes it an offence to 'without lawful authority, wilfully or negligently dispose of waste in a manner which harms or is likely to harm the environment'. Accordingly, the requirements of the POEO Act will be met during the construction works.

4.9. Night time light conditions

To allow for night time training and games, the oval is currently lit from the western side. Light spread to neighbouring properties is likely to currently occur, however the existing illumination effects are not known.

5.0 IMPACT ASSESSMENT AND RECOMMENDED MANAGEMENT AND MITIGATION

5.1. Methodology

Issues identification and assessment is developed through a combination of desktop constraints assessment using in-house/online mapping and other information made available by Council combined with a site inspection of the works area and surrounds.

A basic risk assessment matrix (Table 5.1), was applied, addressing each particular environmental issue.

Assessment tables and maps, covering the site, are attached in Appendix A. Any issues identified as presenting a medium or greater risk were noted and colour-coded in Appendix A, as per Table 5-1 below.

Table 5.1 Risk assessment matrix

Potential consequence ⇩ / Likelihood of occurrence ⇨	Likely	Possible	Unlikely
Major	Very High	High	Medium
Moderate	High	Medium	Medium
Low	Medium	Medium	Low

5.2. Summary

The proposed works generally present minimal environmental risk provided appropriate mitigation and management measures are implemented, as summarised in Table 5.2 below. All potential impacts can be managed and mitigated to an acceptable level.

Table 5.2: Key impacts and management approaches associated with proposed extension of Service Road.

Environmental Issue	Potential impact and location	Management
Outdoor illumination effects of adjacent residents and air traffic during construction and operation.	Impacts on adjacent properties surrounding the oval, and potential impacts on air traffic on approach or take off from Merimbula Aerodrome.	Assessment of lighting impacts shows that spill light onto adjacent properties is restricted to 6.7 lux or lower, below the standard of 10 lux as recommended in AS4282. Photometric assessment and lighting design information has been provided to CASA for assessment. A max of 150 candela is permitted at 3° above the horizontal at this area of the runway approach. Lights will have lighting tilts set up such that light emissions are kept below the horizontal. Notify Merimbula Airport of the use of cranes 24 hours prior to use.
Flooding	The 1% AEP Flood level is approximately 4m AHD over the site, and the 5% AEP is approximately 3.7m AHD. Site levels are between 2.1 to 2.8m AHD.	Consider levels of electrical component construction in relation to potential inundation, and mechanisms to manage inundation (trip switches).
Erosion and sediment transport to receiving waters	Impacts from uncontrolled runoff onto Merimbula Creek.	Implement standard erosion and sediment controls as per the Managing Urban Stormwater series (NSW, 2006).
Acid Sulfate Soils	The area has been mapped a low potential for acid sulphate soils due to the alluvial nature of soils over the area. ASS or PASS are unlikely to be intercepted at depths above 1m.	Works are less than 1m below the natural ground surface, therefore ASS or PASS disturbance is unlikely.

	Excavation is required to a maximum 1m depth for the light pole footings, therefore disturbance of ASS or PASS is highly unlikely.	No field testing or ASSMP is required for areas where excavation is kept above 1m depth. Should additional excavation below 1m be required then field testing of excavated soils for the presence of ASS or PASS is required, and from that a requirement for an ASSMP determined.
Flora and Fauna	Impact on common species.	See Appendix B for significance assessment under Section 7.3 of the BC Act (5 part test). Provide fauna barriers or cover trenches/tower pads overnight- this would also assist in OHS requirements for pedestrians who may access the site. Cyclone fencing with shade cloth attached to the lower part would assist in halting small species from falling into excavations and humans/pets entering works areas. Siltation barriers to any area of Merimbula Creek where heavy rainfall may wash site fill/spoil in to.
Aboriginal Heritage	No Aboriginal sites identified in AHIMS search. The location of some of the works will enter undisturbed land at depth, with the high likelihood of aboriginal heritage items being found.	To limit the risk of harm to an aboriginal artefact follow the recommended procedure for carrying out works outlined in section 5.6.

5.3. Soil and water (erosion and sedimentation)

The proposed four lighting towers and associated electrical conduit is in an open, flat area adjacent to a watercourse. Proposed works on the eastern side of the playing fields have potential for erosion and sedimentation into Merimbula Creek. In order to manage for erosion and sedimentation during construction, an erosion and sediment control plan shall be prepared. *Managing Urban Stormwater; soils and construction Vol 1 (Landcom, 2004)* and other associated guidelines should be used.

The construction contractor should be aware of weather forecast conditions and minimise the exposure of disturbed areas and risk of sediment laden runoff in this area.

Sediment and erosion controls should remain in place until all soil is levelled/removed and the disturbed ground seeded or turfed.

MANAGEMENT AND MITIGATION

An erosion and sedimentation control plan (ESCP) for the project should be prepared. The ESCP should comprise both:

- plans and details (typically 1:500 to 1:1000 scale) showing the layout and details of erosion control measures; and
- sediment control measures supporting commentary or construction notes containing explanatory text, calculations and diagrams as necessary.

Where applicable, the ESCP map should show the location of the following activities:

- stockpile and storage areas;
- temporary work areas;
- materials processing areas;
- crossings (road and creeks)
- compound areas, such as the contractor's and the principal's facilities
- any other activities that might affect water quality.

The road should be constructed so that the site is adequately protected from erosion during works. This can be achieved by undertaking the following:

- Ensure any excavation is the minimum necessary. Limiting the width of the disturbed area for electrical conduit will be an important management tool, particularly near Merimbula Creek
- Divert surface water away from stockpiles close to Merimbula Creek;
- Ensure all disturbed areas are revegetated - replace topsoil and vegetate by turf strips (like for like with surrounding grass species) laid to match surrounding ground levels. The contractor must seek written approval from Council's project manager to vary from turf strips and Council may consider grass seeding mix and soil blend, or a spray on bonded seed mix;
- All stockpile sites to be covered during any rainfall period or suitable sediment controls placed around the perimeter.

The ESCP should be revised whenever the construction program, scope of work or work methods change, whenever the work methods and control structures are found to be ineffective, or if so directed by the relevant regulatory authority.

5.4. Acid sulfate soils

Excavation below 1m depth is not required based on the current light footing design. ASS or PASS are only likely below this depth as such no ASS or PASS testing or management is necessary.

Should excavation below 1m depth be required, soil samples are to be assessed for contact of acid sulfate material by a suitably qualified person and the results lodged with Council. Should ASS or PASS be identified and disturbance of more than 1 Tonne of that material required, siteworks and excavation shall not take place until an Acid Soil Management Plan (ASSMP) has been prepared by a suitably qualified person, in accordance with the NSW Acid Sulfate Soils Manual (1998). The Plan shall identify measures to effectively control, treat and manage acid soils on the site to ensure the environment is not polluted by any release of such soils.

MANAGEMENT AND MITIGATION

Management measures in any ASSMP, if required, should include (but are not limited to) the following:

Stockpile Management

- Prepare a stockpile area for the top 2m of material which will not be ASS or PASS. This material is to be retained as cover material.
- Prepare an area for stockpiling of ASS or PASS material below 2m depth, this area should accommodate about $5m^3$ of material
- Create 100mm compacted clay layer or use plastic liner beneath each stockpile footprint (nominal 5mx5m) to prevent leachate movement into the soil profile.
- Retain plastic liner sufficient to cover untreated stockpiles in event of heavy rainfall.
- Plan excavation and stockpiling to avoid heavy rainfall (>25mm/d), make use of long term (10-14 day forecast).
- Sequence earthworks to limit stockpile life to 1 week.
- Stockpile to be min 10m from waterbody.
- A guard layer of 7.5kg of lime per sqm of stockpile base.
- Leachate collection drain/bund around stockpile.
- Diversion bank/drain to divert runoff around the stockpile.
- Compact stockpile surface to limit permeation of rainwater into stockpile

Leachate management

Runoff from ASS stockpiles has the potential to contaminate soils and waterways. Leachate generation is unlikely given the small amounts stockpiled and short duration of stockpiling and stockpile covers. The following are recommended.

- All PASS stockpiles will be bunded and have a collection basing for any stockpile runoff or leachate.
- Collected runoff or leachate will be treated with hydrated lime prior to disposal based on pH testing.
- pH of treated water will be tested and confirmed between pH 6 and 8 prior to discharge over a low, flat area adjacent to the management area, upstream of a silt fence.

Monitoring and reporting

Stockpile testing prior to backfill:

- Record amounts of ASS material processed and stockpiled
- Stockpile and reuse all excavated material on site.
- Undertake field pH testing in accordance with the ASS management field pH testing guidelines of the stockpile during and immediately after treatment and mixing to establish that even mixing has occurred and pH level is dropping.
- After 24h, collect a representative sample from the stockpile and send for SPOCAS testing.
- Compare results with levels outlined in section 3.4, and use as backfill as required if net acidity levels are met. Cover and compact with stockpiled non ASS or PASS material.

5.5. Flood impact risk management

The 1% AEP flood level is approximately 4m AHD, and the 5% AEP level is 3.7m AHD in the area of proposed works, nominally 1 to 2m deep over the oval area.

MANAGEMENT AND MITIGATION

- Consider flood levels when designing and constructing infrastructure to manage inundation risk.

5.6. Flora and fauna

5.6.1. Direct and potential indirect impacts

Direct impacts

The works will occur on previously cleared land. No direct impact is proposed on native vegetation for the installation of the four lighting towers and electrical conduit. The proposal would have no impact on local or regional habitat connectivity.

Potential indirect impacts

Vegetation/habitat adjacent to the development area may be subject to potential indirect impacts, including:

- Temporary noise/physical disturbance to fauna and their habitats during construction.
- Weed encroachment.
- Damage of native plants by machinery movements during construction.
- Potential damage to root system of native trees during construction .
- Physical disturbance to fauna from lighting during operation of the lights.

The above potential indirect impacts are taken into consideration in the likelihood of occurrence assessments (Appendix B).

5.6.2. Species/communities requiring significance assessment

As determined in the likelihood of occurrence assessments (Appendix B), no threatened species or ecological community requires a significance assessment under the Biodiversity Conservation Act (Appendix B).

5.6.3. SEPP 44 Koala Habitat assessment

The Bega Valley LGA is listed on Schedule 1 of SEPP 44.

SEPP 44 aims to identify areas of potential and core Koala Habitat. These are described as follows:

- Potential Koala Habitat is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component.
- Core Koala Habitat is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

Results:

Berrambool Sporting Complex does not comprise Potential Koala Habitat. Forest Red Gum does appear on the site; however no canopy vegetation will require removal for the works, and impact on this species is not likely to occur.

The site does not comprise Core Koala Habitat, as it does not contain any areas of land with a resident population of koalas, evidenced by attributes such as breeding females (females with young) and recent sightings/historical records of a population. There are no recent Koala records within 10km of the sites.

Therefore, SEPP 44 does not prevent the activity from proceeding.

5.6.4. Conclusion of 5 Part Test

One threatened entity was identified to be assessed under a 5 Part Test of Significance under section 7.3 of the BC Act (see Appendix B).

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is listed as a TEC under the BC Act.

The works are proposed on previously disturbed/cleared land. Disturbance to adjacent habitat that constitutes the TEC by works activities is not envisaged. The implementation of standard mitigation measures shall also prevent any risk of significant impacts.

In conclusion, it has been determined that the proposed activity will not require a Species Impact Statement.

5.6.5. Conclusion of EPBC Act significance assessments

No threatened entities were identified to be assessed in the EPBC Act Significance Assessment (see likelihood of occurrence tables in Appendix B).

No disturbance to adjacent habitat caused by works activities is envisaged. The implementation of standard mitigation measures shall prevent any significant impact on the environment.

In conclusion, it has been determined that the proposed activity is unlikely to significantly impact any Matters of National Environmental Significance listed under the EPBC Act.

Referral to the Commonwealth under the EPBC Act is not recommended.

MANAGEMENT AND MITIGATION

- Fence-off adjacent native vegetation where there is a risk that works activities will cause direct damage to it, or indirect damage such as soil compaction.
- Install silt fencing in all areas where erosion/sedimentation may impact on vegetation or waterways.
- Stockpile soil only where exotic grasses dominate the ground layer or in areas of bare soil.

5.7. Indigenous cultural heritage

A review of the Aboriginal Heritage Information Management System (AHIMS) database showed no recorded sites within 30-300m of proposed works sites. Floodplain areas- such as Berrambool would once have been- are landscapes where Aboriginal Artefacts are more likely to occur.

The playing fields area is disturbed through previous development and levelling for use as sporting fields, the depth of excavations for the lighting towers and trenching for electrical cabling extend from surface disturbance to a maximum of 1m depth for the footings.

Given the extensive modifications to the sports field area where lights are proposed, excavation works are likely within existing disturbed areas, both horizontally and vertically.

In order to manage the risk of disturbance to aboriginal artefacts it is proposed to follow the procedure outlined in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW, 2010) outlined below.

MANAGEMENT AND MITIGATION

Follow the generic due diligence process outlined in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW, 2010)

Step 1. Will the activity disturb the ground surface? *Yes*

Step 2a. Search the AHIMS database and use any other sources of information of which you are already aware. *Search undertaken and Aboriginal sites or artefacts not recorded within 300m of the proposed disturbance area.*

Step 2b. Activities in areas where landscape features indicate the presence of Aboriginal objects. *Some of the works activity area is in a location (floodplain area within 100m of estuaries and watercourses) where Aboriginal artefacts are likely to occur. However, the landscape is highly disturbed to the proposed depth of excavation and disturbance of Aboriginal artefacts is unlikely.*

Step 3 and 4. Can potential disturbance be avoided and/or does visual inspection confirm the presence or likely presence of aboriginal objects. *Disturbance cannot be avoided. Surface has been significantly disturbed due to the construction of the ovals and associated infrastructure therefore presence of objects is unlikely.*

Recommended procedure for carrying out works:

- For the excavation of four lighting tower concrete pad areas and trenching for electrical conduit, proceed with caution when excavating.
- If while undertaking your activity you find an Aboriginal object you must stop work and notify the NSW Office of Environment and Heritage (OEH) and you may need to apply for an AHIP.
- Some works may not be able to resume until you have been granted an AHIP and you follow the conditions of the AHIP.
- Further investigation may be required depending on the type of Aboriginal object that is found. If human skeletal remains are found during the activity, you must stop work immediately, secure the area to prevent unauthorised access and contact NSW Police and OEH.
- The NPW Act requires that, if a person finds an Aboriginal object on land and the object is not already recorded on AHIMS, they are legally bound under s.89A of the NPW Act to notify OEH as soon as possible of the object's location. This requirement applies to all people and to all situations, including when you are following this code. If a person finds an Aboriginal object which is not recorded on AHIMS, they should contact DECCW as soon as practicable. Notification procedures can be found at: www.environment.nsw.gov.au/licences/AboriginalHeritageInformationManagementSystem.htm

5.8. Worker and community safety and social impacts

5.8.1. Site Hazards

The majority of safety hazards at the site will be the result of construction activities. These will need to be addressed through the contractors' work, health and safety procedures prepared for the site.

MANAGEMENT AND MITIGATION

The contractor shall prepare and implement work, health and safety procedures for the site, these should include, but are not limited to:

- Preventing unauthorised access to work sites
- Details on management of parking for the construction machinery and workers vehicles to minimise impacts on adjacent residents and users of the sporting complex.
- Detail on any traffic control required around the entrance and exits to the playing field.

5.9. Hazards and Safety

Some preliminary considerations are included for risk mitigation during the construction period. This is not an exhaustive list and BVSC or the contractor should undertake the required assessments.

- Check Materials Safety Data Sheets (MSDS) where certain substances are used. Ensure that all relevant staff are aware of key information on the MSDS. Include environmental protection measures as required.
- Traffic management – to and from the site and during construction.
- Risk / hazard assessment – to address construction related impacts such as:
    - Crane use
    - Excavation
    - Electrical installation
- As the weather warms up site staff need to be aware of biting insects and snakes becoming more active as well as other biological and weather hazards (heat, hot sun etc.).
- Trips and falls or vehicle hazards associated with objects on or near the ground, undulating ground surface nearer to creek, or channels and soft, slippery or waterlogged areas.

5.9.1. Traffic and Access

Access to the site is from Berrambool Road, a council managed road. Impacts on traffic and access will be the result of:

- Additional vehicle movements associated with machinery and deliveries to site
- Parking and storage of materials.
- Disturbance to road pavement, car park within the Berrambool Sporting Complex that disrupt traffic movement and pedestrian movement, and public access to the playing field.

MANAGEMENT AND MITIGATION

Traffic and Pedestrian Movement

Pedestrian access and use of the playing field and from the Berambool area across an existing pedestrian footbridge to the main shopping area of Merimbula will require management during construction of the lighting towers. Materials required for the construction can be stockpiled in open areas close to the oval and fenced off from public access. A traffic management plan will be prepared to control pedestrian traffic that is likely to occur in the works areas. The contractor shall confirm locations with Council which may include:

- Pedestrian access across the Pedestrian Footbridge or the temporary closure of this access.
- Pedestrian access along a walking track along the western bank of Merimbula Creek.
- Public access to the playing fields, children's playground and nearby electrical equipment required to be upgraded for this proposal.

It is highly unlikely that any other areas will be impacted. However, if any occur, these should be considered by the contractor on a case by case basis.

5.10. Visual Amenity and Noise Impacts

Visual amenity will be temporarily disturbed by construction at the site. Likely impacts will be the result of barrier fencing, temporary signage, machinery, materials stockpiles and earth stockpiles. The lighting towers which will be evenly spaced around the oval will not greatly alter the current appearance of the Berrambool Sporting Complex, replacing four existing towers on the western side. Restoration of visual amenity is proposed by levelling and seeding/turfing any soils disturbed and removal of any waste materials. The study area is dominated by environmental background noises such as traffic and people, birds, the ocean, wind and insects. Construction works within the vicinity of residences should ensure that DECC noise guidelines are not exceeded.

Where vehicles must travel near residences, consideration will be given to noise impacts.

The proposed construction works will not produce significant noise impacts outside of normal daily operating hours, as work will be carried out during designated construction times (7am-5pm, Monday to Saturday). No ongoing noise emissions would occur. No noise monitoring is deemed necessary to evaluate potential noise impacts.

MANAGEMENT AND MITIGATION

As per the *Draft Noise Control Guideline – Construction Site Noise* (DECC, 2008a), construction related noise should be managed to the following standards:

- **Construction period of four weeks or under**. The L10 level* measured over a period of not less than 15 minutes (measured at nearest residence) when the construction site is in operation must not exceed the background level by more than 20dB(A).
- **Time restrictions**. Monday to Friday 7am to 6pm, Saturday 8am to 1pm if audible on residential premises, otherwise 7am to 1pm. No construction work to take place on Sundays or Public Holidays.
- **Silencing.** All possible steps should be taken to silence construction equipment.

*L10: Noise level exceeded for 10% of a specified time period

In addition to the DECC guidelines, the construction activities should be guided by AS2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites".

Mitigation measures may be employed to minimise any impacts should these occur:

Vehicle noise and pollution emissions shall be limited by ensuring that all plant and equipment meet WorkCover regulations and are fitted with correct noise reduction devices in accordance with manufacturer's recommendations:

- Regular servicing of construction equipment shall be undertaken by Council and/or the Construction contractor.
- Working hours to be restricted to comply with EPA and Council regulations and these should be confirmed prior to undertaking any of the proposed works.

(Noise, continued)

- Consultation with affected nearby residents and informing them in advance as to the extent and timing of works and responsibly advising when noise levels during such works may be relatively high.
- Where readily available, deploying plant having lower noise emission levels.
- Properly maintaining plant to ensure rated noise emission levels are not exceeded
- Work only within designated hours.
- Providing a contact telephone number for the public to seek information or make a complaint. A log of complaints will be maintained and actioned by the site superintendent in a responsive manner.
- Undertaking construction activities guided by AS2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites".

Furthermore, construction work is to give due consideration to the amenity of site neighbours and any complaints are to be noted and addressed where possible.

5.11. Air quality

Construction

The potential for dust generation will occur from surface disturbance with the requirement for excavation, possible trenching and backfilling. Exposed soil from these works should be covered as soon as practicable. Some sand material may be required to be transported to any site, therefore airborne dust may affect residents near the construction site, nearby transport routes or water quality. Following the completion of construction works, the proposed works would not have any dust impacts on air quality.

Operation

No dust impacts would occur once the works are installed and the sites are rehabilitated.

MANAGEMENT AND MITIGATION

As part of the soil and water management plan prepared for the site, management of wind-blown dust should be considered. This can be managed through the use of covers over truck loads and any stockpiled soils/sand.

The following mitigation measures should be employed to reduce any potentially adverse air quality impact from dust during construction:

- Stockpiles should be kept to a minimum with
- Excess spoil should be promptly removed from site;
- Exposed areas should be either be covered, turfed or stabilised by fast growing native grasses or approved vegetation

5.12. Waste management

The following major waste streams are identified and methods for their management provided below. During construction the following waste streams will be produced:

- Topsoil – Topsoil shall be stockpiled separately and reused on site or transferred to a Council stockpile for reuse in other areas.
- Bulk earthworks material – excavated material will be reused as backfill on site where possible. Excess fill will be transferred to a Council stockpile for reuse in other areas.
- General construction waste – construction at the site will generate general construction waste such as paper, plastics and metal.

MANANAGEMENT AND MITIGATION

The following mitigation measures are to be implemented:

- Waste stored on site would be held in appropriate skips or bundled into stockpiles and covered where appropriate. Transport of materials from construction site to sites of reuse or disposal would be done using covered trucks where possible.
- Dispose of materials at an approved waste disposal/recycling facility where re-use or storage opportunities cannot be found.
- Securely store waste on site until it is removed so that it does not become litter. Skip bins or other containers will be used on-site for the collection of general waste. An appropriately licensed waste contractor will collect general waste if required.
- Excess soil material exported from the site would be available for resale, reuse or will be disposed at an appropriate landfill.

In the event of any oil waste occurring on-site, this would be collected and transported to the nearest oil recycling facility.

5.13. Chemical and hazardous substance management (non-Asbestos)

Chemical and potentially hazardous substances that are likely to be used for the proposed works will be hydrocarbons, including oils, greases, and fuels. No temporary fuel or chemical storage will be required.

MANANAGEMENT AND MITIGATION

A hydrocarbon spill kit should be available on site whilst machinery are operating to manage any hydrocarbon spills.

Where refuelling of machinery is undertaken on site, ensure a hydrocarbon spill kit is located in close proximity to the refuelling location.

Undertake any refuelling away from Merimbula Creek and stormwater drains.

Spill Management

The spill management procedure shall include at a minimum:

- Contact appropriate authorities if necessary, generally Fire, Council and EPA.
- Isolate spill from transfer to the environment, either through collection, bunding, diversion or other means.
- Undertake necessary clean-up.

5.14. Lighting and illumination impacts

The proposed oval lighting has the potential to Impact on adjacent properties surrounding the oval, and impact on air traffic on approach or take off from Merimbula Aerodrome during both construction, through the use of cranes, and during operation. Community consultation was undertaken via a letterbox drop with residents of the Berrambool area. No responses were received in regards to the works proposal. Consultation with Merimbula Aerodrome and with Civil Aviation Safety Authority (CASA) has also been undertaken. See Appendix G and below.

MANANAGEMENT AND MITIGATION

Modelling of the lighting extents and intensity over the oval, and photometric assessment have been prepared to test the lighting impacts over the oval. The selected lights are able to be set such that light spread is below the horizontal plane.

The new lights will be installed to meet the requirements of AS4282:2019 – Control of Obtrusive Lighting which provides limitations and guidance on the minimisation of light pollution. As such, the lights are very directional and will not produce unacceptable light pollution in areas external to the oval. Minimal acceptable light spill within the limits of the Standard at maximum illumination is produced. More specifically, maximum vertical illuminance is to residences is limited to:

North Resident maximum vertical illuminance = 6.7 lux
East Resident maximum vertical illuminance = 3.4 lux
South Resident maximum vertical illuminance = 4.5 lux

Which are below the maximum vertical illuminance of 10 lux (AS4282).

Refer to Appendix F for lighting analysis modelling and reports.

The lighting proposal, including detailed plans as well as light emission analysis has been provided to CASA for a Safety Assessment and Approval to proceed. Further, liaison with the Merimbula Aerodrome Manager Chris Thane has been undertaken, and advice regarding the use of cranes during construction has been provided.

Refer to Appendix G for correspondence with CASA and the proposed letter for consultation with local residents.

