

Review of Environmental Factors

Kings Forest Zone Substation

A component of the Kings Forest High Voltage Supply Project

17 July 2024

Project No. 794004

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Draft01	Draft prepared for Essential Energy's Environmental Services review.
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Acronyms and Abbreviations

AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ADSS	All-dielectric self-supporting. A type of fibre optic cable which is nonconductive, self-supporting and is capable of being erected under tension between supports.
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASS	Acid Sulfate Soils
AASS	Actual Acid Sulfate Soils
AEMO	Australian Energy Market Operator
BDAR	Biodiversity Development Assessment Report
CEMP	Construction Environmental Management Plan
Consequence	The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain.
dB(A)	Decibels (A) weighted
DCCEEW (Cth)	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DCCEEW (NSW)	Department of Climate Change, Energy, the Environment and Water (New South Wales)
DPHI	Department of Planning, Housing and Infrastructure
DPE	Department of Planning and Environment (Former NSW Government Department)
DP	Deposited Plan
EMF	Electric and Magnetic Fields
Environmental Aspect	Any element of an organisation's activities, products or services that can interact with the environment.
Environmental Impact	Any change in the environment whether adverse or beneficial, wholly or partially resulting from organisation activities, products or services.
EPA	Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Reg	<i>Environmental Planning and Assessment Regulation 2021</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPIs	Environmental Planning Instruments
ES Act	<i>Electricity Supply Act 1995</i>
ESD	Ecologically Sustainable Development

EWP	Elevated Work Platforms
FSC	Field Service Centre (Essential Energy)
FM Act	<i>Fisheries Management Act 1994</i>
GHG	Greenhouse Gas
Ha	Hectare
IPC	Independent Planning Commission
kV	Kilovolts
LALC	Local Aboriginal Land Council
Likelihood	A qualitative description of probability or frequency
LEP	Local Environmental Plan
LG Act	<i>Local Government Act 1993</i>
LGA	Local Government Area
mG	Milligauss
MVA	Mega Volt Amps
NES	National Environmental Significance
NO_x	Oxides of Nitrogen
NPW Act	<i>National Parks and Wildlife Act 1974</i>
PASS	Potential Acid Sulfate Soils
pHF	Field pH
pHFOX	Field pH peroxide test
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
REF	Review of Environmental Factors
RF Act	<i>Rural Fires Act 1997</i>
Roads Act	<i>Roads Act 1993</i>
RMS	Roads and Maritime Service
SCADA	Supervisory control and data acquisition. A computer-based system for gathering and analysing real-time data to monitor and control equipment that deals with critical and time-sensitive materials or events.
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
SHR	State Heritage Register
SIS	Species Impact Statement
SWMP	Soil and Water Management Plan

T&I SEPP	<i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i>
WM Act	<i>Water Management Act 2000</i>
WM General Reg	<i>Water Management (General) Regulations 2018</i>

Review of Environmental Factors Approval Form

REF name	Kings Forest Zone Substation
Project Number	794004
REF prepared by	Nathan Hegerty
Title	Environmental Senior Specialist
Qualifications	Bachelor of Environmental Science (Management) Master of Environmental Law
Proponent Name	Essential Energy
Proponent Address	8 Buller St Port Macquarie NSW 2444

This Review of Environmental Factors (REF) assesses the potential impacts that may result from the proposed activities as outlined in “Description of the Proposal” section of this report.

Essential Energy is a state-owned corporation and is a determining authority as defined in the *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal satisfies the definition of an ‘activity’ under the EP&A Act, and as such Essential Energy must assess and consider the environmental impacts of the proposal before determining whether to proceed. This REF has been prepared in accordance with section 5.5 of the EP&A Act and clause 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Reg). The EP&A Act requires Essential Energy to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. The EP&A Reg sets out environmental factors to be considered in making that assessment. If the activity is considered likely to significantly affect the environment, additional assessment requirements under the EP&A Act would be required.

Section 5.7 of the EP&A Act states that a determining authority shall not carry out an activity, or grant an approval in relation to an activity, that is likely to significantly affect the environment (including critical habitat) or threatened species, populations or ecological communities, or their habitats, unless the determining authority has examined and considered an Environmental Impact Statement or Species Impact Statement in respect of the activity.

The REF has addressed the matters that are required to be considered by Part 5, Division 5.1 of the EP&A Act, with the conclusion that if the activity is carried out as described, it is not likely to have a significant effect on the environment (including critical habitat) or threatened species, populations, ecological communities or their habitats, and accordingly an Environmental Impact Statement is not required. The mitigation strategies forming part of the activity are fully considered and discussed in the REF.

The activity was also assessed against the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). As the proposed activity will not have, and is not likely to have a significant impact on matters of national environmental significance, a referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required.

The proposed activity is permissible under all relevant state and federal legislation, including the EPBC Act and the *Biodiversity Conservation Act 2016* (NSW).

Under *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) the activity is classified as development for the purpose of an electricity transmission or distribution network undertaken by or on behalf of a public authority, and is hence permitted on the land without the requirement for development consent.

Declaration

The Review of Environmental Factors for the proposed activity has been assessed by Essential Energy.

Considering the assessment of the impacts, including sections 1.7 and 5.5 of the *Environmental Planning and Assessment Act 1979* and clause 171 of the *Environmental Planning and Assessment Regulations 2021*, it is concluded that:

- there is not likely to be a significant environmental effect as a result of the construction, operation and maintenance of the activity and an Environmental Impact Statement is not required; and
- a Species Impact Statement (SIS), or Biodiversity Development Assessment Report (BDAR) is not required.

Site and Assessment Review – I affirm that the information provided within this assessment is accurate to the best of my knowledge, belief and information.

Nathan Hegerty
Environmental Senior Specialist
(Author)
Date:

Tim Haydon
Environmental Senior Specialist
(Peer Review)
Date:

The assessment has been reviewed and it is recommended that the Activity may now proceed subject to the implementation of the recommendations and mitigation measures contained in the REF documentation.

Glenn Potter
Project Manager
Date:

1. Considering the assessment of the impacts, including sections 1.7 and 5.5 of the *Environmental Planning and Assessment Act 1979* and clause 171 of the *Environmental Planning and Assessment Regulation 2021*, it is determined that there is not likely to be a significant environmental effect as a result of the construction, operation and maintenance of the Kings Forest Zone Substation. Neither an Environmental Impact Statement (EIS), nor SIS, nor BDAR is required.
2. The Activity may now proceed subject to obtaining and complying with the relevant approvals as identified in the REF and subject to the implementation of the recommendations and mitigation measures contained in the REF documentation.

Brett Hayward
Environmental Services Manager
Date:

Executive Summary

Background / Justification

Essential Energy is proposing to design, construct, operate and maintain a new section of high voltage electricity supply network, known as the Kings Forest High Voltage Supply Project (KFHVSP). The KFHVSP will deliver high voltage electricity supply to the new master planned Kings Forest community development, which when complete will comprise approximately 4,500 new dwellings, over an approximately 856 hectare (ha) site. The Tweed LGA is categorised as one of 25 LGAs in NSW which has a high need for affordable housing (JBA Planning, 2011). Tweed Shire Council (TSC) has adopted a number of strategic plans relating to housing and employment lands. Kings Forest features prominently in the plans, recognising the importance of the master planned development to council for providing affordable housing and employment opportunities. Kings Forest is also recognised in the NSW State Government's *North Coast Regional Plan 2041* (NSW DPE, 2022) as an important urban release area on the north coast of NSW. The Kings Forest development is expected to be one of the largest projects for new housing and employment in the Tweed in the next 25 years (TSC, 2024).

In order to facilitate the new high voltage electricity supply to the Kings Forest development and improve local electricity infrastructure, Essential Energy is proposing to design, construct, operate and maintain a new 33/11 kilovolt (kV) Zone Substation (ZS), located off Secret Lane, within Precinct 2 of the broader Kings Forest development site. High voltage electricity connection works will also include installation of approximately 4.4 kilometres (km) of new high voltage underground cables from Essential Energy's existing Cudgen ZS to the new proposed Kings Forest 33/11kV ZS. Together, the proposed new Kings Forest ZS and underground high voltage cables form the KFHVSP.

The proposed new 33/11kV Kings Forest ZS is the subject of this REF report prepared under Part 5, Division 5.1, of the EP&A Act. The proposed new high voltage underground cables making up the other component of the KFHVSP are subject to separate environmental assessments and approvals. The separation was required to align with the construction schedules of early site preparatory activities and civil works associated with the broader Kings Forest development. That is, as the broader Kings Forest development commenced, significant land disturbance associated with civil works for new roads and other infrastructure were occurring, and this provided an optimal period to include installation of the shorter sections of underground high voltage cables in those areas, along with commencement of construction activities for the new ZS, while refinement of the design for the remainder of the underground high voltage cable route was ongoing.

Construction, operation and maintenance of the new Kings Forest ZS, forms an integral component of the KFHVSP. It will ensure the local electricity infrastructure meets the current and future needs for the new Kings Forest development, thereby supporting a critical new affordable housing release area, as identified by both TSC and the NSW State Government. The new ZS will also strengthen Essential Energy's existing electricity network in the broader area, as well as increase its capacity, which will help support future electricity connections.

The Proposal

The proposal comprises the construction, operation and maintenance of the Kings Forest 33/11kV ZS. Together with a proposed new underground high voltage cables (to be assessed separately), the proposal will support the Kings Forest master planned development, and strengthen Essential Energy's electricity network in the broader area.

The proposal involves the construction of a new 33/11kV ZS, within Precinct 2 of the Kings Forest development, and would include the following elements:

- Two transformer bays, and two new 33/11kV transformers
- High voltage switchgear operating at 11kV and 33kV
- Concrete tilt panel building with amenities
- Control equipment
- Underground cabling and associated conduits

- Auxiliary equipment and structures, including lightning masts, fencing and driveways.

Project Alternatives

One option would be to refrain from undertaking any further development of the network in the area. The consequences of Essential Energy doing nothing would be that, as years passed, supply interruptions would occur more frequently and affect more people. Furthermore there is insufficient capacity within the existing electricity supply network to meet the demand anticipated to be required by the Kings Forest development. The proposed 33/11kV ZS is an integral component of the KFHVSP, required to supply the Kings Forest development, and without the augmentation of high voltage supplies, additional electricity supplies at the distribution level are not possible. Due to Essential Energy's network licence obligations, the 'do nothing' option is not a viable alternative to the proposed new electricity supply to the Kings Forest development, of which the proposed new 33/11kV ZS is a vital component.

Planning for the electricity supply to Kings Forest development commenced approximately 20 years ago. An Options Assessment (SKM, 2004) considered the location of a new 33/11kV ZS and associated connector powerlines to the existing Cudgen ZS to the north and existing Hastings Point high voltage powerline to the south. A short list of five substation sites and five powerline routes was identified, taking into account the assessment of environmental constraints, cost, access and constructability. However, at the time of this assessment, much of the study area and surrounding land was currently under investigation for future urban development, and the Concept Plan for the Kings Forest master planned community was still under development. As such, the recommendations provided in the Options Assessment (SKM, 2004) were superseded once more was known about the scale and supply load forecasts for the Kings Forest development.

As the Concept Plan was developed, refined and ultimately approved (MP 06_0318) and the subsequent Stage 1 Subdivision and Bulk Earthworks Project for the Kings Forest development also granted approval (MP 08_0194), it became apparent that the development would require its own high voltage supply and ZS. Over several years now, engagement with the developer (Leda) has been ongoing with the aim of determining the most appropriate route for the high voltage powerline and location of the ZS. Several route options for the high voltage powerline to supply the development were canvassed and are documented in the REF being prepared for the powerline (separate to this REF). Two options for the locations of the ZS within the footprint of the Kings Forest development were considered, as follows.

One option considered for the siting of a new Kings Forest ZS during a preliminary environmental constraints assessment (Country Energy, 2011), was in line with the existing high voltage powerline route that traverses the Kings Forest development. This location had the advantage of being located in line with existing high voltage supply arrangements. However, a number of disadvantages were identified, including it being located in low lying land subject to periodic inundation, as well being located within, or close to, land with sensitive ecological and Aboriginal heritage values. This option would have also placed the ZS in close proximity to future residential land and meant that the existing high voltage powerline remained in its current alignment, further restricting land available for future residential development.

The second option involved siting the new proposed Kings Forest ZS within an employment lands precinct (Precinct 2) of the Kings Forest development. This site had the advantages of being:

- Most accessible to a new connection with the proposed new high voltage supply
- Located on land not designated for future residential land use
- Already heavily modified and disturbed by historical and more recent land uses
- Located on land above the 1% Annual Exceedance Probability (AEP) for flooding
- Located further away from land with more sensitive ecological and Aboriginal heritage values.

Ultimately, the second option was selected as the preferred location for the ZS, and is subject to assessment in this REF. Option 2 was selected due to the following characteristics:

- meeting the needs of the customer
- providing ease of connection to the new high voltage supply

- being located in an employment lands precinct, thus minimising land use conflicts and
- having the least societal and environmental impacts of the two options considered.

Statutory Planning and Legislation

Clause 2.44 of *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) applies to electricity transmission and distribution activities undertaken by an energy supply authority. Clause 2.44 states that development for the purpose of a transmission or distribution network may be carried out by or on behalf of an electricity supply authority or public authority without consent on any land, with additional requirements for land reserved under the *National Parks and Wildlife Act 1974*.

As the activity does not require development consent, Essential Energy is the designated determining authority. Additionally, whilst Essential Energy does not require development consent to undertake the proposed activity, it has an obligation under Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to consider the environmental impacts of the activity.

Specifically, Essential Energy has a statutory obligation to examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of this activity. This REF has been prepared to facilitate the determination through consideration of the relevant factors specified in section 5.5 of the EP&A Act and clause 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Reg).

The proposed ZS site is located within Precinct 2, of the Kings Forest Stage 1 Project Application for bulk earthworks and subdivision, for which an approval under sections 130(1) and 133(1) of the EPBC Act has been granted (EPBC 2012/6328). The proposed new 33/11kV ZS will be undertaken within the footprint of this approval. Given that the proposal would not significantly impact on matters of national environmental significance in addition to impacts approved for the Stage 1 Project Application, and would not be carried out on Commonwealth land, the EPBC Act is not triggered and approval, or modification to EPBC 2012/6328, from the Commonwealth Minister for the Environment and Water is not required.

Environmental Impact Assessment

This REF has been prepared in accordance with Part 5, Division 5.1 of the EP&A Act to assess the environmental impacts associated with the construction, operation and maintenance of the proposed activity. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the project.

A number of potential environmental impacts associated with the project have been avoided or reduced to acceptable levels during the design development and assessment stages. However, the project may still result in some impacts including air quality (dust), noise, vegetation, traffic, waste generation, and visual amenity during construction and operation, as outlined in **Section 6**. Management and mitigation measures to alleviate these impacts have been developed as part of this REF and would be implemented during construction and operation of the proposal. Cumulative impacts associated with all components of the KFHVSP, and other nearby developments, have been considered. These impacts will be minimised to the greatest extent possible, and would not be significant.

Considering the assessment of the impacts detailed in this REF, it is concluded that the proposed activity is not likely to have a significant impact on the environment. On balance, the project is justified on the basis of supporting a critical new housing development on the Tweed (i.e., the Kings Forest development) and strengthening Essential Energy's electricity network in the broader area, whilst minimising potential environmental impacts.

1. Introduction

1.1 The Proposal

This Review of Environmental Factors (REF) assesses the potential environmental impacts associated with the construction, operation and maintenance of the proposed Kings Forest 33/11 kilovolt (kV) Zone Substation (ZS), located off Secret Lane, Kings Forest, New South Wales (NSW). The proposal forms part of the Kings Forest High Voltage Supply Project (KFHVSP). The significance of impact has been determined and appropriate mitigation measures recommended.

1.2 Context and Justification of the Proposal

Essential Energy has received a connection request from Kings Forest Estate Pty Ltd (known as “Leda”) to service a new \$5 billion, 4,500 dwelling, 856 hectare (ha) master planned community development at Kings Forest, located on the far north coast of NSW. The Kings Forest development received concept plan approval (MP 06_0318) and Stage 1 project approval (MP 08_0194) under the former Part 3A approval pathway of the Environmental Planning and Assessment Act (EP&A Act). In 2018 the Stage 1 project approval (MP 08_0194) was transitioned from the former Part 3A approval pathway to State Significant Development (SSD) under Part 4 of the EP&A Act.

The Tweed Local Government Area (LGA) is categorised as one of 25 LGAs in NSW which has a high need for affordable housing (JBA Planning, 2011). Tweed Shire Council (TSC) has adopted a number of strategic plans relating to housing and employment lands, including but not limited to *Tweed Shire Council Local Strategic Planning Statement – 2020* (TSC, 2020), and the *Tweed Urban and Employment Land Release Strategy 2009* (TSC, 2009). Kings Forest features prominently in the plans, recognising the importance of the master planned development to council for providing affordable housing and employment opportunities. Kings Forest is also recognised in the NSW State Government’s *North Coast Regional Plan 2041* (NSW DEP, 2022) as an important urban release area on the north coast of NSW. The Kings Forest development is expected to be one of the largest projects for new housing and employment in the Tweed in the next 25 years (TSC, 2024).

In order to facilitate the connection of the Kings Forest development and improve local electricity infrastructure, Essential Energy is proposing to design, construct, operate and maintain a new section of high voltage electricity supply network, known as the Kings Forest High Voltage Supply Project (KFHVSP). An integral component of the KFHVSP will be the construction and operation of a new 33/11kV ZS, proposed to be located off Secret Lane, within Precinct 2 of the broader Kings Forest development site. High voltage electricity connection works will also include installation of approximately 4.4 kilometres (km) of new high voltage underground cables from Essential Energy’s existing Cudgen ZS to the new proposed Kings Forest 33/11kV ZS (to be assessed separately). Together, the proposed new Kings Forest ZS and underground high voltage cables form the KFHVSP (refer **Figures 1-1** and **1-2**).

The proposed new 33/11kV Kings Forest ZS is the subject of this REF report, prepared under Part 5, Division 5.1, of the EP&A Act. Installation of the proposed new high voltage underground cables, making up the other component of the KFHVSP are subject to separate environmental assessments and approvals. The separation was required to align with the construction schedules of early site preparatory activities and civil works associated with the broader Kings Forest development. That is, as the broader Kings Forest development commenced, significant land disturbance associated with civil works for new roads and other infrastructure were occurring, and this provided an optimal period to include installation of the shorter sections of underground high voltage cables in those areas, along with commencement of construction activities for the new ZS, while refinement of the design for the remainder of the underground high voltage cable route was ongoing.

Figure 1-3 depicts the various components of KFHVSP, while **Figure 1-4** confirms the proposal site subject to assessment in this REF.

Construction, operation and maintenance of the new 33/11kV Kings Forest ZS, as an integral component of the KFHVSP, will ensure the local electricity infrastructure meets the current and future needs for the new Kings Forest development. It will thereby support the development of a critical new affordable housing release area, as identified by both TSC and the NSW State Government. The new ZS will also strengthen Essential Energy’s existing electricity network in the broader area, as well as increase its capacity, which will help support future electricity connections.

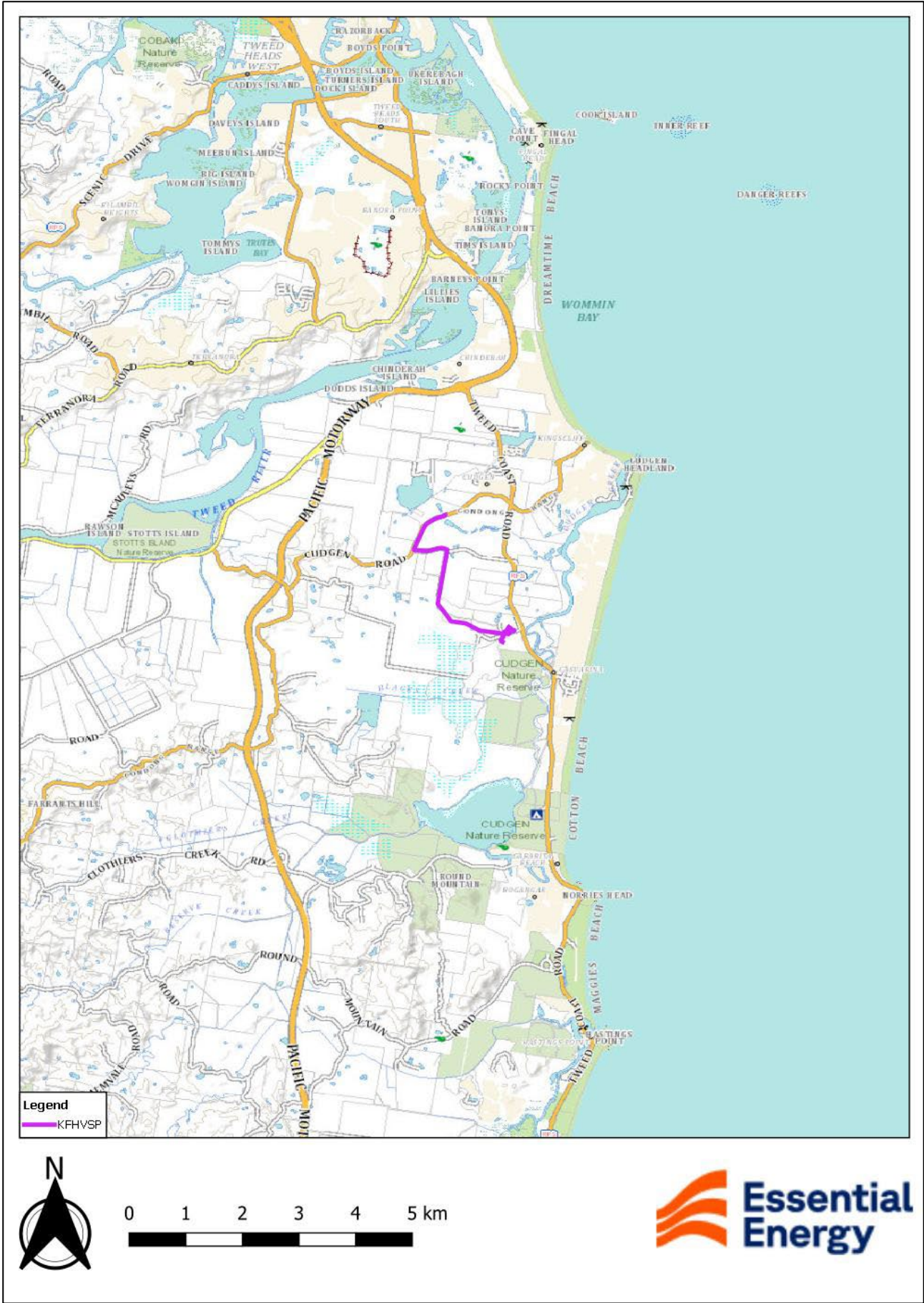


Figure 1-1: KFHVSP in regional context

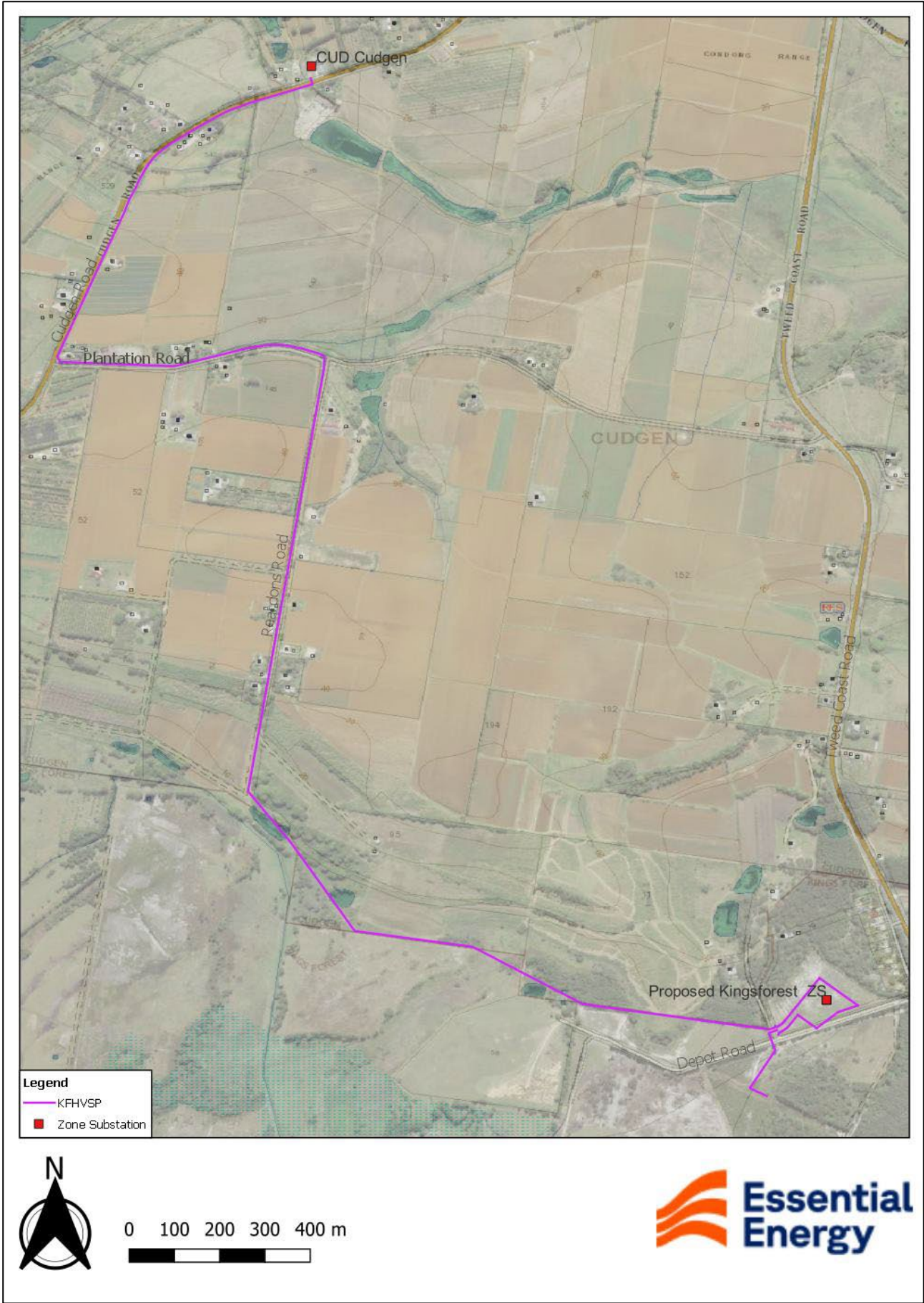


Figure 1-2: KFHVSP in local context

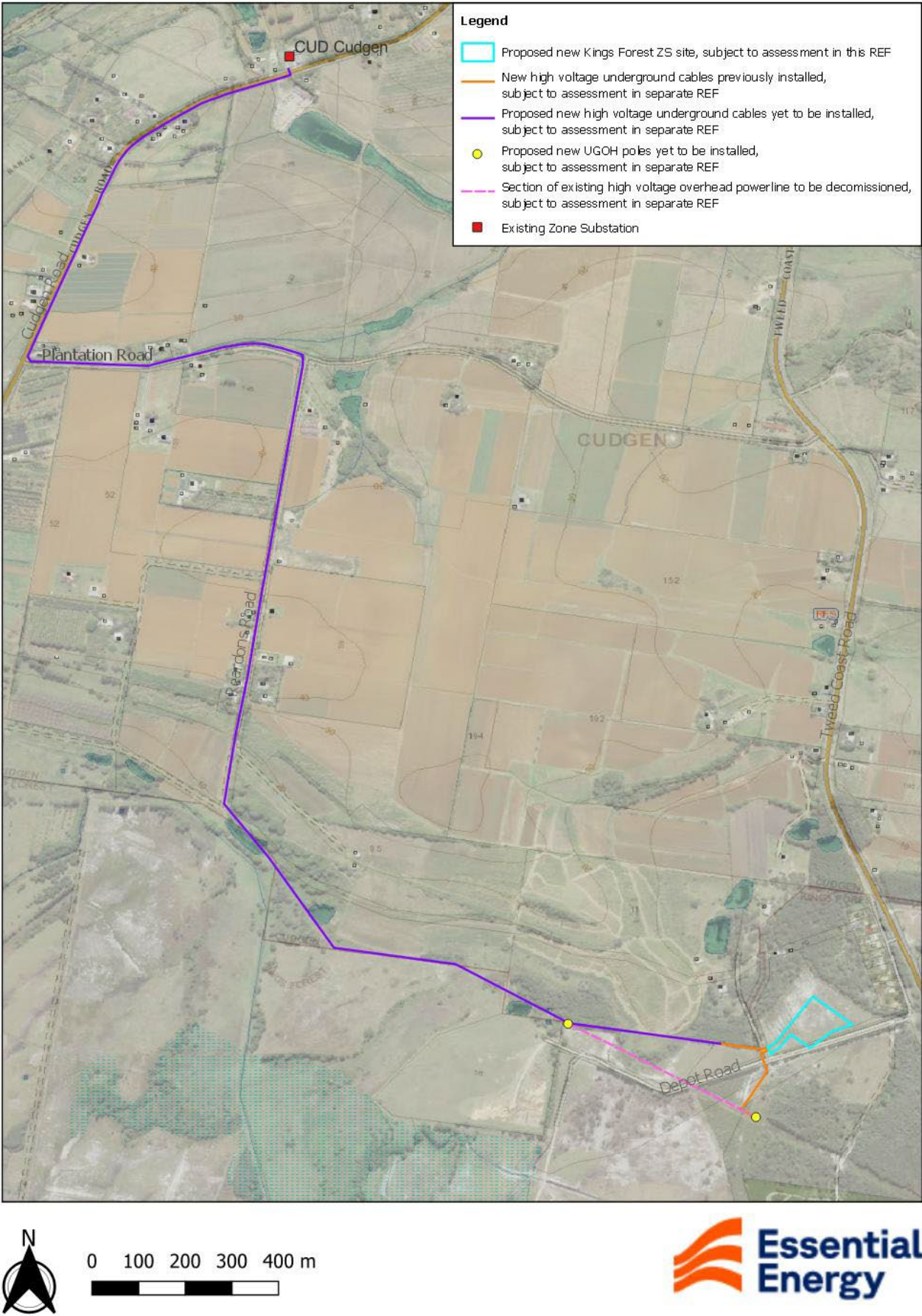


Figure 1-3: Components of the KFHVSP

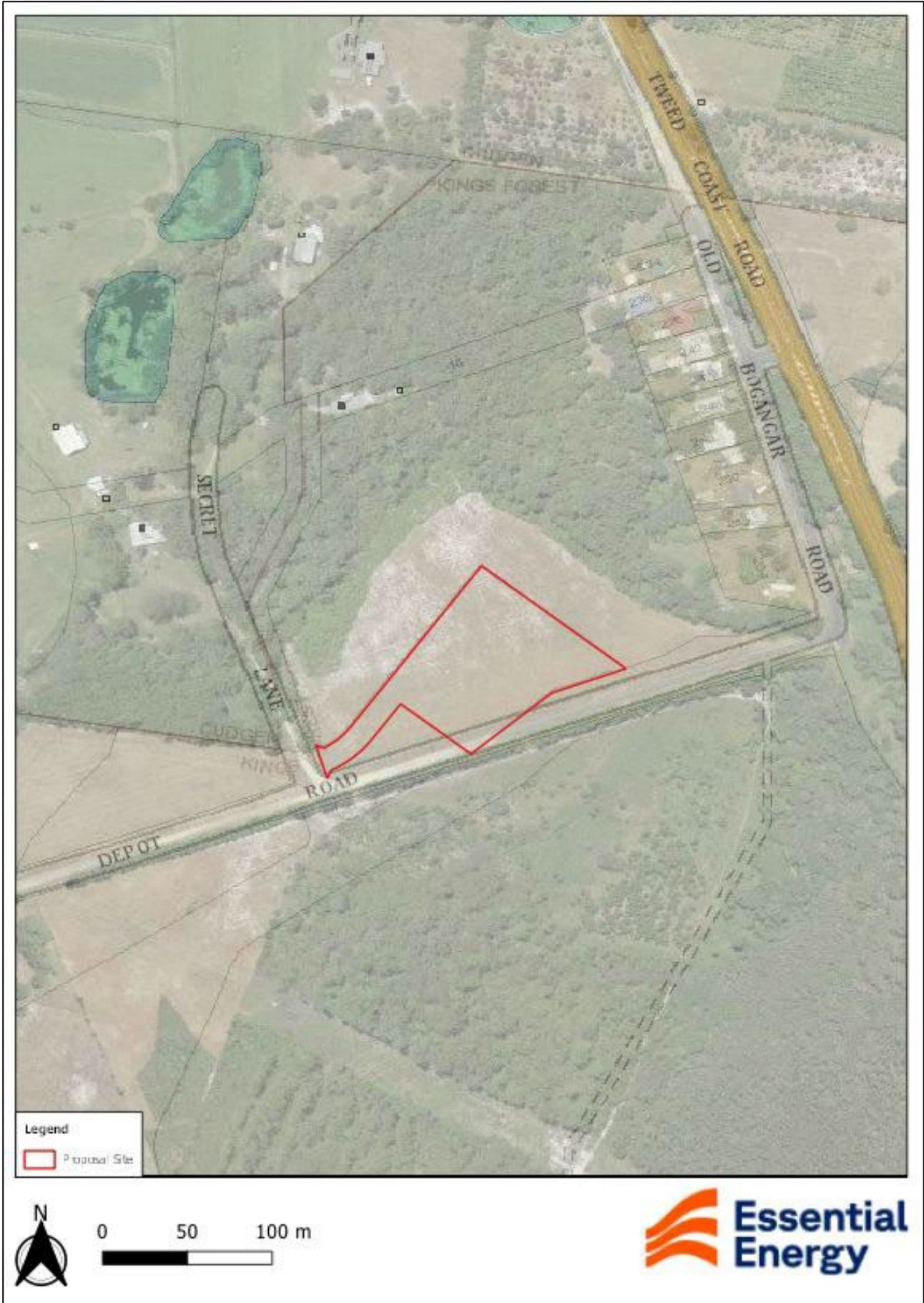


Figure 1-4: Proposal site subject to assessment in this REF

1.3 Network Investment Criteria

Network asset investment by Essential Energy is generally required to:

- Meet Essential Energy's duty of care
- Connect customers to the supply network
- Provide a satisfactory standard of supply to customers.

The overall performance of the network is driven by the reliability of individual network components and the redundancy provided by the network to enable maintenance of supply at times when critical parts of the network are out of service (due to maintenance or repair requirements). To maintain acceptable standards of customer service it is necessary to ensure:

- Infrastructure performance (reliability) is maintained at acceptable levels; and
- The network design provides adequate security (redundancy).

The reliability performance of equipment and infrastructure is managed through maintenance and replacement of that infrastructure and construction of new infrastructure. For Essential Energy, the decision to replace or construct new infrastructure is based on an assessment of equipment condition and consideration of the strategic needs of the network.

1.4 Proposal Objectives

The primary objective of the project is to design, construct, operate and maintain a new 33/11kV ZS, which as part of the KFHVSP will service the new master planned Kings Forest community development. The proposal will also strengthen Essential Energy's existing electricity network in the broader area. Secondary objectives associated with the project are to:

- Maximise social and economic benefits; and
- Minimise the environmental and social impacts.

1.5 Proposal Site

The proposed new 33/11kV Kings Forest ZS site is located on the far north coast of NSW, in an area referred to as Kings Forest. The nearest population centres are Casuarina, located approximately 1km to the east; Kingscliff, located approximately 4km to the northeast; and Cabarita Beach / Bogangar, located approximately 4.5km to the south. The Queensland / NSW border is located approximately 13km north of the proposal site.

The proposed new ZS site will be located at the intersection of the of Secret Lane and Depot Road, and form part of Precinct 2 of the Kings Forest development site (refer **Figure 1-5**). Depot Road will be replaced and realigned slightly to become Kings Forest Parkway, forming the main road entry into the broader Kings Forest development. The new ZS site is currently located on land recognised as Lot 7 DP1270901. Ultimately, this lot will be subdivided into separate lots to accommodate the alignment of the new King Forest Parkway (formerly Depot Road) and future land uses at the boarder development site. Two lots will be created on the northern side of Kings Forest Parkway one of which will accommodate the proposed new ZS, and the other a yet to be determined future commercial use (refer **Figure 1-6**). The new ZS lot encompasses approximately 9,420 square metres (m²), and will accommodate all buildings, electrical plant and equipment, drainage and access roads, ("the proposal site") (refer **Figures 1-4** and **1-6**). **Figure 1-7** shows the location of the proposal site in the context of the immediate surround landscape.

The proposal site is located within the Tweed Shire Council (TSC) Local Government Area (LGA). The land is currently zoned 2(c) – Urban Expansion according to the "State Environmental Planning Policy (Major Development) 2005 Kings Forest Land Application Map", listed in *State Environmental Planning Policy (Precincts—Regional) 2021*.

The proposal site will be accessed primarily via a new access road to be constructed from Secret Lane to the west. This access road will be a shared right of access for both the ZS and other lot created to the southeast of the ZS site, A secondary access point will also be provided to the ZS from the proposed Kings Forest Parkway to the south, however, this will only be used in emergencies or to facilitate heavy load movements.

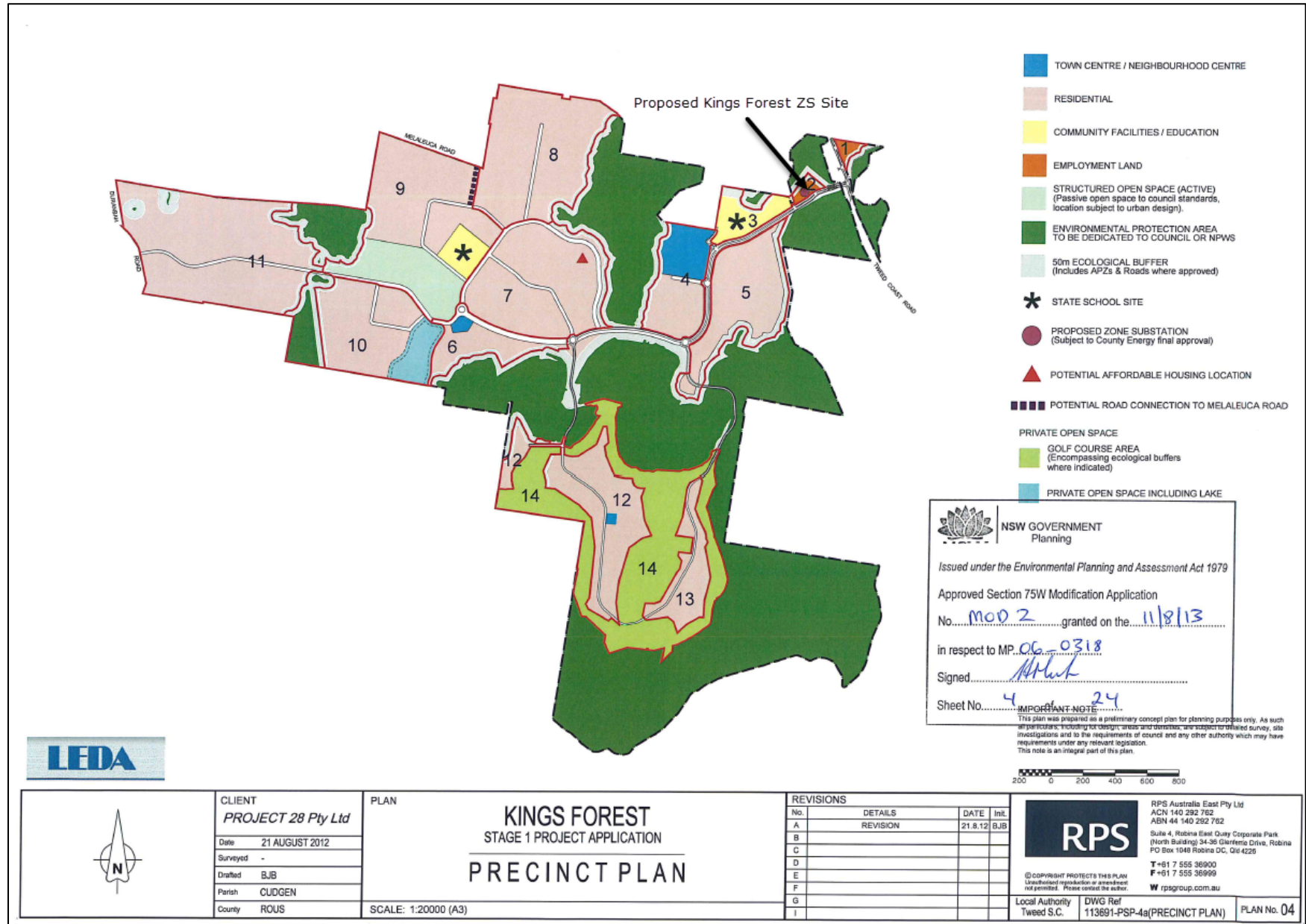


Figure 1-5: Proposal in the context of the broader Kings Forest development

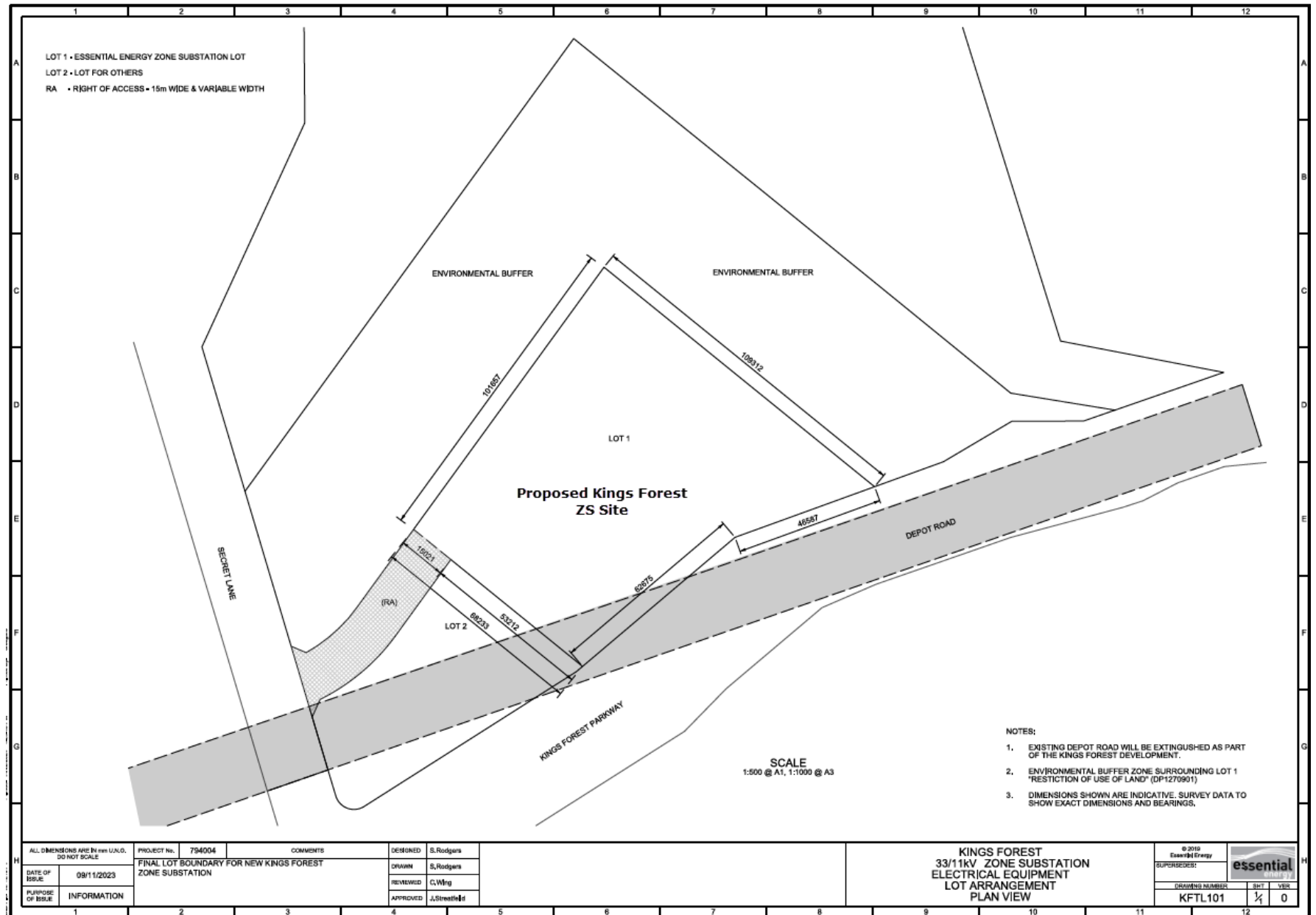


Figure 1-6: Proposal site in the context of the proposed new lot arrangement north of Kings Forest Parkway

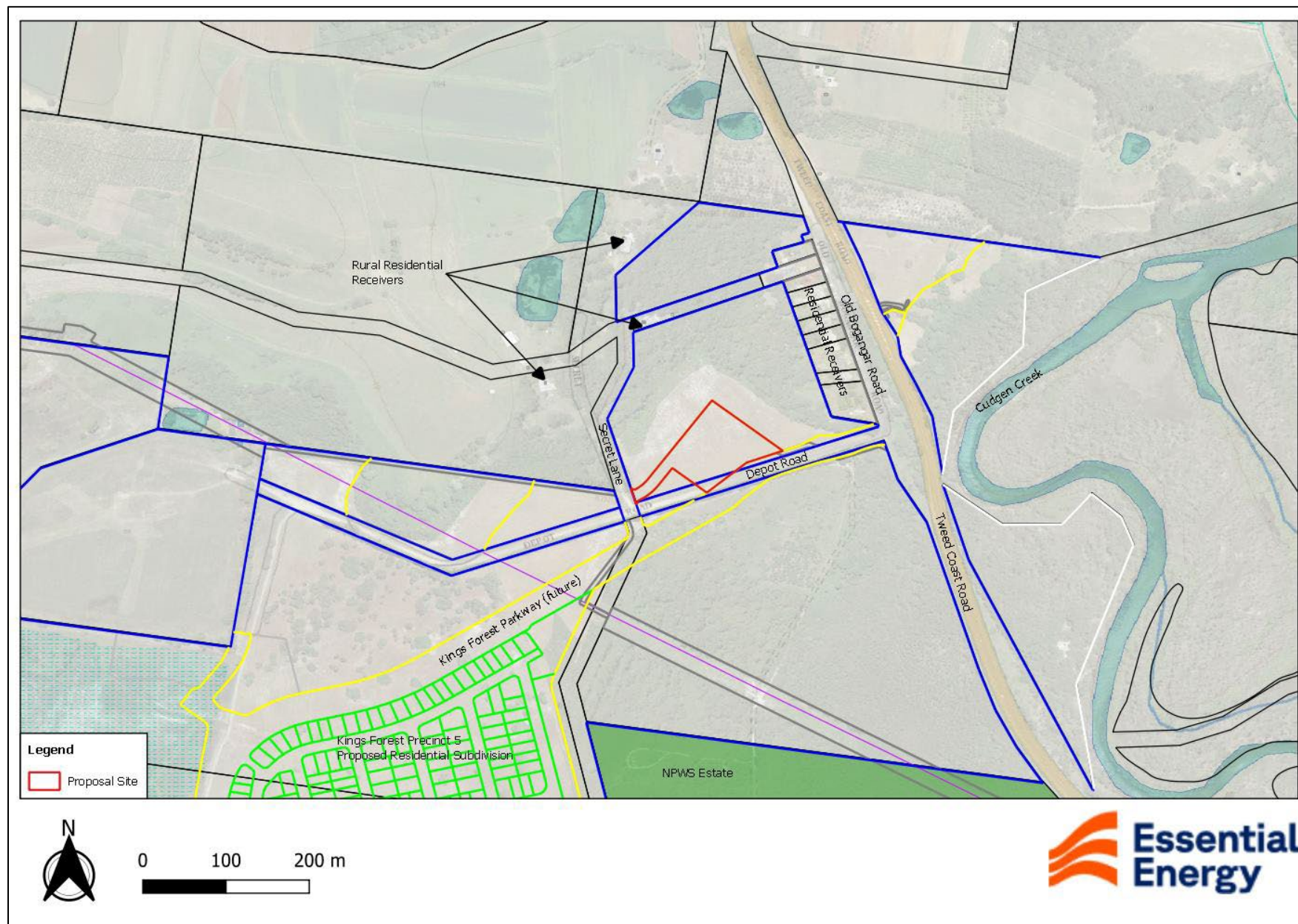


Figure 1-7: Proposal site in the context of the local environment and immediate surrounding land use

The proposal site is heavily modified and disturbed through previous and recent land uses. The Environmental Assessment Report (EAR) prepared for Kings Forest Stage 1 Project Application (JBA Planning, 2011) indicated the broader development site has historically been used for sand mining, turf production, dairy farming, small cropping and grazing, sugar cane production and as a pine plantation. Weed mapping from James Warren and Associates (2011e) indicates the proposed ZS site was a harvest area for Slash Pine in the recent past.

A site inspection undertaken on 29 February 2024 indicated the proposal site has undergone regrading work, with a cut evident along much of the northwestern boundary (refer **Plate 1-1**). The northeastern portion of the proposal site is currently being used as a laydown yard, containing construction materials, equipment and machinery for preparatory, early civil and construction works associated with Stage 1 of the Kings Forest development (refer **Plates 1-2** and **1-3**). The proposal site has been cleared of all woody vegetation. There are no trees or shrubs present. The northeastern portion of the proposal site, currently being used as a laydown yard, is largely devoid of all vegetation, including groundcover. The western portion of the proposal site, including the proposed primary access driveway contains groundcover species only, comprising predominately exotic grass species (refer **Plate 1-4**).

Review of the NSW State Vegetation Type Map (SVTM) (DPE, 2023) indicates that the proposal site is mapped as Plant Community Type (PCT) 0 – not classified (refer **Figure 6-5**). Further review and assessment of the vegetation types present at, and nearby the proposal site, as well as potential impacts on threatened species, communities and their habitats, is provided in **Section 6.5**

The surrounding land uses were noted to comprise:

- **North:** Predominately cleared land designated as both environmental and agricultural buffer zones immediately to the north, with vegetated land associated with an environmental protection zone, rural-residential properties, and agricultural land, further north beyond.
- **East:** Predominately cleared land designated as environmental buffer zone immediately to the east, with a strip of vegetated land associated with an environmental protection zone, residential properties, Old Bogangar Road, Tweed Coast Road, and Cudgen Creek further east beyond
- **South:** Depot Road, which will become Kings Forest Parkway immediately to the south, with partially vegetated land designated as both environmental and agricultural buffer zones, predominately vegetated land associated with an environmental protection zone, and Cudgen Nature Reserve further south beyond.
- **West:** Secret Lane immediately to the west, with predominately cleared land designated as both environmental and agricultural buffer zones, a small patch of vegetated land designated as an environmental protection zone, agricultural land and land mapped as coastal wetlands, further west beyond.

A row of residential properties are located within a subdivision along Old Bogangar Road to the east and northeast of the proposal site. The closest of these is located approximately 100m east of the proposal site. Several rural residential properties are also located to the north of the proposal site, the closest being approximately 120m north.

The closest waterway is Cudgen Creek, located approximately 230m east of the proposal site, on the opposite side of Tweed Coast Road. There are several farm dams located to the northwest and west of the proposal site, the closest being approximately 260m northwest (refer **Figure 1-7** and **6-3**). Current drainage at the proposal site would be expected to follow overland flow to the south and southwest, towards Depot Road. Once constructed, the proposal site would have its own internal drainage (refer **Section 6.5.3**)

1.6 Study Area

The broader study area includes the predominately cleared, rural and partially vegetated areas, residential properties and existing road and powerline infrastructure in the general vicinity of the proposal site. Sensitive environmental areas within the broader region include waterways, wetlands, biodiversity, Aboriginal and non-Aboriginal heritage, and other environmental values, that form part of the immediate surrounding landscape.



Plate 1-1 – View of proposal site looking southwest along the northwestern boundary, showing evidence of cut material.



Plate 1-2 – View from the northeastern portion of the proposal site showing current laydown area for Stage 1 of the broader Kings Forest development.



Plate 1-3 – View from the eastern corner of proposal site showing highly modified and disturbed area associated with current laydown area for the Kings Forest development.



Plate 1-4 – View from near centre of the proposal site looking towards the northern corner, showing grassed area of the site.

1.7 Purpose of REF

The purpose of this REF is to document the assessment of potential environmental impacts of the proposal, and identify if there are likely to be any significant environmental impacts. It informs Essential Energy's determination of the proposal under Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act)

2. Description of the Proposal

2.1 Scope of Works

In summary, the proposal involves the construction and operation of a new 33/11kV ZS, including a control building, two transformer bays, 33kV and 11kV electrical and switching equipment, communication equipment, earthing, parking, access roads and site drainage. A general site layout is provided in **Figure 2-1**. An outline of each component is provided below. Further detail is provided in the civil design plans (**Appendix A**), and structural, building, footings, trenching and earth grid plans (**Appendix B**).

2.1.1 Site establishment

- Installation of temporary construction fence around entire work area
- Installation and maintenance of erosion and sediment control measures
- Arrangement of suitable builder's power and water supply to site.

2.1.2 Civil work

- Bulk earth works and benching
- Excavation work for building footings
- Excavation and trenching work for installation of underground conduits
- Temporary shoring to prevent collapsing soil
- Installation of site drainage, including stormwater pipes and pits
- Construction of new primary and secondary access roads.

Refer bulk earthwork plans and other civil works plans in **Appendix A** and footings and trenching plans in **Appendix B**.

2.1.3 Building work

- Foundations and concreting
- Retaining wall construction
- Blockwork
- Structural reinforcing
- Installation of new control building, approximately 35m long by 15m wide by 15m tall. The building walls will be of concrete tilt-up construction, with Colourbond roof and guttering, all of neutral colouring
- Installation of power and lighting systems
- Installation of fire protection systems
- Installation of security system installation
- Installation of conduits, paths and all finishes as per design drawings.

Refer structural, building, and footings plans in **Appendix B**.

2.1.4 Underground Conduits

- Installation of all conduits as per design drawing and footing layouts (**Appendix B**).

2.1.5 Earth grid

- Installation of earth grid and device risers as per earth grid plans (**Appendix B**).

Earth grid, device risers, fence risers, concrete reinforcement earthing, and tilt panel building earthing shall be installed by one of Essential Energy's preferred contractors.

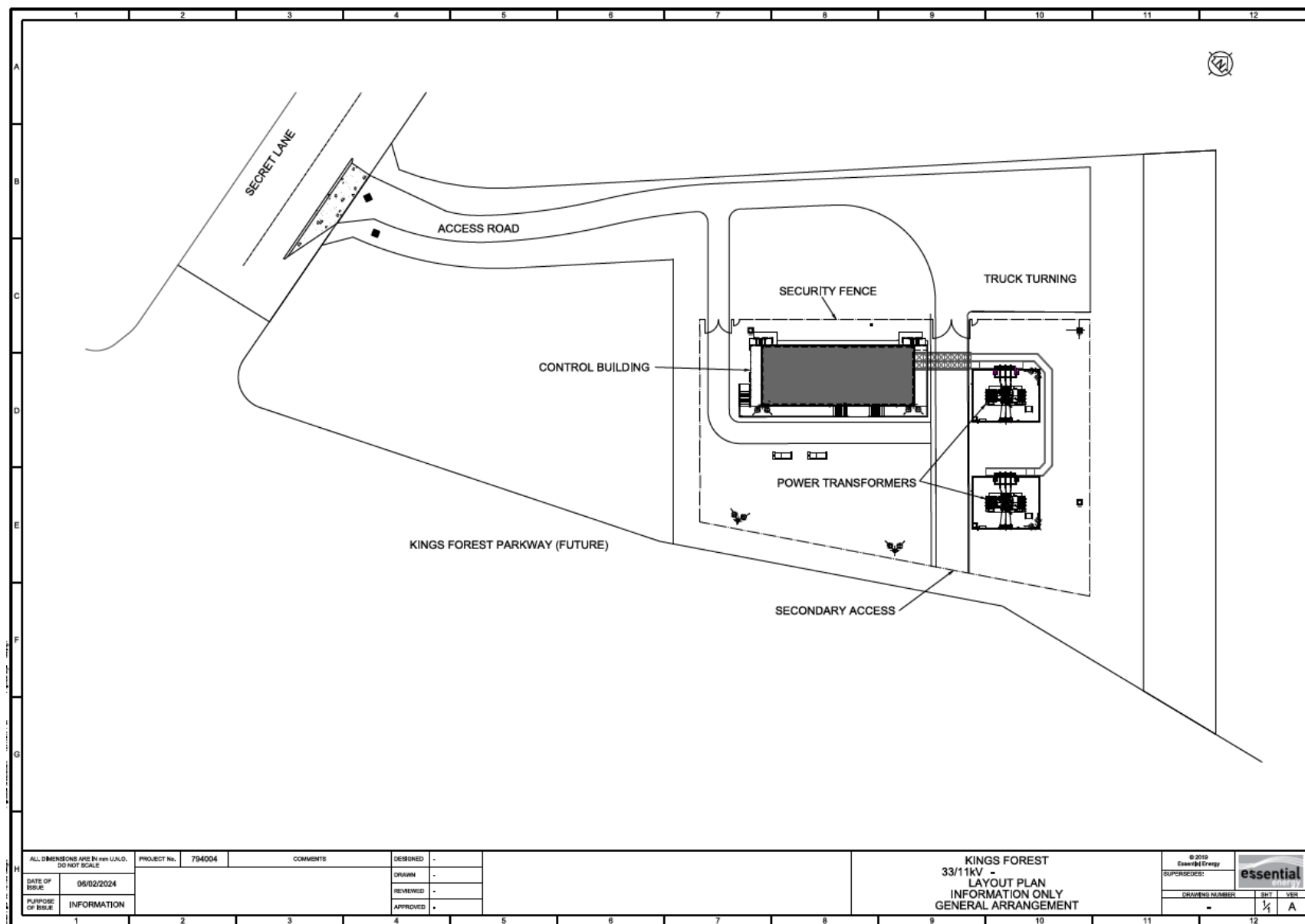


Figure 2-1: Proposed general site layout

2.1.6 Other ZS yard work

- Construction of transformer bunds (**Appendix B**)
- Kerbing, and installation and pavement of driveways and runway (**Appendix A**)

2.1.7 Electrical Work

- Installation of two 33/11kV power transformers
- Installation of two 11kV/415V auxiliary supply transformers
- Installation, termination and testing of underground 33kV cables
- Installation, termination and testing of 33kV switchboard and transformer cables.
- Installation, termination and testing of 11kV transformer and distribution cables.
- Termination and testing of all 11kV transformer and distribution cables.
- Installation of all secondary wiring.
- Installation of the following equipment inside the new control building:
 - One, seven panel 33kV indoor switchboard in the 33kV switchroom
 - One, 13 panel 11kV indoor switchboard in the 11kV switchroom
 - Nine control panels, duplicate supervisory control and data acquisition (SCADA) remote terminal units (RTU) and communications in the control room.
 - Two, 110V 208AH DC batteries and charger and one 110/48V DC/DC converter in the battery room.
- Installation of new dual distance protection relays and settings on existing and new 33kV distribution powerlines to Hastings Point ZS.

