



Pukekohe North Substation

Infrastructure Design Report

21007-RPT-01/ Revision 1.0 / 2-Sep-2021

INSPIRED. AGILE. GENUINE.

Document history and status

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1.0	3/09/21	SRG	SD/AW	SRG	Consent

Revision details

Revision	Details
1.0	For consent

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1. Introduction

This summary report covers the civil site considerations for the development of a substation at 8 Whangapouri Road, Karaka. The proposed works is for a 110kV outdoor air-insulated switchgear switchyard, a 22kV switchroom and outdoor power transformers.

Counties Energy are allowing for the development of increased load in the area north of Pukekohe and the requirement to expand their 110 kV and 22kV networks. The site will be supplied from Counties Energy's proposed Quarry Road 110kV substation.

8 Whangapouri Road has been considered for development of a new substation to provide a suitable site for the development of a substation. A concept design of the substation layout has been determined, which will be subject to change, which provides an indication of size, earthworks, infrastructure needs and to inform the planning for the site.

The conceptual layout can be found in Appendix 1.

1.1 Summary of Site Works

The proposed works for the substation at 8 Whangapouri Road:

- Subdivision 8 Whangapouri Road of the approximate 1.07 hectare site, into 0.68HA and 0.39HA lots for the substation and residential sites respectively
- Relocation of second dwelling on the site to the newly developed residential lot, including services.
- Approximately 2500m³ of earthworks over an area of approximately 5800m², predominantly to form a level platform for the substation yard.
- Construction of a 110kV switchyard comprising primary switchgear, transformers plus associated concrete foundation pads and steel stands.
- Construction of a 22kV switchroom building, to house 22kV GIS switchgear, plus associated protection, control and ancillary panels.
- Civil site works such as earthworks, stormwater drainage, wastewater drainage and driveways.
- Fencing of the full site

1.2 Site Location & Description

The location of the proposed substation is 8 Whangapouri Road, Karaka. A 1.07HA lot on the northeast corner of Whangapouri Road and Karaka Road (SH22).



Figure 1.2.1 : 8 Whangapouri Road – Auckland GIS Aerial View

The site is currently a residential lifestyle block, with two residential dwellings on it and several sheds and greenhouses. The site gently falls from the southeast corner towards the northwest and is typically covered in lawn and has a developed trees in the southeast corner of the site.

1.3 Proposed Site Layout & Design

1.3.1 Subdivision

The site will be subdivided to allow for the substation and retain the residential property on the eastern side of site.

The subdivision will create a 0.68HA lot for the substation on the west side of the site, and the residual 0.39HA on the west side of the site retained for the existing residence. A right of way for access and utilities will be created at the north side of the site for the residential lot.

A scheme plan for the development has been created by survey firm Envivo and is the appendices.



Figure 1.3.1 : Proposed Scheme Plan

1.3.2 Site Layout

As noted above the site will be split into an existing residential site and the new substation.

The site has two requirements for setback from Karaka Road, which is the New Zealand Transport Agency (NZTA) controlled SH22. The first setback is a 5m wide designation along the northern boundary and the second is a development restriction of a further 20m. Both the substation and residential layouts will encroach into the 20m development restriction.

Residential Site

The main dwelling and sheds will remain unchanged. The minor dwelling, and associated garage, currently in the middle of the site will be relocated to the southwest side of the site.

A new driveway will be created on the north side of the site which will also provide a corridor for power and communications to the lot.

Substation

A concept substation has been considered for the purposes of the site infrastructure and planning purposes. The concept will be subject to change and will be determined at later stage.

A summary of the concept development is for:

- A 19m long by 7.5m wide, 4.5m high, concrete switchroom building along the front southern boundary.
- 12-15m high gantries placed in the middle of the site for the incoming 110kV lines*.

- 8-10m high bus works and equipment structures in the middle of the site, on concrete foundations.
- 2-3 110kV transformers at the rear of the site on concrete foundations, with fire and bund walls.

* 110kV cabling or overhead lines coming into or distributed from the site are not dealt with in this report.

1.4 Significant Design Considerations

The current site will be subdivided into a residential lot and a large substation.

The site has two requirements for setback from Karaka Road, which is New Zealand Transport Agency (NZTA) controlled SH22.

There is a minor overland flow path indicated on the Auckland GIS maps to the northwest corner. This is not considered significant and will not affect the site development.

2. Concept Substation Yard & Building

The following is the conceptual substation development to aid the planning for the site.

The substation will have incoming 110kV lines landing onto a 12-15m high gantry structures in the middle of the site. The 110kV lines will be dropped onto a series of 5m high 110kV circuits. These will be connected to a 110/22kV power transformers to the rear, or north side of the site via a main longitudinal strung busbar, comprising 10m high gantry structures in the centre of the site.