The following mitigation measures are to be implemented to ensure the installation and

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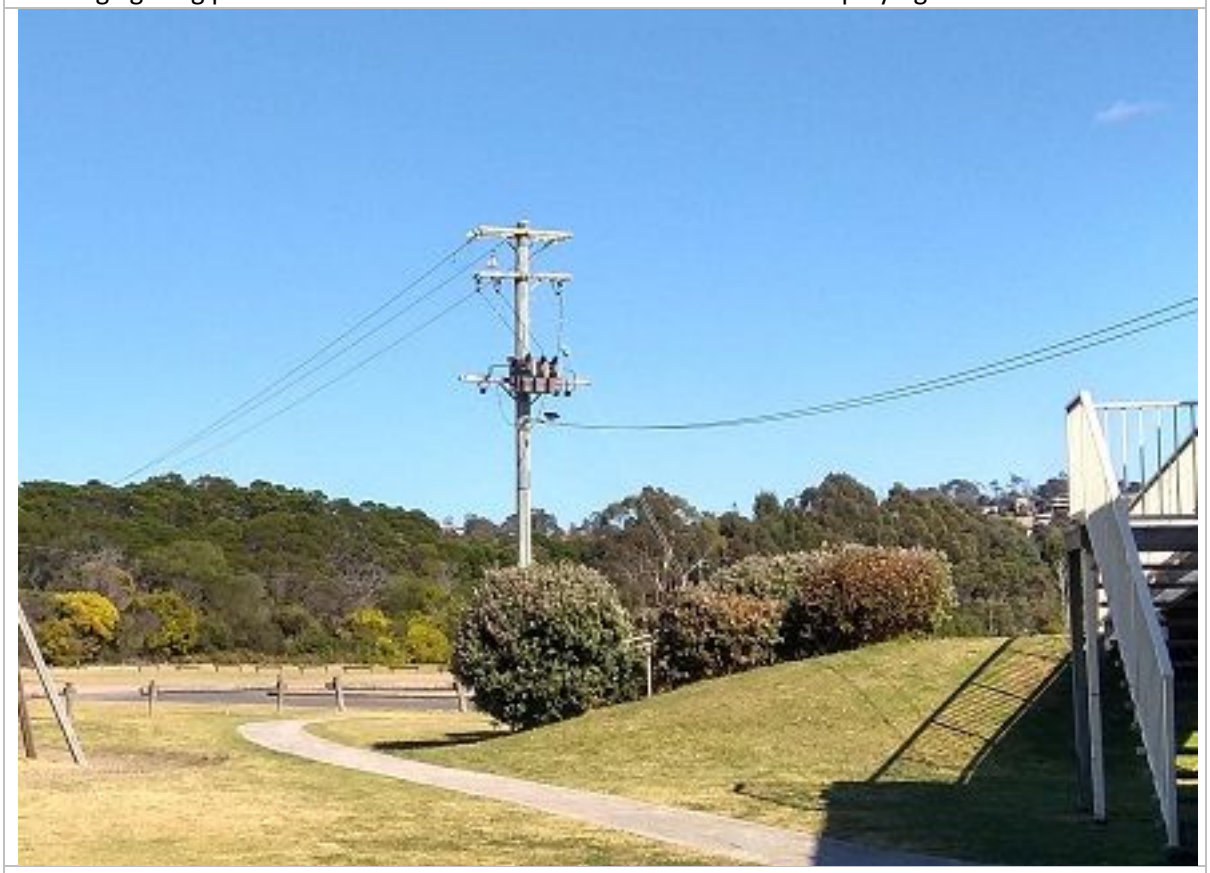
APPENDIX A – RISK ASSESSMENT TABLE & SITE PHOTOS

SITE	Vegetation/TEC	Acid sulfate soil disturb.	Sediment & erosion risk	Flora and fauna species	Aboriginal heritage	Lighting and illumination
Berrambool Sporting Complex	Plant Community Type (PCT) 1108- *River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion*. The PCT 1108 is included as part of the Threatened Ecological Community (TEC) *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* Highly modified/poor condition – on edge of proposed works area. No direct impact.	Low	Low	Low	Medium	Medium

Proximity of riparian vegetation to eastern side of playing field.

Small rise on northern edge of existing grandstand, riparian vegetation along Merimbula Creek in background.

Existing lighting poles to be removed on west and south-west side of playing field.



Current power connection to be upgraded to new sub-station.

Steel rail fence along perimeter of playing field. Electrical conduit to be placed underground 4500mm from fenceline.

APPENDIX B - THREATENED SPECIES ASSESSMENTS

LIKELIHOOD OF OCCURRENCE TABLE

An assessment of likelihood of occurrence was made for all threatened and migratory species. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement.

Those species where it is considered that impacts may be possible are further considered in the threatened species assessments.

The terms for likelihood of impact occurring are defined below:

- "yes" = the species was or has been observed on the site
- "likely" = a medium to high probability that a species uses the site
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the site or that proposed actions will influence habitat for the species.
- "None" = habitat on site and in the vicinity is unsuitable for the species.

(E = Endangered, V = Vulnerable, M = Migratory, EEC = endangered ecological community, CEEC = critically endangered ecological community)

Scientific name	Common name	TSC Act	EPBC Act	Habitat present or likelihood of occurrence (in/adjacent to works corridor)	Impacts predicted
LISTED ECOLOGICAL COMMUNITIES					
Araluen Scarp Grassy Forest in the South East Corner Bioregion		EEC	-	Not present	None
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions		EEC	-	Not present	None
Brogo Wet Vine Forest in the South East Corner Bioregion		EEC	-	Not present	None
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		EEC	-	Not present	None
Subtropical and Temperate Coastal Saltmarsh		-	VEEC	Not present	None
Dry Rainforest of the South East Forests in the South East Corner Bioregion		EEC	-	Not present	None

Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		EEC	-	Not present	None
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions		EEC	-	Not present	None
Lowland Grassy Woodland in the South East Corner Bioregion		EEC	CEEC	Not present	None
River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion		EEC	-	Present	None
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		EEC	-	Not present	None
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions		EEC	-	Not present	None
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions		EEC	-	Not present	None
FLORA					
Acacia georgensis	Bega Wattle		V	No suitable habitat	None
Amphibromus fluitans	River Swamp Wallaby-grass	-	V	No suitable habitat	None
Austrotricha crassifolia	Thick-leaf Star-hair		V	No suitable habitat. North coast species. Not recorded in this area.	None
Austrosticha sp. Wallagaraugh	Merimbula Star-hair	E	-	Recorded on the northern side Merimbula point (Middle Beach). Habitat at the Berrambool sporting Complex and along Merimbula Creek not suitable for the species, being highly modified. Impact on vegetation surrounding the site also	Unlikely

				not expected from the works.	
Caladenia tessellata	Thick-lipped Spider-orchid	-	V	No suitable habitat	None
Correa baeuerlenii	Chef's Cap Correa	V	V	No suitable habitat	None
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	No suitable habitat	None
Leionema ralstonii	Ralston's Leionema	V	V	No suitable habitat	None
Persicaria elatior	Tall Knotweed	V	V	Known from Bermagui area. Not seen in previous surveys. As no stream bank vegetation is to be cleared, impact on the species should it be present is unlikely.	Unlikely
Pomaderris bodalla	Bodalla Pomaderris	V	-	No suitable habitat	None
Pomaderris cotoneaster	Cotoneaster Pomaderris		E	Unpredictable species, Not seen in previous surveys. Unlikely to be present.	Unlikely
Pomaderris parrisiae	Parris' Pomaderris	V	V	No suitable habitat	None
Thesium australe	Austral Toadflax, Toadflax	-	V	No suitable habitat	None
AMPHIBIANS					
Heleioporus australiacus	Giant Burrowing Frog	V	-	Habitat not present	None
Litoria aurea	Green and Golden Bell Frog	E	V	Habitat not present	None
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Habitat not present	None
Mixophyes balbus	Stuttering Frog	E	V	Habitat not present	None
FISH					
Epinephelus daemelii	Black Rock Cod	-	V	No suitable habitat	None
Protoroctes mraena	Australian Grayling	-	V	Predicted habitat only. The species utilises freshwater rivers and deeper streams.	Unlikely

				Merimbula Creek wold be considered marginal habitat for the species.	
BIRDS					
Anthochaera phrygia	Regent Honeyeater	E	CE, M	Some flowering eucalypts present in surrounding area represent potential foraging habitat. However, as no canopy vegetation is to be impacted by this proposal, there will be no impact on the species.	None
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Records in the locality, some habitat in bushland areas surrounding the site, however no impact expected	None
Botaurus poiciloptilus	Australasian Bittern	E	E	Predicted habitat nearby, but not known from the area	None
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	Records in the locality however habitat not present	None
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Records in the locality however habitat not present	None
Cuculus optatus	Oriental Cuckoo	-	Marine/Migratory	Predicted habitat only. No impact expected	None
Daphoenositta chrysoptera	Varied Sittella	V	-	Records in the locality, some habitat in nearby bushland areas however no impact expected	None

Dasyornis brachypterus	Eastern Bristlebird	-	E	Predicted only, no records in locality	None
Epthianura albifrons	White-fronted Chat	V	-	Predicted habitat only. No impact expected	None
Falco subniger	Black Falcon	V	-	Predicted habitat only. Vagrant or misidentified along south coast area. A species more typical of inland areas	None
Gallinago hardwickii	Latham's Snipe	-	Marine/Migratory	Possible habitat in periods of flooding, however no impact expected.	None
Gallinago megala	Swinehoe's Snipe	-	Marine/Migratory	Predicted habitat only. Not known from area.	None
Gallinaga stenura	Pin-tailed Snipe	-	Marine/Migratory	Predicted habitat only. Not known from the area, and habitat not suitable.	None
Glossopsitta pusilla	Little Lorikeet	V	-	Some flowering eucalypts present in surrounding area represent potential foraging habitat. However, as no canopy vegetation is to be impacted by this proposal, there will be no impact on the species.	None
Grantiella picta	Painted Honeyeater	-	V	Predicted habitat only. Rare vagrant to coastal areas.	None
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	M	Recorded in the locality. Wide ranging species. No mature tree removal so no impact expected.	None

Hieraaetus morphnoides	Little Eagle	V	-	Some foraging habitat present but wide ranging and overfly only	None
Hirundapus caudacutus	White-throated Needletail	-	Marine/Migratory	Some foraging habitat, unlikely to alight in the area. No impact expected	None
Lathamus discolor	Swift Parrot	E	E	Records from the area. Some flowering eucalypts present in surrounding area represent potential foraging habitat. However, as no canopy vegetation is to be impacted by this proposal, there will be no impact on the species.	None
Lophoictinia isura	Square Tailed Kite	V	-	Suitable foraging habitat. Large home range of c100km2. No foraging habitat will be impacted.	None
Melanodryas cucullata cucullata	Hooded Robin (South-eastern form)	V	-	Marginal habitat surrounding the site.	None
Monarcha melanopsis	Black-faced Monarch	-	Marine/Migratory	No suitable habitat	None
Monarcha trivirgatus (Symposiarchus trivirgatus)	Spectacled Monarch	-	Marine/Migratory	Predicted habitat only. As no impact expected on vegetation surrounding the playing fields, impact is not expected.	None
Myiagra cyanoleuca	Satin Flycatcher	-	Marine/Migratory	No suitable habitat	None
Neophema chrysogaster	Orange-bellied Parrot	CE	CE, M	No suitable habitat	None
Ninox connivens	Barking Owl	V	-	Species with large home range. These sites may form part of a home range but would not be	None

				considered essential habitat. Lighting would not affect the foraging No impact is expected.	
Ninox strenua	Powerful Owl	V	-	Records in locality. Species with large home range. These sites may form part of a home range but would not be considered essential habitat. No impact is expected.	None
Pachycephala olivacea	Olive Whistler	V	-	No suitable habitat	None
Pandion cristatus	Eastern Osprey	V	-	Records in the locality, Marginal foraging habitat as Merimbula Creek is narrow and cluttered in woody debris making swooping for fish complicated for this large bird. Proposed work is not considered to impact on this species.	None
Petroica boodang	Scarlet Robin	V	-	Marginal habitat for this species exists in the surrounding area. As no canopy vegetation requires removal, no impact is expected.	None
Petroica phoenicea	Flame Robin	V	-	No suitable habitat	None
Rhipidura rufifrons	Rufous Fantail		Marine/Migratory	Suitable habitat along Merimbula Creek. As no vegetation in this area will	None

				be removed, impact is not expected.	
Rostratula australis	Australian Painted-snipe		E	Marginal habitat in floodplain land surrounding Merimbula Creek	None
Stagonopleura guttata	Diamond Firetail	V	-	Recorded within 10kms of the site, but not usually known from coastal areas. Forages on the ground, so ground disturbance may have a short-term impact on any birds in the area. As much of the grassland vegetation surrounding the installation of lighting towers will remain and the site will be remediated any impact is considered negligible.	Unlikely
Tyto novaehollandiae	Masked Owl	V	-	Species with large home range. These sites may form part of a home range but would not be considered essential habitat. No impact is expected.	None
Tyto tenebricosa	Sooty Owl	V	-	Species with large home range. These sites may form part of a home range but would not be considered essential habitat. No impact is expected.	None
MAMMALS					

Cercartetus nanus	Eastern Pygmy-possum	V	-	Recorded within 10kms of the sites. Potential habitat along Merimbula Creek. However, the urban nature of the site suggests it would be unlikely to be present and as no canopy vegetation requires removal impact is not expected.	Unlikely
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Records in the greater locality. Marginal foraging habitat, and the species is occasionally known from urban sites. However, as the works are temporary in nature and mitigation measures are in place to protect the surrounding environment, no impact is expected. Use of lighting would not affect the species from foraging in the area.	Unlikely
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	No suitable habitat	None
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	No suitable habitat	None
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Records in the locality. Habitat suitable for foraging. Limited roosting habitat. As no canopy vegetation requires removal, no impact is expected. May be attracted to light sources to feed on	None

				insects. This would not be detrimental to the species.	
Miniopterus orianae oceanensis	Large Bentwing-bat	V	-	No roosting habitat, potential foraging only. No impact is expected. May be attracted to light sources to feed on insects. This would not be detrimental to the species.	None
Petaurus australis	Yellow-bellied Glider	V	-	No suitable habitat.	None
Petaroides volans	Greater Glider	-	V	Records from greater area. As no canopy vegetation requires removal no impact is expected. As the species prefers high canopy, denser vegetation than that surrounding the oval, use of the lights would not impact on the species.	None
Petrogale penicillata	Brush-tailed Rock-wallaby	-	V	No suitable habitat	None
Phascolarctos cinereus	Koala	V	-	Records from greater area. As no canopy vegetation requires removal no impact is expected.	None
Potorous tridactylus	Long-nosed Potoroo	V	V	No suitable habitat	None
Pseudomys fumeus	Smoky Mouse,	-	E	Predicted only, no records	None
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Records from surrounding area. Some flowering eucalypts present in surrounding area represent potential foraging habitat. As no canopy vegetation requires removal no impact	None

				is expected. Lighting use would not affect the movement or foraging of the species which routinely use highly urban, well-lit environs.	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Marginal foraging habitat. Impact not expected. May be attracted to light sources to feed on insects. This would not be detrimental to the species.	None

CONCLUSION OF ASSESSMENT OF SIGNIFICANCE

Following habitat and likelihood of occurrence assessment, it was determined that no entity required assessment under Section 7.3 of the *Biodiversity Conservation Act 2016* – Significant effect on threatened species, populations or ecological communities, or their habitats, or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

This Assessment of Significance has determined that the proposed activity is 'unlikely' to have a 'significant effect' on any matter of NES or TES, provided the mitigation measures in section 5 are followed. Therefore, the proposed activity will not require a Species Impact Statement.

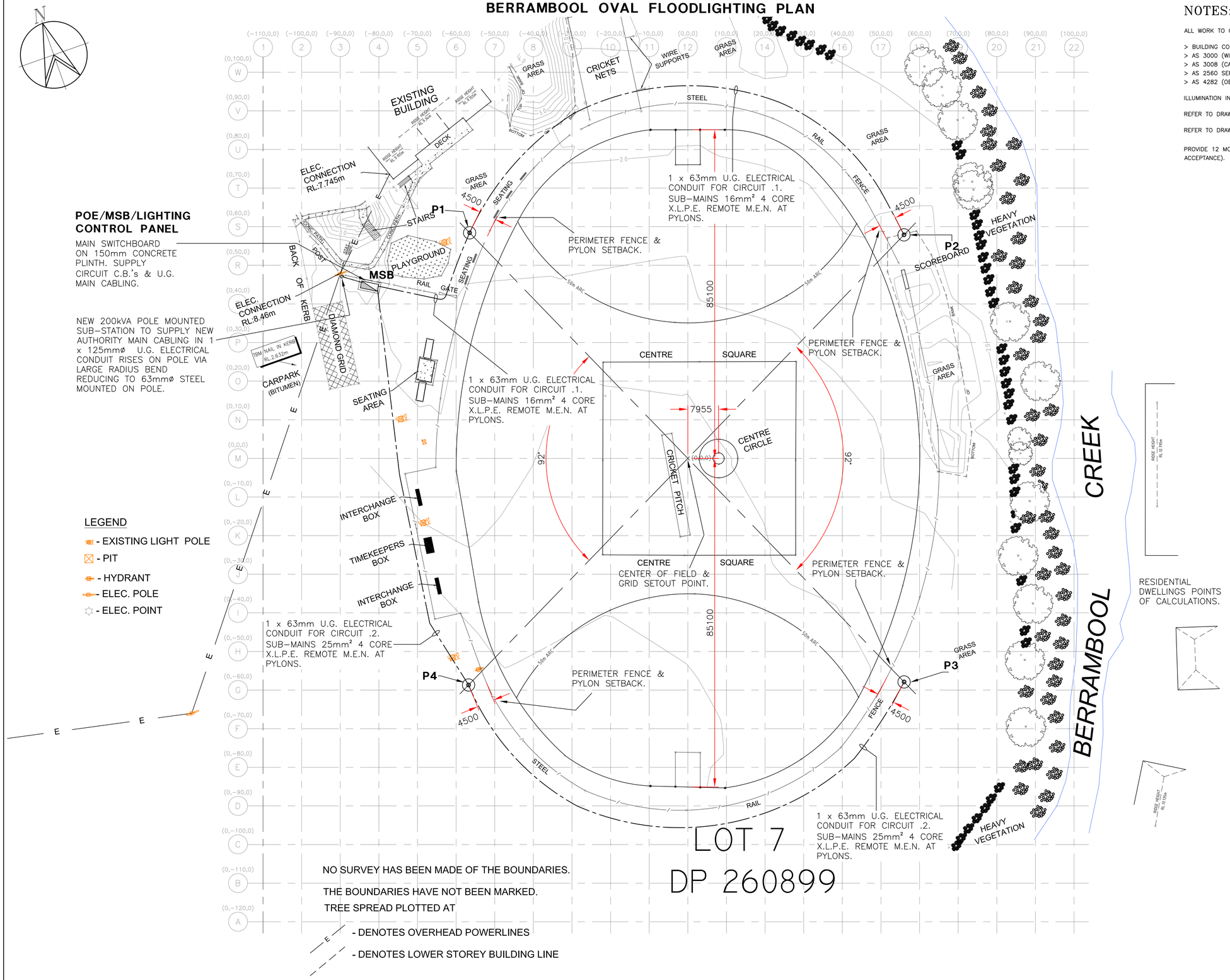
APPENDIX C – CONSTRAINTS/RISK MAPS

Acid Sulfate Soils Mapping (extract from eSPADE accessed 24/09/2019). Red line indicative of oval perimeter.

Threatened ecological community mapping (by SOUTHEAST)

APPENDIX D – DESIGN DRAWINGS

BERRAMBOOL OVAL FLOODLIGHTING PLAN



POE/MSB/LIGHTING CONTROL PANEL

MAIN SWITCHBOARD ON 150mm CONCRETE PLINTH. SUPPLY CIRCUIT C.B.'s & U.G. MAIN CABLING.

NEW 200kVA POLE MOUNTED SUB-STATION TO SUPPLY NEW AUTHORITY MAIN CABLING IN 1 x 125mmø U.G. ELECTRICAL CONDUIT RISES ON POLE VIA LARGE RADIUS BEND REDUCING TO 63mmø STEEL MOUNTED ON POLE.

LEGEND

- EXISTING LIGHT POLE
- PIT
- HYDRANT
- ELEC. POLE
- ELEC. POINT

NO SURVEY HAS BEEN MADE OF THE BOUNDARIES.

THE BOUNDARIES HAVE NOT BEEN MARKED.

TREE SPREAD PLOTTED AT

E - DENOTES OVERHEAD POWERLINES

- DENOTES LOWER STOREY BUILDING LINE

NOTES:

ALL WORK TO COMPLY WITH:

> BUILDING CODE OF AUSTRALIA
> AS 3000 (WIRING RULES)
> AS 3008 (CABLE SELECTION & DE-RATING)
> AS 2560 SERIES (SPORTS LIGHTING STANDARDS)
> AS 4282 (OBTRUSIVE EFFECTS OF OUTDOOR LIGHTING)

ILLUMINATION INFORMATION SHOW IS BASED ON THE 28 FITTINGS 200 LUX CALCULATIONS.

REFER TO DRAWING 1577-E2 FOR SCHEMATIC DIAGRAMS & DETAILS.

REFER TO DRAWING 1535-E3 FOR AIMING DETAILS, SINGLE LINE DIAGRAMS & SCOREBOARD DETAILS.

PROVIDE 12 MONTHS DEFECT LIABILITY PERIOD COMMENCING FROM PRACTICAL COMPLETION (HAND OVER & ACCEPTANCE).

No.	Date	Description	Init.
C	02/09/19	Client Issue	A.H.
B	19/06/19	Survey Background	A.H.
A	26/04/19	INITIAL SETUP	A.H.

AMENDMENTS

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CONSULTING ENGINEERS

Project: SPORTSGROUND FACILITIES UPGRADE WORKS 2019
BERRAMBOOL DRIVE, BERRAMBOOL

LOT 7, DP 260899
MERIMBULA, NSW

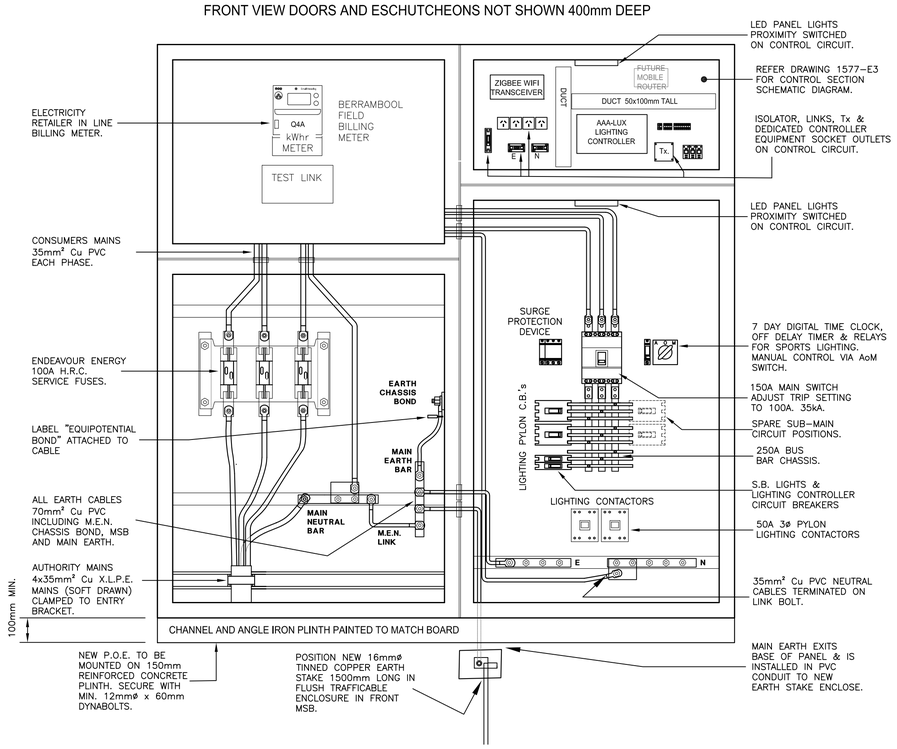
Title: BERRAMBOOL OVAL FLOODLIGHTING SITE PLAN & DETAILS

Scale: 1:500		Date: 26/04/2019	
Drawn: A. Hill		Checked: ---	Approved: ---
CAD File: A1		Sheet 1	of 4
Job No.:		Drawing Number	Amdt.
1577		1577-E1	C

P.O.E. / M.S.B. PANEL INDICATIVE ARRANGEMENT

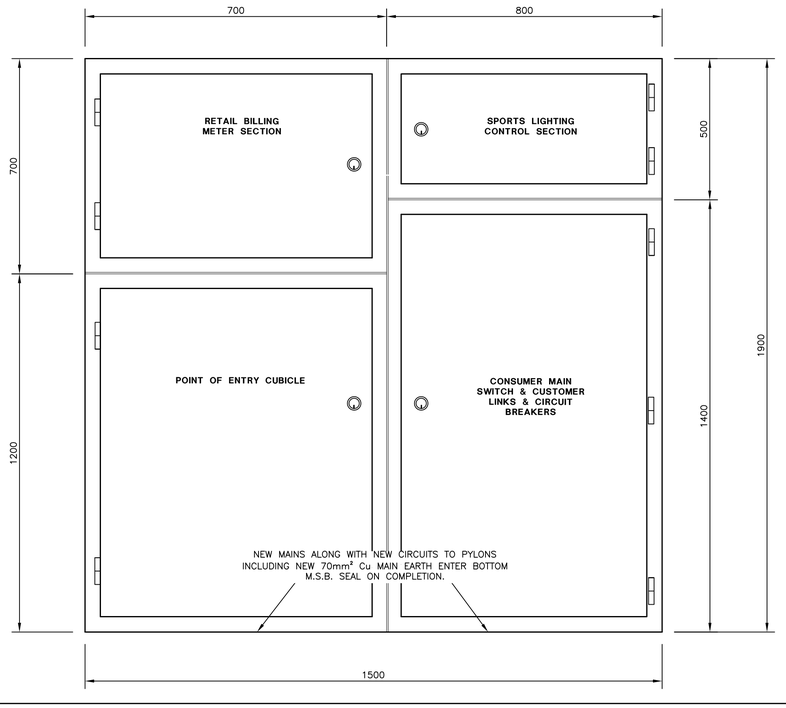
REFER TO SWITCHBOARD MANUFACTURE's
APPROVED DRAWINGS FOR MAIN SWITCHBOARD
ARRANGEMENT.

