The Department of Education (DoE)
New High School for Medowie
Electric and Magnetic Fields Assessment Report

Document Record

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Issue Date	30 January 2025
Document Number	ZSE25050-01 R1

Revision History

Revision	Issue Date	Description
Revision 0	28 October 2024	Initial Issue
Revision 1	21 November 2024	Revised to include confirmation of safety compliance for school occupants
Revision 2	30 January 2025	Revised to DoE report format guidelines

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1 INTRODUCTION

This ELF & EMF Assessment has been prepared to support a Review of Environmental Factors (REF) for the proposed New High School for Medowie (the activity). The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Section 3.37 of the T&I SEPP.

The activity will be carried out at 6 Abundance Street, Medowie (the site), on the corner of Abundance Rd and Ferodale Rd. This site is located near and crossed by an existing 132kV transmission line. The transmission line is owned by Ausgrid, providing connection between Tomago Bulk Supply Point (BSP) and Taree Substation.

The purpose of this report is to assess the impact of the transmission lines that traverse the site on the proposed activity and where required, provide mitigation measures to minimize any such impact.

Zero Sequence Earthing scope of works include:

- Calculation of Electric Field Strength and Magnetic Flux Density to be computed at 1m and 2m above surface level, relevant to human exposure

This report presents the results of the hazard assessment associated with the existing 132kV transmission line affecting the proposed activity.

The project location is illustrated in Figure 1-1 (refer Appendix – A: Project Location for details).

