Meteorological Mast

Development Application

Lightsource Development Services Australia Pty Ltd

9 October 2026

→ **The Power of Commitment**



PUBLIC CONSULTATION COPY

Appendix A (Certificate of Title) and Appendix B (Development Application Forms) have been omitted from this public consultation copy to protect personal information. The complete application is retained in the Shire's records.

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Appendices

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Appendix B	Development Application Forms
Appendix C	Development Plans
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1. Introduction

Lightsource Development Services Australia (Lightsource bp) have engaged GHD Pty Ltd (GHD) to prepare this application for development approval for the installation of a meteorological mast structure (met mast) and associated infrastructure (the proposal) to support progression of the Narrogin East Renewable Energy project.

The proposal comprises the installation of a 150 metre lattice mast supported by guy wires at a location approximately 18 kilometres east of the town of Narrogin. The proposal is 'development' for the purpose of the *Planning and Development Act 2005* (PD Act) and requires development approval under the Shire of Narrogin Local Planning Scheme No. 3 (LPS3).

This report provides description and commentary on the following matters:

– Site details and locational information/context.
– Description of the applicable regulatory, planning and environmental attributes.
– Consideration against the relevant planning and broader regulatory framework.
– Justification for the project against various strategies, policies and regulatory requirements of the State government and Shire of Narrogin.

1.1 Scope and limitations

This report has been prepared by GHD for Lightsource Development Services Australia Pty Ltd and may only be used and relied on by Lightsource Development Services Australia Pty Ltd for the purpose agreed between GHD and Lightsource Development Services Australia Pty Ltd.

GHD otherwise disclaims responsibility to any person other than Lightsource Development Services Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Background

The proposal involves the construction of a met mast in association with the Narrogin East Renewable Energy project. The purpose of installing the met mast is to monitor wind conditions at the site to inform the potential development of a hybrid renewable energy facility, including wind generation, solar and battery energy storage (collectively, the Narrogin East Renewable Energy project). The project will support the West Australian State Government's legislated Net Zero target by 2050 under the Climate Change Bill (2023) by adding to the stock of sustainable, affordable and reliable energy sources.

The Shire of Narrogin has previously granted approvals for met masts at two other locations also associated with the Narrogin East Renewable Energy project. Details of the existing approvals are set out in Table 1.

Table 1 Existing development approvals

DA Reference	Proposed Development	Location	Determination	Determination date
A235-DA30/23-24	Meteorological Mast Tower (Central)	Lot 14816 on DP 205933 Marramucking Road, BOUNDAIN	Approved subject to conditions	Ordinary Council Meeting 26 June 2024
A212-DA30/23-24	Meteorological Mast Tower (East)	Lot 15842 on DP 171405 Williams-Kondinin Road, BOUNDAIN	Approved subject to conditions	Ordinary Council Meeting 26 June 2024

3. Subject site and location

The met mast is proposed to be located within the land parcel formally described in Table 2, located as shown in Figure 1 and Figure 2. The site of the proposed met mast is approximately 17.8 kilometres east of the Town of Narrogin.

The landscape is characterised by relatively flat, cleared farmland interspersed with areas of densely vegetated woodlands. Roads in the area are typically lined with mature vegetation.

The met mast is located approximately 3.32 kilometres north of Narrogin-Harrismith Road and is well set back from local roads, being approximately 1.19 kilometres from Boundain Road and 1.77 kilometres from Cannell Road. The subject site is largely cleared farmland featuring dense patches of woodland to the north, east and south of the proposed installation site. The vegetated areas serve as natural screening for the proposed met mast when viewed from the north, south, east and west. No rural residence has been identified within a 2.0 kilometre radius of this proposed location.

Table 2 Location details

Proposal	Coordinates	Lot	Plan	Lot area
Met mast	-32.916971 117.364529	6419	122527	64.7853 ha

A Certificate of Title for the lot is included as **Appendix A**. Completed development application forms are included as **Appendix B**.

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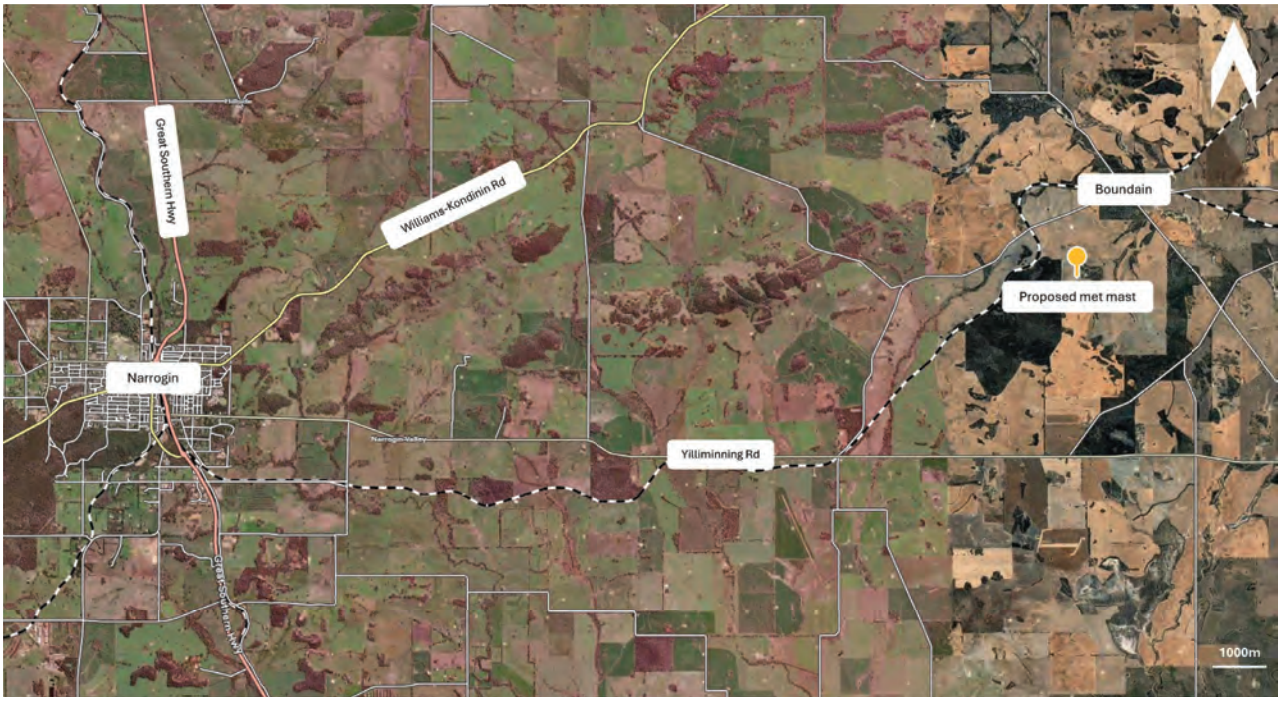


Figure 1 *Proposed location – Regional context*



Figure 2 *Proposed location – Local context*

4. Proposal description

The principal role of the met mast is to record site-based weather data to assist with wind and solar yield estimates for renewable energy projects. Data is collected predominantly via a series of anemometers and wind vanes located at intervals along the met mast. Additional sensors that may be installed along the met mast include temperature and pressure sensors. Compiling the data will be data logger and wireless communications kits to transfer the data to cloud storage as well as a hard backup.

4.1 Infrastructure

The proposed met mast will be of a slimline steel lattice design up to 150 metre high supported by guy wires. Guy wires supporting the structure will terminate at nine anchor footings, with the furthest footing being 120 metres from the base of the met mast. The mast and guy wires will be fixed to the ground by ten concrete footings (nine for the guy wires and one for the met mast).

The mast is intended to be temporary for up to four years and consist of:

- A steel lattice framework
- Anti-climb barrier
- Mounting boom for meteorological monitoring equipment
- Guy-fixing system (including anchor footings and guy wires)
- Data and electrical cabling
- Stock proof fencing

The installation will not require clearing of any existing vegetation on-site.

The met mast will be similar in appearance as met masts already established in Narrogin, and elsewhere in the wider Wheatbelt region, as shown in Figure 3.

Plans and elevations for the 150 metre met mast relating to its general arrangement, configuration for the guy wires, footing schedule and foundation design are in **Appendix C**.



Figure 3 ***Example of existing met mast in the Shire of Narrogin from public viewpoints at 1.0km (left) and 250m (right). May 2024***

4.2 Construction and operation

The met mast construction takes place with 4WD utes and trailers, a 20-30 tonne excavator, and deliveries of concrete and the lattice structure by truck to install the foundations for the mast. A crew of up to four people will use a derrick pole and winch to section the mast up to the target height, individual anemometers and other measurement devices will be installed by hand using a capstan winch. In total, site works is expected to take between two and four weeks depending on weather and site conditions.

Construction activities at the location will be limited to installation and maintenance, should it be required. Minimal excavation is involved with works limited to a 1.6 metre x 1.6 metre foundation of up to 1.2 metre depth to install the mast base, and nine anchor pits to install the guy wire footings. No new access or permanent access roads will be created as part of the installation. No clearing of native vegetation or crossing of watercourses will be required for the met mast construction. Once installed, the met mast will be remotely operated.

All works are conducted to ASNZ standards of earthing system design and will comply with (AS/NZS 1768-2021 Cl 3.5.3), and anchor foundations (AS/NZS 1768-2021).

The met mast will be unstaffed during operation with only periodic maintenance requiring site access. Upon completion of the weather monitoring program, the met mast will be deconstructed, and foundations removed and backfilled using similar equipment for installation.

5. Legislative considerations

5.1 Planning and Development Act 2005

The PD Act sets the basis of the planning system including the role and functions of decision-makers. Section 4 (Terms Used) of the PD Act provides that;

> *'development means the development or use of any land, including —*
>
> *(a) any demolition, erection, construction, alteration of or addition to any building or structure on the land;*
>
> *(b) the carrying out on the land of any excavation or other works'*

The carrying out of works for the project will involve the excavation of land and the installation of structures. Works that are consistent with the term development are subject to development approval, unless specifically exempt.

5.2 Civil Aviation Safety Regulations 1998

The *Civil Aviation Safety Regulations 1998* (CASR) provide regulatory controls for aviation safety in Australia. Regulation 129.165 provides the scenarios in which the Civil Aviation Safety Authority (CASA) must be notified of proposed objects and structures.

> *(1) This regulation applies if a person proposes to construct or erect an object or structure that:*
>
> *(a) will have a height of 100 metres or more above ground level;*
>
> *(2) The person must, as soon as practicable after forming the intention to construct or erect the proposed object or structure, give written notice to CASA of the following:*
>
> *(a) the proposal;*
>
> *(b) the proposed height and location of the object or structure;*

As noted, the proposed met mast is 150m in height. Lightsource bp will liaise with CASA on any further requirements relating to air safety. Aviation safety measures taken by the project are described in section 7.3.

6. Planning considerations

6.1 Strategic considerations

6.1.1 State Planning Strategy 2050

The State Planning Strategy 2050 (Western Australian Planning Commission, Government of Western Australia, 2014) outlines the context, goals, and strategic direction for planning across Western Australia. It outlines a vision of sustained growth and prosperity, with a strong emphasis on the development of renewable energy infrastructure to support the State's ongoing sustainable development. A key strategic goal identified in the Strategy is the creation of strong and resilient regions through economic diversification and the effective use of regional strengths.

By facilitating the development of a renewable energy facility, the proposal is consistent with the strategic goals and directions of the Strategy.

6.2 State Planning Policies

6.2.1 State Planning Policy 2.5 – Rural planning

State Planning Policy 2.5 – Rural Planning (SPP2.5) seeks to protect and preserve Western Australia's rural land assets due to the importance of their economic, natural resource, food production, environmental and landscape values. This policy applies to the proposal, which is located on land zoned Rural under LPS3.

The proposal would have an insignificant impact on rural land supply and value within the Shire, due to its small footprint. The proposal does not involve any activities or land uses that would impact or constrain the use of surrounding rural land.

6.2.2 State Planning Policy 3.7 – Bushfire

State Planning Policy 3.7 – Bushfire (SPP3.7) seeks to guide the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure. It applies to all land designated as bushfire prone by the Department of Fire and Emergency Services (DFES) Commissioner as highlighted on the Map of Bush Fire Prone Areas.

The proposal is not located within a designated Bush Fire Prone area. Further, installation and operation of a met mast does not include habitable buildings or represent a high-risk land use, therefore is not considered to introduce bushfire hazards to adjacent areas. Notwithstanding, the project is investigating co-location opportunities for bushfire detection cameras to be installed on the met mast for identifying first signs of bushfire in the region.

Based on the above, there are no reporting requirements or implications arising under SPP3.7.

6.2.3 Position Statement: Renewable Energy Facilities

The position statement applies to the development or redevelopment of all renewable energy development facilities in Western Australia. The key intent of the position statement is to facilitate growth of the evolving renewable energy industry in Western Australia through implementation of policy measures via planning instruments administered by local government

Lightsource bp has completed the following preliminary assessments to inform the placement of the met mast location and the future design of the potential wind farm project:

– A planning and environmental assessment, including cultural and heritage constraints.
– An Aviation Impact Assessment specific to the met mast

A summary of the key planning and environmental considerations set out in the position statement as applicable to the proposed met mast are outlined in Table 3. This application does not on its own constitute a renewable energy facility, but the purpose of the met mast is to inform the feasibility of renewable energy generation.