FRONT VIEW DOORS AND ESCHUTCHEONS NOT SHOWN 400mm DEEP



P.O.E. / M.S.B. PANEL INDICATIVE ARRANGEMENT

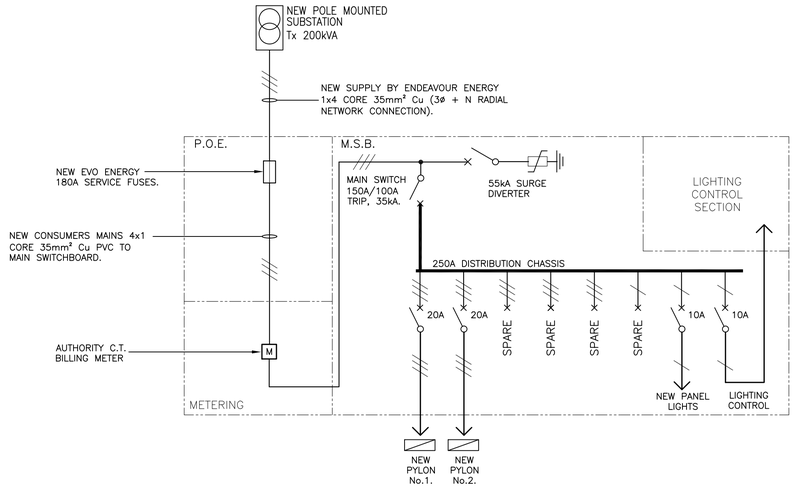
REFER TO SWITCHBOARD MANUFACTURE's
APPROVED DRAWINGS FOR MAIN SWITCHBOARD
ARRANGEMENT.



NOTES:

1. POINT OF ENTRY & MAIN SWITCHBOARD CUBICLES TO COMPLY WITH ENDEAVOUR ENERGY REQUIREMENTS. NEW P.O.E., M.S.B. / METER PANEL EARTHING & M.E.N. ARRANGEMENT AS SHOWN IN ACCORDANCE WITH ENDEAVOUR ENERGY INSTALLATION RULES & POINT OF ENTRY CUBICLE REQUIREMENTS.
2. LABEL ALL CABLING & EQUIPMENT WITH SUPPLY DETAILS CORRESPONDING WITH TYPED LEGEND SUPPLIED IN FRAME ON REAR OF M.S.B. SUB-MAIN SECTION DOOR.
3. P.O.E., METER CUBICLE SECTIONS DOORS TO BE FITTED STANDARD ENDEAVOUR ENERGY KEYED NIGHTLATCH. REMAINING SECTIONS TO BE FITTED WITH STANDARD LOCKWOOD NIGHTLATCH.
4. SWITCHBOARDS TO BE FREE STANDING ON CONCRETE PLINTH . PANELS ARE 400mm DEEP WITH BOTTOM ENTRY ONLY. MANUFACTURER TO INSPECT THE SITE TO ENSURE ALL CONDITIONS ARE ALLOWED FOR. ALL PENETRATIONS TO BE SEALED ON COMPLETION TO EXCLUDE THE INGRESS OF WATER & VERMIN.
5. ON COMPLETION OF SWITCHBOARD INSTALLATION WORKS SUBMIT REQUIRED REQUEST FOR SERVICE FORMS AND ENERGISE THE INSTALLATION.
6. MAKE ALL NECESSARY ARRANGEMENTS FOR SHUTDOWNS ETC. WITH SUPPLY AUTHORITY AND PAY ANY ASSOCIATED FEES & CHARGES.
7. USE BARRIERS AND SIGNAGE TO PROTECT THE PUBLIC FROM INJURY ATTRIBUTED TO THE EXCAVATION OR INCOMPLETE WORKS.
8. ALL WORKS TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS RELEVANT TO THE INSTALLATION. IN PARTICULAR AS 3000, AS 3008, AS/NZS 1939, AS/NZS 3439, AS 1136, AS/NZS 3111, AS/NZS 2184, AS/NZS 60269, AS 3135, AS/NZS 3134, ENDEAVOUR ENGERGY REGULATIONS & BUILDING CODE OF AUSTRALIA (NSW APPENDIX).

LOCATION PLAN
SCALE N.T.S.



P.O.E. / M.S.B. SINGLE LINE DIAGRAM

REFER DRAWING 1577-E1 FOR SITE WORKS PLAN

No.	Date	Description	Init.
C	02/09/19	Client Issue	A.H.
B	19/06/19	Survey Background	A.H.
A	26/04/19	INITIAL SETUP	A.H.

AMENDMENTS

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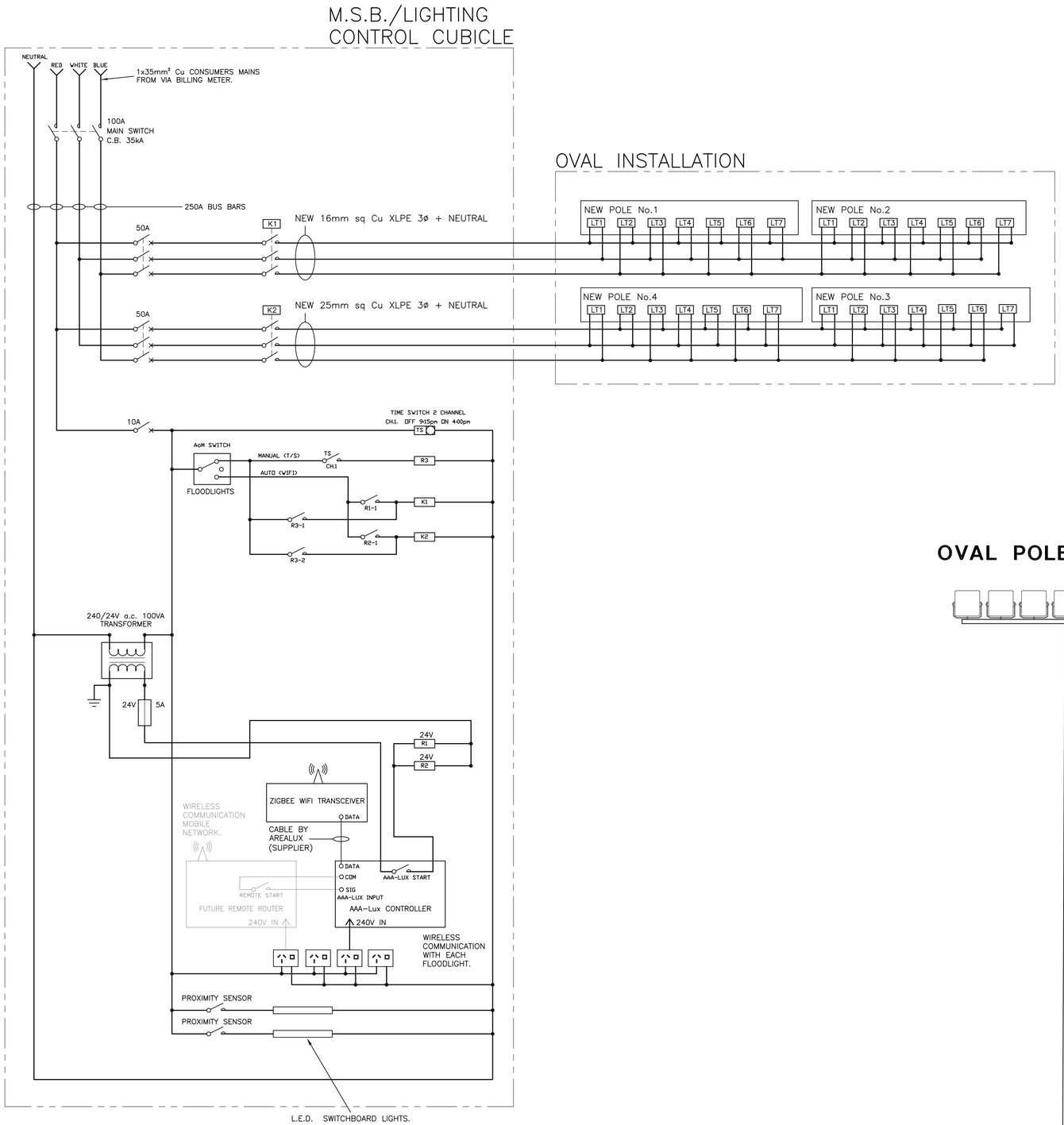
CONSULTING ENGINEERS

Project
SPORTSGROUND FACILITIES UPGRADE WORKS 2019
BERRAMBOOL DRIVE, BERRAMBOOL

LOT 7, DP 260899
MERIMBULA, NSW

Title
BERRAMBOOL OVAL SWITCHBOARD DIAGRAMS & DETAILS

Scale: N.T.S.		Date: 26/04/2019	
Drawn: A. Hill		Checked: ---	Approved: ---
CAD File: A1		Sheet 2	of 4
Job No.: 1577		Drawing Number 1577-E2	Amdt. C



CONTROLS COMMISSIONING NOTES:

LIAISE WITH THE AAA–Lux EQUIPMENT INSTALLER (AREALUX) SUPPLYING THE LIGHTING CONTROLLER & ZIGBEE WIFI EQUIPMENT TO CONTROL SECTION & INSTALL ALL CONTROL CABLING TO & FROM THE EQUIPMENT AS DETAILED. THE AREALUX INSTALLER IS TO PROVIDE SYSTEM PROGRAMING AS FOLLOWS:

- SCENE 1 50 LUX (25%)
- SCENE 2 100 LUX (50%)
- SCENE 3 200 LUX (100%)

ELECTRICAL CONTRACTOR TO PROVIDE ALL OTHER CONTROL EQUIPMENT, CABLING & TERMINATIONS OTHER THAN TERMINATIONS AT THE AAA–Lux EQUIPMENT.

ALLOW SPACE TO MOUNT FUTURE OPTIONAL REMOTE CONTROL MOBILE SIM ROUTER AS SHOWN.

SUPPLY & INSTALL NEW MULTI BAND "PUCK" TYPE AERIAL & INSTALL CENTRALLY ON THE TOP OF THE CONTROL PANEL. CONNECTION TO WIFI TRANSCEIVER BY AREALUX.

ON COMPLETION IN CO–ORDINATION WITH THE AREALUX INSTALLER DEMONSTRATE THE REMOTE CONTROL FUNCTIONS TO THE CLIENT IN THE PRESENCE OF THE ENGINEER.

PRIOR TO PRACTICAL COMPLETION PROVIDE AS INSTALLED DOCUMENTATION INCLUDING CONTROL SYSTEM OPERATIONAL INSTRUCTIONS RELEVANT MAINTENANCE CONTACT DETAILS. PROVIDE MINIMUM 12 MONTHS WARRANTY ON ALL EQUIPMENT AND ASSOCIATED INSTALLATION.

GENERAL ELECTRICAL SPECIFICATION NOTES:

AEC ENGINEERS WILL INSPECT THE INSTALLATION WORKS UNDERTAKE COMMISSIONING TESTS & VERIFICATION MEASUREMENTS AND CERTIFICATION ON COMPLETION.

PROVIDE 12 MONTHS WARRANTY ON INSTALLATION WORKS AND MATERIALS FROM THE DATE OF PRACTICAL COMPLETION CERTIFIED BY THE ENGINEER.

ON COMPLETION OF SWITCHBOARD INSTALLATION WORKS SUBMIT REQUIRED AUTHORITY & RETAILER REQUEST FOR METER CONNECTION FORM AND ENERGISE THE INSTALLATION.

MAKE ALL NECESSARY ARRANGEMENTS FOR SHUTDOWNS ETC. WITH ENDEAVOUR ENERGY AND PAY ANY ASSOCIATED FEES & CHARGES.

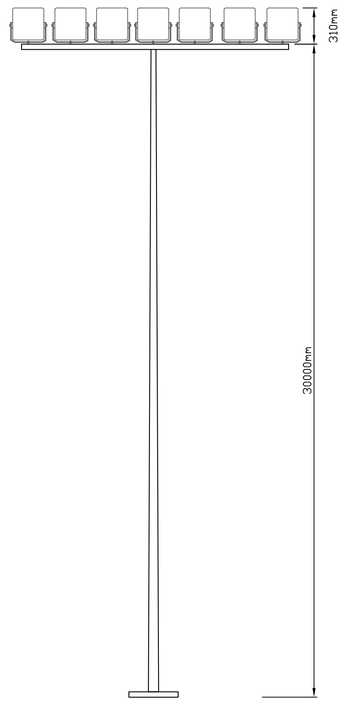
USE BARRIERS AND SIGNAGE TO PROTECT THE PUBLIC FROM INJURY ATTRIBUTED TO THE EXCAVATION OR INCOMPLETE WORKS.

ALL WORK TO COMPLY WITH:

> BUILDING CODE OF AUSTRALIA
> AS 3000 (WIRING RULES)
> AS 3008 (CABLE SELECTION & DE–RATING)
> AS 2560 SERIES (SPORTS LIGHTING STANDARDS)
> AS 4282 (OBTRUSIVE EFFECTS OF OUTDOOR LIGHTING)

REFER TO DRAWING 1577–E4 FOR AIMING DETAILS.

OVAL POLE DETAILS



POLES WITH 7 FITTINGS

No.	Date	Description	Init.
C	02/09/19	Client Issue	A.H.
B	19/06/19	Survey Background	A.H.
A	26/04/19	INITIAL SETUP	A.H.

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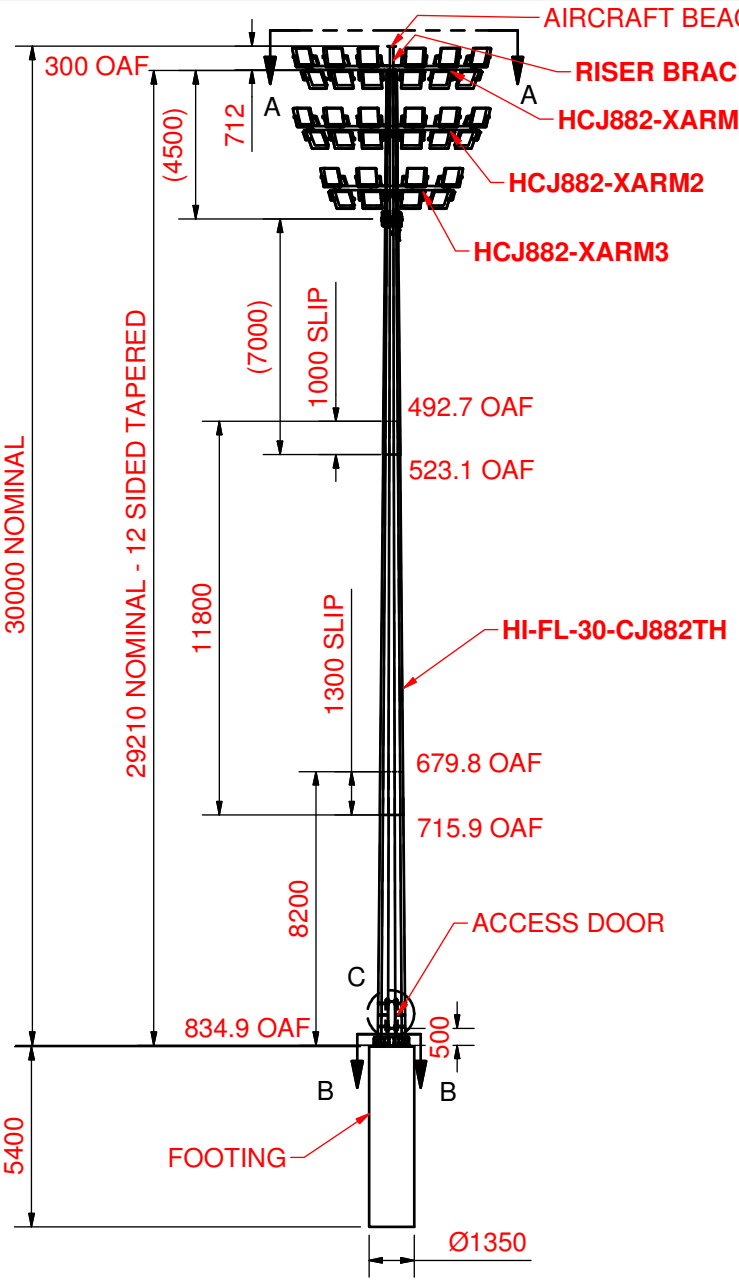
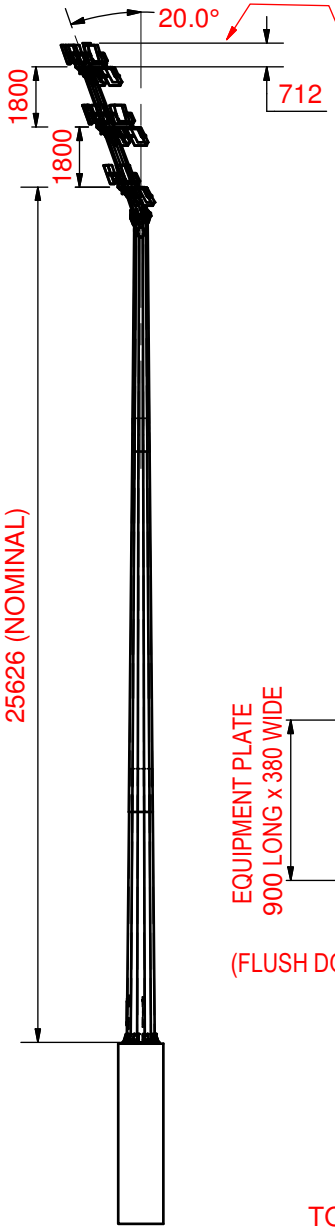
Project
SPORTSGROUND FACILITIES UPGRADE WORKS 2019
BERRAMBOOL DRIVE, BERRAMBOOL

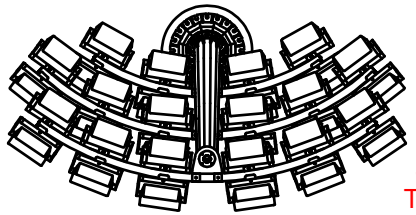
LOT 7, DP 260899
MERIMBULA, NSW

Title
BERRAMBOOL OVAL FLOODLIGHTING DIAGRAMS & DETAILS

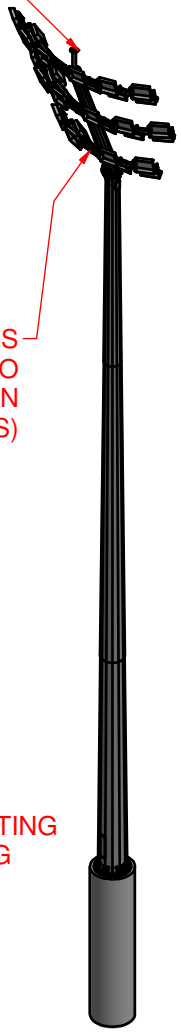
Scale: N.T.S.
Drawn: A. Hill
CAD File: A1
Job No.: 1577
Date: 26/04/2019
Checked: ---
Approved: ---
Sheet 3 of 4
Drawing Number 1577–E3
Amdt. C

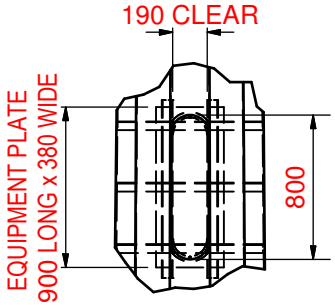




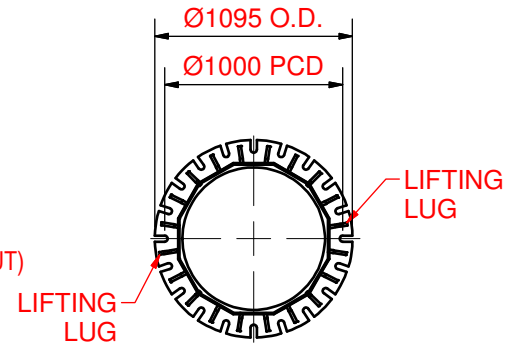


VIEW A-A





DETAIL C
(FLUSH DOOR COVER EX- CUT OUT)



SECTION B-B
SUIT 20x M30 @1000 PCD

QTY:4

TOTAL LIFTING WEIGHT = 5800kgs
(INCLUSIVE OF LIGHTS, CROSSARM, CABLES ETC)

REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPROVED/DATE
A	AIRCRAFT BEACON LEVEL CHANGED TO 30000	FL-02/07/19	3/07/2019	3/07/2019
	NOMINAL			

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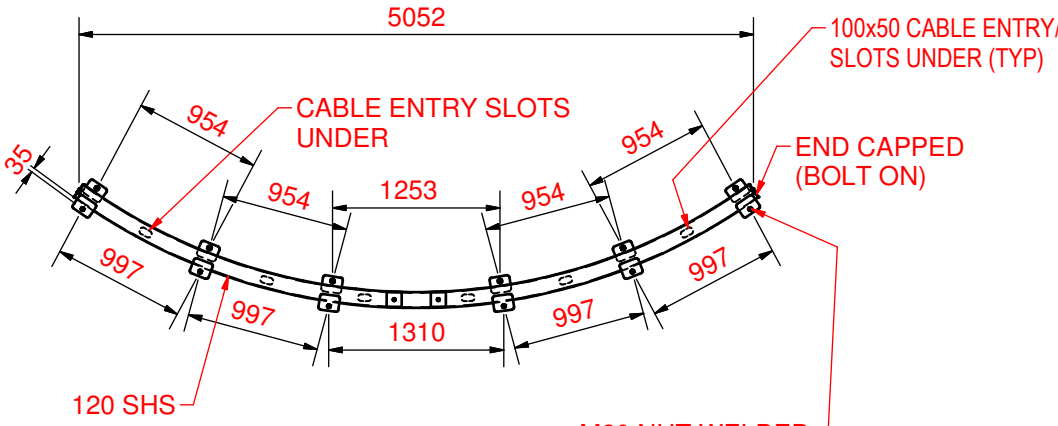
www.haymanindustries.com.au

DRAWN / DATE	FL	24/06/2019	TITLE: CME GROUP KAREN ROLTON PARK 25
CHECKED / DATE			
APPROVED / DATE			
WEIGHT	N / A		
DO NOT SCALE DIMENSIONS IN MILLIMETRES			DRG NO: HP#311 / REV: A / SHEET: 1 OF 5 / A3



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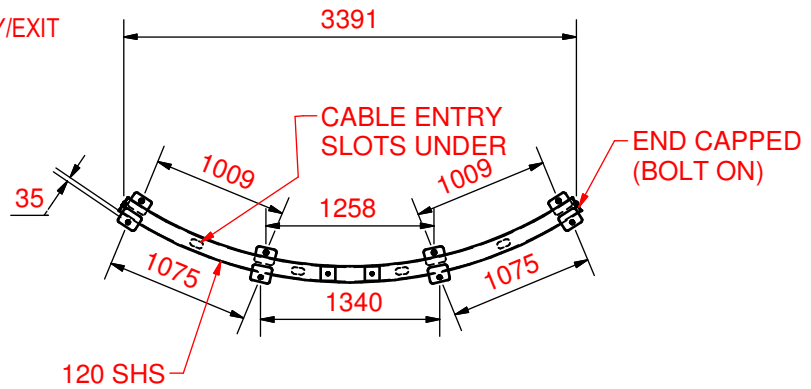

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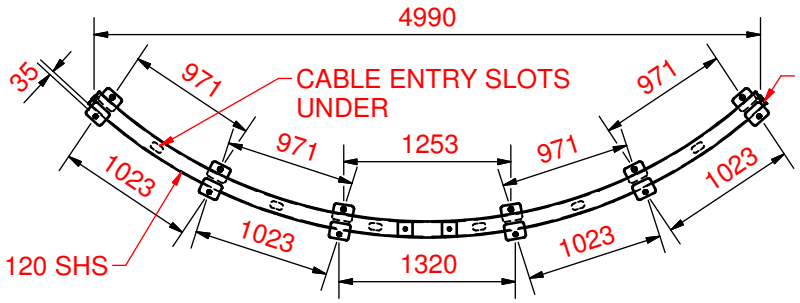