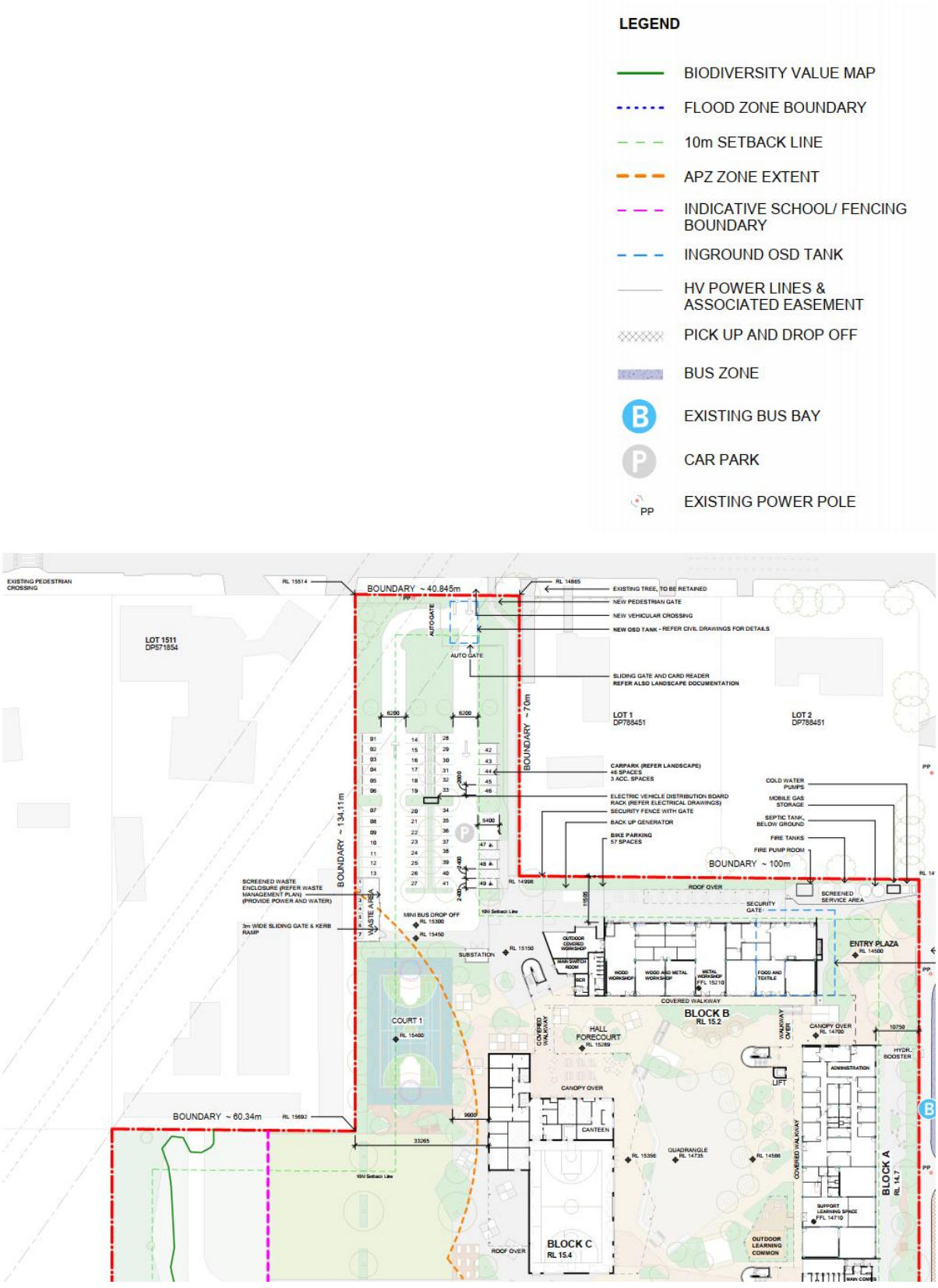


Figure 1-1: Project Location

1.1 Site Description

The site has a street address of 6 Abundance Road, Medowie. It is 6.51ha in area, and comprises 1 allotment, legally described as Lot 3 in DP788451.
A large proportion of the site is currently unused and vacant. A small shed structure and caravan are located adjacent to the northern boundary. A cluster of buildings including a single storey dwelling, an outhouse/shed structure and temporary greenhouse are located within the south eastern corner.

The site contains a largely vegetated area to the south west corner. The site is relatively flat with a gradual fall from west to east toward Abundance Road.
The site has a primary frontage to Abundance Road to the east and Ferodale Road to the north. Abundance Road and Ferodale Road are both classified Local Roads. Medowie Road, approximately 1km east of the site, is a classified Regional Road.

The area surrounding the site mostly consists of industrial, rural residential, educational, and agricultural lands. Adjacent to the north western boundary is a Shell petrol station and mechanic garage. Adjacent to the north eastern boundary is a medical health clinic. Across Abundance Road along the eastern boundary are a number of warehouse and light industrial developments. Directly north of the site across Ferodale Road are large lots used for agricultural purposes. Medowie Public School is located on Ferodale Road, to the north west of the site, opposite the Shell petrol station.

Figure 1-2: Aerial Image of the site (Source: Nearmap)

1.2 Project Description

The proposed activity involves the construction of school facilities on the site for the purpose of the New High School for Medowie. The site contains a densely vegetated area to the southwest corner which is identified as land with high biodiversity values corresponding to the areas of remnant native vegetation (PCT 3995 – Hunter Coast Paperbark-Swamp Mahogany Forest). The existing dwelling house and other structures on the site will be demolished as part of the works. No other works are proposed within this area.

The proposed new school will accommodate 640 students in 29 permanent teaching spaces including 3 support teaching spaces across 3-storeys of buildings on the site. The proposed activity be delivered across 1 stage, and will consist of the following:

29 permanent teaching spaces including 3 support teaching spaces, to accommodate 640 students and school hall to accommodate 1,000 students. Approximately 10,500 sqm of GFA is proposed.

- Main vehicular ingress and egress to Ferodale Road to the north, with a new pedestrian and vehicle crossing proposed.
- Main pedestrian access to Abundance Road.
- Kiss and ride, and bus drop and pick up areas to Abundance Road (6 x parallel spaces).
- New pedestrian wombat crossing to Abundance Road
- Approximately 55 x car parking spaces and 3 x accessible car parking spaces.
- Approximately 70 x bicycle parking spaces.
- Block A (Admin) consisting of administration and learning spaces.
- Block B (Foodtech/Workshop) consisting of food technology rooms and workshops.
- Block C (Hall) consisting of school hall to accommodate 1,000 students.
- Central quad, 1 playing field, and 1 sports courtyard.