Table 3 Position Statement: Renewable energy facilities

Consideration	Comment
Community consultation	Lightsource bp has held discussions with involved landowners, the electricity service provider and the Shire of Narrogin about the potential development of a hybrid renewable energy project. Consultation with the community and key stakeholders has been ongoing as the Project develops and readies itself for the submission of primary environmental and development approvals for the Narrogin East Renewable Energy Project.
Environmental impact	The proposed met mast is located on cleared farmland and constitutes a very small development footprint of the subject lot. The construction and operation of the met mast will not require clearing of any native vegetation or impact on any significant environmental values or water resources. There is no significant risk of soil erosion or land degradation. The met mast construction will utilise existing site entrances and access roads and is not expected to have significant impact on neighbouring landowners or nearby woodland or nature reserves.
Visual and landscape impact	The proposed met mast location is well set back from the nearest main road (>3.0 kilometres) and local roads (>1.0 kilometre). There are no rural residences identified within a 2.0 kilometre radius of the proposed location. The closest rural residence is located 2.16 kilometres north east of the proposed met mast. At this distance, the visual impact of the met mast will be negligible. The met mast is only temporary and once installed will have a low level of visibility and limited visual impact on the rural landscape due to the slimline and semitransparent lattice design. Given the distance from rural residences and separation from roads in the region, no significant visual or landscape impact is anticipated from the proposed development. The proposed met mast is also located greater than the minimum recommended distance of 1.5 kilometres from sensitive receptors, which is the principle applied in relation to separation distance for noise and visual impact under the *Position Statement: Renewable energy facilities*, noting that this separation distances relates more so to wind turbines, not met masts which are notably less prominent.
Noise impact	The proposed met mast itself will not have any noise impact on neighbouring land. Noise impacts associated with the Narrogin East Renewable Energy project will be studied in accordance with applicable legislation and standards as the Project develops.
Public and aviation safety	An Aviation Impact Assessment (**Appendix D**) was completed to address two other met mast locations associated with the Narrogin East Renewable Energy project (June 2024 approvals). The met mast subject of this application is not specifically identified in the 2024 assessment but is; in a comparable location, of a lesser height and ground level, and subject to the same assessment framework. As such, the findings of the previously completed Aviation Impact Assessment can be applied to this location. Relevant findings of the assessment are summarised below: - No certified airport is located within 30 nm and no aircraft landing area is identified within 3 nm of the met mast site. - The met mast is not anticipated to affect the operations of the Narrogin Airport. - Markings and lighting are not mandatory, however markings are recommended for aviation safety and voluntary provision of obstacle lighting should be considered. - Due to the height of the met mast, the Civil Aviation and Safety Authority (CASA) must be notified of its proposed construction in accordance with Part 139.165(1)(2) of the Civil Aviation and Safety Regulations (1998) (CASR). - Upon construction, details of the met mast coordinates and elevation should be provided to Airservices Australia. Proposed installation is not within a designated bushfire prone area and will not create a bushfire risk to land in the local area that is bushfire prone.
Heritage	An Aboriginal cultural heritage and European heritage preliminary desktop assessment has been undertaken for the general area for the proposed mat mast location. No registered heritage sites have been listed in the area. Further assessment of heritage values of the wider region are being completed as part of the broader investigation for the Narrogin East Renewable Energy project.
Construction impact	The met mast construction will have minimal and limited impact on the subject land and surrounding areas. Installation and testing of the guyed mast will take 2 – 4 weeks and no significant increase to traffic is expected during the construction and operation of the met mast. Existing site accesses and internal access tracks will be used to deliver and

Consideration	Comment
	construct the structure. No new access roads or site entrance will be created as part of the installation. The met mast once installed will be remotely operated. No significant risk of soil erosion or land degradation is anticipated from the limited excavation required. The works and installation footprint constitute a very small portion of the overall land parcel.

6.3 Local planning context

6.3.1 Shire of Narrogin Local Planning Strategy

The Shire's Local Planning Strategy was endorsed in 2020, providing a strategic planning direction for the Shire over the next 10 - 15 years. In establishing the local context for the Local Planning Strategy, the document references the vision formed in the development of the Shire of Narrogin Strategic Plan 2017- 2027, '*To be a leading regional economic driver and a socially interactive and inclusive community.'*

One of the areas addressed in the Economic Development section of the Strategy is Agriculture. The vision established for agriculture is:

> *To protect and achieve ecologically sustainable use of all productive agricultural land in the Shire whilst providing diverse and compatible development opportunities in agricultural areas which promote the local economy.*

The met mast proposal aligns with the Strategy, having a low impact on the surrounding rural landscape and agricultural land uses, while enhancing efficiency of the wider energy project. The Narrogin East Renewable Energy project itself diversifies the existing economy through a sustainable industry.

6.3.2 Shire of Narrogin Local Planning Scheme No. 3

The LPS3 was originally gazetted in May of 2023, controlling how land can be used and developed across the Shire, and setting out specific requirements for development applications depending on existing land use and zoning.

6.3.2.1 Land use permissibility

The proposal does not align with any use class listed under LPS3 and is expected to be considered a 'use not listed' by the Shire. As according to LPS3:

> *The local government may, in respect of a use that is not specifically referred to in the zoning table and that cannot reasonably be determined as falling within a use class referred to in the zoning table —*
>
> *(a) determine that the use is consistent with the objectives of a particular zone and is therefore a use that may be permitted in the zone subject to conditions imposed by the local government; or*
>
> *(b) determine that the use may be consistent with the objectives of a particular zone and advertise under clause 64 of the deemed provisions before considering an application for development approval for the use of the land; or*
>
> *(c) determine that the use is not consistent with the objectives of a particular zone and is therefore not permitted in the zone.*

An assessment of the proposal against the objectives of the zone is provided in section 6.3.2.2 below.

6.3.2.2 Zones and objectives

The site is zoned 'Rural' under LPS3 (refer Figure 4).

Clause 3.1 of LPS3 sets out the objectives of the Rural zone:

- *To provide for the maintenance or enhancement of specific local rural character.*

- *To protect broad acre agricultural activities such as cropping and grazing and intensive uses such as horticulture as primary uses, with other rural pursuits and rural industries as secondary uses in circumstances where they demonstrate compatibility with the primary use.*
- *To maintain and enhance the environmental qualities of the landscape, vegetation, soils and water bodies, to protect sensitive areas especially the natural valley and watercourse systems from damage.*
- *To provide for the operation and development of existing, future and potential rural land uses by limiting the introduction of sensitive land uses in the Rural zone.*
- *To provide for a range of non-rural land uses where they have demonstrated benefit and are compatible with surrounding rural uses.*

Given the structure and small footprint of the met mast, it does not interfere with the surrounding rural character and landscape amenity. The proposal is a non-rural land use but does not interfere with the objectives of the Rural zone, being compatible with surrounding rural land uses.

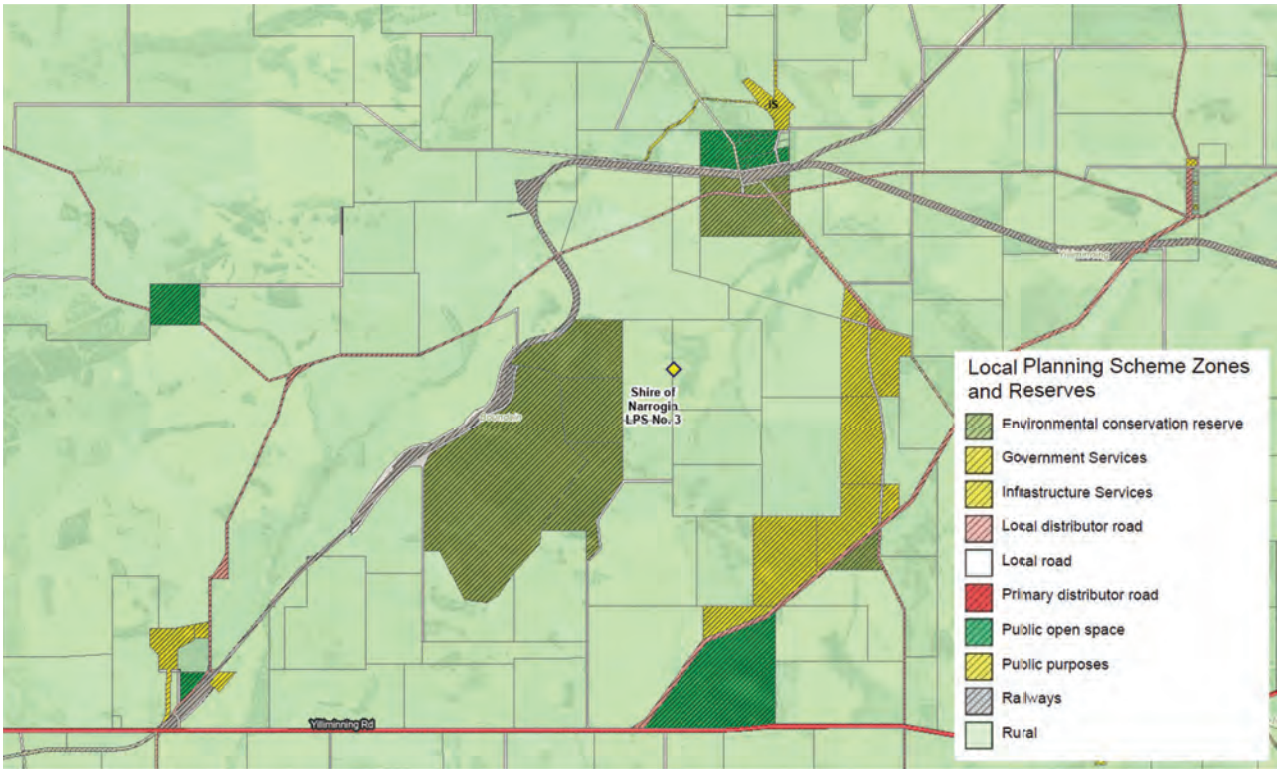


Figure 4 *Local Planning Scheme No. 3 zones and reserves*

6.3.2.3 General development requirements

Part 4 of LPS3 sets out general development standards and requirements for land within the scheme area.

Table 3 summarises the requirements for development within the Rural zone applicable to this proposal.

Table 4 *Rural zone and general development requirements*

Development requirement	Comment
Setbacks	The met mast will be set back in excess of the 20 metre minimum set out in Table 5 of LPS3 from the northern, eastern and southern lot boundaries. The met mast will have a setback of approximately 10 metres from the western lot boundary however the subject lot is part of a larger land holding that extends further west. This results in the met mast being set back beyond 20 metres of the western boundary of the land holding.

Development requirement	Comment
Height	The met mast is proposed to have a height of 150 metres, requiring a variation to the maximum height requirement of 10 metres set out in cl. 4.28.1. Further discussion is provided below.
Car parking	The development will not require dedicated parking onsite or offsite during construction or operations, there is sufficient space on the property to accommodate vehicles during the installation.
Site access	Site access will be via existing road entry points utilising internal access tracks to deliver and construct the met mast. No new access roads or site entrance will be created as a result of the installation. Existing site accesses will be used for maintenance.

Clause 4.28 of LPS3 addresses maximum building height. According to cl.4.28.1:

> *Unless provided for elsewhere in the Scheme or the Residential Design Codes, no site shall be developed or building constructed to contain more than two storeys or exceed 10 metres in height measured to the highest proportion of the building from mean natural ground level, or such other ground level, as may reasonably be determined by the local government.*

Under cl. 4.28.2 of LPS3, the local government may vary the maximum height requirement set out in cl. 4.28.1 if it is satisfied that the development can comply with the development standards and:

(a) will not restrict light, sunshine and natural ventilation enjoyed by surrounding properties;

(b) will not intrude upon the privacy enjoyed by surrounding properties by virtue of overview;

(c) will not diminish views or outlook available from surrounding properties; and

(d) is sympathetic with the scale, townscape and character of the surrounding built environment.

As demonstrated by this report, the proposal is in alignment with relevant legislation, and State and local planning frameworks. The proposal is not expected to have significant environmental or visual impact and given its remote location and lightweight design. The proposed masts is a temporary structure and will not affect future development of the land or locality and will be removed following the weather monitoring program.

It is requested that the Shire exercise its discretion to approve this application for development.

6.3.3 Local Planning Policy D11 – Wind Farm/Turbines

The Shire of Narrogin adopted Local Planning Policy D11 - Wind Farm/Turbines (LPP D11) in March 2024. The policy provides a framework for the assessment and regulation of wind farms and turbines in the Shire. It seeks to ensure that any wind energy projects will be developed to maximise community and environmental benefit and to minimise negative impacts associated with such developments. Whilst this application is for a met mast only (and does not on its own constitute a wind farm), given the intent of the met mast is to inform the feasibility of future wind energy generation, a summary of how the proposal aligns with the objectives of LPP D11 follows.

The proposal aligns with the promotion of renewable energy development in the Shire by proposing to install a met mast to monitor wind resource in the region as part of the first step of a potential hybrid wind energy project, which is subject to a future and separate development application.

Planning, environmental, cultural and heritage constraints assessment alongside a suite of technical assessments are being undertaken as part of the wider Narrogin East Renewable Energy Project. The proposed met mast is a temporary structure, and any potential impact will be negligible and only for a short term. No clearing of native vegetation is required, and the installation is not expected to have any significant visual impact to the surrounding landscape. Further consultation with the community will be undertaken as the broader Narrogin East Renewable Energy project progresses through approvals.

While LPP D11 is not applicable to this proposal, the development of a met mast enables and generally supports the objectives of the policy.

7. Environmental considerations

7.1 Environmental impact

The proposed met mast is located on cleared farmland and constitutes a very small development footprint of the subject lot. The construction and operation of the met mast will not require clearing of any native vegetation or impact on any significant environmental values or water resources. There is no significant risk of soil erosion or land degradation. The met mast construction will utilise existing site entrances and access roads and is not expected to have significant impact on neighbouring landowners and woodland or nature reserves.

7.2 Heritage

A review of the Heritage Council of Western Australia's InHerit database shows that there are no sites of State or local European cultural heritage significance in proximity to the proposal.

A review of the DPLH Aboriginal Heritage and Inquiry System confirms that there are no registered sites of Aboriginal cultural heritage significance in proximity to the proposal.

Further assessment of heritage values of the wider region will be completed as part of the broader investigation for the Narrogin East Renewable Energy project.

7.3 Aviation

In order to ensure adequate visibility to aircrafts operating in the area, the met mast will be equipped with the following aviation markers;

– obstacle marking for at least the top one third of the mast and be painted in alternating contrasting bands of colour
– marker balls or high visibility flags or high visibility sleeves placed on the outside guy wires; and
– guy wire ground attachment points in contrasting colours to the surrounding ground/vegetation.

In accordance with part 139.165 of the CASR, details of the met mast will be reported to CASA as soon as practicable. CASA will review the proposal and provide a recommendation for obstacle lighting if they determine the masts to be hazardous to aircraft operations.

7.4 Visual amenity

The met mast is not expected to have a significant impact to the visual amenity of the surrounding rural landscape. Despite the significant height, the structure has a small ground footprint, is slim and designed with a lightweight lattice structure. The met mast may be visible from local access roads but is not located in proximity to residential dwellings.

It is noted that the measures outlined in section 7.3 above, such as aviation safety markers, painting or lighting, will increase the visibility of the structures to some extent. These features can be installed should they be required by the relevant agencies from an aviation safety standpoint.

The met mast is proposed to be installed at the land for a period of up to **four** years.

8. Conclusion

This development application proposes the installation of a met mast and associated infrastructure to support the development of the Narrogin East Renewable Energy project.

The proposal is consistent with the applicable planning framework and will have negligible impacts on the amenity of the surrounding area. The siting of the met mast has considered and minimised potential impacts on the environment, visual amenity and aviation safety.