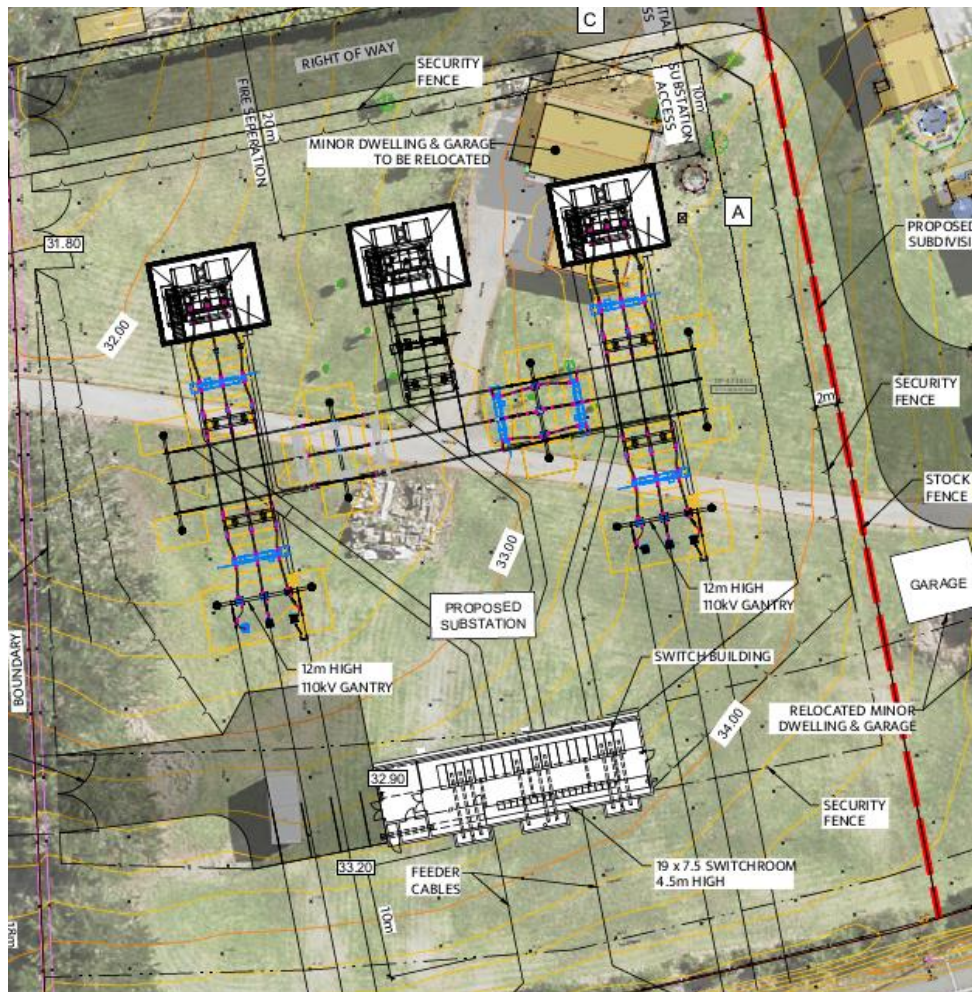


Figure 2.1: Concept Substation Layout

The 22kV switchroom will be built at the front, or south side, of the site.

2.1 Switchroom Building

The switchroom building will be at the front of the substation site, with the substation yard equipment behind. This is similar to the Counties Energy substation at Tuakau, see street view image below:



Figure 2.1.1 : Example substation view from road – Tuakau Substation

The building will house:

- 22kV switchgear
- Protection/control panels
- Ripple plant
- Ante room
- Toilet.

The building will be a precast concrete structure, approximately 19m long by 7.5m wide, with a full basement. The building will be very similar to the Counties Energy Waiuku Substation switchroom.

3. Three Waters

3.1 Stormwater

3.1.1 Stormwater Discharge

It is proposed that a rainwater from the site pavements and roofs will be discharged to individual soakage systems across the site, as has the existing site development. The geotechnical investigations has indicated poor soakage soils, and further investigations will be needed.

A possible solution may be the use of soakage fields, with suitable storage to provide hydraulic neutrality, and overflow discharge to the road drains. Approval from Auckland Transport will be required for the discharge to the road drains.

3.1.2 Site Coverage

The site will now be broken into two sites and the impermeable areas are as follows.

Lot A – Residential Site Coverage – 3874m²

Name	m ²	Percentage of Area
Existing site coverage (driveways & roofs)	517	13.3%
New site coverage (driveways & roofs)(including deductions)	214	5.5%
TOTAL	731	18.9%

Lot B – Substation Coverage – 6847m²

Name	m ²	Percentage of Area
Existing site coverage (driveways & roofs)	416	6.1%
New site coverage (driveways & roofs)(including deductions)	996	14.5%
TOTAL	1412	20.5%

Total overall site coverage of the 10,721m² site will be 20%. The overall increase in impervious areas is not significant and would be less than any residential redevelopment at the property.

3.1.3 Stormwater Treatment

No proposed stormwater treatment is proposed for the sites. The stormwater will be ‘detained’ as part of the soakage systems and there is not expected to be any increased stormwater flows from the site.

No stormwater treatment system is proposed for the driveways or carpark areas. The site will have very little traffic, with likely traffic count of 4 vehicles a week for the substation.

3.1.4 Transformer Oil Management

The transformers on the site will each contain approximately 27,000-30,000 litres of oil. It is proposed to provide bunding around the transformers which will provide emergency containment of the volume of oil, plus either 10% extra oil and a contingency for rain or fire-fighting water. The rainwater from the transformer bunded area will be reticulated through a proprietary oil plate separator during normal operation.

3.1.5 Flooding & Overland Flow Paths

Auckland Council GIS maps do not indicate any flooding risk at the site, but do indicate a minor overland flow path (OLFP) exiting the site from the north west corner, see figure below.