The proposed school development will include the following spaces; general learning spaces, General support learning spaces, administrative services, staff areas, gym and canteen, library areas for science, wood and metal, food and textiles, health PE, performing arts, additional learning spaces, student amenities, storage, movement (stairs and covered walkways).

2 ASSESSMENT INPUT DATA

2.1 System Configuration

The existing 132kV transmission (Feeder 963) provide connection between Tomago BSP to Taree Substation as shown in Figure 2-1.

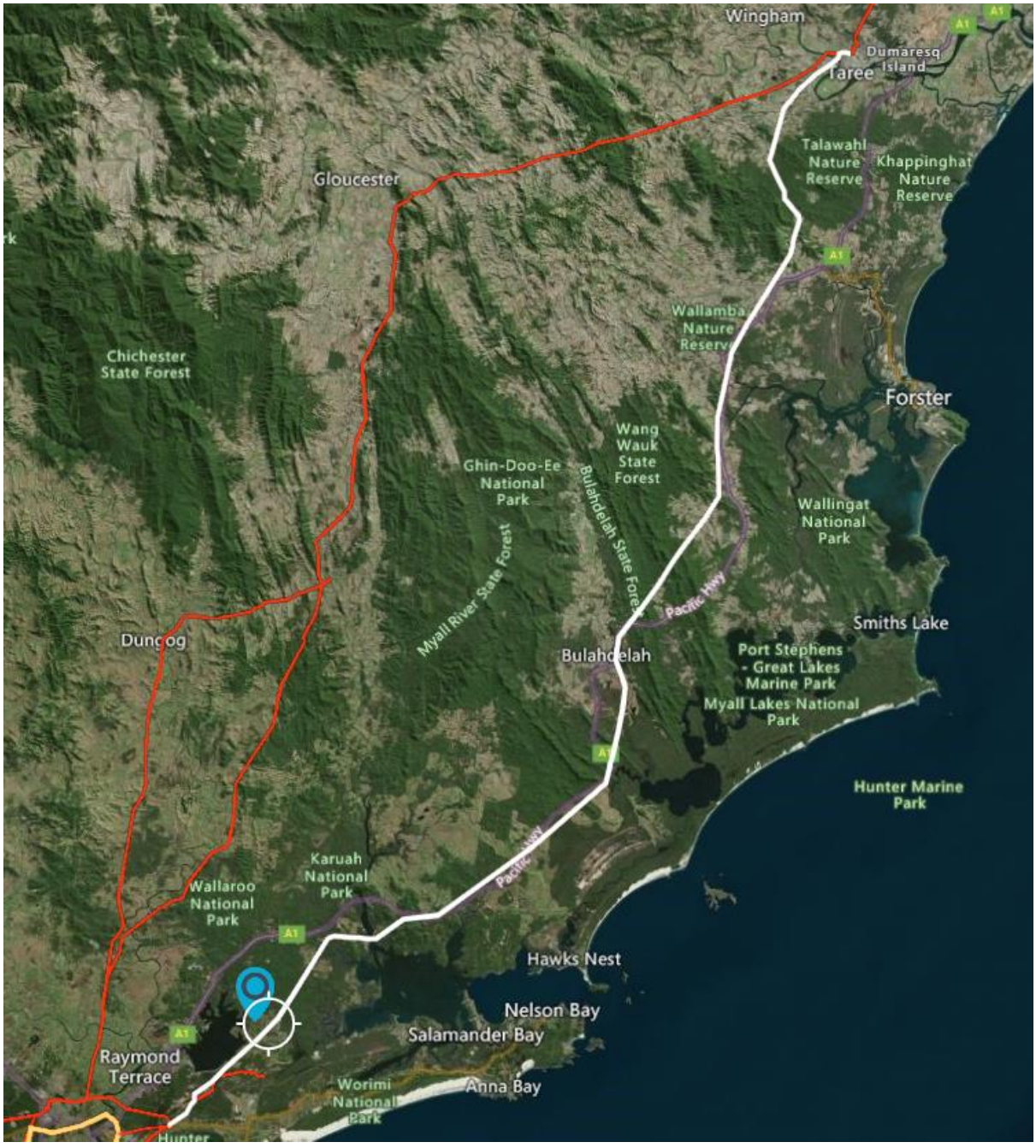


Figure 2-1: Transmission Line Route (site identified with blue marker)

Google street view imagery in Figure 2-2 shows an existing overhead earth wire being installed on the feeder. It is estimated that the phase conductors are installed at 16m above surface.