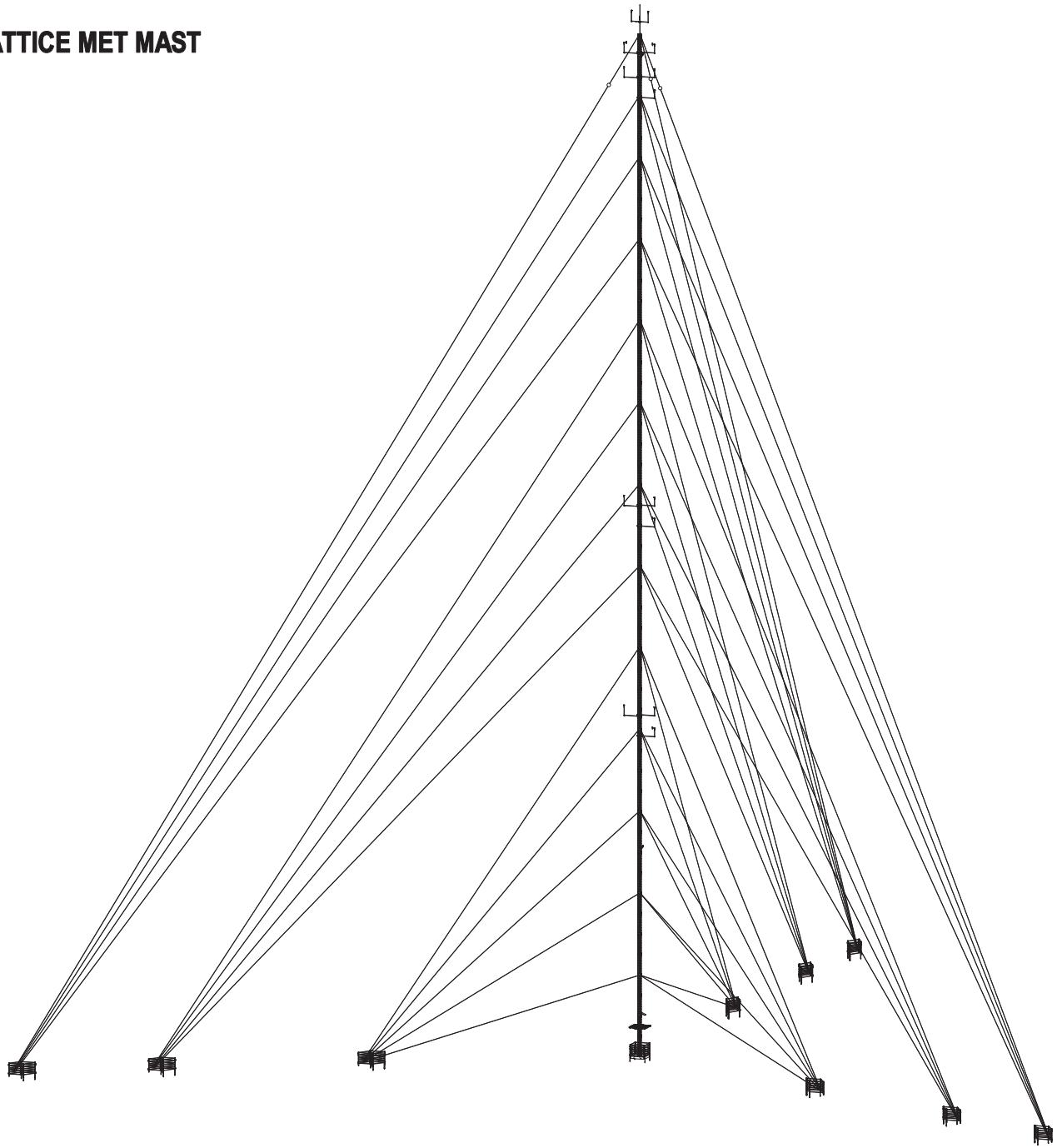
The met mast is proposed to be installed at the land for a period of up to **four** years. This recognises the temporary nature of the structure.

Appendix C

Development Plans

150m (nom.) GUYED LATTICE MET MAST

LOCATION



REV	DESCRIPTION	DATE
A		-/-/-

MESI

CLIENT

PROJECT

XXXm GUYED LATTICE MET MAST

DRAWING TITLE

-- --

SITE

--

UNITS	PAPER	SCALE
mm, kg	A3	---

DO NOT SCALE FROM DRAWING - IF IN DOUBT ASK

STATUS

FOR INFORMATION ONLY

THIRD ANGLE PROJECTION

DRAWN	CHECKED	APPROVED	REVISION
D S			A

DRAWING	SHEET
ST-GLXXX-DR1	1/8

GENERAL NOTES

1. ALL DIMENSIONS ARE TO BE CHECKED ON SITE BEFORE WORK COMMENCES.
2. DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE STRUCTURAL DRAWINGS.
3. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED.
4. ALL WORKMANSHIP AND MATERIALS TO BE IN ACCORDANCE WITH THE CURRENT AUSTRALIAN STANDARDS AND THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITY.
5. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING ALL CONSTRUCTION AND TEMPORARY WORKS ARE STABLE AT ALL TIMES.
6. GUYED LATTICE MASTS BY NATURE HAVE NO REDUNDANCY AND ARE A HIGH RISK ACTIVITY TO ERECT. ONLY EXPERIENCED AND QUALIFIED RIGGERS (ADVANCED RIGGING HIGH RISK WORK LICENCE) WITH A PROVEN CONSTRUCTION METHODOLOGY AND A DEMONSTRATED HISTORY OF GUYED LATTICE MAST ERECTION SHALL BE ENGAGED FOR WORKS. APPROPRIATE SAFE WORK METHOD STATEMENTS (SWMS) SHALL BE DEVELOPED BY THE CONTRACTOR AND STRICTLY ADHERED TO ALONG WITH WHS REGULATIONS.
7. ONLY ONE MAST SECTION TO BE LIFTED AND INSTALLED AT A TIME DURING ERECTION.

DESIGN LOADS

1. WIND LOAD:

WIND REGION	B1
TERRAIN CATEGORY	2.0
IMPORTANCE LEVEL (AS. 1170.2)	2.0
(AS.3995 STRUCTURE TYPE)	II
TOPOGRAPHIC MULTIPLIER Mt	1.02
DIRECTION MULTIPLIER Md	0.95
SERVICE WIND SPEED Vs	27m/s
REGIONAL WIND SPEED Vr	52m/s
DESIGN LIFE	25 YRS.

FOUNDATIONS

1. REQUIRED MINIMUM SAFE BEARING CAPACITY OF FOUNDATION MATERIAL SHALL BE 100 KPa (NO GEOTECHNICAL REPORT AVAILABLE).
2. THE FOLLOWING DESIGN ASSUMPTIONS HAVE BEEN MADE UNO. IN THE GEOTECHNICAL REPORT:
   a. SOLID ROCK, LOOSE FILL AND SOFT CLAYS ARE NOT ENCOUNTERED.
   b. WATER TABLE IS NOT ENCOUNTERED.
   c. FINAL SOIL DENSITY IS 16kN/m^3 OR HIGHER.
   d. CLAYS HAVE A MINIMUM 5kPa SHORT TERM COHESION WITH FRICTION 25° OR HIGHER.
   e. SANDS ARE COHESIONLESS WITH FRICTION ANGLE 32° OR HIGHER.
   f. NON-AGGRESSIVE SOILS ASSUMED. CONTRACTOR TO VERIFY ONSITE WITH INSITU TESTING. IF AGGRESSIVE SOILS ARE FOUND NOTIFY DESIGN ENGINEER FOR FURTHER ADVICE ON PROTECTIVE TREATMENTS.
3. WHERE NO GEOTECHNICAL REPORT IS AVAILABLE IT IS RECOMMENDED THAT GROUND CONDITIONS, DEPTH OF ROCK AND SUITABILITY OF FOUNDATION SYSTEM AND ASSUMPTIONS ABOVE ARE CONFIRMED PRIOR TO WORKS BY A QUALIFIED GEOTECHNICAL ENGINEER.
4. ALL TOP SOIL AND UPPER STRATA CONTAINING ORGANIC MATTER TO BE REMOVED.
5. WHERE LOOSE GROUND OR WATER INGRESS REQUIRES A WORKING SLAB THE CONTRACTOR MAY PROVIDE A BLINDING LAYER OF 15MPa CONCRETE, 50mm THICK MINIMUM BENEATH ALL PAD FOOTINGS PRIOR TO INSTALLING MOISTURE BARRIER AND REINFORCEMENT.
6. WHERE FILL OR BACKFILL IS REQUIRED, BECAUSE MATERIAL ON SITE IS UNSUITABLE FOR STANDARD COMPACTION SPECIFICATION, THEN IMPORTED FILL SHALL CONSIST OF APPROVED MATERIAL SUCH AS CRUSHED ROCK AND BE INSTALLED IN ACCORDANCE WITH COMPACTION SPECIFICATIONS.
7. SWMS FOR EXCAVATIONS SHALL BE DEVELOPED WITH GUIDANCE FROM A GEOTECHNICAL ENGINEER, ADOPT SHORING, BENCHING OR BATTERING WHERE REQUIRED.

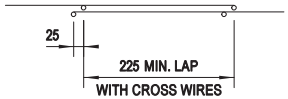
CONCRETE

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS. 3600.
2. CONCRETE QUALITY:
   PLACE CONCRETE OF THE FOLLOWING CHARACTERISTIC COMPRESSIVE STRENGTH fc AS DEFINED IN AS. 1379.

LOCATION	AS. 1379 fc MPA AT 28 DAYS	SPECIFIED SLUMP	NOMINAL AGG. SIZE
MAST BASE FTG.	N32	80mm	20mm
GUY ANCHOR FTGS.	N32	80mm	20mm

3. PROVIDE BAR SUPPORTS OR SPACERS TO GIVE THE FOLLOWING CONCRETE COVER TO ALL REINFORCEMENT UNLESS NOTED OTHERWISE ON DRAWINGS.

   FOOTINGS:
   50mm TOP & BTM. & SIDES.
4. ALL CONCRETE IS TO BE VIBRATED.
5. NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
6. ALL CHAIRS SHALL BE LOCATED AT 800 MAX. CTRS. (BOTH TO SUPPORT REINFORCEMENT AND GIVE THE CORRECT CONCRETE COVER).
7. REINFORCEMENT SYMBOLS:
   N - DENOTES GRADE 500 NORMAL DUCTILITY DEFORMED BAR.
   R - DENOTES GRADE 250 R HOT ROLLED PLAIN BAR.
   W - DENOTES HARD DRAWN PLAIN WIRE.
   RF - DENOTES GRADE 500 RIBBED WIRE REINFORCED FABRIC.
   SL/RL - DENOTES GRADE 500 LOW DUCTILITY RIBBED FABRIC,
   THE NUMBER IMMEDIATELY FOLLOWING THESE SYMBOLS IS THE NUMBER OF MILLIMETRES IN BAR DIAMETER.
   REINFORCEMENT SHALL COMPLY WITH AS. 4671.
8. WHERE HAND MIXED CONCRETE IS REQUIRED USE 'BORAL' BLUE CIRCLE CONCRETE MIX WITH THE ADDITION OF 1kg OF NEAT CEMENT ADDED TO EACH BAG OF PREMIX. CONCRETE TO BE MIXED AND INSTALLED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
9. LAPS AND SPLICES TO REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS AND TO THE DIMENSIONS SHOWN. TYPICAL FABRIC LAP, UNLESS NOTED OTHERWISE:



10. UNLESS NOTED OTHERWISE ALL CAST-IN STEELWORK SHALL BE HOT DIPPED GALVANISED

GUY ANCHOR COMPACTION SPECIFICATION:

REPLACEMENT SOIL FOR MASTS:

1. EXCAVATE ANCHOR PIT AND INSTALL STEEL/CONCRETE ANCHOR AND ATTACHMENTS.
2. STEEL ANCHOR BEAM ENCASED IN CONCRETE TO AS.3600. PROVIDE MINIMUM BEAM COVERAGE OF 50mm (UNO.).
3. FILL REMAINDER OF BEAM EXCAVATION WITH SELECT MATERIAL WON FROM EXCAVATION OR FROM SURROUNDING SOURCES AND COMPACT THE FILLING TO A MINIMUM DENSITY OF y=16kN/m^3. SELECT FILL IS TO BE FREE FROM ANY ORGANIC MATERIAL SUCH AS ROOTS AND TOPSOIL AND BE EITHER:
   *CLAYS AND SILTS (BASED ON Ø=25° ANDcU=20KPa), OR
   *SANDS (BASED ON Ø=32°)
   NOTE: MINIMUM SOIL PROPERTIES ARE AS STATED ABOVE, UNLESS NOTED DIFFERENTLY IN GEOTECHNICAL REPORT. SELECT FILL PARTICLES SIZE AND SHAPE IS TO SUIT COMPACTED LAYER THICKNESS.
4. ADEQUATE COMPACTION IS ACHIEVED BY PROVIDING A COMPACTED DENSITY EQUAL TO A CONTROLLED FILL CLASSIFICATION. CONTROLLED FILL IS DEFINED IN AS.2870.

   SANDY FILL IS TO BE PLACED IN LAYERS NOT GREATER THAN 300mm LOOSE. NON-SANDY SOILS AND CLAY SOILS REQUIRE LAYER DEPTHS NOT GREATER THAN 150mm WHEN COMPACTED. COMPACTION IS TO BE ACHIEVED BY MECHANICAL TAMPING. THIS WILL REQUIRE COMPACTION BY RODDING, BY A VIBRATING PLATE OR SMOOTH DRUM ROLLER ATTACHED TO A BACKHOE/EXCAVATOR OR WALK BEHIND WACKER PACKER.
5. COMPLIANCE WITH CONTROLLED FILL IS DEEMED TO BE ACHIEVED IN SANDY SOILS OF A DYNAMIC CONE PENETROMETER TEST (AS DEFINED BY AS.1289.6.3.3) PRODUCES A BLOW COUNT OF 7 OR MORE FOR 300mm. FOR NON SANDY AND CLAY SOILS CONTROLLED FILL IS DEEMED TO BE ACHIEVED IF SOIL IS MOIST AND COMPACTED IN LAYER DEPTHS NOT MORE THAN 150mm WHEN COMPACTED.
6. WHERE SOILS DEPART FROM THE MINIMUM REQUIREMENTS IN THE COMPACTION SPECIFICATION, OR WHERE A HIGH WATER TABLE IS ENCOUNTERED, OR WHERE THE SOILS DEPART FROM THE GEOTECHNICAL REPORT, THEN THE DESIGN ENGINEER IS TO BE NOTIFIED FOR DESIGN REVIEW.

