Electrical Infrastructure Review
Chapmans Rd, Tuncurry Subdivision

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DOCUMENT CONTROL

Version	Date	Author	Reviewer	Revision Details
A	25/01/2024	Andrew Heckendorf	Chris Lever	Initial Issue
B	12/02/2024	Andrew Heckendorf	Chris Lever	Client requested amendments

TABLE OF CONTENTS

1. SCOPE

This report has been prepared by Power Solutions as part of an electrical servicing strategy for the proposed site. The review was commissioned by ADW Johnson Pty Ltd on behalf of Allam Property Group. The intention of this report is to;

- Review Essential Energy's WebGIS systems and Google Streetview records to Investigate the existing network capacity and identify service connection points for electrical & communications
- Review urban development proposed loads and review impact upon existing network capacity and capability
- Provide summary report outlining findings inclusive of; Essential Energy's expected servicing requirements, concept sketch, possible lead in requirements and opinion of costs to meet urban development loads with network
- Obtain respective authority concurrence confirming capacity for development proposal – Via an Essential Energy Preliminary Enquiry Application

2. BACKGROUND

The proposed development location is currently not being utilised and is to be re-developed into community title residential lots. The concept development layout totals approximately 22.5ha, subdividing two lots:

- Lot 100 DP 1286524, 40-80 Chapmans Road, Tuncurry,
- Lot 11 DP 615229, 82 Chapmans Road, Tuncurry.

This report's intent is to determine what electrical infrastructure will need to be installed for supply to 290 dwellings and ancillary community facilities, including 6kW solar unit installation across the development.

Refer to appendix A for the proposed site plan with the existing electrical infrastructure.

3. EXISTING ELECTRICAL AND COMMUNICATIONS NETWORK

230V/415V – Low Voltage Network

From the Essential Energy GIS, there are overhead LV distribution conductors servicing the neighbouring properties from multiple pole mounted substations along Chapmans Road.

Note the capacity of the existing LV network would need to be confirmed during the detailed design phase. However, it is unlikely that the existing LV network can accommodate additional load.

Interconnection with the existing LV will likely be required for redundancy and extension of the MEN (Multiple Earth Neutral) network.

See appendix A for details of existing electrical infrastructure.

11kV – High Voltage Network

Referring to appendix A, the development has access to Essential Energy's high voltage (11kV) network along the southern side of Chapmans Road from feeder TUN3B5.

The site will need to connect into the existing 11kV network to supply the proposed development.

66kV – High Voltage Network

From the Essential Energy GIS, there is one existing 66kV overhead line on the northern side of Chapmans Road. The sub-transmission overhead will remain unaffected by the proposed development, augmentation to the 66kV overhead is unlikely to be required.

See appendix A for details of existing electrical infrastructure.

Communication Network

There is currently a Telstra and NBN network installed along Chapmans Road which can be utilised to service the proposed development.

4. MAXIMUM DEMAND

The maximum demand has been calculated using an After Diversity Maximum Demand (ADMD)* value of 4kVA per residence given its' coastal proximity. This does not include community centre supplies.

Table 1 details the expected low voltage demand of the development.

Project Load Estimate (Residential Lots)			
No of Customers	Maximum Demand		
	Apparent power (kVA)	Phase Current (A)	HV Phase Current (A)
290	1,160	1,681	61

Table 1 - Estimated Site Maximum Demand (Residential Lots)

*Note, Essential Energy does not govern the maximum demand for Community title dwellings, 4kVA is common for coastal regions.

To allow for a solar take up of 50% or greater, additional substation capacity will be required within the development. Assuming 50% and 100% solar take up, the required additional substation capacity has been calculated below.

Project Load Estimate (Residential Lots)			
Solar Take Up	Maximum Demand		
	Apparent power (kVA)	Phase Current (A)	HV Phase Current (A)
50%	870	1,261	46
100%	1,740	2,522	92

Table 2 - Estimated additional capacity for solar installation

Based on the calculations provided in Tables 1 & 2, it is expected that the following substation configurations are likely.

50% solar installation

- 3 x 750kVA padmount substations
- 2 x 1000kVA & 1 x 500kVA padmount substations

100% solar installation

- 3 x 1000kVA & 1 x 315kVA padmount substations (Note, 315kVA substation required for public space supply.)

Please note, substation configuration to be confirmed during detailed design. Note, an additional capacity of approximately 300A for public spaces has been taken into consideration, if additional supply is required, the substations above will require uprating.

EV Charging

To allow for EV charging for each dwelling a larger substation capacity will be required. Given that the proposed development is a +55 seniors living, this report assumes the utilization of 50% EV charging during the day supplied by solar power.

The proposed EV charging capacity for each dwelling is 2kW.