The control building floor and basement plan is provided in **Appendix B**.

2.1.8 Communications

- Installation and commissioning of dual RTU's and telecommunication equipment as per plans in **Appendix B**.

Note: A new dual fibre pathway from existing fibre between Cudgen ZS and the new Kings Forest ZS is required. Installation of the new optic fibre cables between the two ZSs will be assessed separately in conjunction with the new high voltage underground cables.

2.1.9 Staging areas

The designated ZS lot will house all the construction equipment required for the activity. Civil work will be completed by a suitably competent contractor.

2.2 Design Criteria

The proposed new 33/11kV ZS will be primarily constructed to form a component of the KFHVSP required to facilitate power supply to the new Kings Forest development and strengthen Essential Energy's existing electricity network in the broader area.

Siting of the proposed ZS has been selected based on careful consideration to ensure the ZS is located as far as practicable from future residential areas. The design has also been sympathetic to the future surrounding building infrastructure by minimising direct views of certain pieces of electrical infrastructure from vehicle and pedestrian traffic along the new Kings Forest Parkway. The design also avoids other sensitive and critical infrastructure within the immediate vicinity through consultation with important nearby stakeholders.

The design has been developed to meet the following criteria:

- Meet the design life requirements
- Be cost effective when assessed on a life cycle cost basis
- Be capable of being constructed cost-efficiently and within time constraints
- Provide durability and reliability of the intended function

- Minimise potential environmental impacts.

2.3 Building Code of Australia

Essential Energy's design standards for buildings and substations meet the requirements of the BCA where appropriate; and the relevant Australian standards (such as AS2067 2008 Substations and high voltage installations exceeding 1kV a.c.).

2.3.1 Utilities

Utilities and services (i.e., water, sewer) to service Stage 1 of the Kings Forest development will be constructed as part of that development. The new 33/11kV ZS will require connection to these services.

2.3.2 Fencing and signage

Security of a substation is of paramount importance due to the extreme dangers which energised electrical equipment can pose to untrained individuals. Adequate security fencing will be provided. The fence will be designed in accordance with Essential Energy's zone substation security fencing requirements.

To minimise visual impacts, it is proposed to erect a three metre high, neutral colour, concrete tilt panel fence along the southern boundary of the site, which fronts the new Kings Forest Parkway. The tilt panel fence will screen much of the control building and electrical equipment within the ZS site from passing motorists on Kings Forest Parkway and the broader Kings Forest development (refer **Figure 2-2**). A metal palisade fence will be erected around the remaining three sides of the ZS.

2.3.3 Access and parking

The ZS will be accessed primarily via a new access road to be constructed from Secret Lane to the west. This access road will be a shared right of access for both the ZS and the other lot created to the southeast of the ZS site, up until the road enters the fenced area of the ZS, where it will solely be for the ZS. The new access road will be approximately 6m wide and designed to cater for all construction traffic and ongoing maintenance use, including 46 tonne transformer delivery vehicles. A secondary access point will also be provided to the ZS from the proposed Kings Forest Parkway to the south, however, this will only be used as an emergency access and infrequent oversized loads.

Car parking will be provided within the substation yard. Given that the substation will be an unmanned facility, this will provide for more than adequate off-street parking.

2.4 Construction Activities

2.4.1 Timing and work hours

Construction work is expected to commence in July 2024, and take approximately 6 months to complete, weather dependant.

In considering the remote nature of the proposed ZS site location, being at least 100m away from the nearest sensitive residential receiver, work that has the potential to create and audible noise at the nearest sensitive receiver, will be between 7am and 6pm Monday to Saturday. On occasions, works outside these hours may be undertaken where the following requirements are met:

- Neighbours (and other sensitive receivers) adjacent to the works or the local council or the Environment Protection Authority (EPA) have been notified; and
- The works are justified on the basis that they are emergency works, or, because of supply security network outages or construction limitations, it is deemed that the works can only be achieved outside these hours.

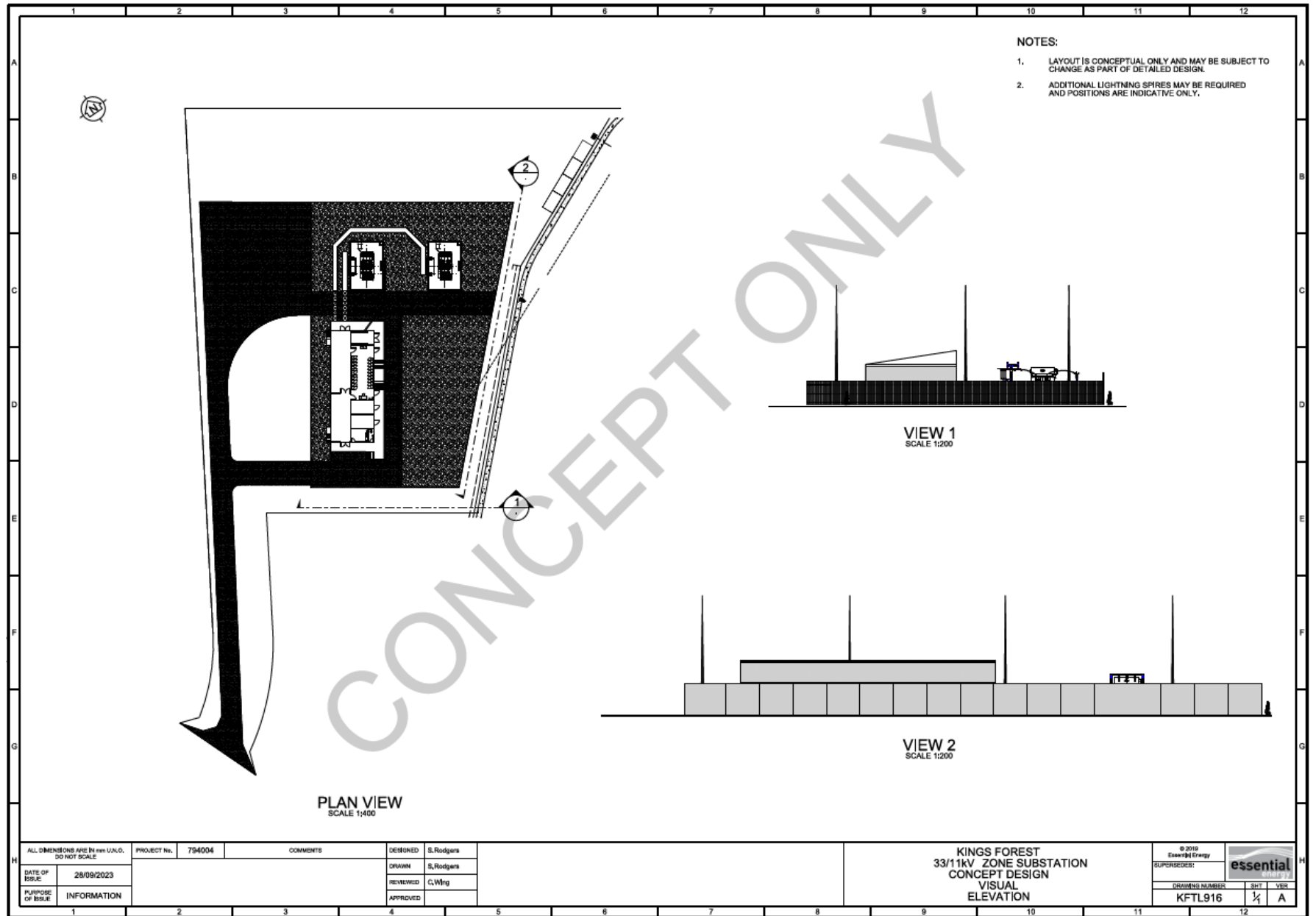


Figure 2-2: Visual elevation drawing

2.4.2 Resources and equipment

The following equipment is likely to be used on site to complete the work:

- Excavator
- Backhoe
- Elevated work platforms (EWP)
- Trucks
- Concrete trucks
- Cranes
- Grader
- Roller
- Bulldozer
- Concrete pump truck
- Forklift
- Under borers
- Bobcat
- Water truck
- Trencher
- Cable trucks
- Light vehicles.

2.4.3 Impact mitigation

The mitigation measures as detailed in **Section 6** form part of the proposed activity and will be implemented, as required, as part of the construction and operational phases.

2.5 Operation and Maintenance Requirements

Once the project is constructed, periodic maintenance will be required. Regular inspections of the infrastructure will be undertaken to help identify defects and hazards such as damaged components and vandalism. The site will not accommodate staff or contractors on a permanent basis. Periodic collection of waste may be required.

Likely maintenance activities include:

- Vegetation maintenance around perimeter of new ZS
- General landscape maintenance within the new ZS site
- Regular inspection and maintenance of ZS equipment.

3. Consultation

3.1 Overview

Community consultation defines the processes we use to seek views or provide information about projects. The term consultation can describe processes ranging from simply delivering information to residents, community information displays, or holding meetings with community representatives designed to actively seek feedback from local communities into a particular project.

The population as a whole is more aware than ever of their social, environmental and economic needs. They want to know about what is planned for their area and how it would impact on them.

Incorporating community consultation as a key business practice is both a necessary and a desirable path for Essential Energy to take. It must be undertaken in good faith and be transparent in all activities.

Essential Energy has in place a policy for community consultation on all major projects. The policy ensures that the community is informed about proposed development, and that concerns and issues are taken into consideration.

Essential Energy has consulted extensively with Leda regarding the siting of the ZS, to ensure the location poses the least land use conflict with the broader Kings Forest development.

Landholder consultation regarding the overall KFHVSP, in particular with the residents located along the proposed underground cable route has commenced and is continuing. Existing nearby residents to the ZS site would also be advised of the works schedule and provided with details of a site contact.

Ongoing engagement and project progression has also been created via the Essential Energy Engagement website: <https://engage.essentialenergy.com.au/kings-forest-high-voltage-supply-project#:~:text=The%20Kings%20Forest%20development%20is,with%20educational%20facilities%20and%20parks.>

3.2 Consultation and its Requirements under the T&I SEPP 2021

Under the EP&A Act, Essential Energy is the determining authority for certain developments defined under the T&I SEPP as being permissible without consent. While the nature of work being undertaken does not require council consent, Division 1 of the T&I SEPP does provide consultation requirements with the local council where works are anticipated to impact upon council infrastructure, local heritage items, flood liable land and certain land within the coastal zone. In addition, consultation may be required with the State Emergency Service (flood liable land) and other specified public authorities in certain circumstances.

The proposed construction and operation of the new 33/11kV ZS will be limited to the designated lot for ZS site. The proposal site will include its own site drainage, and will likely require connection to the local stormwater system being installed as part of the broader Kings Forest development, however, this is unlikely to have a substantial impact on the stormwater system. The proposal site will also require connection to water supply and sewage systems, however given it is an unmanned site, it will not result in any substantial impact to either. While some disruption to local roads may occur during the delivery of large plant and equipment, the works are considered to be minor and inconsequential and will not involve significant disruption of pedestrian or vehicle traffic. Consultation with the local council is therefore not triggered under clause 2.10 of the T&I SEPP.

The proposal site is not located within a mapped area of local heritage, according to Tweed Shire LEP. Consultation with the local council is therefore not triggered under clause 2.11 of the T&I SEPP.

The proposal site is not located on flood liable land (refer **Section 6.5.3**, and **Appendix A**). Consultation with the local council or State Emergency Services (SES) is therefore not triggered under clauses 2.12 and 2.13, respectively.

The proposal site is located within the coastal zone (coastal environment area), however, coastal vulnerability area mapping is currently not available and the Tweed Coast and Estuaries Coastal Management Program (TCECMP) is currently under development. Notwithstanding, the proposal is not inconsistent with the management objectives set out in the Tweed Coast Estuaries Coastal Zone Management Plan 2013, which will be superseded by the TCECMP once developed. Consultation with the local council is therefore not triggered under clause 2.14.

The proposal is not located on land, or adjacent to land, that would trigger consultation with other specified public authorities under clause 2.15 of the T&I SEPP.

In addition to consultation requirements, additional notification and approval requirements are outlined in **Table 5-2**.

4. Project Alternatives

4.1 Do Nothing (Maintain Current Supply Infrastructure)

One option would be to refrain from undertaking any further development of the network in the area. The consequences of Essential Energy doing nothing would be that, as years passed, supply interruptions would occur more frequently and affect more people. Furthermore, there is insufficient capacity within the existing electricity supply network to meet the demand anticipated to be required by the Kings Forest development.

The proposed 33/11kV ZS is an integral component of the KFHVSP, required to supply the Kings Forest development, and without the augmentation of high voltage supplies, additional electricity supplies at the distribution level are not possible. Due to Essential Energy's network licence obligations, the 'do nothing' option is not a viable alternative to the proposed new electricity supply to the Kings Forest development, of which the proposed new 33/11kV ZS is a vital component.

4.2 Project Planning Options

Planning for the electricity supply to Kings Forest development commenced approximately 20 years ago. An Options Assessment (SKM, 2004) considered the location of a new 33/11kV ZS and associated connector powerlines to the existing Cudgen ZS to the north and existing Hastings Point high voltage powerline to the south. A short list of five substation sites and five powerline routes was identified, taking into account the assessment of environmental constraints, cost, access and constructability. However, at the time of this assessment, much of the study area and surrounding land was currently under investigation for future urban development, and the Concept Plan for the Kings Forest master planned community was still under development. As such, the recommendations provided in the Options Assessment (SKM, 2004) were superseded once more was known about the scale and supply load forecasts for the Kings Forest development.

As the Concept Plan was developed, refined and ultimately approved (MP 06_0318) and the subsequent Stage 1 Subdivision and Bulk Earthworks Project for the Kings Forest development also granted approval (MP 08_0194), it became apparent that the development would require its own high voltage supply and ZS. Over several years now, engagement with the developer (Leda) has been ongoing with the aim of determining the most appropriate route for the high voltage powerline and location of the ZS. Several route options for the high voltage powerline to supply the development were canvassed and are documented in the REF being prepared for the powerline (separate to this REF). Two options for the locations of the ZS within the footprint of the Kings Forest development were considered, as detailed in section 4.3.

4.3 ZS Site Options

4.3.1 Option 1

One option considered during a preliminary environmental constraints assessment (Country Energy, 2011) for the siting of a new Kings Forest ZS, was in line with the existing high voltage powerline route that traverses the Kings Forest development (refer **Figure 4-1**). This location had the advantage of being located in line with existing high voltage supply arrangements. However, a number of disadvantages were identified, including it being located in low lying land subject to periodic inundation, as well as being located within, or close to, land with sensitive ecological and Aboriginal heritage values. This option would have also placed the ZS in close proximity to future residential land and meant that the existing overhead high voltage powerline remained in its current alignment, further restricting land available for future residential development.

4.3.2 Option 2

Option 2 involved siting the new proposed Kings Forest ZS within an employment lands precinct (Precinct 2) of the Kings Forest development (refer **Figure 1-5**). This site had the advantages of:

- being most accessible to a new connection with the proposed new high voltage supply
- being located on land not designated for future residential land use
- already being heavily modified and disturbed by historical and more recent land uses
- being located on land above the 1% Annual Exceedance Probability (AEP) for flooding
- being located further away from land with more sensitive ecological and Aboriginal heritage values to the south.

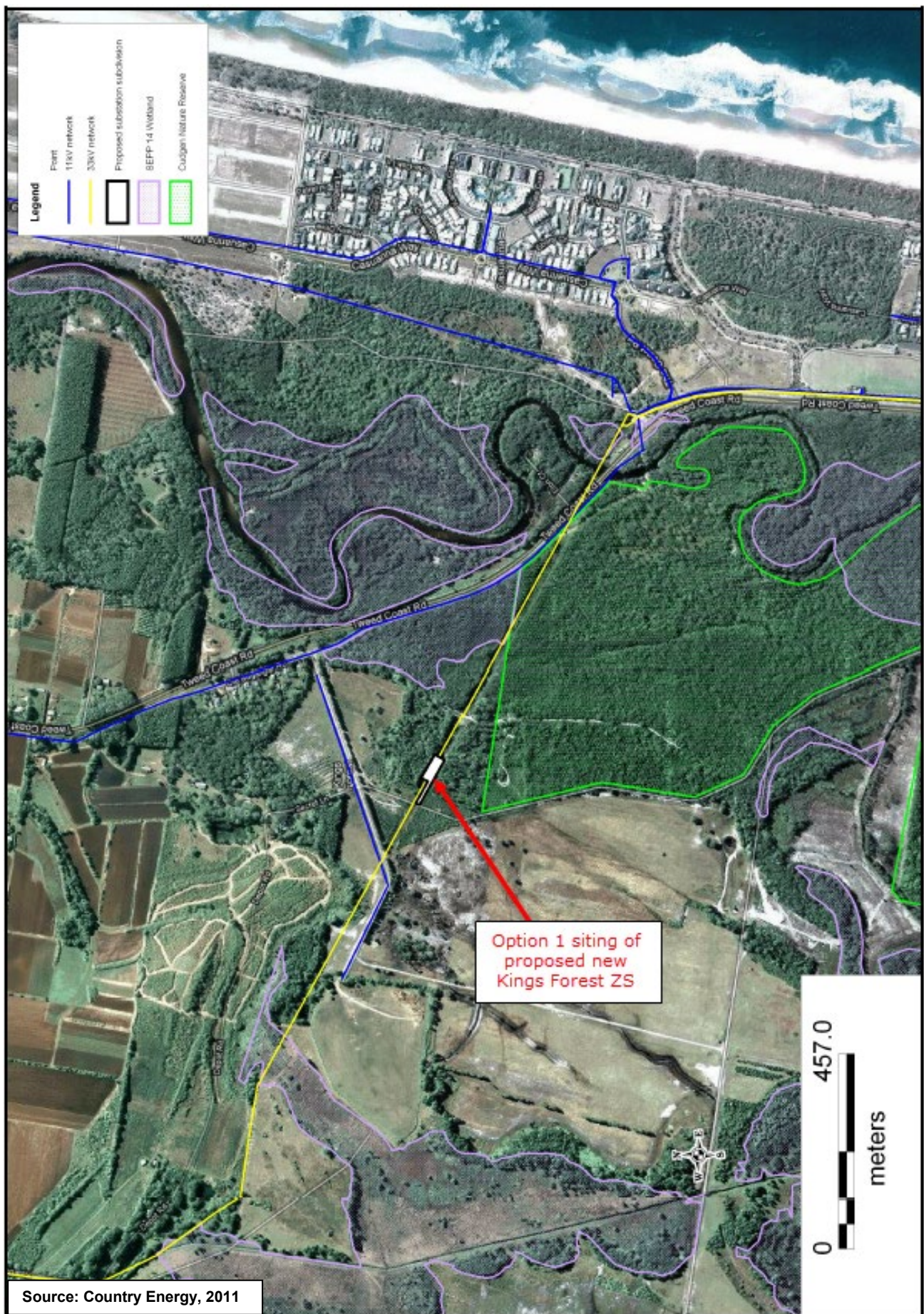


Figure 4-1: Option 1 considered for proposed new Kings Forest ZS site

4.4 Preferred ZS Site

Ultimately, Option 2 was selected as the preferred location for the ZS, as it, meets the needs of the customer; provides ease of connection to the new high voltage supply; is located in an employment lands precinct, thus minimising land use conflicts; and has the least societal and environmental impacts of the two options considered.

5. Environmental Legislation

The following section addresses the regulatory and statutory context of the proposed activity including its definition, land use permissibility, and compliance with the relevant environmental planning instruments (EPIs).

5.1 Environmental Planning and Assessment Act, 1979 (EP&A Act)

The EP&A Act is the primary piece of legislation regulating land use planning in NSW. It provides the framework for the development of state and local planning instruments which, through their hierarchy, determine the statutory process for environmental impact assessment. Under the EP&A Act there are two distinct processes, which are:

- Part 4 - 'development' proposals which require consent, including state significant development; and
- Part 5, which regulates 'activities' and requires an approval by a determining authority (e.g. Essential Energy). Part 5 also includes an assessment pathway for state significant infrastructure.

The proposed Kings Forest ZS was historically included as part of the Concept Plan Approval (MP 06_0318) and Stage 1 Subdivision and Bulk Earthworks Project Approval (MP 08_0194) for the broader Kings Forest development, pursuant to the former Part 3A approval pathway of the EP&A Act. The project satisfied the definition of a 'transitional Part 3A project' under Clause 2(1) of Schedule 2 to the *Environmental Planning & Assessment (Savings, Transitional and Other Provisions) Regulation 2017* (ST&OP Regulation), which came into effect on 1 March 2018. Under the ST&OP Regulation, projects subject to existing Part 3A approvals remained transitional Part 3A projects until they were transitioned to State Significant Development (SSD) (clause 3(1)-(2), Schedule 2). As of 1 March 2018, new proposals to modify existing Part 3A project approvals can only be determined once the project has been declared to be SSD by the Minister for Planning, and the relevant provisions to modify an SSD consent under Part 4 of the EP&A Act apply. On 6 July 2018, an Order was published in the New South Wales Government Gazette transitioning the Part 3A project approval (MP 08_0194) to SSD. The effect of this order is that the project approval is taken to be a development consent under Part 4 of the EP&A Act for the carrying out of the development and may be modified under section 4.55 of the EP&A Act.

In April 2023 Leda submitted a modification application (Modification 13) for the Stage 1 project approval (MP 08_0194), under section 4.55(A) of the EP&A Act, to delete reference to the ZS in Precinct 2, through a modification to Conditions A3 and A12. On 21 June 2023, the then NSW Department of Planning and Environment (DPE) approved the modification, which enables Essential Energy to assess the proposed ZS under Part 5, Division 5.1 of the EP&A Act, pursuant to the development without consent provisions of *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) (refer **Section 2.2.1.1**).

The proposal can therefore proceed under Part 5, Division 5.1 of the EP&A Act, given the proposal:

- May be carried out without development consent;
- Is not exempt development; and
- Would be carried out by a determining authority or requires the approval of a determining authority.

A determining authority, for the purposes of this activity, is defined in Part 5 of the EP&A Act to include, but not be limited to, a state-owned corporation within the meaning of the *State Owned Corporations Act 1989*. Essential Energy is listed as a state-owned corporation, and would therefore be the determining authority for the activity covered by this REF.

In accordance with state and local EPIs (described below), this REF has been prepared under Part 5, Division 5.1 of the EP&A Act to assess the possible environmental outcomes of the proposed activity. In determining the proposal and degree of impact, Essential Energy is required to consider Section 5.5 of the EP&A Act and clause 171 of the EP&A Reg which are summarised in **Section 9** of this REF.

In accordance with clause 171(4) of the EP&A Reg, Essential Energy is required to publish this REF on the NSW planning portal, as the capital value of the ZS will exceed \$5 million, prior to the activity commencing.

5.2 Environmental Planning Instruments

EPIs regulate the permissibility to undertake an activity and the type of assessment process that is required. EPI is the generic term used to describe state environmental planning policies, regional environmental plans¹ and local environmental plans (LEPs). EPIs that apply to this development are outlined below.

5.2.1 State Environmental Planning Policies

5.2.1.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) consolidates and updates the planning process for new infrastructure. Subject to certain exemptions the T&I SEPP allows development for the purpose of an electricity transmission or distribution network to be carried out by or on behalf of an electricity supply authority or public authority without consent on any land.

Exemptions to this broad (on any land) application include developments which require Part 4 approval under *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) or activities triggering designated development under *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazard SEPP) (refer below).

The proposed activity falls within the scope of the T&I SEPP as being permissible without development consent.

Consultation requirements under the Infrastructure SEPP are addressed in **Section 3.3**, whilst notification provisions are detailed in **Table 5-2**.

5.2.1.2 State Environmental Planning Policy (Planning Systems) 2021

State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP) identifies state or regionally significant development, state-significant infrastructure, and critical state-significant infrastructure. It also provides for consideration of development delivery plans by local Aboriginal land councils in planning assessment, and allows the planning secretary to elect to be the concurrence authority for certain development that requires concurrence under nominated state environmental planning policies.

The proposed Kings Forest ZS was historically included as part of the concept plan approval (MP 06_0318) and Stage 1 project approved (MP 08_0194) for the broader Kings Forest development, pursuant to the former Part 3A approval pathway of the EP&A Act and the former *State Environmental Planning Policy (Major Development) 2005* (Major Development SEPP), both now repealed, by Division 4.7 (SSD) of the EP&A Act and The Planning Systems SEPP, respectively. As the project approval (MP 08_0194) has now been modified, to delete reference to the ZS and it will be assessed under Part 5, Division 5.1 of the EP&A Act, pursuant to the development without consent provisions of the T&I SEPP, the provisions of the Planning Systems SEPP no longer apply to the proposal.

5.2.1.3 State Environmental Planning Policy (Resilience and Hazards) 2021

State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) provides provisions for land use planning within the coastal zone, and to manage hazardous and offensive development. It also provides a state-wide planning framework for the remediation of contaminated land and to minimise the risk of harm.

The proposal site is not located on land identified as coastal wetlands or littoral rainforest on the *Coastal Wetlands and Littoral Rainforests Area Map*, according to Resilience and Hazard SEPP. As the proposal is not seeking development consent the provisions relating to hazardous and offensive development and contaminated land do not apply. Notwithstanding, the risk of potential contamination is assessed in **Section 6.8**.

5.2.1.4 State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP), among other things, provides planning rules and controls for the clearing of native vegetation in NSW and the land use planning and assessment framework for Koala habitat.

No vegetation clearing is proposed at the site, and while the provisions relating to Koala habitat do not apply to Part 5 assessments under the EP&A Act, potential impacts to Koalas has been

¹ The *Environmental Planning and Assessment Amendment Act 2008 No 36* repealed the power to make regional environmental plans. Regional environmental plans still in force are now considered to be state environmental planning policies.

considered in **Section 6.5**.

5.2.2 Local Environmental Plans (LEP)

LEPs are developed by councils (they become law only after Ministerial approval) and guide planning decisions for local government areas. According to the NSW Planning Group, now part of the NSW Department of Planning, Housing and Infrastructure (DPHI), LEPs, through zoning and development controls, allow councils to regulate the ways in which land is used. Council LEPs also list heritage items that are of local heritage significance.

The application of the T&I SEPP as it relates to electricity transmission and distribution network overrides the need to consider zoning controls, as developments covered by the T&I SEPP (Division 5) are permissible on *any land* without consent. However, the T&I SEPP provides consultation and notification provisions where activities are likely to substantially impact upon council-related infrastructure, or items of local heritage significance (refer **Section 3.2**).

5.3 Key Legislation

5.3.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) (EPBC Act)

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) requires the approval of the Commonwealth Minister for the Environment for actions that may have a significant impact on matters of national environmental significance (NES). Approval from the Commonwealth is in addition to any approvals under NSW legislation.

The EPBC Act lists nine matters of NES which must be addressed when assessing the impacts of a project. An assessment of how the project may impact on matters of NES is provided in **Table 5-1**.

Table 5-1: Matters of national environmental significance

Matter of national environmental significance	Impact
World heritage properties	There are no world heritage properties proximate to the proposed development, or that would potentially be affected by the proposal.
National heritage places	There are no national heritage places proximate to the proposed development, or that would potentially be affected by the proposal.
Wetlands of international importance	There are no Ramsar wetlands proximate to the proposed development, and the proposal is not likely to have a significant impact on the ecological character of a Ramsar wetland.
Commonwealth listed threatened species and ecological communities	The proposal is not expected to have any significant impact on threatened species, populations or ecological communities listed within Commonwealth (or State) legislation (refer Section 6.5).
Great Barrier Reef Marine Park	The proposal would not result in any impacts to the Great Barrier Reef Marine Park.
Commonwealth listed migratory species	The proposal is not expected to have an impact on listed migratory species (refer Section 6.5).
Nuclear action	The proposal would not result in any nuclear action, nor would the activity require any nuclear action to be undertaken.
Commonwealth marine areas	There are no Commonwealth marine areas proximate to the proposed development, or that would potentially be affected by the proposal.
Impacts on water resources resulting from large coal mining and coal seam gas developments	The proposal is not related to any large coal mining or coal seam gas developments. The project would not impact on water resources.

The proposal site falls within land for which an approval under sections 130(1) and 133 of the EPBC Act has been granted (EPBC 2012/6328) (Commonwealth DCCEEW, 2024a). The proposed new 33/11kV ZS will be undertaken within the footprint of this approval. Given that the proposal would not significantly impact on matters of NES in addition to impacts approved, and would not be carried out on Commonwealth land, the EPBC Act is not triggered and approval, or modification to EPBC 2012/6328, from the Commonwealth Minister for the Environment and Water is not required.

5.3.2 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides the process for listing threatened species, threatened ecological communities, and areas of outstanding biodiversity value, and details the process for assessing impacts on those matters.

Section 1.7 of the EP&A Act requires that assessment of an activity must consider its impact on threatened species, threatened populations, and threatened ecological communities or their habitats in accordance with Part 7 of the BC Act. The assessment for determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats, referred to in section 7.3 of the BC Act, determines whether the proposed works are likely to have a significant impact. If a significant impact is determined, a species impact statement (SIS) is required, or if the proponent so elects, a Biodiversity Development Assessment Report (BDAR) can be prepared.

The proposed ZS site is not located within a declared area of outstanding biodiversity value. The proposed activity, being construction of the ZS, will be carried out on cleared and highly disturbed land associated with the broader Kings Forest development. A significant impact on threatened species, populations or ecological communities as a result of the proposal is considered unlikely (refer to **Section 6.5** and **Appendix E**).

5.3.3 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) provides for the prevention, elimination, minimisation and management of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. Section 22 of the Biosecurity Act requires that any person who deals with biosecurity matter, or a carrier, and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing, has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised. This obligation is referred to elsewhere within the Biosecurity Act as the “general biosecurity duty”.

Given the excavation and disturbance of surface and sub soils associated with the proposed activity, Essential Energy has a general biosecurity duty to ensure the biosecurity risks posed by the potential for the introduction of weed species are prevented, eliminated or minimised.

In addition, the proposal site is located on the far north coast of NSW, where there have been three red imported fire ant infested areas declared (Murwillumbah, Wardell, and part of NSW within 5km of the Currumbin Waters detection in Qld). The proposal site is located with the NSW protection zone (i.e., all of NSW), but not within a declared fire ant infested area or movement control area. Notwithstanding Essential Energy has an obligation to comply with the relevant biosecurity orders, as they relate to movement of material into and out of infested and movement control areas, where applicable. At the time of writing, *Biosecurity (Fire Ant) Emergency Order (No 7) 2024*, was in place, but did not include the area of the proposed substation works.

5.3.4 Electricity Supply Act, 1995 (ES Act)

The *Electricity Supply Act 1995* (ES Act) establishes a comprehensive wholesale and retail market in electricity and regulates the network operations, wholesale trading, and electricity supply in the retail market. The ES Act confers special powers on Essential Energy in respect of development and maintenance of electricity infrastructure and sets out the licencing regime. In particular, it allows Essential Energy to trim and remove trees, carry out works on public roads, and acquire land.

The ES Act also requires that no works (other than routine repairs or maintenance works) may be carried out unless 40 days' notice has been given to the local council to make a submission in relation to the proposal. Any submission must be considered by Essential Energy.

5.3.5 Heritage Act, 1977 (Heritage Act)

The *Heritage Act 1977* (Heritage Act) provides for the protection of heritage items of local and state significance. Such items may include places, buildings, works, relics, moveable objects, or precincts with historical, scientific, cultural or aesthetic value to the state. Where works are likely to impact upon an item listed on the State Heritage Inventory (SHI), approval may be required under two sections of the Heritage Act:

- Section 60 approval relating to impacts on items listed on the SHI; and
- Section 140 approval requiring an excavation permit for activities with potential to excavate or disturb a relic.

As described in **Section 6.7.2** there is no foreseeable likelihood that an item listed on the SHI would be impacted by the proposal, therefore further assessment and a permit from the Department is not required. Further discussion of potential impacts and measures to minimise impacts to items of local heritage significance is provided in **Section 6.7**.

5.3.6 Local Government Act 1993 (LG Act)

The Local Government Act 1993 (LG Act) implements a commitment made under section 51 of the NSW Constitution Act 1902 that requires the continuance of local government. The LG Act provides the legislative framework in which local councils operate, and encourages local participation in the affairs of local government.

Whilst the central focus of the LG Act is about the governance of local councils and the participation of the local community in its affairs, the LG Act also includes provisions for approval of certain works. In areas outside of the operation of the Sydney and Hunter Water Boards, local councils have the responsibility for the regulation of water supply, sewerage and stormwater drainage work.

According to section 68 of the LG Act, approval from local council is required for water supply work, sewerage work, and stormwater drainage work. Water supply work includes the extension of any pipes or fittings of any water services communicating or intended to communicate, directly or indirectly, with any water main of a council. Sewerage work includes not only works related to the sewer system, but also septic tank disposal systems.

As the proposal will require construction and extension of sewerage and water supply service pipes and connection to stormwater drainage work, it is likely a section 68 approval will be required from the local council.

5.3.7 Local Land Services Act, 2013 (LLS Act)

The *Local Land Services Act 2013* (LLS Act), established Local Land Services, a government agency with the responsibility for providing advice on biosecurity, natural resources and agricultural advisory services in NSW. The LLS Act includes provisions for the regulation of native vegetation including the approval of certain activities.

Under the LLS Act, approval is required from the Minister for the Environment or delegate to clear native vegetation (exemptions apply). Exemptions include, but are not limited to, urban areas, electricity line maintenance and Part 5 activities under the EP&A Act.

The LLS Act is administered by the various local land services under delegated authority by the Minister for the Environment.

Given that the proposal will be assessed under Part 5 of the EP&A Act, the provisions relating to the LLS Act are not applicable.

5.3.8 National Parks and Wildlife Act, 1974 (NPW Act)

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves. It also provides for the protection and care of native flora and fauna, and Aboriginal places and objects throughout NSW. Under the NPW Act it is an offence, without authorisation, to:

- Harm an Aboriginal object or place without consent;
- Pick or harm any plant or animal that is protected or is a threatened species, population or ecological community; or
- Damage any critical habitat, or habitat of a threatened species, an endangered population or an endangered ecological community or reserved land.

When an activity is likely to harm an Aboriginal object or place, approval under section 90 is required.

The NPW Act also serves to direct the management and protection of reserved land². In relation to utility installations, the Minister for the Environment may grant easements or rights of way through reserved land for the conveyance or transmission of electricity.

The proposal site is not located on reserved land. Approval under the NPW Act is not required in

² Land being a national park, historic site, state conservation area, regional park, karst conservation reserve, nature reserve or an Aboriginal area.

respect of the proposed activity.

As described in **Section 6.6**, based on the design, and mitigation measures, the proposal is not likely to impact upon Aboriginal objects.

5.3.9 Protection of the Environment Operations Act, 1997 (POEO Act)

The *Protection of the Environment Operations Act 1997* (POEO Act) provides a framework for the licencing of activities that have potential to result in pollution of the environment. The POEO Act is administered by OEH. An environment protection licence is not required for the proposed activities as they do not fall within Schedule 1 of the POEO Act; however, the following restrictions apply:

- The proposal must not pollute waters;
- Waste from the works must not be wilfully or negligently disposed of in a manner that harms or is likely to harm the environment;
- Waste must not be transported to a place that cannot lawfully be used as a waste facility for that waste;
- There must be no litter in or on a public place or an open private place caused by workers; and
- Any environmental incident that involves actual or potential harm to the health or safety of human beings or to ecosystems must be reported to the Environment Protection Authority (EPA).

During construction, there is the potential for discharge to surface waters from excavation, and trenching activities. A number of management strategies are available to Essential Energy for the discharge to surface waters, including discharging water over grassed or well vegetated areas away from waterways, or the use of filter bags in urban environments.

5.3.10 Roads Act 1993 (Roads Act)

The *Roads Act 1993* (Roads Act) provides for the ownership and management of public roads, and also requires the consent of the appropriate roads authority for various works in respect of certain public roads.

Section 138 of the Roads Act requires the consent of the appropriate roads authority for various works in respect of public roads and classified roads. Under Schedule 2 (5) (1) of the Roads Act Essential Energy is exempt from obtaining approval for works on or over an unclassified road other than a Crown road. However, works that require a connection to or crossing of a classified³ road must be approved by Transport for NSW (TfNSW).

The proposed activity will be limited to private property. No work within, on, or over a classified road is required, therefore there is no requirement for a Section 138 approval from TfNSW.

5.3.11 Water Act, 1912 (Water Act)

Under the *Water Act 1912*, for any temporary or permanent works not defined in a gazetted water sharing plan under the *Water Management Act 2000* (WM Act), a licence or permit is required to:

- Extract water from a stream, river or water course via a pump or other work; or
- Extract groundwater via any type of bore, well, spear point or groundwater interception scheme (including dewatering).

The proposal site is located on land to which Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023 and potentially the Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016 apply and are in force. A licence or permit under the Water Act is therefore not required. Assessment of applicable licences, work or use approvals under the WM Act is provided in the following section.

5.3.12 Water Management Act, 2000 (WM Act)

The *Water Management Act 2000* (WM Act) governs the issue of new water licences and the trade of water licences and allocations for those water sources (rivers, lakes and groundwater) in NSW where water sharing plans have commenced. Under the WM Act, should water need to be extracted from a surface water or groundwater source, defined in gazetted water sharing plan, then four licence/approvals may apply, including:

³ Classified Roads include main roads, highways, freeways, a controlled access road, a secondary road, a tourist road, a tollway, a transitway and State work.

- An access licence to obtain access to a share of the water source
- A water use approval to obtain permission for how the water would be used
- A water management works approval to obtain permission to install and use the works for water supply, drainage or flood mitigation work
- An activity approval, namely a controlled activity approval and/or aquifer interference approval.

The proposed activity would not trigger the need to obtain a water use approval or a water management works approval.

The proposal does not involve the taking of water from a surface water or groundwater source, however, a water licence is required whether water is taken for consumptive use or whether it is taken incidentally by the aquifer interference activity. For example, dewatering of groundwater during building construction activity requires a water licence (unless an exemption applies) even where that water is not being used consumptively as part of the activity's operation.

The WM Act defines an aquifer interference activity as involving any of the following:

- (a) *the penetration of an aquifer,*
- (b) *the interference with water in an aquifer,*
- (c) *the obstruction of the flow of water in an aquifer,*
- (d) *the taking of water from an aquifer in the course of carrying out mining, or any other activity prescribed by the regulations,*
- (e) *the disposal of water taken from an aquifer as referred to in paragraph (d).*

An aquifer is defined as, *a geological structure or formation, or an artificial landfill, that is permeated with water or is capable of being permeated with water.*

A geotechnical investigation undertaken by Regional Geotechnical Solutions (RGS), 2023, for the boarder KVHVSP, included five boreholes within the ZS site. Groundwater was not encountered in 4 of the 5 boreholes augured during the investigation. Groundwater was encountered at approximately 2.6m depth, at borehole BHS5, located along the southern boundary of the proposal site. It is therefore unlikely that the shallow excavation and trenching works (to a maximum of approximately 1.2m depth) at the proposed ZS site will intercept ground. As such aquifer interference activity approval or water access licence is not required.

A controlled activity approval confers a right on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land. Under the WM Act, a controlled activity means:

- a) *the erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or*
- b) *the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or*
- c) *the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or*
- d) *the carrying out of any other activity that affects the quantity or flow of water in a water source.*

Waterfront land means—

- (a) *the bed of any river, together with any land lying between the bed of the river and a line drawn parallel to, and the prescribed distance inland of, the highest bank of the river, or*
- (a1) *the bed of any lake, together with any land lying between the bed of the lake and a line drawn parallel to, and the prescribed distance inland of, the shore of the lake, or*
- (a2) *the bed of any estuary, together with any land lying between the bed of the estuary and a line drawn parallel to, and the prescribed distance inland of, the mean high water mark of the estuary, or*
- (b) *if the regulations so provide, the bed of the coastal waters of the State, and any land lying between the shoreline of the coastal waters and a line drawn parallel to, and the prescribed distance inland of, the mean high water mark of the coastal waters,*

where the prescribed distance is 40 metres or (if the regulations prescribe a lesser distance, either generally or in relation to a particular location or class of locations) that lesser distance. Land that falls into 2 or more of the categories referred to in paragraphs (a), (a1) and (a2) may be waterfront land by virtue of any of the paragraphs relevant to that land.

The proposed ZS site is not located within 40m of waterfront land. Notwithstanding, Section 41 of the *Water Management (General) Regulation 2018*, Essential Energy, a public authority, is exempt from section 91E (1) of the WM Act in relation to all controlled activities that it carries out in, on, or under waterfront land. A controlled activity approval is therefore not required.

5.4 Summary of Licences, Permits, Approvals and Notifications

Specific approvals required for the construction, maintenance and operation of the proposal are outlined in **Table 5-2**.

Table 5-2: Summary of licences, permits, approvals and notifications

Legislation	Authority	Requirement
<i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i>	Local Council and occupiers adjoining land	21 days notification required for works involving new or existing substations. Essential Energy's Design Services will be responsible for this notification. These notifications have been sent.
<i>Electricity Supply Act 1995</i>	Local Council	40 days notice of the proposed works must be given. Essential Energy's Design Services will be responsible for this notification. This notification has been sent.
<i>Local Government Act 1993</i>	Tweed Shire Council	Section 68 approval will likely be required for construction and extension of water supply and any sewerage service pipes and stormwater connection.

6. Environmental Assessment

6.1 Air Quality and Greenhouse Gases

6.1.1 Existing environment

The proposal site is situated on cleared and highly disturbed land associated with the broader Kings Forest development site. Likely historical disturbances include clearing, agricultural use and Slash Pine plantation. More recently the northeastern portion of the proposal site has been used as a laydown yard, containing construction materials, equipment and machinery for the site preparatory, and early construction works for Stage 1 of the Kings Forest development. The remaining portion of the site is currently grassed with exotic groundcover species. The main air quality influences on the existing environment would be predominately rural, as well as that associated with the construction of Stage 1 of the broader Kings Forest development, including the generation of dust. Transport exhaust emissions from vehicles and machinery used for construction of the broader Kings Forest development site, as well as vehicles utilising Tweed Coast Road and Old Bogangar Road to the east of the proposal site, would also contribute to local air quality in the vicinity of the proposal site.

A row of residential properties are located within an existing subdivision along Old Bogangar Road to the east and northeast of the proposal site. The closest of these is located approximately 100m east of the proposal site. Several rural-residential properties are also located to the north of the proposal site, the closest being approximately 120m north (refer **Figure 1-7**).

6.1.2 Assessment of impact

6.1.2.1 Air quality during construction

It is expected that during bulk earth works, including benching, excavation and trenching work there would be minor amounts of dust generated from the disturbance of soil, and wind erosion of any exposed stockpiles.

There will be minimal exhaust emissions from vehicles. Exhaust emissions from construction equipment are likely to include nitrogen oxides (NO_x), carbon monoxide (CO), sulphur oxides (SO₂), hydrocarbons, and total suspended particulates. All vehicles will be fitted with approved exhaust systems to maintain vehicle exhaust emissions within accepted standards.

Works will be limited to the proposal site itself. Impacts to air quality will be small in intensity, over twelve months, and will be small in scope. It is unlikely that there will be an odour impact. Any impacts on air quality will be short-term and localised.

6.1.2.2 Air quality during operation

Once operational, the ZS will have negligible impacts on air quality. All Essential Energy's assets are subject to regular maintenance and monitoring to ensure all equipment is operating effectively. Capped surfaces, gardening and landscaping will ensure no dust is generated during the lifetime of the substation.

6.1.3 Environmental mitigation measures

Appropriate dust minimisation measures will be implemented as required, including:

- Any potential dust-borne materials transported to and from the activity site will be covered at all times during transportation
- All vehicles and machinery will be well maintained according to manufacturer requirements to ensure emissions are kept within acceptable limits.
- Progressive stabilisation will occur as soon as reasonably practicable throughout construction to prevent dust generation

6.1.4 Conclusion

The proposal is not anticipated to result in substantial or uncontrollable dust or exhaust emissions in the area during construction or operation. Any air quality impacts would be short-term and minor during construction or future maintenance. Given the mitigation measures outlined in this assessment the overall environmental risk is considered to be low.

6.2 Geology and Soil

6.2.1 Existing environment

Reference to the NSW Geology Simplified layer, which can be viewed on the NSW Government's Central Resource for Sharing and Enabling Environment Data in NSW (SEED) website, indicates the proposal site is underlain by Quaternary coastal dune deposits.

Review of the Mitchell Landscapes Mapping V3 (Department of Environment, Climate Change and Water [DECCW] 2010a) indicates that the proposal site is located on the Byron-Tweed Alluvial Plains soil landscape, comprising channels, floodplain, terraces and estuary of the Tweed River and other coastal streams on Quaternary alluvium. General elevation is 0 to 50m, with local relief 15m. Soils are characterised by uniform brown earths and structured brown clays on floodplains, and brown texture-contrast soil with high organic content on terrace remnants. **Figure 6-1** illustrates the soil landscapes relative to the proposal site.

The geotechnical investigation for the proposed ZS undertaken by RGS (2023) indicated that at the time of the investigation the proposed ZS site was used as a laydown area for the broader Kings Forest development, containing numerous stockpiles, construction materials and waste. Five boreholes were augured to between 3.0m and 4.5m depth. The investigation indicated subsurface conditions at the proposed ZS site comprised of very loose, pale grey, fine sand down to approximately 0.15m depth. Loose, dark grey, fine silty sand was present from approximately 0.15m to between approximately 0.3 - 0.7m depth, with medium dense, grey, brown and pale grey, fine silty sand / sand beyond. Groundwater was not encountered in 4 of the 5 boreholes augured during the investigation. Groundwater was encountered at approximately 2.6m depth, at borehole BHS5, located along the southern boundary of the proposal site.

According to the Tweed LEP 2014, the proposal site is mapped as Class 3 potential acid sulfate soils (PASS), meaning that any works more than 1 metre below the natural ground surface, or whereby the water table is likely to be lowered more than 1 metre below the natural ground surface, will likely encounter PASS. **Figure 6-2** illustrates the PASS classes relative to the proposal site.

Historic acid sulfate soil testing, reviewed and summarised in Gilbert and Sutherland (2011a) for Stage 1 of the broader Kings Forest development site, indicated the material with the highest acid sulfate soil potential occurred within the wetland/relict stream channel areas and was generally encountered throughout the sampling depth (i.e., from 0 to 6m below ground level). Whereas those samples not exhibiting any acid sulfate potential during screening were generally found outside the wetland/relict stream channel areas, and were associated with older Pleistocene sands, often indurated, underlying the more recently deposited Holocene peats and sediments.

More recent acid sulfate soil testing, specific for the ZS site was undertaken by RGS (2023), as part of the geotechnical investigation. RGS (2023) collected six samples from the proposed ZS site and submitted them to a NATA registered laboratory for acid sulfate soil (ASS) screening. The samples revealed soil field pH (pHF) values ranging between 5.31 and 6.32 in distilled water. pHF less than 4 is an indicator of Actual ASS. Field pH peroxide test (pHFOX) values ranged between 2.22 and 2.66. Values less than 3 can be an indicator of PASS but can also be the result of high organic content in the soil (RGS, 2023).

6.2.2 Assessment of impact

The proposed works will involve site disturbance through bulk earthworks, which will include cut and fill, benching, excavations and trenching. Cut and fill analysis undertaken by WGA APD Engineering (2024) indicated approximately 1,619m³ of cut material and 1,309m³ of fill material required at the proposal site, leaving a surplus of approximately 310m³ of cut material. The majority of the cut material would be generated from the northern portion of the site and the majority of fill material required on the southern portion of the site, and western extent of the proposed primary access road (refer Bulk Earthworks Heat Map in **Appendix A**). Approximately 300mm of imported Densely Graded Base (DGB) material will then be used to form the final ZS bench heights.

These activities have the potential to impact on soil stability and erosion potential within the proposal site. The extent of these impacts will be restricted to the ZS site. With implementation of appropriate erosion and sediment control measures, the proposed activity is expected to have a low impact on soils and geology in the area.

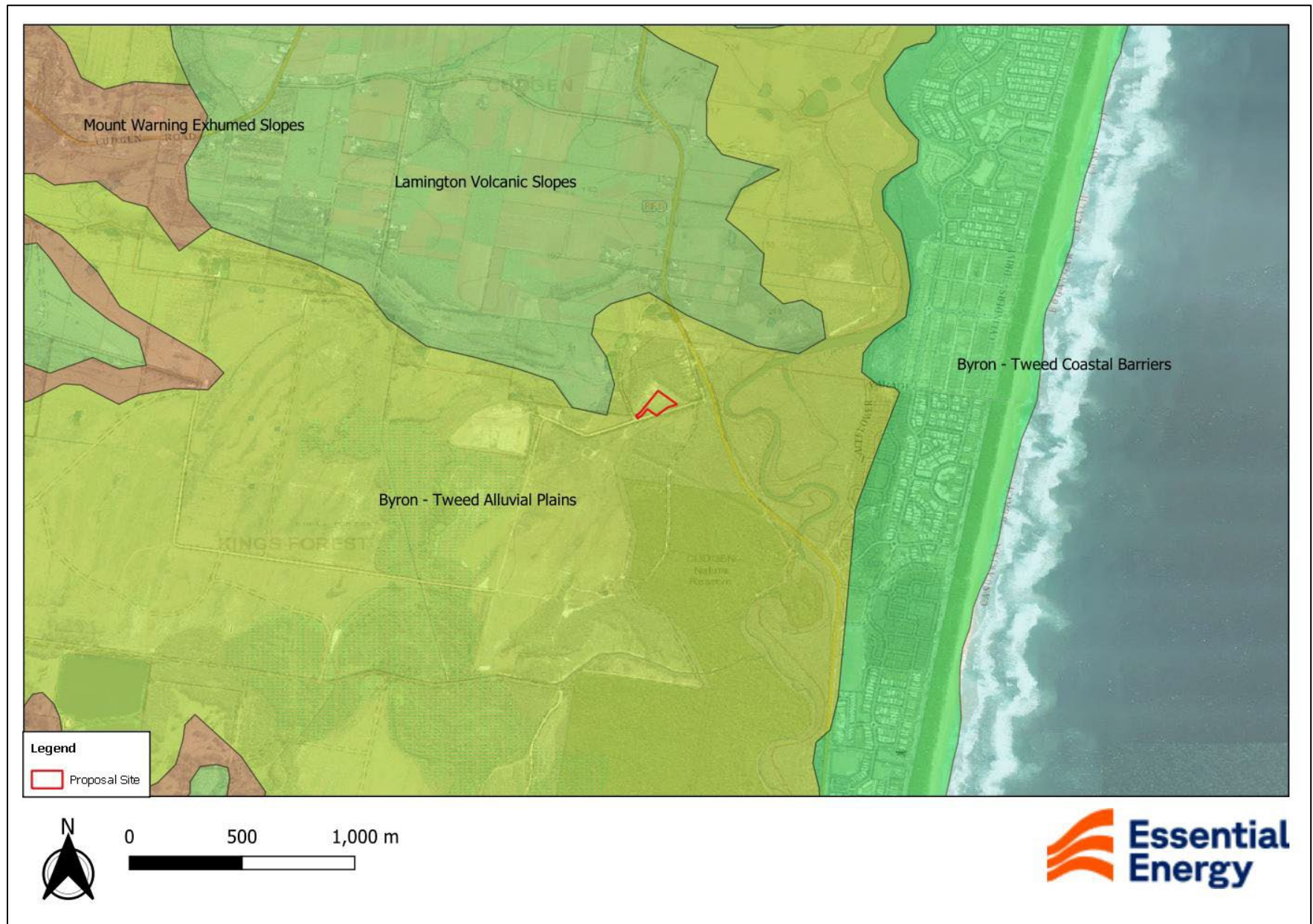


Figure 6-1: Soil landscapes relative to the proposal site

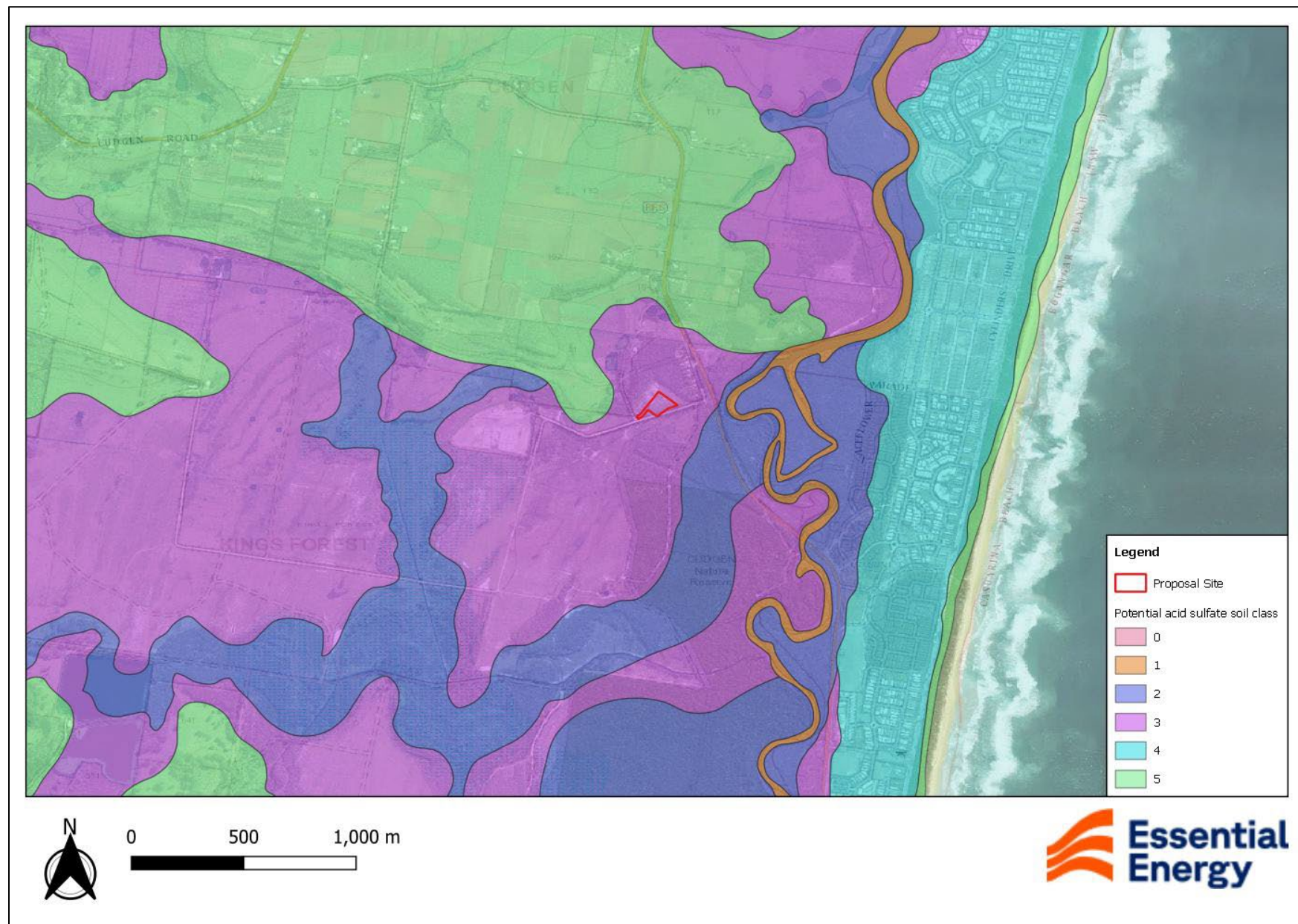


Figure 6-2: Mapped Potential Acid Sulfate Soils (Tweed LEP 2014) relative to the proposal site

While the proposed ZS site is located within an area mapped Class 3 PASS, it is located on land outside the wetland/relict stream channel areas, which decreases the chances of PASS being encountered. The pHFOX values recorded by RGS (2013) suggest PASS is likely to be present, although the lower pHFOX values could also be attributed to high organic content of the soil (RGS, 2023). Based on these results, and taking a conservative approach, it is considered the PASS will potentially be encountered at the proposal site and will need to be managed accordingly.

Mitigation measures proposed to manage erosion and sedimentation are outlined in **Section 6.2.3**. Water quality impacts are discussed in **Section 6.3.2**, air quality impacts are discussed in **Section 6.1.2**, and contamination impacts are discussed in **Section 6.8.2**.

6.2.3 Environmental mitigation measures

The following mitigation measures will be employed to manage erosion and sedimentation:

- Risks associated with sediment and erosion will be managed in accordance with The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom 2004). In particular, controls including, but not limited to the following, will be implemented:
 - Sediment control fences or other measures shall be installed at the downslope perimeter of disturbed areas, including any temporary stockpiles.
 - Maintenance of all erosion control measures at operational capacity until land is stabilised.
- Disturbed areas will be stabilised as soon as practicable following construction activities
- A site specific erosion and sediment control plan should be included as part of the civil contractor's Construction Environmental Management Plan (CEMP).
- Essential Energy's CEOP8064 Management of Excavated Material; Guideline for Construction Sites will be consulted to determine the most appropriate beneficial reuse or disposal method for any surplus excavated materials
- PASS may be encountered during earthworks. A site specific acid sulfate soil management plan should be included as part of the civil contractor's CEMP.

6.2.4 Conclusion

The proposal is not anticipated to have any adverse impacts on the soils and geology of the environment. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low. Further potential impacts to water quality are discussed in the following section.

6.3 Water Quality and Hydrology

6.3.1 Existing environment

The closest waterway is Cudgen Creek, located approximately 230m east of the proposal site, on the opposite side of Tweed Coast Road. Cudgen Creek flows from Cudgen Lake, located approximately 2.9km south of the proposal site, to its mouth at Kingscliff, approximately 4km to the northeast of the proposal site. There are several farm dams located to the northwest and west of the proposal site, the closest being approximately 260m northwest. Mapped coastal wetlands are located approximately 115m east and 385m northwest of the proposal site, respectively. The Pacific Ocean is located approximately 1,500m to the east of the proposal site.

Waterways relevant to the proposal site are illustrated on **Figures 1-2** and **6-3**.