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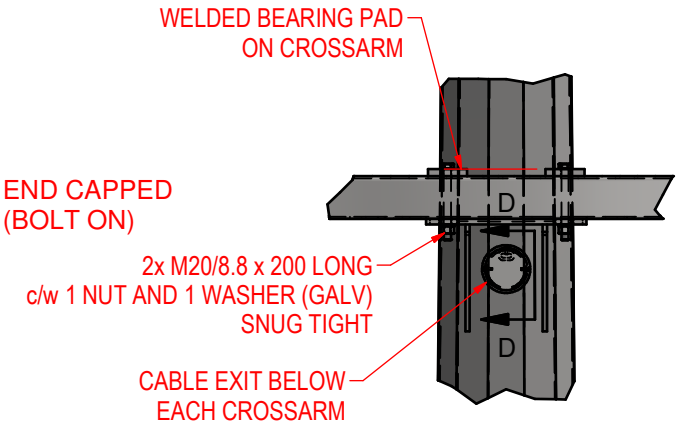
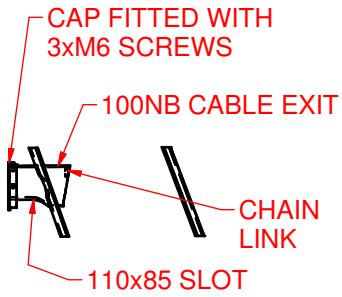


TYPICAL CROSSARM CONNECTION



SECTION D-D

CROSSARM DETAILS

REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPROVED/DATE
A	AIRCRAFT BEACON LEVEL CHANGED TO 30000	FL-02/07/19		
	NOMINAL			

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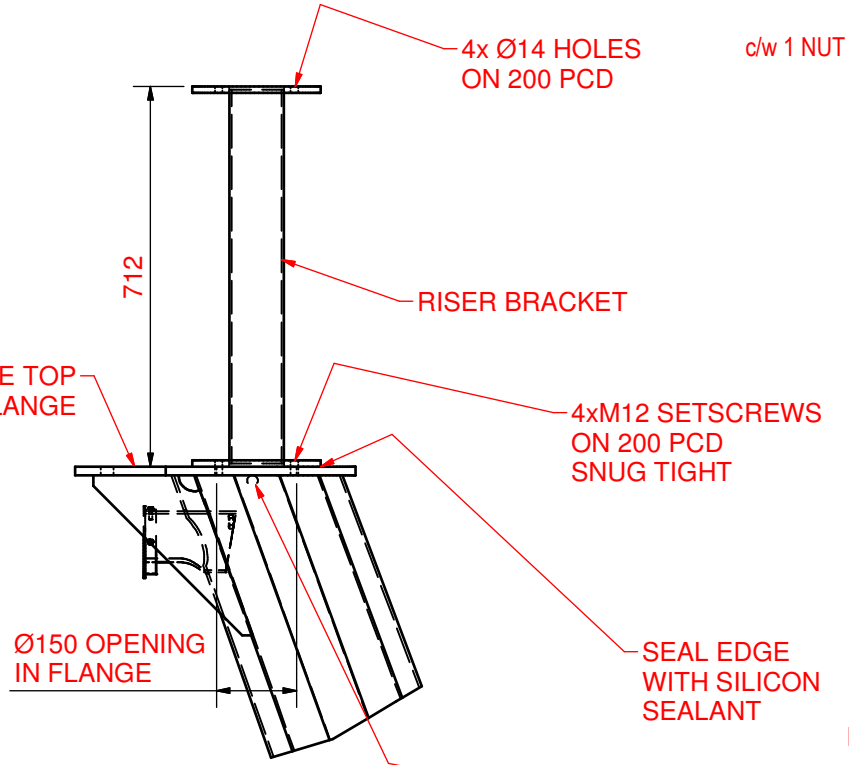
DRAWN / DATE	FL 24/06/2019	
CHECKED / DATE		
APPROVED / DATE		
WEIGHT	N / A	
DO NOT SCALE DIMENSIONS IN MILLIMETRES		

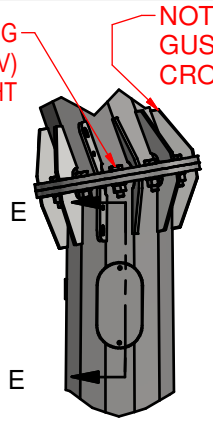
TITLE: CME GROUP KAREN ROLTON PARK 25

DRG NO	REV	SHEET	
HP#311	A	2 OF 5	A3

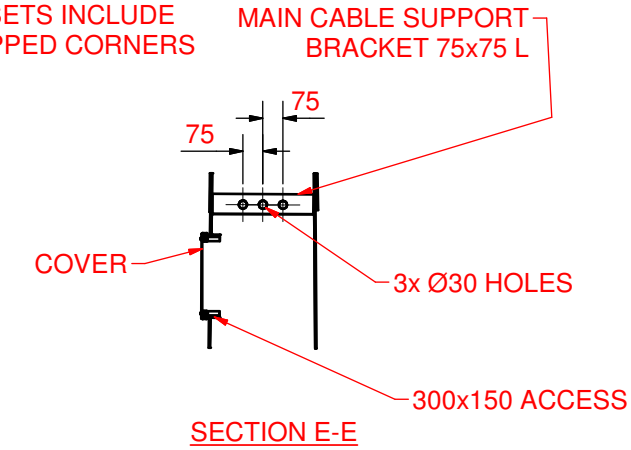


RISER BRACKET CONNECTION
(CROSSARM / LIGHTS REMOVED FOR CLARITY)

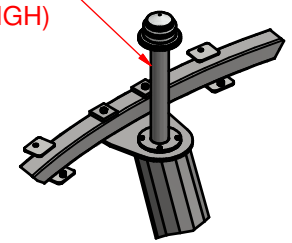
4x RISER BRACKET c/w BLANKING COVER SUPPLIED
OBSTRUCTION LIGHT MAYBE FITTED DIRECTLY TO
POLE TOP OR TO RISER BRACKET
- FIT BLANKING COVER IF NOT REQUIRED



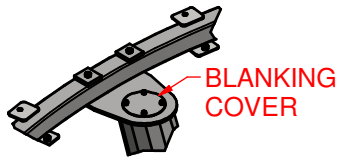
HEADFRAME / POLE CONNECTION



SECTION E-E



POLE TOP
(WITH BEACON LIGHT)
QTY = 2



POLE TOP
(WITHOUT BEACON LIGHT)
QTY = 2

REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPROVED/DATE
A	AIRCRAFT BEACON LEVEL CHANGED TO 30000	FL-02/07/19		
	NOMINAL			

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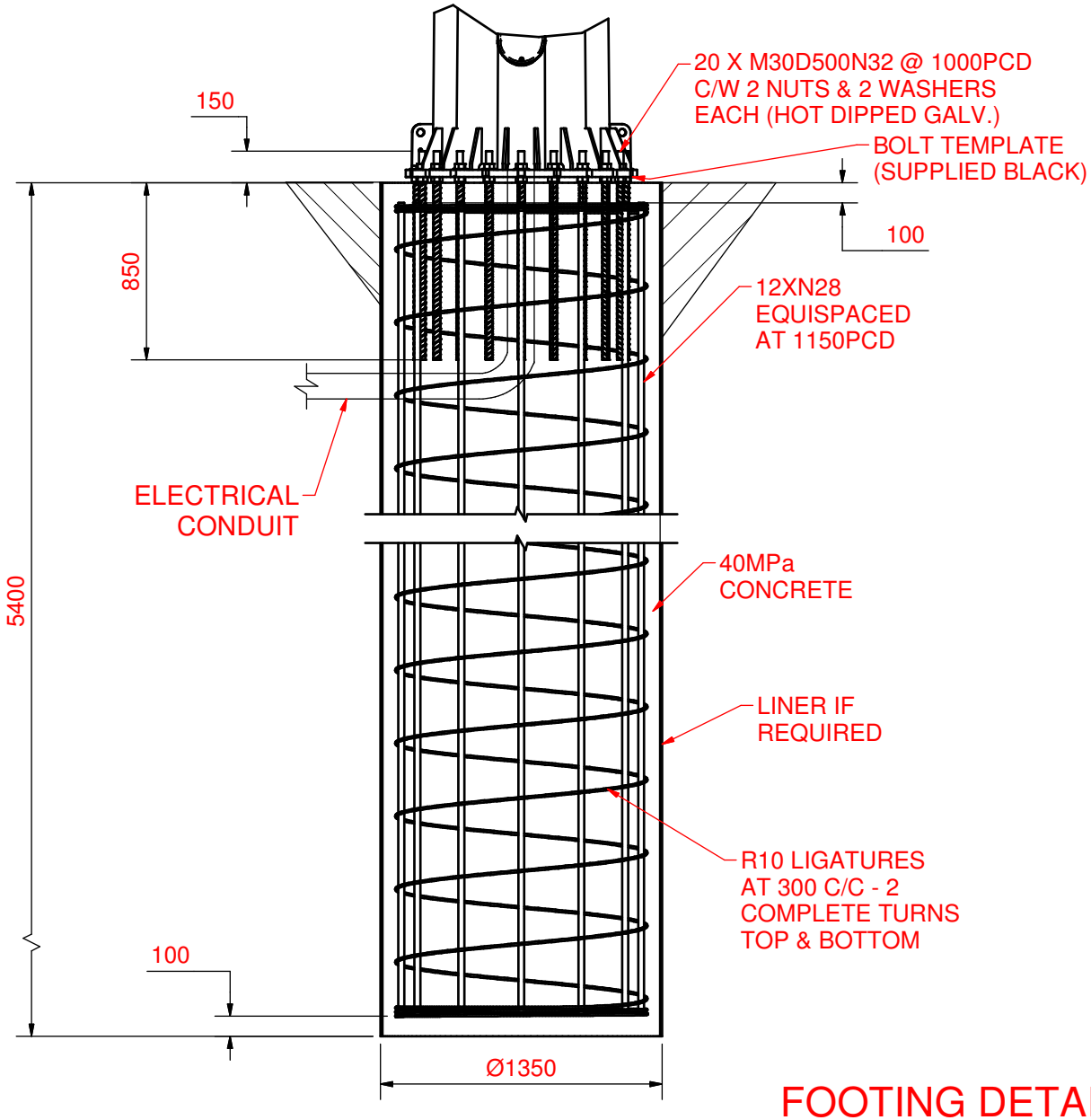
www.haymanindustries.com.au

DRAWN / DATE	FL 24/06/2019
CHECKED / DATE	
APPROVED / DATE	
WEIGHT	N / A
DO NOT SCALE DIMENSIONS IN MILLIMETRES	

TITLE
CME GROUP
KAREN ROLTON PARK 25

DRG NO	REV	SHEET	
HP#311	A	3 OF 5	A3



FOOTING DESIGN BASED ON THE FOLLOWING:

ULTIMATE BASE MOMENT = 825kNm
ULTIMATE BASE SHEAR = 36kN
ULTIMATE BASE AXIAL = 65kN

FOOTING DESIGN BASED ON
ASSUMED SOIL CONDITIONS:
SAND PROFILE Ø>31° & Y>18kN/m³ or
CLAY PROFILE Cu>40kPa.

BEARING CAPACITY AT BOTTOM
OF PILE>175kPa

ACTUAL CONDITIONS SHALL BE VERIFIED

FOOTING DETAILS

REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPROVED/DATE
A	AIRCRAFT BEACON LEVEL CHANGED TO 30000	FL-02/07/19		
	NOMINAL			

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DRAWN / DATE	FL	24/06/2019
CHECKED / DATE		
APPROVED / DATE		
WEIGHT	N / A	
DO NOT SCALE DIMENSIONS IN MILLIMETRES		

TITLE
CME GROUP
KAREN ROLTON PARK 25

DRG NO	REV	SHEET	
HP#311	A	4 OF 5	A3

DESIGN STANDARDS

AS/NZS 4600 COLD FORMED STEEL STRUCTURES
AS/NZS 4100 STEEL STRUCTURES
AS/NZS 4676 STRUCTURAL DESIGN REQUIREMENTS FOR STEEL UTILITY SERVICES POLES
AS/NZS 1170.2 WIND LOADS
WIND REGION A
TERRAIN CATEGORY 3
BASIC WIND SPEED V500 = 45M/S
AS3600 CONCRETE STRUCTURES
AS2159 PILING - DESIGN AND INSTALLATION DETAILS

MANUFACTURE

MATERIAL

STEEL BASED ON COMMERCIALLY AVAILABLE CHINESE / AMERICAN STEEL, EQUIVALENT TO AS/NZS3678 STRUCTURAL STEEL & AS/NZS1594 HOT ROLLED STEEL FLAT PRODUCTS.
POLE SECTIONS - 3MM & 4MM THICK, GB/T 1591-2008 Q345B (EQUIVALENT TO HU350 AS/NZS1594 & GR350 AS/NZS3678 WITH MINIMUM YIELD = 345MPA)
POLE SECTIONS - 5MM & 6MM THICK, ASTM A572 GR65 (EQUIVALENT TO HU450 AS/NZS1594 & GR450 AS/NZS3678 WITH MINIMUM YIELD = 450MPA)
RHS, SHS AND CHS, GB700-88, Q235B (EQUIVALENT TO HU250 AS/NZS1594 & GR250 AS/NZS3678 WITH MINIMUM YIELD = 235MPA)
OTHER STRUCTURAL PLATE - GB/T1591-2008 Q345B (EQUIVALENT TO GR350 AS/NZS3678 WITH MINIMUM YIELD = 325MPA (SUBJECT TO PLATE THICKNESS)
REINFORCING BARS - AS/NZS4671
FOUNDATION BOLT THREAD - METRIC COARSE, AS1275 8G
BOLTS / NUTS - COMMERCIAL GRADE = CL4.6 AS1111 BOLTS/CL5 AS1112 NUTS; STRUCTURAL GRADE = AS/NZS1252

WELD QUALITY

AS/NZS 1554.1 SP AND ALSO ISO 5817 LEVEL C

GALVANISING

HOT DIP GALVANISING AFTER ALL FABRICATION IN ACCORDANCE WITH AS/NZS4680

TOLERANCES

AS1798 LIGHTING POLES AND BRACKETS & AS/NZS4677 STEEL UTILITY SERVICES POLES

REV	DESCRIPTION	DRAWN/DATE	CHECKED/DATE	APPROVED/DATE
A	AIRCRAFT BEACON LEVEL CHANGED TO 30000	FL-02/07/19		
	NOMINAL			

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APPROVED / DATE		
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DO NOT SCALE DIMENSIONS IN MILLIMETRES		

TITLE: CME GROUP
KAREN ROLTON PARK 25

DRG NO	REV	SHEET	
HP#311	A	5 OF 5	A3

APPENDIX E- GEOTECHNICAL REPORT

ACT Geotechnical Engineers Pty Ltd
ACN 063 673 530

5/9 Beaconsfield Street, Fyshwick ACT 2609
PO Box 9225, Deakin ACT 2600
Ph: (02) 6285 1547

20 May 2019
Our ref: SM/C9979

Affinity Electrical
53 Grimwade Street
Mitchell ACT 2911

Attention: Mr Brendan Read

Dear Sir

PROPOSED LIGHT TOWERS – BERRAMBOOL OVAL
MERIMBULA, NSW

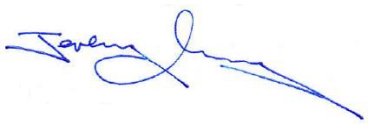
GEOTECHNICAL INVESTIGATION REPORT

In response to a request by Affinity Electrical, ACT Geotechnical Engineers Pty Ltd conducted a geotechnical investigation for four proposed field lighting poles on the Berrambool oval located off Berrambool Drive, in Merimbula, NSW.

The report outlines the methods and results of field investigations, describes site subsurface conditions, and provides design and construction recommendations for the light pole footings.

Should you require any further information regarding this report, please do not hesitate to contact our office.

Yours faithfully
ACT Geotechnical Engineers Pty Ltd



Jeremy Murray
Director

AFFINITY ELECTRICAL

PROPOSED LIGHT TOWERS – BERRAMBOOL OVAL MERIMBULA, NSW

GEOTECHNICAL INVESTIGATION REPORT

MAY 2019

AFFINITY ELECTRICAL

PROPOSED LIGHT TOWERS – BERRAMBOOL OVAL
MERIMBULA, NSW

GEOTECHNICAL INVESTIGATION REPORT

TABLE OF CONTENTS

AFFINITY ELECTRICAL

PROPOSED LIGHT TOWERS – BERRAMBOOL OVAL
MERIMBULA, NSW

GEOTECHNICAL INVESTIGATION REPORT

1 INTRODUCTION

At the request of Affinity Electrical, ACT Geotechnical Engineers Pty Ltd carried out a geotechnical investigation for four (4) proposed field light poles on the Berrambool oval (AFL) located off Berrambool Drive, in Merimbula, NSW.

It is understood the project involves the construction of four light poles on the oval. It is assumed that the light poles could extend to ~20m/25m high.

The aim of the investigation was to:

i) Identify subsurface conditions including extent and nature of any fill materials, soil strata, bedrock type and depth, and groundwater presence.
ii) Provide a site classification to AS2870 "Residential Slabs & Footings".
iii) Recommend suitable footing systems for the buildings including types, founding depths and allowable bearing pressures.
iv) Advise on excavation conditions and suitability of excavated materials for use as structural fill.
v) Advise on excavation batters support.
vi) Advise on site drainage, and other relevant geotechnical issues.

2 SITE DESCRIPTION & GEOLOGY

The site is located at Berrambool oval (AFL) located off Berrambool Drive, in Merimbula, NSW. Figure 1 shows the site locality. The proposed lighting poles will be spaced evenly, located towards each end/diagonal of the sporting field. Figure 2 is a recent aerial photo showing the present site layout and the borehole locations.

The 1:250,000 Bega/Mallacoota SJ-55 (NSW Government 1995) Geology Map (Reference 1) documents the site to be underlain by Quartenary Age (Cainozoic Units) alluvial deposits, fluvial sands, grits, lacustrine clays.

3 INVESTIGATION METHODS

The field investigation was carried out on 16 May 2019, comprising four push-tube boreholes, designated 1A to 4A, extending to the full 4m investigation depth. The locations of the boreholes were selected and cleared by the client, and are shown on Figure 2.

The boreholes were investigated by push-tube equipment with a 50mm diameter tube attachment. Bedrock was not encountered in the boreholes within the 4m investigation depth. Borehole logs are presented in Appendix A.

The profiles were visually logged in accordance with the Unified Soil Classification System (USCS). Definitions of geotechnical engineering terms used on the logs and in this report, including a copy of the USCS chart, are provided in Appendix B.

4 INVESTIGATION RESULTS

4.1 Subsurface Conditions

Boreholes 1A to 4A found the subsurface profile to comprise;

Geological Profile	Depth Interval	Description
TOPSOIL	0m to 0.4m/0.5m	CLAYEY SILTY SAND; fine to medium sand, low plasticity fines, dark brown/black, upper grass roots, dry/moist, loose/medium dense.
ALLUVIAL/ FLUVIAL SOILS	Below 0.5m/0.6m to >5m	SAND, SANDY SILTY CLAY; fine to medium/coarse sand, low/medium plasticity clay, ~10% silt fines, dark grey/black, dry, moist/wet, loose/medium dense, stiff/firm.

No signs of uncontrolled fill were found within the four boreholes (1A to 4A), with natural soils/sands extending to 4m depth across the site. Bedrock was not encountered within the investigation depths at 4m depth. The depth to bedrock is unknown but could be greater than 6m/8m depth.

Table 1 below shows the estimates of soil strength properties for the soil based on our visual assessment.

TABLE 1

Estimates of Soil Strength Properties

Layer	Depth Interval (m)	D_d (kN/m³)	C_u (kPa)	Ø (degrees)
Overburden Soil – Alluvial/Fluvial (firm/stiff, loose/medium dense)	0.0m – 4.0m	18	10	20

where,
D_d is the in-situ, dry unit weight, in kN/m³
C_u is the cohesion, in kPa
Ø is the internal friction angle, in degrees

4.2 Dynamic Cone Penetrometer (DCP) Testing

To assess the relative density condition of the subsurface profile at the proposed locations for the light poles, four (4) dynamic cone penetrometer (DCP) tests were conducted at each of the four borehole locations. The tests were conducted in accordance with AS1289.6.3.2 "Determination of the penetration resistance of a soil – 9kg dynamic cone penetrometer test", designated DCP1 to DCP4. The results of the DCP testing are summarised in Table 1 below and the locations of the DCP tests are shown in the attached Figure 2 (borehole locals), which is an aerial photograph of the site.

TABLE 1
Summary of DCP Testing

Depth (mm)	Blows per 100mm Penetration from Surface			
	DCP1 (from 1.3m)	DCP2 (from 1.5m)	DCP3 (from 1.3m)	DCP4 (from 1.5m)
0 - 100	1	1	1	1
100 – 200	2	1	1	1
200 – 300	2	1	1	1
300 – 400	3	1	2	1
400 – 500	2	0	1	0
500 – 600	2	1	1	1
600 - 700	2	1	0	1
700 – 800	2	1	2	1
800 – 900	1	2	3	2
900 – 1000	2	1	5	1
1000 – 1100	2	2	4	2
1100 – 1200	1	2	7	2
1200 – 1300	2	1	5	1
1300 - 1400	2	0	3	0
1400 – 1500	3	1	2	1
1500 – 1600	2	0	5	0
1600 – 1700	1	1	3	1
1700 – 1800	2	2	6	2
1800 – 1900	2	1	10	1
1900 – 2000	2	1	Ref @20mm	1
2000 – 2100	2	1	-	1
2100 – 2200	1	2		2
2200 – 2300	2	1		1
2300 - 2400	1	-		-

DCP tests 1 to 4 found the subsurface profiles of the proposed light pole foundations to be in a generally very loose/loose condition, with DCP3 (3A) showing at least a medium dense and stiff condition from ~2.3m depth, then refusal into dense material at ~2.3m depth.

4.3 Groundwater

Depth to groundwater is expected to be encountered within 1.1m (2A) to 2.1m (3A) across the site. Accordingly, footing excavation may encounter ground water ingress, and also collapse in of the sandy materials whilst boring/excavating. Temporary perched seepages could also be present in the upper soils following rainfall, but these are expected to be minor.

5 DISCUSSION & RECOMMENDATIONS

5.1 Site Classification

The upper (low/medium plasticity) soil in the vicinity of boreholes 1A to 4A is slightly reactive in terms of potential shrink-swell movements that may occur due to seasonal ground moisture changes. Accordingly, the characteristic ground surface movement "ys", as defined by AS2870 for the range of extreme dry to extreme wet ground moisture conditions is estimated to be below 20mm. The site is therefore designated a Class "S" (slightly reactive).

Deemed-to-comply footing designs provided by AS2870 are applicable specifically to residential style one and two-storey structures, or buildings with similar loads and superstructure stiffness.

5.2 Building Footings & Ground Slabs

It is expected that footings to support the light poles could be concrete pads in weaker site overburden soils, or augered "pier" holes in competent soil or deeper into bedrock (depth unknown).

Footing systems for the light poles, dimensioned to resist anticipated overturning moments can include:

- multiple or single monolithic pad footing, founding in overburden soils.
- Bored piers socketing deeper into dense soil or stronger bedrock (not encountered). It should be noted that bored pier holes would be likely to collapse below groundwater level, so CFA piles or screw piles would be more practical.

If multiple or single pad footings with ground anchors are considered, this would reduce the amount of excavation required if mass concrete pads are used. In this case, the shallow pad(s) could be excavated to be founded on the stiff and medium dense alluvial soil. Ground anchors can then be installed by percussion-drilling holes to the required depth and multi-strand cable anchors installed into the holes and grouted. Allowable shaft adhesion values for cement-grouted, tensioned anchors in the site soils are provided in Table 1.

Recommended allowable end-bearing pressures and shaft adhesion values for various footing systems are provided in Table 2 below.

TABLE 2

Recommended Allowable End-Bearing Pressures for Footings

Foundation Material Type	Depth Interval	Allowable End-Bearing Pressure			Allowable Side Adhesion
		Strips	Pads	Bulk or Bored Piers	Downward Loading & Uplift
Overburden Soil – Alluvial/Fluvial (firm/stiff, loose/medium dense)	0.0m – >4m	100kPa	125kPa	150kPa	15kPa / 7kPa

All footing excavations should be inspected and approved by an experienced geotechnical engineer to confirm the foundation material and design values, and to ensure the excavations are clean and stable.

5.3 Lateral Resistance

The allowable horizontal passive resistance provided by the socketed sections of pad and pier footings in alluvial soils and underlying weathered bedrock can be calculated as:

$\sigma_p = 30z$ (Overburden soil socket – 0m/4m)

where,
σ_p is the allowable passive pressure acting on the front of the footing at depth z, in kPa
z is the pad socket length below ground level, in metres

In addition, the soil strength properties provided in Section 4 can be used for calculation of sliding resistance of concrete anchor blocks in the soil.

5.4 Excavation Conditions & Use of Excavated Materials

Proposed excavation depths for the light pole footings have not been indicated, but excavations would be through topsoil, and natural alluvial soils. The overburden soils to >4m depth, can all be dug by medium-sized backhoe and excavator. The loose soils will be prone to collapse below groundwater level.

Overburden soils generally comprise low/medium plasticity sand/clayey soils and are suitable for use in controlled fill construction. Any medium/high plasticity or wet material is not suitable for controlled fill construction. Any excavated bedrock can be used for controlled fill, provided it is broken down to less than 75mm maximum particle size, along with any low/medium plasticity soils.