Table 3 details the expect low voltage demand for EV charging.

Project Load Estimate (Residential Lots)			
No of Customers	Maximum Demand		
	Apparent power (kVA)	Phase Current (A)	HV Phase Current (A)
145	290	420	15

Table 3 - Estimated EV Charging Maximum Demand

Based on the calculations provided in Table 3, it is expected that uprating the substations will be sufficient for supply to the development.

Please note, uprated LV infrastructure will likely be required to allow for additional supply to each dwelling.

For any additional moderate to high-speed public EV charging, additional substations will be required. Please note that the permitted substation sizes are 315kVA, 500kVA, 750kVA, 1000kVA & 1500kVA, an appropriate size will need to be installed to accommodate the required EV charging capacity.

For example, a 315kVA substation can supply 12 22kW EV charging units while maintaining substation utilisation under 90% to allow for other ancillary supplies if required (I.e. lighting).

5. DEVELOPMENT SERVICING STRATEGY

Proposed 11kV Network

It is proposed that the development be supplied by underground reticulation, looped into the existing 11kV overhead network along Chapmans Road.

It is anticipated that the development will require multiple padmount substations of varying sizes, this will need to be confirmed during detailed design.

The substations can be connected to the Essential Energy 11kV overhead network along Chapmans Road. Two new underground to overhead (UGOH) poles will be required to facilitate the connections, see appendix B for potential HV routes. The timber poles may need to be replaced to facilitate the 11kV UGOH's.

Note, proposed substation locations and HV layout to be confirmed at detailed design and is dependent upon load requirements.

Substation Design

The kiosk substation must be located on the development lot within a registered easement (nominally 7.0m x 4.2m). No other utilities are permitted within this easement. If the substation is not directly accessible from a dedicated Council roadway, suitable easements are to be provided for Essential Energy to access the substation. Any Essential Energy cables within private land will require a minimum 1m (Low voltage) or 2m (11kV) cable easement as per CEOP8046.

Kiosk substations are not to be installed in intersections and should ideally be located centrally to obtain full utilisation.

Substations require the following clearances:

- 3 metre clearance to any portion of a building unless an appropriate 120/120/120 fire rated barrier protects them, openable or fixed windows or glass blockwork. Any meter, regulator or exposed pipe work associated with the reticulation of gas and any portion of an area which may be used for storage of combustible material must be sheltered by a non-ignitable blast-resisting barrier.

- 5 metre clearance to open stormwater drainage pits and 40 metre clearance to waterways and drainage basins.

- 6 metre clearance to building ventilation system air intake and exhaust duct openings (openable windows to one building compartment are not regarded as ventilation openings)

Proposed LV Network

The proposed internal LV network is to be privately owned and to be confirmed during the reticulation design.

An LV interconnection (owned by Essential Energy) from each substation is to be installed between the existing LV network along Chapmans Road for the purposes of electrical earthing.

11kV upstream augmentation

It is not anticipated that any upstream high voltage (11kV) network upgrades will be required to facilitate this connection.

This will need to be confirmed by Essential Energy, existing loading based on Essential Energy's Estimated Network Capacity Map and may not reflect current network loading.

Please note, we do not have access to proposed loads that may currently be in application phase with Essential Energy.

To formally confirm the final scope of works required to service the site, we recommend submitting a preliminary enquiry to Essential Energy.

6. EXPECTED COSTS

A contestable design process will be required to complete the electrical works. An estimate of fees for this process is outlined below:

ASP3 Design Costs:

The design can be completed in a single stage or as multiple stages, approximate cost breakdown for works completed in various numbers of stages is provided below.

Single stage: ~$20,000 - $25,000 (Pending Essential Energy and client requirements)

Two stages: ~$30,000 - $35,000 (Pending Essential Energy and client requirements)

Three stages: ~$40,000 - $45,000 (Pending Essential Energy and client requirements)

Private Electrical Design Costs: ~$8,000 - $15,000 per stage (Pending staging and servicing requirements)

ASP1 Construction Estimate:

- Substation Installation:
  - 3 x padmount substations: $570,000 +/- 20%, or
  - 4 x padmount substations: $720,000 +/- 20%
- HV Network (Inc. UGOH's, Trenching & Conduit): $260,000 +/- 20%
- LV Network (Inc. UGOH's & Conduit): $130,000 +/- 20%*

*Note, this does not include the internal private LV electrical reticulation.

ASP2 Construction Estimate: $750,000 +/- 40%

Please note, internal private LV reticulation is subject to staging and site requirements, construction costs are high level approximations only.

Essential Energy Services Fees:

- Design Services / Certification: $4,000 +/- 20% per stage
- Construction Services Fees: $30,000 +/- 20% per stage

Note that the expected cost for the HV & LV network is an approximation only, cable routes to be confirmed during detailed design.