REV	DESCRIPTION	DATE
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PROJECT
XXXm GUYED LATTICE MET MAST

DRAWING TITLE
MAST GENERAL NOTES

SITE

UNITS mm, kg	PAPER	SCALE
	A3	1:400

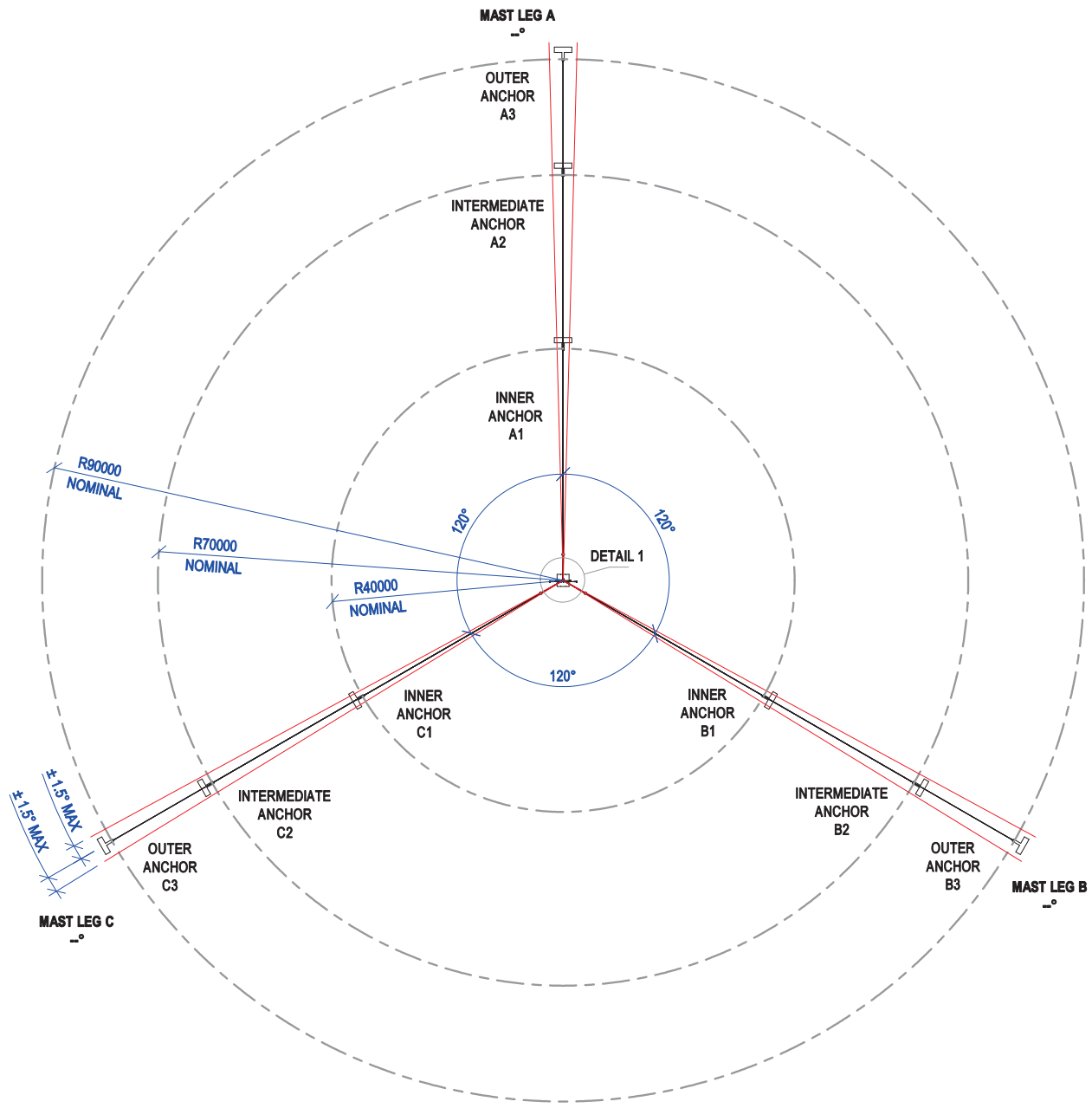
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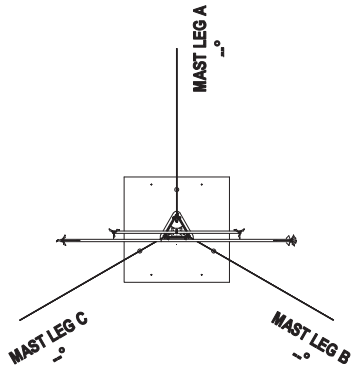
STATUS
FOR INFORMATION ONLY

THIRD ANGLE PROJECTION

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DRAWING	SHEET
ST-GLXXX-GN1	2/8





DETAIL 1
SCALE 1:100

REV	DESCRIPTION	DATE
A		-/-/-

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PROJECT
XXXm GUYED LATTICE MET MAST

DRAWING TITLE
MAST SITE LAYOUT

SITE
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UNITS	PAPER	SCALE
mm, kg	A3	1:750

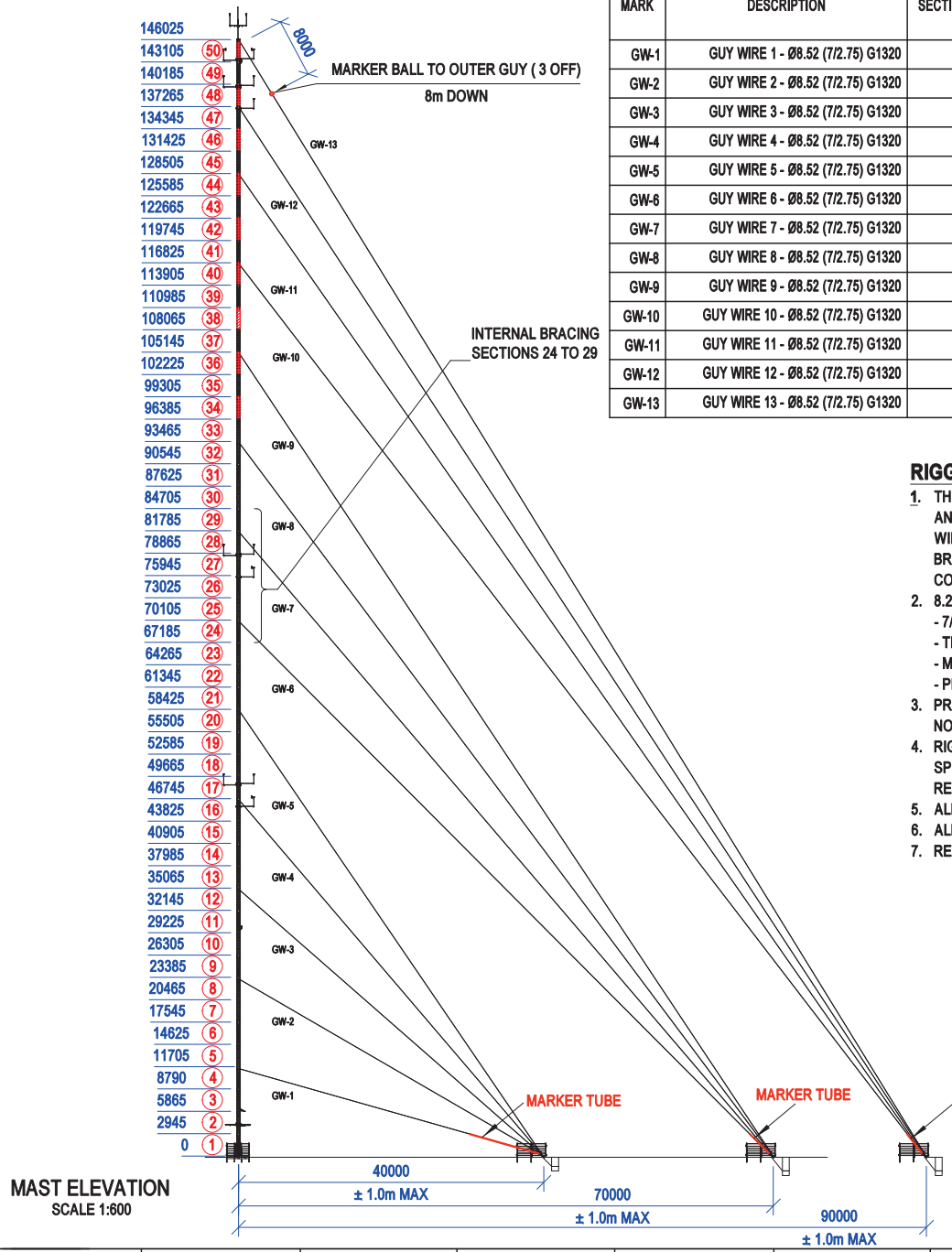
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STATUS
FOR INFORMATION ONLY

THIRD ANGLE PROJECTION

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DRAWING	SHEET
ST-GLXXX-001	3/8



MAST ELEVATION
SCALE 1:600

GUY WIRE SCHEDULE

MARK	DESCRIPTION	SECTION	HEIGHT	LENGTH	RADIUS	SIZE	PRE-TENSION	BOW SHACKLE GLAV.	TURNBUCKLE GALV.	FAN-WRAP GALV.	THIMBLE GALV.
GW-1	GUY WIRE 1 - Ø8.52 (7/2.75) G1320	4	11440	40700	40000	Ø8.52	3.5KN	4.7t	5/8"	8.25mm	11mm
GW-2	GUY WIRE 2 - Ø8.52 (7/2.75) G1320	8	23120	45300							
GW-3	GUY WIRE 3 - Ø8.52 (7/2.75) G1320	12	34800	52200							
GW-4	GUY WIRE 4 - Ø8.52 (7/2.75) G1320	16	46480	60500							
GW-5	GUY WIRE 5 - Ø8.52 (7/2.75) G1320	20	58160	69800							
GW-6	GUY WIRE 6 - Ø8.52 (7/2.75) G1320	24	69840	98100	70000						
GW-7	GUY WIRE 7 - Ø8.52 (7/2.75) G1320	28	81520	106600							
GW-8	GUY WIRE 8 - Ø8.52 (7/2.75) G1320	32	93200	115800							
GW-9	GUY WIRE 9 - Ø8.52 (7/2.75) G1320	36	104880	125300							
GW-10	GUY WIRE 10 - Ø8.52 (7/2.75) G1320	40	116560	146500	90000						
GW-11	GUY WIRE 11 - Ø8.52 (7/2.75) G1320	44	128240	155900							
GW-12	GUY WIRE 12 - Ø8.52 (7/2.75) G1320	47	137000	163200							
GW-13	GUY WIRE 13 - Ø8.52 (7/2.75) G1320	50	145760	170500							

RIGGING NOTES:

1. THE SAFE WORKING LOAD (SWL) OR WORKING LOAD LIMIT (WLL) OF TURNBUCKLES, SHACKLES AND TERMINATIONS SHALL MATCH OR EXCEED THE DESIGN CAPACITIES OF ADJOINING GUY WIRES. THE DESIGN CAPACITY OF THE GUY WIRES SHALL BE TAKEN AS HALF THE MINIMUM BREAKING FORCE (MBF) OF THE WIRE ROPE UNLESS NOTED OTHERWISE. IF REQUIRED, CONTACT THE DESIGN ENGINEER FOR VERIFICATION OF SELECTED RIGGING COMPONENTS.
2. 8.25mm GUY WIRE SPECIFICATION:
   - 7/2.25mm STRANDS G1320.
   - TENSILE STRENGTH = 1320 MPa.
   - MINIMUM BREAKING FORCE (MBF) = 50 KN.
   - PRE-TENSION TO 3.5 KN.

   10mm GUY WIRE SPECIFICATION:
   - 19/2mm STRANDS G1320.
   - TENSILE STRENGTH = 1320 MPa.
   - MINIMUM BREAKING FORCE (MBF) = 71 KN.
   - PRE-TENSION TO 5.0 KN.
3. PRE-TENSION GUY WIRES AND PROVIDE SUITABLE TERMINATIONS WITH ULTIMATE CAPACITY NO LESS THAN GUY BREAKING FORCE.
4. RIGGING COMPONENTS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION AND UNDERGO PERIODIC MAINTENANCE AND INSPECTION AS PER SUPPLIER RECOMMENDATIONS AND RELEVANT AUSTRALIAN STANDARDS.
5. ALL BOLTS TO BE SUPPLIED WITH NUT & SNUG TIGHTENED.
6. ALL BOLTS TO BE SUPPLIED G8.8 WITH STRUCTURAL WASHERS - UNO.
7. REFER DWG. N1 FOR STEELWORK NOTES.

*** NOTE**
LEVEL OF GUY ANCHORS FOOTINGS MAY VARY UP TO RL. ±3.0m AT THE INNER & INTERMEDIATE PERIMETER, UP TO RL. ±5.0M AT THE OUTER PERIMETER RELATIVE TO BASE OF MAST (RL. 0.0m)

NOTE
MARKER BALLS 8m DOWN ON UPPER GUY WIRES & MARKER TUBES TO 3m ABOVE GROUND ON LOWER GUY WIRES AT ANCHORS - TYPICAL

NOTE
STOCK PROOF FENCING TO BE INSTALLED AROUND MAST BASE AND EACH ANCHOR WHERE REQUIRED

REV	DESCRIPTION	DATE
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PROJECT
XXXm GUYED LATTICE MET MAST

DRAWING TITLE
MAST GENERAL ELEVATION

SITE
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UNITS	PAPER	SCALE
mm, kg	A3	1:600