Any topsoil is not typically suitable for controlled fill, but could be used in non-structural applications such as landscaping, along with any medium to high plasticity materials.

5.5 Stable Batter Slopes

Temporary site excavations to 1.5m depth can be formed near-vertical, although the loose material near surface levels should be cut at 1(H):1(V). If required, deeper temporary cuts can be benched or formed at 1(H):1(V). Exposed temporary batters in soil should be protected from the weather by black plastic or similar, and should be inspected during construction by a geotechnical engineer. The loose sandy soils below groundwater level will be prone to collapse and would likely require temporary shoring to support.

Permanent cut and fill batters should be formed at no steeper than 2(H):1(V), although cut batters in weathered bedrock (if found) could be formed at 1(H):1(V). All soil cut and fill surfaces should be protected against erosion by topsoiling and grassing, or other suitable means. It is advisable that permanent batters are inspected during excavation by an experienced geotechnical engineer to confirm stability.

5.6 Controlled Fill Construction

If required, the following sequence is recommended for construction of controlled fill building platforms:

1. Areas be fully stripped of any topsoil soils or uncontrolled fill. A stripping depth of up to 0.4m/0.5m could be expected.

2. Stripped foundations be cross-ripped, moisture conditioned, and proof-rolled by a vibratory pad-foot roller of not less than 9 tonne static mass to check for any weak or wet areas that require replacement.

3. Replacement fill and platform fill of suitable materials (Section 5.4) be compacted to required level in not thicker than 150mm layers to not less than 98%StdMDD at about optimum moisture content.

4. Fill placement and control testing be overviewed and certified by a geotechnical engineer at Level 1 or 2 responsibility as defined in AS3798 - 1996 "Guidelines on Earthworks for Commercial & Residential Developments" (Reference 3).

5.7 Earthquake Site Factor

Table 2.3 of AS1170.4 "Minimum Design Loads on Structures - Part 4: Earthquake Loads" (Reference 4) lists the earthquake acceleration coefficients for major centres to be considered in structural design. The Merimbula area has an acceleration coefficient of 0.04.

Section 4 of AS1170.4 summarises the Site Subsoil Class which depends on the subsurface conditions at the site in question. A Site Subsoil Class C_e is applicable for this development.

5.8 Drainage

Suitable surface drainage should be provided to ensure rainfall run-off or other surface water cannot pond against concrete or steel structures.

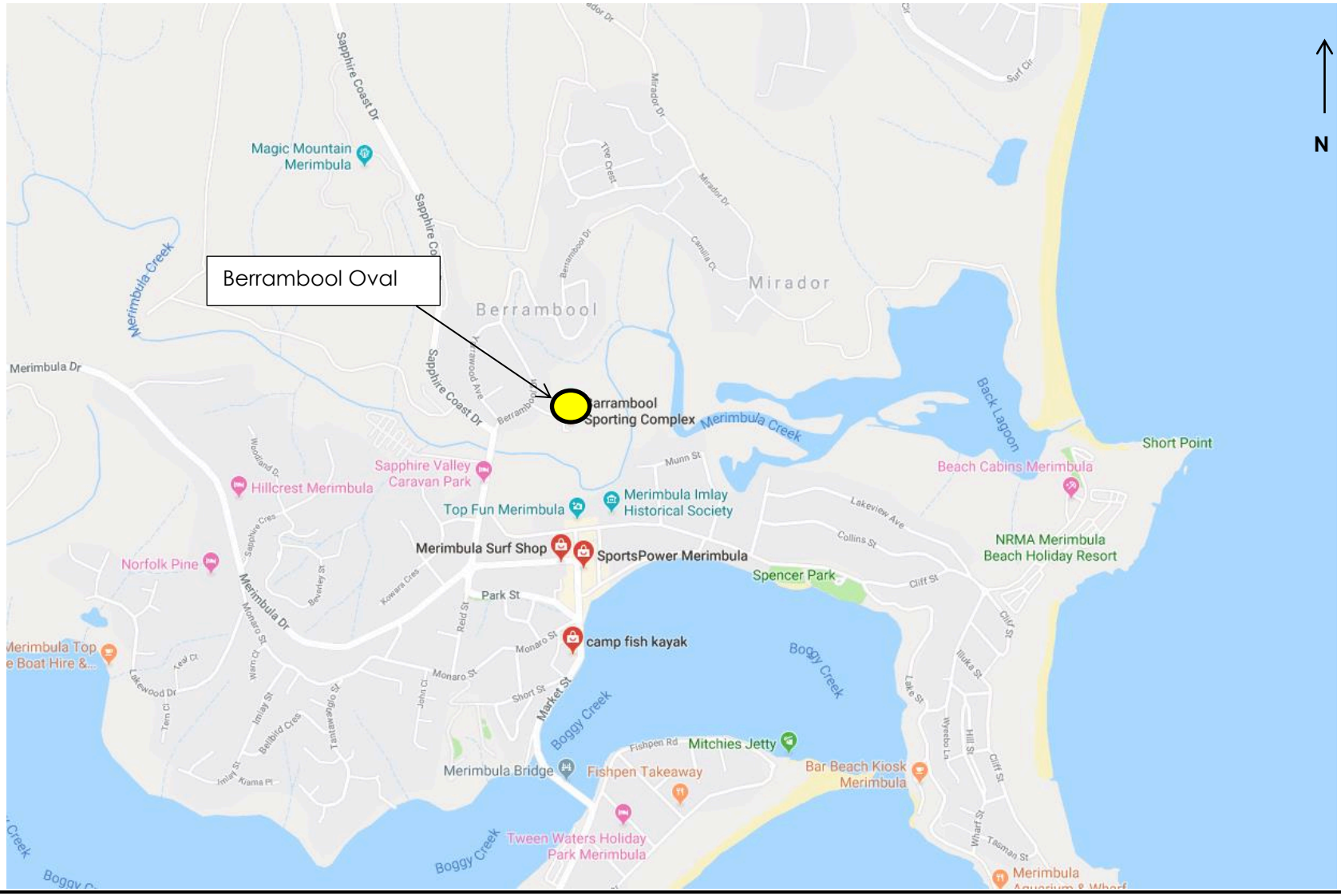
REFERENCES

Reference 1 Bega - Mallacoota 8728 (NSW Governmaent) 1:250,000 scale geological map.

Reference 2 Standards Australia, "AS2870 - Residential slabs and footings - Construction", 2011.

Reference 3 Standards Australia, "AS3798 - Guidelines on Earthworks for Commercial & Residential Developments", 1996.

Reference 4 Standards Australia, "AS1170.4 - 1993 - Minimum Design Loads on Structures Part 4: Earthquake Loads".



PROPOSED LIGHT TOWERS – BERRAMBOOL OVAL
MERIMBULA, NSW
SITE LOCALITY

ACT Geotechnical Engineers Pty Ltd	**C9979**	**FIGURE 1**

PROPOSED LIGHT TOWERS – BERRAMBOOL OVAL
MERIMBULA, NSW
AERIAL PHOTOGRAPH & BOREHOLE LOCATIONS

ACT Geotechnical Engineers Pty Ltd	**C9979**	**FIGURE 2**

APPENDIX A
Borehole Log 1A to 4A

Borehole Log

Borehole No.	**1A**
Sheet	1 of 1
Job No.	C9979

CLIENT: AFFINITY ELECTRICAL

PROJECT: PROPOSED LIGHT TOWERS
BERRAMBOOL OVAL, MERIMBULA, NSW

Location : SEE PLAN

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : PUSH TUBE
Hole Diameter : 50mm

Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Consistency or Relative Density	Field Test Results	Geological Profile
0.0		SM	CLAYEY SILTY SAND; fine to medium sand, low plasticity fines, black, dark brown, some upper grass roots, dry/moist.	LOOSE/ MEDIUM DENSE		TOPSOIL
0.5		CL	SANDY SILTY CLAY; low/medium plasticity clay, fine to medium sand, dark grey /black, moist.	STIFF		ALLUVIUM
1.0						
1.1		SP	SAND; fine to coarse, poorly graded, grey, dark grey, ~10% silt fines, moist/wet.	LOOSE/ MEDIUM DENSE		
2.0						
3.0						
4.0						

Water: ▽

Dynamic Cone Penetrometer Test. Results in Blows per 100mm

DCP
1
2
2
3
2
2
2
1
2
2
1
2
2
3
2
1
2
2
2
2
2
1
2
1

BOREHOLE TERMINATED AT 4m

Logged By : JM Date : 16/5/19 Checked By : Date :

BOREHOLE/EXCAVATION LOG C9979.GPJ ACT GEO.GDT 20/5/19

ACT Geotechnical Engineers

Borehole Log

Borehole No.	2A
Sheet	1 of 1
Job No.	C9979

CLIENT: AFFINITY ELECTRICAL

PROJECT: PROPOSED LIGHT TOWERS
BERRAMBOOL OVAL, MERIMBULA, NSW

Equipment Type : PUSH TUBE
Hole Diameter : 50mm

Location : SEE PLAN

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Samples	Water	Casing	Depth Metres	Graphic Log	U.S.C.S.	Material Description, Structure (Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure)	Consistency or Relative Density	Field Test Results	Geological Profile
			0.0–0.4		SM	CLAYEY SILTY SAND; fine to medium sand, low plasticity fines, black, dark brown, some upper grass roots, dry/moist.	LOOSE/ MEDIUM DENSE		TOPSOIL
	▽ (approx. 1.1)		0.4–1.2		CL	SANDY SILTY CLAY; low/medium plasticity clay, fine to medium sand, dark grey /black, moist.	STIFF		ALLUVIUM
			1.2–4.0		SP	SAND; fine to coarse, poorly graded, grey, dark grey, ~10% silt fines, wet.	LOOSE/ MEDIUM DENSE	DCP (Dynamic Cone Penetrometer Test. Results in Blows per 100mm): 1, 1, 1, 1, 0, 1, 1, 1, 2, 1, 2, 2, 1, 0, 1, 0, 1, 2, 1, 1, 1, 2, 1	

Depth scale: 0.4, 1.0, 1.2, 2.0, 3.0, 4.0

BOREHOLE TERMINATED AT 4m

Logged By : JM	Date : 16/5/19	Checked By :	Date :

BOREHOLE/EXCAVATION LOG C9979.GPJ ACT GEO.GDT 20/5/19

ACT Geotechnical Engineers

ACT Geotechnical Engineers

Borehole Log

Borehole No.	**3A**
Sheet	1 of 1
Job No.	C9979

CLIENT: AFFINITY ELECTRICAL

PROJECT: PROPOSED LIGHT TOWERS
BERRAMBOOL OVAL, MERIMBULA, NSW

Location : SEE PLAN

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : PUSH TUBE
Hole Diameter : 50mm

Depth (Metres)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Consistency or Relative Density	Field Test Results	Geological Profile
0.0		SM	CLAYEY SILTY SAND; fine to medium sand, low plasticity fines, black, dark brown, some upper grass roots, dry/moist.	LOOSE/ MEDIUM DENSE		TOPSOIL
0.4		SP	SAND; fine to coarse, poorly graded, dry	MEDIUM DENSE		ALLUVIUM
1.0		CL	SANDY SILTY CLAY; low/medium plasticity clay, fine to medium sand, dark grey /black, moist.	STIFF/ FRIM		
1.4		SP	SAND; fine to coarse, poorly graded, grey, dark grey, ~10% silt fines, moist/wet.	LOOSE/ MEDIUM DENSE		
2.0						
3.0						
3.2						
4.0						

Water: ▽

Field Test Results — Dynamic Cone Penetrometer Test. Results in Blows per 100mm

DCP
1
1
1
2
1
1
0
2
3
5
4
7
5
3
2
5
3
6
10

BOREHOLE TERMINATED AT 4m

Logged By : JM Date : 16/5/19 Checked By : Date :

BOREHOLE/EXCAVATION LOG C9979.GPJ ACT GEO.GDT 20/5/19

ACT Geotechnical Engineers

ACT Geotechnical Engineers

Borehole Log

Borehole No.	**4A**
Sheet	1 of 1
Job No.	C9979

CLIENT: AFFINITY ELECTRICAL

PROJECT: PROPOSED LIGHT TOWERS
BERRAMBOOL OVAL, MERIMBULA, NSW

Location : SEE PLAN

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : PUSH TUBE
Hole Diameter : 50mm

Samples	Water	Casing	Depth Metres	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered		0.4		SM	CLAYEY SILTY SAND; fine to medium sand, low plasticity fines, black, dark brown, some upper grass roots, dry/moist.	LOOSE/ MEDIUM DENSE		TOPSOIL
			1.0		CL	SANDY SILTY CLAY; low/medium plasticity clay, fine to medium sand, dark grey /black, moist.	STIFF		ALLUVIUM
			1.2		SP	SAND; fine to coarse, poorly graded, grey, dark grey, ~10% silt fines, wet.	LOOSE/ MEDIUM DENSE		
			2.0						
			3.0						
			4.0						

Dynamic Cone Penetrometer Test. Results in Blows per 100mm

DCP
1
1
1
1
0
1
1
1
2
1
2
2
1
0
1
0
1
2
1
1
1
2
1

BOREHOLE TERMINATED AT 4m

Logged By : JM Date : 16/5/19 Checked By : Date :

BOREHOLE/EXCAVATION LOG C9979.GPJ ACT GEO.GDT 20/5/19

ACT Geotechnical Engineers

APPENDIX B
Definitions of Geotechnical Engineering Terms

DESCRIPTION AND CLASSIFICATION OF SOILS

The methods of description and classification of soils used in this report are based on the Australian Standard 1726 – 1993, Geotechnical site investigations. In general, descriptions cover the following properties – soil type, colour, secondary grain size, structure, inclusions, strength or density and geological description.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (e.g. sandy clay) on the following basis:

Classification	**Particle Size**
Clay	Less than 0.002mm
Silt	0.002mm to 0.06mm
Sand	0.06mm to 2.00mm
Gravel	2.00mm to 60.00mm
Cobbles	60mm (63mm) to 200mm
Boulders	>200mm

Soils are also classified according to the Unified Soil Classifications System which is included in this Appendix. Rock types are classified by their geological names.

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The terms are defined as follows:

Consistency	**Shear Strength su(kPa) (Representative Undrained Shear)**	
Very soft	< 12	<2 (~SPT "N")
Soft	12 - 25	2-4
Firm	25 - 50	4-8
Stiff	50 – 100	8-15
Very Stiff	100 – 200	15-30
Hard	> 200	>30

Non-cohesive soils are classified on the basis of relative density, generally from the results of in-situ standard penetration tests as below:

Term	**Relative Density (%)**	**SPT Blows/300mm 'N'**
Very loose	< 15	<4
Loose	15-35	4-10
Medium dense	35-65	10-30
Dense	65-85	30-50
Very Dense	>85	>50

SAMPLING

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are generally taken by one of two methods:

1. Driving or pushing a thin walled sample tube into the soil and withdrawing with a sample of soil in a relatively undisturbed state.

2. Core drilling using a retractable inner tube (R.I.T.) core barrel.

Such samples yield information on structure and strength in additions to that obtained from disturbed samples and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

PENETRATION TESTING

The relative density of non-cohesive soils is generally assessed by in-situ penetration tests, the most common of which is the standard penetration test. The test procedure is described in Australian Standard 1289 “Testing Soils for Engineering Purposes” Testing Soils for Engineering Purposes” – Test No. F3.1.

The standard penetration test is carried out by driving a 50mm diameter split tube penetrometer of standard dimensions under the impact of a 63 kg hammer having a free fall of 750mm.

The “N” value is determined as the number of blows to achieve 300mm of penetration (generally after disregarding the first 150mm penetration through possibly disturbed material). The results of these tests can be related empirically to the engineering properties of the soil.

The test is also used to provide useful information in cohesive soils under certain conditions, a good quality disturbed sample being recovered with each test. Other forms of in situ testing are used under certain conditions and where this occurs, details are given in the report.

DEFINITIONS OF ROCK, SOIL, AND DEGREES OF CHEMICAL WEATHERING

GENERAL DEFINITIONS – ROCK AND SOIL

ROCK In engineering usage, rock is a natural aggregate of minerals connected by strong and permanent cohesive forces.

Note: Since "strong" and "permanent" are subject to different interpretations, the boundary between rock and soil is necessarily an arbitrary one.

SOIL In engineering usage, soil is a natural aggregate of mineral grains which can be separated by such gentle mechanical means as agitation in water, can be remoulded and can be classified according to the Unified Soil Classification System. Three principal classes of soil recognized are:

Residual soils: soils which have been formed in-situ by the chemical weathering of parent rock. Residual soil may retain evidence of the original rock texture or fabric or, when mature, the original rock texture may be destroyed.

Transported soils: soils which have been moved from their places of origin and deposited elsewhere. The principal agents of erosion, transport and deposition are water, wind and gravity. Two important types of transported soil in engineering geology and materials investigations are:

Colluvium – a soil, often including angular rock fragments and boulders, which has been transported downslope predominantly under the action of gravity assisted by water. The principle forming process is that of soil creep in which the soil moves after it has been weakened by saturation. It may be water borne for short distances.

Alluvium – a soil which has been transported and deposited by running water. The larger particles (sand and gravel size) are water worn.

Lateritic soils: soils which have formed in situ under the effects of tropical weathering include all reddish residual and non residual soils which genetically form a chain of material ranging from decomposed rock through clay to sesqui-oxide rich crusts. The term does not necessarily imply any compositional, textural or morphological definition; all distinctions useful for engineering purposes are based on the differences in geotechnical characteristics.

ROCK WEATHERING DEFINITIONS

Extremely Weathered (EW)	Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered (HW)	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of the chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered (MW)	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Slightly Weathered (SW)	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance, usually by limonite, has taken place. The colour and texture of the fresh rock is recognisable.
Fresh (Fr)	Rock substance unaffected by weathering.

The degrees of rock weathering may be gradational. Intermediate stages are described by dual symbols with the prominent degree of weathering first (e.g. EW-HW).

The various degrees of weathering do not necessarily define strength parameters as some rocks are weak, even when fresh, to the extent that they can be broken by hand across the fabric, and some rocks may increase in strength during the weathering process.

Fresh drill cores of some rock types, such as basalt and shale may disintegrate after exposure to the atmosphere due to slaking, desiccation, expansion or contraction, stress relief or a combination of any of these factors.

AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS

This classification system provides a standardised terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable. Where other rock types are encountered, such as in dykes, standard geological descriptions are used for rock types and the same descriptions as below are used for strength, fracturing and weathering.

Under this system rocks are classified by Rock Type, Strength, Stratification Spacing, Degree of Fracturing and Degree of Weathering. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc) where these are relevant.

ROCK TYPE DEFINITIONS

ROCK TYPE	DEFINITION
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments.
Sandstone:	More than 50% of the rock consists of sand sized (0.06 to 2mm) grains.
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated.
Claystone:	More than 50% of the rock consists of silt or clay sized particles and the rock is not laminated.
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated.

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly Laminated	< 6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	> 2m

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks.

Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter
Highly Fractured:	Core lengths are generally less than 20mm – 40mm with occasional fragments.
Fractured:	Core lengths are mainly 30mm – 100mm with occasional shorter and longer section.
Slightly Fractured:	Core lengths are generally 300mm – 1000mm with occasional longer sections and occasional sections of 100mm – 300mm.
Unbroken:	The core does not contain any fracture.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Society of Rock Mechanics.

Term	Point Load Index Is(50) MPa	Field Guide	Approx qu MPa*
Extremely Weak:	0.03	Easily remoulded by hand to a material with soil properties.	0.7
Very Weak:	0.1	May be crumbled in the hand. Sandstone is “sugary” and friable.	2.4
Weak:	0.3	A piece of core 150mm long x 50mm dia. May be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium Strong:	1	A piece of core 150mm long x 50mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
Strong: (SW)	3	A piece of core 150mm long x 50mm dia. core cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very Strong (SW)	10	A piece of core 150mm long x 50mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely Strong (Fr)	>10	A piece of core 150mm long x 50mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	>240

The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ration to the point load index of 24:1. This ratio may vary widely.

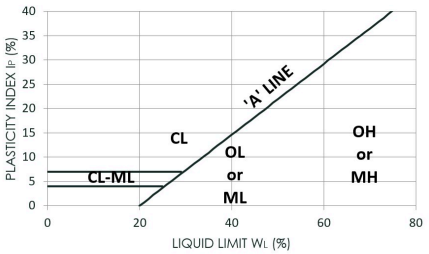
Unified Soil Classification System (Metricated)
Data for Description Indentification and Classification of Soils

MAJOR DIVISIONS				DESCRIPTION				FIELD IDENTIFICATION						LABORATORY CLASSIFICATION				
				Group Symbol	Graphic Symbol	TYPICAL NAME	DESCRIPTIVE DATA							% [2] < 0.06mm	PLASTICITY OF FINE FRACTION			NOTES
COARSE GRAINED SOILS	More than 50% by dry mass, less than 60mm is greater than 0.06mm.	GRAVELS	More than 50% of coarse grains are greater than 2.0mm	GW		Well graded gravels and gravel-sand mixtures, little or no fines	Give typical name, indicate approximate percentages of sand and gravel, maximum size, angularity, surface condition and hardness of the coarse grains, local or geological name and other perfinent descriptive information, symbols in parenthesis. For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics. EXAMPLE: Silty Sand, gravelly, about 20% hard, angular gravel particles, 10mm maximum size, rounded and sub angular sand grains coarse to fine, about 15% non-plastic fines with low dry strength, well compacted and moist in place, light brown alluvial sand, (SM)	Determine approximate percentages of material over 60mm size, maximum size, shape, surface texture, hardness of material, geological description identify on estimated percentage mass of the various fractions.	COARSE GRAINED SOILS	More than half of the material less than 60mm is larger than 0.06mm	0.06mm is about the smallest particle visible to the naked eye	GRAVELS AND SANDS	GRADATIONS	NATURE OF FINES	DRY STRENGTH	GW	0-5	-	>4	Between 1 and 3	1. Identify Fines by the method given for fine grained soils. 2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.06mm size) is greater than 5% and less than 12%. Borderline classifications require the use of dual symbols eg SP-SM GW-GC
				GP		Poorly graded gravels and gravel-sand mixtures, little or no fines						GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	GP	0-5	-	Fails to comply with above		
		GRAVELLY SOILS		GM		Silty gravels, gravel-sand-silt mixtures						POOR	Predominantly one size or range of sizes			GM	12-50	Below 'A' line and Ip >7	-	-	
				GC		Clayey gravels gravel-sand-clay mixtures						GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (1)	None to medium	GC	12-50	Above 'A' line and Ip > 7	-	-	
		SANDS	More than 50% of coarse grains are greater than 2.0mm	SW		Well graded sands and gravelly sands, little or no fines						GOOD	Wide range in grain size	"Clean" materials (not enough fines to band coarse grains)	None	SW	0-5	-	>6	between 1 and 3	
				SP		Poorly graded sands and gravelly sands, little or no fines						POOR	Predominantly one size or range of sizes			SP	0-5	-	Fails to comply with above		
		SANDY SOILS		SM		Silty sand, sand-silt mixtures						GOOD TO FAIR	"Dirty" materials (Excess of fines)	Fines are non-plastic (1)	None to medium	SM	12-50	Below 'A' line or Ip < 4	-	-	
				SC		Clayey sands, sand-clay mixtures								Fines are plastic (1)		SC	12-50	Above 'A' line and Ip > 7	-	-	
FINE GRAINED SOILS	More than 50% by dry mass, less than 60mm is less than 0.06mm	Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, colour in wet condition, odour if any, local or geological name and r pertinent descriptive information, symbols in parenthesis. For undisturbed soil add information on structure, stratification, consistancy in undisturbed and remoulded states, moisture and drainage conditions. EXAMPLE Clayey Silt, brown, low plasticity, small percentage of fine sand, numerous vertical root-holes, firm and dry in place, fill, (ML).		FINE GRAINED SOILS	More than half of the material less than 50mm is less than 0.06mm		SILT AND CLAY FRACTION								
				CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.						Fraction smaller than 0 20mm AS sieve size								
				OL		Organic silts and organic silty clays of low plasticity						DRY STRENGTH	DILATANCY	TOUGHNESS						
		Liquid Limit more than 50%		MH		Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.						None to low	Quick to slow	None		ML				
				CH		Inorganic clays of high plasticity, fat clays.						Medium to high	None to very slow	Medium		CL				
				OH		Organic clays of medium to high plasticity.						Low to medium	Slow	Low		OL				
												Low to medium	Slow to none	Low to medium		MH				
												High to very high	None	High		CH				
												Medium to high	None to very slow	Low to medium		OH				
				Pt		Peat muck and other highly organic soils.		Readily identified by colour, odour, spongy feel and generally by fibrous texture								Pt*	*Effervescence with H2O2		

Use the gradation curve of material passing 60mm for classification of fractions according to criteria given under 'Major Division'.