Figure 3.1.5 : Auckland GIS Flood Risk & OLFP – indicating a flowpath from the site on NW corner

A walk over assessment of the site has been carried out by a civil engineer and there is little risk of global or local flooding.

The overland flowpath indicated on the northwest side of the site will not be affected by the development works. The installation of a driveway along the northern boundary will likely direct the overland flowpath away from the neighbouring property and onto Whangapouri Road, which will have no negative effects on the downstream receiving environment.

3.2 Wastewater

The site is rural and has no public wastewater system and onsite disposal systems will be adopted.

3.2.1 Residential Site

It is proposed to relocate the existing Biolytix wastewater system that currently serves the property, located near the existing minor dwelling, to the southeast corner. The existing discharge trench, approximately 100m long, will be replicated within the new site boundaries for the house units.

3.2.2 Substation

A single toilet will be installed in the substation building and will have very infrequent use. Due to the infrequent use and low flow a septic storage tank will be installed which will be emptied periodically. A septic system is not suitable as it is reliant on ongoing flows to keep it functional.

3.3 Waste Supply

The site is rural and has no public water supply is available and rainwater tanks will be adopted for the substation.

3.3.1 Residential Site

The existing main dwelling has its own water bore and pumped water supply.

The relocated minor dwelling be connected back to the supplied water bore system.

3.3.2 Substation

Rainwater tanks, supplied from the roof of the switchroom, will be used for site water supply via a booster pump system.

4. Site Access

4.1 Vehicle Crossings

The existing single access way from Whangapouri Road will be removed as part of the site development and three new crossings will be installed.

The crossings will be:

4.1.1 Residential Site

Crossing will be installed to the northwest side of the site, for access to the two house sites to the east side of the site. The vehicle crossing is to meet Auckland Transport GD020B-1B for rural crossings, with gates set back 13m from the edge of road.

The volume of traffic for the crossing will be that of a two-household lot and will not be significant.

4.1.2 Substation main access

Crossing will be installed 18-25m from the intersection with SH22. The vehicle crossing is to meet Auckland Transport GD020B-1B for rural crossings, with gates set back 13m from the edge of road. During operation of the substation the crossing will only see 2-4 vehicles per week.

4.1.3 Substation maintenance access

Crossing will be installed at the middle of the site for maintenance access. The crossing will be installed for intermittent access for maintenance and will need to be sized to allow for large vehicles. The vehicle crossing will only be used in infrequently.

Generally the site development will see a negligible increase in traffic volumes to Whangapouri Road.

4.2 Access Driveway – Residential Lot

A 3.5m wide asphalt driveway will be installed along the northern boundary of the site for the access to the residential lot.

4.3 Access & Carparking

The main substation access will be a sealed pavement area and parking for four maintenance vehicles.

5. EARTHWORKS & SOIL CONDITIONS

5.1 Soil & Geotechnical Conditions

A geotechnical investigation for the site has been carried out by Coffey Geotechnics, and report dated 30 August 2021 and appended to this report.

The site is suitable for development as a substation, with no particular areas of concern.

No significant earthquake or liquefaction risks was identified at the site.

5.2 Soil Contamination

A contamination investigation (DSI) for the site has been carried out by Geosciences Ltd, and report dated 3 August 2021, and appended to this report.

The investigation has indicated an area with high levels of arsenic, which are at levels that may be hazardous to human health, shown in the figure below:



Figure 5.2.1 : Area of site requiring soil remediation

A site remediation plan, including additional testing, will be required due to the arsenic found on site. A resource consent for earthworks, under the National Environmental Standards (NES), will be required for the works.

The relocation of the existing septic tank will require that the soil around the tank be tested and likely disposed of at managed landfill site.

5.3 Earthworks

The proposed earth works at the site will be related to site clearance, construction of level yard platform, excavation for driveways, foundations and buildings.

The earthworks

Cut to fill	550 m3
Cut to waste	2000 m3
Imported Fill	700 m3
Area of earthworks	5750 m2

Extent of earthworks are shown in the figure below:

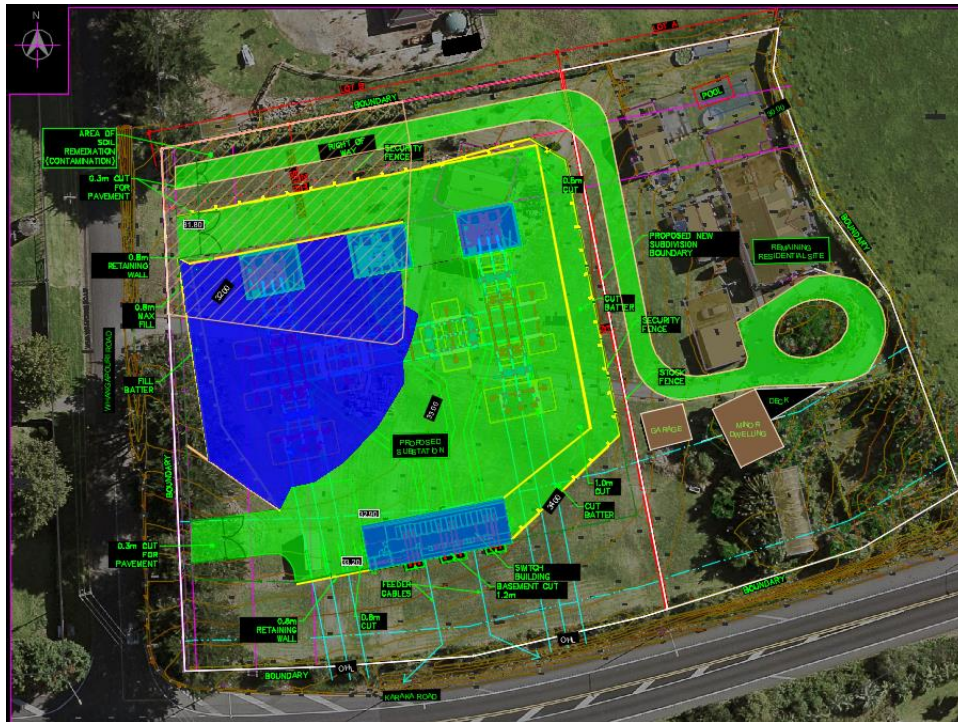


Figure 5.3.1 : Area likely earthworks

5.4 Silt & Sediment Control

Due to the size of the site and extent of the earthworks a specific silt and sediment plan (ESCP) will be required.

Due to the conceptual nature of design a specific ESCP will be developed during the future stages of the project.

6. Other Considerations

6.1 Acoustics

An acoustic assessment for the site has not been developed due to the early stages of the design. The transformers will be placed approximately 30m from the neighbouring road behind and 20m to the existing residential house on the site. There will only be minimal noise effect from the site. An acoustic wall may be needed between the transformer on the eastern side, between it and the existing dwelling on the site.

A full acoustic assessment will be produced during the detailed design of the site.

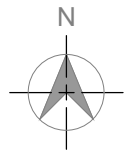
6.2 Fire Engineering

The concept design has considered that that the transformers require to be 20m from any boundary or dwelling.

7. Appendices

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Appendix 1. Concept Site Plans



- NOTES
- 1. SURVEY COMPLETED BY ENVIVO ON JULY 2021
 - 2. COORDINATES ARE IN TERMS OF NZGD 2000 DATUM, MOUNT EDEN 2000 CIRCUIT.
 - 3. LEVELS ARE IN TERMS OF AUCKLAND VERTICAL DATUM 1946 (MSL)