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STATUS
FOR INFORMATION ONLY

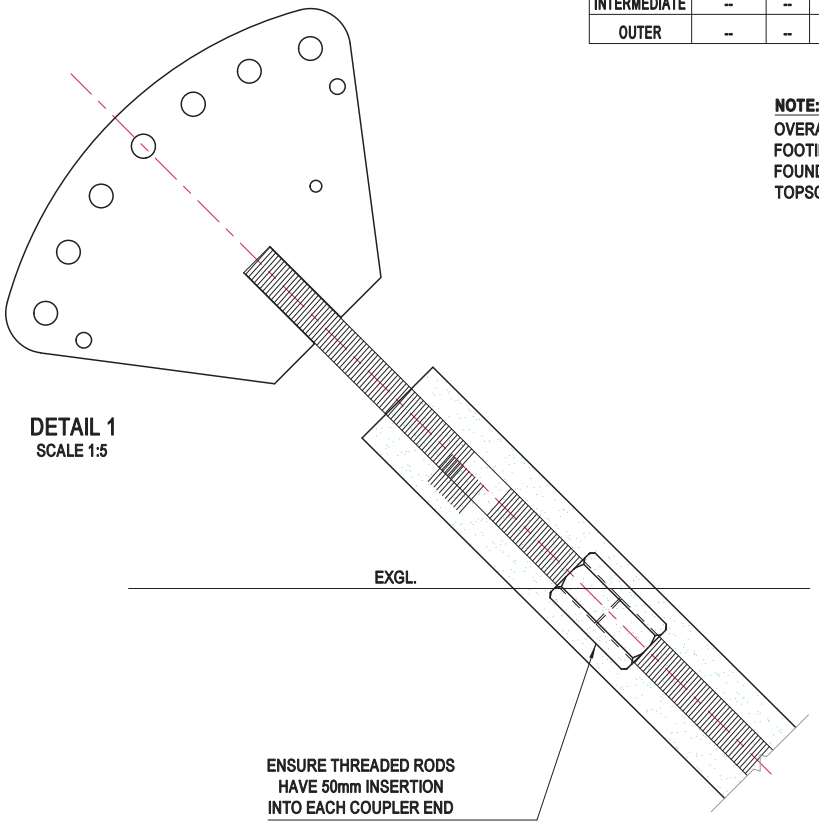
THIRD ANGLE PROJECTION

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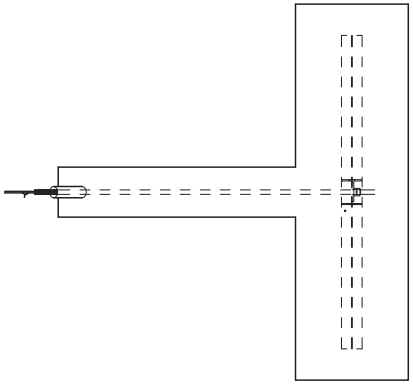
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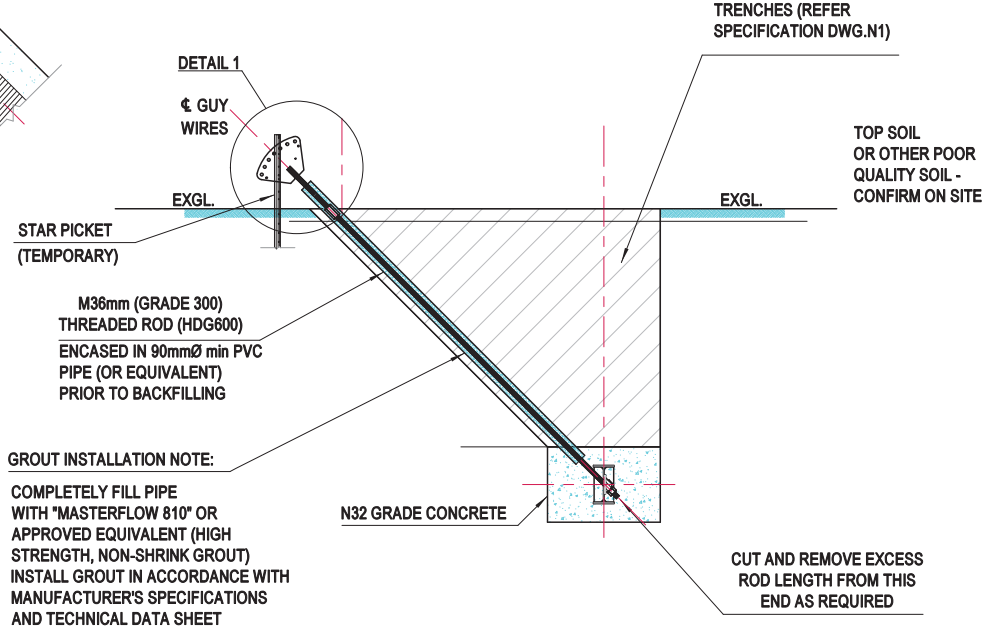
FOOTING	RADIUS	No. GUYS	EXCAVATION WIDTH	EXCAVATION LENGTH	EXCAVATION DEPTH	BEAM LENGTH	CONCRETE DEPTH	ANGLE	DIM A	DIM B	DIM C	PVC PIPE D#	36Ø ROD E#
INNER	--	--	--	--	--	--	--	--°	--	--	--	--	--
INTERMEDIATE	--	--	--	--	--	--	--	--°	--	--	--	--	--
OUTER	--	--	--	--	--	--	--	--°	--	--	--	--	--

NOTE:
OVERALL FOOTING DEPTH IS DETERMINED BY THE FOOTING HEIGHT PLUS THE DEPTH OF ANY UNSUITABLE FOUNDING MATERIALS AT THE SURFACE, INCLUDING TOPSOIL AND ANY OTHER POOR QUALITY SOILS - TYPICAL.



DETAIL 1
SCALE 1:5





GUY FOOTING
SCALE 1:40

REV	DESCRIPTION	DATE
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CLIENT

PROJECT
XXXm PERMANENT GUYED LATTICE MAST

DRAWING TITLE
GUY FOOTING DETAIL

SITE
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UNITS	PAPER	SCALE
mm, kg	A3	Various

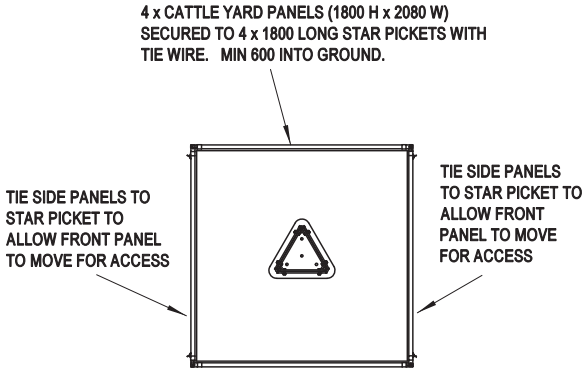
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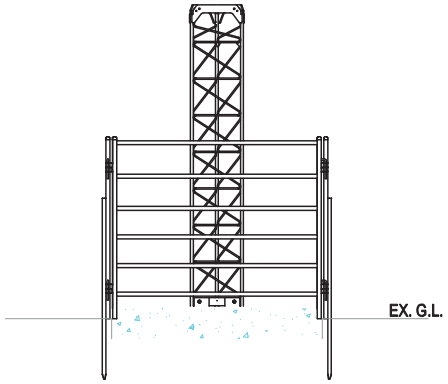
THIRD ANGLE PROJECTION

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DRAWING	SHEET
ST-GLXXX-005	5/8

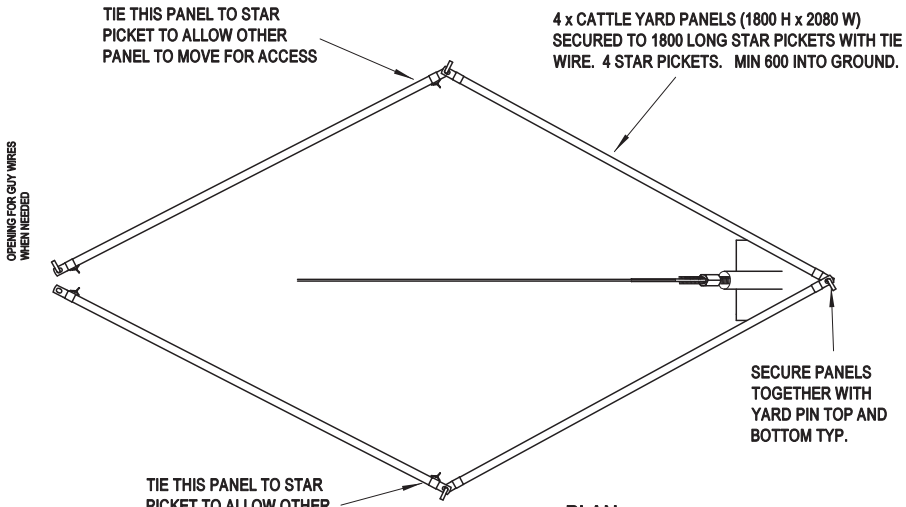


PLAN
SCALE 1:50

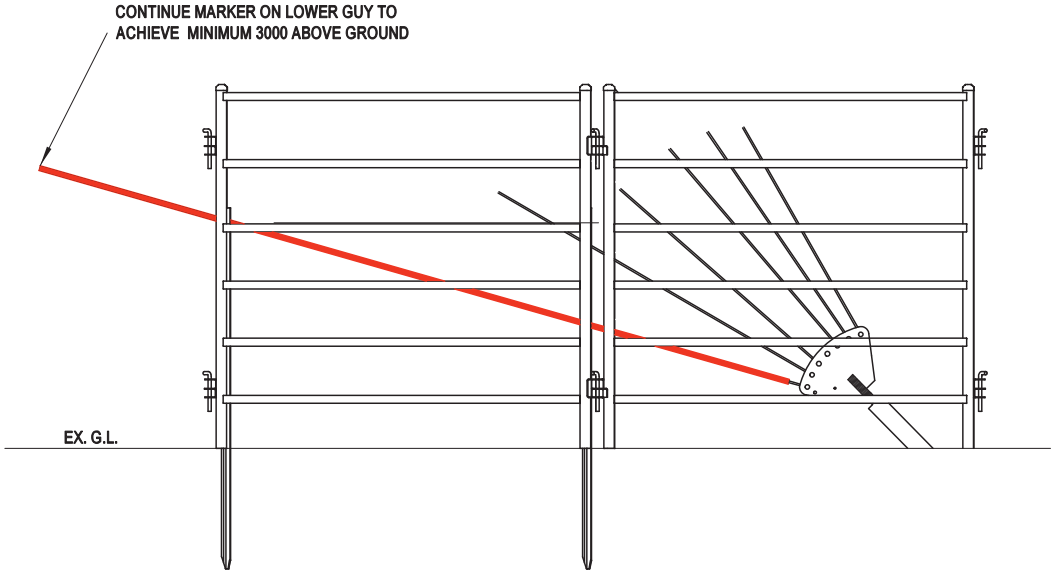


ELEVATION
SCALE 1:50

MAST BASE FENCING TYPICAL



PLAN
SCALE 1:25



ELEVATION
SCALE 1:25

GUY ANCHOR FENCING TYPICAL

REV	DESCRIPTION	DATE

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CLIENT

PROJECT
XXXm GUYED LATTICE MET MAST

DRAWING TITLE
GUY AND MAST FENCING

SITE
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UNITS	PAPER	SCALE
mm, kg	A3	Various

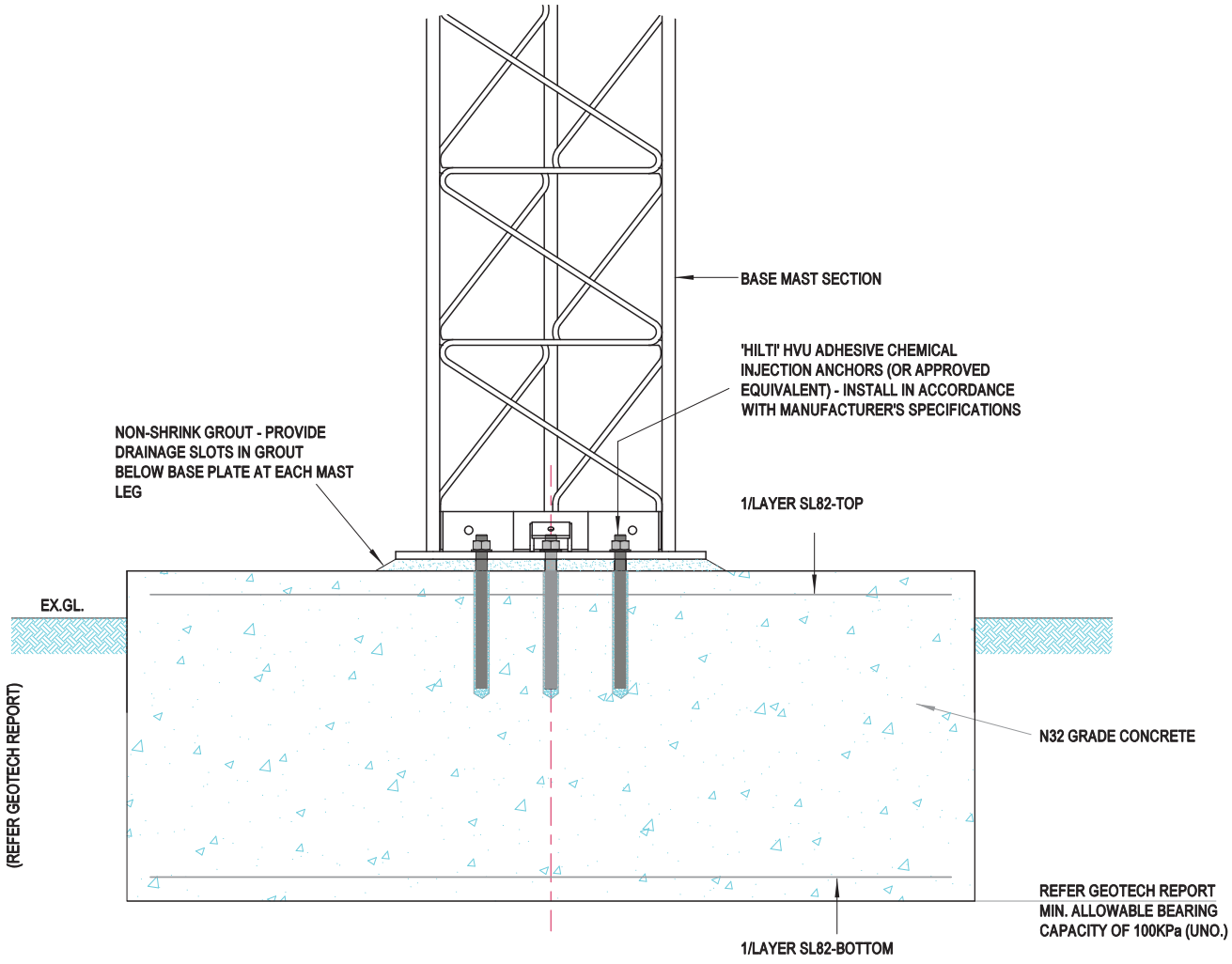
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STATUS
FOR INFORMATION ONLY

THIRD ANGLE PROJECTION

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DRAWING	SHEET
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MAST BASE CAST-INSITU
SCALE 1:10

REV	DESCRIPTION	DATE

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PROJECT
XXXm GUYED LATTICE MET MAST

DRAWING TITLE
MAST BASE CAST-INSITU

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UNITS	PAPER	SCALE
mm, kg	A3	1:10

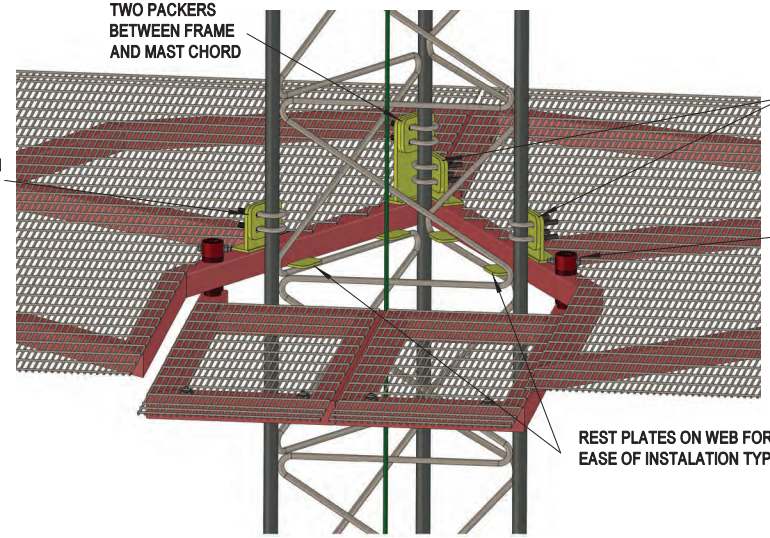
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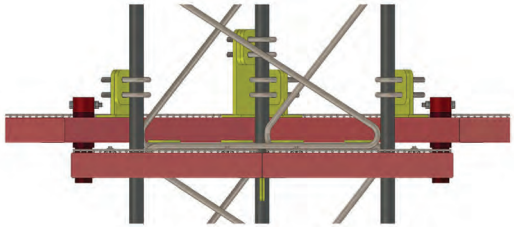
THIRD ANGLE PROJECTION