Current drainage at the proposal site would be expected to follow overland flows to the south and southwest, towards Depot Road, and what will become the new Kings Forest Parkway. Once constructed, the proposal site would have its own internal drainage (refer **Section 6.3.2**).

Groundwater was not encountered in 4 of the 5 boreholes down to 3m depth during the geotechnical investigation (RGS, 2023) for the proposed ZS site. Groundwater was encountered at approximately 2.6m depth, at borehole BHS5, located along the southern boundary of the proposal site.



Figure 6-3: Waterways in the vicinity of the proposal site

Flood map data has been provided by WGA APD Engineering (2024) through information supplied by Leda's stormwater consultant, Gilbert and Sutherland (2011d). The flood map data shows peak flood levels (m AHD) for the 100 year ARI (1% AEP) flood within the vicinity of the proposal site and the surrounding regions. Based on WGA's (2024) review of the Gilbert and Sutherland (2011d) flood map, the extent of flooding does not appear to impact the proposal site. The nearest flood impacted areas are located to the northeast of the proposal site (refer to **Figure 6-4**).

6.3.2 Assessment of impact

The following activities have the potential to impact on water quality during the construction and operation of the project:

- Earthworks, including benching, excavations and trenching
- Concreting works
- Fuel or oil leaks from construction and maintenance equipment

In consideration of the disturbance area being restricted to the proposed ZS site, and the location away from immediate receiving waterways, any potential impacts to surface water flows are likely to be negligible. Similarly, the proposal is not expected to have an impact on the Cudgen Creek system.

Given the depth to groundwater below the natural ground surface, the proposed level of filling (between approximately 0.6 and 1.1m) along the southern boundary, and limited excavation of trenching work in this area, it is unlikely groundwater will be intercepted.

The substation bench is required to be able to withstand a 1% AEP (1 in 100yr flood) or major storm event without significant damage. Control cubicles for the yard equipment and the buildings floor level required to be a minimum 500mm above expected flood levels

According to TSC flood mapping, the proposed ZS site is not affected by flooding for the design flood, with only the very eastern margin affected by projected climate change events. The design flood event is based on the 1% Annual AEP. The climate change flood event level is the projected 2100 design flood event considering expected sea level rise and increased rainfall intensity. Following 2007 guidance from the NSW State Government, this event is based on 0.91m rise in sea levels and a 10% increase in rainfall intensity (TSC, 2024).

Detailed flood mapping provided by WGA APD Engineering (2024) through information supplied by Leda's stormwater consultant, Gilbert and Sutherland (2011d), which included impacts from the Kings Forest development, indicated peak flood levels by the blue dot points shown in **Figure 6-4**. These levels are along the eastern margin of the site, which range from 4.394m AHD in the north to 3.44m AHD in the south. The lowest level of the proposed ZS bench is 7.2m AHD. Based on this data, the proposed ZS is positioned 2.81m to 3.76m above the adjacent flood levels. As such, it is likely that the ZS is adequately protected from flood inundation, including from future climate change events.

Construction of the proposed ZS, particularly the raising and levelling of the site, will result in minor changes to surface water flows in the immediate vicinity of the proposal site. However, this will be limited to diversion of upslope flows and management of stormwater generated on site. Similarly, anticipated changes to groundwater flows are negligible. While parts of the proposal site will be hard stand (i.e., transformer bunds and access roads), much of the site will remain either semi permeable or permeable, and allow natural infiltration. These minor changes are not expected to significantly impact on local hydrological conditions.

The ZS site will include its own site drainage, including installation of stormwater pipes and pits. Stormwater would be directed to an appropriately located discharge point, and ultimately enter the stormwater management system of the broader Kings Forest development site.

Appropriate sediment and erosion control measures installed and maintained during construction and until the site has stabilised will minimise any potential impacts associated with sediment laden runoff exiting the site.

Transformers will be situated within appropriately sized containment bunds to minimise the potential for oily water to exit the site during transformer maintenance, or an uncontrolled release of oil from the transformers.

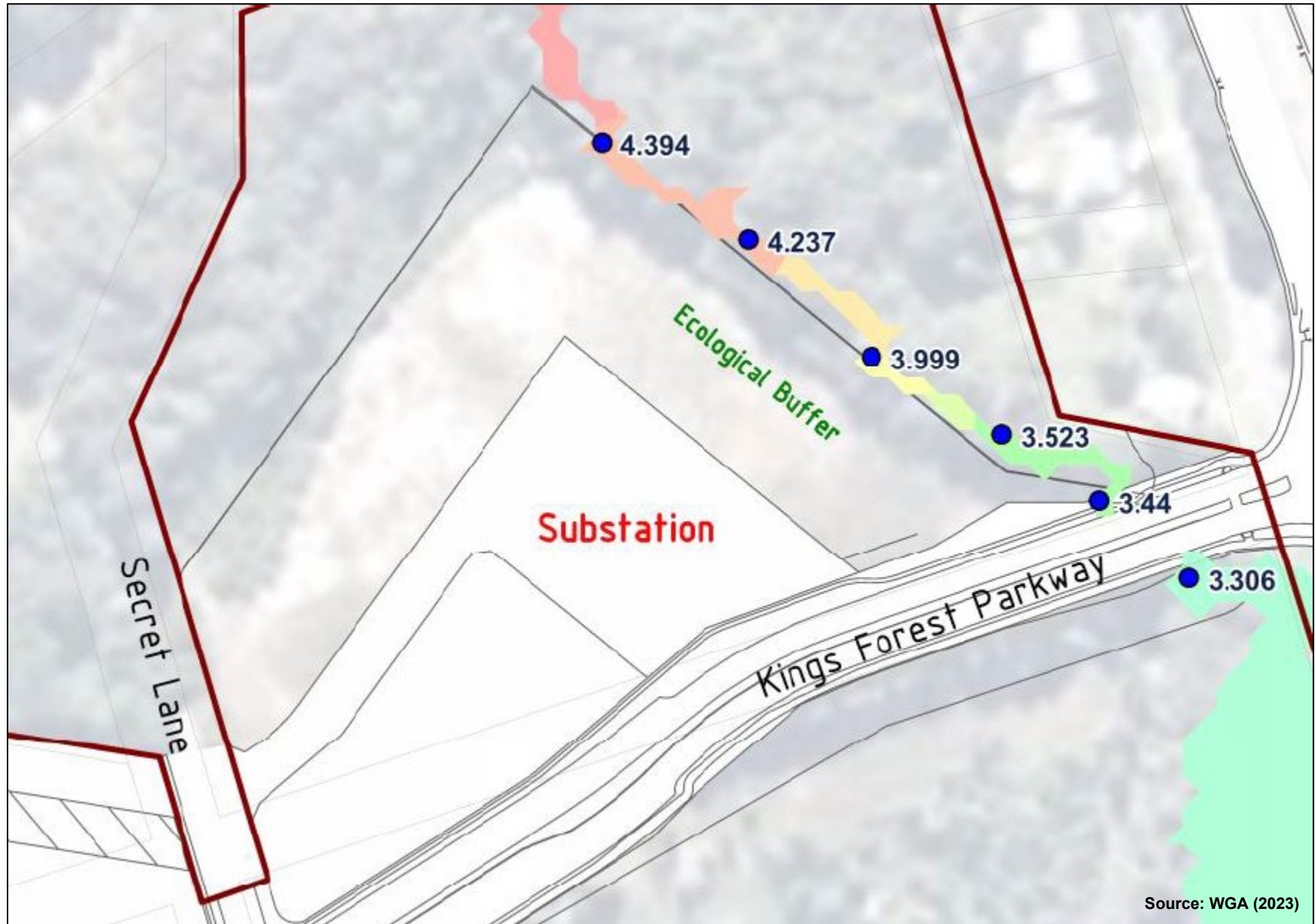


Figure 6-4: 100 Year ARI (1% AEP) Flood Level (Gilbert and Sutherland, 2011)

6.3.3 Environmental mitigation measures

The following mitigation measures will be applied:

- Control measures will be implemented to manage risks associated with the handling of fuel through using spill trays when undertaking in field re-fuelling
- Transformers will be housed inside appropriately bunded areas
- Disturbed areas will be managed in accordance with the requirements of the Blue Book to minimise potential impacts to waterways. Sediment fencing will be erected, where required, downslope of disturbed areas, and impacts would be minimised where practicable. The use of filter bags may be required to discharge collected sediment-laden water where there are insufficient grassed areas available.
- Progressive stabilisation will occur as soon as reasonably practicable throughout construction to prevent generation of sediment laden runoff.
- Spill kit to be present on-site during construction activities to manage potential releases from construction equipment
- Any water collected in excavations and trenches during rainfall and surface water ingress should be pumped to a grassed area on-site (where a suitable area is available) to allow for infiltration, reused for dust suppression, or pumped to stormwater using a sediment sock. All options should be conducted in a manner that does not result in turbid water entering the stormwater system or nearby waterway.

6.3.4 Conclusion

The proposal is not anticipated to have any impact upon the water quality or hydrological conditions in the area. Any impacts that might occur would be short-term and minor, and would occur during construction and maintenance. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low.

6.4 Noise and Vibration

6.4.1 Existing environment

The proposal site is located in a predominately rural environment, with some residential and rural-residential properties located nearby. A row of residential properties are located within a subdivision along Old Bogangar Road to the east and northeast of the proposal site. The closest of these is located approximately 100m east of the proposal site. Several rural residential properties are also located to the north of the proposal site, the closest being approximately 120m north. Tweed coast road is located approximately 150m east. The Kings Forest development site is located immediately adjacent to the proposal site, with site preparatory and major civil works underway.

The main noise influences on the existing environment would therefore be construction work for the Kings Forest development, and Tweed Coast Road to the east. Currently, the immediately surrounding environment would be characterised as a moderate noise environment with daytime background noise levels expected to be consistent with commercial and industrial premises (i.e., approximately 60-75 dB(A)). Night-time background noise levels, when noise from construction activities at the Kings Forest development site cease, are expected to be more consistent with a low noise environment, (i.e., approximately 30dB(A)). Following completion of the Kings Forest development the immediate surrounding landscape would be dominated by residential and rural residential and characterised as a low noise environment, with background night-time and day-time noise levels expected to be between approximately 30 and 35 dB(A).

6.4.2 Assessment of impact

Construction noise

The main sources of noise during the construction phase will be equipment needed for site works and the transportation and installation of electrical equipment. The following activities are likely to be the main sources of construction noise impacts:

- Site preparation
- Excavation and trenching
- Set up and movement of construction vehicles and equipment

- Vehicles and trucks transporting construction materials to and from the site
- Alteration of traffic movements on surrounding roads.

Construction vehicles will use the local road network, including the newly constructed access to the Kings Forest development, to access the proposal site.

Construction is expected to take 12 months to complete, dependent on weather. Noise levels would vary depending on the nature of the activities being undertaken. The use of several items of construction equipment simultaneously is only expected to occur intermittently, if at all. Any impacts are not anticipated to be significant due to the distance (approximately 100m) to a limited number of sensitive receivers, and the existing ambient noise, which would be dominated by the construction activities occurring at the adjoining the Kings Forest development site.

Given the duration of the works, surrounding land use, the open landscape, the nature of existing construction works underway for the Kings Forest development, traffic movements and relatively low intensity construction methods proposed, it is anticipated that construction activities will not substantially affect the ambient noise in the area.

Construction Vibration

The use of the construction equipment also has the potential to cause some vibration impacts. The vibration generated from construction works would vary depending on the level and type of activity carried out at each site during each activity. Potential vibration generated to receivers for the works would be dependent on separation distances, the intervening soil and rock strata, dominant frequencies of vibration and the receiver structure.

Dominant vibration generating plant include:

- Excavator
- Compactor
- Truck movements along unsealed roads

Given the distance from sensitive receivers and the relatively low intensity construction methods, there is not expected to be any increase in construction vibration from the perspective of any residential receiver.

Operational noise

The proposal will include the installation of a new building housing high voltage switchboards, and two new outdoor 33/11kV transformers. Noise from the 33/11kV transformers has been conservatively estimated at 75dB(A) (worst case scenario with fans and pumps in operation).

Based upon the land use type of the local area, a background noise level of 30dB(A) has conservatively been adopted. As noted above, the nearest residential property to the proposal site is approximately 100m east, however the distance from the predominate noise generating equipment (i.e. the two 33/11kV transformers) is approximately 155m.

To determine the potential sound power level or 'noise' from the proposed ZS at the nearest sensitive receiver the following formula can be applied as per the EPA 2013:

SPL=SWL-20log10r-8, where:

- **SPL** is sound pressure level in dB(A),
- **SWL** is sound power level (noise source) in dB(A),
- **r** is the distance from the source to the measuring point.

Based on this calculation, the estimated 75dB(A) noise at the transformer source will be attenuated to a noise level of approximately 23dB(A) at the nearest receiving property, approximately 155m east of the proposed new 33/11kV transformers. This figure is at least seven dB(A) under the noise goal for the surrounding land use. Given the ecological and agricultural buffer area, and strip of vegetation between the proposal site and nearest receivers, the attenuation will, in reality, likely be greater.

The proposal site is situated within Precinct 2 of the broader Kings Forest development, which according to the Kings Forest concept plan approval (MP 06_0318), has been designated as employment lands. As such, it is assumed land use in this precinct will comprise future commercial,

or light industrial. The future commercial / light industrial land use would be located in the new lot proposed to adjoin the ZS to the southeast. The distance from the new 33/11kV transformers to the boundary with the future commercial / light industrial lot is conservatively estimated at 50m. Using the same basic noise attenuation calculation, while adopting the worst-case noise emission at the source of the transformers (i.e., 75dB(A)), and 50m distance from future commercial/light industrial receptors, it is estimated that noise levels will be attenuated to approximately 33dB(A). This is well below the commercial amenity noise level of 65dB(A), and industrial amenity noise level of 70 dB(A), adopted in the Noise Policy for Industry (EPA, 2017).

Precinct 5 of the broader Kings Forest development will contain future residential land use (refer **Figure 1-7**). At the time of the preparation of the REF, the nearest identified future residential lots were approximately 340m southwest of the proposed new 33/11kV transformers. At this distance it is estimated that noise levels will be attenuated to approximately 16dB(A), well below the 30dB(A) background noise goal.

Operational vibration

Operation of the ZS is not expected to result any increase in vibration from the perspective of any residential receiver.

6.4.3 Environmental mitigation measures

In considering the proposed ZS site location, with the main noise generating activity (two 33/11kV transformers) being at least 155m away from the nearest sensitive residential receiver, work that has the potential to create and audible noise at the nearest sensitive receiver, will be between 7am and 6pm Monday to Saturday. On occasions works outside these hours may be undertaken where the following requirements are met:

- Neighbours (and other sensitive receivers) adjacent to the works or the local council or the NSW Environment Protection Authority (EPA) have been notified; and
- Where the works are required to take place in the vicinity of private access ways or driveways, consultation with individual residents would be undertaken to advise residents of the planned timing of the works.

All plant and equipment will be operated and maintained in accordance with the manufacturer's specifications. Any noise complaint will be investigated with additional control measures put in place if required.

6.4.4 Conclusion

The proposal will have acoustic and vibration impacts during construction and operation. The acoustic and vibration impacts during the construction phase will be medium term and moderate, whilst operational noise generated by the proposal will be negligible and unlikely to impact on the closest current or future sensitive receivers.

Given the mitigation measures outlined in this assessment, the impacts can be effectively managed, and the overall environmental risk is considered to be low to moderate.

6.5 Flora and Fauna

6.5.1 Existing environment Desktop Assessment

Landscape Context

The proposal site is located on cleared, heavily modified and disturbed land, within the footprint of the broader Kings Forest development. The Environmental Assessment Report (EAR) prepared for Stage 1 subdivision and bulk earthworks of the broader Kings Forest development (JBA Planning, 2011) indicated the broader development site has historically been used for sand mining, turf production, dairy farming, small cropping and grazing, sugar cane production and as a pine plantation.

The proposal site is situated within the Cudgen Creek catchment.

IBRA Bioregion and Subregions

The proposal site is located within the South Eastern Queensland Interim Biogeographic Regionalised of Australia (IBRA) (South Eastern Queensland Bioregion). It is noted that a large part of what was the NSW North Coast bioregion is now South Eastern Queensland bioregion,

which now extends 200km south to encompass Grafton. The proposal site is located within the Burringbar-Conondale Ranges IBRA sub-region, previously forming part of the Richmond-Tweed subregion of the NSW North Coast bioregion. Vegetation of this sub region generally comprises subtropical and warm temperate rainforests and wet sclerophyll forests including; *Argyrodendron actinophyllum* (Black Booyong), *Argyrodendron trifoliolatum* (White Booyon), *Araucaria cunninghami* (Hoop Pine), *Archontophoenix cunninghamiana* (Bangalow Palm), *Calamus muelleri* (Climbing Palm), *Cyathea australis* (Rough Tree Fern), *Toona ciliata* (Australian cedar), *Flindersia australis* (Teak), *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus propinqua* (Small-fruited Grey Gum), *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus saligna* (Sydney Blue Gum).

Ecological Context

Plant Community Types

Review of the NSW State Vegetation Type Map (SVTM) indicates that the proposal site is mapped as Plant Community Type (PCT):0 – not classified (refer **Figure 6-5**). **Table 6-1** lists, and **Figure 6-5** illustrates the PCT identified in the near vicinity (approximately 200m) of the proposal site.

Table 6-1: NSW SVTM PCTs mapped in the near vicinity of the proposal site

PCT ID	PCT Name	Formation	Class
0	Not Classified	-	-
3004	Far North Bangalow Palm Swamp Forest	Rainforests	Subtropical Rainforests
3548	Far North Sands Scribbly Gum Heathy Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Coastal Dune Dry Sclerophyll Forests
3788	Coastal Foredune Wattle Scrub	Heathlands	Coastal Headland Heaths
3913	Northern Sandplain Wet Heath	Freshwater Wetlands	Coastal Heath Swamps
3989	Far North Paperbark Fern Swamp Forest	Forested Wetlands	Coastal Swamp Forests
3991	Far North Sands Swamp Turpentine-Paperbark Forest	Forested Wetlands	Coastal Swamp Forests
4004	Northern Melaleuca quinquenervia Swamp Forest	Forested Wetlands	Coastal Swamp Forests
4008	Northern Sands Swamp Mahogany Shrubby Rush Forest	Forested Wetlands	Coastal Swamp Forests
4026	Estuarine Sea Rush Swamp Oak Forest	Forested Wetlands	Coastal Floodplain Wetlands
4090	Far North Estuarine Mangrove-Swamp Oak Forest	Saline Wetlands	Mangrove Swamps

The various vegetation and threatened species management plans prepared for Kings Forest Stage 1 Project Application (James Warren and Associates, 2011a-e) map the vegetation community to the north and south of the proposal site as the *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* Threatened Ecological Community (TEC) (refer **Figure 6-6**), listed as endangered under the BC Act. The TEC is not listed under the EPBC Act. No TEC's were mapped as occurring within the proposed ZS site. The Buffer Management Plan (James Warren and Associated, 2011a) also maps a 50m ecological buffer between the vegetation present to the north of the proposal site, and the northern and eastern boundaries of the proposal site. The ZS site is not located within the ecological buffer zone.

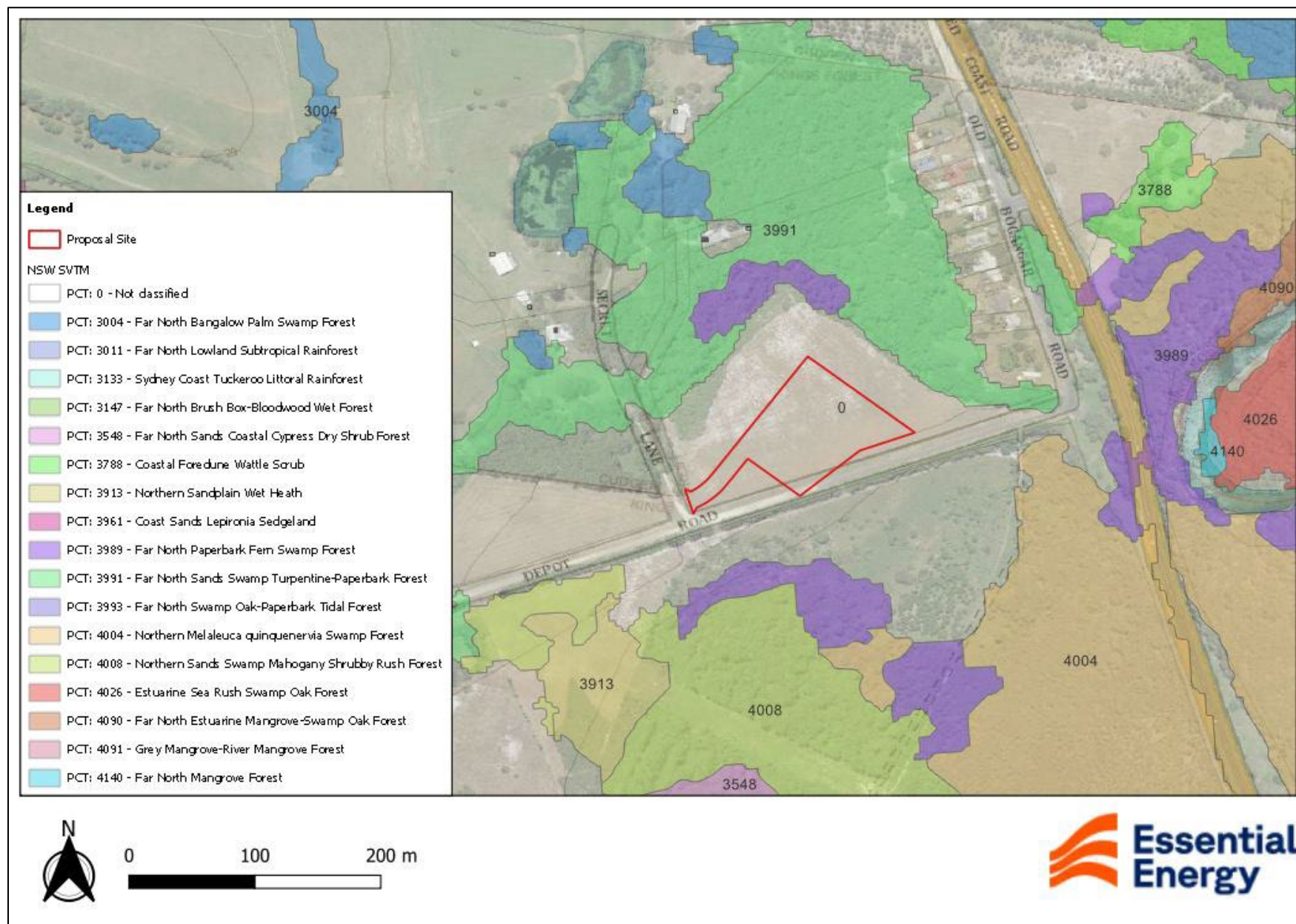


Figure 6-5: PCTs mapped according to the NSW DPE State Vegetation Type Mapping relative to the proposal site

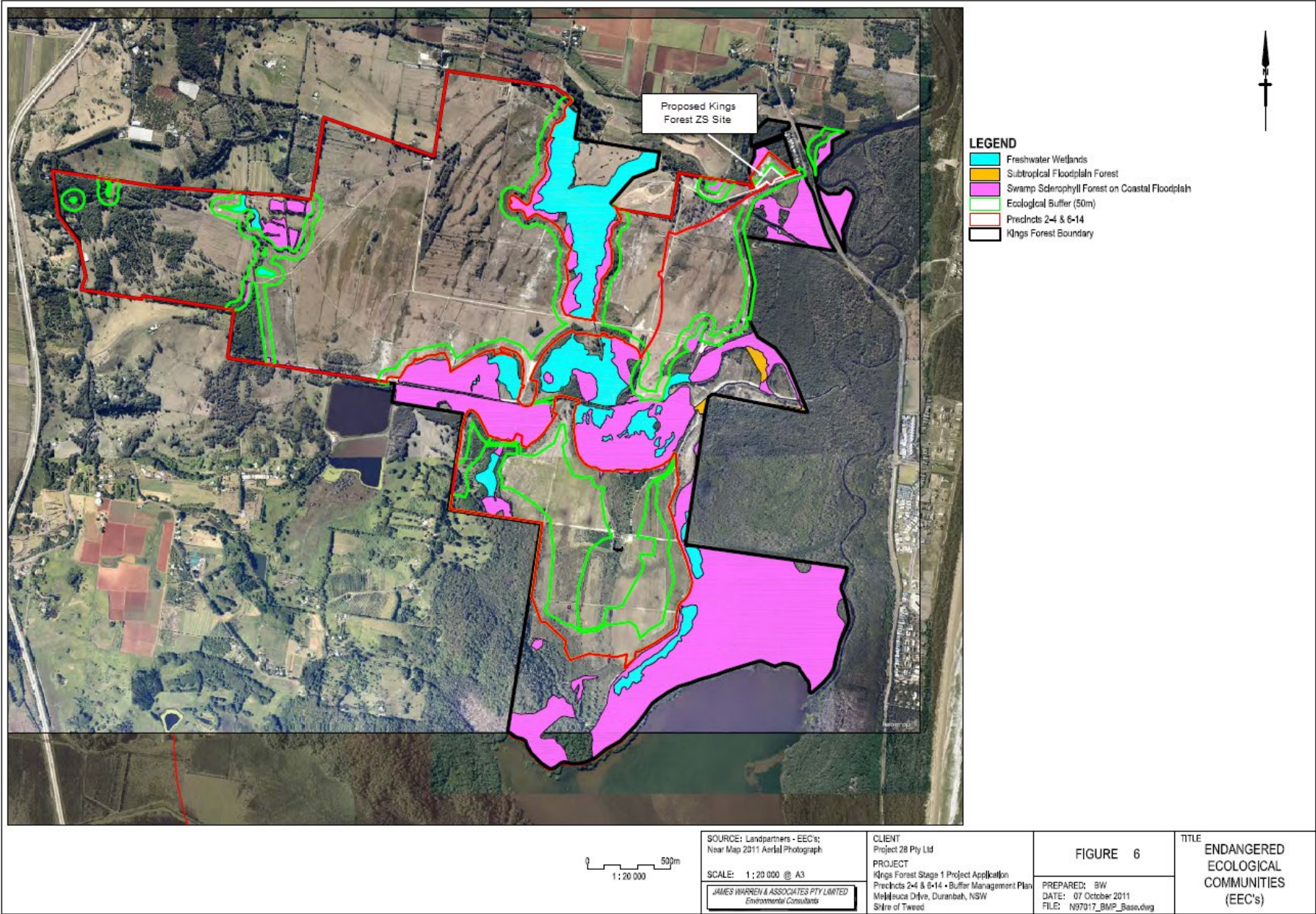


Figure 6-6: TECs and buffer zones mapped relative to the proposal site (James Warren and Associates, 2011a)

NSW BioNet Records

A database review of the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) BioNet database for threatened flora and fauna, was undertaken to identify any threatened species, populations, ecological communities or areas of outstanding biodiversity value that may be impacted by the proposal.

According to the BioNet database there has been 114 recorded sightings of 20 threatened fauna species within a 1,500m buffer of the proposal site, as presented in **Table 6-2** below. An additional 66 threatened fauna species not recorded but having the potential to occur within the 1500m buffer are detailed in the protected matters search (**Appendix C**) and **Table D-1, Appendix D**. The nearest threatened fauna sighting, a *Phascolarctos cinereus* (Koala), listed as endangered under the BC Act (NSW) and EPBC Act (Cth), was recorded approximately 10m east of the eastern boundary of the proposal site. There are 29 BioNet records of Koala within 500m of the proposal site.

The BioNet database indicates there has been nine records of five threatened flora species within a 1,500m buffer of the proposal site, as presented in **Table 6-3**. An additional 27 threatened flora species not recorded but having the potential to occur within the 1500m buffer are detailed in the protected matters search (**Appendix C**) and **Table D-1, Appendix D**. The nearest threatened flora species, *Desmodium acanthocladum* (Thorny Pea), listed as vulnerable under the BC Act (NSW), and EPBC Act (Cth) was recorded approximately 260m southeast of the proposal site and will not be impacted by the proposal.

Figure 6-7 illustrates the distribution of NSW BioNet threatened fauna and flora records within 1500m of the proposal.

Table 6-2: NSW BioNet threatened fauna species recorded within a 1500m buffer of the proposal

Scientific Name	Common Name	BC Act Status	EPBC Act Status	NSW BioNet Recorded Sightings
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1	-	2
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	V	1
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	1
<i>Circus assimilis</i>	Spotted Harrier	V	-	1
<i>Crinia tinnula</i>	Wallum Froglet	V	-	7
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	2
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	1
<i>Macronectes halli</i>	Northern Giant-Petrel	V	V	1
<i>Megaptera novaeangliae</i>	Humpback Whale	V	V	1
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	2
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	2
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V	-	1
<i>Pandion cristatus</i>	Eastern Osprey	V	-	6
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	1
<i>Phascolarctos cinereus</i>	Koala	E1	E	62
<i>Planigale maculata</i>	Common Planigale	V	-	1
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	11
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V	-	1
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	1
<i>Tyto longimembris</i>	Eastern Grass Owl	V	-	9
			Total	114
Notes: E1 – Endangered (BC Act) V – Vulnerable (BC Act) and EPBC Act) E – Endangered (EPBC Act)				

Table 6-3: NSW Bionet threatened flora species recorded within a 1500m buffer of the proposal

Scientific Name	Common Name	BC Act Status	EPBC Act Status	OEH Atlas Recorded Sightings
<i>Acronychia littoralis</i>	Scented Acronychia	E1	E	1
<i>Desmodium acanthocladum</i>	Thorny Pea		V	1
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	E1	-	5
<i>Oldenlandia galioides</i>	(blank)	E1	-	1
<i>Syzygium moorei</i>	Durobby	V	V	1
			Total	9
Notes: E1 – Endangered (BC Act) V – Vulnerable (BC and EPBC Act) E – Endangered (EPBC Act)				

EPBC Protected Matters

An EPBC Protected Matters Report (Commonwealth DCCEEW, 2024b) generated for this proposal considered Matters of National Environmental Significance (MNES) within a 1,500 metre buffer of the proposal. This report is provided in **Appendix C** and summarised in **Table 6-4**.

Other Threatened Species Records

Threatened species mapping produced as part of the Buffer, Threatened Species, and Vegetation Management Plans prepared for Kings Forest Stage 1 Project Application (James Warren and Associates, 2011a, 2011c, and 2011d), indicate records of certain threatened species in the vicinity of the proposed ZS site, in addition to those recorded in the NSW BioNet database. These include records of several threatened flora species, *Endiandra muelleri subsp. bracteata* (Green Leaved Rose Walnut), *Archidendron hendersonii* (White Laceflower), and *Phaius australis* Southern Swamp Orchid located either in vegetated land to the east (opposite of Tweed Coast Road) and south (opposite side of Depot Road) of the proposed ZS site (refer **Figure 6-8**). The White Laceflower is listed as Vulnerable under the BC Act (NSW), while the Green Leaved Rose Walnut and Southern Swamp Orchid are listed as endangered under the BC Act, with the later also listed as endangered under the EPBC Act (Cth). Records of two threatened acid frog species, *Crinia tinnula* (Wallum Froglet), listed as vulnerable under the BC Act (NSW) and (*Litoria olongburensis*) Wallum Sedge Frog, listed as vulnerable under the EPBC Act are recorded south of the site (refer **Figures 6-9**). None of the above species' records are located within the proposed ZS site.

Threatened bird and mammal records presented in the Buffer and Threatened Species Management Plans prepared for Kings Forest Stage 1 Project Application (James Warren and Associates, 2011a and 2011c) (refer **Figure 6-10**) appear largely consistent with the BioNet records. None of these species' records are located within the proposed ZS site.

Threatened Species Habitat Mapping

According to James Warren and Associates (2011c) Wallum Froglets have been recorded in association with constructed drainage lines, as well as inhabiting depressions formed during Slash Pine stump removal. Low lying wet heath and drainage line communities and adjacent areas prone to frequent inundation, were considered to provide core habitat for this species. Many of the Wallum Froglet records within the Kings Forest site occur in forage habitat (i.e. land inundated after heavy rain) rather than core habitat (James Warren and Associates, 2011c).

Wallum Sedge Frogs have been predominantly recorded in association with two constructed dams in the southern portion of the broader Kings Forest development. According to James Warren and Associates (2011) potential habitat is also considered to occur in the vicinity of Precinct 2-4 & 6-11.

Figure 6-11 illustrates core acid frog habitat, as mapped by James Warren and Associates (2011c) for the broader Kings Forest development. The proposed ZS site is not located within mapped areas of core acid frog habitat.

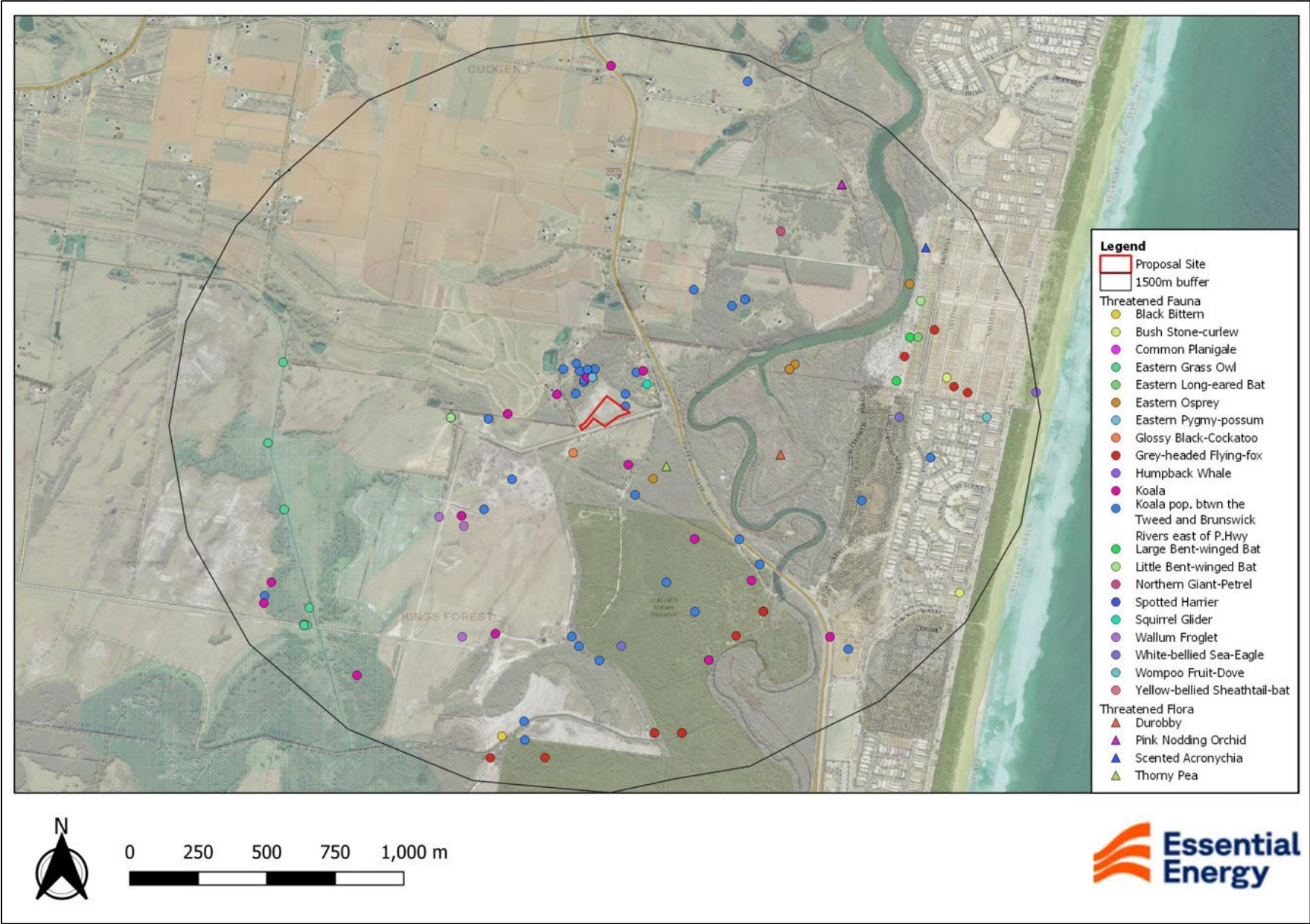


Figure 6-7: NSW BioNet threatened species records within 1500m of the proposal site

Table 6-4: EPBC Protected Matters Report summary

MNES	Result	Summary / Relevance to Proposal Site
World Heritage Properties	None	-
National Heritage Places	None	-
Wetlands of International Importance	None	-
Great Barrier Reef Marine Park	None	-
Commonwealth Marine Area	None	-
Listed Threatened Ecological Communities	5	Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community. Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland. Lowland Rainforest of Subtropical Australia. Subtropical and Temperate Coastal Saltmarsh. Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.
Listed Threatened Species	100	39 bird, four fish, two frog, one insect, 10 mammal, eight reptile, five shark, one mollusc and 30 plant species. Of these, two bird, two mammal and three plant species have been recorded within 1500m of the proposal site, according to the NSW BioNet database.
Listed Migratory Species	56	21 are classified as marine birds, 18 as migratory marine, 6 as migratory terrestrial and 11 migratory wetland species.
Commonwealth Land	None	-
Commonwealth Heritage Places	None	-
Listed Marine Species	86	47 are classified as marine birds, 30 as marine fish and nine marine reptiles (six turtles, three sea snakes).
Whales and Other Cetaceans	12	Seven are toothed whales (including 5 dolphins) and five are baleen whales.
Critical Habitats	None	-
Commonwealth Reserves Terrestrial	None	-
Australian Marine Parks	None	-
Habitat Critical to the survival of Marine Turtles	None	-
State and Territory Reserves	1	Cudgen Nature Reserve, located approximately 330m south of the proposal site at its closest point
Regional Forest Agreements	1	Proposal site falls within the Upper North East Region of the North East Forest Agreement.
Nationally Important Wetlands	1	Cudgen Nature Reserve, located approximately 330m south of the proposal site at its closest point
EPBC Act Referrals	9	Comprise of 9 separate referrals, of most relevance to the proposal site being Kings Forest Residential Development (2012/6328)
Key Ecological Features (Marine)	None	-
Biologically Important Areas	5	2 dolphins, one turtle, one shark and one whale.
Bioregional Assessments	None	-
Geological and Bioregional Assessments	None	-

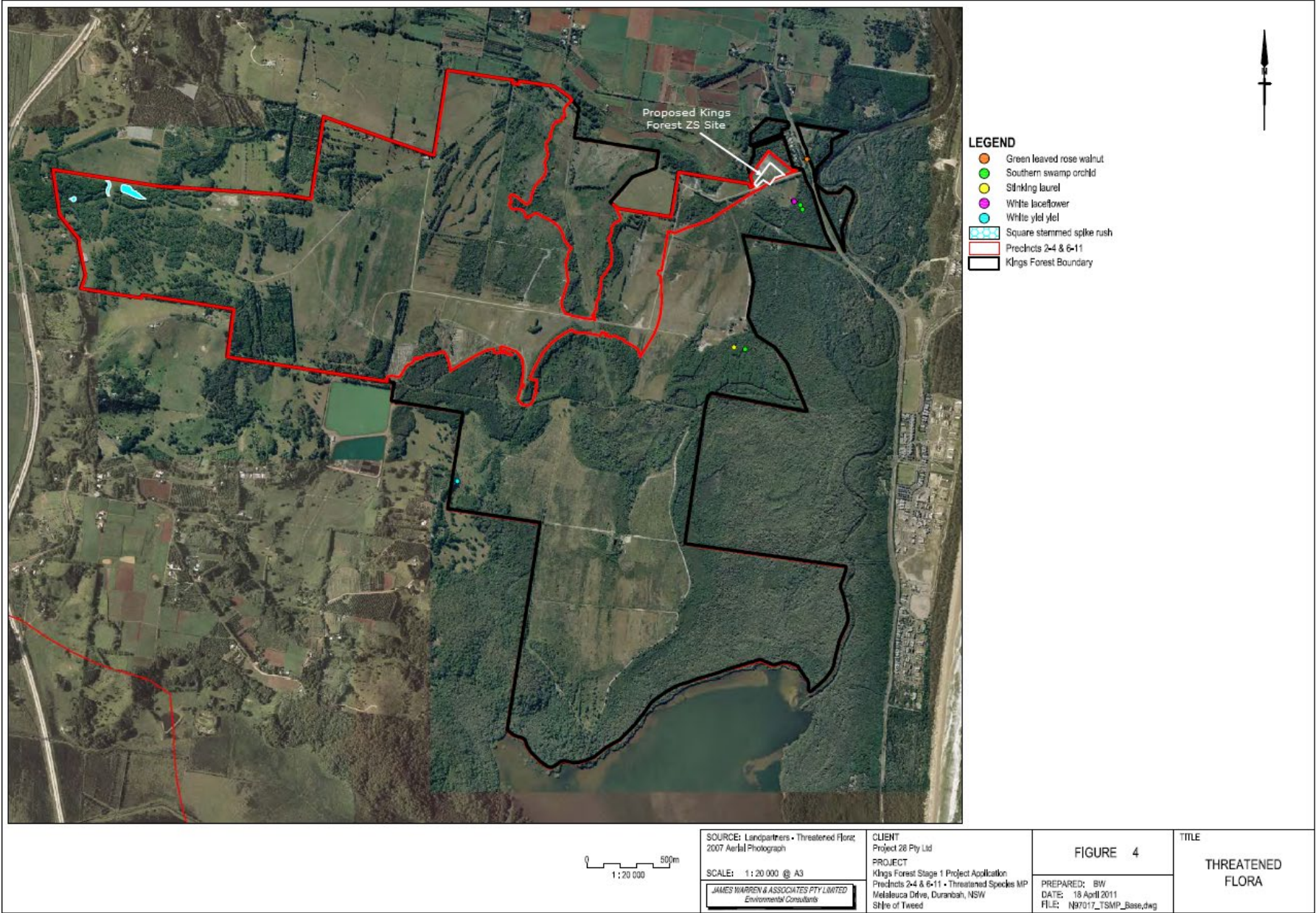


Figure 6-8: Threatened flora species in the vicinity of the proposal site (James Warren and Associates, 2011c)

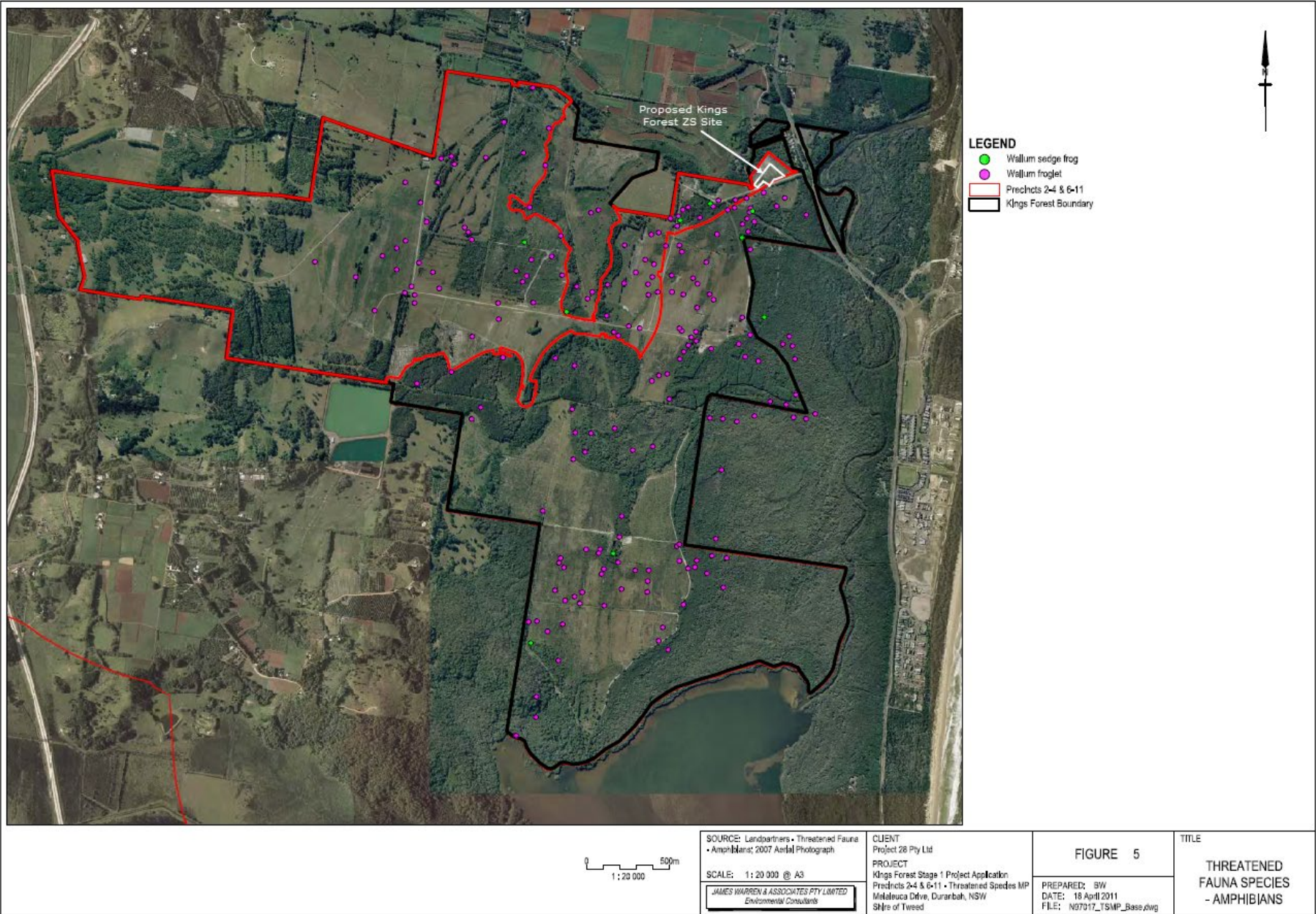


Figure 6-9: Threatened acid frog species in the vicinity of the proposal site (James Warren and Associates, 2011c)

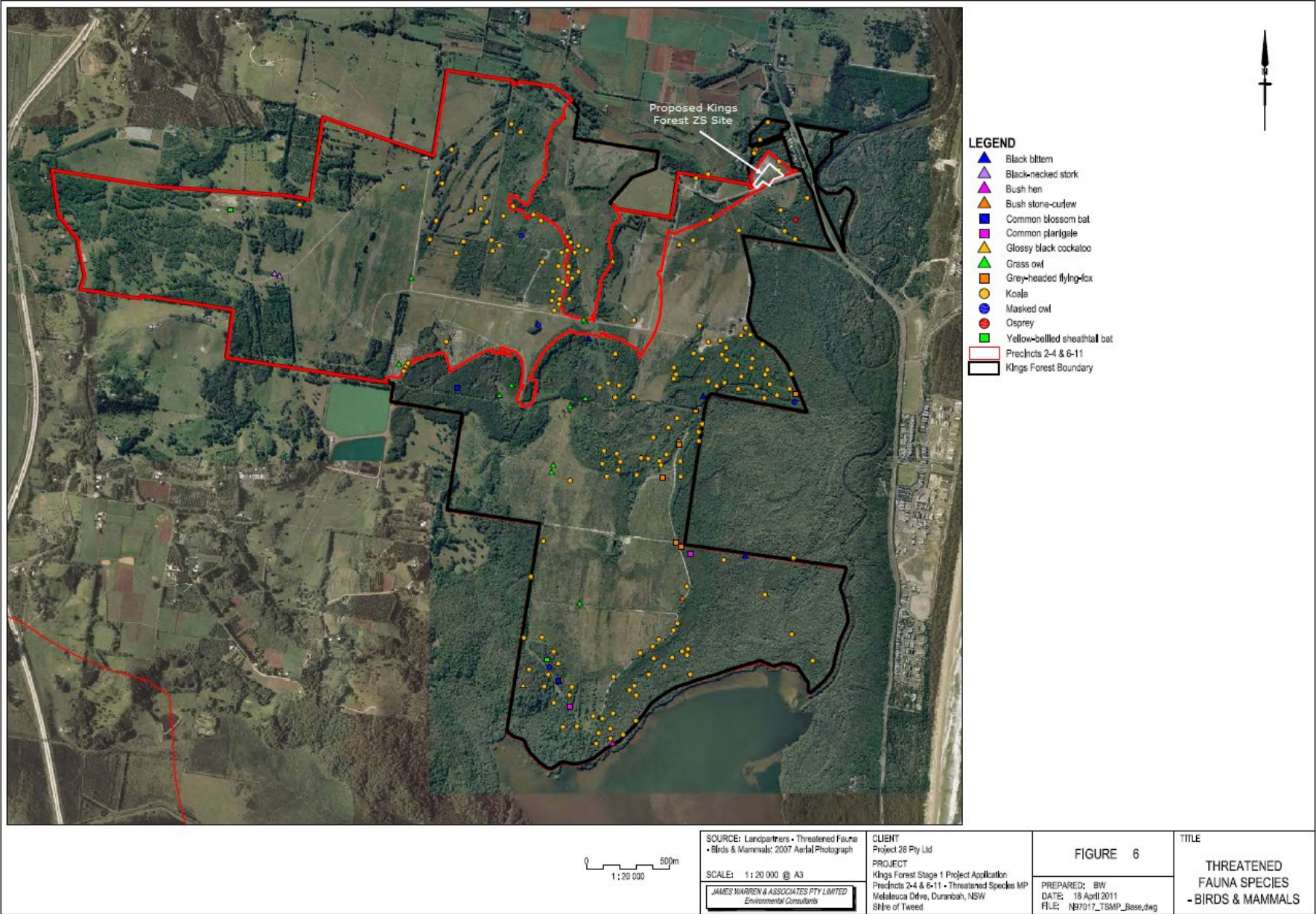


Figure 6-10: Threatened bird and mammal species in the vicinity of the proposal site (James Warren and Associates, 2011c)

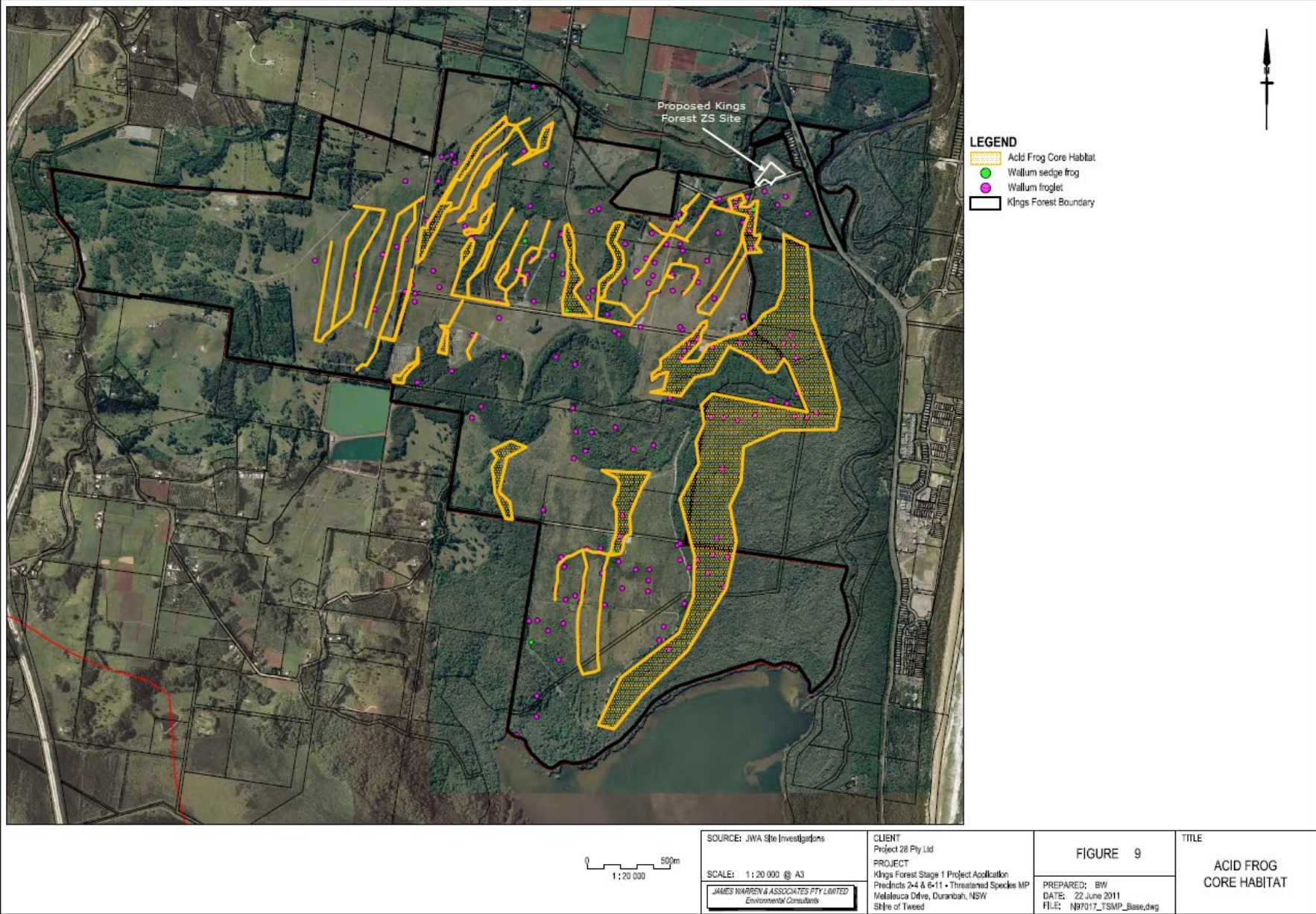


Figure 6-11: Acid frog core habitat in the vicinity of the proposal site (James Warren and Associates, 2011c)

Numerous assessments for the occurrence of Koalas over the broader Kings Forest have been completed. These assessments have included: direct observation (including spotlight surveys); short term radio tracking studies; faecal pellet surveys (to detect Koala presence); faecal cuticle analysis (to determine diet) and vegetation assessments. Koalas have been recorded over much of the broader Kings Forest development site (James Warren and Associates, 2011c). However, there are no records within the proposed Kings Forest ZS site.

Figure 6-12 illustrates core Koala habitat, as mapped by James Warren and Associates (2011c) for the broader Kings Forest development. The proposed ZS site is not located within mapped areas of core Koala habitat. More recent mapping available online through TSC's Koala Habitat Restoration mapping also shows the proposed Kings Forest ZS is not mapped within areas of preferred Koala habitat, activity or linkage precincts (refer **Figure 6-13**)

Weeds, Pests and Disease

James Warren and Associates (2011c) reported various weed species occur across the broader Kings Forest development, including *Pinus elliottii* (Slash Pine), *Brachiaria mutica* (Paramatta Grass), *Cortaderia jubata* (Pampas Grass), *Chrysanthemoides monilifera* (Bitou Bush), *Lantana camara* (Lantana), *Anredera cordifolia* (Madeira vine). Of these, Slash pine was reported as the most common. Slash pine was originally grown as a plantation, but is naturalised in some areas of the site. Opportunistic characteristics such as wind pollination and seed dispersal have enabled the species to invade native vegetation communities. Offspring across the broader Kings Forest development site range in size from 30cm to 20m (James Warren and Associates, 2011d).

The proposed Kings Forest ZS site is mapped as being within a harvest Slash Pine area (refer **Figure 6-14**)

The proposal site is located on the far north coast of NSW, where there have been three Fire Ant (*Solenopsis invicta*) infested areas declared (Murwillumbah, Wardell, and parts of NSW within 5km of the Currumbin Waters detection in Qld). The proposal site is located within the NSW protection zone (i.e., all of NSW), but not within a declared fire ant infested area or movement control area.

The proposal site is located within the large eastern coast zone, extending from Big Tableland near Cooktown in the north to Melbourne in the south, where the disease chytridiomycosis is present. Chytridiomycosis is an infectious disease that affects amphibians worldwide. The disease is caused by a fungus known as the amphibian chytrid fungus or *Batrachochytrium dendrobatidis*, and is known to impact local frog species.

Areas of outstanding biodiversity value

The proposal site is not located within a declared area of outstanding biodiversity value.

Biodiversity values map

The proposal site is not located on land identified as having biodiversity values, according to the NSW Biodiversity Values Map (refer **Figure 6-15**). Vegetation to the north and south of the site is mapped as having biodiversity values. Under Part 5 of the EP&A Act, impact to native vegetation in areas mapped on the Biodiversity Values Map does not trigger assessment under the Biodiversity Offset Scheme. However, this mapping can provide information about the vulnerability of the threatened species and communities in the region.

Key Fish Habitat

The proposal site is not located within mapped key fish habitat according to NSW Fisheries Key Fish Habitat Map (refer **Figure 6-16**). Cudgen Creek and associated low lying land to the east of the proposal site, along with part of the mapped coastal wetlands to the west of the proposal site are mapped as being key fish habitat.

Groundwater dependant ecosystems

The Bureau of Meteorology (BoM) Atlas of Groundwater Dependant Ecosystems map (BoM, 2019) was reviewed for Groundwater Dependent Ecosystems (GDEs). Aquatic and terrestrial GDEs relative to the proposal are shown in **Figures 6-17** and **6-18**, respectively.

No aquatic or terrestrial GDEs are mapped within the proposal site. A high potential terrestrial GDE is mapped north of the proposal site, according to a regional assessment.

No subterranean GDEs have been analysed within the vicinity of the proposal site.