SITE AREA

EXISTING PROPERTY AREA: APPROX
10,720m²

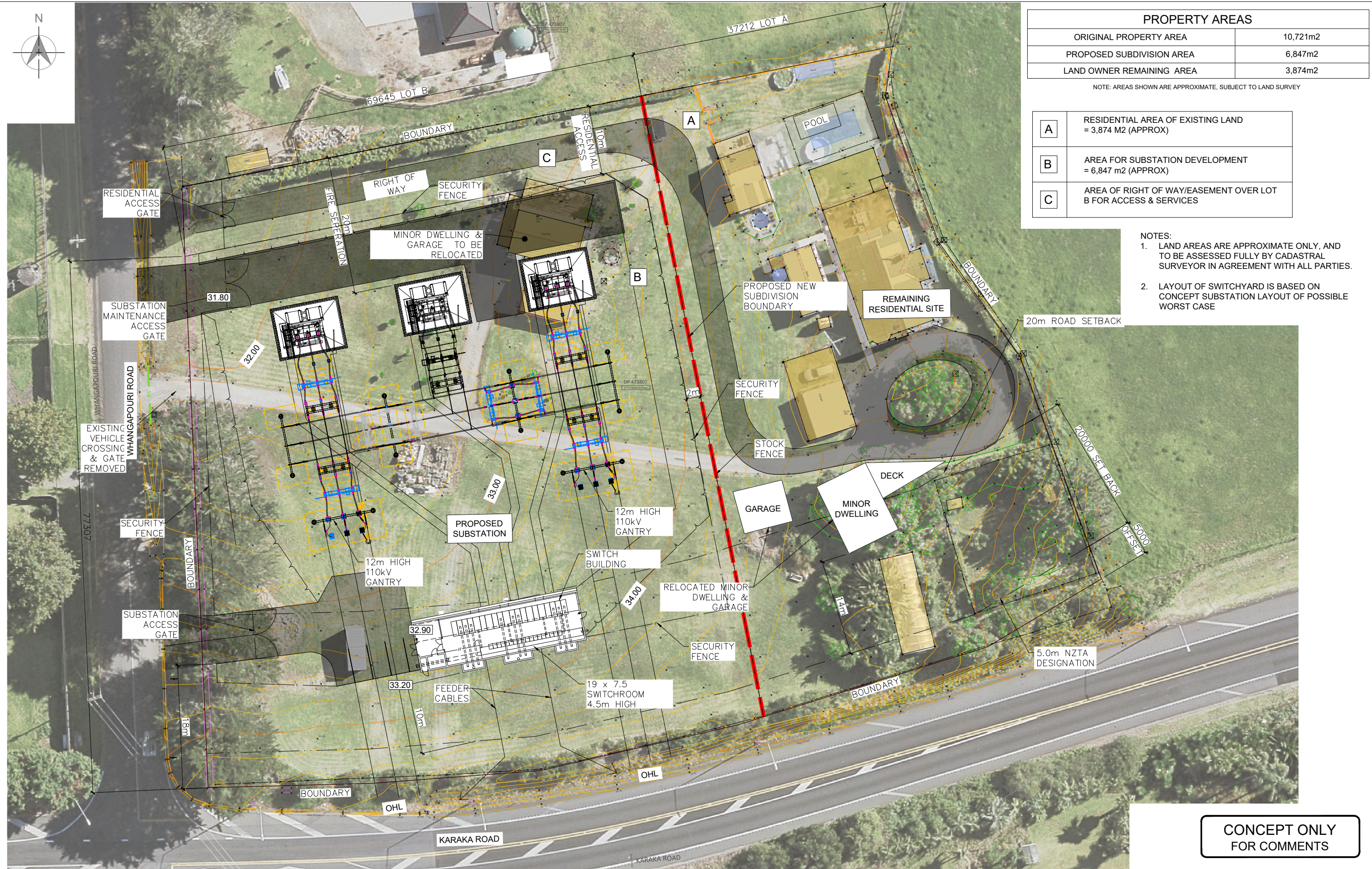
CONCEPT ONLY
FOR COMMENTS

REV	DESCRIPTION	DSN	DATE	APP	REV	DESCRIPTION	DSN	DATE	APP	DRAWN	
1	ISSUED FOR APPROVAL	CA		SG						DESIGNED	
										CHECKED	
										RECOMND	
										APPROVED	
										© COUNTIES ENERGY LIMITED 2021	



ZONE SUBSTATION
PUKEKOHE NORTH CONCEPT EXISTING SITE PLAN

SIZE	SCALE	FOLDER
A1	AS SHOWN	
PUKNTH-SK1		1
FILE NAME: PUKNTH-SK1.dwg		



PROPERTY AREAS	
ORIGINAL PROPERTY AREA	10,721m ²
PROPOSED SUBDIVISION AREA	6,847m ²
LAND OWNER REMAINING AREA	3,874m ²

NOTE: AREAS SHOWN ARE APPROXIMATE, SUBJECT TO LAND SURVEY

A	RESIDENTIAL AREA OF EXISTING LAND = 3,874 M2 (APPROX)
B	AREA FOR SUBSTATION DEVELOPMENT = 6,847 m2 (APPROX)
C	AREA OF RIGHT OF WAY/EASEMENT OVER LOT B FOR ACCESS & SERVICES

- NOTES:
- LAND AREAS ARE APPROXIMATE ONLY, AND TO BE ASSESSED FULLY BY CADASTRAL SURVEYOR IN AGREEMENT WITH ALL PARTIES.
 - LAYOUT OF SWITCHYARD IS BASED ON CONCEPT SUBSTATION LAYOUT OF POSSIBLE WORST CASE