Figure 2-2: Existing 132kV Feeder

2.2 Maximum Feeder Capacity

The maximum feeder capacity of the existing 132kV transmission (Feeder 963) between Tomago BSP to Taree Substation has been reproduced from Ausgrid Feeder Forecast Data [2] as shown in Figure 2-3.

Lower Hunter Transmission Area			
Feeder name	Voltage (KV)	Generator Hosting Capacity (MW)	
		N	N-1
Feeder 950 - Newcastle BSP to Jesmond ZS	132	224	151
Feeder 952 - Newcastle BSP to Rathmines ZS	132	263	167
Feeder 955 - Singleton STS to Rothbury ZS	132	162	0
Feeder 95A - Newcastle BSP to Awaba STS	132	201	153
Feeder 95F - Muswellbrook STS to Mitchell Line STS	132	195	149
Feeder 95G - Awaba STS to Toronto West ZS	132	266	147
Feeder 95H - Muswellbrook BSP to Muswellbrook STS	132	191	135
Feeder 95L - Hydro Aluminium to Kurri STS	132	284	284
Feeder 95M - Muswellbrook BSP to Mitchell Line STS	132	322	245
Feeder 95R - Kurri STS to Rothbury ZS	132	156	0
Feeder 95U - Muswellbrook BSP to Singleton STS	132	355	248
Feeder 95X - Mitchell Line STS to Singleton STS	132	386	255
Feeder 95Y(1) - 95Y Tee 1 to Eraring STS Tx1	132	172	152
Feeder 95Y(2) - 95Y Tee 1 to Morisset ZS	132	186	128
Feeder 95Y(3) - Rathmines ZS to 95Y Tee 1	132	211	167
Feeder 960(1) - Newcastle BSP to 960 Tee 1	132	205	205
Feeder 960(2) - 960 Tee 1 to Charlestown ZS	132	360	266
Feeder 960(3) - 960 Tee 1 to Argenton STS	132	225	225
Feeder 961(1) - Newcastle BSP to 961 Tee 1	132	205	205
Feeder 961(2) - 961 Tee 1 to Merewether STS	132	392	207
Feeder 961(3) - 961 Tee 1 to Argenton STS	132	225	225
Feeder 963 - Tomago BSP to Taree	132	168	130
Feeder 96A - Newcastle BSP to Kurri STS	132	432	297
Feeder 96B - Newcastle BSP to Hydro Aluminium	132	402	284
Feeder 96E - Kurri ZS to Kurri STS	132	287	254
Feeder 96J - Maryland ZS to Waratah STS	132	235	151

Figure 2-3: Ausgrid Feeder Forecast Data

2.3 Safety Targets - Electric and Magnetic Fields

Exposure to ELF EMF at high levels can affect the functioning of the nervous system. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has issued Guidelines [3] for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz -100 kHz) which are aimed at preventing the established health effects resulting from exposure to ELF EMF. Table 2-1 outlines the summary of the electric and magnetic fields as recommended by the ICNIRP.

Table 2-1: Summary of EMF Limits as per the ICNIRP

Exposure Characteristic	Electric Field Strength	Magnetic Flux Density
Occupational exposure *(Whole working day)*	10 kV/m	1,000 μT
Public exposure *(Up to 24 hours/ day)*	5 kV/m	200 μT

3 ELECTRIC AND MAGNETIC FIELDS ASSESSMENT

The objective of this study is to assess the levels of low frequency (LF) electric and magnetic fields (EMF) in the proposed activity location and the potential impact on the school use due to proximity to the transmission line.

The Electric Field Strength and Magnetic Flux Density under each line have been calculated in CDEGS based on the line to ground voltage of the line for the electric field, and the maximum feeder rating for the magnetic field.