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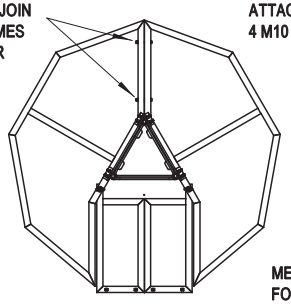
DRAWING	SHEET
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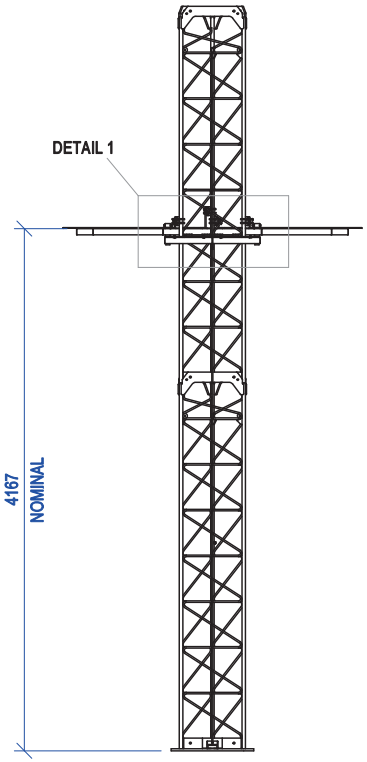
ISOMETRIC
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DETAIL 1
NTS



TOP
SCALE 1:40



ELEVATION
SCALE 1:40

REV	DESCRIPTION	DATE

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CLIENT

PROJECT
XXXm GUYED LATTICE MET MAST

DRAWING TITLE
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SITE
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UNITS	PAPER	SCALE
mm, kg	A3	Various

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STATUS
FOR INFORMATION ONLY

THIRD ANGLE PROJECTION

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DRAWING	SHEET
ST-GLXXX-008	8/8

Appendix D

Aviation Impact Assessment

AVIATION PROJECTS

Stephen Archer
Senior Development Manager
Lightsource BP

By email: stephen.archer@lightsourcebp.com

March 2024

Our reference: 108901-01

Dear Stephen

Re: Met Masts near Narrogin - Aviation Impact Assessment

Lightsource BP is seeking to submit an application to Narrogin Shire Council for the construction of two 150 m Wind Monitoring Towers (WMT)s to support a wind farm development located approximately 15 km northeast of the township of Narrogin in Western Australia (WA).

Aviation Projects has prepared an Aviation Impact Assessment for the WMTs against relevant aspects of the applicable planning scheme, Civil Aviation Safety Regulations Part 139, and National Airports Safeguarding Framework, specifically in relation to assessing whether marking and/or lighting is required.

1.1. References

The following information sources were referenced during the preparation of this report:

1. Airservices Australia, *Aeronautical Information Package, including AIP Book, Departure and Approach Procedures and En Route Supplement Australia,* dated 21 March 2024
2. Airservices Australia, *Designated Airspace Handbook,* dated 30 November 2023
3. CASA, *Civil Aviation Safety Regulations 1998* (CASR)
4. Civil Aviation Safety Authority, *Part 139 (Aerodromes) Manual of Standards 2019*, Version F2024C00161, dated 10 February 2024
5. CASR Part 173 *Manual of Standards– Standards Applicable to Instrument Flight Procedure Design,* version 1.8, dated August 2022
6. Civil Aviation Safety Authority, Advisory Circular 139.E-01 v1.0—Reporting of Tall Structures, dated December 2021
7. CASA AC 139.E-05v1.1: Obstacles, including wind farms outside the vicinity of a CASA-certified aerodrome dated October 2022
8. Australian Government, Department of Infrastructure and Regional Development, *National Airport Safeguarding Framework, Guideline D Managing the Risk To Aviation Safety of Wind Turbine Installation (Wind Farms)/Wind Monitoring Towers*, dated July 2012
9. International Civil Aviation Organization (ICAO), *Doc 8168 Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS)*
10. ICAO Standards and Recommended Practices, Annex 14—Aerodromes
11. OzRunways, aeronautical navigation charts (WAC and ERC) extracts, dated March 2024;

12. Narrogin Local Planning Scheme No 3 (May 2023)
13. Narrogin Local Planning Strategy (December 2019)
14. Draft D11 – Local Planning Policy – Wind Farm Turbines.
15. Planning and Development Act
16. other references as noted.

1.2. Project description

The proposed WMTs will be located approximately 15 km northeast of Narrogin, WA.

The WMTs are 150 m (492 ft) above ground level (AGL). Their highest ground level is Met Mast East, which is 380 m Australian Height Datum (AHD). This results in a maximum height of 530 m AHD (1738.8 ft above mean sea level (AMSL)).

Figure 1 shows the location of the proposed WMTs (Source: Lightsource BP).

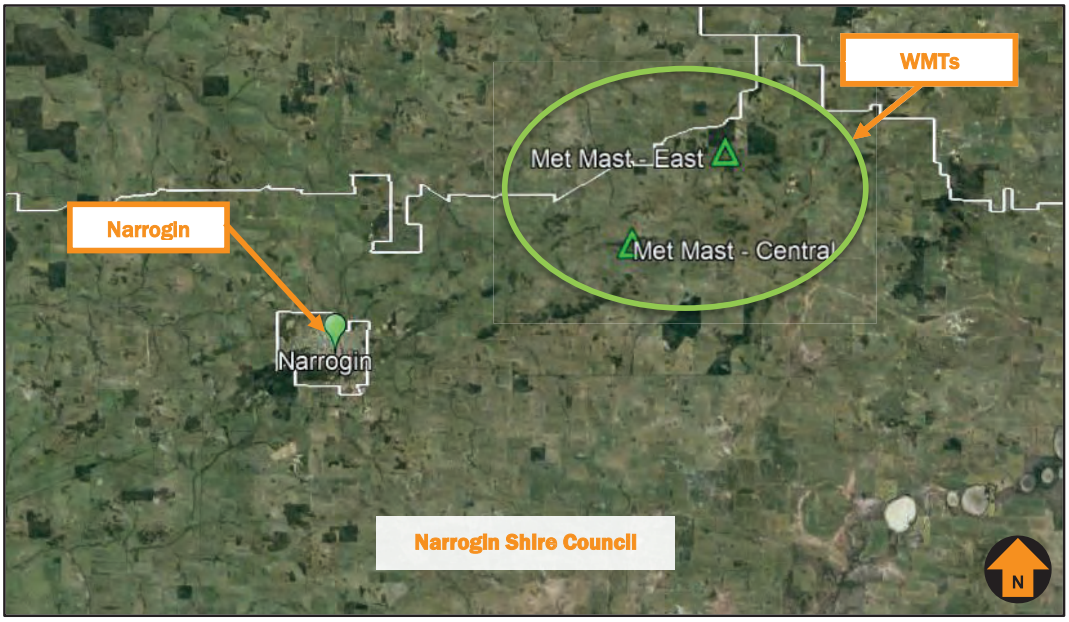


Figure 1 WMT locations

Table 1 provides details of the proposed WMTs (source: email from Stephen Archer, dated 8 March 2024).

Table 1 Details of proposed WMTs

Item	*Met Mast Central*	*Met Mast East*
Location (Easting, Northing)	Easting: 530,600 m E Northing: 6,360,700 m S	Easting: 534,982 m E Northing: 6,364,958 m S
Ground elevation at the site	368 m AHD	380 m AHD

Item	Met Mast Central	Met Mast East
Height of WMT AGL	150 m AGL	150 m AGL
Height of tower	518 m AHD (1699.5 ft AMSL)	530 m AHD (1738.8 ft AMSL)
Reported to Airservices Australia?	TBA when the final location is determined	TBA when the final location is determined

Figure 2 shows a typical steel lattice and guy wire construction.

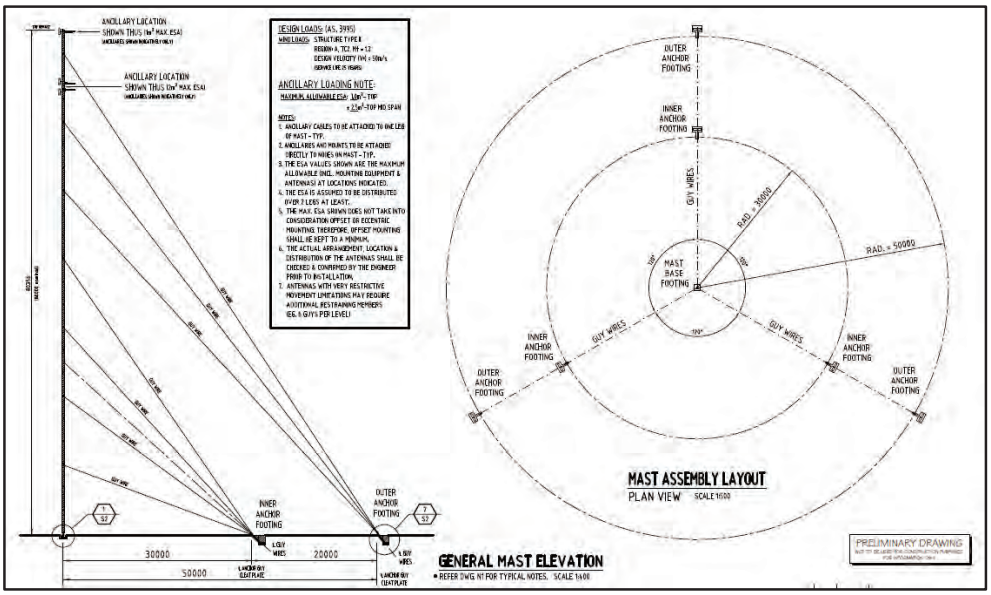


Figure 2 Typical Guyed Lattice Mast - general elevation

1.3. Narrogin Shire Council

There are two town planning documents on the Narrogin Shire Council's website: Local Planning Scheme No3 and Local Planning Strategy

1.3.1. Local Planning Scheme No 3 (May 2023)

The Narrogin Shire Council published the D11 – Local Planning Policy – Wind Farm Turbines. This local planning policy is formulated within the Shire of Narrogin Local Planning Scheme No. 3 (3 May 2023) framework, guided by the Planning and Development Act 2005 and the Planning and Development (Local Planning Schemes) Regulations 2015. It aims to provide clear guidelines for establishing and operating wind farms and turbines within the Shire of Narrogin while adhering to legislative requirements.

This policy aims to provide a framework for the assessment, approval, and regulation of wind farms and turbines within the Shire of Narrogin. The policy seeks to ensure that any proposed wind energy projects are developed in a manner that minimises negative impacts and maximises the benefits to the community and the environment. The aviation-related details are listed below:

Community Consultation

Developers should also liaise with relevant key stakeholders early in the process, including the Shire, Main Roads WA, Western Power, Civil Aviation Safety Authority (CASA), Air Services Australia, Royal Flying Doctor Service (RFDS), Department of Fire and Emergency Services (DFES), Department of Planning, Lands and Heritage (DPLH), Department of Water and Environmental Regulation (DWER), Department of Biodiversity, Conservation and Attractions (DBCA), Department of Primary Industries and Regional Development (DPIRD), Environmental Protection Authority (EPA), Local aerial spraying contractors, unlicenced airstrip owners (within a 5km radius of a turbine) and any relevant incorporated local aeronautical associations.

Other Potential Impacts

All wind farm and turbine developments must adhere to and comply with the regulations, specifications, and requirements outlined by the Civil Aviation Safety Authority (CASA) as though the Narrogin Airport and Airstrips were registered. This ensures that the development does not impede the potential future upgrade of the Narrogin Airport from its current unregistered CASA status to that of a Registered CASA Airport.

Wind farm proposals should not have negatively impact through interference with normal agricultural or farming activities of nearby rural properties, such as aerial spraying. An aviation assessment by a suitable qualified aviation consultant may be required to demonstrate turbines will not impact on aerial spraying activities of surrounding farms or unlicenced airstrips.

1.3.2. Local Planning Strategy (December 2019)

The planning strategy sets out the LGA's long-term planning directions and provides the rationale for any zoning or classification of land under the local planning scheme.

Narrogin airport is identified in the strategy as:

an important part of the Shire's transport network, particularly in terms of emergency services, and has been identified as having significant potential to be developed to accommodate a flying school for international pilots, a number of tourist related activities including but not limited to sky diving, gliding, hot air ballooning and scenic flights and an aviation theme residential estate.

Section 4.5 of the planning strategy (Transport) establishes the key issues, visions/objectives and strategies for transport infrastructure in the LGA, and includes a long-term strategy for Narrogin airport, to:

support and encourage an increase in air traffic volumes at the Narrogin Airport by increasing the services offered, improving utilisation of the existing facilities and creating opportunities for the establishment of complementary land uses subject to due consideration of potential impacts associated with the airport's continued operation to reduce any potential land use conflicts.

The Narrogin airport is recognised as an important component of the LGA transport strategy, particularly for providing aeromedical air transport services. The planning strategy references the 2013 Airport Master plan, which does not appear publicly available at this assessment.

1.4. Nearby certified aerodromes

No airport certified by the Civil Aviation Safety Authority (CASA) under Civil Aviation Safety Regulations (1998) (CASR) Part 139 is located within 30 nm of the proposed WMT sites.

The nearest certified airport is Katanning Airport (YKNG), approximately 51 nm (94 km) away from the proposed WMT sites.

Narrogin Airport (YNRG) is an uncertified airport within 30 nm of the project site. Based on D11—Local Planning Policy—Wind Farm Turbines, Narrogin Airport could potentially be upgraded to a certificated airport in the future.

Figure 3 shows the project site location relative to Narrogin Airport (YNRG) (Source: Lightsource BP, Google Earth). The orange circle represents a distance of 30 nm from the airport's aerodrome reference point (ARP).