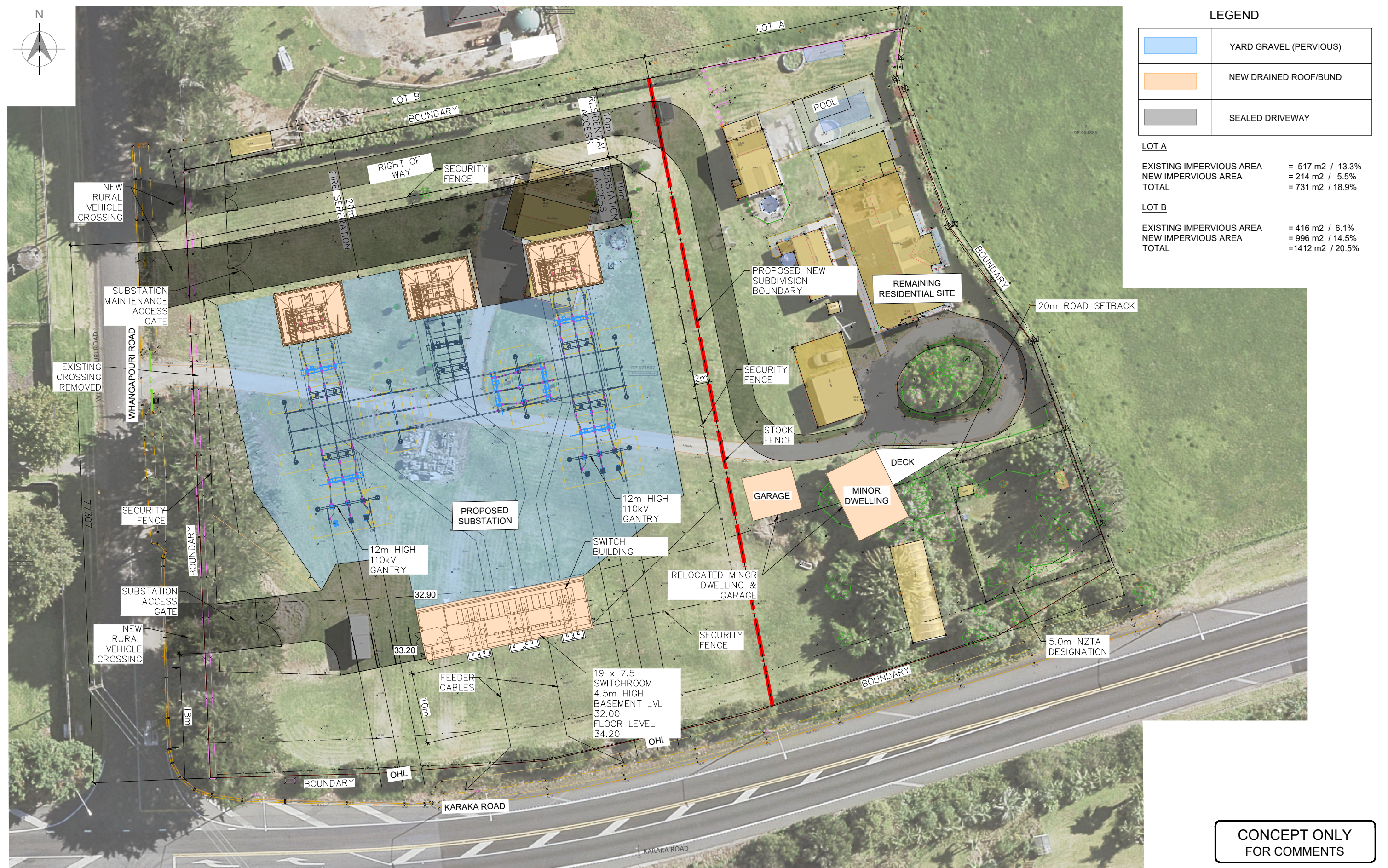
CONCEPT ONLY
FOR COMMENTS

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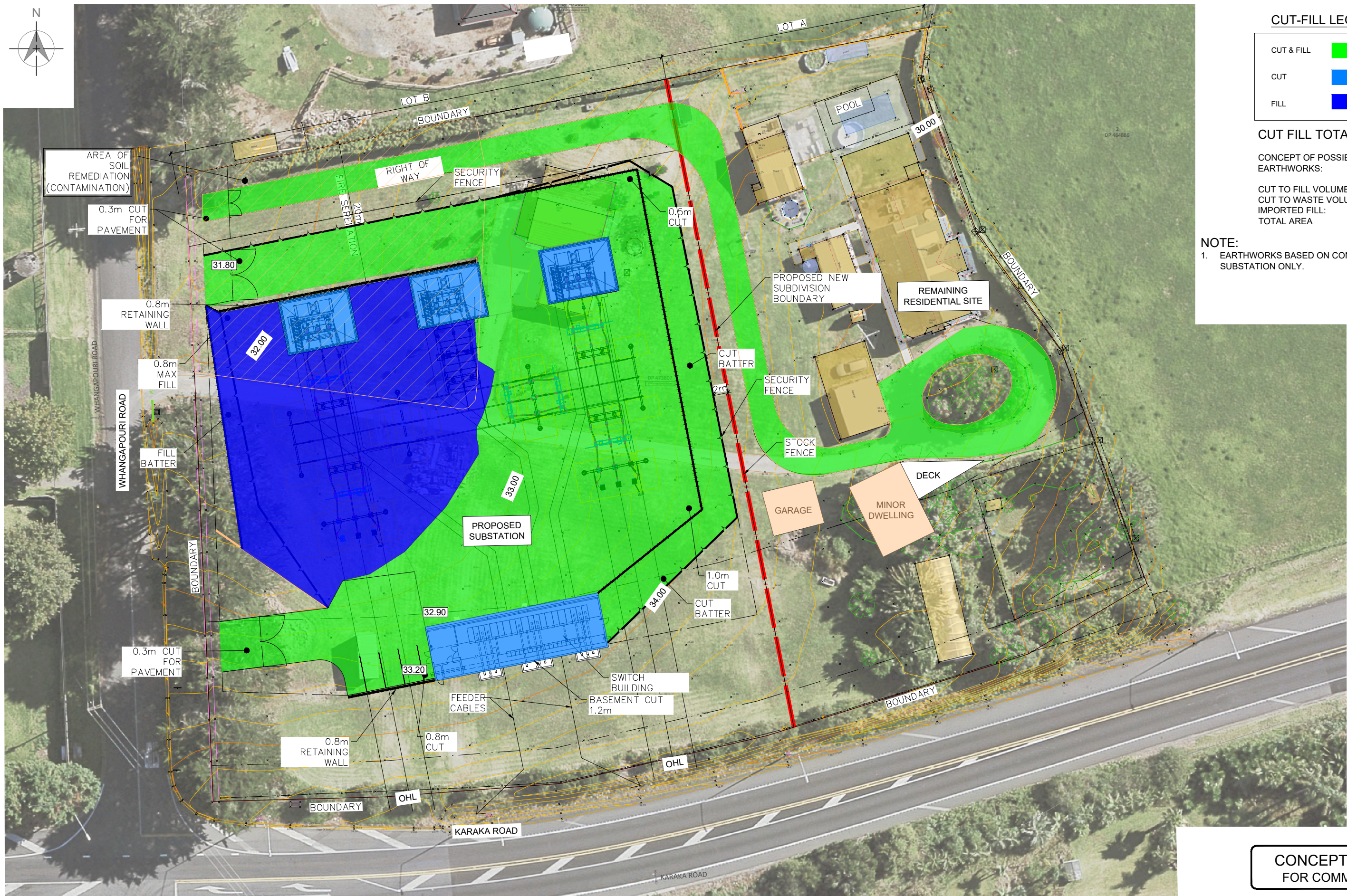
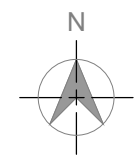