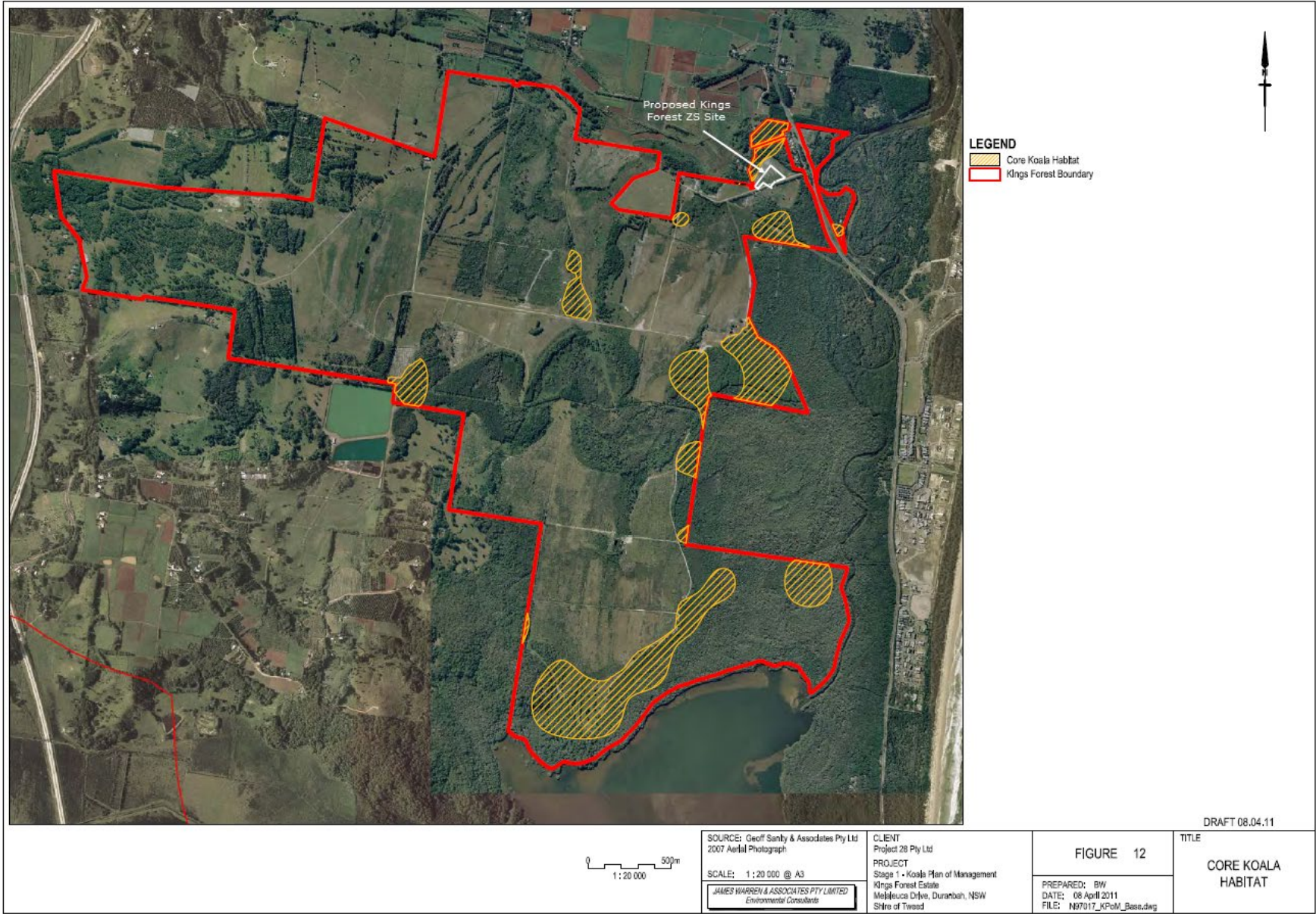


Figure 6-12: Core Koala habitat in the vicinity of the proposal site (James Warren and Associates, 2011c)



Figure 6-13: Koala habitat mapping in the vicinity of the proposal site (TSC, 2024)

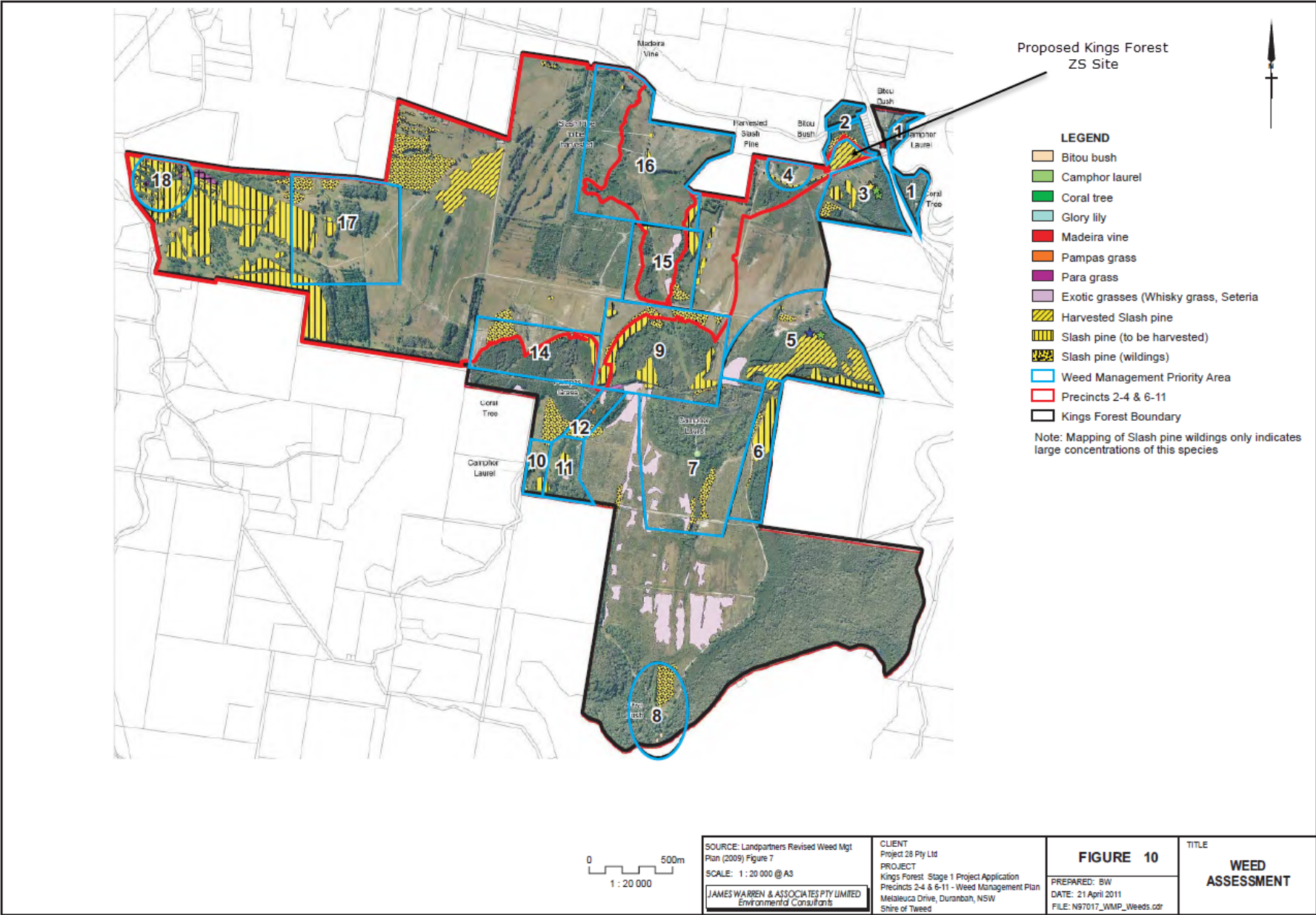


Figure 6-14: Weed mapping in the vicinity of the proposal site (James Warren and Associates, 2011e)

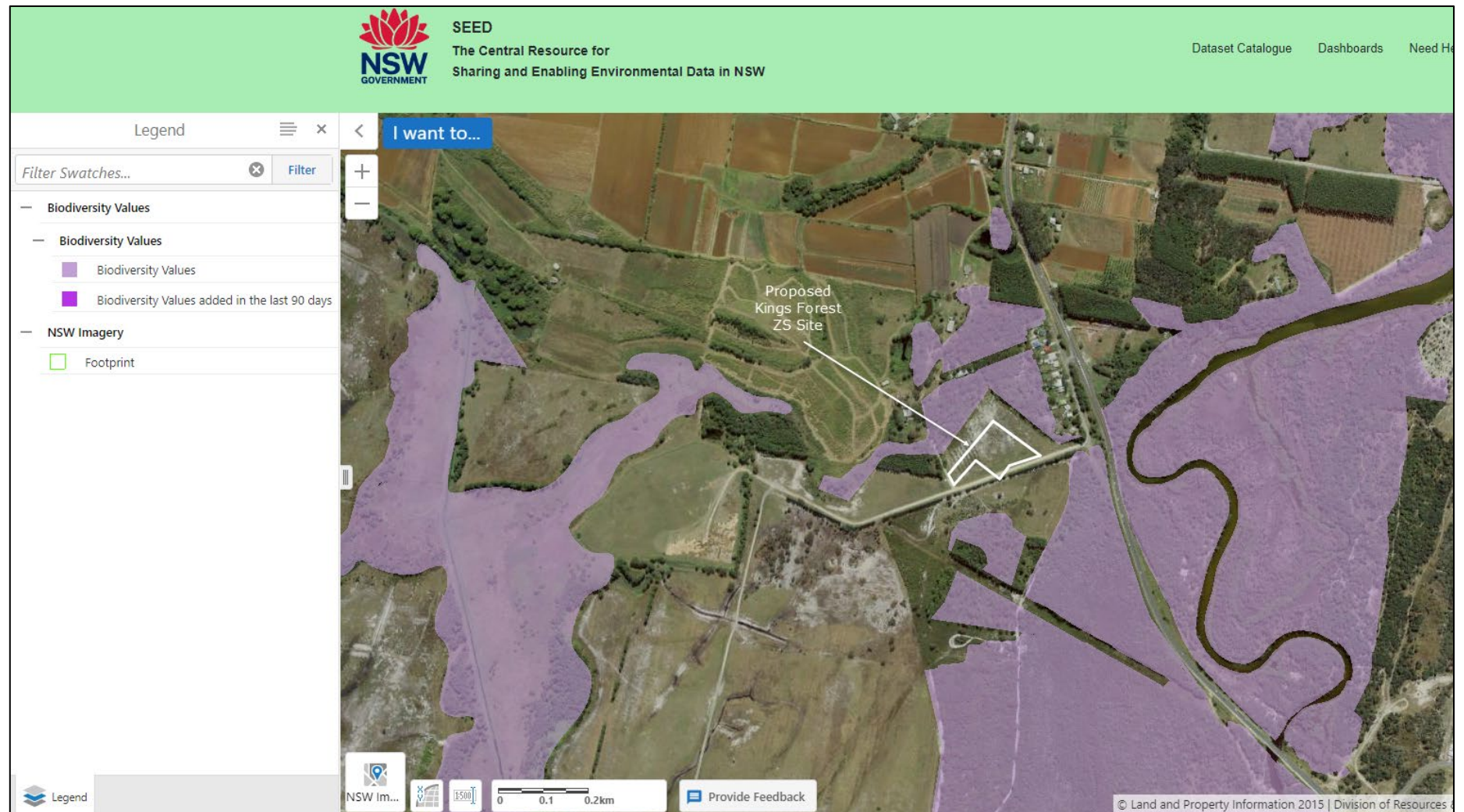


Figure 6-15: Biodiversity values map in the vicinity of the proposal site

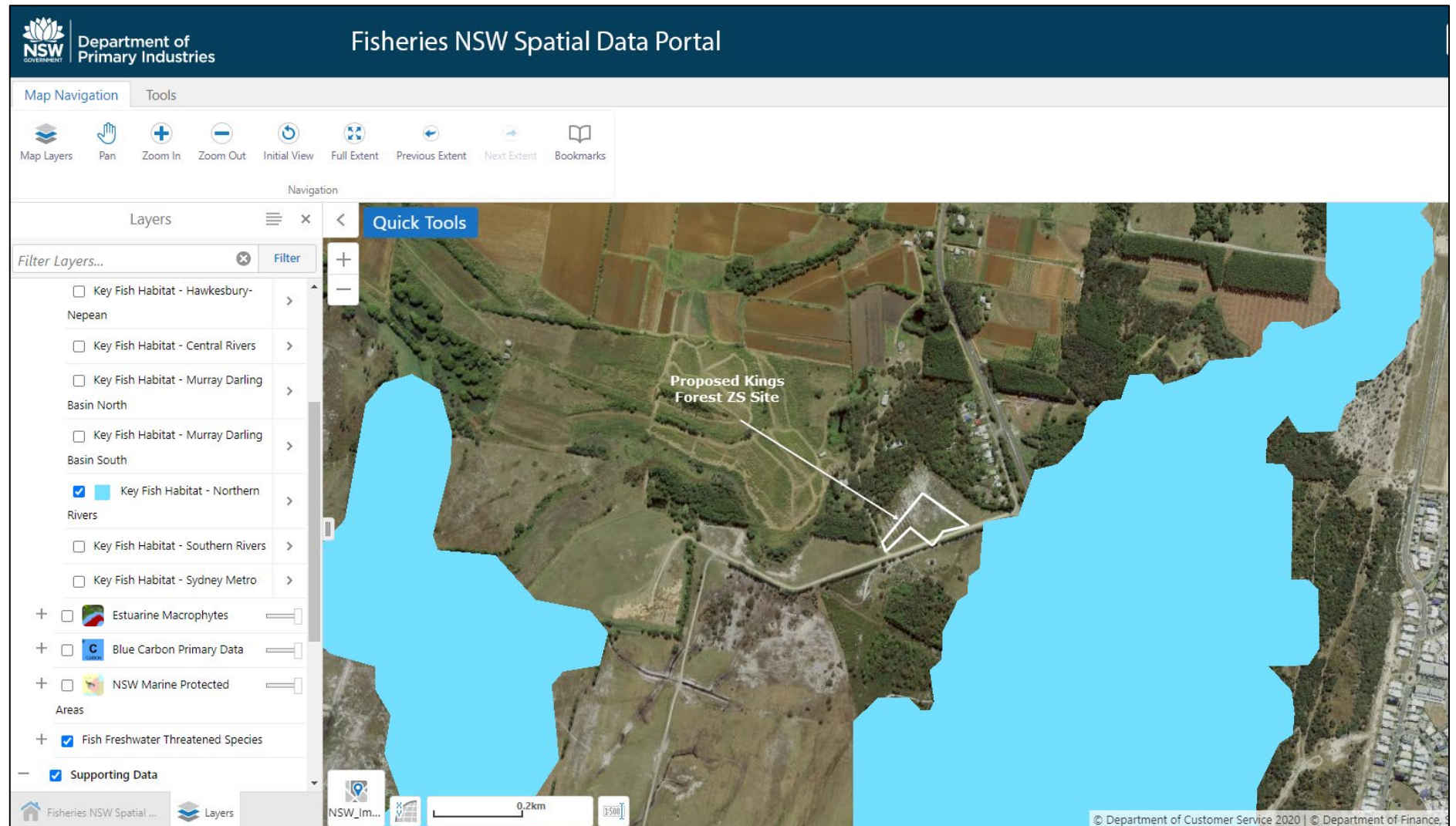


Figure 6-16: Key fish habitat map in the vicinity of the proposal site

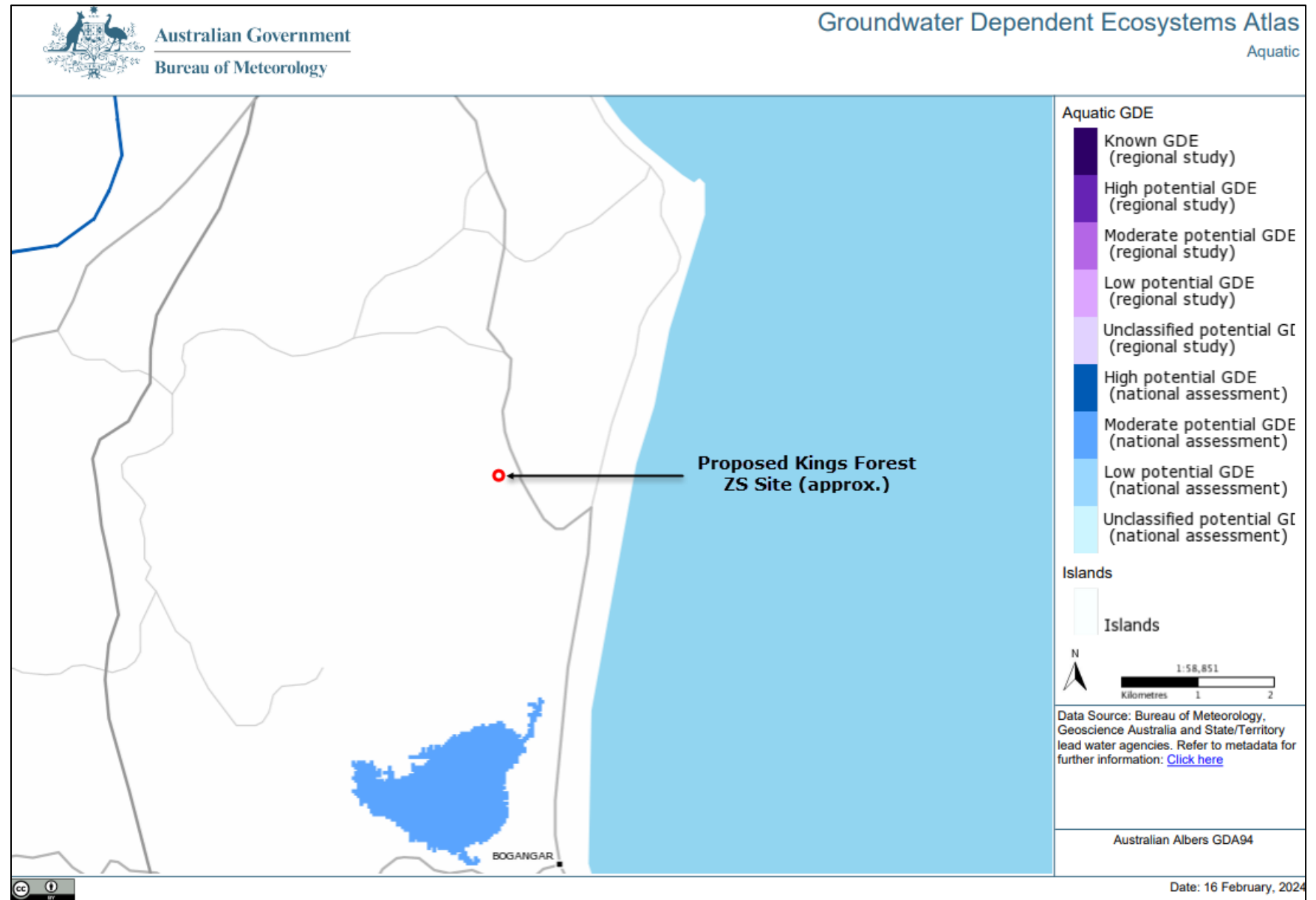


Figure 6-17: Groundwater dependent ecosystems (aquatic) in the vicinity of the proposal site

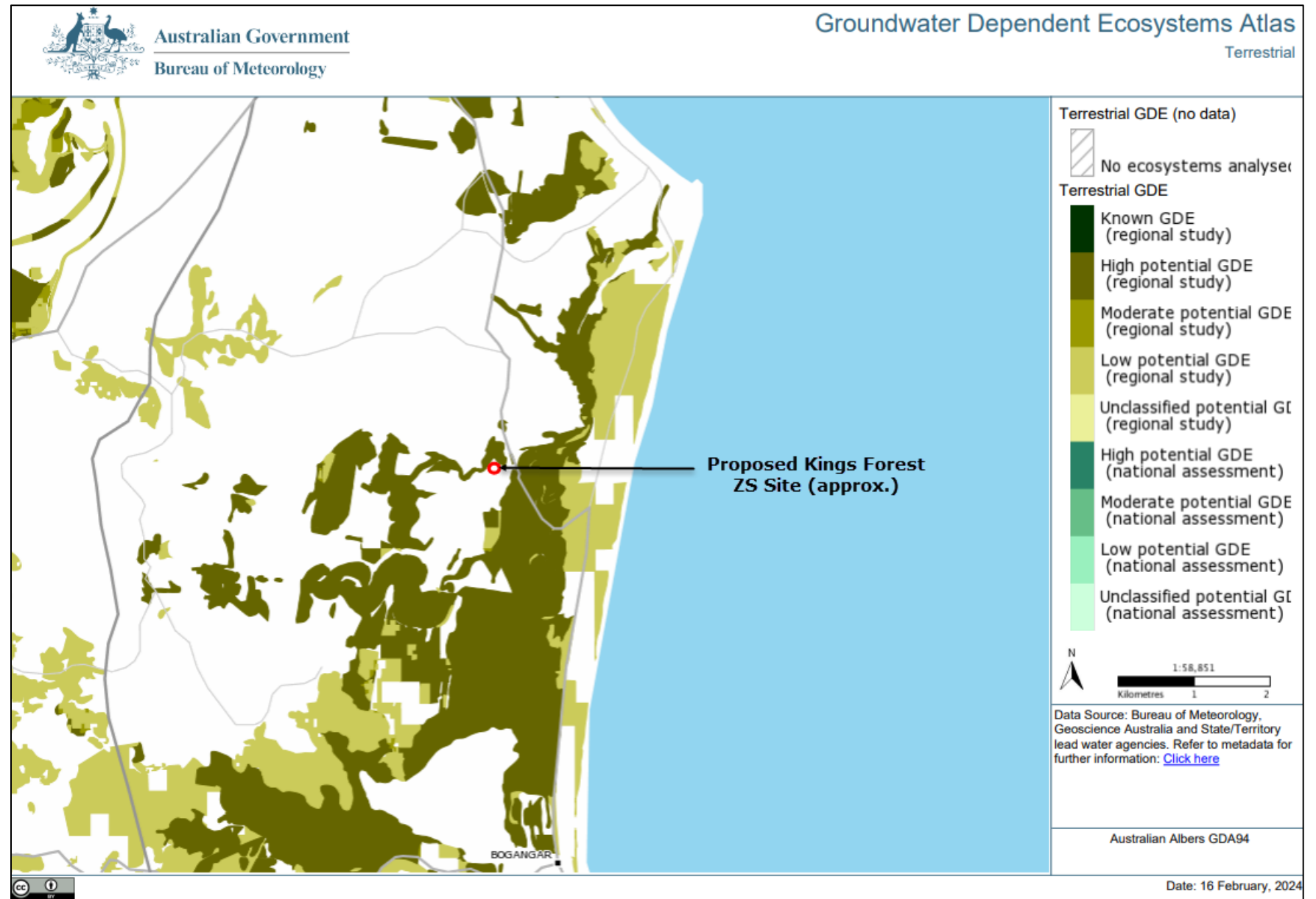


Figure 6-18: Groundwater dependent ecosystems (terrestrial) in the vicinity of the proposal site

Site Inspection

A site inspection was conducted by Essential Energy's Environmental Senior Specialist on 29 February 2024. Weather conditions were fine and warm (approximately 28°C), with a light easterly to northeasterly breeze. The proposal site was consistent with a highly modified and disturbed environment due to the range of historical and more recent land uses identified through the desktop assessment. The proposal site has been cleared of all woody vegetation. There are no trees or shrubs present. The eastern portion, currently being used as a laydown yard for the boarder Kings Forest development, is largely devoid of all vegetation, including groundcover. The western portion of the proposal site, including the proposed primary access road, contained groundcover species only, comprising exotic grasses, *Setaria pariflora* (Slender Pigeon Grass), *Cortaderia selloana* (Pampas Grass), *Paspalum dilatatum* (Paspalum), and *Chlorus gayana* (Rhodes Grass); and a sedge, *Cyrtus eragrostis* (Umbrella Sedge). The only fauna species observed opportunistically during the site inspection was an *Gymnorhina tibicen* (Australian Magpie), which was perched on the temporary construction fence along the southern boundary of the proposal site.

6.5.2 Assessment of impact

The proposed Kings Forest ZS site is located within the broader Kings Forest development site. Desktop review indicates the proposal site has been subject to a range of historical and more recent land use disturbances. Weed mapping from James Warren and Associates (2011e) indicated the proposal site was a harvest area for Slash Pine in the recent past. The level of disturbance was confirmed during the site inspection undertaken on 29 February 2024, where evidence of past disturbance, i.e., clearing and soil disturbance was clearly visible at the proposal site (refer **Plates 1-1 to 1-4**).

Threatened Species Populations and Ecological Communities

No woody vegetation is present at the proposal site, with no tree or shrub layer. The northeastern portion of the site is largely devoid of all vegetation, including groundcover species. Only groundcover species, consisting of exotic grasses and a sedge are present on the remaining portions of the site. The vegetation at the proposal site does not meet the characteristics of any mapped PCTs according to the NSW SVTM. No BC Act or EPBC Act listed TECs have been previously mapped as occurring at the proposal site. The vegetation does not meet the requirements of any of the EPBC Act listed TECs identified to potentially occurring within 1500m of the proposal site (refer **Section 6.5.1**).

The threatened species searches (refer **Tables 6-2, 6-3**, and **Appendix C**) identify that there are records of threatened species and the potential for threatened species to be present in the broader area. However, no threatened flora or fauna species have been historically recorded within the proposal site, and none were detected opportunistically during the site inspection.

The proposal site provides negligible to nil habitat values for threatened species, populations, or communities. The proposal site is not located within mapped Koala habitat. There will be no impacts to Koala habitat trees. Historically, it is possible that Koalas may have used the proposal site on occasion for transitional purposes. However, this is now likely to be significantly reduced due to the degree of existing disturbance and construction activities currently occurring for the Stage 1 works of the broader Kings Forest development, which includes the progressive installation of fauna exclusion fencing.

The proposal site is not located within mapped area of core acid frog habitat, although it is noted that James Warren and Associates (2011c) identified that many of the Wallum Froglets records are in forage habitat (i.e. land inundated after heavy rain) rather than core habitat. It is possible that the southern portion of the proposal site (i.e., along the boundary with Depot Road, and what will become Kings Forest Parkway), which is at lower elevation could be inundated after heavy rain. However, it is unlikely this portion of the proposal site holds surface water for very long, given the sandy soils and depth to groundwater (greater than 2m). It is possible that the southern portion of the proposal site may also represent very degraded form of grasslands, which under wet conditions (i.e., resulting from significant rainfall events), the Wallum Sedge Frog is known to utilise.

An assessment of the habitat requirements for each of the identified threatened species known or predicated to occur with a 1,500m radius of the proposal site, against the limited habitat values present the proposal site, was undertaken to determine the likelihood of threatened species occurrence at the proposal site (refer **Table D-1, Appendix D**). This assessment indicated three threatened fauna species; the Koala, listed as endangered under both the BC act and EPBC Act; Wallum Froglet, listed as vulnerable under the BC Act and the Wallum Sedge Frog, listed as vulnerable under the EPBC Act, are considered to potentially utilise the proposal site, or part of it,

from time to time, either for transitional purposes, or in the case of the acid frogs, after significant rainfall events.

Where a species was identified as potentially being impacted by the proposal, a 'test' and/or an 'assessment' of significance under the BC Act and or the EPBC Act, respectively, was undertaken (**Appendix E**). Site inspection, professional judgement, species specific information and the precautionary principle were applied in determining this requirement.

The Significance Tests prepared in accordance with section 7.3 of the BC Act and Assessments of Significance prepared in accordance with the EPBC Act Matters of National Environmental Significance (refer **Appendix E**) concluded that the proposal could be undertaken without significantly impacting any threatened species, populations, ecological community, or areas of outstanding biodiversity value. Referral to the Federal Minister for the Environment and Water, regarding the potential impacts to the Koala and the Wallum Sedge Frog is not required (refer **Appendix F**).

Migratory Species

Approval under the EPBC Act is required for any action that has, will have, or is likely to have a significant impact on a listed migratory species. Of the 56 migratory species with the potential to be present within 1,500m buffer of the proposal site, 18 of these were solely marine species (i.e., whales, dolphins, sharks, rays and turtles), which would not utilise the proposal site. The remaining 38 migratory species were all birds, which have been considered against the significant impact criteria in **Table 6-5**.

Table 6-5: EPBC Assessment of Significance for Migratory Birds

<i>An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:</i>	
Criteria	Response
I. substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	There is little evidence to suggest that the proposal site supports important habitat for migratory species given the absence of permanent water and high disturbance levels. The lack of proximity of wetlands of international importance reduces the likelihood that habitat in the proposal site is important habitat. The proposal is therefore unlikely to substantially modify, alter, destroy or isolate important habitat for the listed migratory bird species.
II. result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The local area has a history of habitat modification for sand mining, turf production, dairy farming, small cropping and grazing, sugar cane production and as a pine plantation. The proposal is unlikely to further contribute to establishment of invasive species beyond that which may already exist.
III. seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The proposal site is not an area of important habitat for migratory birds, whether they are wetland or terrestrial species. It is unlikely that an ecological significant proportion of migratory birds would rely on habitat in the proposal site.

Impact to groundwater dependent communities

No aquatic or terrestrial GDEs are mapped within the proposal site. A high potential terrestrial GDE is mapped north of the proposal site, according to a regional assessment. However, given works will be contained to the proposal site, potential impacts to this nearby terrestrial GDE are unlikely.

Impact to hollow bearing trees

No trees are located on the proposal site.

Fragmentation of habitat

Vegetation in the surrounding landscape is already highly fragmented from historical and more recent disturbances. The proposal site itself is already cleared of all woody vegetation, and therefore is unlikely to contribute to further fragmentation of habitat.

Soils and drainage

Soils will be disturbed during construction. Disturbed soils have the potential to move off the proposal site and impact waterways if not appropriately managed. Site stabilisation practices, including installation of appropriate erosion and sediment controls (refer **Section 6.2.3**) will be applied to the area during and where required after construction, to ensure no long-term impact to the biodiversity values. The development will not have long term or lasting impact on the hydrology at any scale.

Indirect impacts

Injury to wildlife

Injury to wildlife is possible, but unlikely during the construction phase of this proposal. Contact with wildlife and suitable habitat will be avoided wherever possible. Local wildlife rescue organisation should be contacted in the event wildlife requires rescue or removal.

Spread of pests, weeds and disease

The risk of spreading pests and disease is unlikely given works will be contained to an already disturbed site.

Invasion and spread of weeds is also considered unlikely, although soil disturbance may result in new weed populations or encourage seed germination of existing weed species. Introduction or spread of weeds through the proposal site may be associated with these actions:

- Removing groundcover species
- Excavation, soil stripping and importation of fill.

Management of weed dispersion is considered in the mitigation measures **Section 6.5.3**.

Regarding Fire Ants, Essential Energy has an obligation to comply with the relevant biosecurity orders, as they relate to movement of material into and out of infested and movement control areas, where applicable. At the time of writing, *Biosecurity (Fire Ant) Emergency Order (No 7) 2024*, was in place.

The risk of spreading chytridiomycosis is considered low due to the proposal site not being located within the wetland environments, workers and machinery being limited to the proposal site, and construction personnel not directly handling frogs.

Impact on Key Threatening Processes

Key Threatening Processes (KTPs) listed under the BC Act, EPBC Act and FM Act were reviewed. Only one, invasion of native plant communities by exotic perennial grasses, is considered to be negligibly exacerbated by the proposal. The KTP can be minimised and managed by the mitigation measures in **Section 6.5.3**.

6.5.3 Environmental mitigation measures

Siting the location of the proposed new ZS on previously cleared and disturbed land has minimised potential impact to flora and fauna considerably. Notwithstanding, to ensure potential impacts to flora and fauna are further minimised and managed, the following mitigation and management measures are to be implemented:

- No clearing or disturbance to vegetation outside the lot boundary, which is located within Precinct 2 of the broader Kings forest development, is permitted
- If fauna is detected within the worksite, the animal is to be allowed to leave the site without any coercion or a local wildlife rescue service is to be contacted to facilitate the safe removal of the animal from the worksite
- Essential Energy has a general biosecurity duty under the *Biosecurity Act 2015* to prevent, eliminate or minimise biosecurity risk so far as is reasonably practicable. Field crews shall follow procedures as outlined in Essential Energy's Operational Guideline: Biosecurity Risk Management (CERM1000.96) to prevent, eliminate or minimise biosecurity risk so far as is reasonably practicable, with particular reference to vehicle and equipment hygiene practises. This includes complying with the relevant biosecurity orders, as they relate to movement of material into and out of declared fire ant infested and movement control areas, where applicable.

6.5.4 Conclusion

It is unlikely the proposal will have impacts on flora and fauna during construction and operational activities, in addition to those that have already occurred from the disturbance associated with Stage 1 of the Kings Forest development. The environmental risk is considered to be low.

6.6 Aboriginal Heritage

6.6.1 Existing environment

Desktop Assessment

A desktop assessment of Aboriginal heritage was undertaken in the general vicinity of the proposal site. A review of registered sites from Heritage NSW's Aboriginal Heritage Information Management System (AHIMS) (Heritage NSW, 2024) was undertaken (refer **Appendix G**). The search revealed no Aboriginal sites or objects located within the footprint of the proposed ZS site. An extensive search revealed eight registered sites are located in the general vicinity (within approximately 750m) of the proposal site. These are listed in **Table 6-6**, and illustrated in **Figure 6-19**.

Table 6-6: Registered AHIMS in the General Vicinity of the Proposal Site

Site ID	Site name	Context	Site status	Site features	Site types
04-2-0188	Kings Forest 13	Open site	Destroyed	Artefact: 1	
04-2-0106	Kings Forest 3	Open site	Valid	Shell	Midden
04-2-0223	Cudgen Ridge South East Tweed ACH Artefacts	Open site	Valid	Artefact	
04-2-0111	Seaside City 1	Open site	Valid	Shell	
04-2-0112	Sea Side City a	Open site	Valid	Shell:	
04-2-0098	Cudgen; Old Bogangar Rd	Open site	Valid	Artefact: -	Open Camp Site
04-2-0187	King Forest 12	Open site	Destroyed	Artefact: 1	
04-2-0093	Cudgen	Open site	Valid	Artefact	Open Camp Site

Of the above sites, four (04-2-0111, 04-2-0112, 04-2-0188 and 04-2-0223) are located on land on the opposite side of Tweed Coast Road and would not be impacted by the proposal. The remaining four (04-2-0093, 04-2-0098, 04-2-0106 and 04-2-0187), while located outside the impact footprint of the proposal, are located at closer proximity to the proposal site. Site cards were requested for the four sites in closer proximity to gather further information about the sites, including their extents and to confirm the sites would not be impacted by the proposal. A site card for Site ID: 04-2-0093 was not available from the AHIMS database. A summary of the information obtained from the site cards and other available sources for sites 04-2-0098, 04-2-0106 and 04-2-0187 is provided below.

Site ID: 04-2-0098 (Site Name: Cudgen; Old Bogangar Rd)

Information obtained from site card (National Parks and Wildlife Service (NPWS), 1997) for Site 04-2-0098, indicates the site was first reported in a preliminary investigation of Aboriginal sites in Kings Forest, prepared by Nicholson and Cane (1989). A copy of this report was not available on the AHIMS database, and could not be located online. A subsequent archaeological investigation by Piper (1997) prepared for TSC for the realignment of Old Bogangar Road re-identified the site and recorded it using the then NPWS Standard Site Recording Form (1997). A copy of the Piper (1997) report was available on the AHIMS database. Information on the site card and that presented in the Piper (1997) archaeological survey report indicate the site comprises a quarry, open site and midden. Specifically, it was recorded to include a surface scatter of low density *Donax deltooides* (pipi) fragments and isolated *Dicathius orbita* (cartrut shells) along an exposed eastern edge of dune, bordering Cudgen Creek Wetland and adjacent to Old Bogangar Road. The site was recorded to extend from the intersection of Old Bogangar Road and Depot Road approximately 60m in a northerly direction, along the eastern side of Old Bogangar Road, and is approximately 15m wide, increasing to 30m at the northern end.

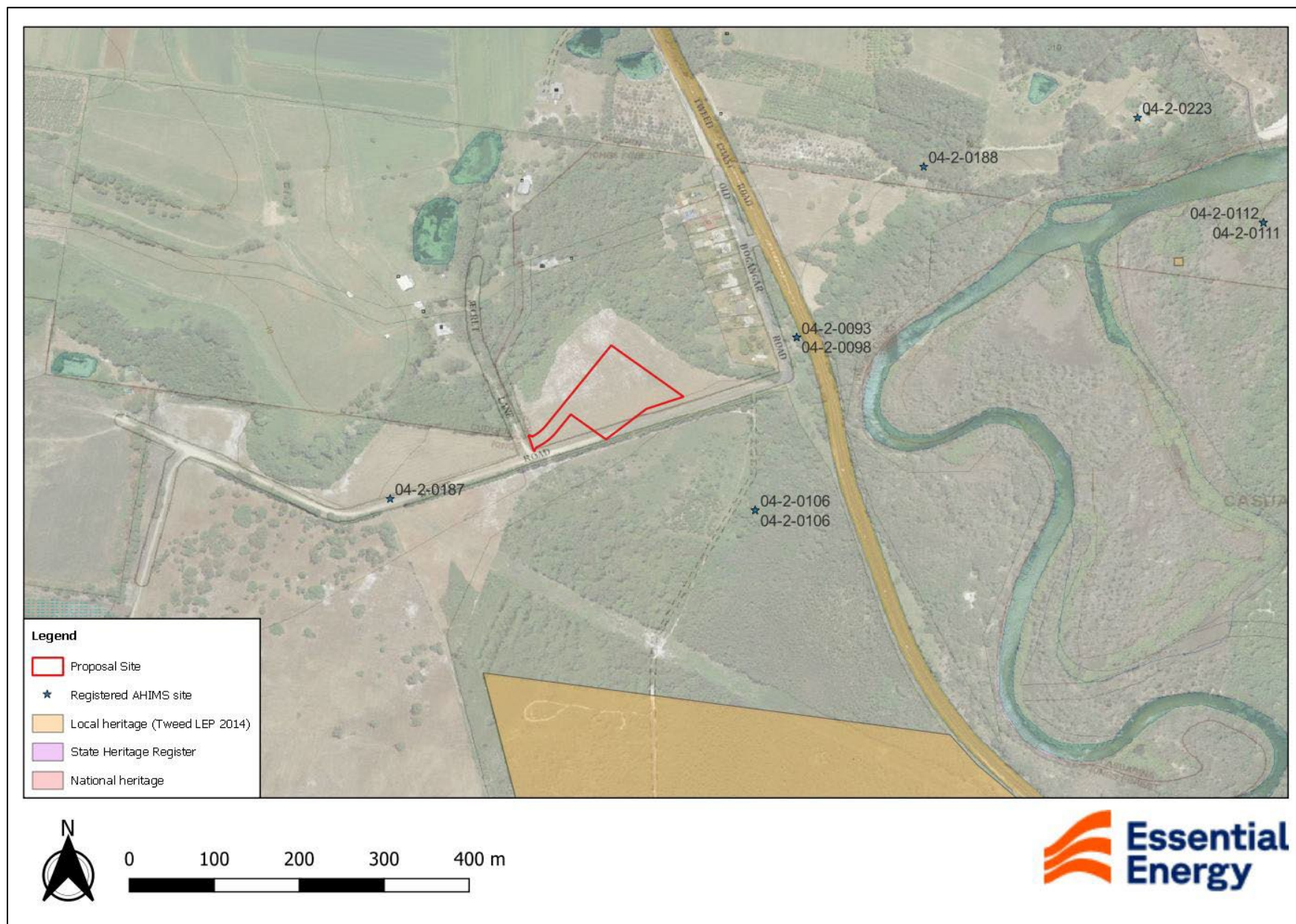


Figure 6-19: Aboriginal and non-Aboriginal heritage sites within the general vicinity of the proposal site

In addition to the pipi fragments and isolated cartrut shells, the following objects were recorded:

- One piece of red orche (3.5cm x 2.5cm x 2.0cm)
- One flaked piece 3cm x 2.5cm x 1.5cm: circular shape at the base, bulbar scar forms base, rejuvenation flakes removed on each margin, flakes removed from dorsal surface.

One flake (4cm x 2cm x 0.5cm): wedge shape on chalcedony, snapped at proximal and distal ends. No evidence of use wear or retouch.

A snapped edge ground axe and black blade reported at the site in Nicholson and Cane (1989) was not evident in the Piper (1997) survey.

Piper (1997) noted that it appeared some of the shell has been dumped with rubbish from houses across the road. Piper (1997) also noted that as the area had been cleared and possibly cultivated, the materials may have been redistributed from higher elevations of the sand mass. The shell material scatter immediately east of the road may have been the result of road grading of a shallow deposit of shellfish refuse and other artefactual materials when the road was first constructed. Piper (1997) concluded that it was doubtful that any of the exposed shell or artefactual material was "in-situ".

Site ID: 04-2-0106 (Site Name: Kings Forest 3)

Information obtained from site card (NPWS, date not decipherable) and the Cultural Heritage Assessment report (Everick, 2012) for site 04-2-0106 (Kings Forest 3), indicates the site comprises a shell midden and artefact scatter, located on the eastern edge of an inner barrier dune which defines the western edge of the Cudgen Creek wetland. The sand mass on which the site is located extends to the west and has been extensively cleared for pine forest plantation and a powerline easement. Pockets of natural vegetation remain. A vehicle track runs the length of the site. The material at the site consists predominantly of a low density scatter of artefacts and highly fragmented pipi shell with some oyster and whelk. The shell fragments are intermittently spread for a distance of approximately 100m while a low density scatter of artefacts can be found along the length of the track (approximately 500m). Artefactual material at the site consists of stone artefacts, ochre, hammer-stones, pebbles and a large stone of an unspecified purpose or origin. The greatest concentration of these materials is immediately north and south of a nonperennial stream which cuts through the site from swamps to the west. The Registered Stakeholders indicated the site was highly significant site and should be protected. Everick (2012) recommended the site would be best managed by preserving the site in situ, with a fence erected around the site, and signage put up to mark the location and explain the site and its significance.

Site ID: 04-2-0187 (Site Name: King Forest 12) – Destroyed.

Information obtained from the site card completed by Everick Heritage Consultants in August 2007, for site 04-2-0187 (Kings Forest 12) indicates the site is located on open sand flat, on the northern side of Depot Road. The site comprises a low density (<1 artefact/sq m.) scatter of stone artefacts. In total 8 artefact were recorded over an area of 40m² (20m x 2m). Everick (2007) noted the site is highly disturbed due to historic sand mining, road building and possibly pine cultivation. Everick (2007) also noted that it is unlikely that the artefacts identified on the surface were indicative of significant subsurface deposits of artefacts. Everick (2007) noted in the site card that Registered Stakeholders agreed the site was highly disturbed and were of the opinion that artefacts be collected and stored in an appropriate Keeping Place. In a subsequent Cultural Heritage Assessment report (Everick, 2012), it was noted that Kings Forest 12 was the subject of surface collection, as the site was considered to be heavily disturbed with little likelihood of artefactual material still in-situ. At the time of the preparation of the Everick (2012) report, and in accordance with existing Department of Planning approvals, all Aboriginal Objects originating from the Kings Forest development areas were to be kept in the care and control of the Tweed Byron Local Aboriginal Land Council (LALC,) until such time as an alternative keeping place could be arranged. In consultation with the Stakeholders, Everick (2012) identified the Minjungbal Cultural Centre as a suitable keeping place, and Care and Control permit applications were lodged with the then NSW Office of Environment and Heritage (OEH).

Site Inspection

Essential Energy's Senior Environmental Specialist undertook an inspection of the proposal site on 29 February 2024. The site inspection included a thorough walkover of the proposal site. Photographic and written records were made of the landscape features relevant to archaeological potential. These features include disturbance levels, Ground Surface Visibility (GSV) and where

present, any landforms of higher archaeological potential.

Ground surface visibility (GSV) was generally good (95%) across the northeastern portion of the proposal site, in the area currently being used as a laydown yard for construction materials and equipment for the broader Kings Forest development. The ground surface in this area was highly disturbed, and comprised regraded sandy soils, with some imported rock and gravel. GSV across the remainder of the site was slightly less but still reasonable (80%). Groundcover species while mainly sparse, did impede GSV in some areas where they were notably thicker. Consistent with the northeastern portion of the proposal site, the remainder of the proposal site has been subject to considerable soil disturbance through regrading activities. There is evidence of a cut along much of the northwestern boundary of the proposal site (refer **Plate 1-1**).

6.6.2 Assessment of impact

The NPW Act requires that proponents follow a due diligence approach in regards to the protection of Aboriginal objects. There are three essential issues to consider when undertaking a due diligence assessment:

- The nature of the proposed activity (e.g. the extent of development impacts)
- Land condition and prior land uses (e.g. impacts to bushland or undisturbed ground, areas containing sandstone outcrops, rock shelters and overhangs, old growth trees, sand bodies, ground adjacent to creeks, rivers, lakes and swamps)
- Knowledge and available information (e.g. AHIMS database search, previous reports or studies relating to the site or in the area, and local knowledge, such as councils or Local Aboriginal Land Councils (LALC)).

An assessment against the due diligence requirements is provided in **Table 6-3**.

Table 6-7: Assessment against due diligence requirements

Aboriginal heritage due diligence process			
Step	Question	Answer	
1.	Are you disturbing the ground surface or culturally modified tree? <i>If yes proceed to step 2, if no, Aboriginal heritage considerations not required proceed with caution</i>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
2.	Are you working near known Aboriginal sites – check the Aboriginal heritage information management system (AHIMS)? (http://www.environment.nsw.gov.au/awssapp/Login.aspx?ReturnUrl=%2fa%2fwssapp). Attach results from search. <i>If no, proceed to step 3. If yes, must obtain site cards/information and proceed to step 4.</i>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
3.	Are you carrying out development on disturbed land? Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable. Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks.)? <i>If yes, Aboriginal heritage considerations not required proceed with caution and no further consideration required. If no proceed to step 4.</i>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
4.	Is there any other information which suggests an Aboriginal object or place at or near where the works will be carried out?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

5.	<p>Are there any landscape features which may indicate the presence of Aboriginal objects? This includes proposed activities:</p> <ul style="list-style-type: none"> a. Within 200m of waters, b. Below within 200m below or above a cliff face, c. located within a sand dune system, d. within 20m of, or in, a cave, rock shelter or a cave mouth; e. land not disturbed <p><i>Note: "waters" and "sand dune system" are defined in the due diligence code of practice) and/or</i></p>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
6.	Are you unable to avoid harm to any known object or disturbance of the landscape feature with potential for an Aboriginal heritage find?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
7.	Has there been a visual inspection by a person with expertise in locating and identifying Aboriginal objects?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
<p><i>If yes to 4, 5, or 6 above, then further Aboriginal archaeological investigations, for example, a field survey by an Environmental Services team member or engagement of an archaeologist are required prior to works. If no, describe why harm to Aboriginal objects is not likely (refer below)..</i></p>			

The proposed Kings Forest ZS site is located within the broader Kings Forest development site. It has been heavily modified and disturbed through previous and more recent land uses. Weed mapping from James Warren and Associates (2011e) indicates the proposal site was a harvest area for Slash Pine in the recent past. A site inspection undertaken on 29 February 2024 indicated the proposal site has undergone regrading work, with a cut evident along much of the northwestern boundary (refer **Plate 1-1**). The northeastern portion of the proposal site is currently being used as a laydown yard, containing construction materials, equipment and machinery for preparatory early civil and construction works associated with Stage 1 of the Kings Forest development (refer **Plates 1-2** and **1-3**). The proposal site has been cleared of all woody vegetation. There are no trees or shrubs present. The eastern portion, currently being used as a laydown yard, is largely devoid of all vegetation, including groundcover. The western portion of the proposal site, including the proposed primary access road contains groundcover species only, comprising predominately exotic grass species (refer **Plate 1-4**). As such, the land on which the proposal site will be located can be considered disturbed land in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (NSW DECCW, 2010).

In addition, the proposal site has been subject to several previous archaeological surveys undertaken for the broader Kings Forest development site. While these surveys identified Aboriginal objects nearby, none were recorded within the proposal site. Piper's (1997) archaeological survey indicates it is unlikely the artefactual material associated with Cudgen Old Bogangar Rd (Site ID: 04-2-0098) is of an in-situ source and is highly disturbed. Regardless, the site extent is located approximately 150m to the east of the proposal site, at its closest point, and will not be impacted by the proposal.

The artefactual material associated Kings Forest 3 (Site ID: 04-2-0106), remains in-situ and within a designated environmental protection zone of the broader Kings Forest development, approximately 160m southeast of the proposal site at its closest point. As such it will not be impacted by the proposal.

King Forest 12 (Site ID: 04-2-0187), which was subject to a surface collection and no longer remains in-situ, was located adjacent to Depot Road southeast of the proposal site. Everick (2007) noted that it was unlikely that the artefacts identified on the surface were indicative of significant subsurface deposits of artefacts and Registered Stakeholders agreed the site was highly disturbed. In a subsequent Cultural Heritage Assessment report (Everick, 2012), it was noted that Kings Forest 12 was heavily disturbed with little likelihood of artefactual material still in-situ. These

conclusions, combined with lack of evidence of surface objects located within the proposal site, despite historical and recent survey effort, indicates little to no potential for Aboriginal objects to be present within the proposal site.

The proposal site has been subjected to varying degrees of historical and more recent land disturbance associated with clearing, pine plantation and harvest activities, and use of the site as a laydown yard for the broader Kings Forest development.

No trees were identified within the proposal site.

Considering the highly disturbed nature of the proposal site, lack of evidence of Aboriginal objects from past surveys at the proposal site, the proposal is not likely to impact Aboriginal heritage.

6.6.3 Environmental mitigation measures

In order to mitigate any potential impacts on Aboriginal heritage, the following mitigation measures will be employed:

- In the unlikely event that an Aboriginal heritage site or object is located during the construction phase of the project, works will cease in that area and a representative from Essential Energy's Environmental Services will be notified. Works with the potential to disturb the object would not resume until the object had been properly identified, and appropriate action taken
- If human remains are uncovered, works must immediately cease and the NSW Police department and Essential Energy's Environmental Services team will be notified.

6.6.4 Conclusion

The proposal is not anticipated to have any impact upon Aboriginal heritage in the area. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low.

6.7 Non-Aboriginal Heritage

6.7.1 Existing environment

Non-Aboriginal heritage refers to any deposit, object or material evidence which relates to the settlement of New South Wales, not being Aboriginal settlement, and is of state or local heritage significance (Section 4 of the Heritage Act).

A desktop search of Australia's World Heritage Sites (Commonwealth DCCEEW, 2024c), National Heritage List (Commonwealth DCCEEW, 2024d), NSW State Heritage Inventory (Heritage NSW, 2024), Tweed LEP 2014 and Tweed LEP 2000 was conducted to determine the extent of non-Aboriginal heritage in the vicinity of the proposal.

6.7.2 Assessment of impact

A review of the above-mentioned heritage registers indicated no sites of world, national, state or local heritage significance are located within, or intersected by, the boundary of the proposal site. The nearest identified non-Aboriginal heritage site was a locally listed heritage site on the Tweed LEP (Item 101) associated with the Cudgen Nature Reserve, located approximately 330m south of the proposal site (refer **Figure 6-19**). The local listing is for the high conservation value of old growth forest. The local heritage site will not be impacted by the proposal.

The site inspection undertaken on 29 February 2024 did not indicate any evidence of non-Aboriginal heritage items being located within the proposal site.

Given the level of historical and more recent disturbance at the site, lack of records at, and in the immediate vicinity of, the proposal site, it is unlikely the proposal will impact non-Aboriginal heritage.

6.7.3 Environmental mitigation measures

The following mitigation measures would be applied:

- All construction work would be undertaken within the assessed areas of the proposal site only
- In the unlikely event that a previously unknown heritage site or object is located during construction of the proposal, works would cease immediately in that area and a representative from Essential Energy's Environmental Services would be notified. Works with the potential to disturb the object would not resume until the object had been properly identified, and appropriate action taken.

6.7.4 Conclusion

The proposal is unlikely to have a significant impact upon non-Aboriginal heritage in the area. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low.

6.8 Contamination

6.8.1 Existing environment

Desktop Assessment

The proposed Kings Forest ZS site is located within the broader Kings Forest development site. It has been heavily modified and disturbed through previous and more recent land uses. In particular weed mapping undertaken by James Warren and Associates (2011e) indicates the proposal site was a harvest area for Slash Pine in the recent past. More recent uses of at least the northeastern portion of the site include a laydown area for construction material, equipment machinery. Therefore, potential on-site sources of contamination include weed and pest spraying and potentially minor leaks or spills of hydrocarbons from equipment or machinery. Contaminants that may be encountered within the study area could include insecticides, fungicides and herbicides, heavy metals and hydrocarbons.

A search of the NSW EPA 'Contaminated Land – Record of Notices' (EPA, 2024a) and 'List of NSW Contaminated Sites Notified to EPA' (EPA, 2024b) did not identify any contaminated sites within or in the near vicinity of the proposal site.

A search of NSW Department of Primary Industries (DPI) Cattle Tick Dip Site Locator did not indicate any tick dip sites within or in the immediate vicinity of the proposal site. The closest cattle tick dip site (Cudgen Creek) is located approximately 1.5km north of the proposal site.

Gilbert and Sutherland (2011b) conducted a review of a number of contamination studies undertaken between 1992 and 2003 for the broader Kings Forest development site. This preliminary assessment identified a number of areas adjacent to and within the broader development site which had the potential for contamination:

- A capped, decommissioned council landfill site (known as Old Bogangar Road Landfill)
- Northern and southern banana plantations
- A fuel storage area and former nursery
- A former orchard
- A former cattle dip site.

The location of these sites relative to the proposed ZS site is presented in **Figure 6-20**.

Of the above listed sites, the closest to the proposed ZS site is the Old Bogangar Road Landfill, located approximately 450m west of the proposal site. According to Gilbert and Sutherland (2011b), the landfill operated between the 1960's and the mid 1980's when it was closed to public disposal of general waste. Soil and other hard fill was deposited at the site up to 2004, when the landfill was decommissioned and capped by Tweed Shire Council.

Given the former landfill's location in close proximity to the broader Kings Forest development it was considered that it had potential to contaminate groundwater within or near the Kings Forest development and therefore required further assessment. Gilbert and Sutherland (2011b) reviewed several site investigation reports, including groundwater monitoring results, prepared between 2001 and 2008 for the former landfill site. From this review it was identified that landfill leachate might be having some influence on concentrations of nutrients (namely ammonia and nitrate) in two of the groundwater monitoring bores adjacent to the boundary of the landfill site. However, Gilbert and Sutherland (2011b) noted that the ammonia (NH_4) is a non-toxic form of ammonia and poses an insignificant risk to human health and a minor risk to the environment, given that the water is contained within the groundwater.

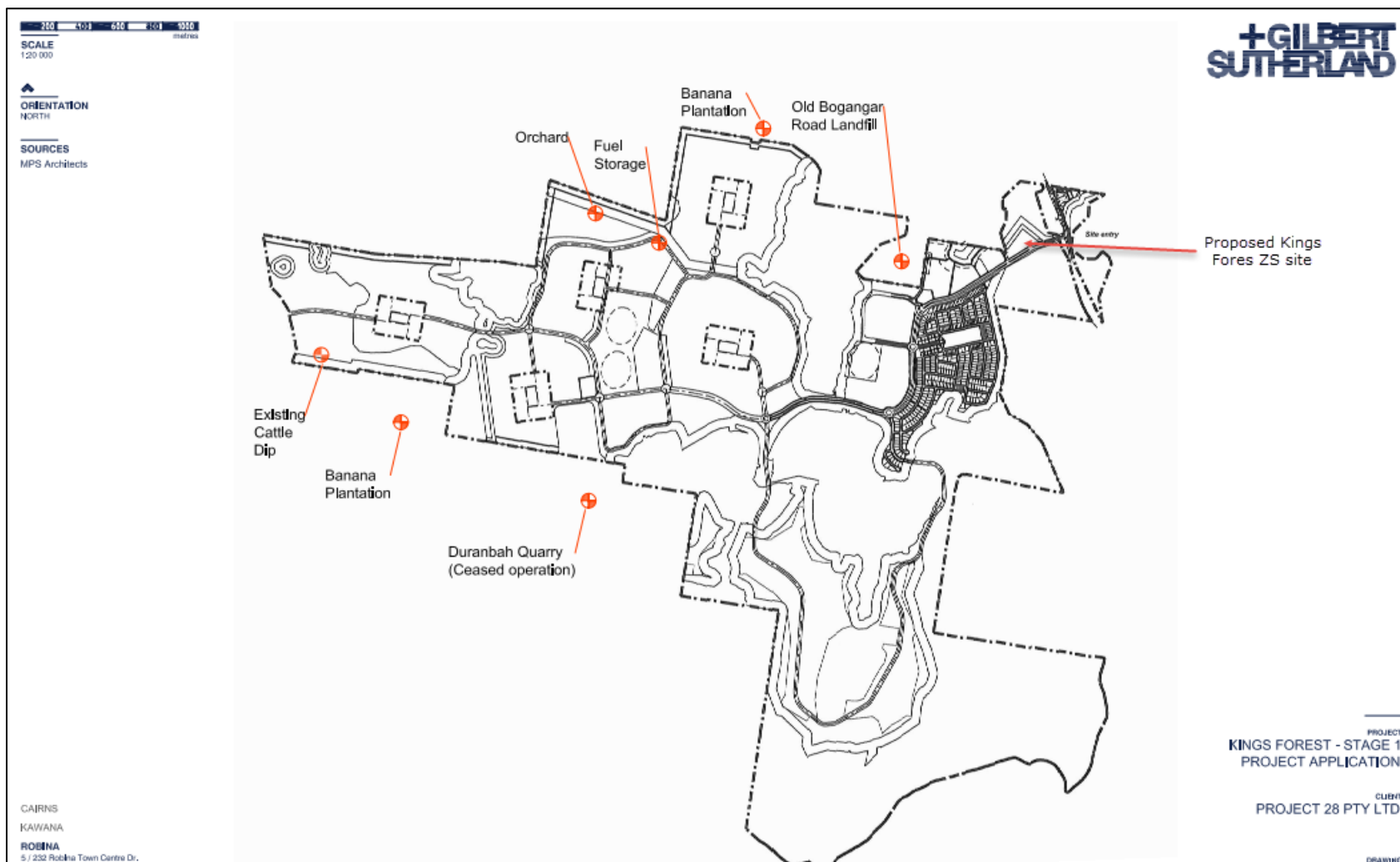


Figure 6-20: Potential sites of contamination within the general vicinity of the proposal site (Gilbert and Sutherland 2011b)

Ultimately Gilbert and Sutherland (2011b) concluded that the groundwater associated with the landfill site would have no significant impact upon the boarder Kings Forest development given that groundwater flows in a westerly direction from the Kings Forest site towards and through to the western side of the landfill site, and the land use adjacent to the landfill will be community infrastructure and the likelihood of private or residential and exposure to the leachate will be avoided.

According to the DPI Cattle Tick Dip Site Locator, the closet cattle tick dip site (Cudgen Creek) is located approximately 1.5km north of the proposal site. The dip site is recorded as demolished. The dip site referred to by Gilbert and Sutherland (2011b) is located approximately 4km west-southwest and referred to as the Duranbah dip site on the DPI Cattle Tick Dip Site Locator. This dip site is also noted as demolished. Given the distances of each dip site and local groundwater flows, any residual contamination from these dip sites would not impact on the proposal site.