Table 3-1: Inputs for EMF Calculations

Transmission Line	Line to Ground Voltage	Maximum Feeder Capacity [2]
132kV Feeder 963	76,200 V	168 MW (735 A/Ph)

3.1 Electric Field Strength

For the 132kV transmission line crossing the site, computer modelling has been performed based on the line to ground voltage as shown in Table 3-1 to calculate the maximum electric field strength at 1m and 2m above surface beneath the line (typical exposure height for human).

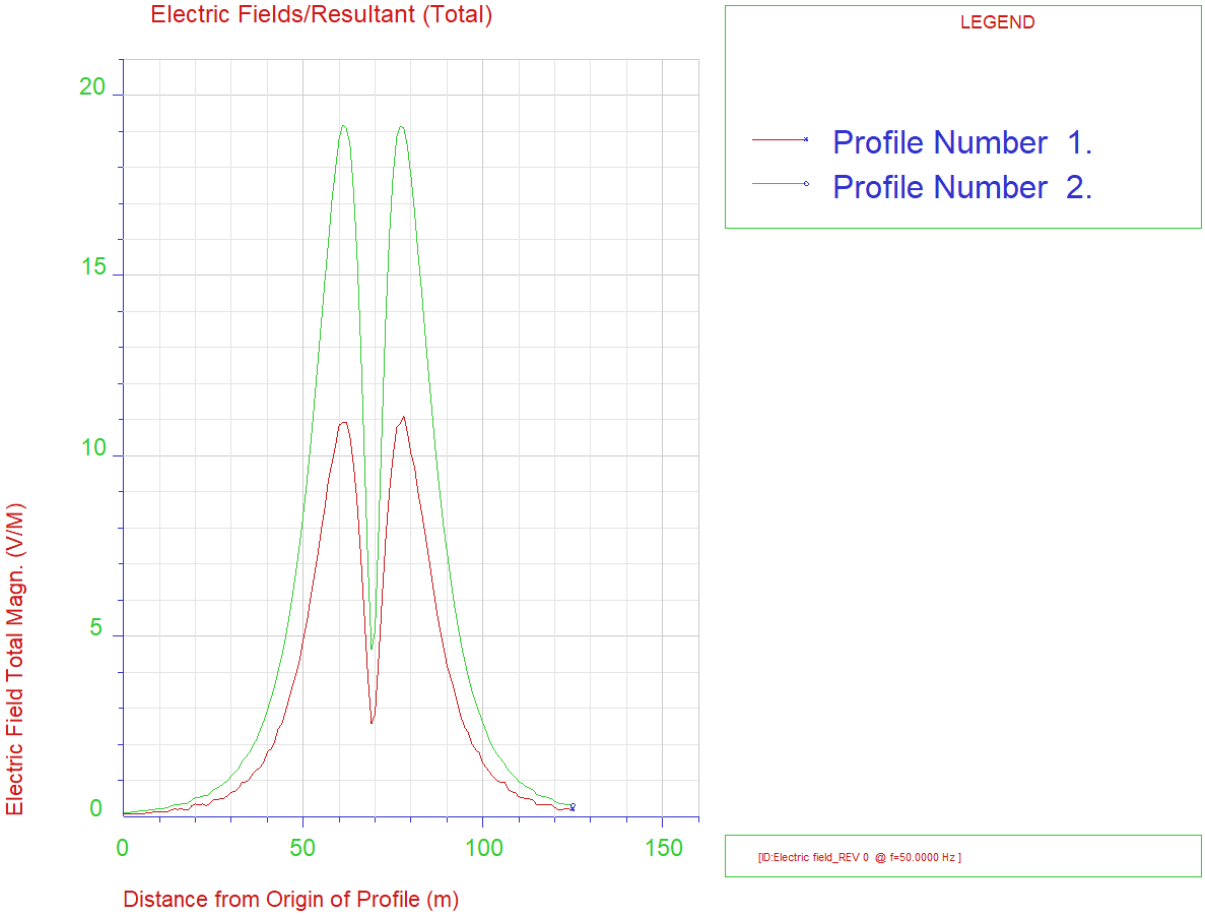


Figure 3-1: Electric Field Strength (V/m) at 1m and 2m off the ground

The calculated maximum Electric Field Strength of 19V/m is significantly less than the ICNIRP limit of 5kV/m (for 24 hours exposure period) as presented in Table 2-1. Safety compliance in according with the ICNIRP guidelines will be achieved.