ZONE SUBSTATION
PUKEKOHE NORTH CONCEPT
PROPOSED CONCEPT SUBSTATION LAYOUT

SIZE	SCALE	FOLDER
A1	AS SHOWN	
PUKNTH-SK2		1
FILE NAME: PUKNTH-SK2.dwg		



SIZE	SCALE	FOLDER
A1	AS SHOWN	
PUKNTH-SK3		1
FILE NAME PUKNTH-SK3.dwg		



CUT-FILL LEGEND

CUT & FILL	<div></div>
CUT	<div></div>
FILL	<div></div>

CUT FILL TOTALS: (APPROX)

CONCEPT OF POSSIBLE EARTHWORKS:	
CUT TO FILL VOLUME:	550 m ³
CUT TO WASTE VOLUME:	2000 m ³
IMPORTED FILL:	700 m ³
TOTAL AREA	5750m ²

NOTE:
1. EARTHWORKS BASED ON CONCEPT SUBSTATION ONLY.

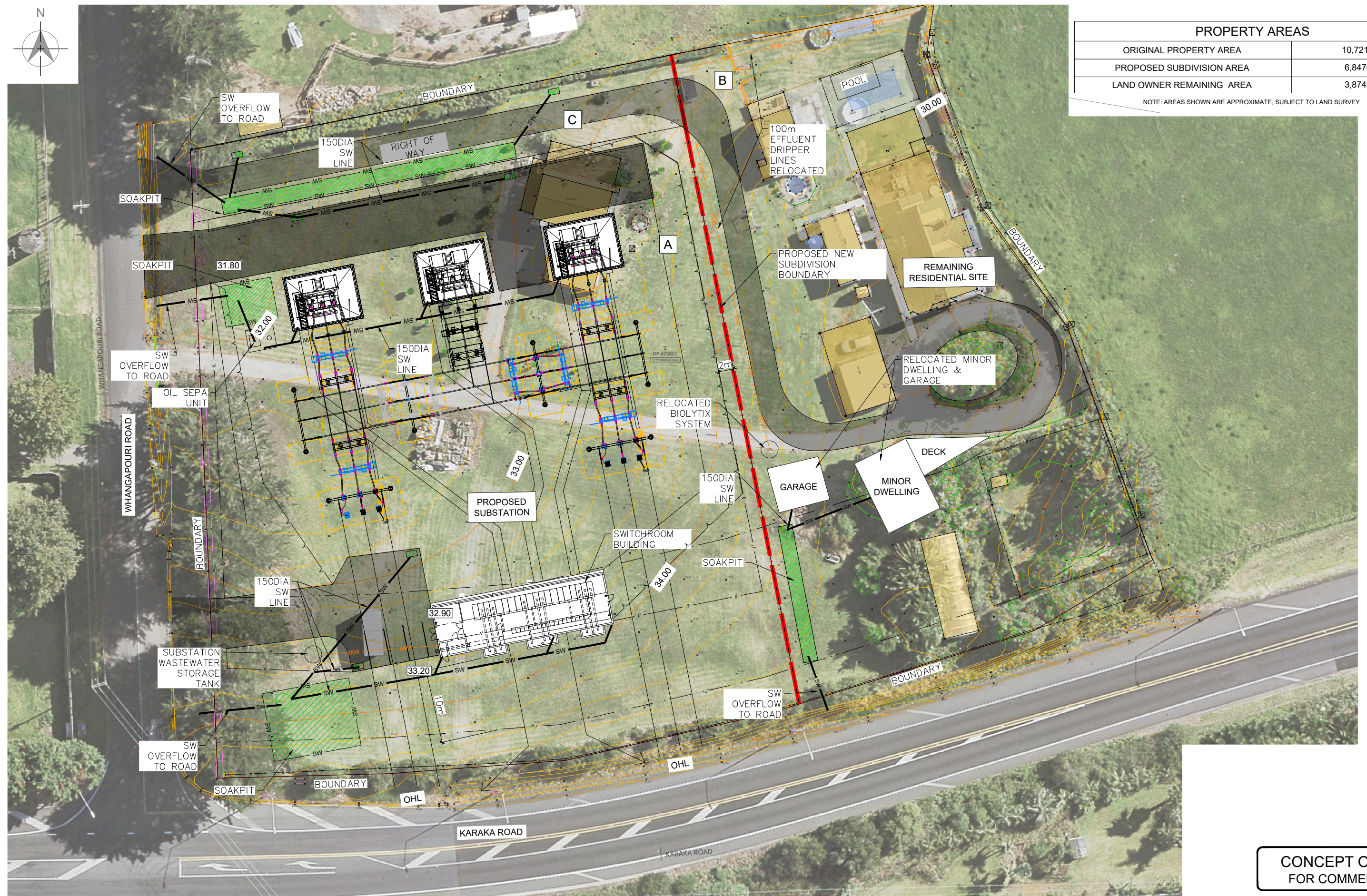
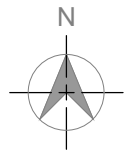
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FOR COMMENTS

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										APPROVED	
										© COUNTIES ENERGY LIMITED	2021