More than 50% passing 0.06mm

Below 'A' line	
Above 'A' line	
Below 'A' line	
Below 'A' line	
Above 'A' line	
Below 'A' line	



PLASTICITY CHART
FOR CLASSIFICATION OF FINE GRAINED SOILS

Geotechnical Engineers ACT

APPENDIX F- LIGHTING REPORTS

Project: Berrambool Oval
Details: 150 lux - 24 Fittings
Ilumination Calculations
Lot 7 DP 260899
Merimbula, NSW

AEC Consulting Group
PO Box 503
Mawson, ACT 2607
Voice Number : 02 6101 4770
Email:aecengineers@tpg.com.au

Date:26/07/2019

OPTION 3 BERRAMBOOL OVAL
24 L.E.D. FITTINGS 27M TALL PYLONS
LIGHTING CALCULATION SUMMARY
AGI 32 ILLUMINATION MODELLING

This option uses twenty four AAA-Lux WS version 6 series LED fittings with L70 rating of 70,000 hrs

The area being illuminated is the AFL Field and Cricket Pitch.

In accordance with AS 2560.2.3 Sports Lighting the installation achieves Amatuer competition level average luminance to 100 Lux on each. The following average values apply to the above areas:

AFL Field 175 lux
Cricket Pitch 170 lux

The values have been calculated without a maintenance factor meaning all L.E.D.'s and equipment are at the start of their life. Maintained average illuminance at 70,000 hours of use based on AAA-Lux LM-80 test report indicating the luminaires L70 rating. The maintained average illuminance achieved in the design after 70,000 hours for each area is:

AFL Field 149 lux
Cricket Pitch 145 lux

With a maintenance factor of 0.855 in accordance with the the LM-80 Test Report the L.E.D. fittings can run for approximately 70,000 before illumination depreciates to 150 lux.

AS 2560.2.3 also requires the illumination to meet minimum uniformity ratios for the level of play. For Amatuer competition level the ratios are:

U1 = 0.5 (minimum lux / average lux).
U2 = 0.3 (minimum lux / maximum lux).

The following uniformity ratios have been achieved on each section:

Australian Rules Field U1 = 0.68 U2 = 0.47
Cricket pitch area U1 = 0.93 U2 = 0.91

The uniformity far exceeds the standards for compliant sports lighting to Amateur competition level of play. The achieved uniformities comply with Semi-professional competition level minimum standard of U1 = 0.6 U2 = 0.4.

AS2560.2.3 also stipulates a maximum Glare Rating GR of 50 from observer positions. The Maximum GR in the design is 46. Glare can be reduced by increasing pylon height reducing field illuminace.

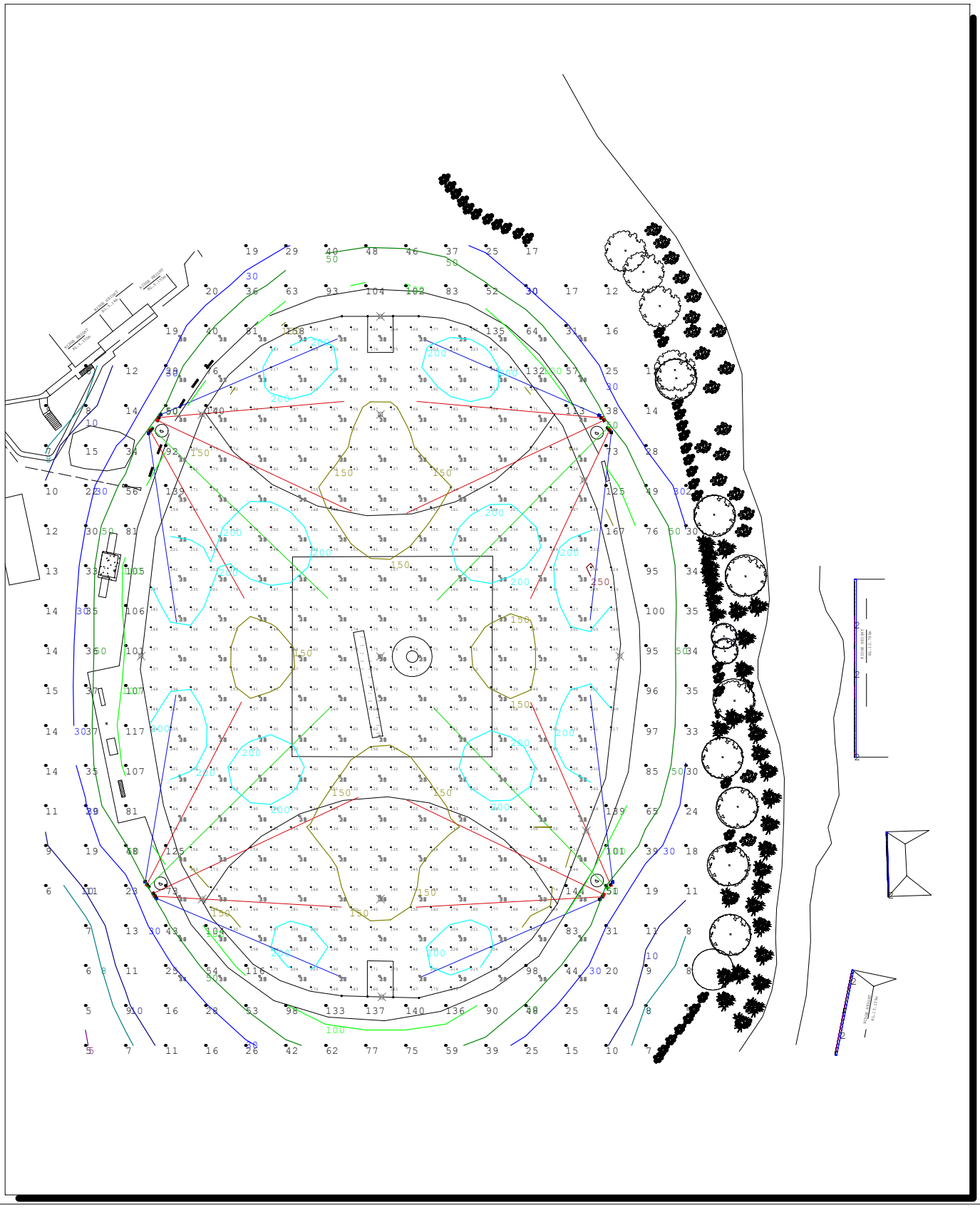
Engineer: Andrew Hill.

Project: Berrambool Oval
Details: 150 lux - 24 Fittings
Ilumination Calculations
Lot 7 DP 260899
Merimbula, NSW

AEC Consulting Group
PO Box 503
Mawson, ACT 2607
Voice Number : 02 6101 4770
Email:aecengineers@tpg.com.au

Date:26/07/2019

BERRAMBOOL OVAL SITE PLAN



Project: Berrambool Oval
Details: 150 lux - 24 Fittings
Ilumination Calculations
Lot 7 DP 260899
Merimbula, NSW

AEC Consulting Group
PO Box 503
Mawson, ACT 2607
Voice Number : 02 6101 4770
Email:aecengineers@tpg.com.au

Date:26/07/2019

LUMINAIRE SCHEDULE & SUMMARY TABLES

Luminaire Schedule					
Project: All Projects					
Symbol	Qty	Label	Description	Lumens	LLF
	4	WS-STAD-01-06 v	20180401	202870	1.000
	12	WS2506 v6_0_0	20180401	202870	1.000
	8	WS-STAD-03-06 v	20180401	202870	1.000

Numeric Summary							
Project: All Projects							
Label	**CalcType**	**Units**	**Avg**	**Max**	**Min**	**Avg/Min**	**Max/Min**
AFL Field	**Illuminance**	**Lux**	**175.76**	**254**	**120**	**0.68**	**0.47**
Cricket Pitch	**Illuminance**	**Lux**	**170.24**	**174**	**159**	**0.93**	**0.91**
Field Surrounds	**Illuminance**	**Lux**	**49.88**	**167**	**5**	**N.A.**	**N.A.**
North Resident Spill	**Illuminance**	**Lux**	**2.06**	**9.7**	**0.1**	**N.A.**	**N.A.**
East Resident Spill	**Illuminance**	**Lux**	**0.67**	**5.3**	**0.0**	**N.A.**	**N.A.**
South Resident Spill	**Illuminance**	**Lux**	**3.05**	**9.1**	**0.0**	**N.A.**	**N.A.**
CalcPtsGR	**Illuminance**	**Lux**	**162.81**	**250**	**27**	**0.17**	**0.11**
CalcPtsGR	**Glare Rating**	**N.A.**	**28.40**	**40**	**10**	**0.35**	**0.25**
CalcPtsGR	**Glare Rating**	**N.A.**	**27.53**	**40**	**10**	**0.36**	**0.25**
CalcPtsGR	**Glare Rating**	**N.A.**	**30.90**	**43**	**11**	**0.36**	**0.26**
CalcPtsGR	**Glare Rating**	**N.A.**	**30.07**	**41**	**10**	**0.33**	**0.24**
CalcPtsGR	**Glare Rating**	**N.A.**	**31.35**	**41**	**19**	**0.61**	**0.46**
CalcPtsGR	**Glare Rating**	**N.A.**	**29.63**	**40**	**10**	**0.34**	**0.25**
CalcPtsGR	**Glare Rating**	**N.A.**	**30.33**	**43**	**11**	**0.36**	**0.26**
CalcPtsGR	**Glare Rating**	**N.A.**	**28.87**	**38**	**10**	**0.35**	**0.26**
CalcPtsGR	**Glare Rating**	**N.A.**	**30.25**	**40**	**18**	**0.60**	**0.45**
CalcPtsGR	**Glare Rating**	**N.A.**	**29.55**	**39**	**10**	**0.34**	**0.26**
CalcPtsGR	**Glare Rating**	**N.A.**	**36.90**	**46**	**10**	**0.27**	**0.22**

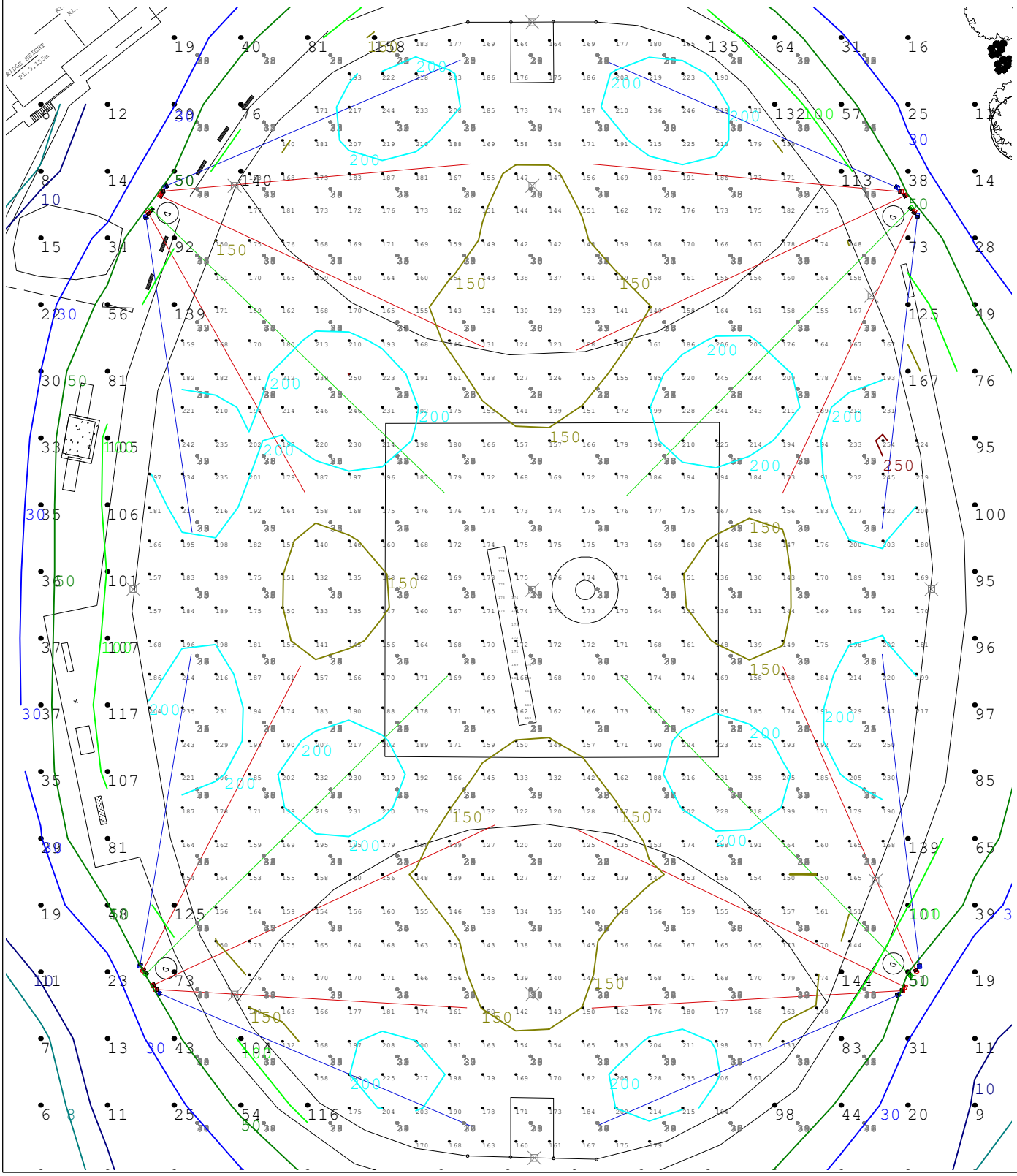
Luminaire Location Summary									
Project: All Projects									
SeqNo	**Label**	**X**	**Y**	**Z**	**Orient**	**Tilt**	**X-Aimpt**	**Y-Aimpt**	**Status**
1	WS-STAD-01-06 v	56.668	57.089	27.2	225.322	65.779	14.156	14.096	On
2	WS-STAD-01-06 v	-56.913	56.901	27.2	315.95	65.942	-13.124	14.54	On
3	WS-STAD-01-06 v	56.581	-57.645	27.2	134.003	66.382	13.367	-12.901	On
4	WS-STAD-01-06 v	-57.775	-57.401	27.2	44.614	66.767	-12.672	-12.901	On
5	WS-STAD-03-06 v	58.043	-56.214	27.2	96.802	59.899	52.486	-9.623	On
6	WS-STAD-03-06 v	57.72	55.88	27.2	263.548	59.97	52.432	9.123	On
7	WS-STAD-03-06 v	-58.731	-56.126	27.2	80.693	60.012	-51.108	-9.611	On
8	WS-STAD-03-06 v	-57.857	55.677	27.2	278.335	60.233	-50.963	8.621	On
9	WS-STAD-03-06 v	-54.767	60.557	27.2	23.186	60.404	-10.746	79.412	On
10	WS-STAD-03-06 v	54.51	60.399	27.2	156.544	60.007	11.279	79.157	On
11	WS-STAD-03-06 v	54.679	-60.764	27.2	203.491	60.832	9.986	-80.189	On
12	WS-STAD-03-06 v	-55.798	-60.507	27.2	336.946	61.88	-8.964	-80.439	On
13	WS2506 v6_0_0	-56.186	-59.899	27.2	356.622	59.676	-9.765	-62.639	On
14	WS2506 v6_0_0	55.331	-60.064	27.2	183.211	59.657	8.937	-62.667	On
15	WS2506 v6_0_0	57.495	-56.957	27.2	113.627	61.303	37.581	-11.435	On
16	WS2506 v6_0_0	57.221	56.469	27.2	244.887	59.612	37.536	14.47	On
17	WS2506 v6_0_0	-57.44	56.348	27.2	299.26	60.386	-34.051	14.601	On
18	WS2506 v6_0_0	-58.257	-56.843	27.2	62.611	62.021	-34.703	-11.381	On
19	WS2506 v6_0_0	55.115	59.703	27.2	174.904	59.49	9.139	63.803	On
20	WS2506 v6_0_0	-55.213	59.777	27.2	5.007	59.547	-9.127	63.815	On
21	WS2506 v6_0_0	-55.548	58.993	27.2	334.875	62.967	-7.284	36.359	On
22	WS2506 v6_0_0	55.793	59.033	27.2	205.177	63.418	6.598	35.908	On
23	WS2506 v6_0_0	-56.633	-59.154	27.2	25.102	64.261	-5.542	-35.219	On
24	WS2506 v6_0_0	55.687	-59.422	27.2	154.363	63.48	6.547	-35.839	On

Project: Berrambool Oval
Details: 150 lux - 24 Fittings
Ilumination Calculations
Lot 7 DP 260899
Merimbula, NSW

AEC Consulting Group
PO Box 503
Mawson, ACT 2607
Voice Number : 02 6101 4770
Email:aecengineers@tpg.com.au

Date:26/07/2019

AUSTRALIAN RULES FIELD ILLUMINANCE



COOPER Lighting

Photometric Toolbox

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 SB V6.0.0.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST] ver 6.0.0
[TESTLAB] AAA-LUX
[BuildNumber] 20180401_600_006
[MORE1] LM79 Intensity distribution source acc. To DEKRA measurement report 218821000-PHO 15-262.
[MORE2] LM80 Flux And efficacy acc.to datasheet LED manufacturer @ 85°C.
[MORE3] Actual luminaire tilt = simulation tilt - 45°, e.G. 60° simulation tilt = 15° luminaire tilt. See Technical Papaer TP03.
[MORE4] WS For sport fields AL For large area JT For low mast Application.
[MORE5] STD For standard usage. MP maximum power For highest Output. HT For high temperature environment.
[MORE6] LX means light spill shield. With X Is the direction of light spill control: L=Left, R=Right And B=Both.
[MORE7] For more information about light spill caps And the positions, see TP15 v3.0
[ISSUEDATE] 20180401
[MANUFAC] AAA-LUX
[LUMINAIRE] WS2506 SB v6.0.0
[LAMP] LED SOURCE AAA-LUX

Note: Candela values converted from Type-C to Type-B

CHARACTERISTICS

NEMA Type	5 H x 4 V
Maximum Candela	281703
Maximum Candela Angle	0H -3V
Horizontal Beam Angle (50%)	53.8
Vertical Beam Angle (50%)	24.9
Horizontal Field Angle (10%)	82.7
Vertical Field Angle (10%)	61.5
Lumens Per Lamp	202870 (1 lamp)
Total Lamp Lumens	202870
Beam Lumens	65793
Beam Efficiency	32 %
Field Lumens	122747
Field Efficiency	61 %
Spill Lumens	15685
Luminaire Lumens	138432
Total Efficiency	68 %
Total Luminaire Watts	1550
Ballast Factor	1.00

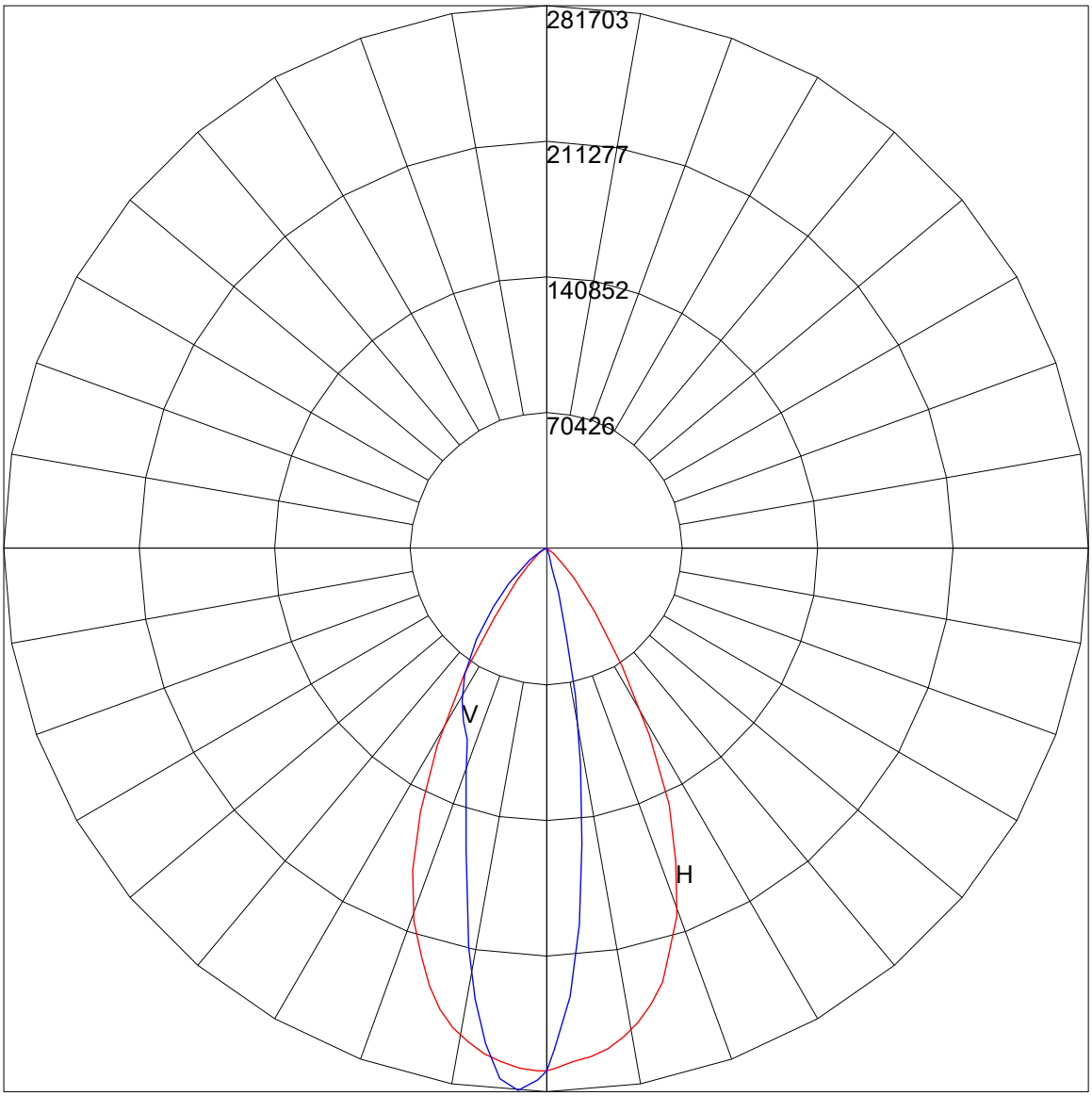
IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 SB V6.0.0.IES

AXIAL CANDELA

DEG.	HOR.	DEG.	VERT.
90	31	90	0
85	42	85	0
75	192	75	0
65	1038	65	0
55	4209	55	0
47.5	11689	47.5	0
42.5	21041	42.5	0
37.5	41873	37.5	179
33	72970	33	444
29	111166	29	914
25.5	147431	25.5	1385
22.5	175510	22.5	2127
19.5	202340	19.5	3963
17	219033	17	10950
15	232598	15	23828
13	242364	13	47239
11	250141	11	77435
9	256288	9	113803
7	261071	7	154391
5	264662	5	195907
3	266469	3	232420
1	269285	1	259136
0	270861	0	270861
-1	270619	-1	275764
-3	269677	-3	281703
-5	267359	-5	276044
-7	263813	-7	258756
-9	259508	-9	236702
-11	253456	-11	210603
-13	245201	-13	183598
-15	234810	-15	161238
-17	222016	-17	142954
-19.5	204902	-19.5	124340
-22.5	180536	-22.5	107631
-25.5	151119	-25.5	99260
-29	116780	-29	90441
-33	77282	-33	77738
-37.5	44524	-37.5	59650
-42.5	22782	-42.5	41181
-47.5	12401	-47.5	26231
-55	4834	-55	10493
-65	1065	-65	2677
-75	83	-75	1282
-85	40	-85	567
-90	47	-90	394