In the EAR prepared for the broader Kings Forest development site (JBA Planning, 2011) it was noted that the broader development site had been historically used for sand mining, with distinctive areas of disturbance found within the eastern portion of the site, in the general vicinity of the proposed ZS site. JPA Planning (2011) indicate that sand mining activity has the potential to give rise to radiation impacts. To support the EAR, Gilbert and Sutherland (2011b) undertook a quantitative radiation assessment (surface radiation survey and sub-surface investigation including 24 boreholes) to assess the potential for radiation within the disturbed areas on the broader Kings Forest Development site. The investigation confirmed that all areas potentially disturbed by sand mining exploration or extraction have been identified and no radioactivity has been identified at levels that would create a health risk, and no further investigation was necessary (Gilbert and Sutherland, 2011b).

Site Inspection

Inspection of the proposal site by Essential Energy's Environmental Senior Specialist, on 29 February 2024 indicated the proposal site has undergone significant previous disturbance, including recent regrading work, with a cut evident along much of the northwestern boundary (refer Plate 1-1). The northeastern portion of the proposal site, currently being used as a laydown yard, for the broader Stage 1 of the Kings Forest development, contained various pieces of construction materials, including, but not limited, to concrete blocks, culverts and pipes; metal stakes, poles, rio and fencing; pvc pipes; orange conduits; rubber tyres; wooden stakes and poles; and a skip bin. There was no visual or olfactory evidence of hydrocarbon spills, or visual evidence of asbestos containing materials (ACM). The remainder of the proposal site was predominately grassed with exotic groundcover species. There was no visual evidence of surface contamination over the remainder of the proposal site.

6.8.2 Assessment of impact

There are no known records of contamination at the proposal site. While surface soils and subsoils may have been subjected to periodic pesticide and fungicide use during the time the proposal site was used for Slash Pine plantation, it is not expected significant contamination would have resulted from the application of these chemicals. Any significant residue of the chemical is considered unlikely, given the predominately sandy soils present at the proposal site. Furthermore, the proposal site has undergone substantial vegetation clearing and disturbance for use as a laydown yard as part of site establishment and early civil works for the broader Kings Forest development. No areas of contamination have been uncovered during that process and there is unlikely to be any further contamination risks on the site given the lack of visual and olfactory evidence to suggest otherwise. Therefore, the risk of encountering significant areas of contamination is considered low, and could be managed on-site during construction.

The construction materials, equipment and machinery located in the laydown area will be relocated by Leda prior to work at the ZS site commencing.

The potential for offsite sources of contamination to impact the proposal site is considered low. Any potential groundwater leachate from the Old Bogangar Road Landfill site is unlikely to impact the proposal site as groundwater was determined to flow in a westerly direction from the landfill site (Gilber and Sutherland, 2011b). The proposed Kings Forest ZS site is located to the east of the former landfill site.

Spillage of diesel, lubricating oils or other chemicals could occur during refuelling and/or maintenance of construction plant/equipment and vehicles, whilst leakage of fuels or oils could occur from poorly maintained construction plant/equipment and vehicles, during civil and construction work for he ZS. Any on-site chemical spill or leak could adversely affect the water

quality of surrounding waterways. The risk of chemical spills and leaks is expected to be minor, provided that adequate mitigation measures are implemented (see **Section 6.8.3**).

6.8.3 Environmental mitigation measures

The following mitigation measures will be adopted if and where required:

- It is intended to reuse surplus spoil beneficially on site, where possible.
- Essential Energy's CEOP8064 Management of Excavated Material; Guideline for Construction Sites will be consulted to determine the most appropriate beneficial reuse or disposal method for excavated materials
- In the event of encountering any suspected contamination in the work area, it will be separated and contained on site until it can be classified in accordance with the EPA (2014) Waste Classification Guidelines, and then disposed of at a facility that is lawfully able to accept the waste
- Control measures will be implemented to manage risks associated with the handling of fuel through using spill trays when undertaking in field re-fuelling
- Sediment and erosion control structures will be established and maintained in accordance with The Blue Book to minimise potential impacts on receiving watercourses.

6.8.4 Conclusion

The proposal is not anticipated to have any impact upon contamination in the area. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low.

6.9 Electric and Magnetic Fields

6.9.1 Existing environment

Electric and magnetic fields (EMF) are part of the natural environment and are present in the Earth's core and the atmosphere. EMF is also produced wherever electricity or electrical equipment are in use. Powerlines, electrical wiring, household appliances and electrical equipment all produce EMF.

The electric field is proportional to the voltage (which can be considered as the pressure with which electricity is pushed through the wires). The magnetic field is proportional to the current, that is, to the amount of electricity flowing through the wires. Both electric and magnetic fields are also dependent on the source geometry (i.e. conductor heights, cable depths, phase separations and so on). All fields decrease rapidly with distance from the source. Generally, the smaller the object or closer the conductors producing the field, the more rapidly the field would decrease with distance from the source. Essential Energy is aware of concerns in the community and some scientists regarding the possibility of adverse health effects from exposure to EMF.

All of the research has been extensively reviewed over the last 30 years by Australian and international inquiries and expert panels established for the purpose of trying to determine whether or not human exposure to EMF is related to adverse health effects.

There is scientific consensus that health effects have not been established, but that the possibility cannot be ruled out. Some scientists argue that there is a need for ongoing high quality scientific research in order to give better answers to the questions which have been raised. Others hold the view that no further research is required and that EMF should not be regarded as a risk to health.

It is well accepted by scientists that no study considered in isolation would provide a meaningful answer to the question of whether or not EMF can contribute to adverse health effects. In order to make an informed conclusion from all of the research, it is necessary to consider the science in its totality. Over many years, governments and regulatory agencies around the world have commissioned independent scientific review panels to provide such an overall assessment. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), as part of the Health and Ageing Portfolio, is a Federal Government agency charged with responsibility for protecting the health and safety of people, and the environment, from EMF.

ARPANSA advises that:

"On balance, the scientific evidence does not indicate that exposure to 50 Hz EMFs found around the home, the office or near power lines is a hazard to human health."

“... the majority of scientists and Australian radiation health authorities in particular, do not regard chronic exposure to 50 Hz electric and magnetic fields at the levels commonly found in the environment as a proven health risk. Moreover, the evidence we have is inconclusive and does not allow health authorities to decide whether there is a specific magnetic field level above which chronic exposure is dangerous or compromises human health.”

“At the present time there is no evidence that exposure to electric fields is a health hazard (excluding of course electric shock).”

There are currently no Australian standards regulating exposure to these fields. The National Health and Medical Research Council has issued interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields. These guidelines are aimed at preventing immediate health effects resulting from exposure to these fields. The recommended magnetic field exposure limit for members of the public (24 hour exposure) is 0.1 millitesla (1,000 mG - milligauss) and for occupational exposure (whole working day) is 0.5 millitesla (5,000 mG).

Essential Energy operates its powerlines, substations and other electrical infrastructure well within these interim guideline limits.

Essential Energy's policy involves providing balanced and accurate information, operating our electrical power system prudently within Australian health guidelines, and closely monitoring scientific research on the EMF health issue.

6.9.2 Assessment of impact

The proposed new ZS incorporates prudent EMF avoidance measures into the standard designs for substations. The design of the proposal has minimised the magnetic field as far as technically reasonable and within the context of “...[doing] whatever can be done without undue inconvenience and at modest expense to avert the possible risk [to health]”, consistent with Gibbs Inquiry (1991).

A row of residential properties are located within a subdivision along Old Bogangar Road to the east and northeast of the proposal site. The closest of these is located approximately 100m east of the proposal site. Several rural residential properties are also located to the north of the proposal site, the closest being approximately 120m north. Given the closest sensitive residential receiver is 100m away, it is unlikely the new ZS will expose sensitive receivers to EMF.

6.9.3 Conclusion

The proposal will comply with all relevant national and international guidelines. The resulting magnetic fields from the ZS are within the range of fields expected from electricity infrastructure in the area. The overall environmental risk is considered to be low.

6.10 Visual and Aesthetics

6.10.1 Approach

The following visual amenity assessment approach was applied to evaluate the potential visual impacts associated with the project. It is based on a professionally recognised system developed by the United States Forest Service (1974), and similar methods adopted by the Forestry Commission of Tasmania (1983) and the NSW Department of Planning (1980).

The approach used in this assessment is as follows:

- The existing visual environment of the site is described (in terms of landscape character, scenic quality, visual and landscape sensitivity and major view points);
- A brief description is made of the proposed visual changes; and
- An impact assessment is then undertaken, assessing both the changes to the site itself, and any impacts to views from surrounding areas.

The visual impact of the proposed activity has been determined through the interaction of visual modification and visual sensitivity. These are discussed in more detail in the following sections. The ‘visual impact matrix’, illustrated in **Table 6-8**, is used to determine the potential visual impact of the proposed activity by combining a ranking of high, medium and low for both visual modification and visual sensitivity.

Table 6-8: Visual impact matrix

Visual Sensitivity				
Visual Modification		High	Medium	Low
	High	High Impact	High Impact	Moderate Impact
	Medium	High Impact	Moderate Impact	Minor Impact
	Low	Moderate Impact	Minor Impact	Minor Impact

6.10.2 Visual modification

Visual modification expresses the visual interaction between the proposal and the existing visual environment. It is the visual contrast between pre and post-development, and is a combination of the appearance of the development (size, form, colour, texture), absorptive capacity of the landscape setting, and the distance from which the development is viewed. Visual modification is expressed here as high, medium or low.

High modification

A high degree of visual modification would result if the proposed developments are a major element and contrast strongly with the existing landscape. The contrast is likely to occur if there is little or no natural screening or integration created by vegetation, or if there is an open plain. For example, powerlines passing over vegetated ridge tops also usually represent a high visual modification, particularly if it is a new powerline passing through otherwise undisturbed vegetated terrain and the viewer is parallel to the line.

Medium visual modification

A medium degree of visual modification would result if the proposed developments are visible and contrast with the landscape but are integrated to some degree. This would happen if the surrounding vegetation and/or topography provide some measure of visual screening, backgrounding or other form of visual integration of the development with its setting. An example of a medium visual modification is an urbanised streetscape with existing powerlines and/or established trees on the roadside.

Low visual modification

A low degree of visual modification occurs if there is minimal visual contrast and a high level of integration of size, form, colour or texture between the development and the environment. This would occur if there is a high degree of visual integration of the development into the existing landscape or a low level of visual modification of the existing visual setting is achieved. A low visual modification may reflect a situation where the development may be noticeable, but it does not markedly contrast with the existing landscape, as is the case with upgrading existing powerlines.

Throughout the study area, the degree of visual modification is highly dependent on the distance the viewer is from a new development. As the distance from the new development to the viewing location increases, the development becomes less prominent, and therefore its visual modification is less.

Visual modification is also affected by the angle at which a new development is viewed. In general, the visual modification when viewing the new development at right angles is less than when viewing in parallel, depending on the distance from the new development.

6.10.3 Visual sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape would be viewed from various viewpoints. This is dependent on a number of viewer characteristics, such as the number of viewers affected, land use, existing vegetation patterns, distance of the development from viewers, and the visibility of the development from critical viewing locations.

High visual sensitivity

Occupiers of residential properties with long viewing periods adjacent or within close proximity to the proposal. High sensitive areas can also apply to users of outdoor recreational areas, including

reserved land or nature recreation such as walking, swimming, fishing or trail riding. This is particularly the case where their attention is focussed, in part, on the landscape and amenity that is being affected by the proposed development.

Medium sensitivity

Medium sensitivity would apply to circumstances in which viewers have intermittent exposure, such as outdoor workers and outdoor recreation users, however, for the recreational user, attention is focussed predominantly on the activity they are viewing, such as a sporting event, rather than the proposed development. In addition, medium sensitivity would also apply to occupiers of residential properties with long viewing periods at a distance from or partially screened from the proposed development or project area.

Low sensitivity

Low sensitive viewers include predominantly those groups that have a short term view of the proposed development. This would be limited to mainly road users, trains or transport routes that are passing through or adjacent to the study area. Low sensitivity would also apply where viewers are adequately screened from the proposed development so that their viewing periods are limited to short periods.

6.10.4 Existing visual environment (landscape description)

The proposal site is located on relative flat parcel of cleared land near the intersection of Secret Lane and Depot Road. It forms part of Precinct 2 in Stage 1 of the broader Kings Forest development site. The proposal site has been heavily modified and disturbed through previous and more recent land uses. In the EAR (JBA Planning, 2011) prepared for the broader Kings Forest development site, indicated the broader development site has historically been used for sand mining, turf production, dairy farming, small cropping and grazing, sugar cane production and as a pine plantation. Weed mapping from James Warren and Associates (2011e) indicates the proposal site was a harvest area for Slash Pine in the recent past. Even more recently the proposal site has been used as a laydown yard for construction material, equipment and machinery for Stage 1 of the broader Kings Forest development.

The surrounding land uses were noted to comprise:

- Predominately cleared land designated as both environmental and agricultural buffer zones immediately to the north, with vegetated land associated with an environmental protection zone, rural-residential properties, and agricultural land, further north beyond.
- Predominately cleared land designated as environmental buffer zone immediately to the east, with a strip of vegetated land associated with an environmental protection zone, residential properties, Old Bogangar Road, Tweed Coast Road, and Cudgen Creek further east beyond
- Depot Road, which will become Kings Forest Parkway immediately to the south, with partially vegetated land designated as both environmental and agricultural buffer zones, predominately vegetated land associated with an environmental protection zone, and Cudgen Nature Reserve further south beyond.
- Secret Lane immediately to the west, with predominately cleared land designated as both environmental and agricultural buffer zones, a small patch of vegetated land designated as an environmental protection zone, agricultural land and land mapped as coastal wetlands, further west beyond.

A row of residential properties are located within a subdivision along Old Bogangar Road to the east and northeast of the proposal site. The closest of these is located approximately 100m east of the proposal site. Several rural residential properties are also located to the north of the proposal site, the closest being approximately 120m north.

6.10.5 Visual changes

The proposed ZS site will comprise construction of two transformer bays, high voltage switchgear operating at 11kV and 33kV, a concrete tilt panel building with amenities, control equipment, underground cabling and associated conduits, and auxiliary equipment and structures including lightning masts, fencing, and driveways. The erection of a three metre high, neutral colour, concrete tilt panel fence along the southern boundary of the site which fronts the new Kings Forest Parkway will screen much of the views of the control building and electrical equipment from motorists passing on Kings Forest Parkway, and of the ZS in general, from the broader Kings Forest development (refer **Figure 2-2**).

In the short-term there will be a high degree of visual change associated with site preparatory works, civil works and construction of the ZS. Over the longer term the ZS will also be a permanent change in the visual landscape, however, some degree of integration will occur as other the commercial buildings making up the balance of Precinct 2 are built. As such, visual modification is expected to be medium over the longer term.

6.10.6 Visual Sensitivity

Being located in what is currently a primarily semi-rural setting, and what will become an employment lands Precinct, the proposal is generally located away from existing and future sensitive residential receivers. The closest existing sensitive receivers are residential properties located within an existing subdivision along Old Bogangar Road to the east and northeast of the proposal site. The closest being approximately 100m east. Several rural residential properties are also located to the north of the proposal site, the closest being approximately 120m north. Both the row of existing residential receivers to the east and northeast, and rural residential receivers to the north are partially or fully screened from the proposal site by existing vegetation. This vegetation is proposed to be retained as part of the broader Kings Forest development.

A new residential subdivision, forming part of Precinct 5 to the southwest of the proposal site, will take place as part of Stage 1 works of the broader Kings Forest development. Based on preliminary lot plan for this subdivision, the closet residential lot will be located approximately 220m southwest of the proposal site, at its closest point (refer **Figure 1-7**). It is possibly that some of the new residential lots fronting what will become the new Kings Forest Parkway will have partial views of the new ZS. Patrial and intermittent views of the new ZS will also occur from vehicles travelling along the new Kings Forest Parkway, however, any such views will be of short duration and transitory in nature.

Given the distance to the existing residential properties to the east and northeast, and rural-residential properties to the north, as well as retention of screening vegetation between these receivers and the proposed ZS site, uninterrupted views of the proposal site from these receivers are not expected. While it is possible that some of the new residential lots forming part of Precinct 5, and fronting what will become the new Kings Forest Parkway, may have limited views of the new ZS, given the distance from the proposal site (i.e., greater than 200m), and erection of the tilt panel fence, it is not expected these views will be significant nor overly obtrusive.

The proposed new ZS will form part of Precinct 2 in Stage 1 of the broader Kings Forest development site. Precinct 2 is identified as employment land on the Precinct Plan for the Stage 1 Project Application for the broader Kings Forest development site (refer **Figure 1-5**). Once construction of the new Precinct 2 commercial subdivision is completed, there is likely to be other commercial premises in the near vicinity that will likely have views of the proposal site. These views will mainly be of the control building located in the centre of the proposal site.

Given the largely rural, but what will become partly commercial in the near vicinity of the proposal, and the distance to sensitive residential receivers (existing and future), visual sensitivity is considered to be low to medium.

6.10.7 Summary of potential impacts

The design has been sympathetic to the future surrounding building infrastructure and minimising direct views of certain pieces of electrical infrastructure from vehicle and pedestrian traffic along the new Kings Forest Parkway, as well as current and future residential receivers. Visual modification has been assessed as being medium over the longer term, whilst visual sensitivity is considered to be low to medium. In accordance with the visual impact matrix, the proposed activity is likely to result in a low to moderate visual impact.

6.11 Waste

6.11.1 Assessment of impact

Waste material generated from the proposal would generally comprise the following:

- General construction waste including but not limited to cardboard, paper, wood, mesh, steel, concrete, and other damaged or excess construction materials
- General refuse generated by personnel including putrescible wastes, food scraps, packaging and other domestic wastes
- Surplus excavated soil material from cut and fill (although not expected), excavation and trenching works.

Any surplus soil that cannot be reused on site will be assessed against the virgin excavated natural material (VENM) criteria, any relevant waste exemption / order, or classified and disposed of at a facility lawfully able to accept the waste.

Operation of the proposal is not expected to generate any substantial quantities of waste material, with the exception of transformer oil.

6.11.2 Environmental mitigation measures

The following mitigation measures will be employed to minimise and manage impacts to waste:

- All waste material will be reused, recycled, or disposed of at a facility lawfully capable of receiving the waste.

6.11.3 Conclusion

The proposal is not anticipated to generate a large quantity of waste. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low.

6.12 Bushfire

6.12.1 Existing environment

The proposal site is located on land mapped as category 3 vegetation, according to the Bushfire Prone Land mapping (refer **Figure 6-21**). Category 3 vegetation is considered to be medium bush fire risk vegetation. It is higher in bush fire risk than category 2 (and the excluded areas) but lower than Category 1. It is represented as dark orange on the Bush Fire Prone Land map. This category consists of grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands.

6.12.2 Environmental impact assessment

The proposal comprises the construction of a new ZS on what is currently rural land, with grass cover as the predominate vegetation type.

6.12.3 Environmental mitigation measures

Activities with the potential to generate a spark will be avoided where possible during times of heightened bushfire risk. Ongoing vegetation maintenance would occur to ensure safe clearance distances are maintained for around the ZS perimeter.

6.13 Traffic and Access

6.13.1 Existing environment

The proposal site will be located near the intersection of Secret Lane and Depot Road. Depot Road will be realigned slightly, and replaced by the new Kings Forest Parkway, which is currently under construction as part of Stage 1 works of the broader Kings Forest development site.

6.13.2 Environmental impact assessment

The new Kings Forest Parkway being constructed as part of Stage 1 works of the broader Kings Forest development site, will provide access the proposal site. Two new access driveways are proposed to be constructed. The main access driveway will be constructed from Secret Lane to the east of the proposal site. This will provide the primary access into and out of the ZS. A portion of this access road will be a shared right of access for both the ZS and other lot created to the southeast of the ZS site, up until the road enters the fenced area of the ZS. From this point it will solely be used for the ZS site (refer **Figure 1-6**). A secondary access point will also be provided to the ZS from the proposed Kings Forest Parkway to the south, however this will only be used as an emergency access or for oversized loads.

The driveways have been designed to provide access for construction plant, supplies, and vehicles around the substation construction site, and access for 4WD service vehicles and periodic heavy vehicle maintenance equipment post construction. They will be constructed of a granular unbound pavement, with a spray sealed wearing surface.

Local road users may be subject to minor delays during the delivery of equipment or materials to the proposal site. During operation, the proposal would only be accessed irregularly by maintenance personnel. The proposal would not strain the capacity of the road system.

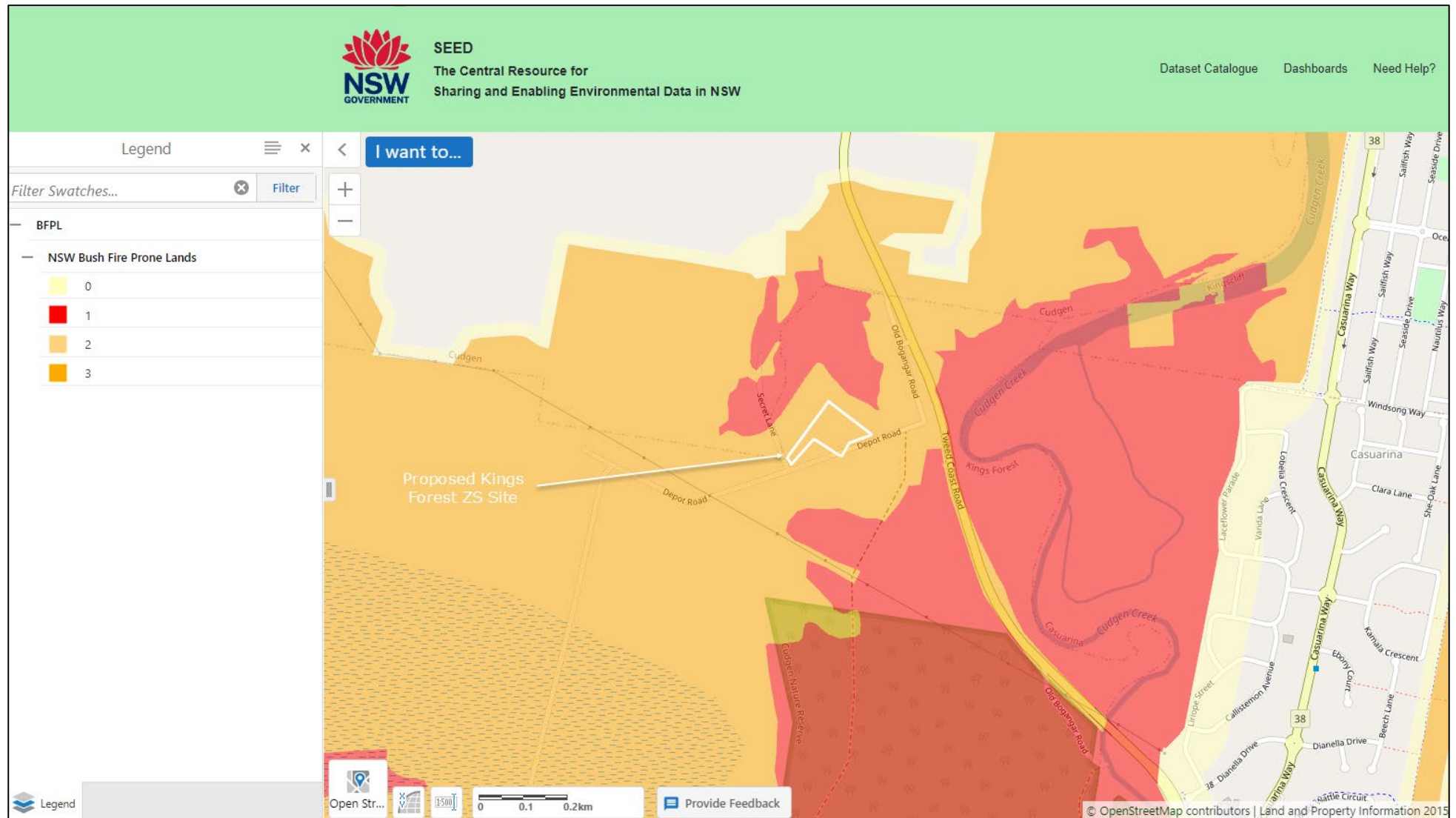


Figure 6-21: Mapped bushfire prone land in the vicinity of the proposal

6.13.3 Environmental mitigation measures

The following mitigation measures will be employed:

- The need for a traffic management plan (TMP) for the construction phase would be determined and, if required, completed prior to traffic impacting works commencing. The TMP would outline requirements for the safe and continued use of local transport corridors during construction

6.13.4 Conclusion

The proposal would have traffic and access impacts during construction and maintenance operations. The impacts would be short-term and minor. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low.

6.14 Land Use

6.14.1 Existing environment

The proposal site is located in what is currently rural land. It is undergoing development as part of Stage 1 of the broader Kings Forest Development. The proposal site is currently zoned 2(c) – Urban Expansion according to the “State Environmental Planning Policy (Major Development) 2005 Kings Forest Land Application Map”, listed in *State Environmental Planning Policy (Precincts—Regional) 2021*.

6.14.2 Assessment of impact

Whilst the construction of the new ZS will change the land use from a current rural use to an infrastructure use, the ZS will be located within Precinct 2 of the Kings Forest development, which is designated as employment lands, and generally away from sensitive residential receivers, limiting potential land use conflict.

6.14.3 Environmental mitigation measures

The following measures should be adhered to during the construction phase of the proposed activity:

- Consultation about the proposed works and schedule will be undertaken with Leda, and nearby residential receivers, where required
- The site should be left in a tidy condition at the conclusion of construction activities.

6.14.4 Conclusion

Any impacts on land use are likely to be minor and manageable. Given the nature of existing land uses, the overall environmental risk is considered to be low

6.15 Social and Economic

6.15.1 Existing environment

The proposal site is located on the far north coast of NSW, within the Tweed LGA, in an area referred to as Kings Forest. The nearest population centres are, Casuarina, located approximately 1km to the east; Kingscliff, located approximately 4km to the northeast; and Cabarita Beach / Bogangar, located approximately 4.5km to the south. The Queensland / NSW border is located approximately 13km north of the proposal site, at its closest point. The nearest capital city is Brisbane, located approximately 105km north.

According to the 2021 Census, the Tweed Shire usual resident population was 97,392, living in 44,661 dwellings, with an average household size of 2.35. The TSC Estimated Resident Population (ERP) for 2022 was 97,969, with a population density of 74.80 persons per square km. In 2021, Tweed Shire had lower proportion of children (under 18) and a higher proportion of persons aged 60 or older than Regional NSW. The largest age group in Tweed Shire was 60 to 64 year olds. The group that changed the most since 2016 was 70 to 74 year olds, increasing by 1,141 people. The three largest ancestries in Tweed Shire in 2021 were English, Australian and Irish. In 2021, 15.4% of people in Tweed Shire were born overseas, compared with 12.2% in Regional NSW (id consulting pty ltd, 2021).

In 2021, 40,681 people living in Tweed Shire were employed, of which 50% worked full-time and 42% part-time. More Tweed Shire residents worked in health care and social assistance than any other industry in 2021, accounting for 17.4%. Construction and retail trade were the next two largest industry sectors, employing 11.8% and 10.3% of the workforce, respectively. There were more professionals in Tweed Shire in 2021 than any other occupation, accounting for 19.4% of all occupations. Technicians and trade workers, followed by community and personal service workers accounted for 15.4% and 14.1 % of occupations, respectively (id consulting pty ltd, 2021).

TSC (2020) has indicated the projected population growth and corresponding need for development in the Tweed over the next 20 years is significant. Much of this growth is likely to be concentrated in the new urban release areas of Cobaki Lakes, Kings Forest and Dunloe Park. These growth areas span Tweed's coastal range from north to south and have been in the planning for over two decades. This coastal concentration of growth adjacent to existing urban areas will augment the Tweed's already diverse urban communities (TSC, 2020).

Gold Coast Airport serves as the major international access to the Tweed and also offers daily domestic services across Australia. The Tweed gains many advantages from its proximity to southeast Queensland and the Gold Coast, including a range of services and employment opportunities for Tweed residents that do not exist in many other regional areas within the State. Up to 23% of the Tweed's working population cross the border for employment in Queensland each day, while 17% of people working in the Tweed live in Queensland. The Tweed is a hub for tourism activity, being positioned between the Gold Coast and Byron Shire (TSC, 2020).

According to the Tweed Community Strategic Plan 2022 – 2032 (TSC, 2022), access to more affordable housing was one of the top three priority issues raised by the community for the Tweed over the next 10 years. The Tweed LGA is categorised as one of 25 LGAs in NSW which has a high need for affordable housing. The need relates to housing for both rental and purchase, however the most significant need is for affordable rental accommodation for existing low and very low income households in the locality (JBA Planning, 2011). Furthermore, pending the opening of a new \$725 million hospital in the Tweed, concerns have been expressed over the ability to attract enough personnel to the region to staff the new hospital. Housing affordability and availability can be a significant barrier to attracting and retaining vital healthcare workers.

6.15.2 Environmental impact assessment

An improvement to the electricity supply network provides many benefits to the broader community through a secure and reliable electricity supply. The construction and operation of the new ZS will be undertaken on what will become Essential Energy property, within the broader Kings Forest development site.

In the absence of further augmentation to the high voltage supply network, there is an increased risk of supply interruptions, and it is unlikely that further development of the Kings Forest could proceed. This would detrimentally impact on economic and social development of the region, and potentially prove to be disruptive to existing commercial enterprises and to residences throughout the local area.

TSC has adopted a number of strategic plans relating to housing and employment lands, including but not limited to *Tweed Shire Council Local Strategic Planning Statement – 2020* (TSC, 2020), *Tweed Urban and Employment Land Release Strategy 2009* (TSC, 2009). Kings Forest features prominently in the plans, recognising the importance of the master planned development to council for providing affordable housing and employment opportunities. Kings Forest is also recognised in the State Government's *North Coast Regional Plan 2041* (NSW DEP, 2022).

The proposal site will form part of Precinct 2 of the Kings Forest development site, a new \$5 billion, 4,500 dwelling, 856 hectare (ha) master planned community development. Construction and operation of the new Kings Forest ZS, forms an integral component to the KFHVSP that will service the broader Kings Forest development. Through the KFHVSP, the proposal indirectly supports *Planning Priority 15* of TSC's *Local Strategic Planning Statement – 2020* (TSC, 2020), to deliver housing supply and infrastructure to meet the needs of a growing population, and *Objective 2* of the *North Coast Regional Plan 2041*, to provide for more affordable and low cost housing (NSW DEP, 2022).

The proposal is unlikely to affect community resources; this may include the use of community infrastructure roads, water, and waste management services. The proposal is unlikely to cause substantial change or disruption to the community through loss of neighbourhood cohesion, access to facilities, community identity, or cultural character. Furthermore, timing of ZS construction will coincide with civil and other site preparatory works for the broader Kings Forest development.

While this will negligibly add to cumulative impacts of current construction works at the broader Kings Forest development site, it will lessen the impacts on future residents of the broader development, as it is planned to have the ZS constructed and operational prior to occupation of houses in the planned nearby future residential subdivisions.

Electricity is an essential service in the human environment, by enhancing productivity, comfort, safety, health and the economy. The benefits of a secure and reliable electricity supply are evident in every aspect of our lives. Construction and operation of the new Kings Forest ZS, forms an integral component to KFHVSP, required to supply electricity to the broader Kings Forest development. It will ensure the local electricity infrastructure meets the current and future needs for the new Kings Forest development. The new ZS will also strengthen Essential Energy's existing electricity network in the broader area, as well as increase its capacity, which will help support future electricity connections.

6.15.3 Environmental mitigation measures

The following mitigation measures will be employed to manage and minimise potential negative social and economic impacts:

- Management of construction traffic in the vicinity of construction works, including communication with existing local residents and road users
- Signs and barriers would be erected around construction work sites, where appropriate, to minimise the possibility of personnel injuries and prevent placing the public at risk.

6.15.4 Conclusion

Construction will be temporary in nature, and apart from some changes to the visual amenity, long-term impacts are not expected.

Negative social impacts would be short-term and minor. Longer term positive impacts are expected due to the proposal supporting a new significant affordable housing development in the Tweed. Given the mitigation measures outlined in this assessment, the overall environmental risk is considered to be low.

6.16 Cumulative Impacts

Cumulative impacts may be experienced due to the interaction of elements within or in connection with the proposal, or with other existing or proposed developments within the locality.

6.16.1 Interactions within or in connection with the proposal

The proposed new Kings Forest ZS, forms an integral component of the KFHVSP that will service the broader Kings Forest development. The KFHVSP also includes installation of approximately 4.4km of new high voltage underground cables from Essential Energy's existing Cudgen ZS to the new proposed Kings Forest ZS. The proposed Kings Forest ZS is the subject of this REF report prepared under Part 5 (Division 5.1) of the EP&A Act. The proposed new high voltage underground cables are subject to separate assessments and approvals, prepared under Part 5 (Division 5.1) of the EP&A Act. In addition, an approximately 95 metre (m) section of the proposed new underground high voltage cables, which intersect with a portion of mapped coastal wetland, will likely be subject to an EIS prepared to support a designated development application to Tweed Shire Council (TSC) under Part 4 of the EP&A Act.

The proposed route of the new underground high voltage cables from Essential Energy's existing Cudgen ZS to the proposed new Kings Forest ZS follows predominately cleared and disturbed road reserves of Cudgen Road, Plantation Road and Reardons Road, and/or existing overhead and underground powerline corridors. From the end of Reardons Road the route traverses low lying land associated with the northern extent of the Kings Forest development site. Here the proposed route will once again follow an existing overhead cleared and maintained powerline corridor, but will be in close proximity to, or intersect with, more sensitive ecological values, including several farm dams, a small (approximately 95m) section of mapped coastal wetland, and vegetation mapped as a TEC and Koala habitat. The preliminary cable design and construction methodology has considered those values and plans to avoid or minimises potential impacts, through the use of underbore technology in these areas. No vegetation clearing within the mapped areas of TEC or Koala habitat is proposed. Detailed geotechnical and site elevation data has been, or is in the process of being, collected along the proposed underbore routes, which will be used to inform a horizontal directional drilling (HDD) plan (or "bore plan") to be prepared by a specialist underbore consultant. The bore plan will advise on the best horizontal and vertical drill path, and other control measures to be implemented, to minimise the likelihood of potential frac-outs within the areas of more sensitive ecological values.

While the potential environmental impacts for the entire route of the proposed underground high voltage cable route are yet to be formalised into the relevant environmental assessment documentation, based on preliminary review of background information, they are likely to be similar to the ZS site. The main difference being the impacts associated with installation of the underground cables will be linear in nature, rather than confined to a defined lot boundary, as is the case with the ZS. Similar potential soil and water impacts would be expected from trenching activities for both cable installation along the new underground cable route and at the ZS site. These will be managed by installation and maintenance of appropriate sediment and erosion control, and acid sulfate soil management, and dewatering measures, where applicable. The underground cable installation via HDD will have the added requirement for implementation of appropriate monitoring and management measures, to minimise the likelihood for, and respond to, any potential frac-outs.

Potential air quality (namely dust) and noise impacts associated with construction activities are anticipated to be similar for both the underground cable installation and construction of the new ZS, only potential dust and construction noise will be for shorter duration at identified sensitive receivers, as work progresses along the proposed underground cable route, compared to longer duration at the ZS site.

The predominately cleared and disturbed nature of the proposed underground cable route within existing road reserves and/or overhead and underground powerline corridors is expected to have negligible potential ecological, Aboriginal and non-Aboriginal heritage impacts, similar to the ZS site.

Preliminary review of potential sources of contamination along the proposed underground cable route suggests significant areas of contamination are unlikely to be encountered, and if encountered could be managed on-site during construction, in a similar manner to that of the ZS site. The majority of the excavated material for installation of the underground cables would be reinstated on-site. Any surplus excavated material would be assessed against the VENM criteria, any relevant waste exemption order, or classified and disposed of at a facility lawfully able to accept the waste, as will be the case at the proposed ZS site.

Visual impacts will differ over both spatial and temporal scales, in that they will be of a linear nature and of shorter duration for installation of the new underground cables, rather than a longer term visual change at the ZS site. There is expected to be negligible to no visual impact associated with the installation of the new high voltage cables, given they will be located underground.

Potential EMF impacts will be negligible and within relevant EMF exposure guidelines for both underground cables and ZS operation. Any potential negative impacts to bushfire, traffic and access, land use, and social and economic associated with construction, maintenance and operation of the proposed new underground cables, are anticipated to be negligible and similar to the ZS site. Installation of the new underground high voltage cables, which includes removal of a section of existing overhead network, will reduce bushfire risk potential and have positive land use and visual impacts.

Overall, construction, operation and maintenance of the KFHVSP, of which the proposed ZS forms an integral component, is expected to have positive social and economic benefits through the support of new affordable housing and employment lands in the Tweed Shire.

6.16.2 Interactions with other developments within the locality

The most significant development proposed in the nearby landscape is the Kings Forest development. The 4,500 dwelling, 856 hectare (ha) master planned community development received concept plan approval (MP 06_0318) and Stage 1 project approved (MP 08_0194) the former Part 3A approval pathway of the EP&A Act. In 2018 the Stage 1 project approval (MP 08_0194) was transitioned from the Part 3A to SSD under Part 4 of the EP&A Act.

The EAR (JBA Planning, 2011), and supporting detailed technical studies, provides a comprehensive analysis of the existing environment and likely environmental impacts associated with Stage 1 of the broader Kings Forest development. The EAR and supporting technical studies identified a range of environmental impacts associated with Stage 1 works, being:

- Air quality
- Noise
- Geotechnical

- Acid sulfate soils
- Surface water and groundwater
- Biodiversity
- Aboriginal and non Aboriginal heritage
- Contamination
- Visual amenity
- Bushfire
- Traffic
- Land use changes.

Potential impacts to several of these environmental aspects will also occur through the construction, operation and maintenance of the ZS, and therefore could be considered cumulative. These include:

- Air quality (dust)
- Noise
- Soil and water
- Visual amenity during construction
- Visual amenity and
- Land use change during operation.

While some cumulative impacts are likely, these will be minimised to the greatest extent possible, and would not be significant. Furthermore, siting the proposed ZS within the existing disturbance footprint of the broader Kings Forest development, avoids alternative, greenfield sites in the locality thus reducing the potential for further cumulative impacts.

6.16.3 Conclusion

Based on the range of environmental impacts associated with the proposal subject to assessment in this REF, and the interaction of elements within or in connection with the proposal, or with other existing or proposed developments within the locality, the potential for some cumulative impacts exist. These include:

- Air quality (dust)
- Noise
- Soil and water
- Visual amenity during construction, and
- Visual amenity and land use change during operation.

However, given the relatively small disturbance footprint and the localised extent of potential impacts during construction and operational phases of the proposal, the potential cumulative impact to other environmental factors during construction and operation of the proposal has been minimised to the greatest extent possible, and would not be significant. Any residual, minor impacts identified in this section of the REF can be mitigated and managed through the range of measures outlined **Chapter 6** and summarised in **Table 6-9**.

6.17 Summary of Environmental Mitigation Measures

The environmental mitigation measures outlined in this document would be incorporated into the Project Construction Environmental Management Plan (CEMP). These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The mitigation measures are summarised in **Table 6-9**.

Table 6-9: Summary of Environmental Mitigation Measures

Aspect	Environmental Mitigation Measures	Timing
General	<ul style="list-style-type: none"> All environmental mitigation measures must be incorporated within the Construction Environmental Management Plan (CEMP), or relevant works plan as applicable for the proposed works. 	Pre-works.
Consultation	<ul style="list-style-type: none"> Consultation has been ongoing with the Leda for many years regarding the location of the ZS site, and its integration into with the overall Kings Forest development. Landholder consultation regarding the overall high voltage electricity supply, in particular the proposed underground route cables has been undertaken and is continuing. Existing nearby residents to the ZS site would also be advised of the works schedule and provided with details of a site contact. 	<p>Project planning and re-works.</p> <p>Project planning and re-works.</p> <p>During works.</p>
Licences, Permits, Approvals and Notifications	<ul style="list-style-type: none"> Notification to the local council and occupiers of adjoining land in accordance with clause 2.45 of <i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i>. Notification to the local council in accordance with clause section 45 of the <i>Electricity Supply Act 1995</i>. Section 68 approval under the <i>Local Government Act 1994</i> may be required for construction and extension of water supply and any sewerage service pipes or fittings or fixtures communicating or intended to communicate, directly or indirectly, with any water supply and sewer of a council. 	<p>21 days prior to works commencing. These notifications have been sent.</p> <p>40 days prior to works commencing. This notification has been sent.</p> <p>Prior to commissioning of ZS.</p>
Air Quality	<ul style="list-style-type: none"> Any potential dust-borne materials transported to and from the activity site will be covered at all times during transportation. All vehicles and machinery will be well maintained according to manufacturer requirements to ensure emissions are kept within acceptable limits. Progressive stabilisation will occur as soon as reasonably practicable throughout construction to prevent dust generation. 	During works.
Geology and Soil	<ul style="list-style-type: none"> Risks associated with sediment and erosion will be managed in accordance with The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom 2004). In particular, controls including, but not limited to the following, will be implemented: <ul style="list-style-type: none"> Sediment control fences or other measures shall be installed at the downslope perimeter of disturbed areas, including any temporary stockpiles. Maintenance of all erosion control measures at operational capacity until land is stabilised. 	During works.

Aspect	Environmental Mitigation Measures	Timing
	<ul style="list-style-type: none"> Disturbed areas will be stabilised as soon as practicable following construction activities. A site specific erosion and sediment control plan will be included as part of the Construction Environmental Management Plan (CEMP). Essential Energy's CEOP8064 Management of Excavated Material; Guideline for Construction Sites will be consulted to determine the most appropriate beneficial reuse or disposal method for any surplus excavated materials. PASS may be encountered during earthworks. A site specific acid sulfate soil management plan will be included as part of the Construction Environmental Management Plan (CEMP). 	
Water Quality and Hydrology	<ul style="list-style-type: none"> Control measures will be implemented to manage risks associated with the handling of fuel through using spill trays when undertaking in field re-fuelling. Transformers will be housed inside appropriately bunded areas. Disturbed areas will be managed in accordance with the requirements of the Blue Book to minimise potential impacts to waterways. Sediment fencing will be erected, where required, downslope of disturbed areas, and impacts would be minimised where practicable. The use of filter bags may be required to discharge collected sediment-laden water where there are insufficient grassed areas available. Any water collected in excavations and trenches during rainfall and surface water ingress should be pumped to a grassed area on-site (where a suitable area is available) to allow for infiltration, reused for dust suppression, or pumped to stormwater using a sediment sock. All options should be conducted in a manner that does not result in turbid water entering the stormwater system or nearby waterway. Progressive stabilisation will occur as soon as reasonably practicable throughout construction to prevent generation of sediment laden runoff. Spill kit to be present on-site during construction activities to manage potential releases from construction equipment. 	During works (Operation only)
Noise and Vibration	<ul style="list-style-type: none"> In considering the proposed ZS site location, with the main noise generating activity (two 33/11kV transformers) being at least 155m away from the nearest sensitive residential receiver, work that has the potential to create and audible noise at the nearest sensitive receiver, will be between 7am and 6pm Monday to Saturday. On occasions works outside these hours may be undertaken where the following requirements are met: <ul style="list-style-type: none"> Neighbours (and other sensitive receivers) adjacent to the works or the local council or the NSW Environment Protection Authority (EPA) have been notified; and Where the works are required to take place in the vicinity of private access ways or driveways, consultation with individual residents would be undertaken to advise residents of the planned timing of the works. 	During works.

Aspect	Environmental Mitigation Measures	Timing
	<ul style="list-style-type: none"> All plant and equipment will be operated and maintained in accordance with the manufacturer's specifications. Any noise complaint will be investigated with additional control measures put in place if required. 	
Flora and Fauna	<ul style="list-style-type: none"> No clearing or disturbance to vegetation outside the lot boundary, which is located within Precinct 2 of the broader Kings forest development, is permitted. If fauna is detected within the worksite, the animal is to be allowed to leave the site without any coercion or a local wildlife rescue service is to be contacted to facilitate the safe removal of the animal from the worksite. Essential Energy has a general biosecurity duty under the Biosecurity Act 2015 to prevent, eliminate or minimise biosecurity risk so far as is reasonably practicable. Field crews shall follow procedures as outlined in Essential Energy's Operational Guideline: Biosecurity Risk Management (CERM1000.96) to prevent, eliminate or minimise biosecurity risk so far as is reasonably practicable, with particular reference to vehicle and equipment hygiene practises. This includes complying with the relevant biosecurity orders, as they relate to movement of material into and out of declared fire ant infested and movement control areas, where applicable. 	Pre-works, during works and post works.
Aboriginal Heritage	<ul style="list-style-type: none"> In the unlikely event that an Aboriginal heritage site or object is located during the construction phase of the project, works will cease in that area and a representative from Essential Energy's Environmental Services will be notified. Works with the potential to disturb the object would not resume until the object had been properly identified, and appropriate action taken If human remains are uncovered, works must immediately cease and the NSW Police department and Essential Energy's Environmental Services team will be notified. 	During works.
Non-Aboriginal Heritage	<ul style="list-style-type: none"> All construction work would be undertaken within the assessed areas of the proposal site only In the unlikely event that a previously unknown heritage site or object is located during construction of the proposal, works would cease immediately in that area and a representative from Essential Energy's Environmental Services would be notified. Works with the potential to disturb the object would not resume until the object had been properly identified, and appropriate action taken. 	During works.
Contamination	<ul style="list-style-type: none"> It is intended to reuse surplus spoil beneficially on site, where possible. Essential Energy's CEOP8064 Management of Excavated Material; Guideline for Construction Sites will be consulted to determine the most appropriate beneficial reuse or disposal method for excavated materials In the event of encountering any suspected contamination in the work area, it will be separated and contained on site until it can be classified in accordance with the EPA (2014) Waste Classification Guidelines, and then disposed of at a facility that is lawfully able to accept the waste Control measures will be implemented to manage risks associated with the handling of fuel through using 	During works.

Aspect	Environmental Mitigation Measures	Timing
	spill trays when undertaking in field re-fuelling <ul style="list-style-type: none"> Sediment and erosion control structures will be established and maintained in accordance with The Blue Book to minimise potential impacts on receiving watercourse. 	
Electric and Magnetic Fields	<ul style="list-style-type: none"> The proposal will comply with all relevant national and international guidelines Siting the location of the proposed new ZS away (approximately 100m) from sensitive residential receivers greatly minimises any potential residual EMF exposure risk 	Project planning and design.
Visual	<ul style="list-style-type: none"> Siting the location of the proposed new ZS away (approximately 650m) from sensitive residential receivers minimises potential views of the proposal from these receivers. The design has also been sympathetic to the future surrounding building infrastructure and minimising direct views of certain pieces of electrical infrastructure from vehicle and pedestrian traffic along the new Kings Forest Parkway. 	Project planning and design.
Waste	<ul style="list-style-type: none"> All waste material will be reused, recycled, or disposed of at a facility lawfully capable of receiving the waste. 	During works.
Bushfire	<ul style="list-style-type: none"> Activities with the potential to generate a spark will be avoided where possible during times of heightened bushfire risk. Ongoing vegetation maintenance would occur to ensure safe clearance distances are maintained for around the ZS perimeter. 	Post construction
Traffic and Access	<ul style="list-style-type: none"> The need for a traffic management plan (TMP) for the construction phase would be determined and, if required, completed prior to traffic impacting works commencing. The TMP would outline requirements for the safe and continued use of local transport corridors during construction 	Pre-works and during works.
Land Use	<ul style="list-style-type: none"> Consultation about the proposed works and schedule will be undertaken with Leda, and nearby residential receivers, where required The site should be left in a tidy condition at the conclusion of construction activities. 	During works.
Social and Economic	<ul style="list-style-type: none"> Management of construction traffic in the vicinity of construction works, including communication with local residents and road users Signs and barriers would be erected around construction work sites, where appropriate, to minimise the possibility of personnel injuries and prevent placing the public at risk. 	Pre-works and during works.

7. Ecologically Sustainable Development

Ecologically sustainable development (ESD) is an attempt to provide the best outcomes for the human and natural environments both now and into the indefinite future. One of the most often cited definitions of sustainability is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability relates to the continuity of economic, technical, social, institutional and environmental aspects of human society, as well as the non-human environment.

The existing environment has been described throughout **Section 6** of this REF for the various aspects of the natural environment assessed as part of this proposed activity.

The proposal has been assessed against the following four principles of ESD listed in the *Protection of the Environment Administration Act 1991*.

The four principles of ESD are:

- The precautionary principle: section 6(2)(a)(i)(ii)
- The principle of inter-generational equity: section 6(2)(b)
- The principle of biological diversity and ecological integrity: section 6(2)(c)
- The principle of improved valuation of environmental resources: section 6(2)(d)(i)(ii)(iii).

An assessment of the proposal against the principles is provided below.

7.1 Precautionary Principle

The precautionary principle states that:

'If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

- 1) *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and*
- 2) *an assessment of the risk weighted consequence of various options.'*

For the precautionary principle to be applicable, two pre-conditions must be satisfied; "*first it is not necessary that serious or irreversible environmental damage has actually occurred – it is the threat of such damage that is required. Secondly, the environmental damage threatened must attain the threshold of being serious or irreversible*"⁴.

If there is no threat of serious or irreversible environmental damage, there is no basis upon which the precautionary principle can apply.

Environmental investigations, including desktop ecological, Aboriginal due diligence, and visual impact assessments, supported by a site inspection have been undertaken during the preparation of this REF to ensure that the potential environmental impacts are understood with a high degree of certainty. The spatial scale of impacts would be local and isolated to the immediate construction area. Therefore, it can be concluded that this proposal will not result in a threat of serious or irreversible damage.

Mitigation measures have also been proposed in this REF to minimise the identified potential impacts of the project. A Construction Environmental Management Plan (CEMP) will be developed and implemented as a precautionary measure, and no mitigation measures have been deferred due to a lack of scientific certainty. The proposal is therefore consistent with the precautionary principle.

⁴ Telstra Corporation Limited v Hornsby Shire Council [2006] NSWLEC 133, Preston CJ at 129

7.2 Principle of Inter-Generational Equity

The principle of inter-generational equity states that:

'The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.'

To the extent possible, all environmental impacts and appropriate mitigation measures have been identified. The proposal would not harm the health, diversity and productivity of the environment to such an extent that future generations would not be able to benefit.

The proposal, which forms an integral component of the KFHVSP, is expected to have positive social and economic benefits through the support of new affordable housing and employment lands in the Tweed Shire, while minimising environmental impacts.

The proposal is therefore consistent with the principle of inter-generational equity.

7.3 Principle of Biological Diversity and Ecological Integrity

The principle of biological diversity and ecological integrity states that:

'Conservation of biological diversity and ecological integrity should be a fundamental consideration.'

The proposal comprises the construction of a new 33/11kV ZS on cleared land, which has been heavily modified and disturbed through previous and more recent land uses. A desktop ecological assessment, supported by a site inspection concluded there are not likely to be any significant impacts to threatened species or ecological communities as a result of the proposal. Impacts upon the ecological integrity would therefore be negligible, as described in **Section 6.5**.

7.4 Improved Valuation of Environmental Resources

The principle of improved valuation of environmental resources states that:

'Environmental factors should be included in the valuation of assets and services such as:

- Polluter pays – that is, those who generate pollution and waste should bear the cost of containment, avoidance and abatement
- The users of goods and services should pay prices based on the full life cycle of costs of providing those goods and services, including the use of natural resources and assets and the ultimate disposal of any waste
- Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise cost to develop their own solutions and responses to environmental problems.'

The proposal has been designed taking into consideration the least possible impact on the environment. All costs associated with the containment, avoidance and abatement of pollution have been factored into the design of this proposal. The proposal will have the positive benefit of supporting the broader Kings Forest development, creating regional economic opportunities, job growth and new affordable housing in the area.

8. Construction Environmental Management Plan

8.1 Introduction

A Construction Environmental Management Plan (CEMP) outlines the environmental objectives of a project, the environmental mitigation measures to be implemented, the timing of implementation, responsibilities for implementation and management, and a review process to determine the effectiveness of the strategies.

The construction contractor(s) would be required to develop a project-specific CEMP that addresses the scope of works to be undertaken. The CEMP would detail how the works would be undertaken to comply with all environmental laws, Essential Energy's environmental policy, and the environmental mitigation measures described in this REF.

The key objectives of the CEMP would include:

- Ensuring that the works are carried out in accordance with legislative requirements and relevant non-statutory policies
- Ensuring that the works are carried out in accordance with the requirements detailed in this REF, including all requirements outlined in any relevant approvals, permits or licences and the mitigation measures described in **Section 6**
- Ensuring that employees engaged to undertake the works comply with the conditions detailed in the CEMP
- Identifying management responsibilities and reporting requirements to demonstrate compliance with the CEMP.

It is also noted that the CEMP would be a working document and may be amended over the course of the project.

If a particular activity falls outside the scope of the REF and CEMP, and it would increase the environmental impact, the activity is not permitted to continue without an appropriate environmental assessment under the EP&A Act.

8.2 Implementation of the CEMP

The CEMP would be a working document and would be amended should strategies initially implemented be found to be inadequate to manage environmental impacts. The CEMP would typically:

- Establish environmental goals and objectives
- List actions, timing and responsibilities for implementation that arise from the mitigation measures recommended in this REF
- Detail statutory requirements
- Provide a framework for reporting on relevant matters on an ongoing basis
- Detail training requirements for personnel in environmental awareness and best practice environmental management systems
- Outline emergency procedures, including contact names and corrective actions
- Detail process surveillance and auditing procedures
- List complaint handling procedures
- Detail quality assurance procedures.

8.2.1 Auditing schedule of the CEMP

Auditing of the proposal would be undertaken to establish whether the contractor is conducting activities in accordance with their current environmental management plans and whether the management plans are providing an effective tool to control adverse environmental impacts.

The following activities are proposed to achieve the audit's purpose:

- Review the on-site implementation of the contractor's CEMP
- Review the documentation process to determine if planned works have received endorsement to proceed
- Monitor the compliance of construction activities with the project determination and environmental legislation
- Review the outcomes of any previous audit(s) and determine if there has been any change in the environmental performance of the construction contractor
- Identify opportunities to improve on-site environmental management practices.

The benefits of conducting the environmental audit are to allow:

- Feedback on the CEMP implementation process to assist both the contractor and project manager to improve the future preparation of site environmental management documentation
- Improve the planning of construction projects through documentation and impact assessment to ensure best environmental management practices are implemented on site
- Improve environmental management processes on site.

9. Environmental Checklist

In accordance with section 5.5 of the EP&A Act and clause 171 of the EP&A Reg, Essential Energy, when assessing the environmental impact of an activity on the environment, must consider the factors identified in **Table 9-1** and **Table 9-2** below.

Table 9-1: Section 5.5 requirements

Requirement	Section Reference
For the purpose of attaining the objects of this Act relating to the protection and enhancement of the environment, a determining authority in its consideration of an activity shall, notwithstanding any other provisions of this Act or the provisions of any other Act or of any instrument made under this or any other Act, examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.	Section 2, 6, 7 and 8
Without limiting the above, a determining authority shall consider the effect of an activity on any wilderness area (within the meaning of the <i>Wilderness Act 1987</i>) in the locality in which the activity is intended to be carried on	N/A – there are no wilderness areas within or close to the activity area

Table 9-2: Clause 171 checklist

171 Factor	Section Reference
The environmental impact on a community <i>The works are located in a what is currently a predominately rural landscape, and on land that will become future employment land, within the broader context of future predominately residential landscape. Impacts on the community have been considered by this REF. These include noise, dust, social and visual impacts. With the exception of noise and visual, these have been assessed to be low. Noise and visual impacts have been assessed as low to moderate</i>	Sections 6.1, 6.2, 6.3, 6.4, 6.6, 6.7, 6.8, 6.9, 6.10, 6.11, 6.12, 6.13 6.14 and 6.15.
The transformation of a locality <i>In the short term there will be a high degree of visual change associated with site preparatory works, civil works and construction of the ZS. Over the longer term the ZS will also be a permanent change in the visual landscape, however, some degree of integration will occur as other the commercial buildings making up the balance of Precinct 2 are built. While much larger transformation of the locality will occur as a result of the broader Kings Forest development, the contribution of the ZS is not considered significant.</i>	Sections 6.10, 6.14 and 6.15
The environmental impact on the ecosystems of the locality <i>As the proposed ZS will be located within the existing cleared and disturbed land parcel associated with Precinct 2 of the broader Kings Forest development. Impacts to threatened species, populations and ecological communities from the construction, operation and maintenance of the ZS have been assessed in this REF, and will be negligible to nil, and not likely to result in a significant impact.</i>	Sections 6.5 and 7.
Reduction of the aesthetic, recreational, scientific, or other environmental quality or value of a locality <i>An overall reduction in aesthetic and recreational quality of the locality is unlikely to occur during the proposed works. Localised impacts may occur at the construction site, however these impacts will be temporary and of short duration, and can be managed through implementation of mitigation measures in this REF.</i>	Sections 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.14, 6.15 and 6.16

171 Factor	Section Reference
<p>The effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.</p> <p><i>No sites of Aboriginal heritage will be impacted by the proposal. An Aboriginal heritage due diligence assessment was undertaken in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (NSW DECCW, 2010). This assessment concluded that considering the highly disturbed nature of the proposal site, the distance from known Aboriginal heritage sites that remain in-situ, and the mitigation measures proposed in Section 6.6.3, the proposal is not likely to impact Aboriginal heritage.</i></p> <p><i>A review of non-Aboriginal heritage databases, registers and LEPs indicated no sites of world, national, state, or local heritage were located at or within close proximity to the proposal site.</i></p>	Sections 6.6, 6.7.
<p>The impact on the habitat of protected fauna (within the meaning of the <i>Biodiversity Conservation Act, 2016</i>).</p> <p><i>The proposed activity is not likely to significantly impact threatened fauna species and their habitat.</i></p>	Section 6.5
<p>The endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air.</p> <p><i>It is not anticipated that the proposal will endanger any species of animal, plant or other form of life, whether living on land, in water, or in the air.</i></p>	Section 6.5
<p>Long-term effects on the environment.</p> <p><i>Long-term adverse environmental effects are not anticipated.</i></p>	Sections 6 and 7
<p>Degradation of the quality of the environment.</p> <p><i>This risk is considered low with the implementation of the management measures included in this REF.</i></p>	Sections 6.1, 6.2, 6.3, 6.5 and 6.8.
<p>Risk to the safety of the environment.</p> <p><i>There is the potential risk to the environment from spillage of materials during construction of the proposal. Implementation of the mitigation measures contained in Section 6 of this REF will ensure that potential environmental risks are minimised.</i></p>	Sections 6.1, 6.2, 6.3, 6.8, 6.11, 6.12, 6.13, 6.14 and 7.
<p>Reduction in the range of beneficial uses of the environment.</p> <p><i>No long-term reduction in the range of beneficial uses of the environment is anticipated as a result of the proposal.</i></p>	Section 6 and 7
<p>Pollution of the environment.</p> <p><i>Risk of pollution to the environment is considered low and can be managed with implementation of mitigation measures provided in this REF.</i></p>	Section 6
<p>Environmental problems associated with the disposal of waste</p> <p><i>Waste generated as a result of the proposed works will be minor. All wastes that are generated as a result of the project will be appropriately disposed of in accordance with the Waste Classification Guidelines (EPA, 2014).</i></p>	Section 6.11
<p>Increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply.</p> <p><i>The proposal is unlikely to increase demands upon rare natural resources.</i></p>	Section 6

171 Factor	Section Reference
<p>The cumulative environmental effect with other existing or likely future activities</p> <p><i>Based on the range of environmental impacts associated with the proposal subject to assessment in this REF, and the interaction of elements within or in connection with the proposal, or with other existing or proposed developments within the locality, the potential for some cumulative impacts exists. However, given the relatively small disturbance footprint and the localised extent of potential impacts during construction and operational phases of the proposal, the potential cumulative impact to other environmental factors during construction and operation of the proposal has been minimised to the greatest extent possible, and would not be significant. Any residual, minor impacts identified in this section of the REF can be mitigated and managed through the range of measures outlined in this Chapter 6 and summarised in Table 6-9.</i></p>	Section 6.16
<p>The impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p><i>The proposal site is located within the coastal zone (coastal environment area), however, coastal vulnerability area mapping is currently not available and the Tweed Coast and Estuaries Coastal Management Program (TCECMP) is currently under development. Notwithstanding, the proposal is not inconsistent with the management objectives set out in the Tweed Coast Estuaries Coastal Zone Management Plan 2013, which will be superseded by the TCECMP once developed.</i></p> <p><i>According to TSC flood mapping, with the proposed ZS site is not affected by flooding for the design flood, with only the very eastern margin affected by projected climate change events. The design flood event is based on the 1% Annual AEP. The climate change flood event level is the projected 2100 design flood event considering expected sea level rise and increased rainfall intensity. Following 2007 guidance from the NSW State Government, this event is based on 0.91m rise in sea levels and a 10% increase in rainfall intensity (TSC, 2024).</i></p> <p><i>Detailed flood mapping provided by WGA APD Engineering (2024) through information supplied by Leda's stormwater consultant, Gilbert and Sutherland (2011d), which included impacts from the Kings Forest development, indicated peak flood levels by the blue dot points shown in Figure 6-4. These levels are along the eastern margin of the site, which range from 4.394m AHD in the north to 3.44m AHD in the south. The lowest level of the proposed ZS bench is 7.2m AHD. Based on this data, the proposed ZS is positioned 2.81m to 3.76m above the adjacent flood levels. As such, it is likely that the ZS is adequately protected from flood inundation, including from future climate change events..</i></p>	Section 3.3 and 6.3
<p>Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,</p> <p><i>TSC has adopted a number of strategic plans relating to housing and employment lands as identified in Section 6.15. Kings Forest features prominently in the plans, recognising the importance of the master planned development to council for providing affordable housing and employment opportunities.</i></p> <p><i>Construction and operation of the new Kings Forest ZS, forms an integral component to the high voltage electricity connection works for the broader Kings Forest development. Through the provision of this new high voltage electricity connection, the proposal indirectly supports Planning Priority 15 of Tweed Shire Council Local Strategic Planning Statement – 2020 (TSC, 2020), to deliver housing supply and infrastructure to meet the needs of a growing population, and Objective 2 of the North Coast Regional Plan 2041, to provide for more affordable and low cost housing (NSW DEP, 2022)</i></p>	Section 6.15
<p>Other relevant environmental factors.</p> <p><i>No other relevant environmental factors have been identified during the preparation of this REF</i></p>	N/A

10. Conclusion

This REF has been prepared to assess the environmental impacts associated with the construction, operation and maintenance of the new Kings Forest 33/11kV ZS. Essential Energy is a determining authority as defined in the EP&A Act. As such, the activity does not require consent under Part 4 of the EP&A Act. The activity has been assessed under Part 5, Division 5.1 of the EP&A Act.