3.2 Magnetic Flux Density

Similarly, for the 132kV transmission line crossing the site, profiles of the magnetic flux density at 1m and 2m beneath the line have been calculated based on the maximum balanced 3 phase current as given in Table 3-1.

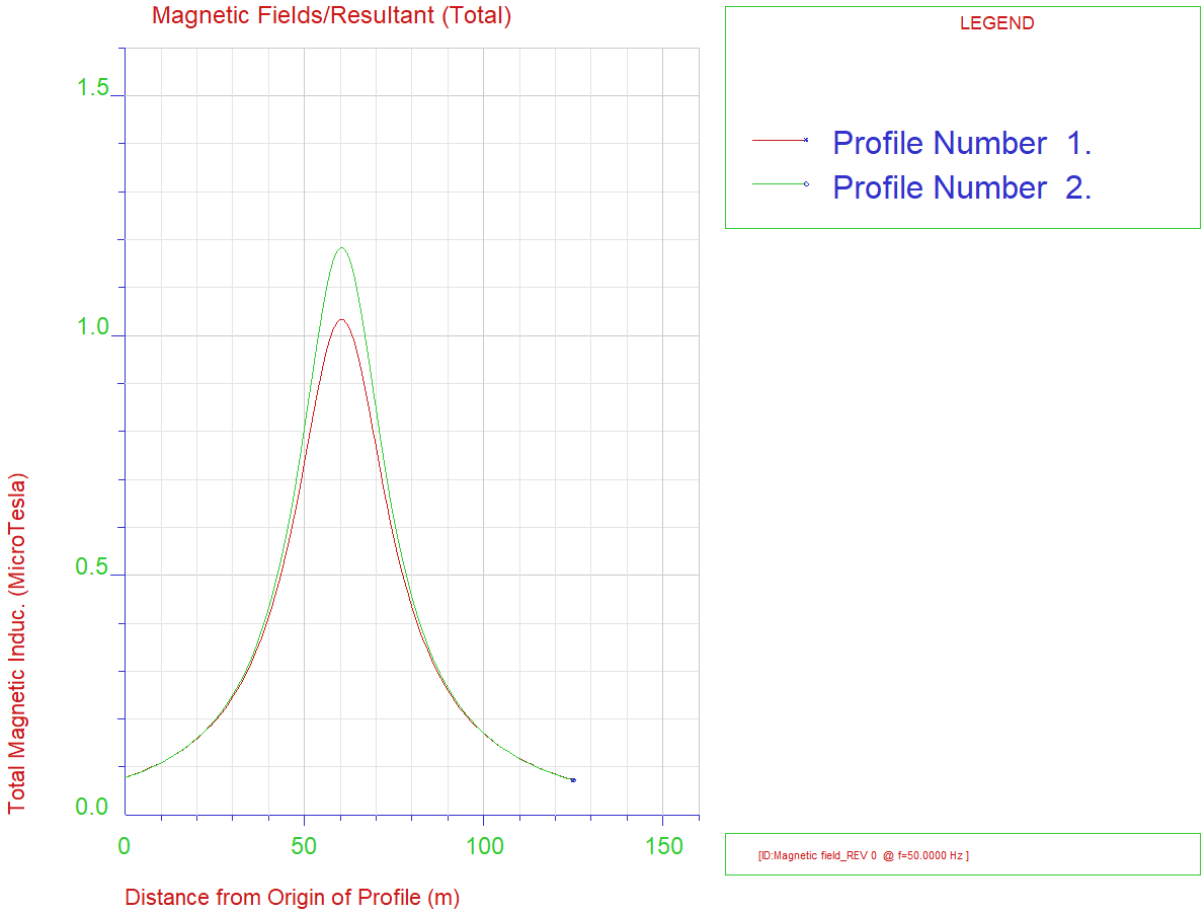


Figure 3-2: Magnetic Flux Density (μT) at 1m and 2m off the ground

The maximum Magnetic Flux Density of 1.2μT is significantly less than the ICNIRP limits of 200μT (for 24 hours exposure period) as presented in Table 2-1. Safety compliance in accordance with the ICNIRP guidelines will be achieved.