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 SB V6.0.0.IES

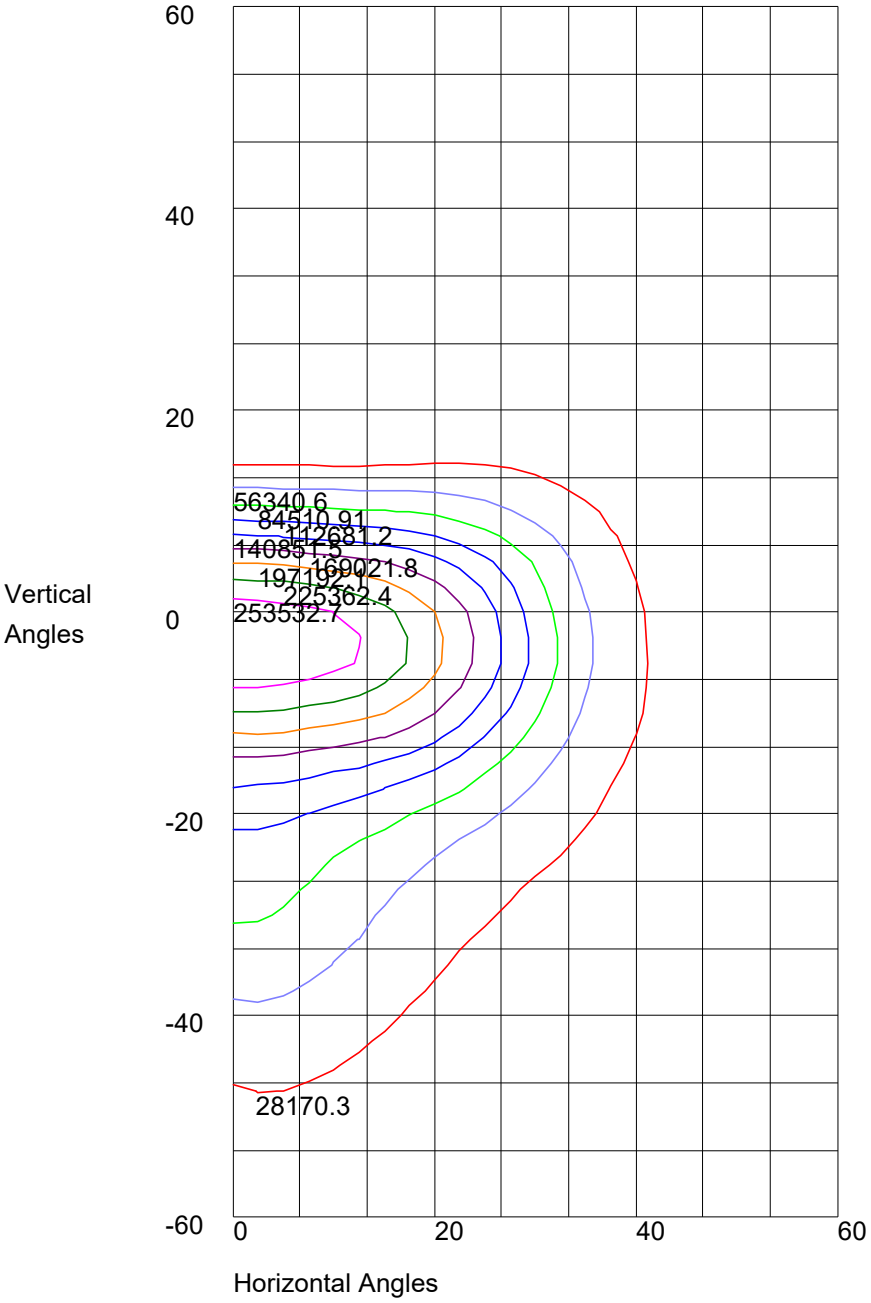
AXIAL CANDELA DISPLAY



Maximum Candela = 281703 Located At Horizontal Angle = 0, Vertical Angle =-3
H - Horizontal Axial Candela
V - Vertical Axial Candela

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 SB V6.0.0.IES

ISOCANDELA CURVES



Maximum Candela = 281703 Located At Horizontal Angle = 0, Vertical Angle =-3
50% Maximum Candela = 140851.5
10% Maximum Candela = 28170.3

COOPER Lighting

Photometric Toolbox

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 V6.0.0.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST] ver 6.0.0
[TESTLAB] AAA-LUX
[BuildNumber] 20180401_600_006
[MORE1] LM79 Intensity distribution source acc. To DEKRA measurement report 218821000-PHO 15-262.
[MORE2] LM80 Flux And efficacy acc.to datasheet LED manufacturer @ 85°C.
[MORE3] Actual luminaire tilt = simulation tilt - 45°, e.G. 60° simulation tilt = 15° luminaire tilt. See Technical Papaer TP03.
[MORE4] WS For sport fields AL For large area JT For low mast Application.
[MORE5] STD For standard usage. MP maximum power For highest Output. HT For high temperature environment.
[MORE6] LX means light spill shield. With X Is the direction of light spill control: L=Left, R=Right And B=Both.
[MORE7] For more information about light spill caps And the positions, see TP15 v3.0
[ISSUEDATE] 20180401
[MANUFAC] AAA-LUX
[LUMINAIRE] WS2506 v6.0.0
[LAMP] LED SOURCE AAA-LUX

Note: Candela values converted from Type-C to Type-B

CHARACTERISTICS

NEMA Type	5 H x 5 V
Maximum Candela	289323
Maximum Candela Angle	-3H 1V
Horizontal Beam Angle (50%)	54.0
Vertical Beam Angle (50%)	29.8
Horizontal Field Angle (10%)	84.9
Vertical Field Angle (10%)	76.7
Lumens Per Lamp	202870 (1 lamp)
Total Lamp Lumens	202870
Beam Lumens	83118
Beam Efficiency	41 %
Field Lumens	156739
Field Efficiency	77 %
Spill Lumens	25422
Luminaire Lumens	182161
Total Efficiency	90 %
Total Luminaire Watts	1550
Ballast Factor	1.00

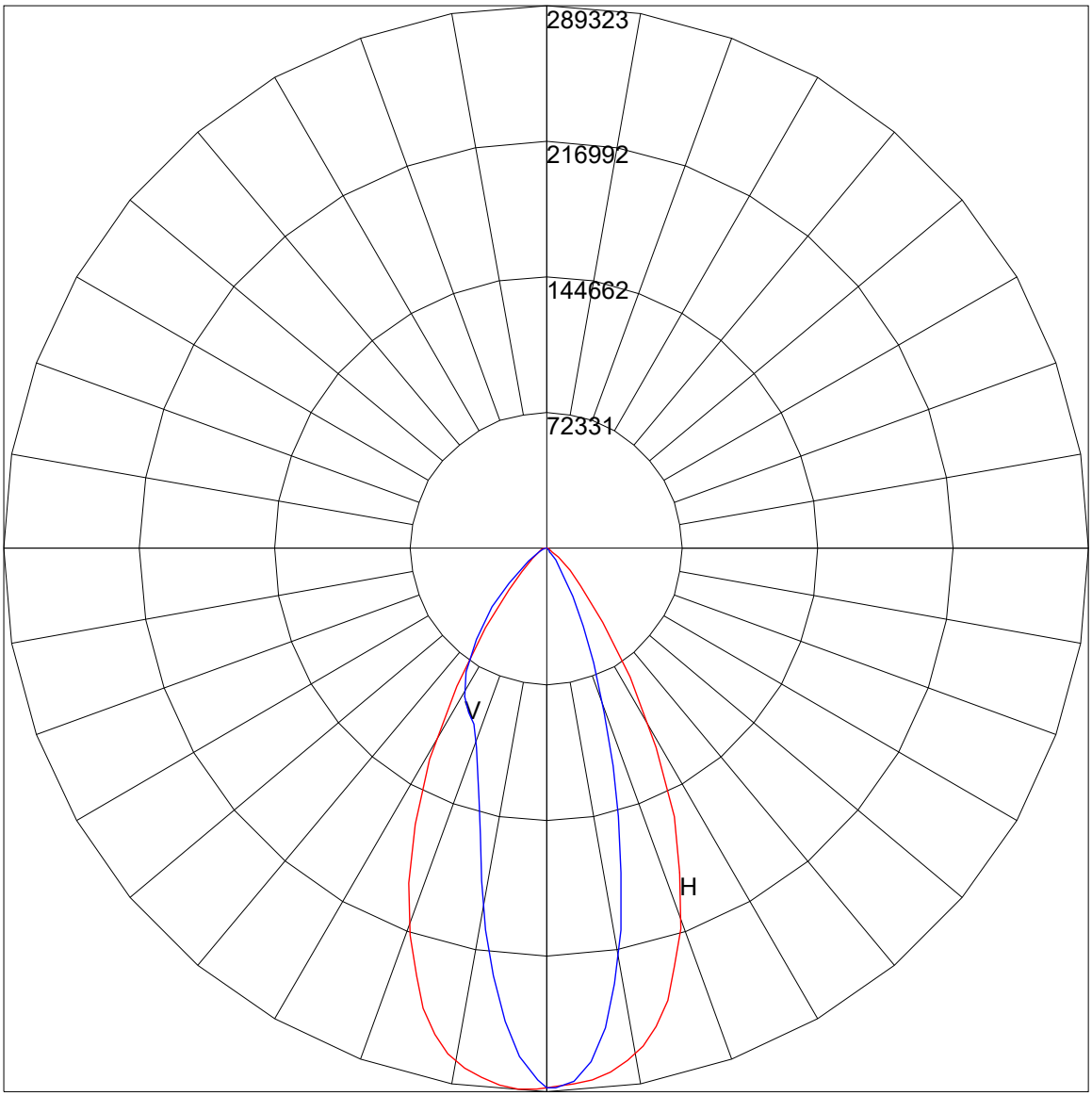
IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 V6.0.0.IES

AXIAL CANDELA

DEG.	HOR.	DEG.	VERT.
90	556	90	0
85	827	85	0
75	1883	75	0
65	3595	65	224
55	8052	55	1592
47.5	16978	47.5	2556
42.5	27386	42.5	3868
37.5	49255	37.5	7908
33	82027	33	16082
29	121301	29	29278
25.5	158027	25.5	46077
22.5	186577	22.5	66214
19.5	214616	19.5	92899
17	233187	17	121302
15	249187	15	147692
13	261479	13	177417
11	270189	11	207209
9	276402	9	234476
7	280954	7	257351
5	284435	5	274697
3	285299	3	284377
1	286746	1	287258
0	287566	0	287566
-1	287938	-1	282858
-3	288142	-3	271176
-5	286726	-5	252694
-7	283884	-7	229464
-9	280171	-9	205407
-11	274524	-11	180298
-13	265924	-13	156369
-15	253394	-15	138307
-17	237865	-17	124908
-19.5	218285	-19.5	112132
-22.5	192556	-22.5	101197
-25.5	163098	-25.5	96342
-29	128149	-29	89951
-33	87738	-33	78638
-37.5	53341	-37.5	61150
-42.5	29839	-42.5	42499
-47.5	17864	-47.5	27385
-55	9318	-55	11786
-65	4256	-65	4416
-75	2295	-75	1569
-85	850	-85	567
-90	567	-90	394

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 V6.0.0.IES

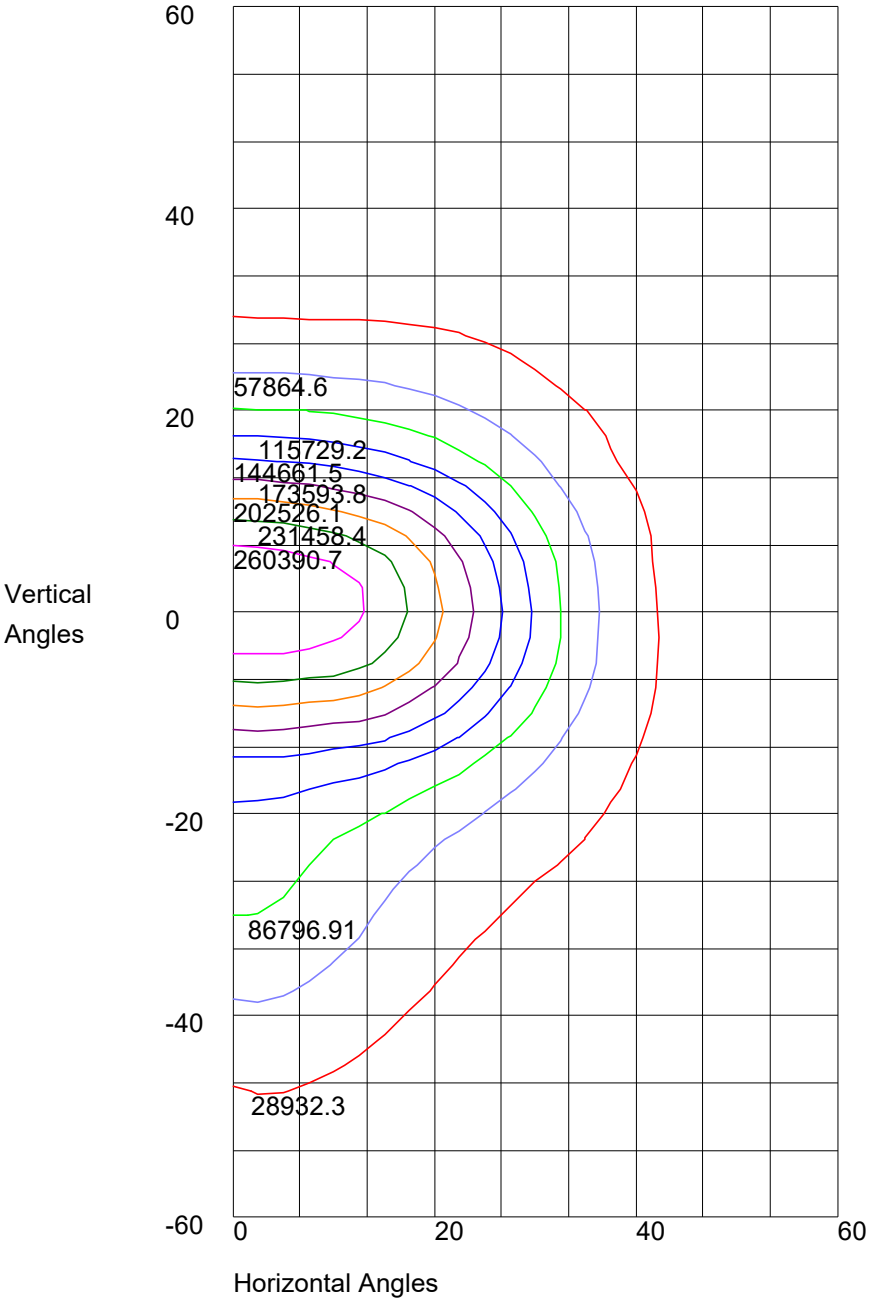
AXIAL CANDELA DISPLAY



Maximum Candela = 289323 Located At Horizontal Angle =-3, Vertical Angle = 1
H - Horizontal Axial Candela
V - Vertical Axial Candela

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS2506 V6.0.0.IES

ISOCANDELA CURVES



Maximum Candela = 289323 Located At Horizontal Angle =-3, Vertical Angle = 1
50% Maximum Candela = 144661.5
10% Maximum Candela = 28932.3

COOPER Lighting

Photometric Toolbox

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-01-06 V6.0.0.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST] ver 6.0.0
[TESTLAB] AAA-LUX
[BuildNumber] 20180401_600_006
[MORE1] LM79 Intensity distribution source acc. To DEKRA measurement report 218821000-PHO 15-262.
[MORE2] LM80 Flux And efficacy acc.to datasheet LED manufacturer @ 85°C.
[MORE3] Actual luminaire tilt = simulation tilt - 45°, e.G. 60° simulation tilt = 15° luminaire tilt. See Technical Papaer TP03.
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[MORE7] For more information about light spill caps And the positions, see TP15 v3.0
[ISSUEDATE] 20180401
[MANUFAC] AAA-LUX
[LUMINAIRE] WS-STAD-01-06 v6.0.0
[LAMP] LED SOURCE AAA-LUX

Note: Candela values converted from Type-C to Type-B

CHARACTERISTICS

NEMA Type	3 H x 3 V
Maximum Candela	633121
Maximum Candela Angle	0H 0V
Horizontal Beam Angle (50%)	26.6
Vertical Beam Angle (50%)	26.1
Horizontal Field Angle (10%)	42.3
Vertical Field Angle (10%)	40.7
Lumens Per Lamp	202870 (1 lamp)
Total Lamp Lumens	202870
Beam Lumens	81700
Beam Efficiency	40 %
Field Lumens	123339
Field Efficiency	61 %
Spill Lumens	34228
Luminaire Lumens	157567
Total Efficiency	78 %
Total Luminaire Watts	1550
Ballast Factor	1.00

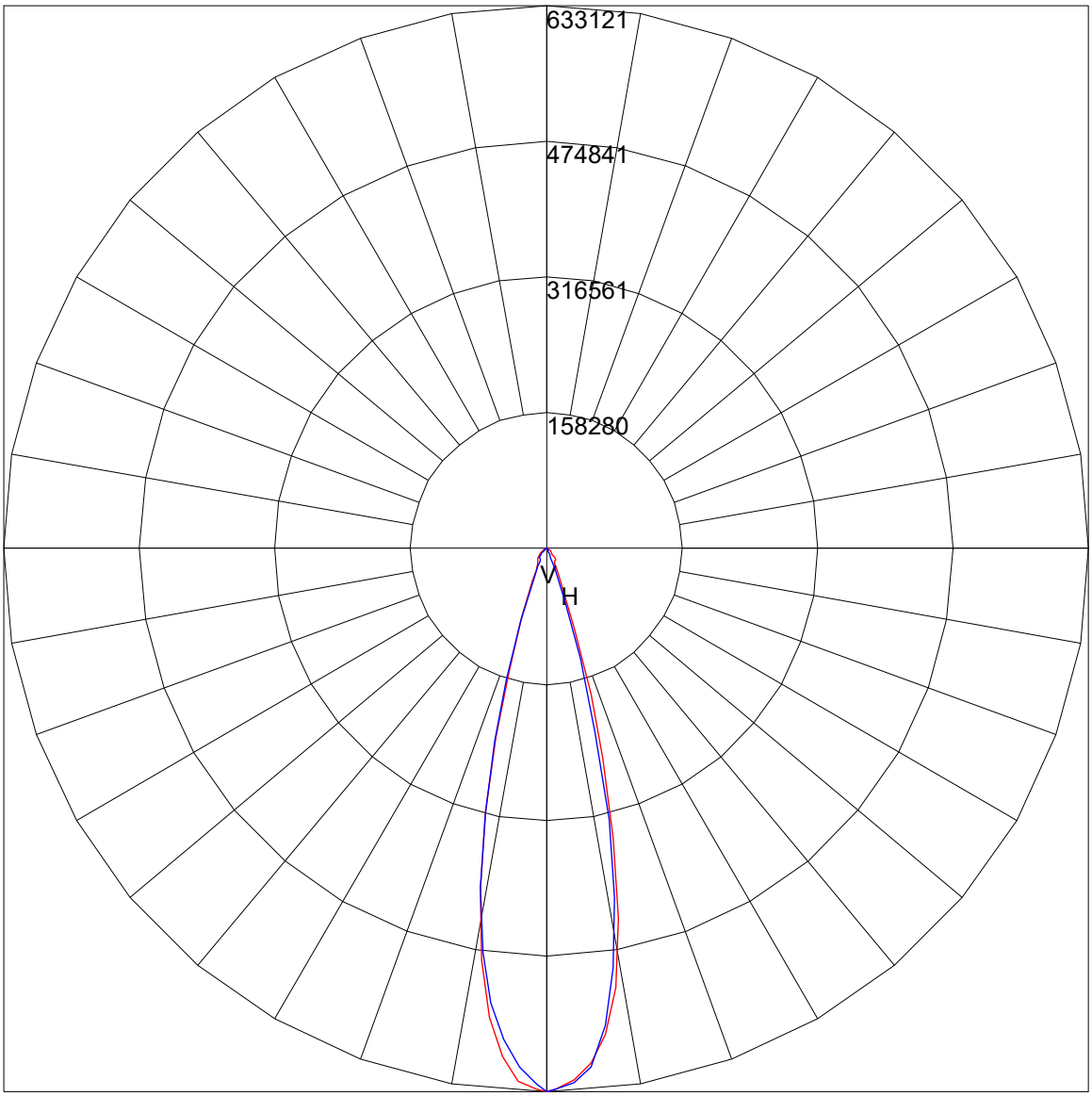
IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-01-06 V6.0.0.IES

AXIAL CANDELA

DEG.	HOR.	DEG.	VERT.
90	0	90	0
85	60	85	0
75	958	75	0
65	2904	65	508
55	5404	55	1311
47.5	9394	47.5	2336
42.5	13459	42.5	3532
37.5	17542	37.5	4148
33	17851	33	4218
29	20673	29	6820
25.5	28777	25.5	13398
22.5	43710	22.5	24887
19.5	97341	19.5	64889
17	176691	17	134474
15	252051	15	221028
13	346026	13	323559
11	439862	11	414603
9	517482	9	494232
7	571122	7	559956
5	601330	5	606717
3	620650	3	622732
1	630065	1	630567
0	633121	0	633121
-1	630924	-1	624819
-3	621092	-3	604669
-5	594946	-5	573880
-7	549932	-7	534334
-9	485533	-9	476806
-11	404589	-11	401479
-13	314537	-13	315349
-15	227409	-15	232220
-17	149999	-17	160735
-19.5	82790	-19.5	89588
-22.5	40984	-22.5	38652
-25.5	27376	-25.5	22470
-29	20763	-29	16163
-33	18499	-33	13975
-37.5	16452	-37.5	13644
-42.5	15214	-42.5	11141
-47.5	9321	-47.5	7943
-55	5200	-55	3773
-65	2661	-65	1850
-75	892	-75	279
-85	0	-85	0
-90	0	-90	0

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-01-06 V6.0.0.IES

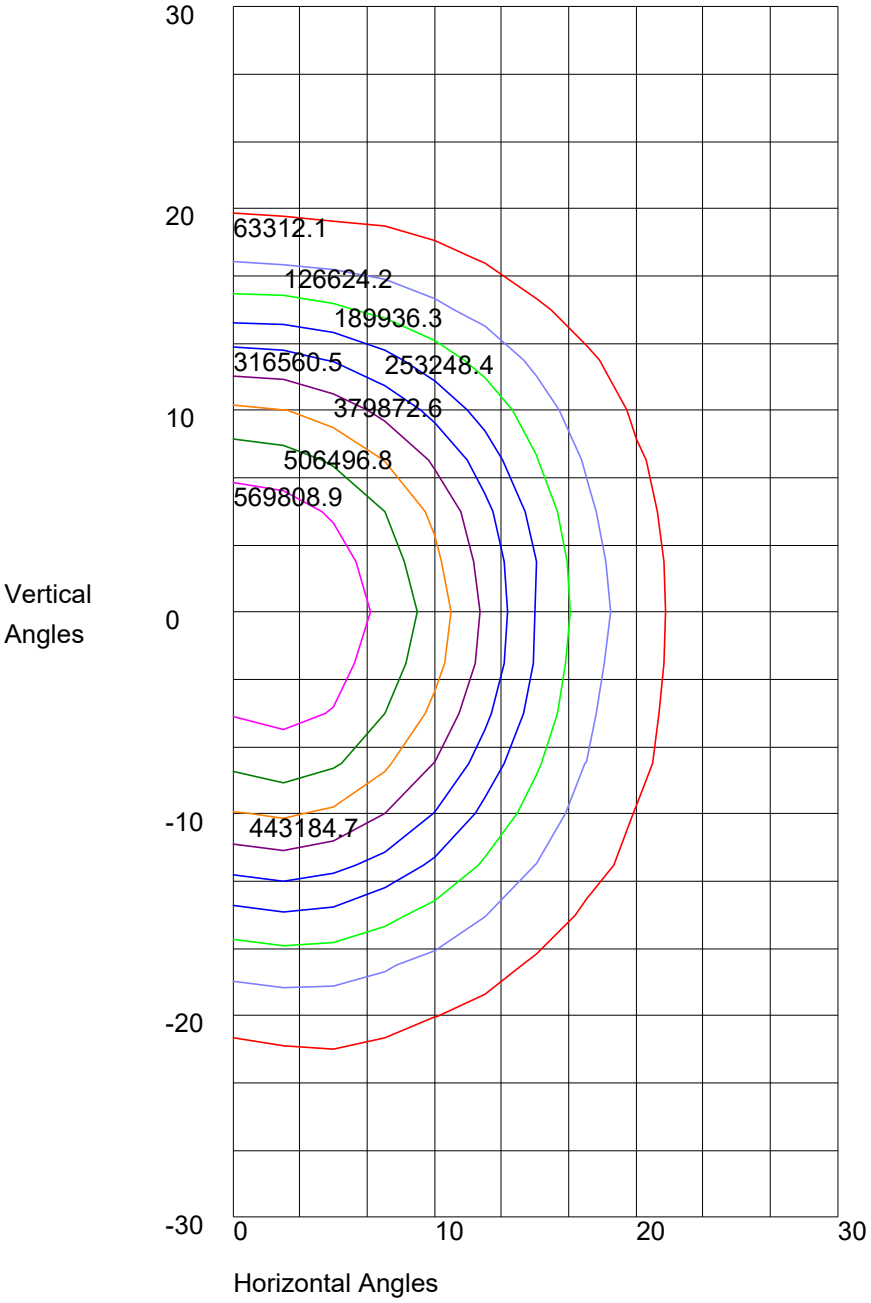
AXIAL CANDELA DISPLAY



Maximum Candela = 633121 Located At Horizontal Angle = 0, Vertical Angle = 0
H - Horizontal Axial Candela
V - Vertical Axial Candela

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-01-06 V6.0.0.IES

ISOCANDELA CURVES



Maximum Candela = 633121 Located At Horizontal Angle = 0, Vertical Angle = 0
50% Maximum Candela = 316560.5
10% Maximum Candela = 63312.1

COOPER Lighting

Photometric Toolbox

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-03-06 V6.0.0.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST] ver 6.0.0
[TESTLAB] AAA-LUX
[BuildNumber] 20180401_600_006
[MORE1] LM79 Intensity distribution source acc. To DEKRA measurement report 218821000-PHO 15-262.
[MORE2] LM80 Flux And efficacy acc.to datasheet LED manufacturer @ 85°C.
[MORE3] Actual luminaire tilt = simulation tilt - 45°, e.G. 60° simulation tilt = 15° luminaire tilt. See Technical Papaer TP03.
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[MORE7] For more information about light spill caps And the positions, see TP15 v3.0
[ISSUEDATE] 20180401
[MANUFAC] AAA-LUX
[LUMINAIRE] WS-STAD-03-06 v6.0.0
[LAMP] LED SOURCE AAA-LUX