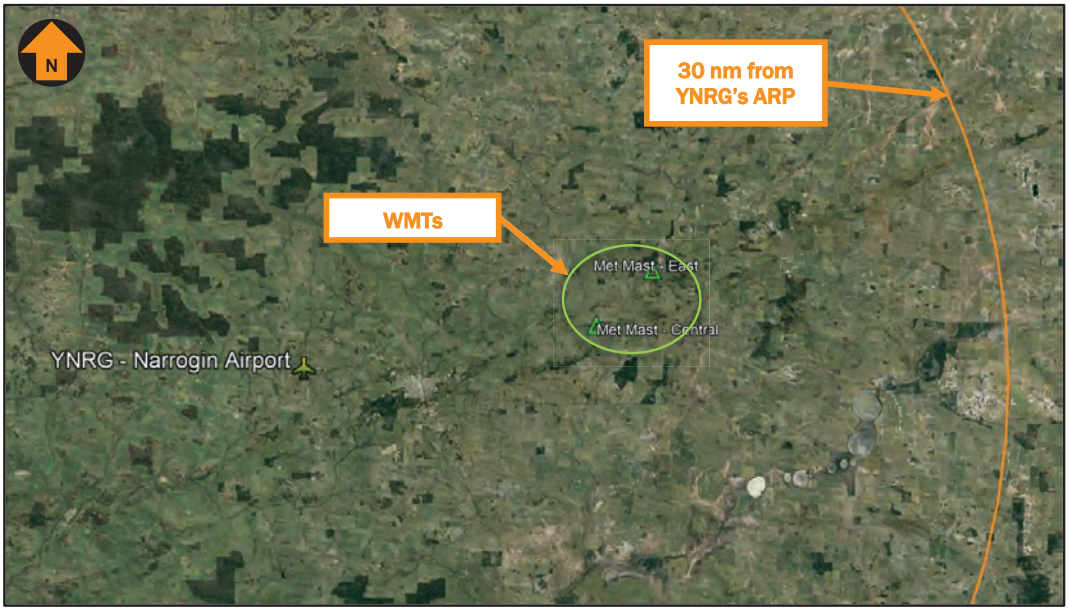


Figure 3 Location of Narrogin Airport in relation to the proposed WMTs

1.5. Narrogin Airport (YNRG)

Narrogin Airport is an uncertified aerodrome. Narrogin Shire Council operates the airport, which has a published aerodrome elevation of 329 m AHD (1080 ft AMSL) (source: Airservices Australia (AsA), FAC, dated 21 March 2024).

Narrogin Airport's ARP coordinates published in Airservices Australia's FAC are Latitude 32°55'48" S and Longitude 117°04'48"E.

As Narrogin Airport is currently uncertified, no information on instrument procedures is available from Airservices Australia's public web page. Aviation Projects can therefore not assess instrument procedure-related data such as minimum sector altitude (MSA) and instrument procedures.

However, when Narrogin Airport is upgraded to a certified airport, if the WMT data has already been advised to Airservices Australia, the flight procedure designer will consider the WMTs as obstacles during the procedure design and will, therefore, not cause any infringement.

1.5.1. Narrogin Airport aircraft operations

It is understood that Narrogin Airport is used primarily for private and recreational flying operations, including gliding activity, conducted in visual conditions. It is understood the aerodrome is also used frequently by the Royal Flying Doctor Service (estimated as 200 arrivals annually according to Shire of Narrogin council meeting minutes), which may include night-time operations in visual meteorological conditions.

The aerodrome does provide runway lighting on runway 10/28, although the lighting system is not inspected by the Shire of Narrogin.

1.5.2. Aircraft operations at non-controlled aerodromes

Advisory Circular AC 91-10 v1.1 Operations in the vicinity of non-controlled aerodromes provides guidance for pilots flying at or in the vicinity of non-controlled aerodromes, with respect to CASR 91.

A conventional circuit pattern and heights are provided in AC 91-10 v1.1. The standard circuit consists of a series of flight paths known as legs when departing, arrival or when conducting circuit practice. Illustrations of the standard aerodrome traffic circuit procedures provided in AC 91-10 v1.1. are shown in Figure 4 and Figure 5.

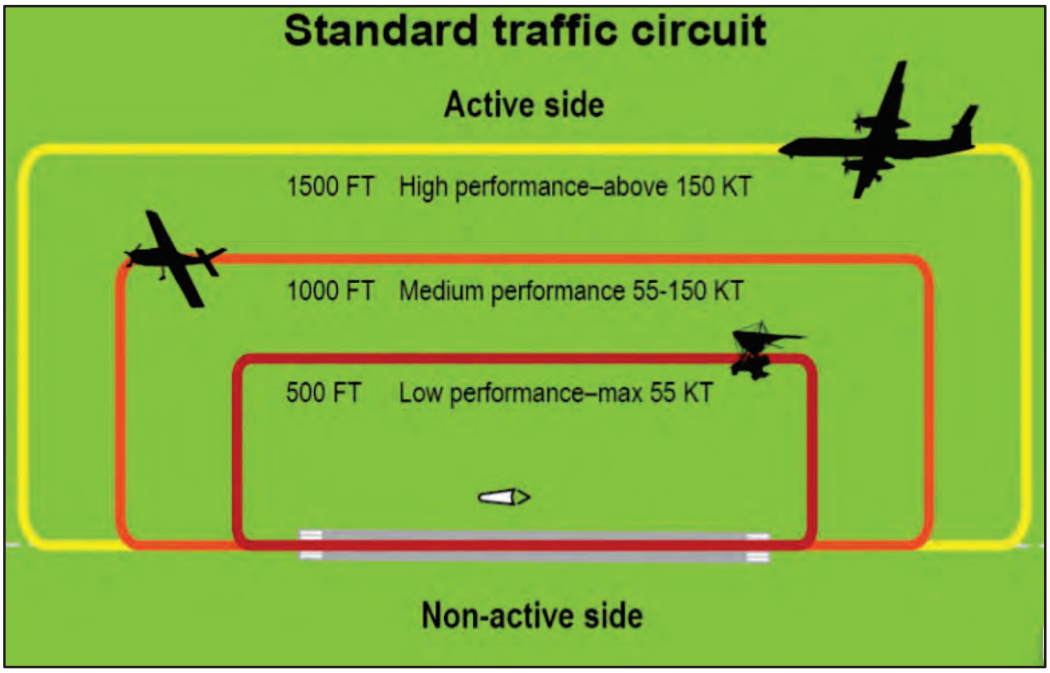


Figure 4 Lateral and vertical separation in the standard aerodrome traffic circuit

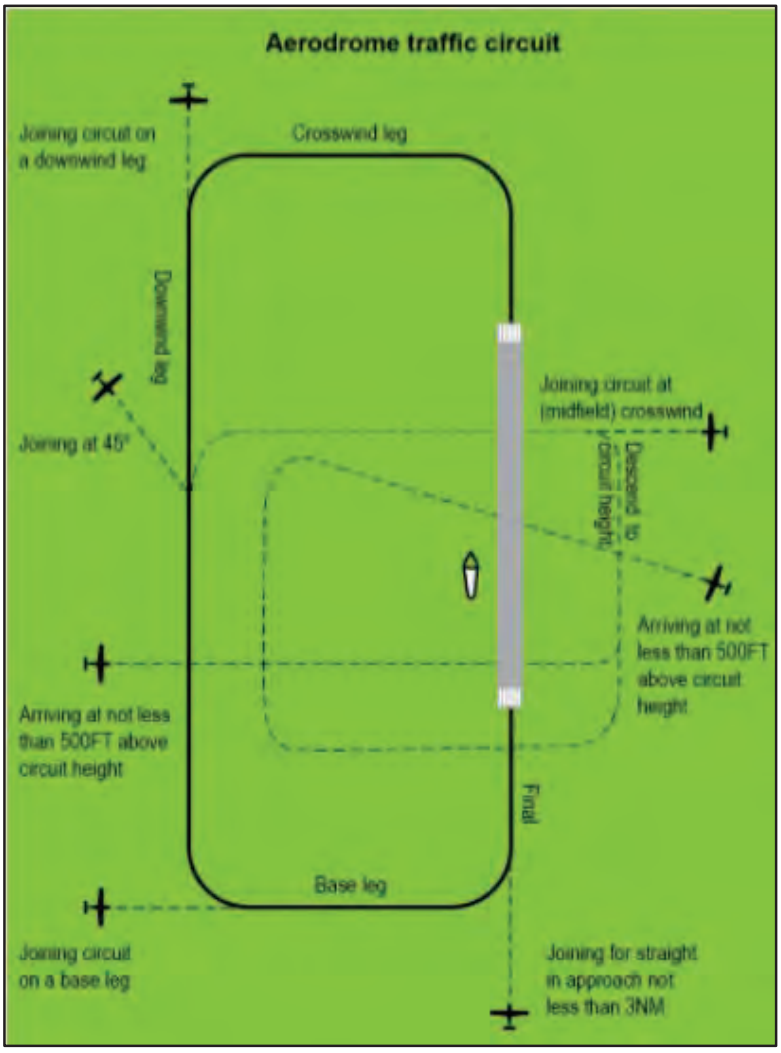


Figure 5 Aerodrome standard traffic circuit, showing arrival and joining procedures

AC 91-10 v1.1. paragraph 7.10 makes reference to a distance that is "normally" well outside the circuit area and where no traffic conflict exists, which is at least 3 nm (5556 m). The paragraph is copied below:

> *7.10 Departing the circuit area*
>
> *7.10.1 Aircraft should depart the aerodrome circuit area by extending one of the standard circuit legs or climbing to depart overhead. However, the aircraft should not execute a turn to fly against the circuit direction unless the aircraft is well outside the circuit area and no traffic conflict exists. This will normally be at least 3 NM from the departure end of the runway, but may be less for aircraft with high climb performance. In all cases, the distance should be based on the pilot's awareness of traffic and the ability of the aircraft to climb above and clear of the circuit area.*

All WMT locations are further than 3 nm of YNRG. Generally, aircraft operations at YNRG will not require aircraft to overfly the WMT locations while arriving or departing the aerodrome in normal operations, and aircraft operations at YNRG are not anticipated to be adversely affected by the WMT in any of the proposed locations.

1.5.3. IFR Circling areas

Narrogin Airport will have a circling approach once upgraded to a certificated airport. A circling approach extends an instrument approach to the specified circling minima (lowest altitude permitted without visual reference to the ground). At this point, the pilot will visually manoeuvre the aircraft to align with the runway for landing. Typically, a circling approach is only conducted where there is no runway-aligned instrument procedure or if the runway used for the approach procedure is not suitable for landing.

Circling areas are established by the instrument flight procedure designer based on ICAO specifications related to the performance category of the designed aircraft. The circling area is determined by drawing an arc centred on the threshold of each usable runway and joining these arcs by tangents.

The radii for each relevant category of aircraft related to Narrogin Airport are provided below:

- Category A – 1.70 nm / 3.15 km
- Category B – 2.72 nm / 5.04 km
- Category C – 4.30 nm / 7.96 km
- Category D – 5.40 nm / 10.00 km

The closest WMT (Met Mast Central) is approximately 23 km from the runway end at Narrogin Airport and will not impact circling areas established for instrument flight procedures.

1.5.4. Obstacle limitation surfaces

Obstacle Limitation Surface (OLS) is established for each certified aerodrome runway. The maximum lateral extent of the OLS is up to 6 km for the conical surface and 15 km for the take-off and approach surfaces.

If Narrogin Airport is upgraded to a certificated airport, the proposed WMTs will be located beyond the extent of the airport OLS.

1.6. Nearby aircraft landing areas (uncertified aerodromes)

A search of various aviation datasets identified Aircraft Landing Areas (ALAs) near the project area. These are non-certified aerodromes and are not subject to CASR Part 139 regulations.

The aviation datasets used for the search are:

- AIP aeronautical charts effective 21 March 2024.
- OzRunways – which sources its data from Airservices Australia (AIP). The aeronautical data provided by OzRunways is approved under CASA CASR Part 175.
- Australian Government National Map online.

As a guide, an area of interest within a 3 nm radius of an ALA is used to assess the potential impacts of proposed developments on aircraft operations at or near the ALA.

Figure 6 shows the location of nearby ALA relative to the project site and a nominal 3 nm buffer from the closest ALA (source: Lightsource BP, Google Earth).

The proposed WMTs are not located within 3 nm of any nearby ALA.



Figure 6 ALA in the vicinity of the project site.

1.7. Air routes and Grid LSALT

MOS 173 requires that the published lowest safe altitude (LSALT) for a particular airspace grid or air route provides a minimum of 1000 ft clearance above the controlling (highest) obstacle within the relevant airspace grid or air route tolerances.

1.7.1. Grid LSALT

The proposed WMTs are within an airspace grid with the LSALT of 3000 ft AMSL, which provides clearance above obstacles with heights up to 2000 ft AMSL.

Figure 7 shows the grid LSALT in proximity to the WMTs (source: ERC Low National, OzRunways, March 2024, Google Earth).

The highest WMT height is 530 m AHD (1738.8 ft AMSL), below the 2000 ft obstacle height limit.

Therefore, the WMTs will not impact the 3000 ft Grid LSALT.

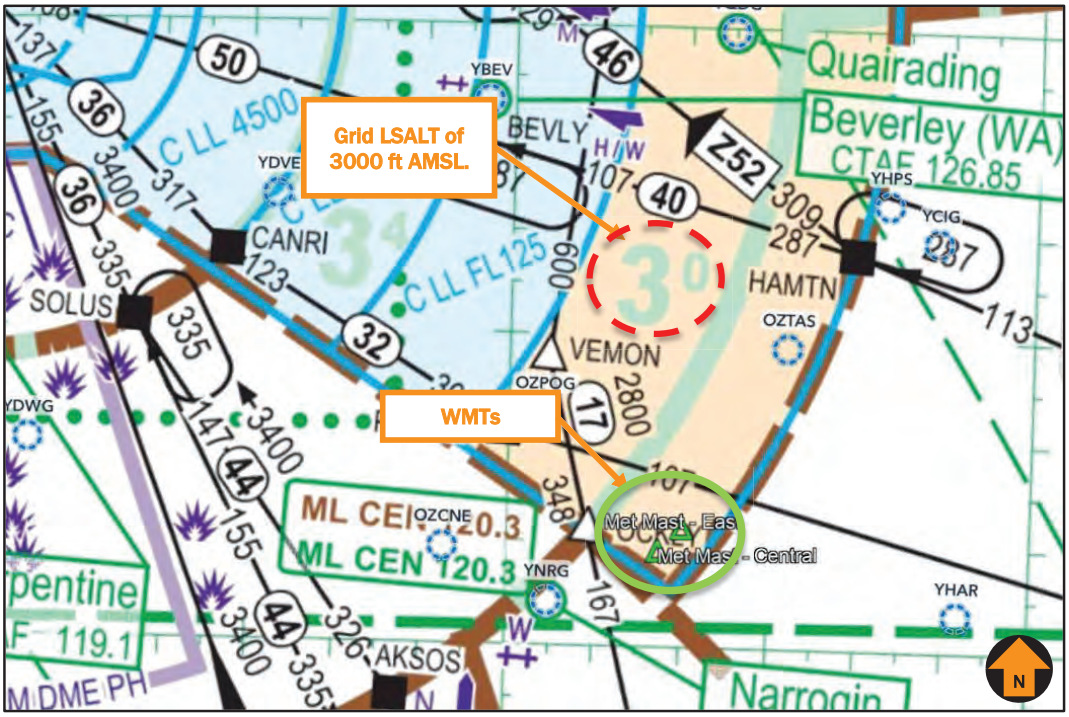


Figure 7 Grid LSALTs in proximity to the WMTs.