4 SUMMARY

The calculations of the Electric Field Strength and Magnetic Flux Density below the 132kV transmission line show that safety compliance to the International Commission on Non-Ionizing Radiation Protection (ICNIRP) is achieved.

EMF risk to students, staff or any other users at the school will be significantly lower than the ICNIRP guidelines based on the analysis results. No specific mitigation measures or controls will be required to further reduce the risk. From an EMF risk perspective, the site is suitable for the intended school use.

5 REFERENCES

Project Information

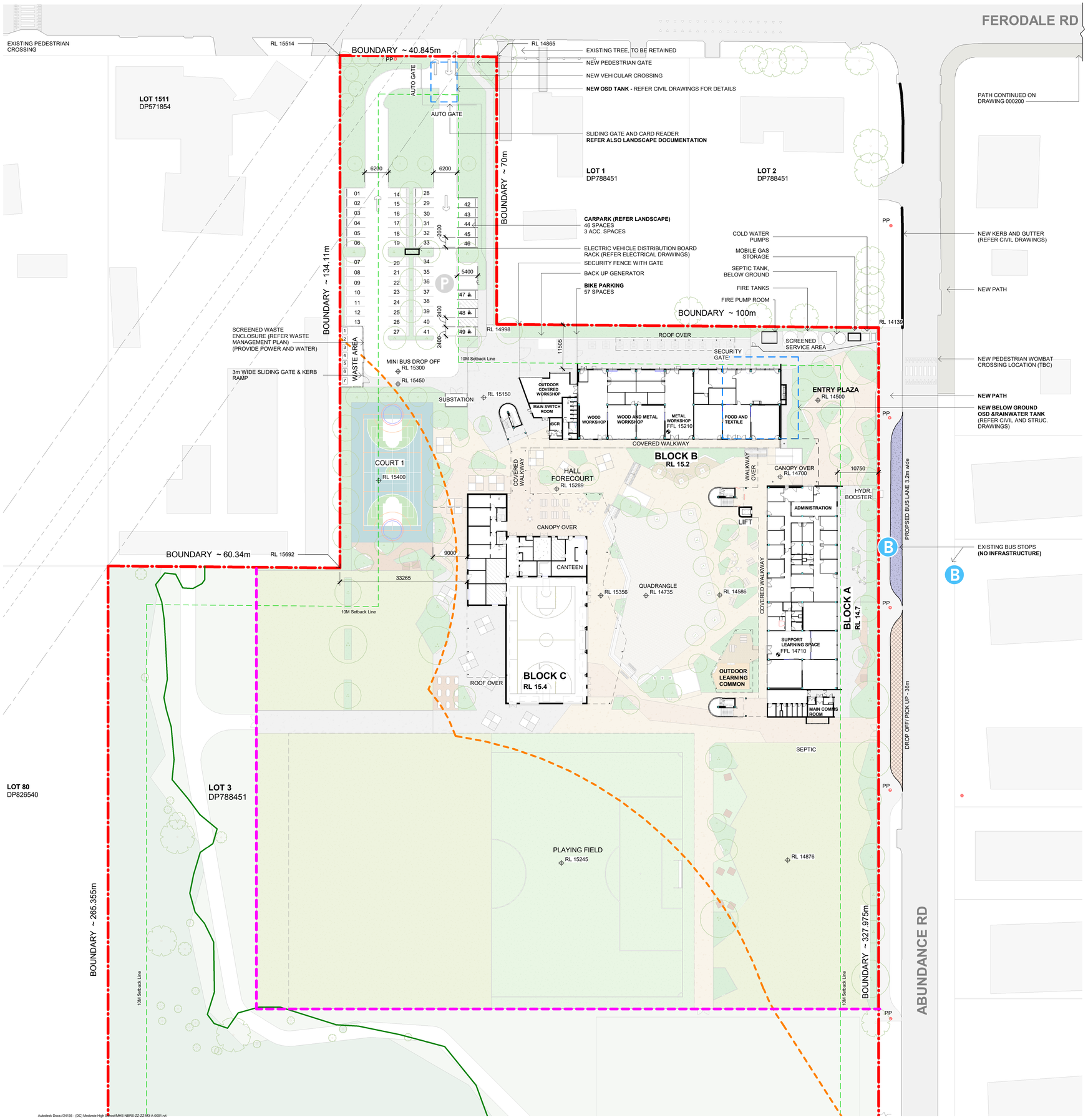
[1] MHS-NBRS-ZZ-ZZ-DR-A-00200 Revision 2, 'Medowie High School Site Plan', NBRS, 20/09/2024.