ZONE SUBSTATION
PUKEKOHE NORTH CONCEPT
CONCEPT EARTHWORKS PLAN

SIZE	SCALE	FOLDER
A1	NTS	
PUKNTH-SK4		1
FILE NAME: PUKNTH-SK4.dwg		



PROPERTY AREAS

ORIGINAL PROPERTY AREA	10,721m ²
PROPOSED SUBDIVISION AREA	6,847m ²
LAND OWNER REMAINING AREA	3,874m ²

NOTE: AREAS SHOWN ARE APPROXIMATE, SUBJECT TO LAND SURVEY

CONCEPT ONLY
FOR COMMENTS

REV	DESCRIPTION	DSN	DATE	APP	REV	DESCRIPTION	DSN	DATE	APP	DRAWN	
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										APPROVED	
										© COUNTIES ENERGY LIMITED 2021	

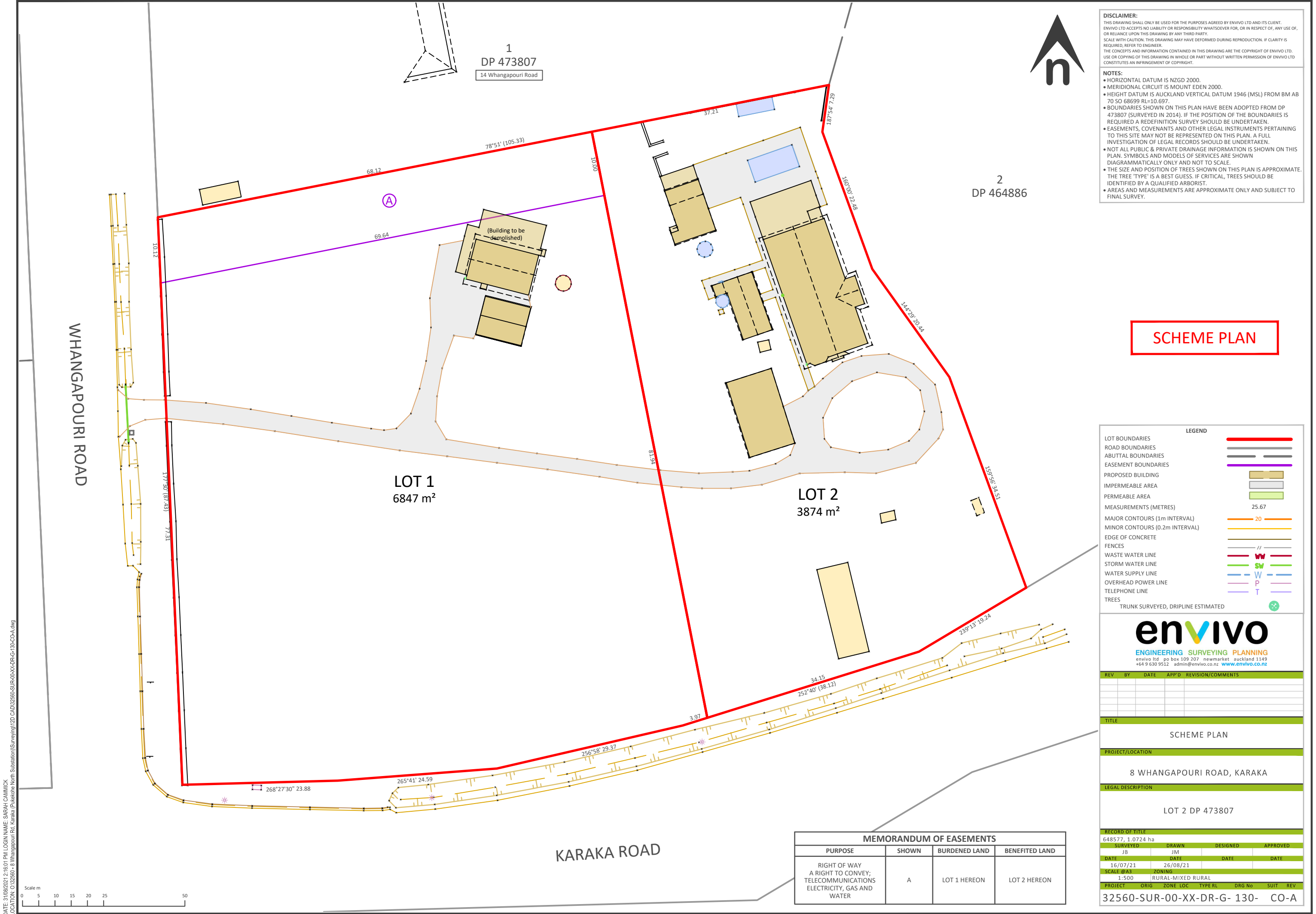


ZONE SUBSTATION

PUKEKOHE NORTH CONCEPT
CONCEPT DRAINAGE PLAN

SIZE	SCALE	FOLDER
A1	NTS	
PUKNTH-SK5 1		
FILE NAME: PUKNTH-SK5.dwg		

Appendix 2. Subdivision Scheme Plan



DATE: 31/08/2024 2:46:01 PM LOGIN NAME: SARAH CAMMICK
LOCATION: C:\2560-8 Whangapouri Rd, Karaka (Palakara North Substation)\Surveying\2D CAD\2560-SUR-00-XX-DR-G-130-CO-A.dwg

Appendix 3. Geotechnical Report

Appendix 4. Contamination Report