1.7.2. Air Route LSALTs

A protection area 7 nm laterally either side of an air route is used to assess the LSALT for the air route.

Few air routes are within 7 nm of the WMT sites. The highest WMT height is 530 m AHD (1738.8 ft AMSL). Table 2 provides an impact analysis of the surrounding air routes, showing that the WMTs are below the air route LSALT.

Therefore, there is no impact on the air route LSALT.

Table 2 Air route impact analysis

Air route	*Waypoint pair*	*Route LSALT*	*Protection Surface*	*Covered WMTs*	*Impact on airspace design*	*Potential solution*	*Impact on aircraft ops*
W185	OCKLY to/from PAVSO	3800 ft AMSL	2800 ft AMSL	Met Mast Central	Nil	N/A	N/A
H44	PUMRY to ESP VOR	3000 ft AMSL	2000 ft AMSL	Met Mast East	Nil	N/A	N/A

1.8. Airspace

The highest WMT is 530 m AHD (1738.8 ft AMSL), which will be lower than the vertical limits of Perth controlled airspace Class A and E (above 8500 ft). Therefore, the WMTs are located within the Class G airspace (non-controlled airspace). The WMTs are also not located in any Prohibited, Restricted or Danger areas.

Therefore, the proposed WMTs will not impact controlled or designated airspace.

1.9. Aviation navigation facilities

Part 139 MOS 2019 specifies the protection of Communication, Navigation and Surveillance Systems (CNS) from development, which may affect the function of these systems.

The proposed WMTs are not located within the prescribed clearance zones or areas of interest specified in Part 139 MOS 2019 Chapter 19 and will not affect CNS facilities.

1.10. ATC Surveillance Radar Systems

Airservices Australia currently requires an assessment of the potential for wind farms to affect radar lines of sight.

The open lattice construction of slim wind monitoring towers does not impact ATC Surveillance Radar Systems.

1.11. Civil Aviation Safety Authority - regulatory context

The Civil Aviation Safety Authority (CASA) regulates aviation activities in Australia. Applicable requirements include the Civil Aviation Regulations 1988 (CAR), Civil Aviation Safety Regulations 1998 (CASR), Advisory Circular (AC) 139 E 0.1-v1.0 and AC.139 E 0.5-v1.1. Relevant provisions are outlined in further detail in the following section.

1.11.1. Civil Aviation Safety Regulations 1998, Part 139—Aerodromes

CASR 139.165 requires the owner of a structure (or proponents of a structure) that will be 100 m or more above ground level to inform CASA. This must be given in written notice and contain information on the proposal, the height and location(s) of the object(s) and the proposed timeframe for construction. This is to allow CASA to assess the effect of the structure on aircraft operations and determine whether or not the structure will be hazardous to aircraft operations.

The proponent of the WMTs is required to report the WMTs to CASA in accordance with CASR 139.165, *as soon as practicable after forming the intention to construct or erect the proposed object or structure.*

The notification should be provided to CASA via email to Aerodromes@casa.gov.au and Airspace.Protection@casa.gov.au.

1.11.2. Advisory Circular 139.E-01 v1.0—Reporting of Tall Structures

Advisory Circular (AC) 139.E-01 v1.0—*Reporting of Tall Structures*, CASA guides those authorities and persons involved in the planning, approval, erection, extension or dismantling of tall structures so that they may understand the vital nature of the information they provide.

> *2.2.1 The hazards that such buildings or structures may pose to aircraft requires assessment. CASA routinely performs such assessments however needs to be first notified of the obstacle, structure of source of a hazardous plume. The need to report such hazards is outlined in this AC.*

2.2.2 If you are the person who owns, controls or operates the object, structure or a source of a hazardous plume which is either present, imminent or has been approved for erection/construction, details need to be provided about:

– the construction, extension or dismantling of tall structures if the top is:

o 100 m or more above ground level

or

o affects the obstacle limitation surface of an aerodrome as defined in

2.2.3 In addition, tall structures may pose a specific hazard for the operation of low-flying Defence aircraft or to the flight paths of arriving/departing aircraft (refer Paragraph 2.1.3). Therefore, the RAAF and Airservices Australia require information on structures that are 30 m or more above ground level—within 30 km of an aerodrome or 45 m or more above ground level elsewhere for the RAAF, or 30 m or more above ground level elsewhere for Airservices Australia.

2.2.4 Information provided for the database should be accurate and readily interpreted. The tall structure report form has been designed to help owners and/or developers in this respect. The form is available on the Airservices Australia website (including a spreadsheet for reporting multiple structures) at: https://www.airservicesaustralia.com/industry-info/airport-development-assessments/

1.11.3. Advisory Circular AC 139.E-05-v1.1 Obstacles including wind farms outside the vicinity of a CASA certified aerodrome – October 2022

AC 139.E-05-v1.1 provides advice about the lighting and marking of wind farms and other tall structures in submissions to planning authorities who are considering a wind farm or tall structure proposal.

2.1.2 Regardless of CASA advice, planning authorities make the final determination whether a wind farm or a tall structure not in the vicinity of a CASA regulated aerodrome will require lighting or marking.

2.2.1 All wind turbine developments and tall structures should be assessed to determine whether they could be a risk to aviation safety. This AC augments the information in the National Aerodromes Safeguarding Framework (NASF) Guideline D and provides additional guidance on the assessment of wind farm developments and guidance for establishing what reasonable measures may be put in place to mitigate any adverse effect the wind farm development could be to aviation safety.

2.2.2 For the purposes of this AC, navigable airspace is considered to be the airspace above the minimum altitudes of VFR and IFR flight, including airspace required to ensure the safe take-off and landing of an aircraft. Generally, minimum altitude limits equate to 500 ft (152 m) or 1 000 ft (305 m) above ground level depending on the situation, i.e., whether or not the flying is over a populous area. The presence of wind turbines, wind monitoring masts and other tall obstacles may create a risk to the safety of flight, due to the risk of collision. An entity that is proposing to introduce a hazard into navigable airspace, such as a wind farm, must mitigate the risk of the hazard on airspace users to ensure an acceptable level of safety is maintained.

2.2.4.1 Part 139 of the Civil Aviation Safety Regulations 1998 (CASR), regulates obstacles within the vicinity of certified aerodromes. This is supported by Part 139 (Aerodromes) Manual of Standards (MOS) which provides the definition of an obstacle as well as the standards for marking and lighting of an obstacle. Any wind turbine (where the height is defined to be the maximum height reached by the tip of the turbine blades), wind monitoring mast or other tall structure that penetrates an Obstacle Limitation Surface (OLS) of an aerodrome will be assessed in accordance with the provisions of Part 139 of CASR and the MOS.

2.2.6.1 Outside the vicinity of an aerodrome, which is defined as being outside the OLS of an aerodrome, wind farms and other tall structures may constitute a risk to low-flying aviation operations which may be conducted down to 500 ft above ground level (AGL) over non-populous areas. Additionally, wind monitoring masts can also be hazardous to aviation, given they are very thin and difficult to see.. Wind farms can also affect the performance of communications, navigation and surveillance (CNS) equipment operated by Airservices or the Department of Defence.

2.5 Aviation hazard lighting - International best practice

2.5.2 Australian regulations state that aircraft in uncontrolled airspace may operate under visual flight rules (VFR), which requires the pilot to remain clear of clouds and to adhere to visibility minima.

> *- in Class G airspace below 3000 ft Above Mean Sea Level (AMSL) or 1000 ft AGL (whichever is the higher) – remain clear of cloud with minimum visibility of 5000 m.*
>
> *– in Class G airspace below 10 000 ft AMSL (subject to the above) – remain 1000 ft vertically and 1500 m horizontally from cloud and with 5000 m visibility.*

Note: Helicopters may be permitted to operate in lower visibility and that further exemptions may apply to special cases such as military, search and rescue, medical emergency, agricultural and fire-fighting operations.

2.5.4 2000 candela medium intensity obstacle lighting recommendation satisfies the 5000 m VFR visibility requirements, according to practical exercises undertaken by the FAA and documented in AC 70/7460-1L (FAA, 2015).

2.5.5 In Australia, CASA has accepted the use of 200 candela lighting in some circumstances due to a lack of back lighting in rural and remote areas, meaning that a lower intensity light is still visible to pilots at an acceptable distance to permit a pilot to see and avoid the obstacle.

2.6 Hazard Lighting

2.6.1 This describes the reasoning behind CASA's preference to recommend aviation hazard lighting for tall structures and aircraft detection systems for wind farms.

2.6.2 Hazard lighting for wind farms and other tall structures is intended to alert pilots, flying at low altitude, to the presence of an obstacle allowing them sufficient awareness to safely navigate around or avoid it. The pilot is responsible for avoiding other traffic and obstacles based on the "alerted" see-and-avoid principle.

2.6.3 Unless the wind farm or tall structure is located near an airport, it is not expected to pose a risk to regular public transport operations. The kind of air traffic that is usually encountered at low altitude in the vicinity of a wind farm or tall structure includes light aircraft (private operators, flight schools, sport aviation, agricultural, survey, fire spotting and control) and helicopters (military, police, medical emergency services, survey, fire spotting and control). Hazard lights are therefore designed to provide pilots with sufficient awareness about the presence of the structure(s), so they can avoid it. This means that the intensity of the hazard lights should be such that the acquisition distance is sufficient for the pilot to recognise the danger, take evasive action and avoid the obstacle by a safe margin in all visibility conditions. This outcome considers the potential speed of an aircraft to determine the distance by which the pilot must become aware of the obstacle to have enough time and manoeuvrability to avoid it.

2.7 CASA's commitment to aviation safety

2.7.1 CASA will consider the lighting intensity management and systems that achieve an acceptable level of aviation safety on a case-by-case basis during its assessment.

2.7.2 A CASA determination will consider the environmental setting when determining the need and level of lighting required on a wind farm or tall structure. This may include consideration of lower lighting intensities for obstacles away from an aerodrome. The backlighting of some locations is almost non-existent, meaning the risk of an aviation hazard light being compromised by background lighting from a rural and remote town is lower than would otherwise apply in a residential area closer to a city.

There is no regulatory requirement to provide obstacle lighting on the WMTs. Generally, for WMTs that will be installed prior to WTG installation and WMTs that are not in close proximity to a WTG, the voluntary provision of obstacle lighting should be considered to ensure visibility in low light and deteriorating atmospheric conditions. CASA will review the WMTs for potential hazards to aircraft operations and may recommend lighting the WMTs.

1.12. National Airport Safeguarding Framework Guideline D

National Airport Safeguarding Framework (NASF) Guideline D: Managing the Risk To Aviation Safety of Wind Turbine Installation (Wind Farms)/Wind Monitoring Towers provides guidance to State/Territory and local government decision-makers, airport operators and developers of wind farms to jointly address the risk to civil aviation arising from the development, presence and use of wind farms and wind monitoring towers.

When wind turbines over 150 metres above ground level are to be built within 30 kms of a certified or registered aerodrome, the proponent should notify the Civil Aviation Safety Authority (CASA) and Airservices. If the wind farm is within 30km of a military aerodrome, Defence should be notified.

The Aeronautical Information Service of the Royal Australian Air Force (RAAF AIS) maintains a database of tall structures in the country. The RAAF AIS should be notified of all tall structures meeting the following criteria:

- *30 metres or more above ground level for structures within 30km of an aerodrome; or*
- *45 metres or more above ground level for structures located elsewhere.*

Marking and lighting of wind monitoring towers

Before developing a wind farm, it is common for wind monitoring towers to be erected for anemometers and other meteorological sensing instruments to evaluate the suitability or otherwise of a site. These towers are often retained after the wind farm commences operations to provide the relevant meteorological readings. These structures are very difficult to see from the air due to their slender construction and guy wires. This is a particular problem for low flying aircraft including aerial agricultural operations. Wind farm proponents should take appropriate steps to minimise such hazards, particularly in areas where aerial agricultural operations occur. Measures to be considered should include:

- *the top 1/3 of wind monitoring towers to painted in alternating contrasting bands of colour. Examples of effective measures can be found in the Manual of Standards for Part 139 of the Civil Aviation Safety Regulations 1998. In areas where aerial agriculture operations take place, marker balls or high visibility flags can be used to increase the visibility of the towers;*
- *marker balls or high visibility flags or high visibility sleeves placed on the outside guy wires;*
- *ensuring the guy wire ground attachment points have contrasting colours to the surrounding ground/vegetation; or*
- *a flashing strobe light during daylight hours.*

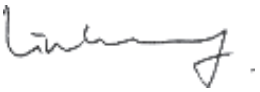
1.13. Summary

The following list of findings summarises the outcome of this assessment, based on the maximum height of 150 m AGL / 530 m AHD (1738.8 ft AMSL):

- There are no certified airports located within 30 nm (56 km) of the Project.
- The WMTs are not anticipated to affect the operation of aircraft at Narrogin Airport adversely.
- Narrogin Airport will potentially upgrade to a certificated airport. The proposed WMTs are located beyond the circling areas and OLS surfaces. If the WMT data has already been advised to Airservices Australia before the Narrogin Airport upgrades to a certificated airport, the flight procedure designer will consider the WMTs as obstacles during design, and they will not cause any infringement.
- No aircraft landing area (ALA) is identified within 3 nm of the WMT sites.
- The WMTs will not affect any grid or airway route segment LSALT.
- The WMTs will not have an impact on controlled or designated airspace.
- Marking the WMTs is not mandatory. However, the following markings are recommended to be implemented in consideration of potential day VFR aerial work and military aircraft training operations in accordance with NASF Guideline D:
    - obstacle marking for at least the top 1/3 of the mast and be painted in alternating contrasting bands of colour
    - marker balls or high visibility flags or high visibility sleeves placed on the outside guy wires; and
    - guy wire ground attachment points in contrasting colours to the surrounding ground/vegetation.
- There is no regulatory requirement to provide obstacle lighting on the WMTs. Generally, for the WMTs that will be installed prior to WTG installation and the WMTs that are not in close proximity to a WTG, the voluntary provision of obstacle lighting should be considered to ensure visibility in low light and deteriorating atmospheric conditions. CASA will review the WMTs for potential hazards to aircraft operations and may recommend lighting the WMTs.
- Due to exceeding 100 m AGL, details of the WMTs must be reported to CASA as soon as practicable after forming the intention to construct or erect the proposed object or structure in accordance with CASR Part 139.165(1)(2). The notification should be provided to CASA via email to Aerodromes@casa.gov.au and Airspace.Protection@casa.gov.au.
- 'As constructed' details of the WMT coordinates and elevation should be provided to Airservices Australia, by submitting the form at this webpage: https://www.airservicesaustralia.com/wp-content/uploads/ATS-FORM-0085_Vertical_Obstruction_Data_Form.pdf to the following email address: airport.developments@airservicesaustralia.com

If you wish to clarify or discuss of the contents of this correspondence, please contact me on 0433 747 835.

Kind regards



Lyn Wang

Specialist Aviation Consultant

21 March 2024



ghd.com

The Power of Commitment