[2] Ausgrid Feeder Forecast Data, https://dtapr.ausgrid.com.au/ausgrid_data/Feeder%20Forecast.xlsx

Standards and Guides

[3] Published in Health Physics 99(6):818-836; 2010, International Commission on Non-Ionizing Radiation Protection Guidelines, For Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz – 100 kHz), 2010

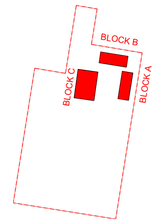
APPENDIX – A: PROJECT LOCATION



NBRS

LEGEND

- BIODIVERSITY VALUE MAP
- FLOOD ZONE BOUNDARY
- 10m SETBACK LINE
- APZ ZONE EXTENT
- INDICATIVE SCHOOL/ FENCING BOUNDARY
- INGROUND OSD TANK
- HV POWER LINES & ASSOCIATED EASEMENT
- PICK UP AND DROP OFF
- BUS ZONE
- B EXISTING BUS BAY
- P CAR PARK
- PP EXISTING POWER POLE



KEY PLAN

SUMMARY OF AREAS

Function	Area	SLU Total	Special Teaching Space Total	Workshop /Labs Totals	Teaching Space Totals
	11 m²	0	0	0	0
AMENITIES	130 m²	0	0	0	0
HS 101 GENERAL LEARNING SPACES	1228 m²	0	0	0	14
HS 101.03 LEARNING COMMONS	345 m²	0	0	0	0
HS 102 GENERAL LEARNING SPACES (SUPPORT)	517 m²	3	0	0	0
HS 201 ADMINISTRATION HUB	369 m²	0	0	0	0
HS 202 STAFF HUB	413 m²	0	0	0	0
HS 203 GYMNASIUM + CANTEEN	977 m²	0	0	0	0
HS 204 LIBRARY HUB	528 m²	0	1	0	0
HS 301 SCIENCE LEARNING HUB	332 m²	0	2	1	0
HS 302 VISUAL ARTS LEARNING HUB	326 m²	0	2	1	0
HS 303 WOOD + METAL TECHNOLOGY LEARNING HUB	608 m²	0	2	2	0
HS 304 FOOD + TEXTILES LEARNING HUB	392 m²	0	2	1	0
HS 305 HEALTH/PE LEARNING HUB	315 m²	0	2	1	0
HS 306 PERFORMING ARTS LEARNING HUB	263 m²	0	2	1	0
HS 401 STUDENT AMENITIES	119 m²	0	0	0	0
HS 402 OTHER STORAGE	46 m²	0	0	0	0
HS 501 OUTDOOR AREAS	191 m²	0	0	0	0
HS CIRCULATION	1167 m²	0	0	0	0
HS SERVICES	468 m²	0	0	0	0
SERVICES	13 m²	0	0	0	0
VER	7 m²	0	0	0	0
Grand total: 218	8766 m²	3	13	7	14

REF

Issue

No.	Date	Description	Chkd
1	2024/11/29	ISSUE FOR DRAFT REF	
2	2025/01/15	DRAFT REF (FINAL ISSUE)	

Changes to this Revision

NBRS
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Jonathan West NSW 9899
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Project
24135 - MEDOWIE HIGH SCHOOL

at
6 Abundance Rd, Medowie NSW 2318

NSW GOVERNMENT Education

Drawing Title
SITE PLAN

Date 15/01/2025 11:44:44 AM
Scale 1:500 @ A1
NBRS Project # 24135
Drawing Reference MHS-NBRS-ZZ-ZZ-DR-A-000201
Revision 2

0 5m 10m 15m 20m 25m 30m 35m 40m 1:500