Note: Candela values converted from Type-C to Type-B

CHARACTERISTICS

NEMA Type	4 H x 4 V
Maximum Candela	593151
Maximum Candela Angle	0H 0V
Horizontal Beam Angle (50%)	27.0
Vertical Beam Angle (50%)	26.1
Horizontal Field Angle (10%)	53.7
Vertical Field Angle (10%)	48.8
Lumens Per Lamp	202870 (1 lamp)
Total Lamp Lumens	202870
Beam Lumens	74891
Beam Efficiency	37 %
Field Lumens	139236
Field Efficiency	69 %
Spill Lumens	36714
Luminaire Lumens	175950
Total Efficiency	87 %
Total Luminaire Watts	1550
Ballast Factor	1.00

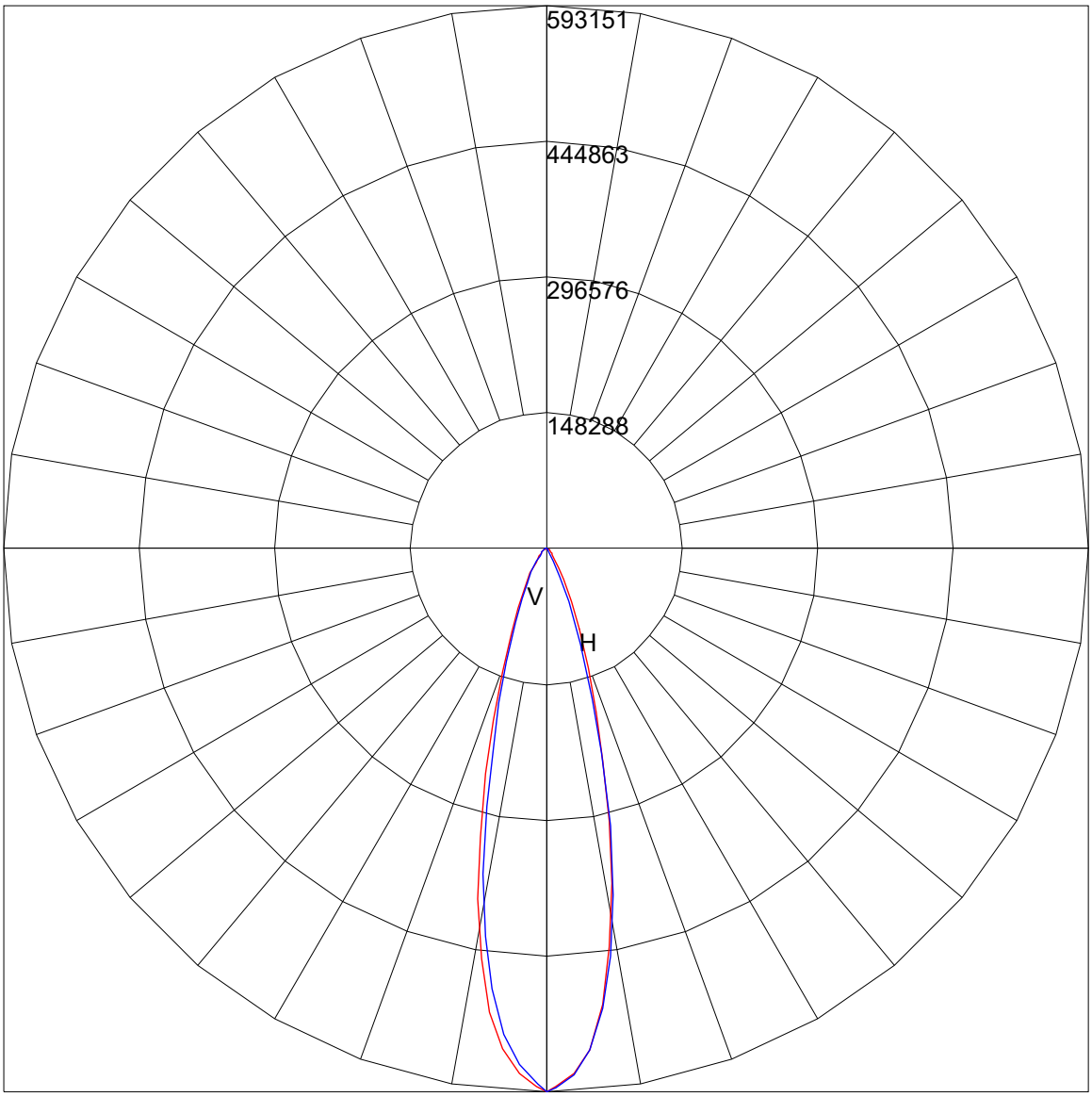
IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-03-06 V6.0.0.IES

AXIAL CANDELA

DEG.	HOR.	DEG.	VERT.
90	0	90	0
85	125	85	0
75	959	75	0
65	2951	65	868
55	6099	55	1890
47.5	7925	47.5	1971
42.5	9436	42.5	2514
37.5	14775	37.5	3544
33	24193	33	6455
29	38986	29	15965
25.5	64346	25.5	34789
22.5	95389	22.5	62754
19.5	138126	19.5	111592
17	187061	17	172246
15	239577	15	231401
13	304189	13	311109
11	372892	11	385308
9	440270	9	450615
7	501014	7	505472
5	549925	5	550146
3	573400	3	575124
1	587598	1	588438
0	593151	0	593151
-1	587785	-1	584565
-3	573557	-3	563906
-5	548839	-5	532788
-7	510360	-7	484252
-9	453479	-9	428949
-11	389549	-11	361614
-13	323627	-13	288185
-15	254465	-15	225806
-17	196556	-17	177272
-19.5	143145	-19.5	130296
-22.5	98964	-22.5	88032
-25.5	71718	-25.5	61613
-29	49822	-29	43454
-33	31926	-33	29284
-37.5	18848	-37.5	17303
-42.5	11241	-42.5	10214
-47.5	7869	-47.5	7491
-55	6413	-55	5684
-65	3245	-65	2618
-75	1536	-75	464
-85	95	-85	0
-90	0	-90	0

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-03-06 V6.0.0.IES

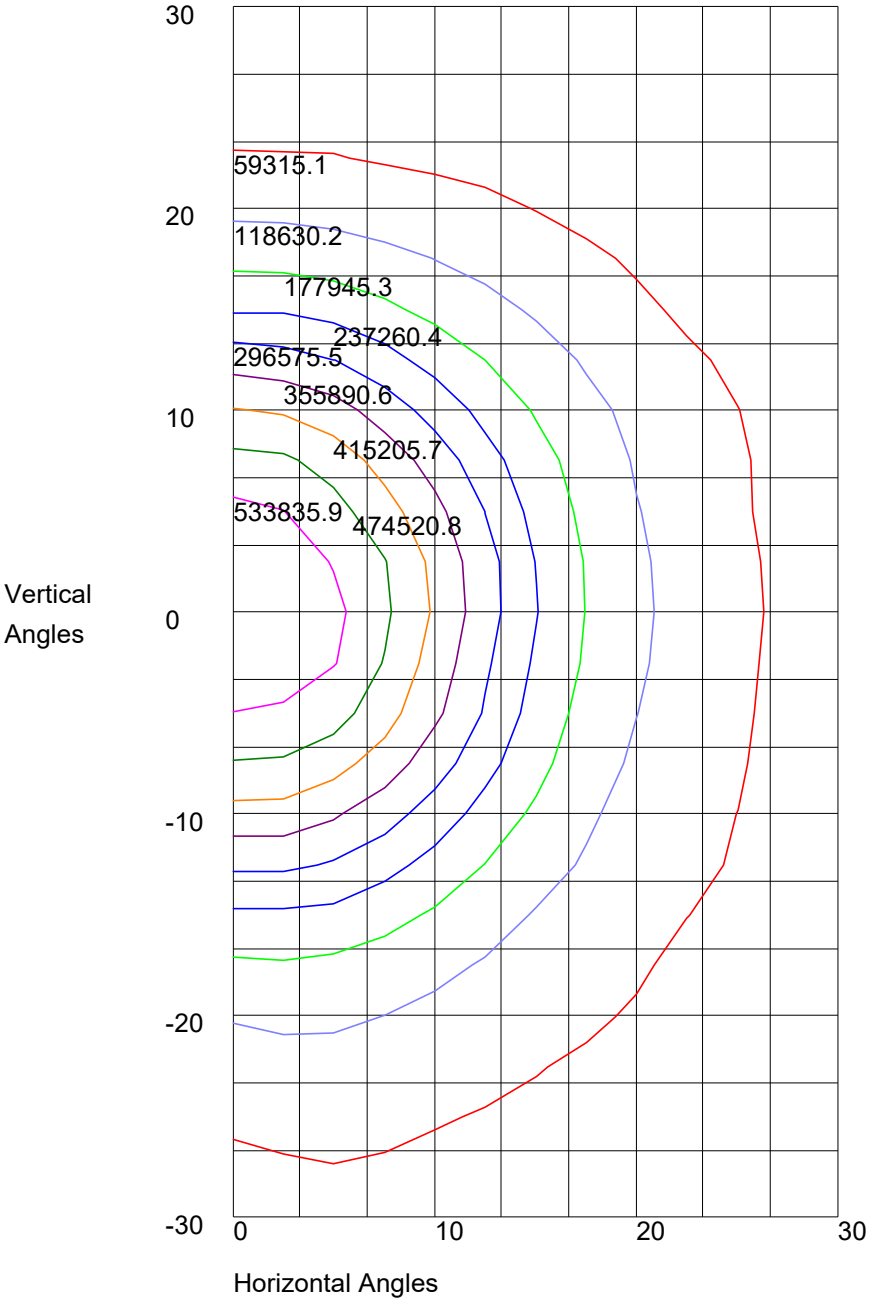
AXIAL CANDELA DISPLAY



Maximum Candela = 593151 Located At Horizontal Angle = 0, Vertical Angle = 0
H - Horizontal Axial Candela
V - Vertical Axial Candela

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20180401 WS-STAD-03-06 V6.0.0.IES

ISOCANDELA CURVES



Maximum Candela = 593151 Located At Horizontal Angle = 0, Vertical Angle = 0
50% Maximum Candela = 296575.5
10% Maximum Candela = 59315.1

COOPER Lighting

Photometric Toolbox

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20181210 WS-STAD-05-06 CRI70 VRC6.0.3.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST] ver RC6.0.3
[TESTLAB] AAA-LUX
[BuildNumber] 20181210_603_001
[MORE1] LM79 Intensity distribution source acc. To AAA-LUX measurement report
[MORE2] LM80 Flux And efficacy acc.to datasheet LED manufacturer @ 85°C.
[MORE3] Actual luminaire tilt = simulation tilt - 45°, e.G. 60° simulation tilt = 15° luminaire tilt. See Technical Papaer TP03.
[MORE4] WS For sport fields AL For large area JT For low mast Application.
[MORE5] STD For standard usage. MP maximum power For highest Output. HT For high temperature environment.
[MORE6] LX means light spill shield. With X Is the direction of light spill control: L=Left, R=Right And B=Both.
[MORE7] For more information about light spill caps And the positions, see TP15 v3.0
[ISSUEDATE] 20181210
[MANUFAC] Release Candidate AAA-LUX
[LUMINAIRE] WS-STAD-05-06 CRI70 vRC6.0.3
[LAMP] LED SOURCE Release Candidate AAA-LUX

Note: Candela values converted from Type-C to Type-B

CHARACTERISTICS

NEMA Type	2 H x 2 V
Maximum Candela	1919630
Maximum Candela Angle	-1H 0V
Horizontal Beam Angle (50%)	14.9
Vertical Beam Angle (50%)	16.0
Horizontal Field Angle (10%)	27.4
Vertical Field Angle (10%)	27.7
Lumens Per Lamp	186712 (1 lamp)
Total Lamp Lumens	186712
Beam Lumens	81522
Beam Efficiency	44 %
Field Lumens	139489
Field Efficiency	75 %
Spill Lumens	41346
Luminaire Lumens	180836
Total Efficiency	97 %
Total Luminaire Watts	1550
Ballast Factor	1.00

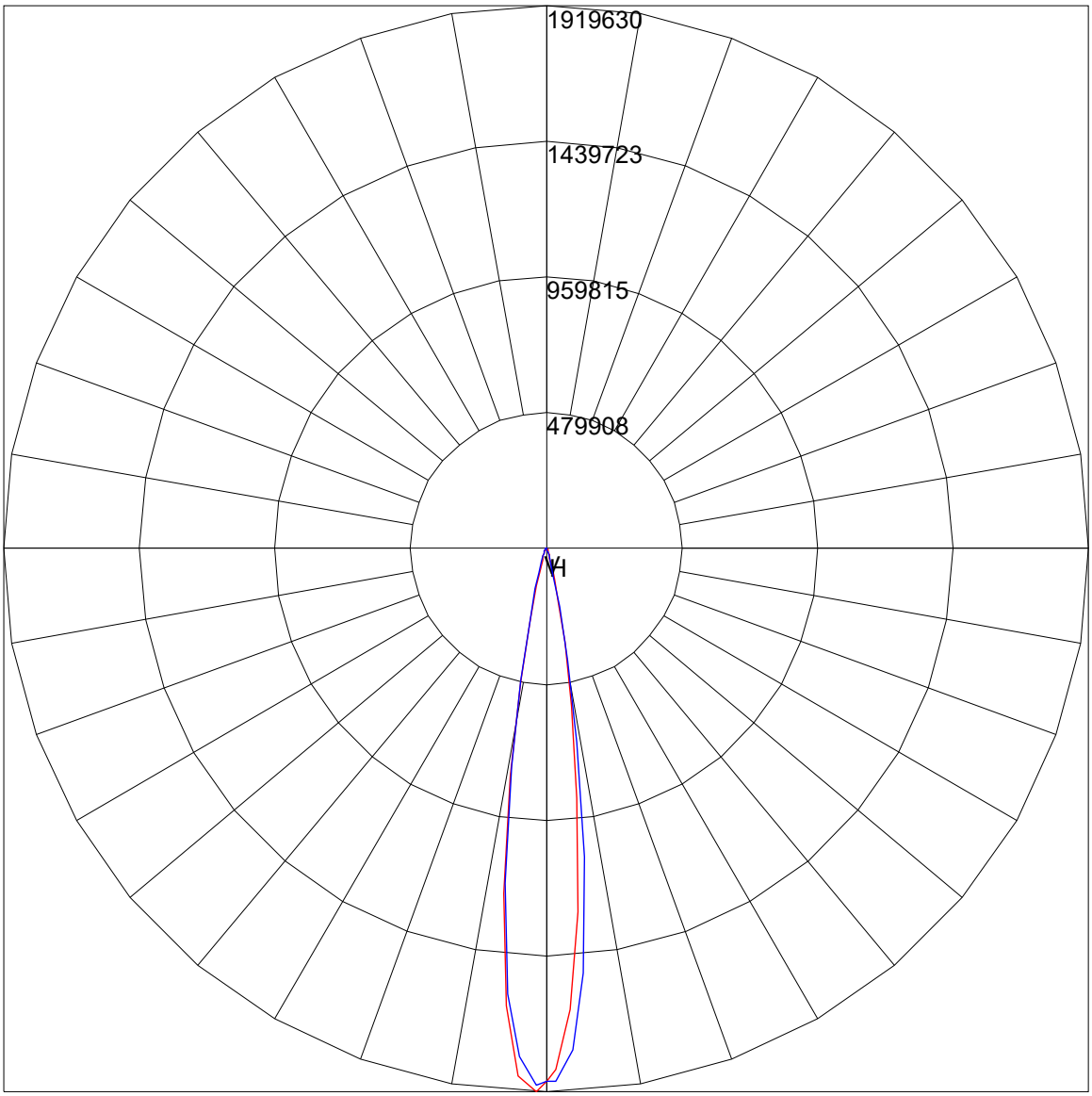
IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20181210 WS-STAD-05-06 CRI70 VRC6.0.3.IES

AXIAL CANDELA

DEG.	HOR.	DEG.	VERT.
90	0	90	0
85	98	85	0
75	1904	75	0
65	3385	65	823
55	4337	55	963
47.5	5571	47.5	1408
42.5	6052	42.5	1745
37.5	8389	37.5	2079
33	10259	33	2738
29	10393	29	4455
25.5	13679	25.5	8814
22.5	22215	22.5	15263
19.5	35341	19.5	27232
17	63608	17	54219
15	112349	15	101610
13	201149	13	210430
11	338618	11	401336
9	563660	9	692191
7	888060	7	1100505
5	1288881	5	1507380
3	1632149	3	1774645
1	1839373	1	1883058
0	1884308	0	1884308
-1	1919630	-1	1895147
-3	1868115	-3	1799338
-5	1621027	-5	1580367
-7	1228273	-7	1189750
-9	814550	-9	783308
-11	483385	-11	477071
-13	267342	-13	266467
-15	137441	-15	145514
-17	79660	-17	89036
-19.5	42978	-19.5	46199
-22.5	26858	-22.5	26972
-25.5	17407	-25.5	17870
-29	14206	-29	13486
-33	13042	-33	12856
-37.5	10789	-37.5	9702
-42.5	7682	-42.5	6710
-47.5	6634	-47.5	6804
-55	5232	-55	4180
-65	4158	-65	3327
-75	2467	-75	2002
-85	75	-85	126
-90	0	-90	0

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20181210 WS-STAD-05-06 CRI70 VRC6.0.3.IES

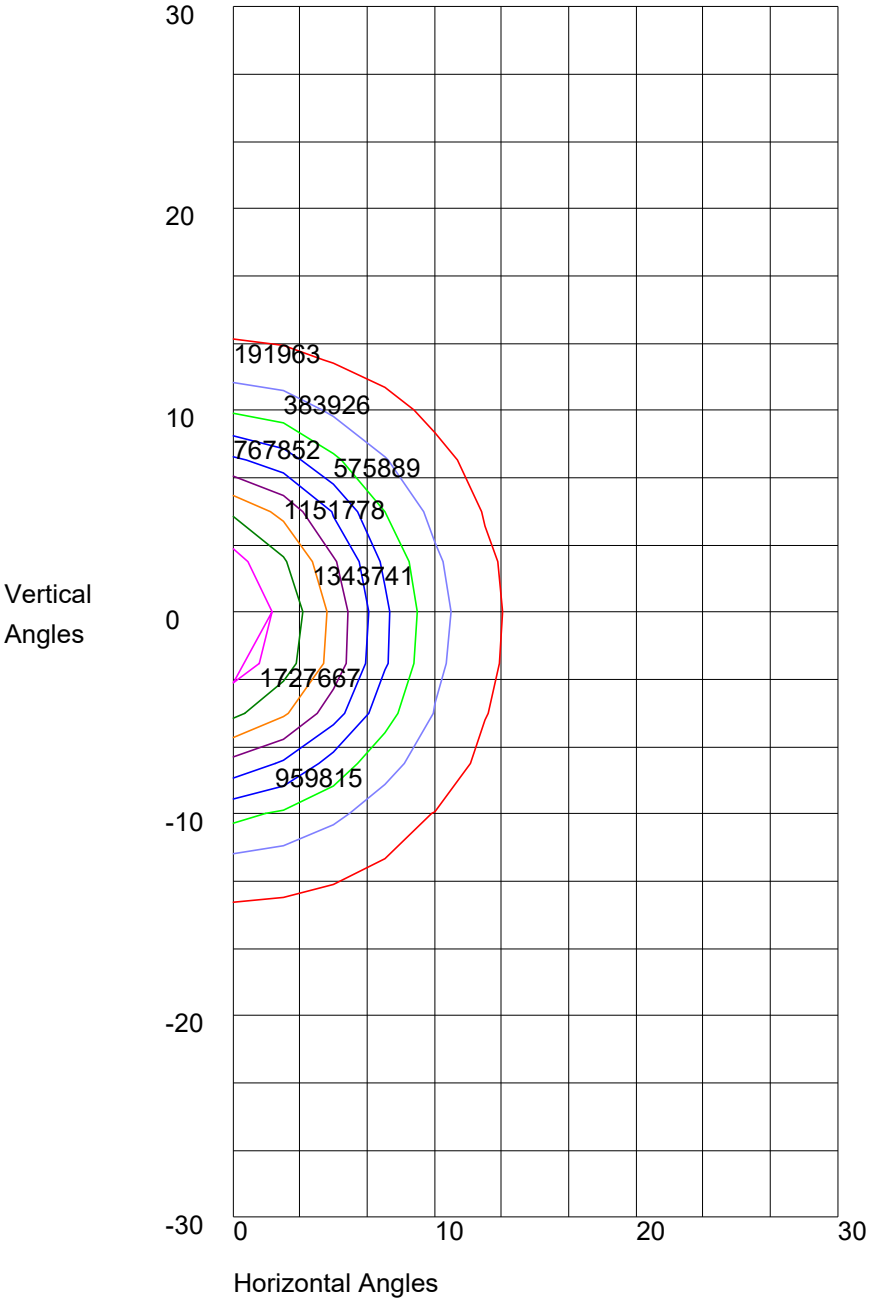
AXIAL CANDELA DISPLAY



Maximum Candela = 1919630 Located At Horizontal Angle =-1, Vertical Angle = 0
H - Horizontal Axial Candela
V - Vertical Axial Candela

IES FLOOD REPORT
PHOTOMETRIC FILENAME : 20181210 WS-STAD-05-06 CRI70 VRC6.0.3.IES

ISOCANDELA CURVES



Maximum Candela = 1919630 Located At Horizontal Angle =-1, Vertical Angle = 0
50% Maximum Candela = 959815
10% Maximum Candela = 191963

APPENDIX G- CORRESPONDANCE AND COMMUNITY CONSULTATION

From: Andrew Hill [mailto:andrew.hill-aec@tpg.com.au]
Sent: Wednesday, 2 October 2019 12:37 PM
To: 'joe.hain@casa.gov.au' <joe.hain@casa.gov.au>
Subject: Merimbula Aerodrome

Hello Joe,

Thank you for your time yesterday to discuss the proposed sports lighting system at Berrambool Oval Merimbula.

We propose a new sports lighting system replacing the existing aged lighting at Berrambool Oval located approximately 1.8km north and 450m from the extended Runway centre line as indicated on attached Vicinity Map.

In accordance with CASA Manual of Standards Part 139 – Aerodromes, in particular Clause 9.1.3 Lighting in the Vicinity of an Aerodrome we request a Safety Assessment and Approval to proceed.

In accordance with Section 9.21 of the Standard Part 139 the specialised sports light fittings have been selected for the high control of light emissions in both the horizontal and vertical angles. The attached ZIP file contains the independent Coopers Lighting reports based on the AAA-LUX manufacture's certified photometric data of the different fitting configurations used in the design. The CASA Standard also restricts the maximum lighting intensity emitted at 3° above the horizontal to 150 candela as located in Runway Zone C.

As indicated in the fitting AXIAL CANDELA DISPLAY the vertical light emissions (shown in blue) have close cut off angles allowing aiming tilts to be applied keeping the light emission below the horizontal axis.

We have also contacted the Aerodrome Manager Chris Thane to ascertain if there are any local regulations above the CASA Standards. Chris requested that any operation of Cranes to erect the pylons must be with notification and approval of the Aerodrome.

If you have any queries please contact this office.

Kind regards,
Andrew Hill
Managing Director
Mobile 0402 793 531

AEC Design & Consulting Engineers

Office: 02 6101 4770
Email: aecengineers@tpg.com.au

P.O. Box 503
Mawson ACT 2607

Wednesday, 9 October 2019

Dear Resident

The Merimbula Diggers Football Club and AFL Sapphire Coast have been successful in attaining a sporting grant from the NSW Government which will be used to upgrade the lighting at Berrambool Oval. Affinity Electrical Technologies has been engaged to carry out these works in February 2020, which will enable full use of the lighting upgrades during the 2020 season and beyond.

Currently, the lighting at Berrambool Oval is inadequate for training and night games, however the proposed upgrade will lift the lighting level to a maximum capacity of 200 lux and enable the grounds to be used more effectively throughout the football season. Despite the capacity of the new lights, the lighting level on training nights is generally up to 100 lux.

The new lights will be installed to meet the requirements of *AS4282:2019 – Control of Obtrusive Lighting* which provides limitations and guidance on the minimisation of light pollution. As such, the lights are very directional and will not produce unacceptable light pollution in areas external to the oval. Minimal acceptable light spill within the limits of the Standard at maximum illumination is produced.

Minor disruption to the local area is expected during material delivery only, with associated risks mitigated by the use of suitable temporary traffic management.

The Berrambool Oval has ample space to carry out the necessary works without disruption to the wider community, and signs will be posted around the site closer to the start date to remind residents and visitors of the upcoming works. Avoiding the oval for the duration of the project will be appreciated.

Should you have any questions or concerns, or if you would like a copy of the Review of Environmental Factors (REF) that was approved by Bega Valley Shire Council for this project, please apply to xxxxxx@bvsc.nsw.gov.au.

Best regards

<signature>

Full Name; Position; Company

AFL SAPPHIRE COAST

merimbula diggers football club

bega valley shire council