The proposal would enable the upgrade of the local electricity network to both support the Kings Forest development and increase overall network capacity, placing Essential Energy in a better position to meet customers' future electricity needs.

The proposal complies with the provisions of section 5.5 of the EP&A Act and clause 171 of the EP&A Reg as shown in **Section 9**.

The proposal and its associated environmental impacts are unlikely to have a significant impact on the environment. In conjunction with the new underground high voltage cables, making up the other component of the KFHVSP, the proposal would support the Kings Forest development, and strengthen Essential Energy's electricity network in the broader area, maximising the social and economic benefits, whilst minimising any adverse environmental impacts.

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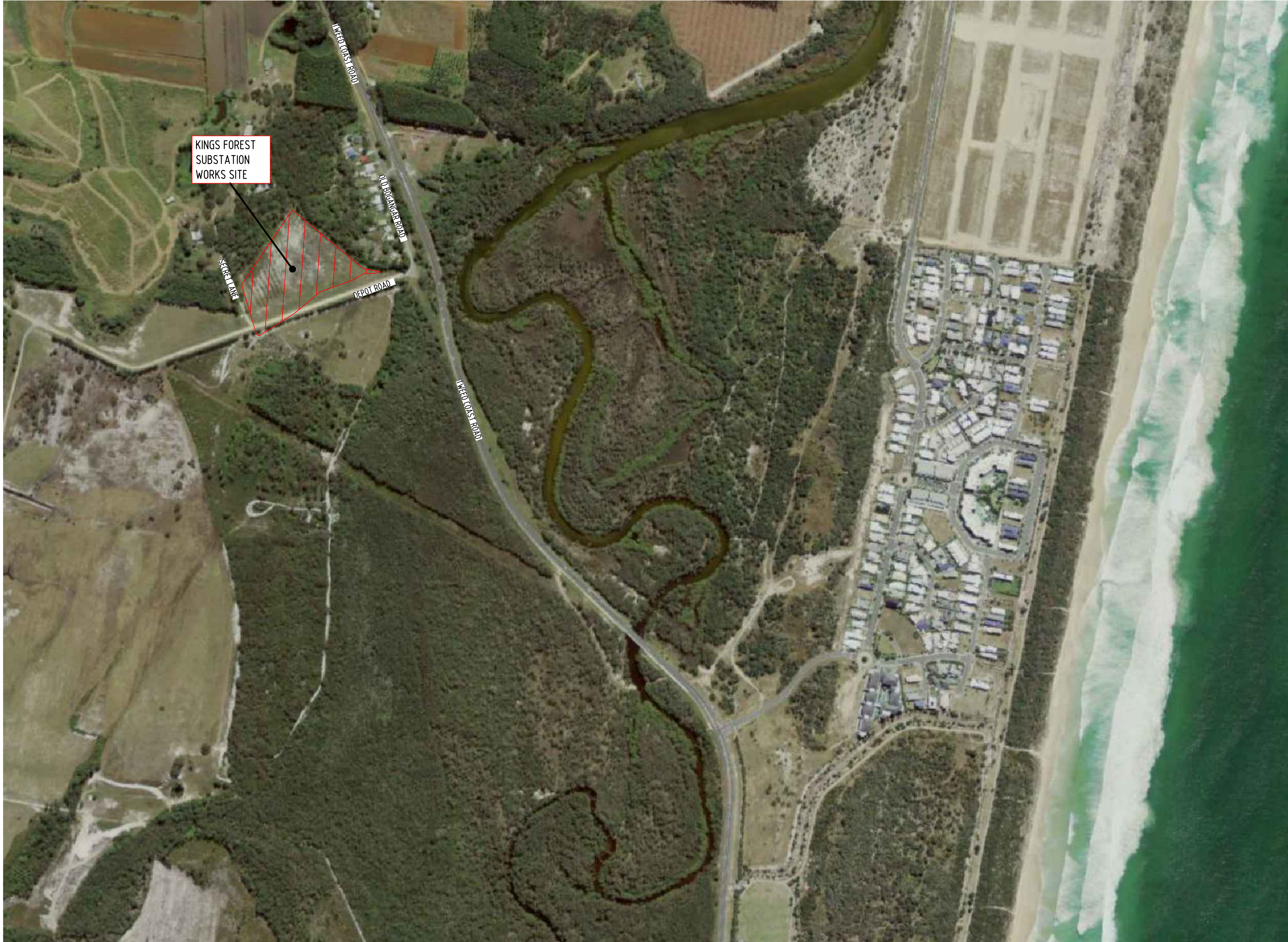
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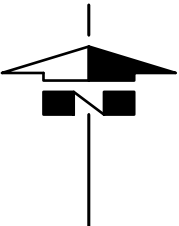
Appendix A – Civil Design Plans

KINGS FOREST SUBSTATION

CIVIL WORKS PACKAGE



DRAWING INDEX		
WGA DRAWING NUMBERS	TITLE	CLIENT DRAWING NUMBERS
WGA231007-DR-CV-0000	COVER SHEET	KFTC201-1
WGA231007-DR-CV-0001	GENERAL NOTES	KFTC202-1
WGA231007-DR-CV-0002	BULK EARTHWORKS GENERAL NOTES	KFTC203-1
WGA231007-DR-CV-0003	BULK EARTHWORKS LAYOUT PLAN	KFTC203-2
WGA231007-DR-CV-0004	BULK EARTHWORKS HEATMAP	KFTC203-3
WGA231007-DR-CV-0005	BULK EARTHWORKS BENCH SECTIONS	KFTC203-4
WGA231007-DR-CV-0006	CIVIL WORKS AND DRAINAGE PLAN	KFTC204-1
WGA231007-DR-CV-0007	ACCESS ROAD LONGITUDINAL SECTIONS	KFTC205-1
WGA231007-DR-CV-0008	ACCESS ROAD CROSS SECTIONS	KFTC205-2
WGA231007-DR-CV-0009	STORMWATER MANAGEMENT PLAN	KFTC206-1
WGA231007-DR-CV-0010	STORMWATER LONG SECTIONS	KFTC206-2
WGA231007-DR-CV-0011	STORMWATER PIT SCHEDULE	KFTC206-3
WGA231007-DR-CV-0012	CIVIL DETAIL - SHEET 1	KFTC207-1
WGA231007-DR-CV-0013	CIVIL DETAIL - SHEET 2	KFTC207-2
WGA231007-DR-CV-0014	CIVIL DETAIL - SHEET 3	KFTC207-3
WGA231007-DR-CV-0015	SETOUT PLAN	KFTC208-1



LOCALITY PLAN

100 50 0 100 200

SCALE BAR (m)

When sheet printed full size, the scale bar is 100mm.

0 50 100mm



REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD	<div><div>WGA</div><div>APD ENGINEERING KINGS FOREST SUBSTATION - CIVIL DESIGN</div><div>COVER SHEET</div><div>DOCUMENT NUMBER Project Number Sheet No. Rev.</div></div>		
0	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF			
						CLIENT DRAWING NUMBER: KFTC201-1		
						Design Drawn WGA231007-DR-CV-0000		
						APE APE		

GENERAL NOTES

GENERAL

- ALL WORKS TO COMPLETED IN ACCORDANCE WITH ESSENTIAL ENERGY "BRANCH PROCEDURE: TRANSMISSION AND ZONE SUBSTATION DESIGN GUIDELINES CEOP8032".
- DO NOT SCALE FROM THESE DRAWINGS.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE. ALL LEVELS ARE EXPRESSED IN M AHD UNLESS STATED OTHERWISE. ALL CHAINAGES ARE EXPRESSED IN METRES.
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE RELEVANT AUSTRALIAN STANDARDS, ESSENTIAL ENERGY AND OTHER RELEVANT CODES AS REFERENCED IN THE TECHNICAL SPECIFICATION, UNLESS OTHERWISE STATED.
- ALL WORKS IN PUBLIC LANDS SHALL BE TO THE APPROVAL AND SATISFACTION OF THE RELEVANT AUTHORITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND OBTAINING RELEVANT AUTHORITY WRITTEN APPROVAL OF THE WORKS.
- WHERE SPECIFIC PRODUCTS HAVE BEEN CALLED FOR, EQUIVALENT PRODUCTS, SUBJECT TO THE SUBCONTRACT SUPERINTENDENT'S REPRESENTATIVE'S APPROVAL, MAY BE USED.
- THE CONTRACTOR IS RESPONSIBLE FOR SETTING OUT THE WORKS. ALL DISCREPANCIES BETWEEN THE DRAWINGS AND SITE FEATURES SHALL BE REFERRED TO THE SUBCONTRACT SUPERINTENDENT'S REPRESENTATIVE FOR RESOLUTION BEFORE PROCEEDING WITH THE WORK. (HOLD POINT)
- ALL EXISTING SERVICES ARE TO BE LOCATED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
- EXISTING SURFACE CONTOURS AND NATURAL SURVEY TIN ARE PROVIDED BY OTHERS.
- THE CONTRACTOR SHALL NOT UNDERTAKE ANY CLEARING WORK OR ANY TYPE OF DISTURBANCE OUTSIDE THE LIMITS OF WORK UNLESS APPROVED BY THE SUBCONTRACT SUPERINTENDENT'S REPRESENTATIVE.
- ON COMPLETION OF THE WORKS THE CONTRACTOR SHALL REMOVE ALL UNWANTED MATERIALS, PLANT, EQUIPMENT AND TEMPORARY CONSTRUCTION FACILITIES FROM THE SITE, REMEDIATE AREAS USED BY THE CONTRACTOR DURING THE COURSE OF THE WORK, AND RESTORE THE SITE TO A NEAT AND TIDY CONDITION. ALL WORK AREAS SHOULD BE SMOOTHED AND GRADED IN A MANNER TO CONFORM TO THE APPEARANCE OF THE SURROUNDING LAND. (HOLD POINT)
- VERTICAL DATUM AHD.
- SITE SURVEY & SET-OUT CONTROLS DETAILED ON DRG. XXXXXX.
- THE 3D DESIGN MODEL & SET-OUT CAD FILES ARE TO BE PROVIDED AT IFC FOR DRAWINGS AS REQUIRED.

SAFETY AND SERVICES

- THE CONTRACTOR SHALL UNDERTAKE THE WORKS IN ACCORDANCE WITH THE STANDARDS LAID DOWN IN APPLICABLE OCCUPATIONAL HEALTH, SAFETY AND ENVIRONMENTAL ACTS AND ALL REGULATIONS THEREUNDER.
- THE IDENTIFICATION, LOCATION AND SAFE WORKING WITH RESPECT TO ALL EXISTING SERVICES IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL LIAISE DIRECTLY WITH ALL SERVICE AUTHORITIES INVOLVED AND SHALL COMPLY WITH ALL THEIR REGULATIONS AND REQUIREMENTS AND SHALL PAY ANY FEES OR CHARGES. WHERE SERVICES THAT ARE REQUIRED TO REMAIN ARE DAMAGED DURING THE COURSE OF THE WORKS, THEIR REPAIR SHALL BE CARRIED OUT AT THE CONTRACTOR'S EXPENSE.

STORMWATER

- ALL WORKS TO COMPLETED IN ACCORDANCE WITH ESSENTIAL ENERGY STANDARDS
- CONTRACTOR TO CONFIRM SETTING OF ALL FINISHED SURFACE LEVELS AT PITS, INVERTS OF ALL EXISTING DRAINS, PIPES AND SUMPS PRIOR TO CONNECTING AND LAYING NEW PIPEWORK. (HOLD POINT)
- SUBCONTRACT SUPERINTENDENT TO CHECK ALL STORMWATER EXCAVATED SURFACES BEFORE PLACING BEDDING MATERIAL AND ALL PIPE JOINTS BEFORE CONVERGING.
- ALL BLACKMAX PIPES TO BE PLACED MIN 500MM CLEARANCE FROM STRUCTURAL FOOTINGS.
- CONSTRUCT OVERLAND FLOW DIVERSION BUNDS SUCH THAT THEY DIVERT WATER AWAY FROM THE PLATFORM, ROADWAY AND STRUCTURES.
- ALL PIPE OUTLETS SHALL BE PROVIDED WITH AN END WALL AND WITH ROCK ARMOUR WHERE SHOWN. ARMOUR TO BE SIZED AS NOMINATED ON DRAWINGS.
- CONSTRUCT ROCK PROTECTION WITH APPROPRIATE MATERIALS AS APPROVED BY SUBCONTRACT SUPERINTENDENT.
- FABRICATE A WIRE BARRIER FROM SL82 MESH AND FIX TO OUTLET PIPES SO AS TO PREVENT ANIMAL ACCESS.

ACCESS ROAD

- INTERSECTION DESIGNED IN ACCORDANCE WITH AUSTRROADS PART 4 FIGURE 7.4
- ACCESS ROAD WIDTH 6M, MAX CROSS FALL 3% (TYP ALIGNING WITH NATURAL TOPOGRAPHY CROSS FALL)
- ALL CHAINAGES OF ROAD REFER TO CENTERLINE

EARTHWORKS

- ALL WORKS TO COMPLETED IN ACCORDANCE WITH ESSENTIAL ENERGY STANDARDS
- FOR DETAILED BULK EARTHWORKS NOTES REFER DWG NO - WGA231007-DR-CV-0002

PAVEMENT

- ALL WORKS TO COMPLETED IN ACCORDANCE WITH TWEED SHIRE COUNCIL GUIDELINES.
- THE THICKNESS OF THE FINISHED SURFACING LAYER IS DESIGNED TO SUPPORT HEAVY VEHICLES UP TO W7 AND T44 STANDARD AXLE LOADS UNDER ALL WEATHER CONDITIONS.
- IMPORTED GRANULAR MATERIAL TO MEET CRITERIA DEFINED IN ESSENTIAL ENERGY STANDARD
- THE FINISHED PLATFORM TO BE TREATED WITH "SIMAZINE" WEED CONTROL OR APPROVED SIMILAR HERBICIDE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS PRIOR TO RECEIVING A 100MM LAYER OF 20MM STONE AGGREGATE ONCE ALL CIVIL, EARTHING AND CONDUIT INSTALLATION WORK HAS BEEN COMPLETED.
- WHERE REQUIRED ALL ASPHALT WORKS TO BE IN ACCORDANCE WITH AS 2150 HOT MIX ASPHALT - A GUIDE TO GOOD PRACTICE.
- ENSURE FINISHED SURFACE HAS REQUIRED SLOPE SO AS TO ALLOW FOR SURFACE RUN-OFF OF WATER.

CONCRETE

- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3600 CONCRETE STRUCTURES, THE SPECIFICATION AND DETAILS PROVIDED ON THE DRAWINGS, UNLESS INSTRUCTED OTHERWISE BY THE ENGINEER.
- THE BUILDER SHALL CO-ORDINATE WITH ALL TRADES TO ENSURE THAT PROVISION IS MADE FOR ALL NECESSARY REBATES OR OPENINGS IN CONCRETE, AND CASTING IN OF CONDUITS. REFER ALL CONTRACT DRAWINGS.
- CLEAR CONCRETE COVER TO REINFORCEMENT FOR IN-SITU CONCRETE ELEMENTS SHALL BE AS PER TABLE C1.

COVER (mm) - (TABLE C1)

LOCATION	TOP	BOTTOM	SIDE EXTERNAL
FOOTING	50 U.N.O.	50 U.N.O.	50 U.N.O.

- REQUIRED SURFACE FINISH AND CLASS OF FORMWORK FOR IN-SITU CONCRETE SHALL CONFORM WITH THE FOLLOWING UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER. (REFER TABLE C2.)

SURFACE FINISH - (TABLE C2)

LOCATION	SURFACE	TYPE OF FINISH	CLASS OF FORMWORK
FOOTING	TOP FACE	STEEL TROWEL	-
FOOTING	SIDE FACE	OFF-FORM	4
FOOTING	BOTTOM FACE	-	-

- SCHEDULE OF CONCRETE PROPERTIES TO BE USED FOR THE PARTICULAR SECTION OF WORK SHALL BE AS FOLLOWS UNLESS OTHERWISE INSTRUCTED. MIX DESIGNS SHALL BE SUBMITTED BY THE CONTRACTOR TO THE ENGINEER FOR REVIEW 28 DAYS PRIOR TO POUR. (REFER TABLE C3.)

CONCRETE PROPERTIES - (TABLE C3)

LOCATION	GRADE (MPa)
PAD CONCRETE	N32

- ALL REINFORCEMENT IN SLABS AND FOOTINGS SHALL BE SUPPORTED ON CHAIRS TO GIVE THE REQUIRED COVER. SPACING OF THE CHAIRS TO SLAB REINFORCEMENT SHALL BE SUFFICIENT TO SUPPORT LOADS WITHOUT DISTORTION. REINFORCEMENT TIES SHALL BE SUFFICIENT TO ENSURE THAT ALL BARS REMAIN IN THEIR INTENDED POSITIONS DURING ALL CONSTRUCTION ACTIVITIES AND SHALL BE AT THE STEEL FIXERS' DISCRETION. IN ALL CASES, AS A MINIMUM TIE TOP MAT REINFORCEMENT AT EVERY FIFTH INTERSECTION. TIE BOTTOM MAT REINFORCEMENT AT EVERY SEVENTH INTERSECTION.
- LAPS. UNLESS NOTED OTHERWISE, ALL LAPS SHALL BE AS PER TABLE C4. NOTE: ALL BAR CRANKS TO BE NO GREATER THAN 1 IN 6 U.N.O.

BAR LAPS - (TABLE C4)

BAR SIZE	LAP (BOTTOM BAR)	LAP (TOP BAR)
N12	400mm	500mm
N16	550mm	700mm
N20	800mm	1000mm
N24	1100mm	1350mm

- REINFORCEMENT GRADE AS PER TABLE C5

REINFORCEMENT - (TABLE C5)

BARS	GRADE 500N TO AS4671
FABRIC	GRADE 500L TO AS4671
LIGATURES AND TIES	HARD DRAWN WIRE GRADE 450W TO AS1303

- A WORK METHOD STATEMENT SHOULD BE PROVIDED FOR WHENEVER THE CURRENT AMBIENT TEMPERATURE OR THE TEMPERATURE FORECAST FOR THE DAY OF POUR EXCEEDS 32°C. IF NO WORK METHOD STATEMENT IS IN PLACE THE BUILDER SHALL NOTIFY WGA WITHIN 24 HOURS OF THE INTENTION TO POUR CONCRETE. THE ENGINEER AT THEIR DISCRETION MAY OR MAY NOT PERMIT CONCRETE POURING.
- CONSTRUCTION JOINTS WHERE NOT SHOWN ON THE DRAWINGS SHALL BE LOCATED TO THE APPROVAL OF THE ENGINEER.
- NO REINFORCEMENT SPLICES SHALL BE MADE IN POSITIONS OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
- TYPICAL REINFORCEMENT NOTATION: 23-N24-200 BF
23 - DENOTES NUMBER OF BARS REQUIRED
N - DENOTES GRADE OF REINFORCEMENT
24 - DENOTES BAR DIAMETER IN MILLIMETRES
200 - DENOTES BAR SPACING IN MILLIMETRES
BF - ABBREVIATION (REFER TABLE C6. FOR TYPICAL ABBREVIATIONS).
- EARTHING OF REINFORCEMENT SHALL BE TO ESSENTIAL ENERGY ADVICE.

REINFORCEMENT NOTATION - (TABLE C6)

ABBREVIATIONS	DENOTES
B, BF, BB, B1	BOTTOM MOST BOTTOM BARS / BOTTOM BARS PLACED FIRST
BU, B2	BOTTOM BARS / BOTTOM BARS PLACED SECOND
EW	EACH WAY
EF	BARS IN EACH FACE
SF	BARS IN SIDE FACE
NF	BARS IN NEAR FACE
FF	BARS IN FAR FACE
NSOP	NOT SHOWN ON PLAN
T, TF, TT, T2	TOP MOST TOP BARS / TOP BARS PLACED FIRST
TU, T2	TOP BARS / TOP BARS PLACED SECOND
CENT	BARS PLACED CENTRALLY
ABR	ALTERNATE BARS REVERSED
ALT	BARS ALTERNATING
STAG	BARS STAGGERED
HORIZ	HORIZONTAL BARS
VERT	VERTICAL BARS
MAX	MAXIMUM
MIN	MINIMUM
CTS	AT CENTRES (SPACING)
TYP	TYPICAL

TESTING

- FOR EARTHWORKS TESTING REFER DWG NO - 310 607/794-052
- SAMPLES OF MATERIALS TO BE USED FOR BASE, SUB-BASE AND ASPHALT AGGREGATE (25 KG OF EACH MATERIAL) TESTED AND THE RESULTS PROVIDED TO THE SUPERINTENDENT NOT LATER THAN TEN DAYS BEFORE ANY OF THESE MATERIALS ARE DELIVERED ON SITE FOR CONSTRUCTION PURPOSES. THE CONTRACTOR SHALL SUBMIT FURTHER 25 KG SAMPLES OF CONSTRUCTION MATERIALS AS DIRECTED BY THE SUPERINTENDENT DURING THE COURSE OF THE WORKS. THE SUPERINTENDENT AT ITS DISCRETION WILL SUBMIT THESE SAMPLES TO A NATA REGISTERED LABORATORY FOR TESTING. IN THE EVENT THAT THE TEST RESULTS SHOW THAT THE MATERIALS ARE OUTSIDE THOSE SPECIFIED THE CONTRACTOR SHALL REMOVE AND REPLACE AT HIS OWN COST ALL SUCH MATERIALS REPRESENTED BY THE SAMPLE. THE SUPERINTENDENT SHALL DETERMINE WHAT MATERIALS ARE REPRESENTED BY ANY PARTICULAR SAMPLE. THE COST OF UNSATISFACTORY TESTS SHALL BE BORNE BY THE CONTRACTOR AND DEDUCTED FROM THE RELEVANT PROGRESS CLAIM. WHERE REQUIRED.
- TESTING FOR COMPLIANCE WITH THE REQUIREMENTS SPECIFIED FOR BITUMINOUS SURFACING SHALL BE CARRIED OUT BY THE CONTRACTOR. THE FREQUENCY OF DENSITY TESTING FOR ASPHALT SHALL BE 1 TEST PER 500M2.


1. REFER ELECTRONIC 2D & 3D SETOUT FILE.
2. CUT TO FILL VOLUMES ARE 'TIN TO TIN' FROM SURVEYED NATURAL SURFACE TO TOP OF BULK EARTHWORKS SUBGRADE LEVEL AND DOES NOT INCLUDE ANY ALLOWANCE FOR BULKING OR UNSUITABLE MATERIALS.
3. NATURAL SURVEY TIN IS PROVIDED BY OTHERS.
4. CUT TO FILL VOLUMES ARE FOR PAD ONLY.
5. CONTOURS SHOWN ARE TO BULK EARTHWORKS SUBGRADE LEVEL (BL.)
6. SITE SURVEY & SET-OUT CONTROLS DETAILED ON DRG. WGA231007-DR-CV-0015.
7. THE 3D DESIGN MODEL & SET-OUT CAD FILES ARE TO BE PROVIDED AT IFC FOR DRAWINGS AS REQUIRED.

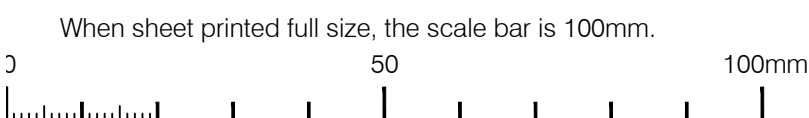
1. ALL WORKS TO COMPLETED IN ACCORDANCE WITH THE FOLLOWING ESSENTIAL ENERGY STANDARDS:
2. PRIOR TO COMMENCING WORKS ON SITE, THE CONTRACTOR SHALL REVIEW THE FOLLOWING PROJECT GEOTECHNICAL REPORT PROVIDING INFORMATION REGARDING THE TYPICAL SOIL PROFILES AT THE SITE:
 - 2.1. REGIONAL GEOTECHNICAL SOLUTIONS , DEPOT ROAD AND SECRET LANE, KINGS FOREST, GEOTECHNICAL REPORT PROJECT RGS33650.1-AB, OCTOBER 2023.
3. THE CONTRACTOR SHALL ENGAGE A GEOTECHNICAL INSPECTION AND TESTING AUTHORITY (GITA) APPROVED BY WGA TO UNDERTAKE LEVEL 1 INSPECTION AND TESTING SERVICES DURING THE BULK EARTHWORKS AND VERIFY THAT THE ENGINEERED FILL PLACEMENT AND SUBGRADE PREPARATION WORKS (INCLUDING IMPACT ROLLING OF THE SUBGRADE) UNDERTAKEN COMPLY WITH THE REQUIREMENTS OF THE PROJECT SPECIFICATION. THE GITA NOMINATED BY THE CONTRACTOR SHALL BE PROVIDED TO WGA AT LEAST 1 WEEK PRIOR TO EARTHWORKS COMMENCING ON SITE.
4. THE ENGINEERED FILL SHALL BE PLACED UNDER LEVEL 1 OVERVIEW BY THE GITA IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF AS3798 "GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS".
5. CUT AND FILL BATTERS SHALL NOT BE STEEPER THAN 1 VERT. TO 4 HORIZ. UNLESS OTHERWISE REQUIRED BY SITE CONSTRAINTS OR SHOWN IN THE DRAWINGS. THE CONTRACTOR SHALL REHABILITATE ALL THESE BATTERS WITH STOCKPILED TOPSOIL, NATIVE LOCAL VEGETATION AND EXCESS ROCK, TO PRODUCE VEGETATED AND EROSION PROOF BATTERS. THIS MAY INCLUDE COVERING WITH JUTEMESH, "HYDROMULCH" OR OTHER SIMILAR METHODS.
6. ALL CIVIL BENCHING AND STORMWATER PIPEWORK INSTALLATION MUST BE COMPLETED PRIOR TO INSTALLING THE EARTHING CONDUCTORS
7. EARTH GRID AND EQUIPMENT EARTHING INSTALLATION TO BE IN ACCORDANCE WITH ESSENTIAL ENERGY SPECIFICATIONS. REFER TO ELECTRICAL DRAWINGS FOR GENERAL NOTES AND DETAILS.

1. GENERAL SITE PREPARATION METHODOLOGY:
 - a. EXCAVATE AND STOCKPILE 50MM TOP SOIL AND NON-ENGINEERED FILL TO EXPOSE NATURAL SOIL. WHERE THE EXISTING STOCKPILED MATERIALS AND NON-ENGINEERED FILL ARE TO BE RE-USED AS ENGINEERED FILL, DUE ALLOWANCE FOR SELECTIVE SORTING AND SCREENING MUST BE MADE. THE COMPOSITION OF THE ENGINEERED FILL USED IN THE EARTHWORKS MUST MEET THE REQUIREMENTS OF AS3798.
 - b. ON COMPLETION OF THE IMPACT ROLLED SURFACE MOISTURE CONDITION AND COMPACT THE UPPER 200 MM OF THE IMPACT ROLLED SURFACE TO ACHIEVE A DRY DENSITY RATIO OF AT LEAST 98% STANDARD (AS 1289 5.1.1);
 - c. PLACE ADDITIONAL LAYERS OF CONTROLLED FILL ON THE IMPACT ROLLED SURFACE TO ACHIEVE THE DESIGN SUBGRADE LEVEL
3. WGA'S GEOTECHNICAL ENGINEER TO ASSESS THE BULK EARTHWORKS CUT LEVELS OF THE PLATFORM AND ROAD TO CONFIRM EXTENT OF SOIL AND ROCK SUITABILITY.
4. FILL PLACED TO ACHIEVE DESIGN BULK EARTHWORKS LEVELS MAY COMPRISE SELECT SITE WON FILL WITH A SOAKED CBR OF AT LEAST 6% OR ALTERNATIVELY SELECT IMPORTED INERT MATERIALS (SUCH AS QUARRY RUBBLE, QUARRY WASTE OR RECYCLED PAVEMENT MATERIAL WITH A SOAKED CBR OF AT LEAST 15%, OR IMPORTED FILL AS PER ELECTRANET STANDARD 1-11-ADM-19 V1.0 SECT 5.4.2).
5. THE ENGINEERED FILL SHALL BE COMPACTED IN LAYERS NOT EXCEEDING 200MM IN LOOSE THICKNESS PRIOR TO COMPACTION TO ACHIEVE A DRY DENSITY RATIO OF AT LEAST 98% BASED ON STANDARD COMPACTION (AS1289 5.1.1). AT THE TIME OF COMPACTION THE FILL SHALL BE MOISTURE CONDITIONED TO WITHIN 2% OF THE OPTIMUM MOISTURE CONTENT.
6. TEST LOCATION SET-OUT TO BE ESTABLISHED WITHIN THE INSPECTION TEST PLAN TO BE PREPARED BY THE CONTRACTOR.
7. CONTRACTOR TO ALLOW FOR EXISTING MATERIAL UNSUITABLE FOR REUSE TO BE DISPOSED IN LINE WITH THE RELEVANT CEMP / LEGAL REQUIREMENTS TO AN APPROPRIATELY LICENSED WASTE FACILITY.

1. RECOMMEND NOT LESS THAN 1 TEST PER LAYER OR 200mm THICKNESS PER MATERIAL TYPE PER 1000m².
2. TEST LOCATIONS SHALL BE GPS LOCATED AND SHOWN ON DRAWINGS INCLUDED IN CONSTRUCTION ITP'S.


1. ALL WORKS TO COMPLETED IN ACCORDANCE WITH ESSENTIAL ENERGY STANDARD.
2. CONTRACTOR TO MANAGE DUST CONTROL ON-SITE APPROPRIATELY FOR ALL EARTHWORKS AND CONSTRUCTION ACCESS AREAS

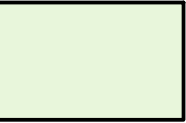
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0	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF	
<div> <div>CLIENT DRAWING NUMBER:</div> <div>KFTC203-1</div> </div>						<div> <div>Design</div> <div>APE</div> </div> <div> <div>Drawn</div> <div>APE</div> </div> <div> <div>Project Number</div> <div>WGA231007-DR-CV-0002</div> </div> <div> <div>Sheet No.</div> <div>0</div> </div> <div> <div>Rev.</div> <div>0</div> </div>

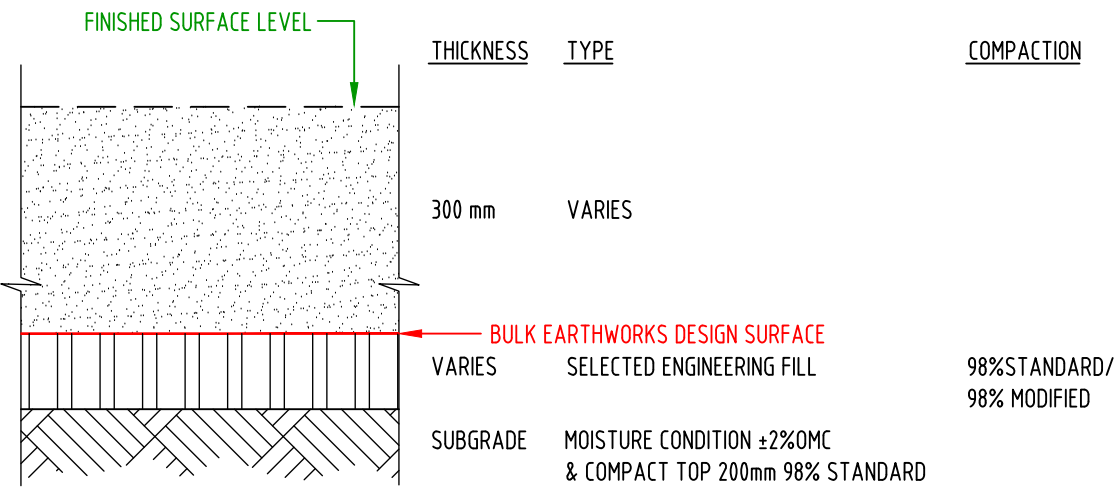


LEGEND:

--- 337.0 --- EXISTING CONTOURS
--- 0.75 --- DESIGN CONTOURS (100mm INTERVALS)

 BENCH TYPE 1

 BENCH TYPE 1 (LANDSCAPE)

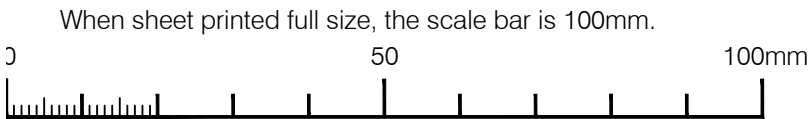


BENCH TYPE 1 - BULK EARTHWORKS DESIGN SURFACE


1 IN 15 BATTER. REFER TO BULKEARTHWORKS NOTES FOR TOPSOIL TREATMENT REQUIREMENTS.

- NOTES
1. BULK EARTHWORKS DESIGN SURFACES IS 300mm BELOW THE FINISHED SURFACE LEVEL
 2. ALL EMBANKMENTS TO BE 1 IN 4 U.N.O.
 3. NATURAL SURVEY TIN IS PROVIDED BY APD. NATURAL SURVEY IS A COMBINATION BETWEEN EXISTING NATURAL LEVELS AND FUTURE KINGS FOREST PARKWAY DESIGN LEVELS.
 4. REFER BEW NOTES ON DRG. WGA231007-DR-CV-0002

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APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

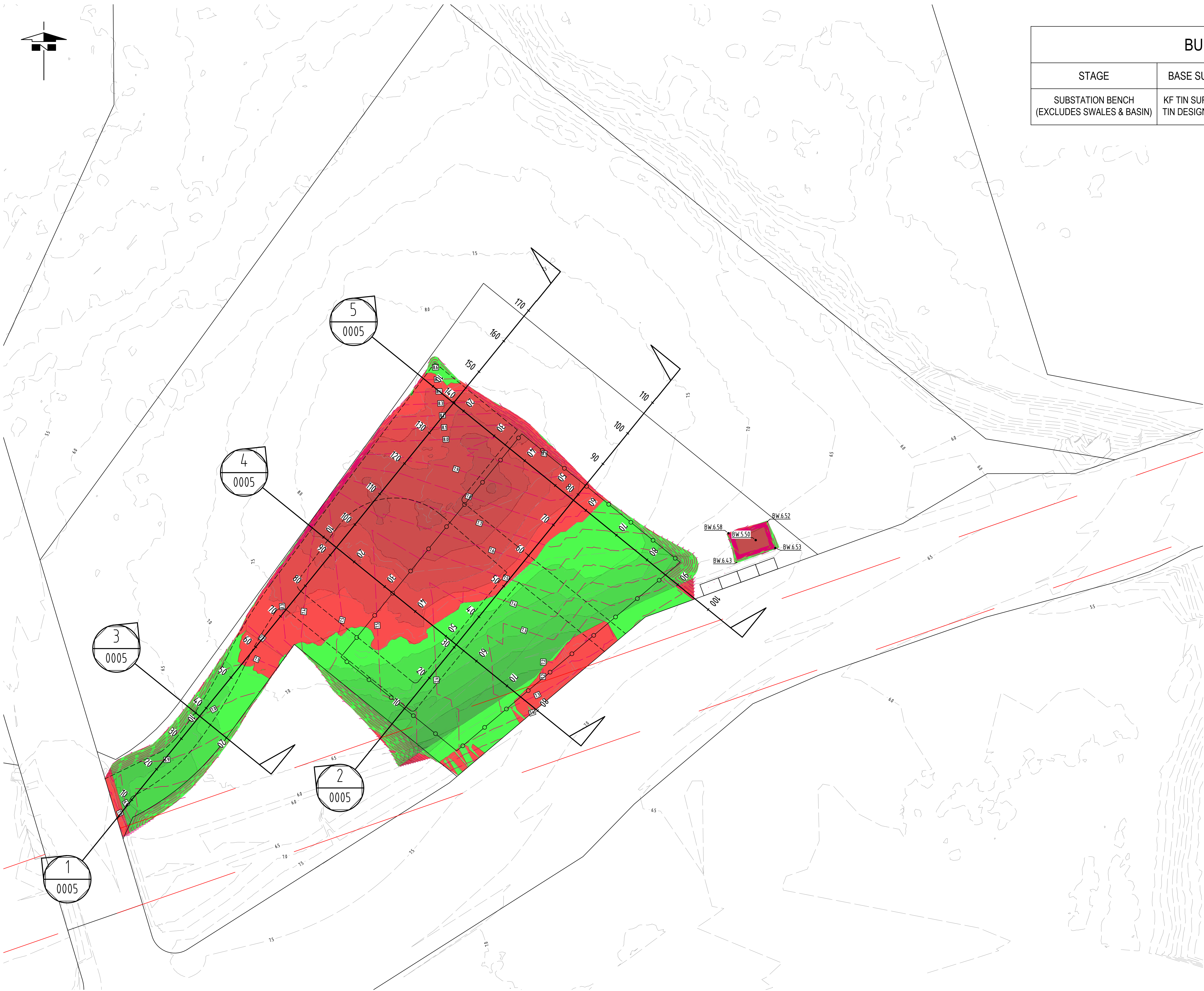
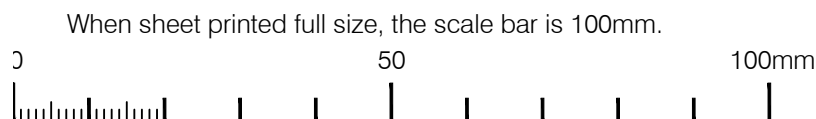
BULK EARTHWORKS LAYOUT PLAN

A1 DOCUMENT NUMBER
Project Number Sheet No. Rev.

CLIENT DRAWING NUMBER: KFTC203-2
Design APE Drawn APE

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BULK EARTHWORKS VOLUMES					
STAGE	BASE SURFACE	COMPARISON SURFACE	CUT	FILL	NET
SUBSTATION BENCH (EXCLUDES SWALES & BASIN)	KF TIN SURVEY + KF TIN DESIGN (BY APD)	DESIGN BENCH FINAL SURFACE	-1,619 m³	1,309 m³	-310 m³ (CUT)

Cut/Fill Depth Table			
Number	Depth from	Depth to	Color
1	-1200	-1000	
2	-1000	-800	
3	-800	-600	
4	-600	-400	
5	-400	-200	
6	-200	0.000	
7	0.200	0.400	
8	0.400	0.600	
9	0.600	0.800	
10	0.800	1.000	
11	1.000	1.200	
12	1.200	1.400	
13	1.400	1.600	
14	1.600	1.800	

- LEGEND:
- EXISTING CONTOURS
 - BULK EARTHWORKS LEVEL CONTOURS (100mm INTERVALS)
 - NEW SECURITY FENCE WITH ACCESS GATES
 - PROPOSED ACCESS ROAD

- NOTES
- REFER ELECTRONIC 2D & 3D SETOUT FILE.
 - CUT TO FILL VOLUMES ARE 'TIN TO TIN' FROM SURVEYED NATURAL SURFACE TO TOP OF BULK EARTHWORKS SUBGRADE LEVEL AND DOES NOT INCLUDE ANY ALLOWANCE FOR BULKING OR UNSUITABLE MATERIALS.
 - NATURAL SURVEY TIN IS PROVIDED BY APD. NATURAL SURVEY IS A COMBINATION BETWEEN EXISTING NATURAL LEVELS AND FUTURE KINGS FOREST PARKWAY DESIGN LEVELS.
 - CUT TO FILL VOLUMES ARE FOR SUBSTATION BENCH ONLY (GREEN & RED HEATMAP).
 - CONTOURS SHOWN ARE TO BULK EARTHWORKS SUBGRADE LEVEL.
 - REFER GENERAL & BEW NOTES ON DRG. WGA231007-DR-CV-0002

REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
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APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

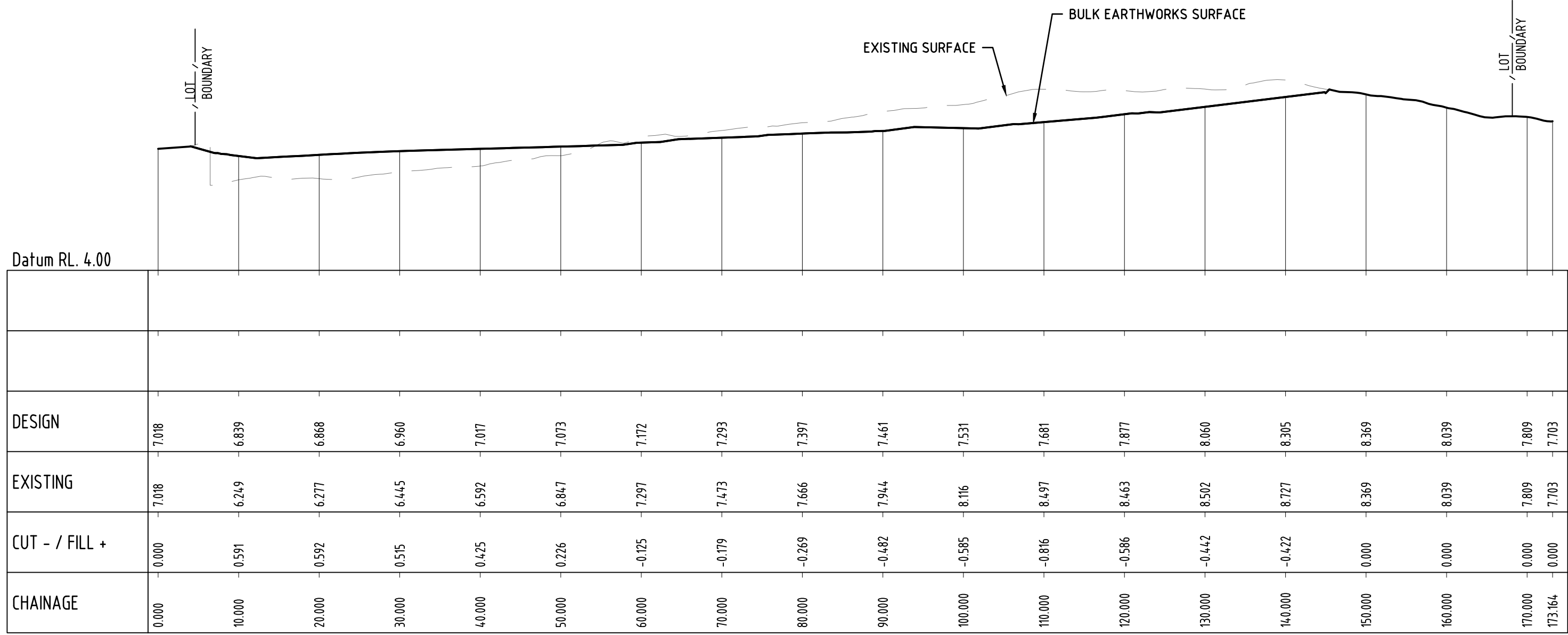
BULK EARTHWORKS HEATMAP

A1 DOCUMENT NUMBER

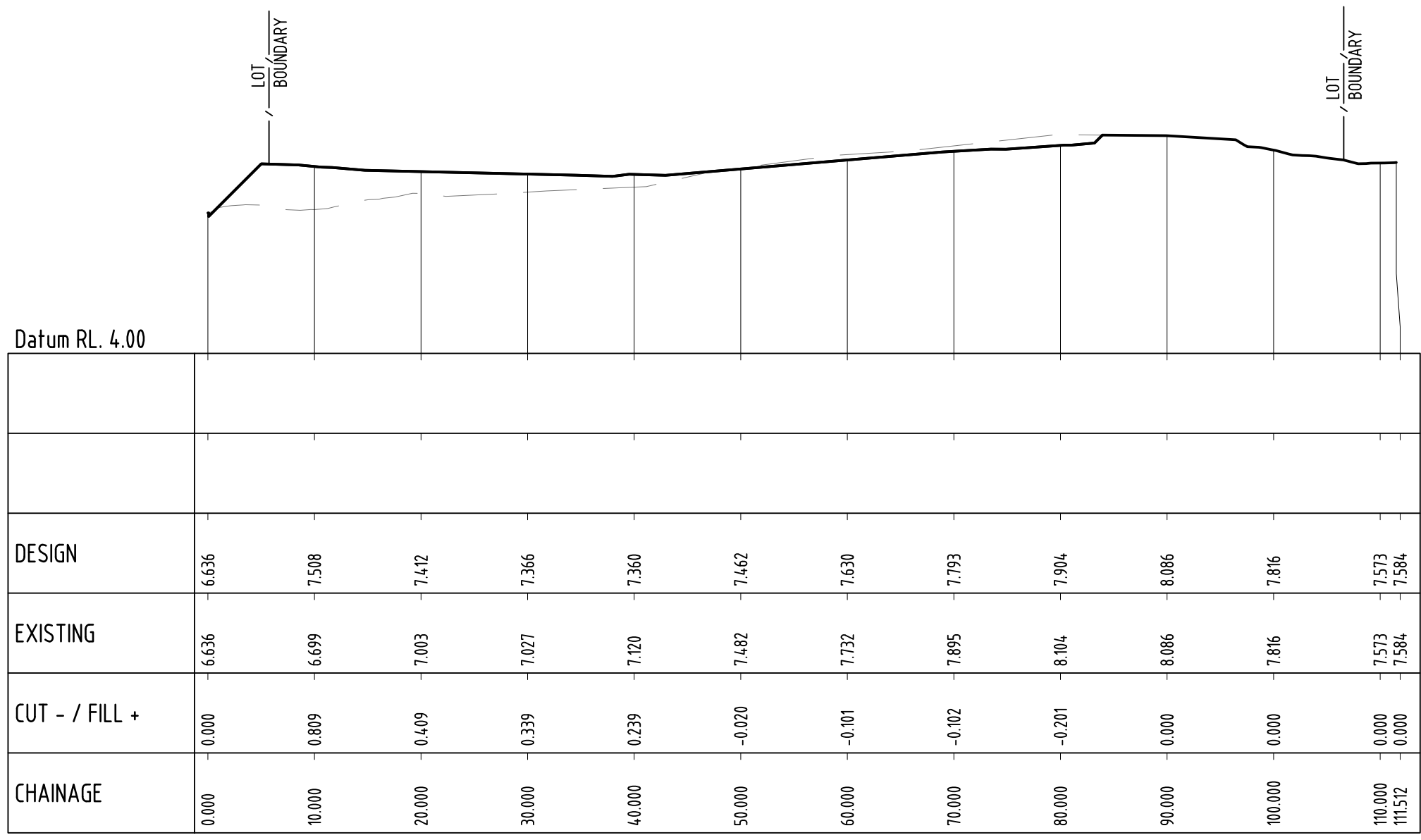
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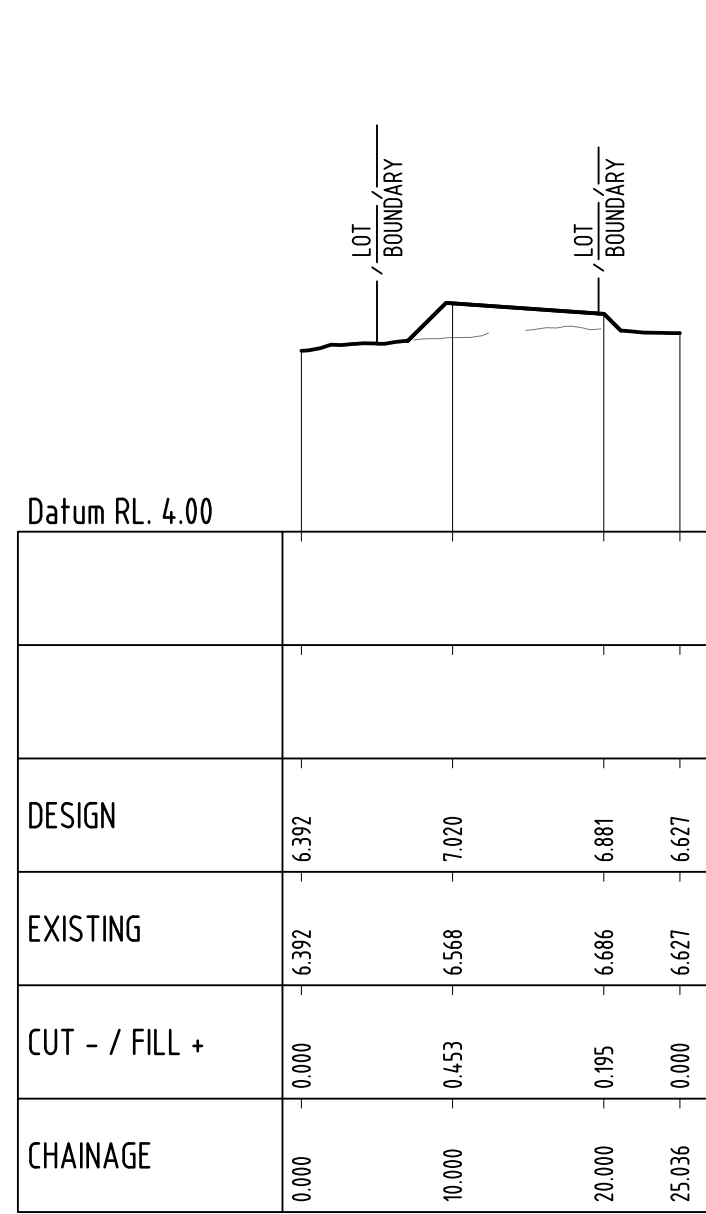
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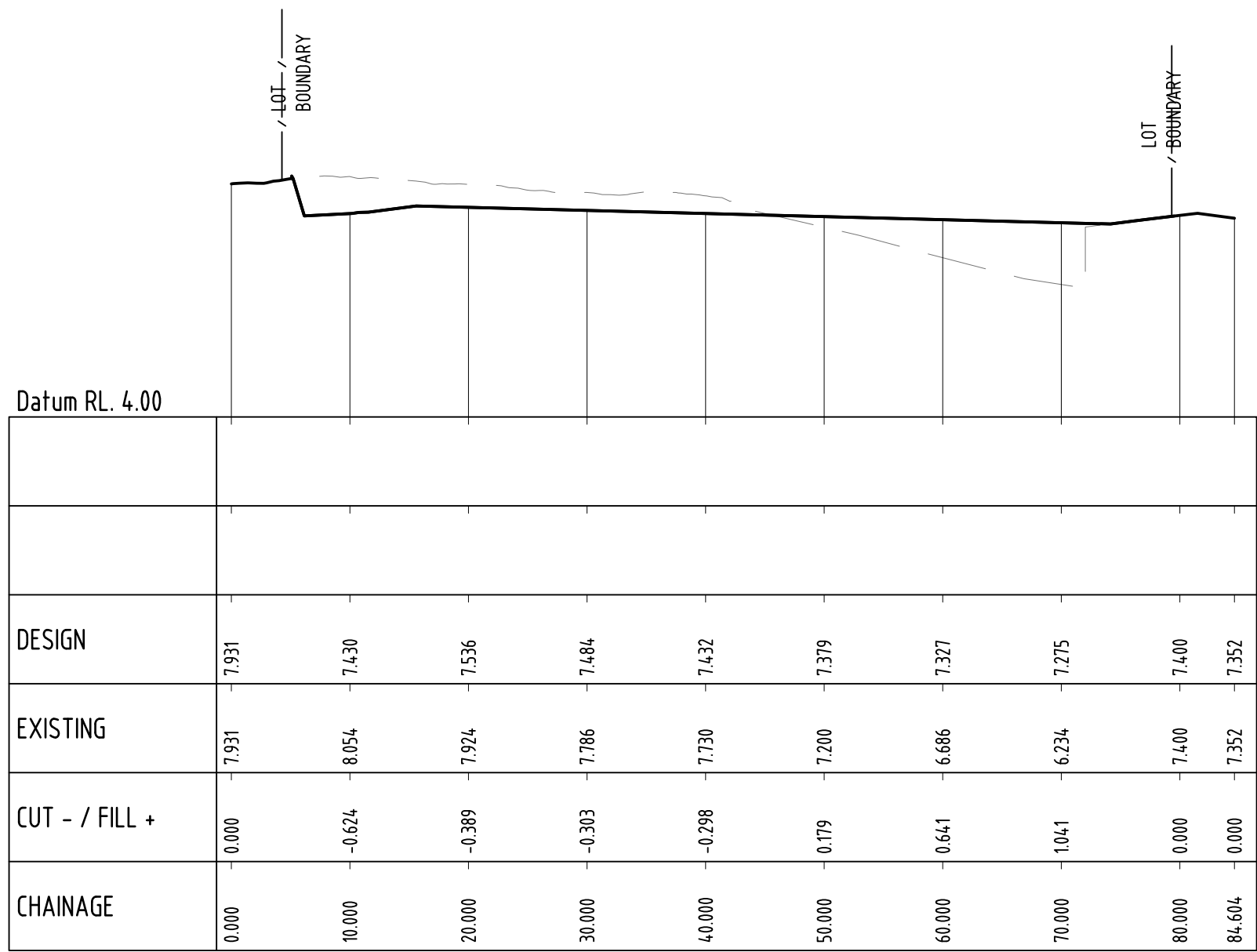
SECTION 1
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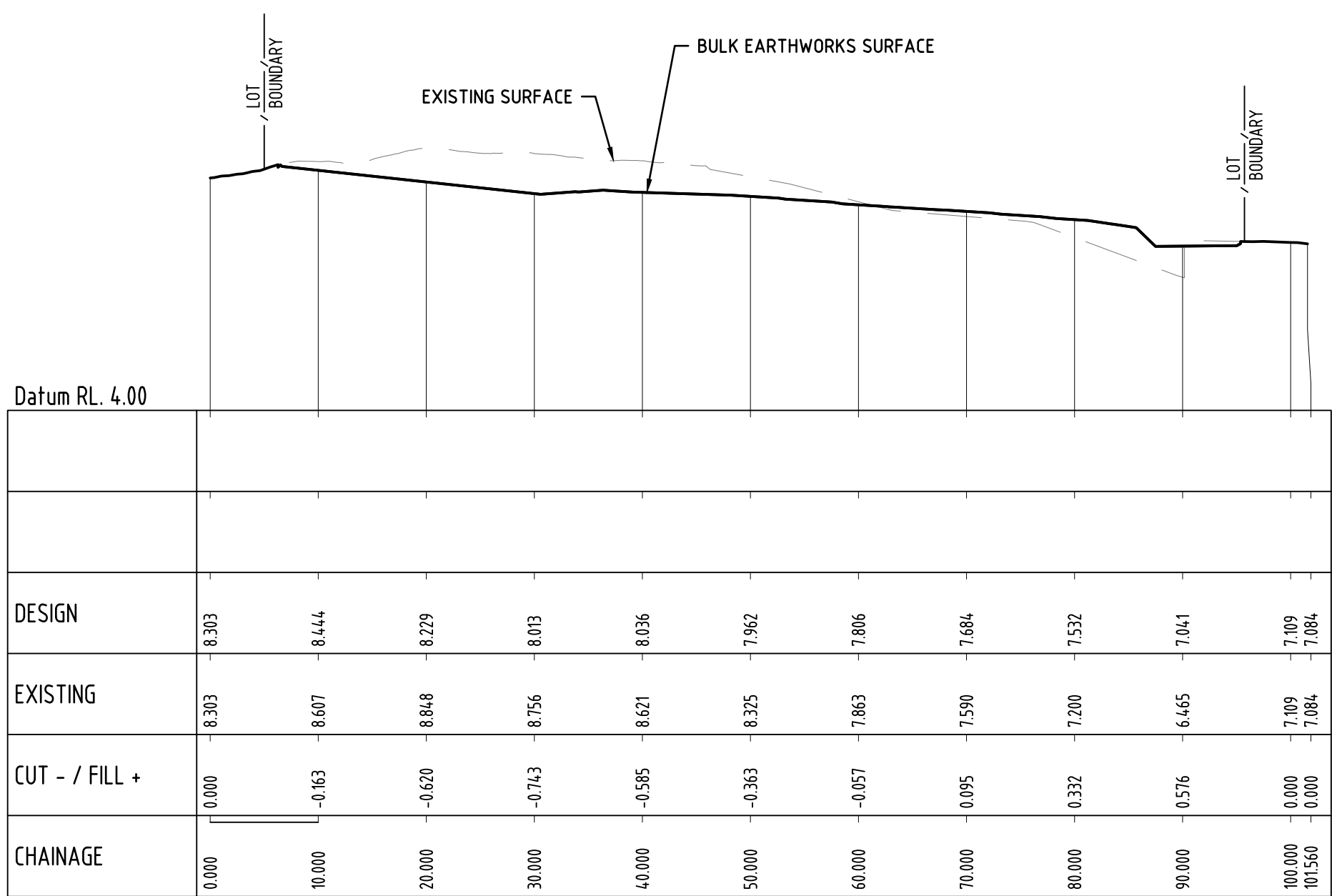
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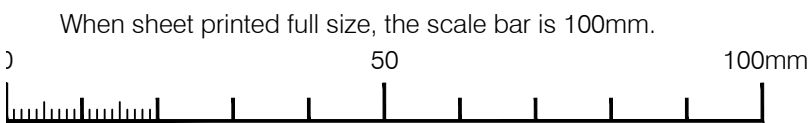
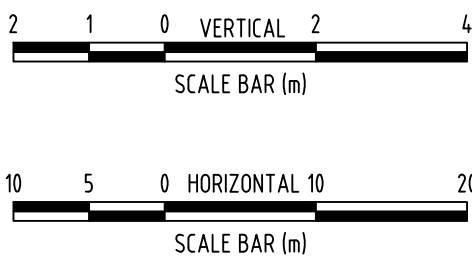
SECTION 3
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SECTION 4
SCALE 1:500H, 1:100V