All construction costs are indicative only, pricing will need to be confirmed by an ASP/1 contractor.

7. CONCLUSION

The proposed development is anticipated to require three to five padmount substations of varying sizes pending site requirements in relation to solar and EV charging, this is to be determined during the detailed design. Two 11kV UGOH's will be required to extend the HV network into the development site, the UGOH poles may need to be replaced with stronger and taller poles to facilitate the new connection, to be confirmed in the detailed design.

There is an existing communication network sufficient for connection to the Telstra and NBN service along the development frontage. A connection at the Northern extents of the development can be installed to service the proposed development.

The proposed electrical works can be implemented in a single design, with energisation of all equipment occurring simultaneously – or split into stages, with one energisation per design.

Upgrades to Essential Energy's High Voltage (11kV) network are not anticipated, but this will need to be confirmed via an Essential Energy preliminary enquiry.

Please note, site environmental impacts unknown. Essential Energy to confirm impacts on Flora and Fauna, heritage, aboriginal heritage and bushfire land in their design information package (DIP).

To formally confirm the final scope of works required to service the site, we recommend submitting a preliminary enquiry to Essential Energy.

APPENDIX A – EXISTING ESSENTIAL ENERGY INFRASTRUCTURE

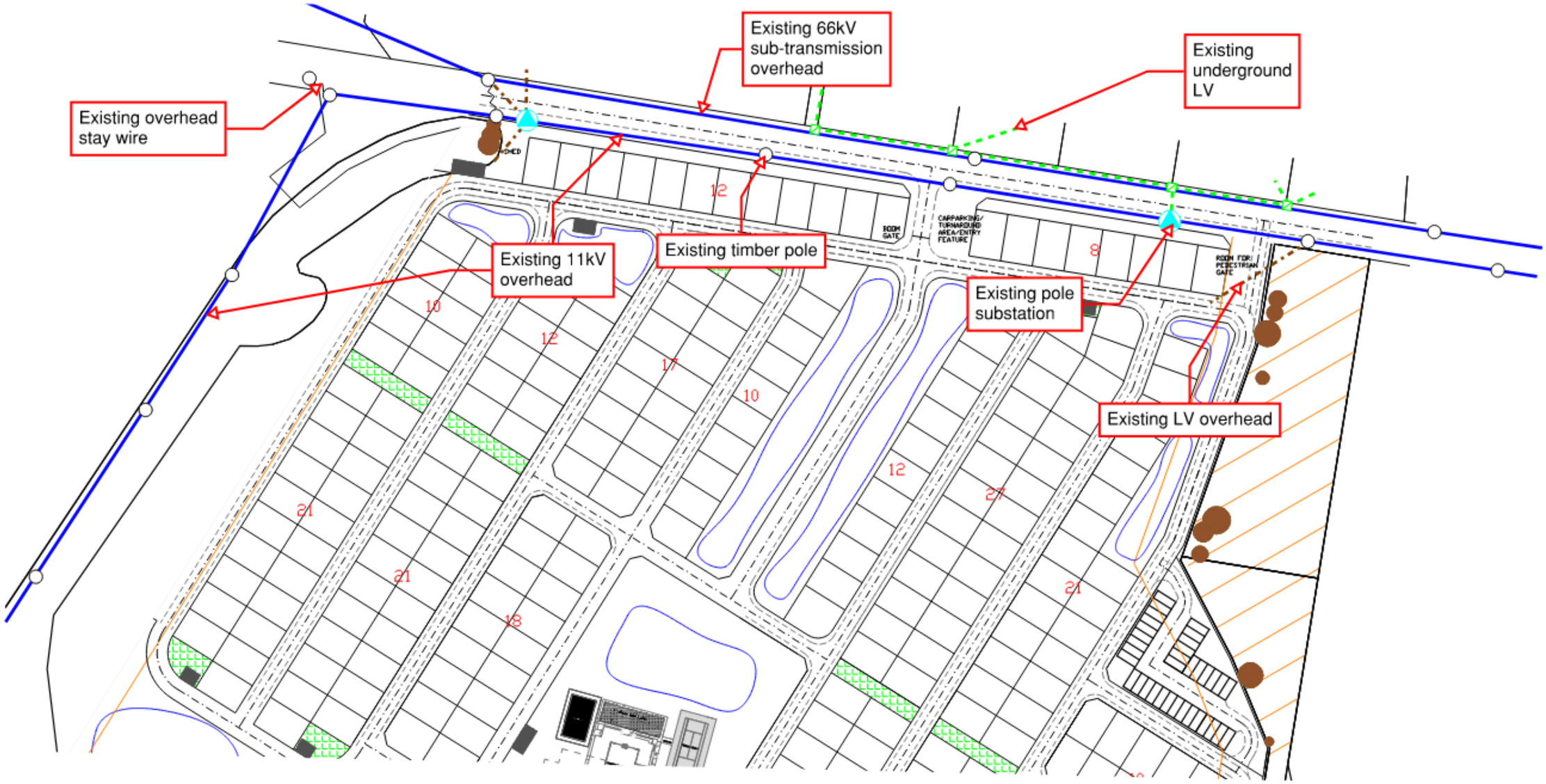

Figure 1 - Existing Essential Energy Infrastructure

APPENDIX B – PROPOSED ESSENTIAL ENERGY INFRASTRUCTURE

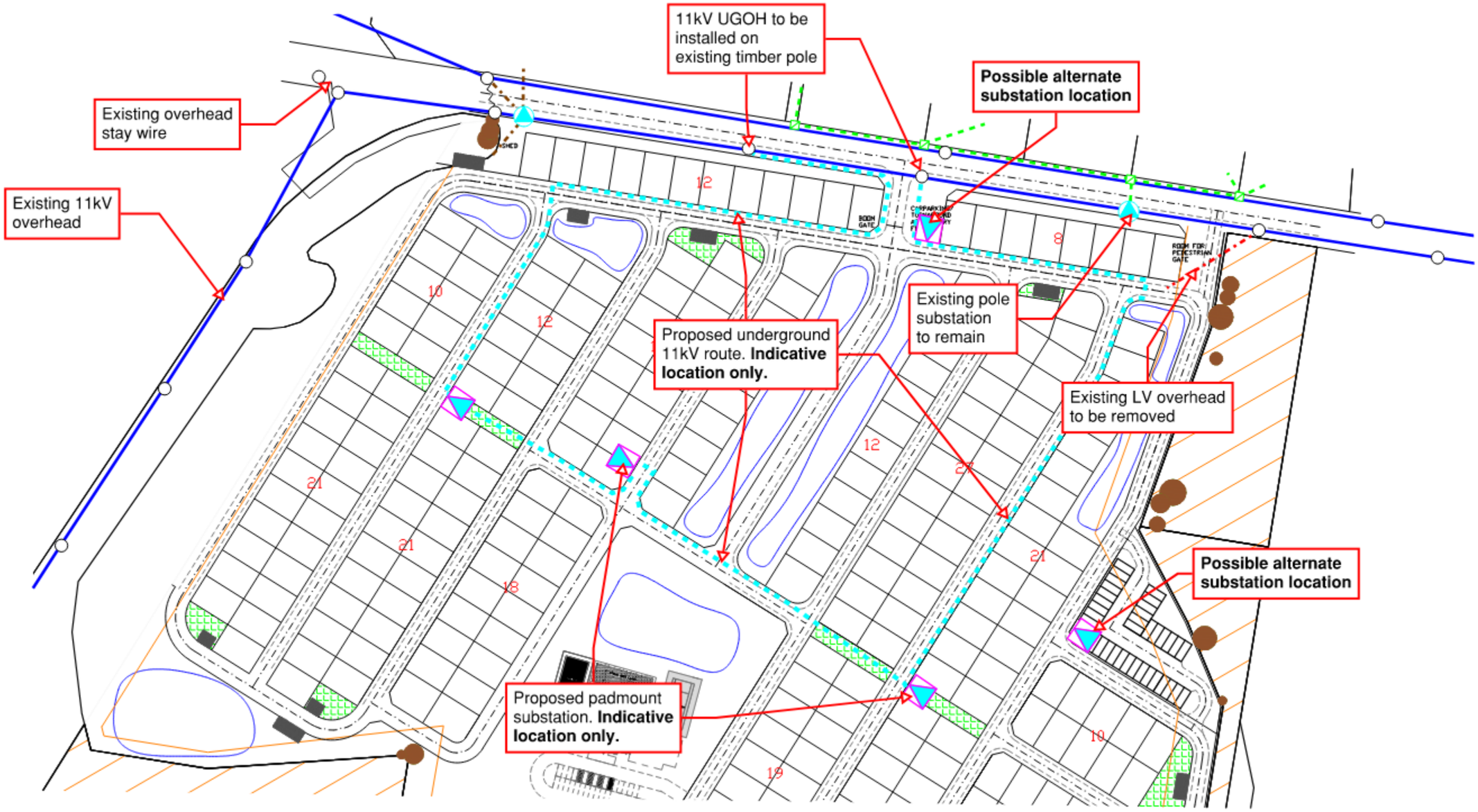

Figure 2 - Proposed Essential Energy Infrastructure

Note, proposed substation locations and HV layout to be confirmed at detailed design and is dependent upon load requirements and development staging.