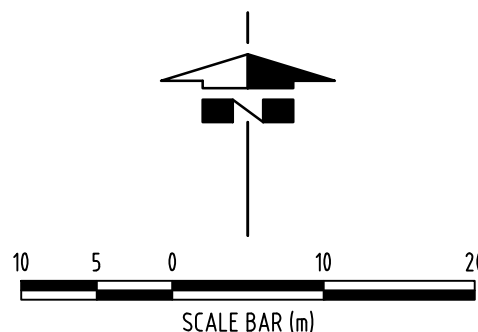
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Ø	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF				KINGS FOREST SUBSTATION - CIVIL DESIGN		
									BULK EARTHWORKS SECTIONS		
									A1		
									DRAWING NUMBER		
									Job Number		
									Rev.		
									CLIENT DRAWING NUMBER:		
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									Design		
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									Drawn		
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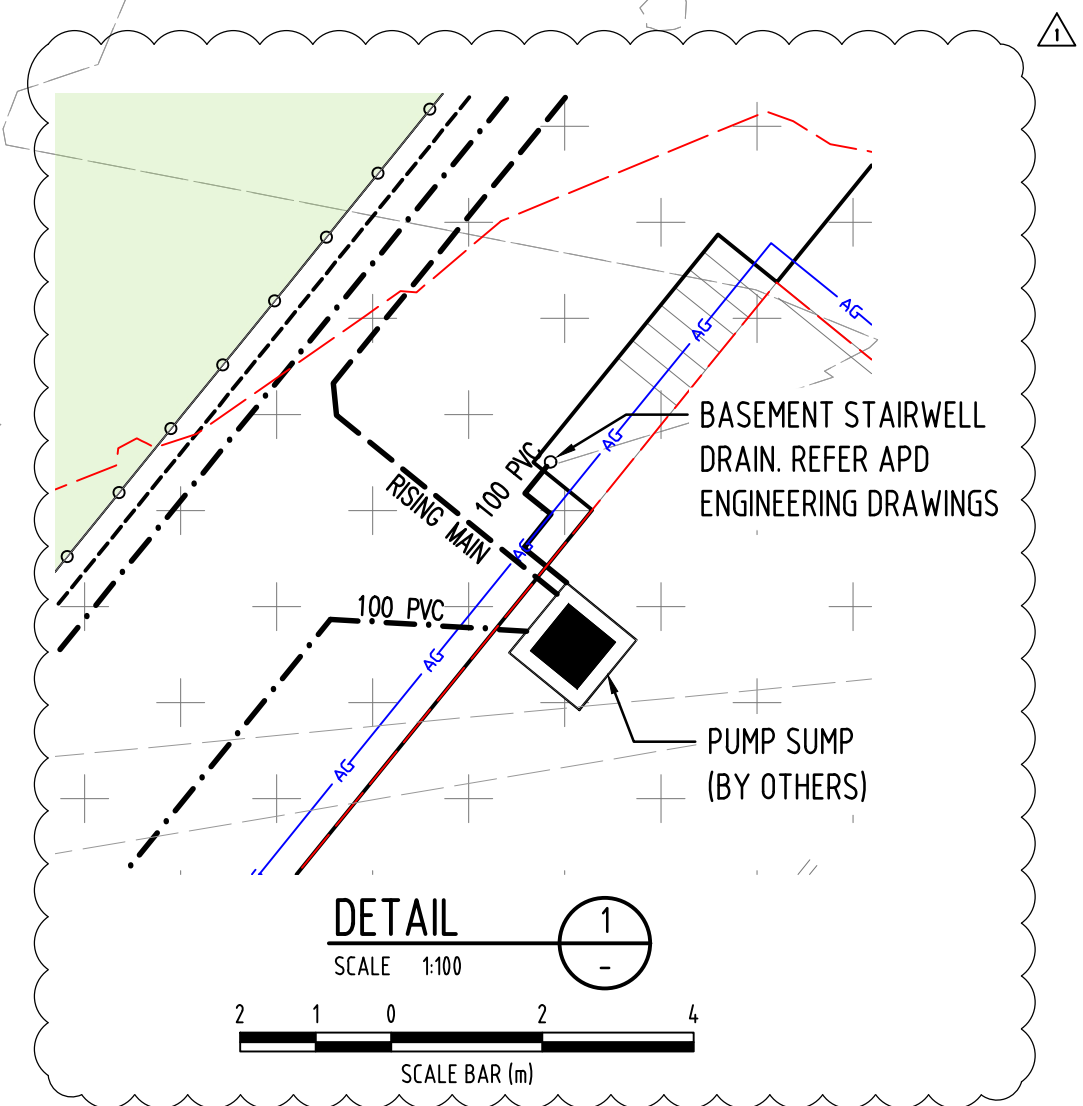
<div>WGA</div>			APD ENGINEERING		
			KINGS FOREST SUBSTATION - CIVIL DESIGN		
			CIVIL WORKS & DRAINAGE PLAN		©
			A1		
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			Job Number		
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CLIENT DRAWING NUMBER:			KFTC204-1		Design
			APE		
			WGA231007-DR-CV-0006		1

LEGEND:

- EXISTING CONTOURS
- DESIGN CONTOURS (100mm INTERVALS)
- NEW SECURITY FENCE WITH ACCESS GATES
- PLINTH AND PERIMETER FENCE
- DRAINAGE PLINTH AND PERIMETER FENCE
- KERB & GUTTER
- EDGE KERB ONLY
- SPOON DRAIN
- SPOON DRAIN (BURIED)
- SPOON DRAIN (WITH BURIED KERB & GUTTER)
- SLEEPER RETAINING WALL
- RETAINING WALL HEIGHT (H)
TOP OF WALL DESIGN LEVEL (TW)
BOTTOM OF WALL DESIGN LEVEL (BW)
- FALL DIRECTION
- CABLE TRENCH
- STORMWATER PIPE - HOPE AG DRAIN
- STORMWATER PIPE - BLACKMAX
- STORMWATER PIPE - PVC DN100 S8
- CABLE TRENCH DRAINAGE
INSTALL @ MIN. 0.5% GRADE
(WITH INSPECTION POINTS WITH TRAFFICABLE LIDS)
- RAISED SURGE GRATED PIT (900x900)
- VEE-GRATE INLET PIT
- STORMWATER GRATED INLET PIT
- STORMWATER JUNCTION BOX
- STORMWATER DRAINAGE PIT No.
- SWALE DRAIN
HEADWALL OUTLET AND ROCK SCOUR
PROTECTION, REFER DETAIL.
- SPRAY SEAL PAVEMENT TYPE 1
- PAVEMENT TYPE 2 (UNSEALED)
- LANDSCAPE TYPE 3 (UNSEALED)
- CONCRETE PAVEMENT

NOTES

- CONTRACTOR TO VERIFY ALL STORMWATER PIT INVERT LEVELS AND TOP LEVELS.
- REFER DRAINAGE LONGITUDINAL SECTIONS FOR ROAD CHAINAGES OF STORMWATER PITS.
- ALL CROSSOVER DETAILS REFER TO TWEED SHIRE COUNCIL STANDARDS DRAWINGS.



11.5m LONG x 1m WIDE SCOUR PROTECTION ON BIDUM A32 GEOTEXTILE FABRIC OR APPROVED SIMILAR (MIN ROCK SIZE D50=150mm).

ROOF WATER TO BE DISCHARGED AT PIT B7 & F1.

PROVIDE SUBMERSIBLE SUMP PUMP CONTAINED IN JB WITHIN BASEMENT. PROVIDE BACK FLOW PREVENTION DEVICE. DISCHARGE TO BE DIRECTED TO S-GIP (B7) VIA PUMPING MAIN, IN ACCORDANCE WITH SUMP PUMP SPECIFICATIONS.

CONNECT AG DRAIN TO 150 PVC AND DRAIN TO PIT H6 AT 1% MIN. GRADE

PROVIDE 100H x 300W OPENING IN SCREEN FENCING.

CABLE TRENCH DRAINAGE TO BE DISCHARGED THROUGH EMBANKMENT AT EXISTING SURFACE LEVEL.

2m LONG x 2m WIDE SCOUR PROTECTION ON BIDUM A32 GEOTEXTILE FABRIC OR APPROVED SIMILAR (MIN ROCK SIZE D50=150mm).

PROVIDE 2m LONG WEIR AT TOP OF BASIN LEVEL (-50mm FROM TOP LEVEL) FOR OVERLAND FLOW PATH.

PROVIDE 100H x 300W OPENING IN SCREEN FENCING.

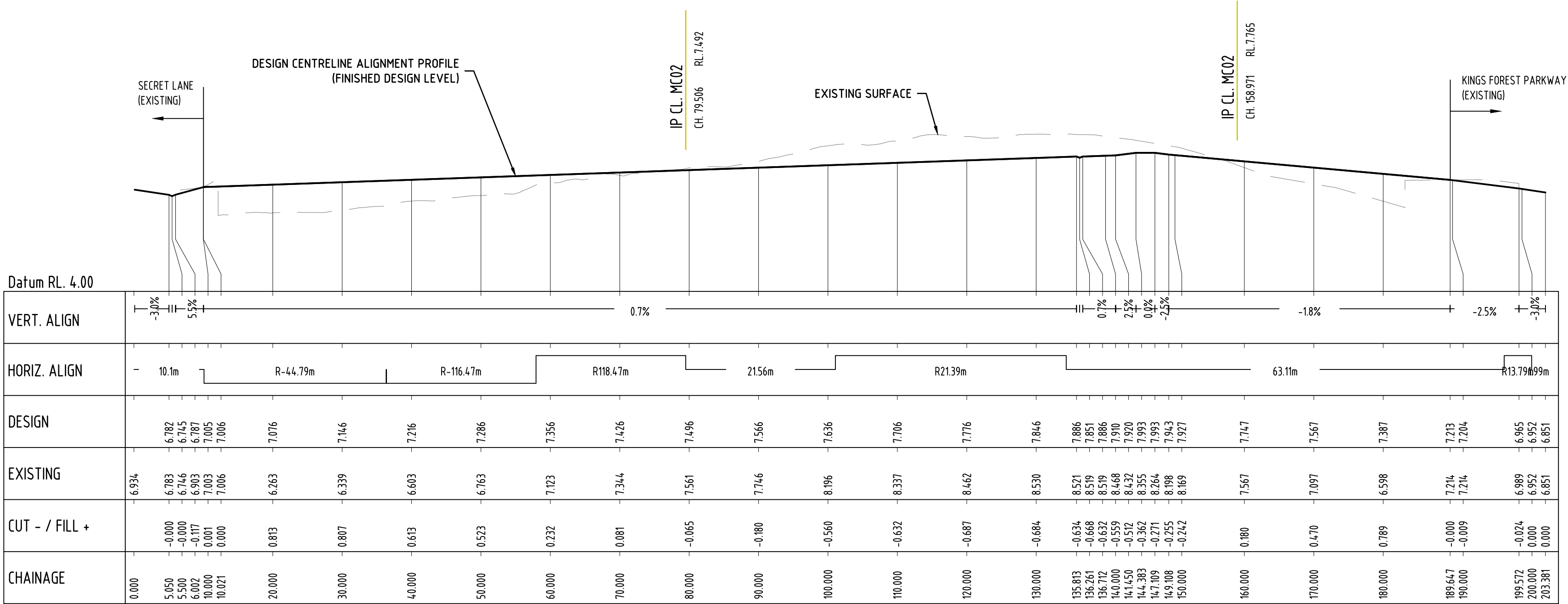
PROVIDE 100H x 1000W OPENING AT PROPOSED SPOONRAIN IN SCREEN FENCING.

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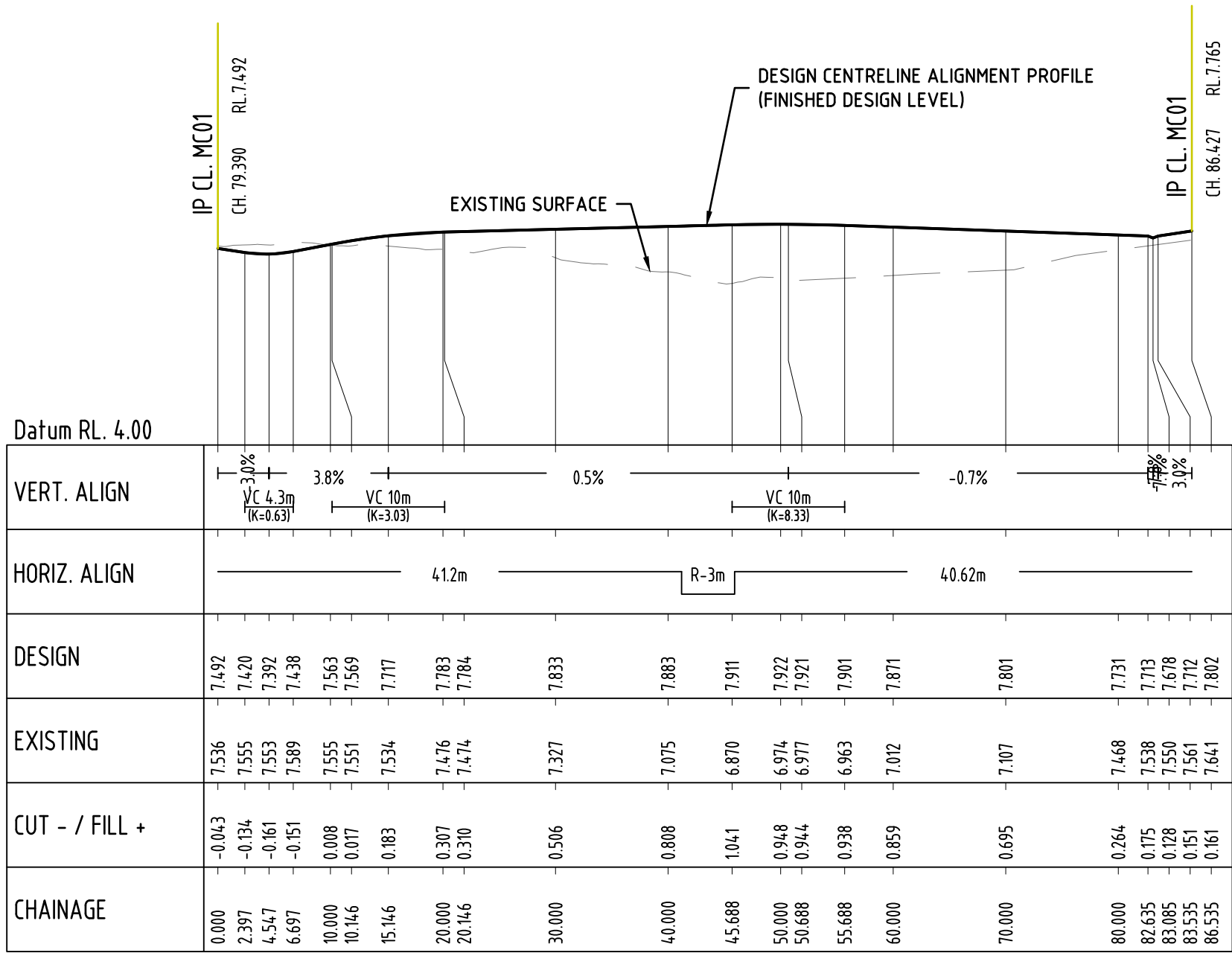
50

100mm



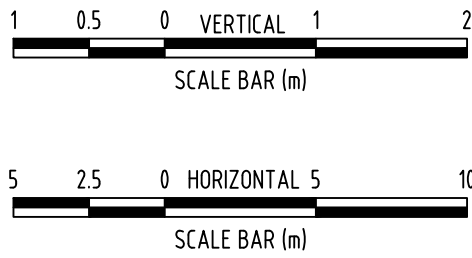
LONGITUDINAL SECTION -MC01

H: 1:500
V: 1:100



LONGITUDINAL SECTION -MC02

H: 1:500
V: 1:100



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APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

ROAD LONGITUDINAL SECTION

A1

CLIENT DRAWING NUMBER: KFTC205-1

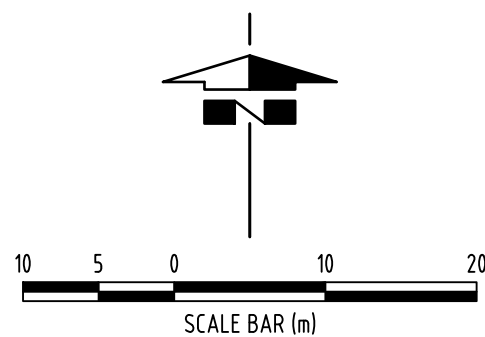
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Job Number Sheet No. Rev.

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WGA

CLIENT DRAWING NUMBER: KFTC206-1

APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

STORMWATER MANAGEMENT PLAN

A1

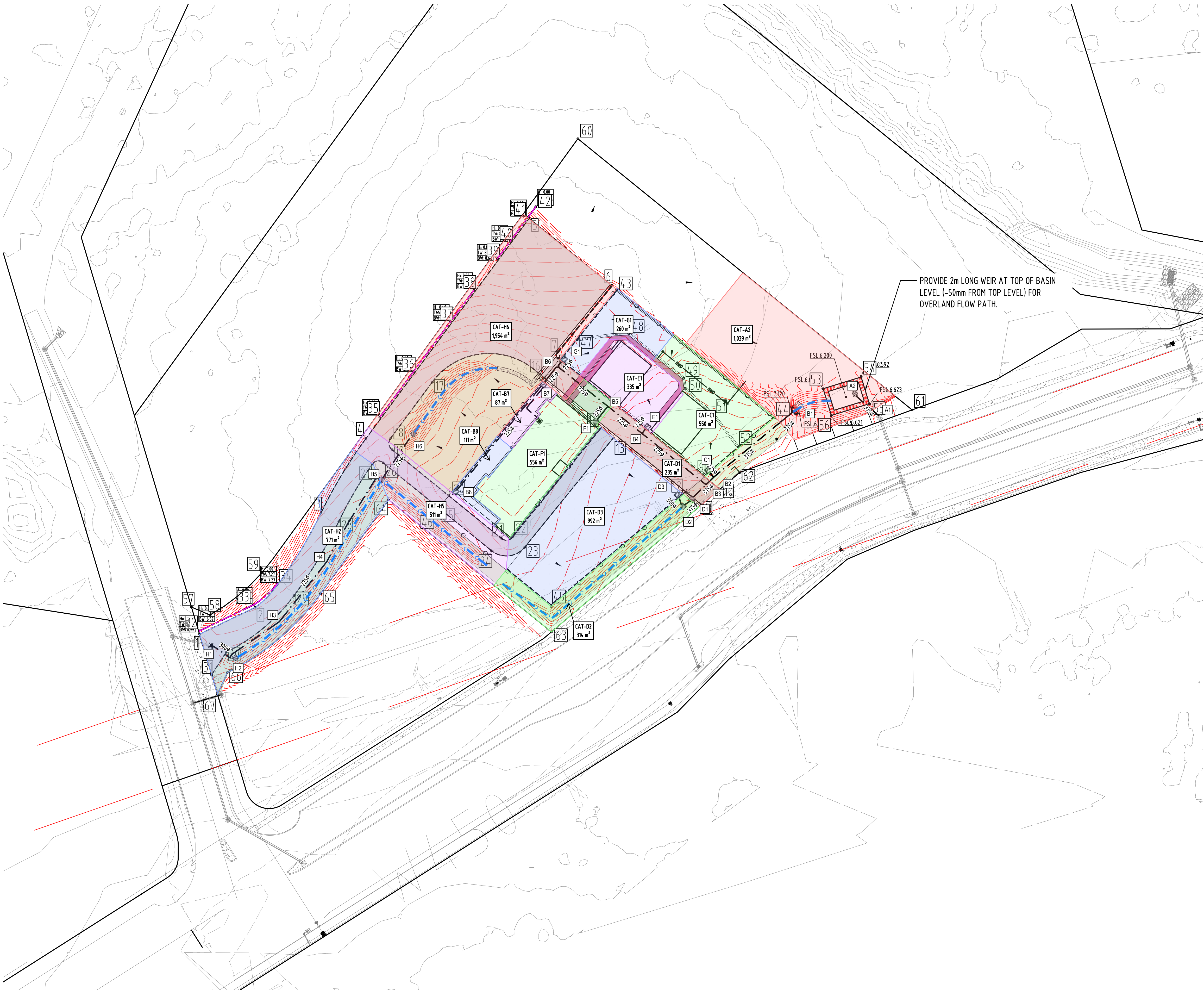
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Job Number

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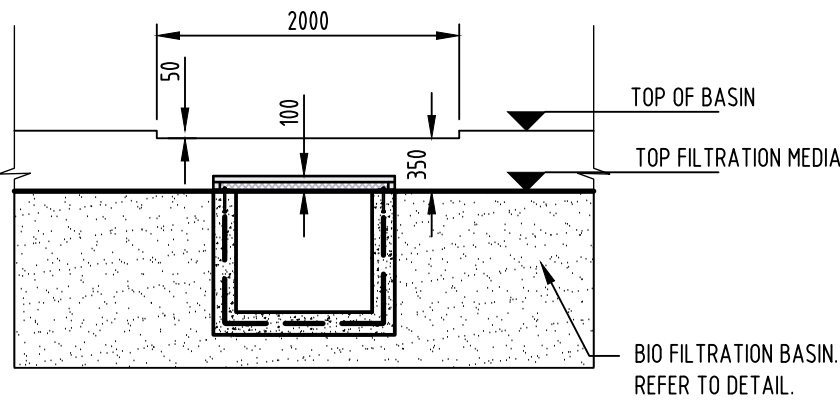
Rev.

WGA231007-DR-CV-0009 0



- LEGEND:**
- EXISTING CONTOURS
 - DESIGN CONTOURS (100mm INTERVALS)
 - FALL DIRECTION
 - CABLE TRENCH
 - STORMWATER PIPE - HDPE AG DRAIN @ MIN. 0.5% GRADE
 - STORMWATER PIPE - BLACKMAX
 - STORMWATER PIPE - PVC DN100 S/N8
 - CABLE TRENCH DRAINAGE
 - INSTALL @ MIN. 0.5% GRADE
 - RAISED SURGE GRATED PIT (900x900)
 - VEE-GRATE INLET PIT
 - STORMWATER GRATED INLET PIT
 - STORMWATER JUNCTION BOX
 - STORMWATER CATCHMENT AREA
 - STORMWATER DRAINAGE PIT No.
 - SWALE DRAIN
 - HEADWALL OUTLET AND ROCK SCOUR PROTECTION, REFER DETAIL.

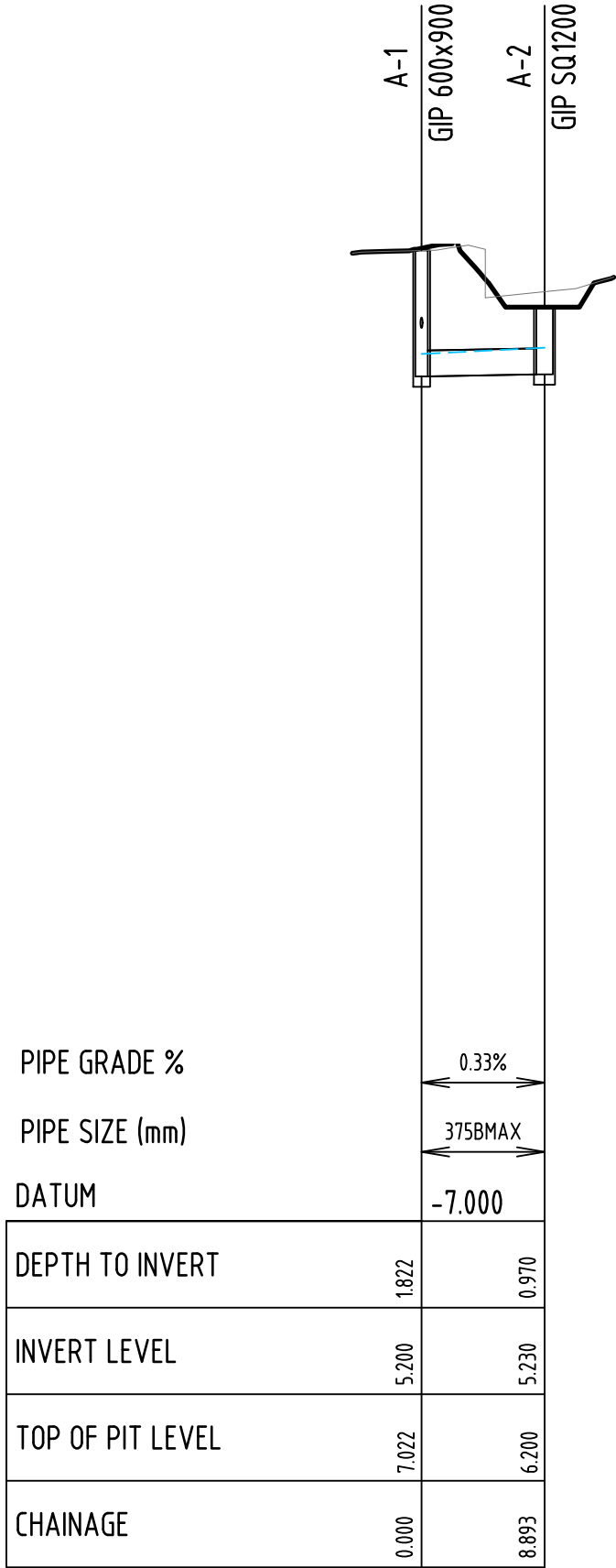
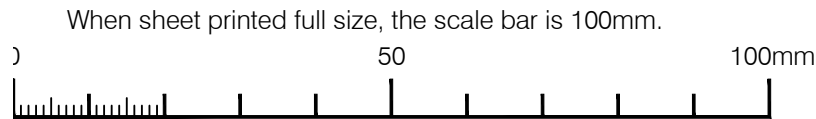
- NOTES**
- CONTRACTOR TO VERIFY ALL STORMWATER PIT INVERT LEVELS AND TOP LEVELS.
 - REFER TO DRAWING WGA231007-DR-CV-0010 FOR DRAINAGE LONGITUDINAL SECTIONS.
 - REFER TO DRAWING WGA231007-DR-CV-0006 FOR KERBS AND SPOONDRAIN LOCATION.



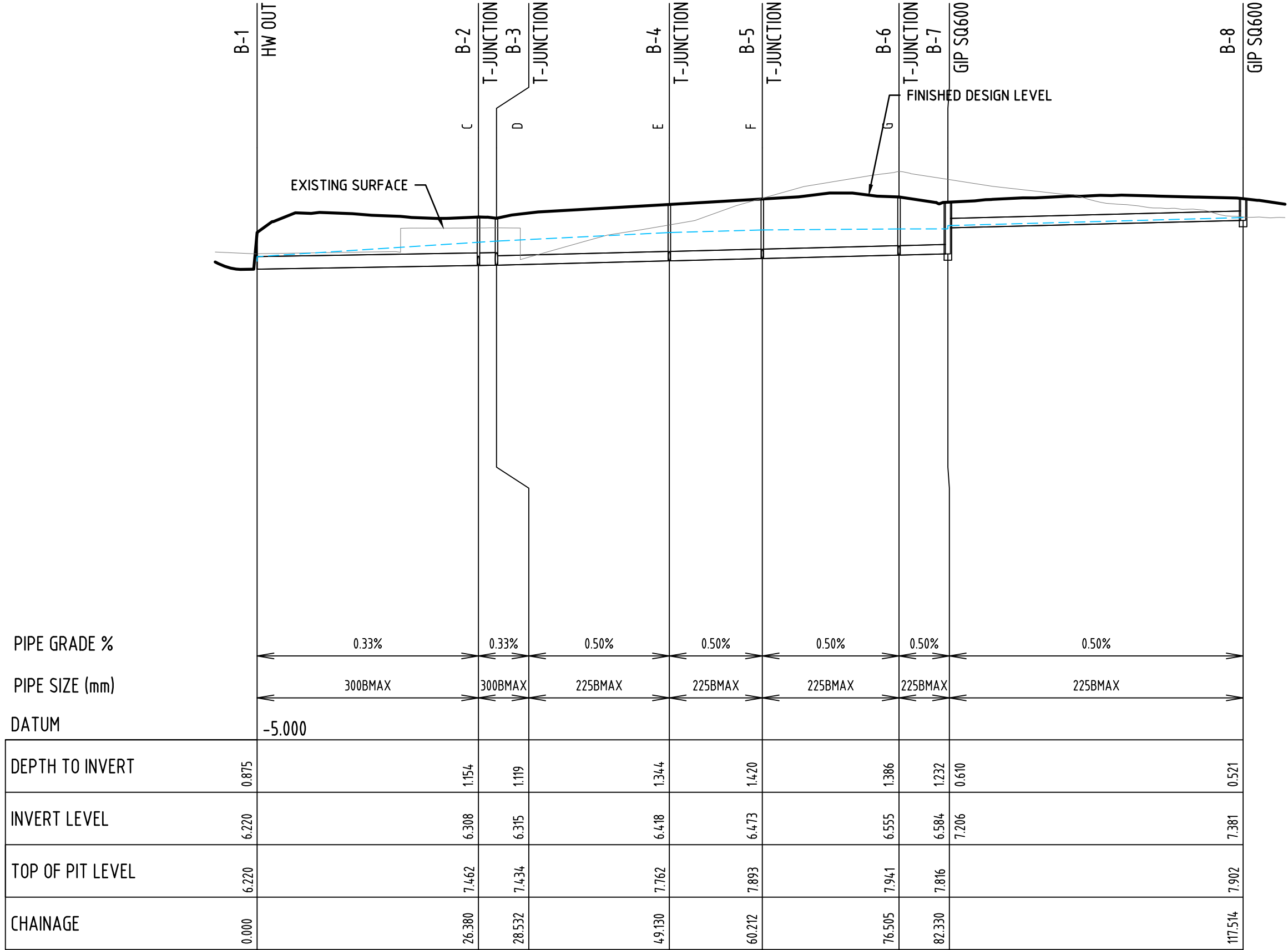
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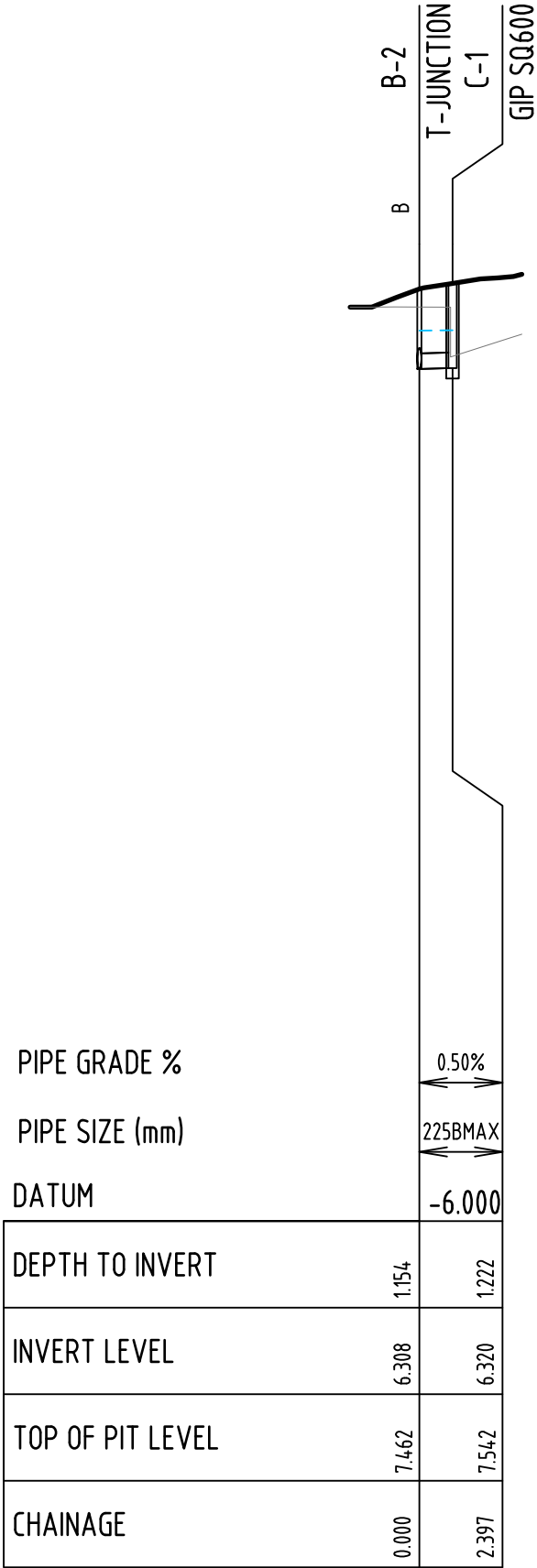
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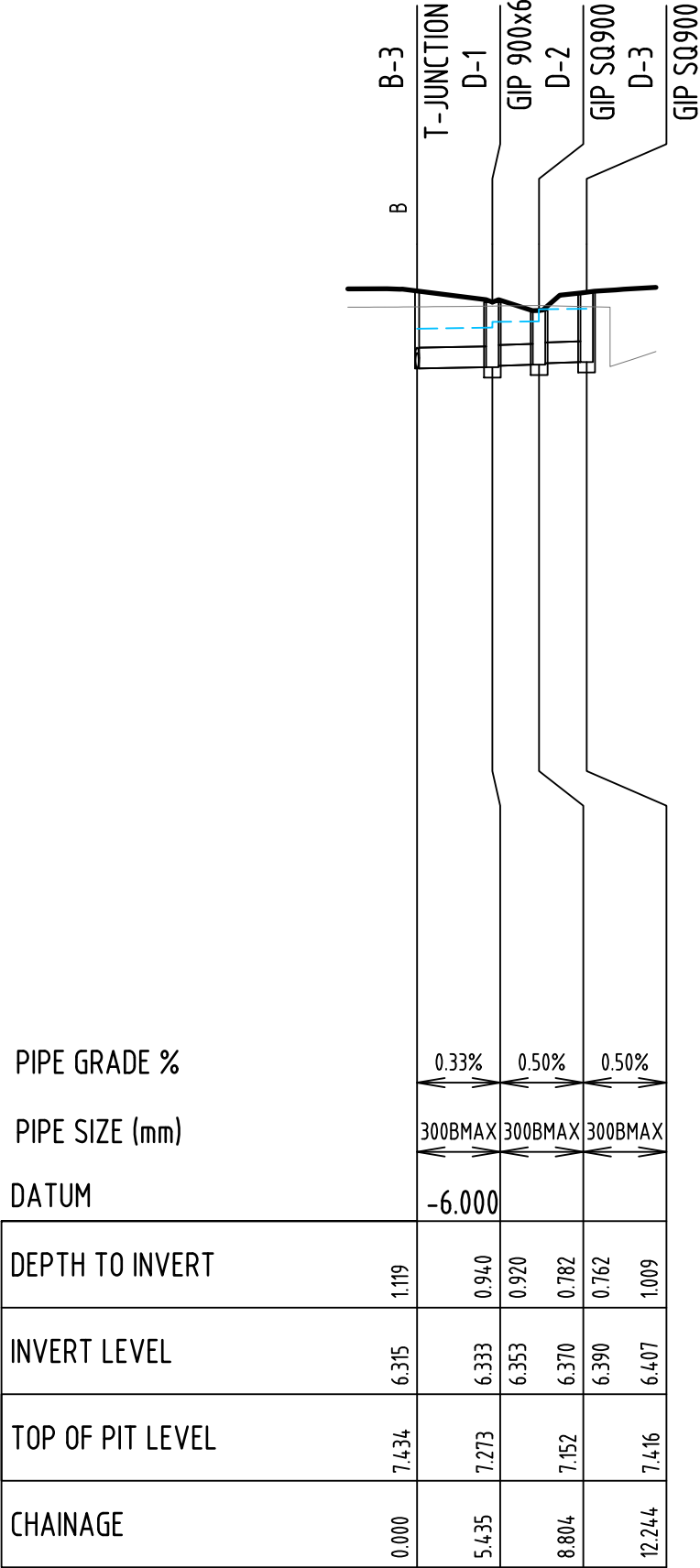
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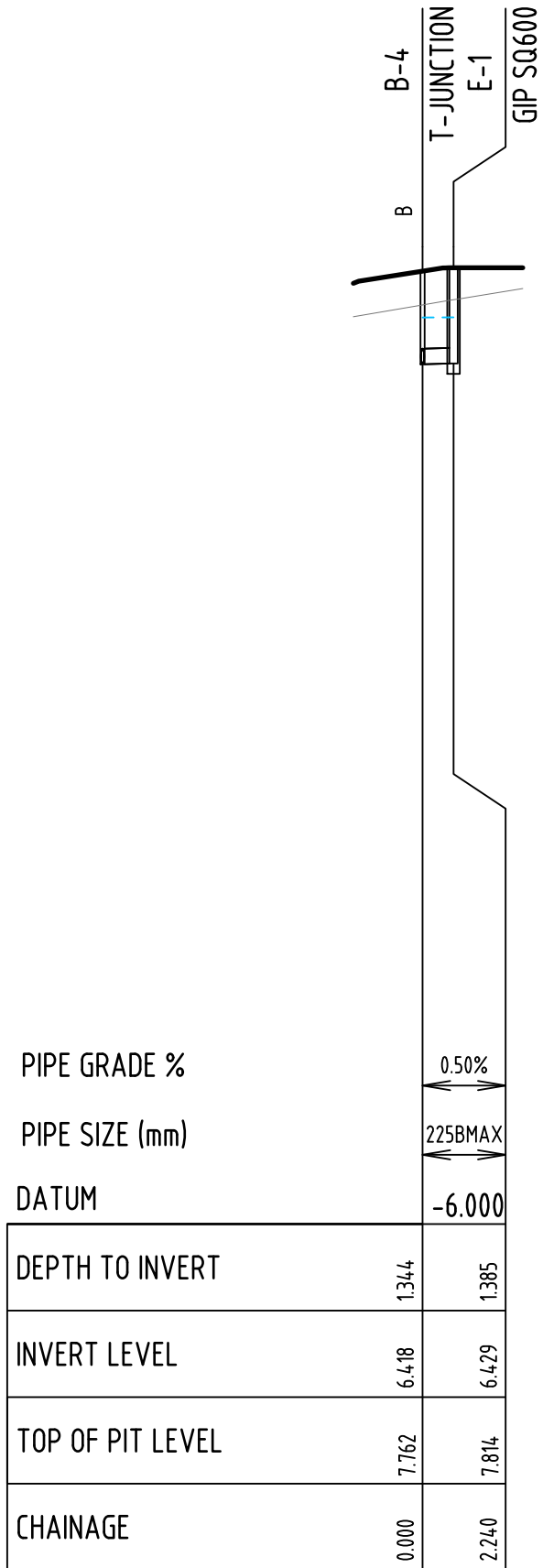
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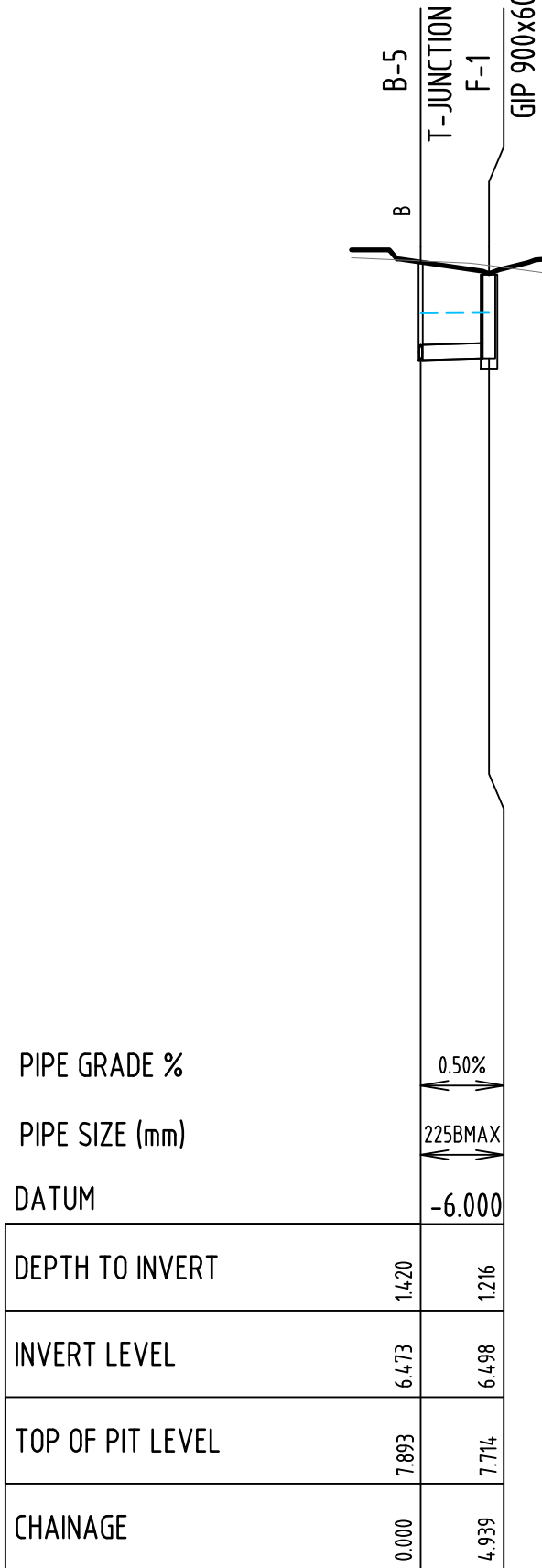
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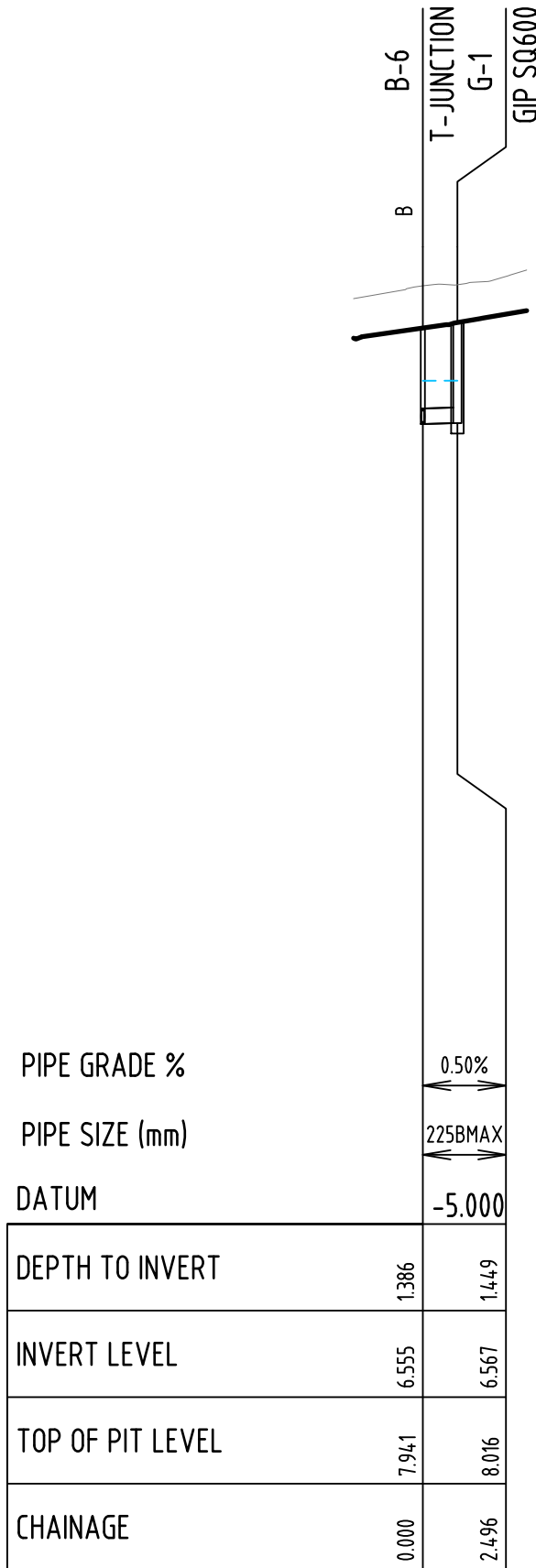
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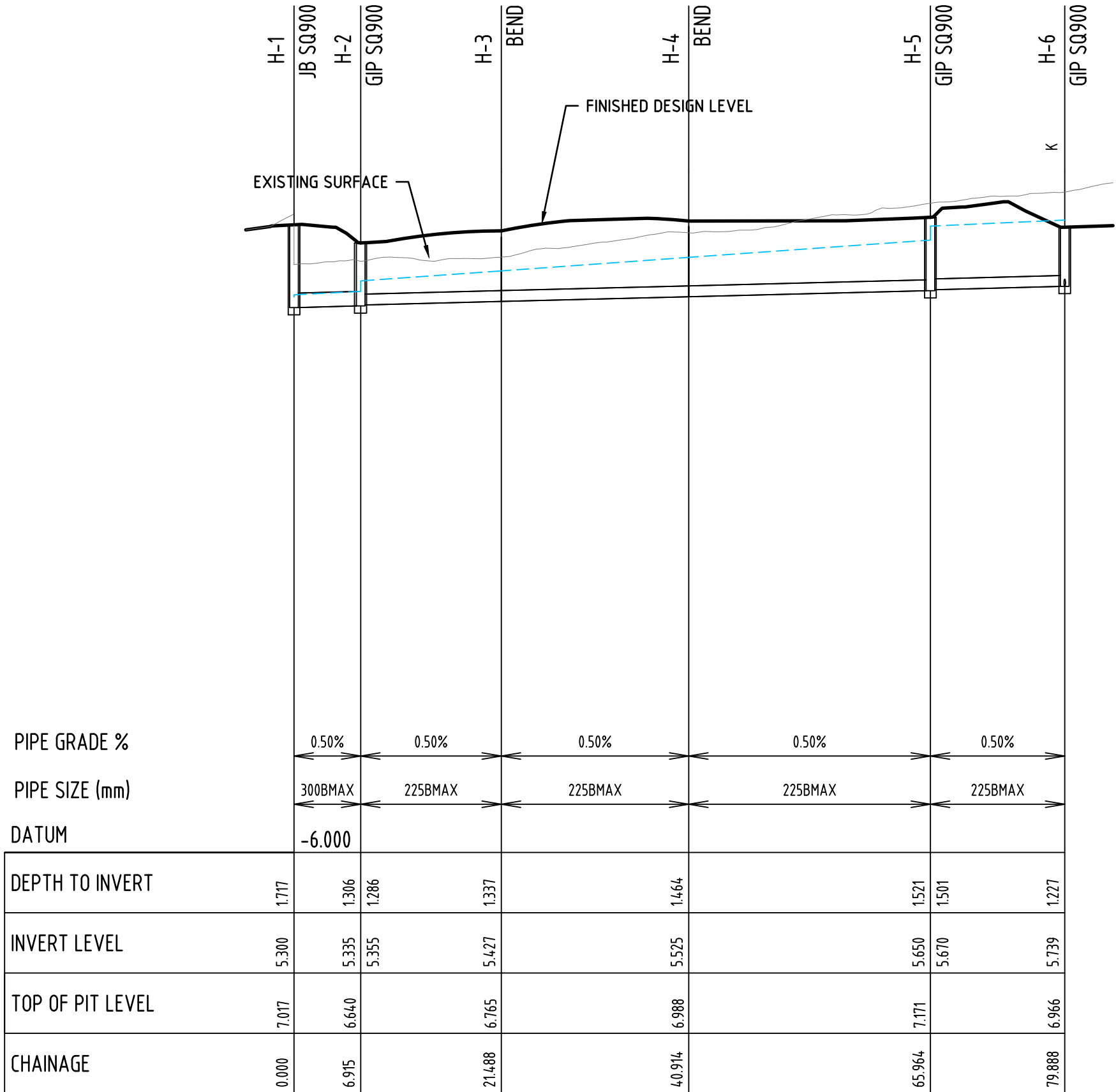
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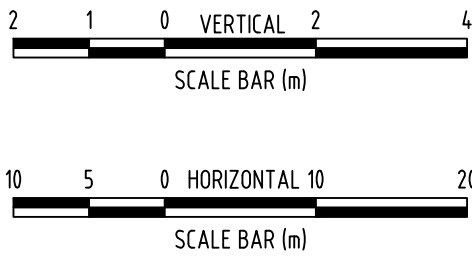
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H



REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
0	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF



APD ENGINEERING

KINGS FOREST SUBSTATION - CIVIL DESIGN

STORMWATER LONG-SECTION

CLIENT DRAWING NUMBER: KFTC206-2

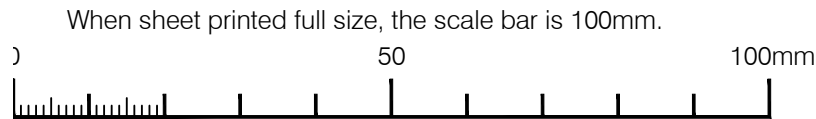
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DRAWING NUMBER

Job Number Sheet No. Rev.

WGA231007-DR-CV-0010

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Drainage Pit Schedule												
Pit No.	Pit Type	Pit Width (internal)	Pit Length (internal)	Outlet Diameter	Outlet Invert RL	Inlet Diameter	Inlet Invert RL	Pit Depth	Pit Lid Level	Easting	Northing	Comment
		(mm)	(mm)	(mm)	(m)	(mm)	(m)	(m)	(m)	(m)	(m)	
A1	GIP - 600x900SQ (EXISTING)	600	900	375	5.200	375	5.220	1.822	7.022	55114.010	70709.226	
A2	GIP - 1200SQ	1200	1200	375	5.230			0.970	6.200	55092.759	70725.673	
B1	HEADWALL OUTLET			300	6.220					55090.952	70711.578	
B2	T JUNCTION											
B3	T JUNCTION											
B4	T JUNCTION											
B5	T JUNCTION											
B6	T JUNCTION											
B7	GIP - 600SQ	600	600	225	6.584	225	7.206	1.232	7.816	55028.659	70717.603	
B8	GIP - 600SQ	600	600	225	7.381			0.521	7.902	55006.348	70690.398	
C1	GIP - 600SQ	600	600	225	6.320			1.222	7.542	55069.750	70695.203	
D1	GIP - 600x900 (V GRATE)	600	900	300	6.333	300	6.353	0.940	7.273	55066.355	70688.514	
D2	GIP - 900SQ	900	900	300	6.370	300	6.390	0.782	7.152	55064.155	70686.643	
D3	GIP - 900SQ	900	900	300	6.407			1.009	7.416	55062.696	70689.515	
E1	GIP - 600SQ	600	600	225	6.429			1.385	7.814	55055.058	70706.912	
F1	GIP - 600x900 (V GRATE)	600	900	225	6.498			1.216	7.714	55041.936	70708.226	
G1	GIP - 600SQ	600	600	225	6.567			1.449	8.016	55033.890	70724.033	
H1	JB - 900SQ	900	900	300	5.300	300	5.320	1.717	7.017	54944.275	70651.282	
H2	GIP - 900SQ	900	900	300	5.335	225	5.355	1.306	6.915	54950.350	70648.197	
H3	BEND											
H4	BEND											
H5	GIP - 900SQ	900	900	225	5.650	225	5.670	1.521	7.171	54987.555	70693.518	
H6	GIP - 900SQ	900	900	225	5.739			1.227	6.966	54995.575	70705.061	



REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
0	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF

APD ENGINEERING

KINGS FOREST SUBSTATION - CIVIL DESIGN

STORMWATER PIT SCHEDULE

A1

DRAWING NUMBER

CLIENT DRAWING NUMBER:

KFTC206-3

Design

Drawn

APE

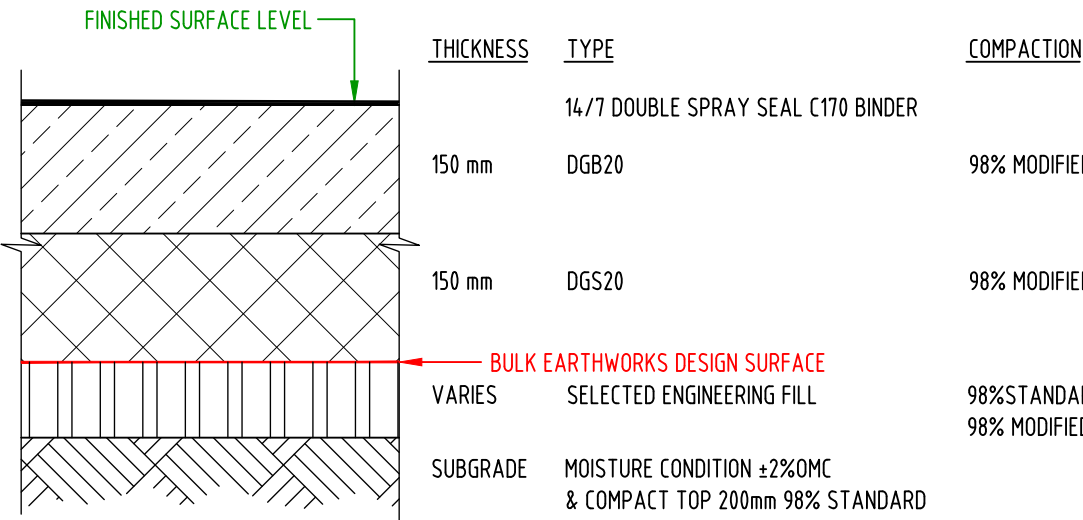
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WGA231007-DR-CV-0011

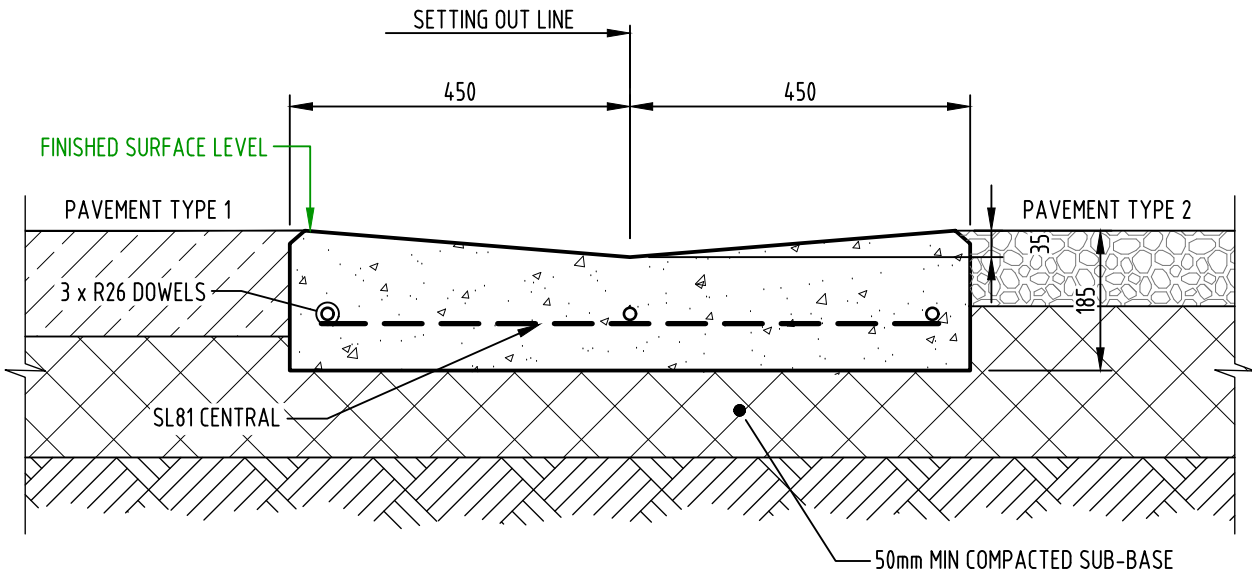
Job Number

Sheet No.

Rev.

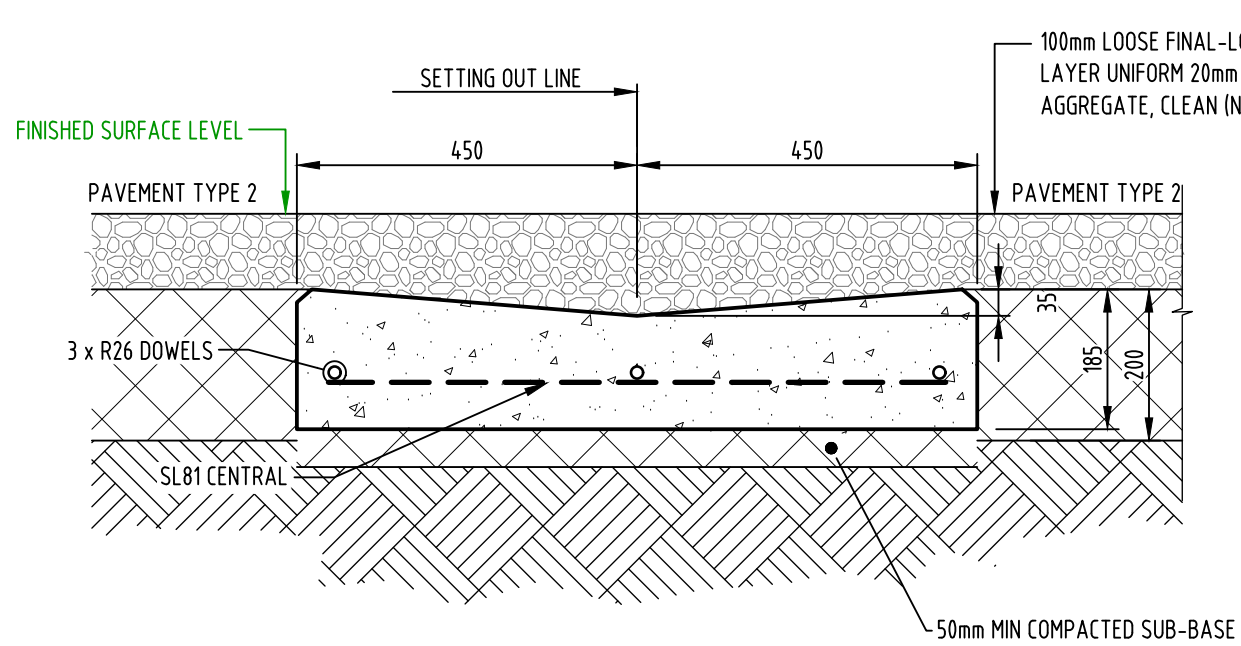


PAVEMENT TYPE 1 - SPRAY SEAL BITUMEN



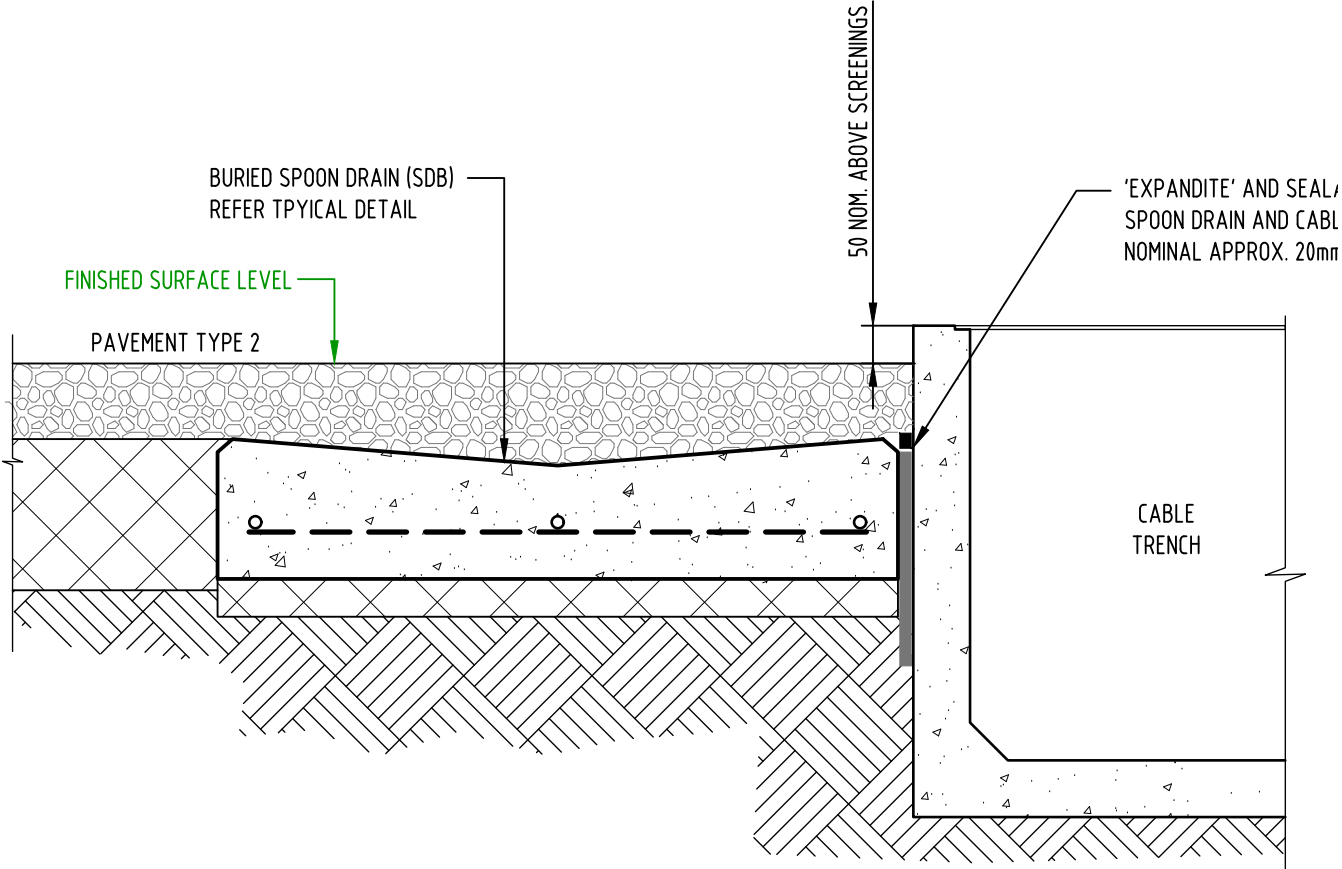
SPOON DRAIN (SD)

SCALE 1:10
NOTE: PROVIDE TOOLED JOINTS AT 3000 c/c.



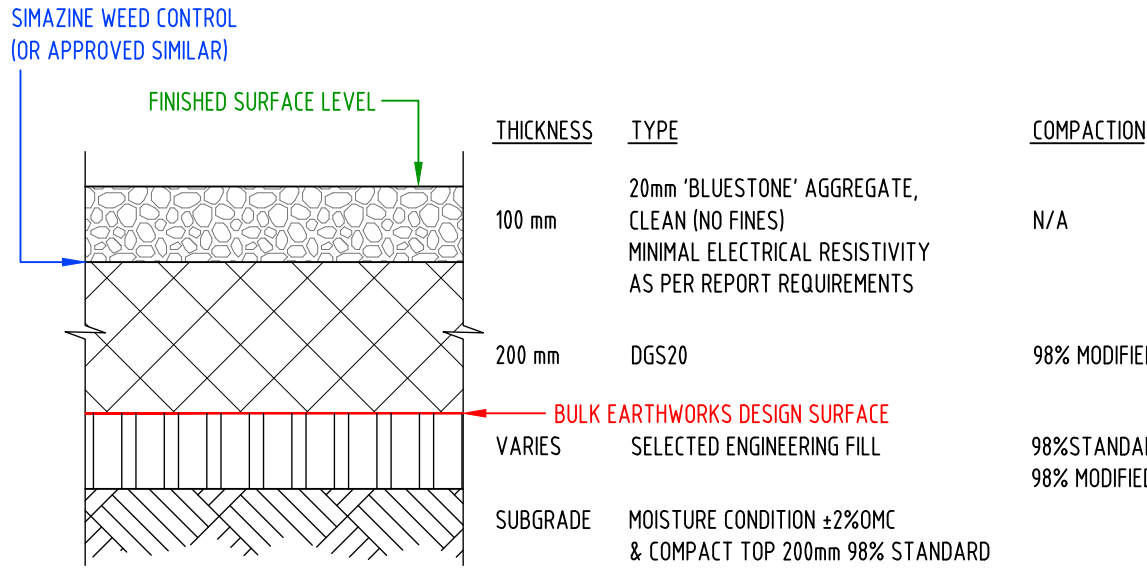
BURIED SPOON DRAIN (BSD)

SCALE 1:10
NOTE: PROVIDE TOOLED JOINTS AT 3000 c/c.

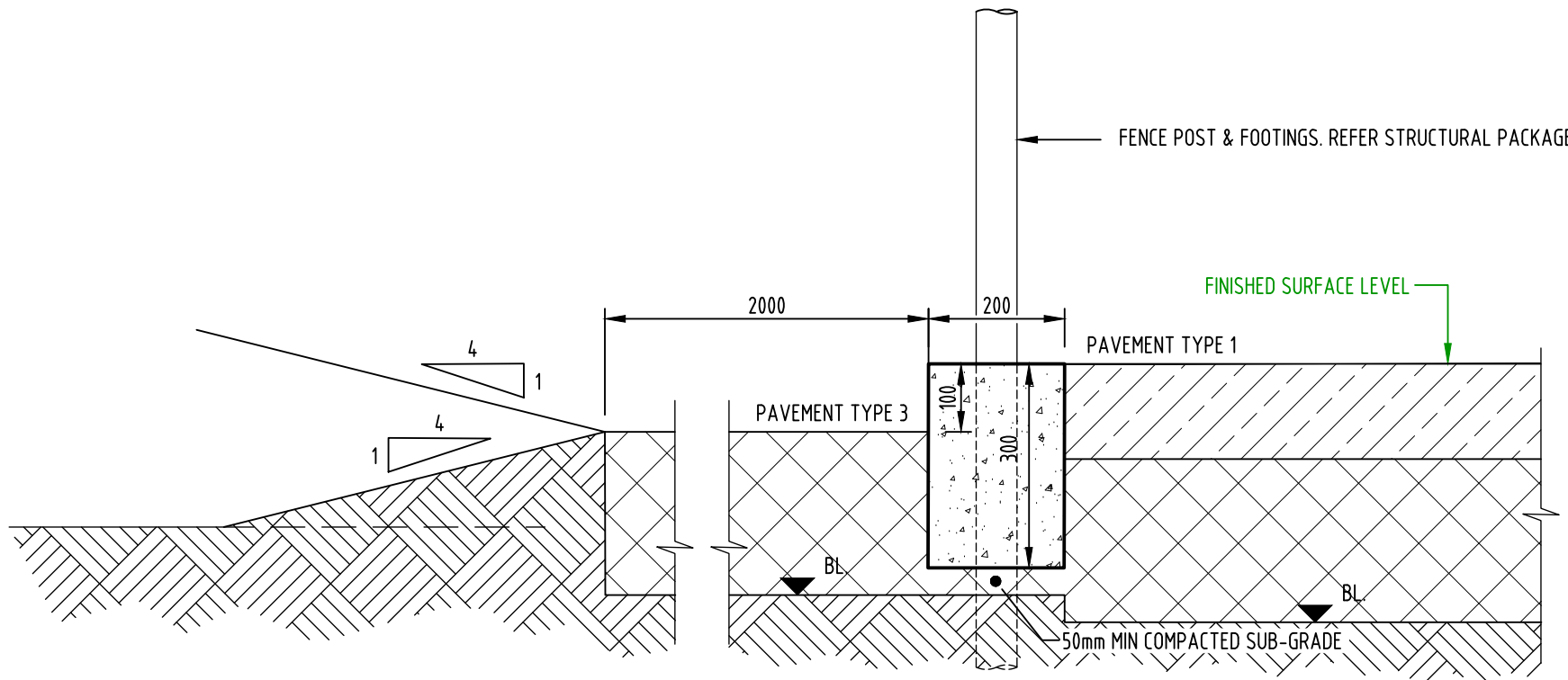


BURIED SPOON DRAIN (BSD) ADJACENT
CABLE TRENCH DETAIL

SCALE 1:10

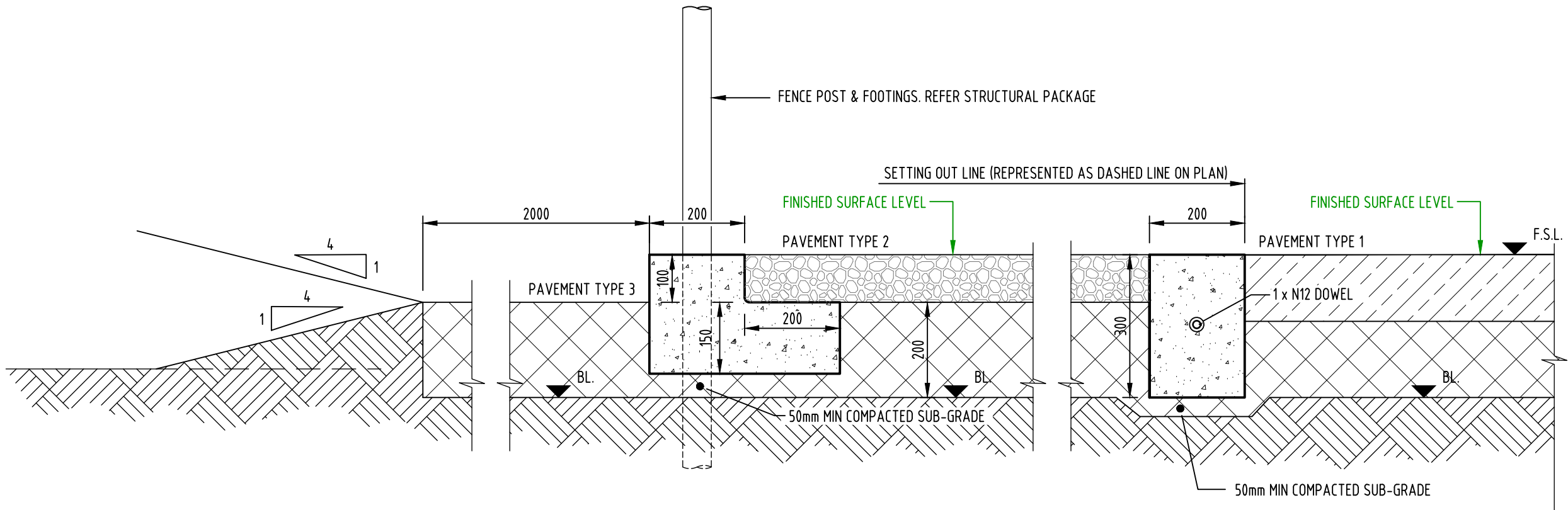


PAVEMENT TYPE 2 - SUB-STATION PAVEMENT



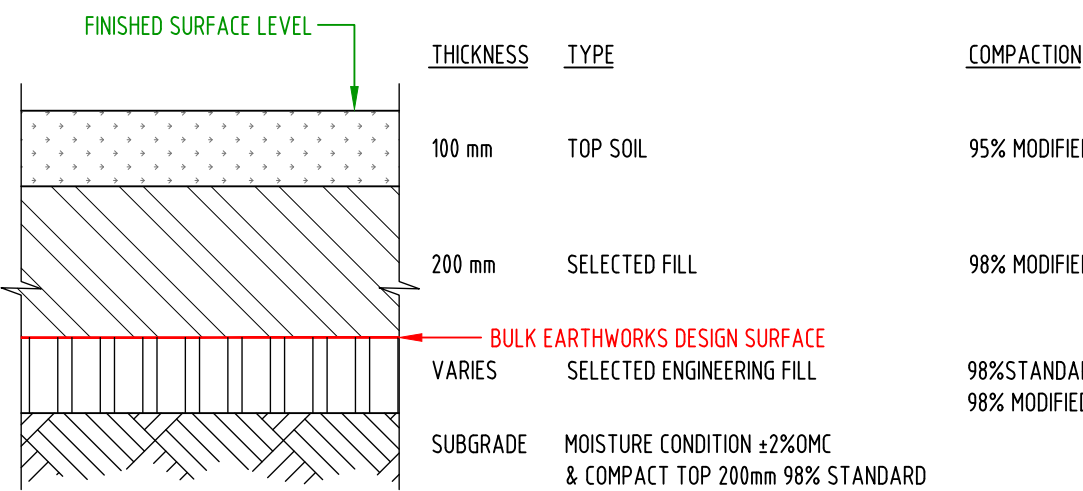
PLINTH DETAIL (P)

SCALE 1:10
NOTE: PROVIDE TOOLED JOINTS AT 3000 c/c.



DRAINAGE PLINTH DETAIL (DRP)

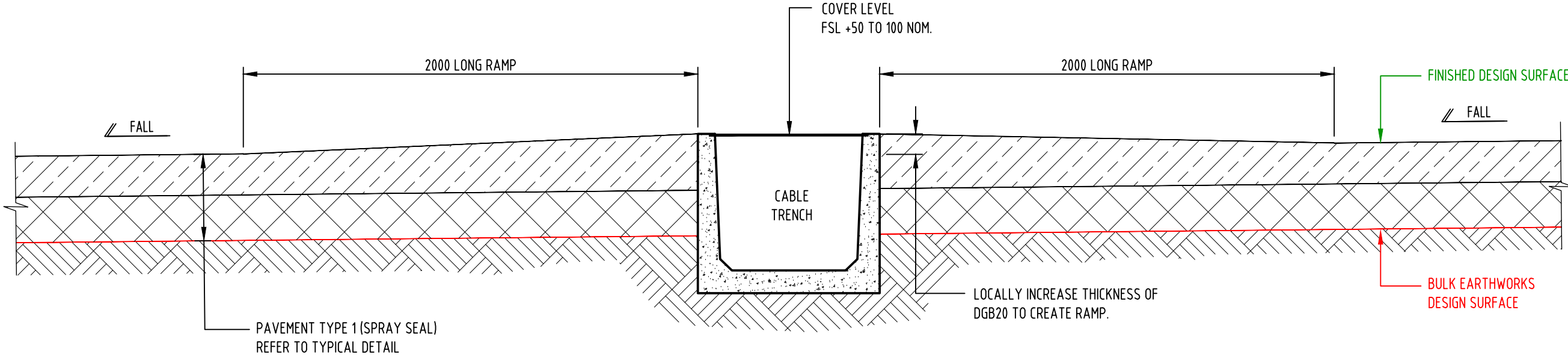
SCALE 1:10
NOTE: PROVIDE 10mm WIDE x 20mm DEEP TOOLED JOINTS AT 3000 c/c.



PAVEMENT TYPE 3 - LANDSCAPE

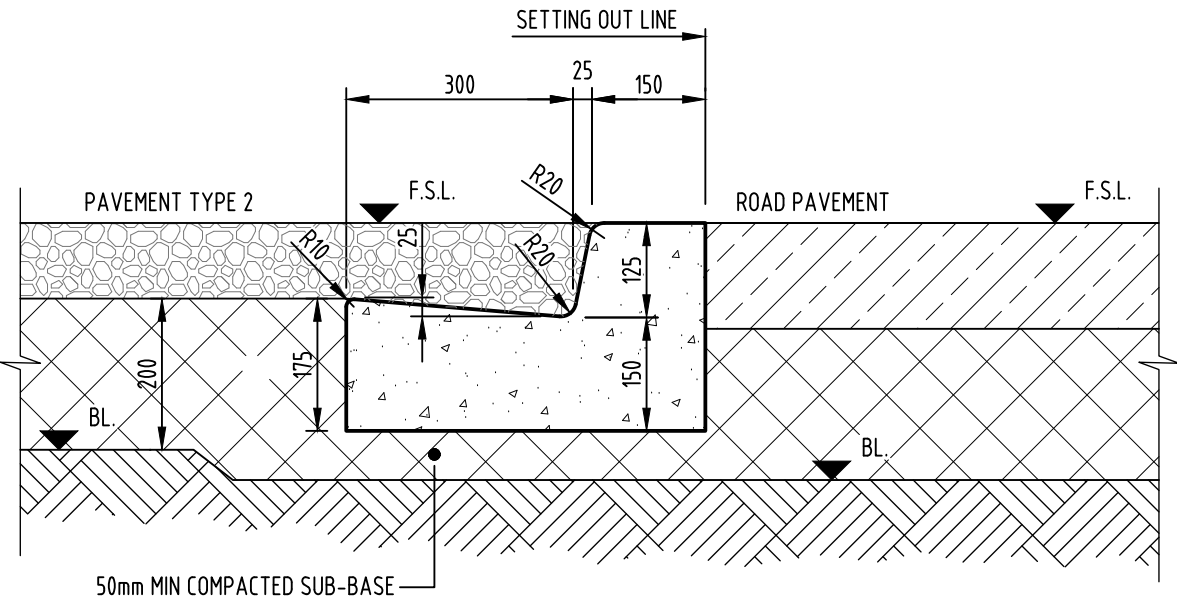
EDGE KERB DETAIL (EK)

SCALE 1:10
NOTE: PROVIDE 10 WIDE x 20 DEEP TOOLED JOINTS AT 3000 CTS. & DOWELLED JOINTS AT 6000 CTS. TERMINATE REINFORCEMENT AT JOINT & PROVIDE 2 R12 DOWELS x 400 LONG, GREASE ONE END.



CABLE TRENCH ROAD CROSSING RAMP DETAIL

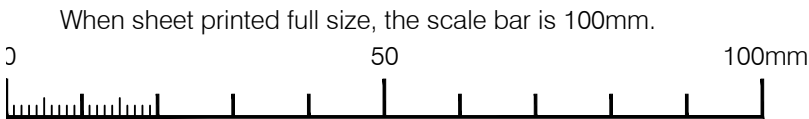
SCALE 1:20



BURIED KERB & GUTTER DETAIL (K&BG)

SCALE 1:10

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REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
0	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF

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APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

CIVIL DETAILS - SHEET 1

A1

CLIENT DRAWING NUMBER: KFTC207-1

DOCUMENT NUMBER

Project Number

Design APE

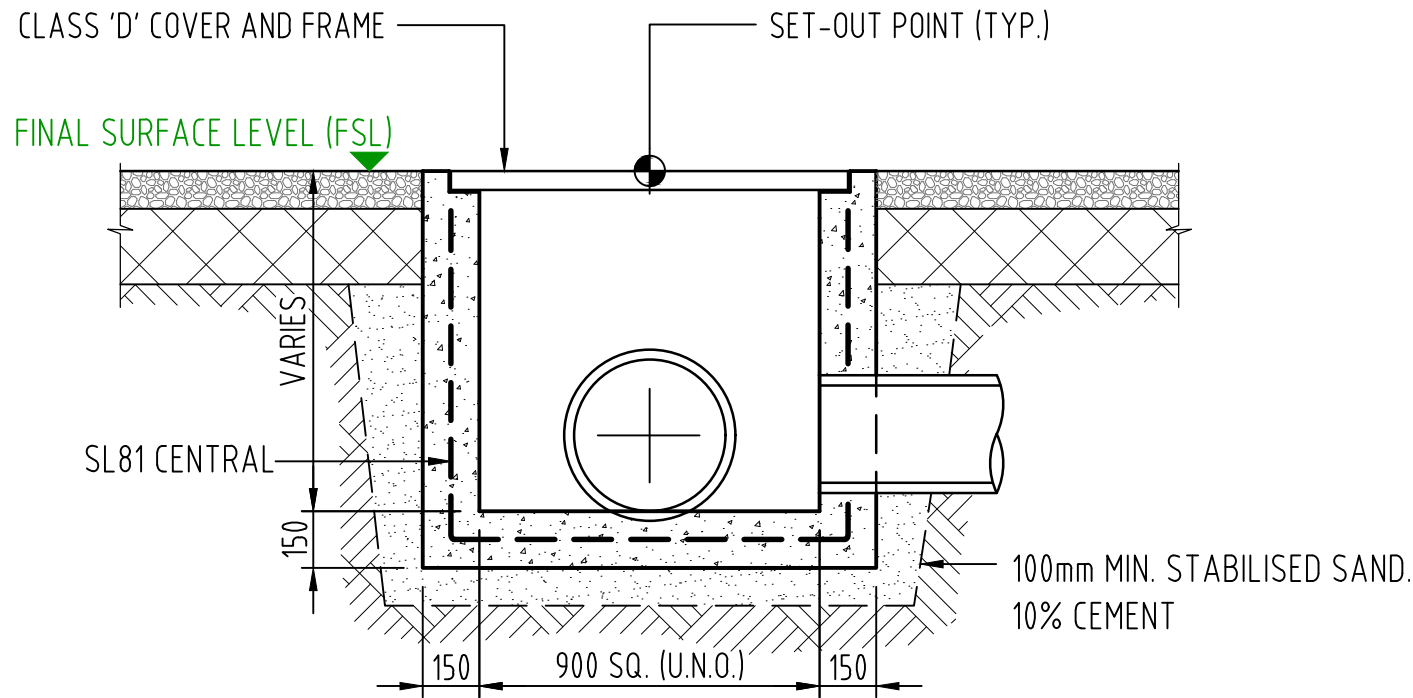
Drawn APE

Sheet No.

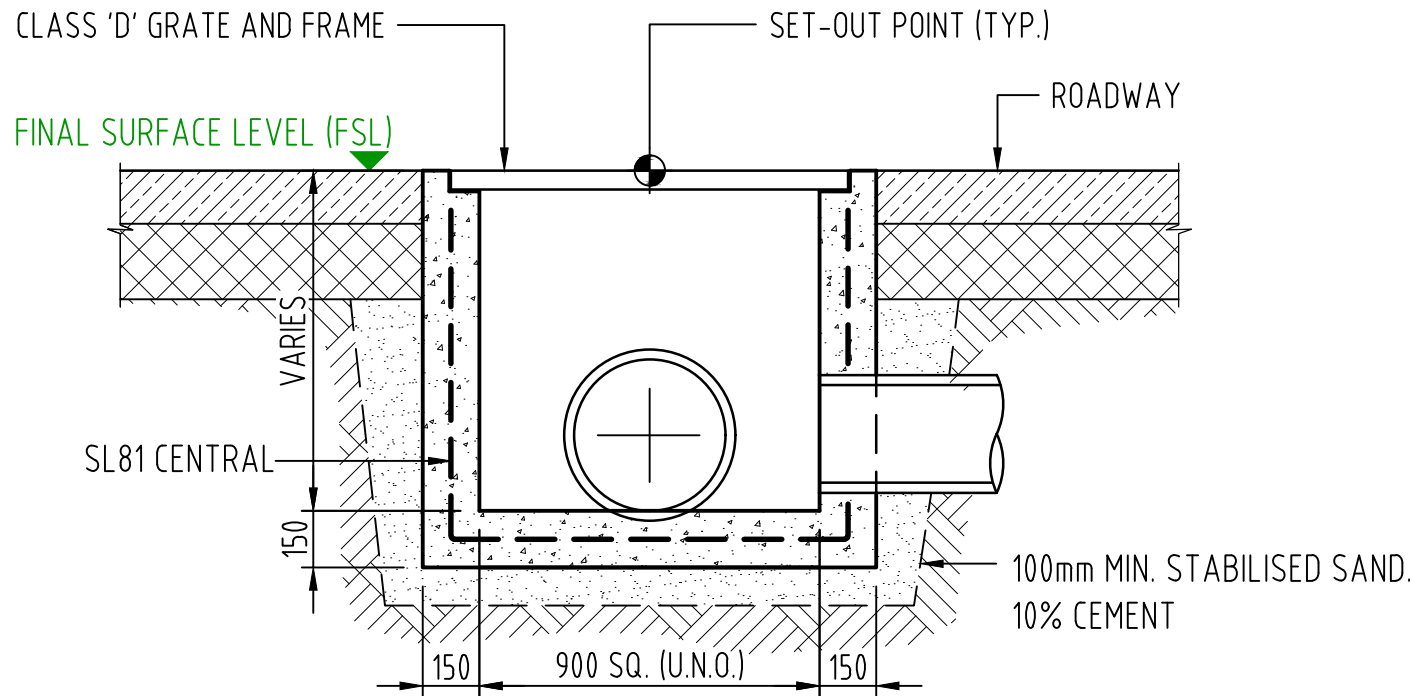
Rev.

WGA231007-DR-CV-0012

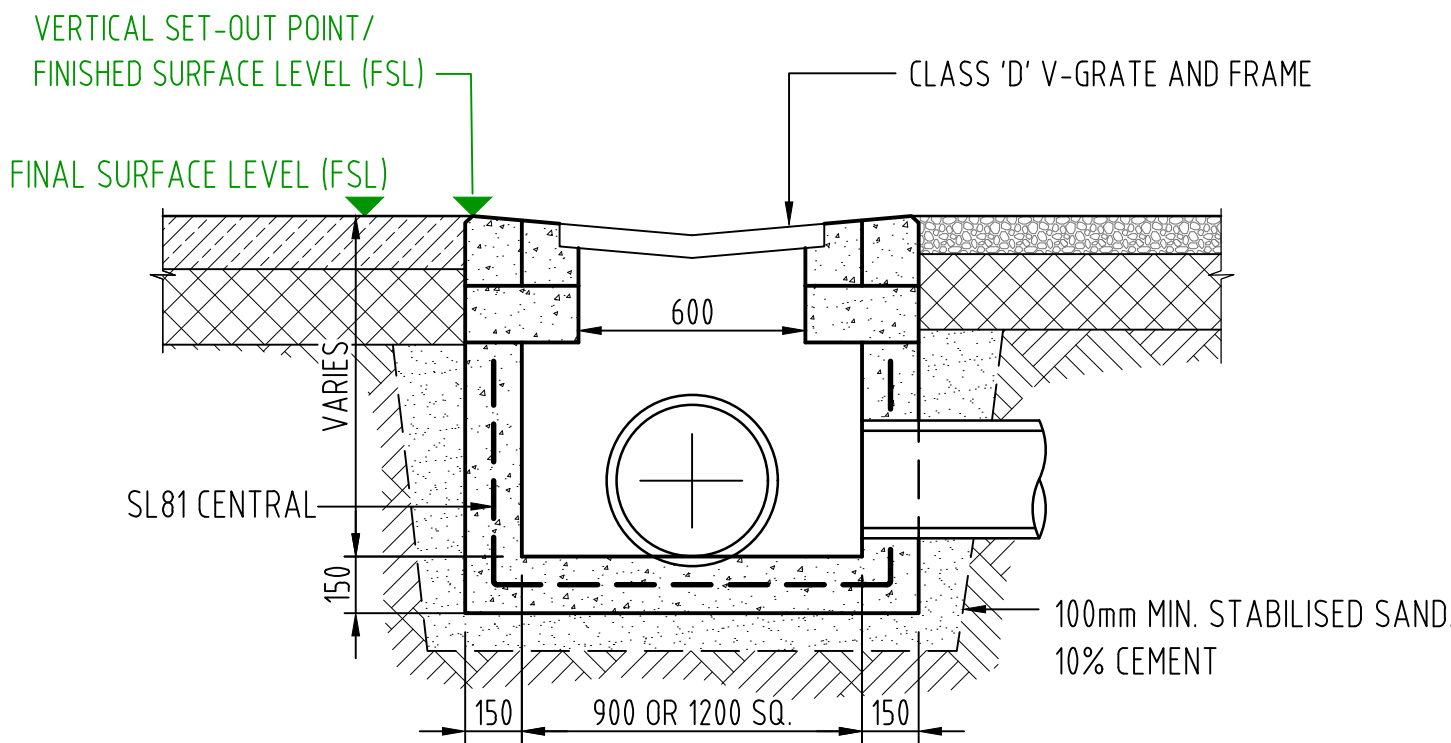
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STORMWATER JUNCTION BOX DETAIL (JB)
SCALE 1:20

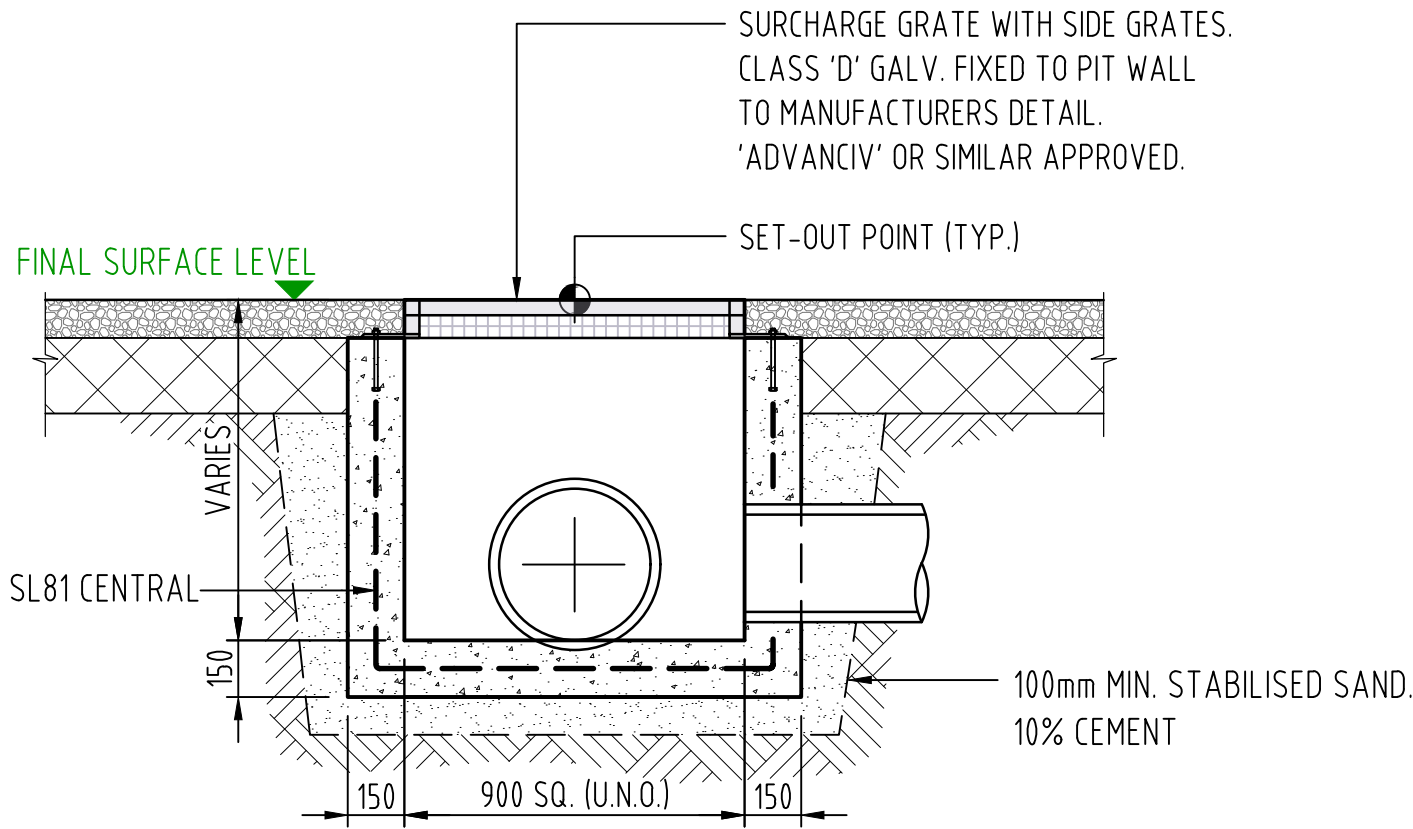


STORMWATER GRATED INLET PIT DETAIL (GIP)
SCALE 1:20



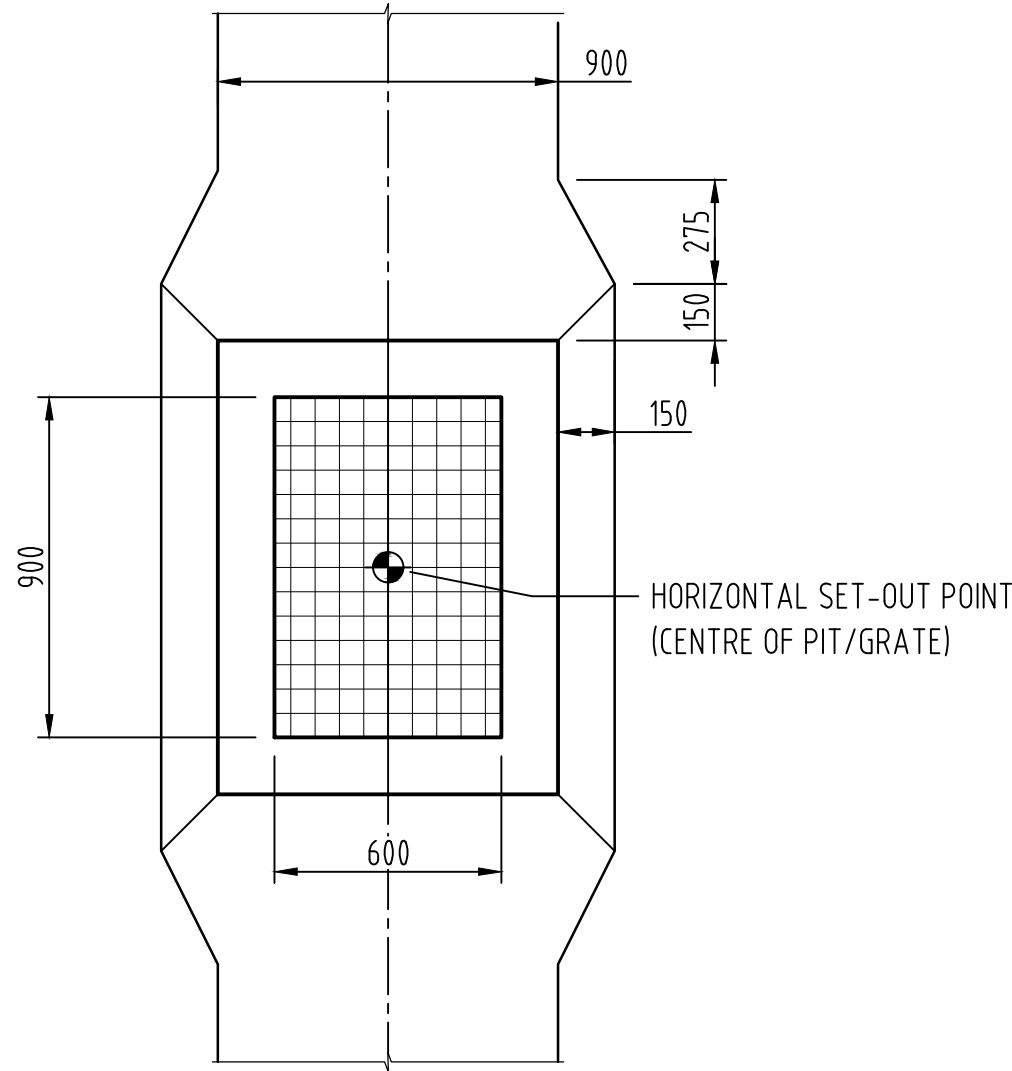
STORMWATER GRATED INLET PIT DETAIL (V-GRATE GIP)
SCALE 1:20

- NOTE:
1. ALL V-GRATE GIPs TYPICALLY TO BE 900 SQ. WITH 900 x 600 V-GRATE (U.N.O.)
 2. SHOP DRAWING TO BE PROVIDED FOR REVIEW

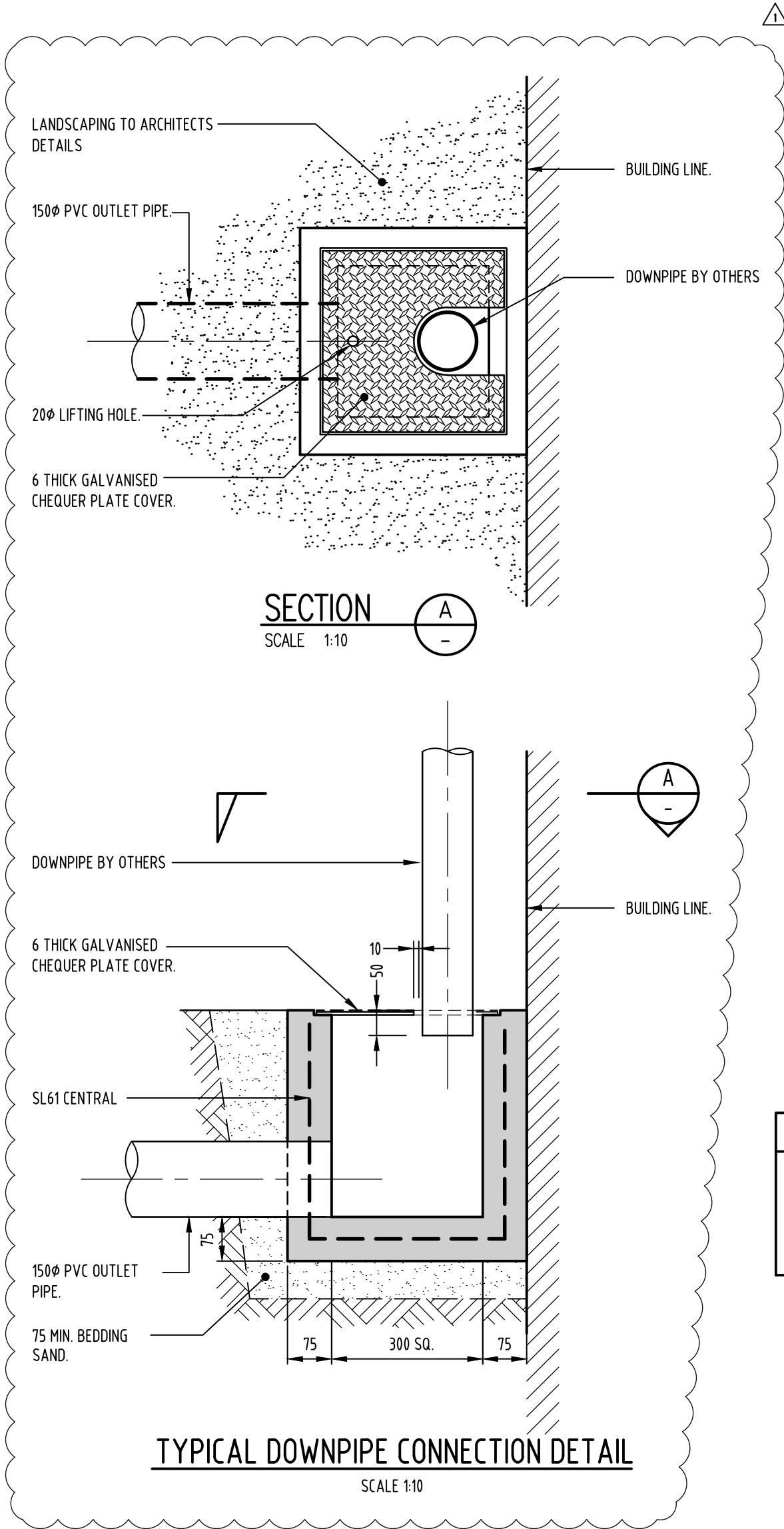


RAISED SURGE GRATED PIT DETAIL (S-GIP)
SCALE 1:20

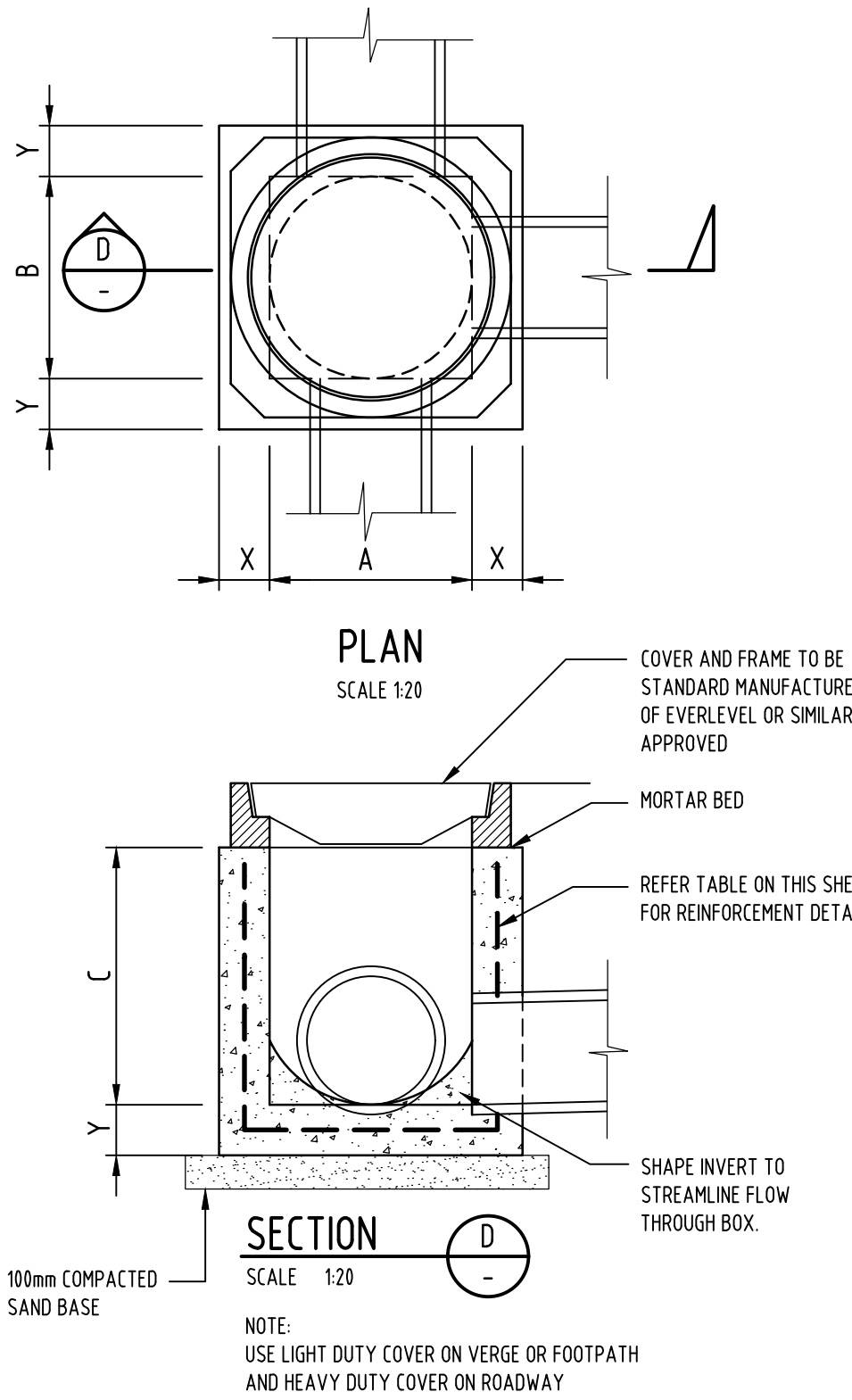
- NOTE:
- SHOP DRAWING TO BE PROVIDED FOR REVIEW



STORMWATER GRATED INLET PIT DETAIL (V-GRATE GIP)
PLAN IN SPOON DRAIN



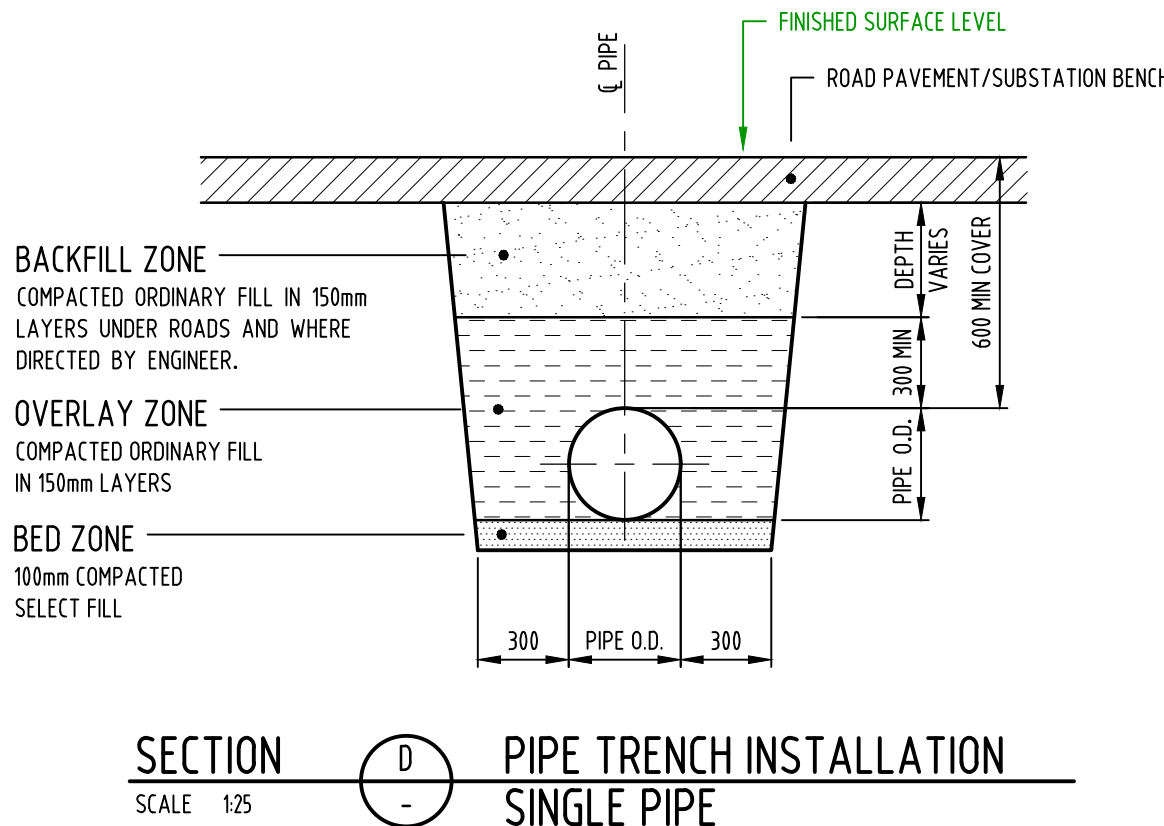
TYPICAL DOWNPIPE CONNECTION DETAIL
SCALE 1:10



GRATED INLET PIT	DIMENSION 'X'	DIMENSION 'Y'	COVER & FRAME
300 SQUARE	75	75	CLASS 'D'
450 SQUARE	100	100	CLASS 'D'
600 SQUARE	150	150	CLASS 'D'
900 SQUARE	150	150	CLASS 'D'

- GENERAL NOTES
1. CLEAR COVER OVER REINFORCEMENT TO BE MINIMUM 50mm.
 2. REINFORCEMENT CUT TO ALLOW 50mm CLEAR COVER AROUND PIPE PROFILES.
 3. COVER AND FRAME OF THE JB (ON VERGE OR FOOTPATH) SHALL BE CONSTRUCTED WITH A LEVEL TOP.

JUNCTION BOX DETAILS



SECTION SCALE 1:25 PIPE TRENCH INSTALLATION SINGLE PIPE

PIT CODE	TRAFFIC (T)	NON-TRAFFIC (N-T)	A	B	C	WALL MESH	BASE MESH
1	N-T		600	600	900	SL62	SL62
2	N-T		600	600	1200	SL62	SL62
3	N-T		900	900	1500	SL72	SL62
4	N-T		900	900	1500	SL72	SL62
5	N-T		900	900	3000	SL72	SL62
6	N-T		1200	1200	2000	SL82	SL72
7	N-T		1200	1200	3500	SL92	SL72

REINFORCEMENT TABLE

NOTE:
IF PHYSICAL ACCESS IS REQUIRED DIMENSIONS A AND B ARE TO BE 1200 x1200 MINIMUM. STEP IRONS ARE TO BE PROVIDED WHERE DEPTH EXCEEDS 1500.

- NOTE:
1. COVER AND FRAME TO BE STANDARD MANUFACTURE OF EVERLEVEL OR SIMILAR APPROVED.
 2. COVERS TO BE BOLT DOWN TYPE. BOLTS TO BE STAINLESS STEEL WITH HEADS FOR 7/32" ALLEN KEY AND 5/16" WHITWORTH THREADS.
 3. PIPE ENTRIES AT PRECAST PIT TO BE SEALED AT TIME OF LAYING WITH EPOXY RESIN.
 4. CENTRAL SUPPORT TO BE CAST INTO CONCRETE.
 5. CONCRETE STRENGTH - F'C=32MPA.

When sheet printed full size, the scale bar is 100mm.

0 50 100mm

REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
0	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF
1	18.01.24	CONSTRUCTION ISSUE	APE	APE	MF

WGA

APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

CIVIL DETAILS - SHEET 2

A1 DOCUMENT NUMBER

CLIENT DRAWING NUMBER: KFTC207-2

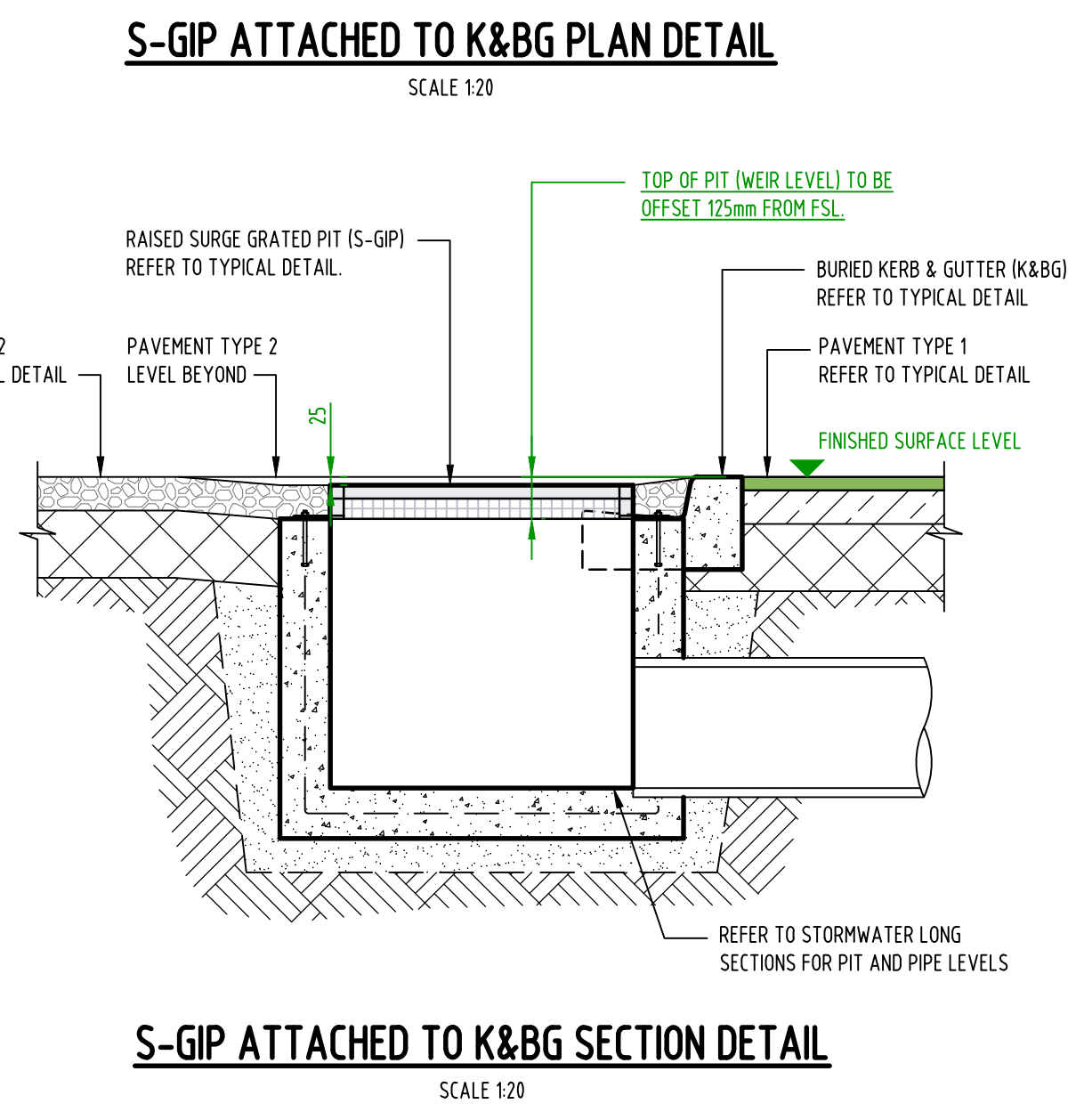
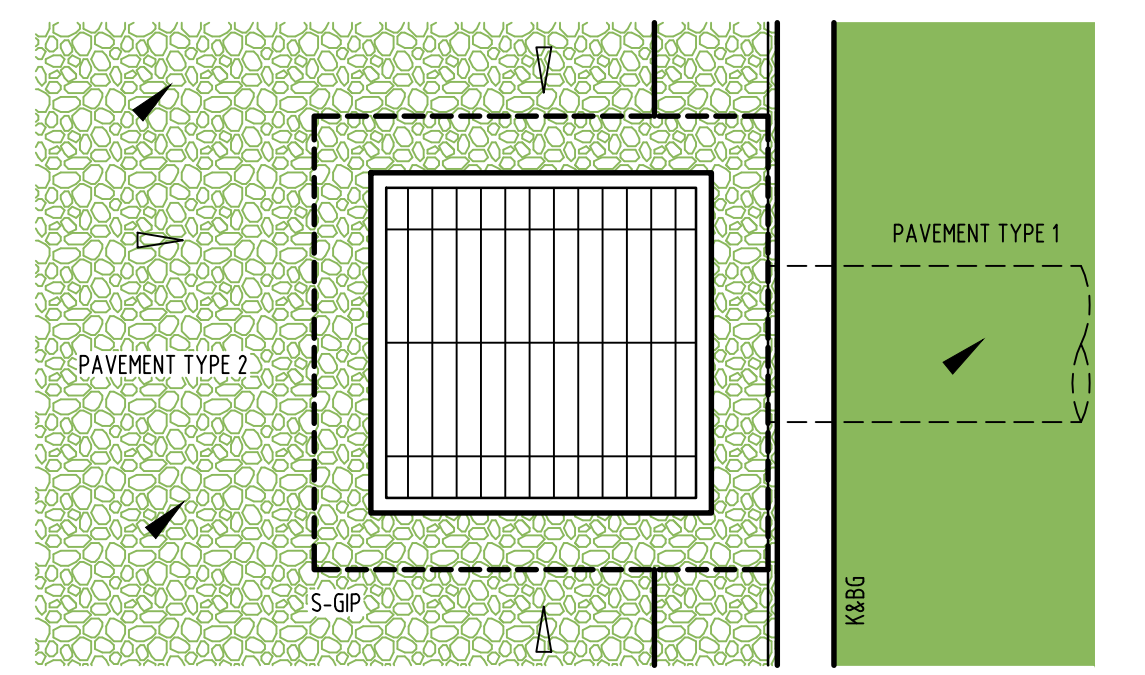
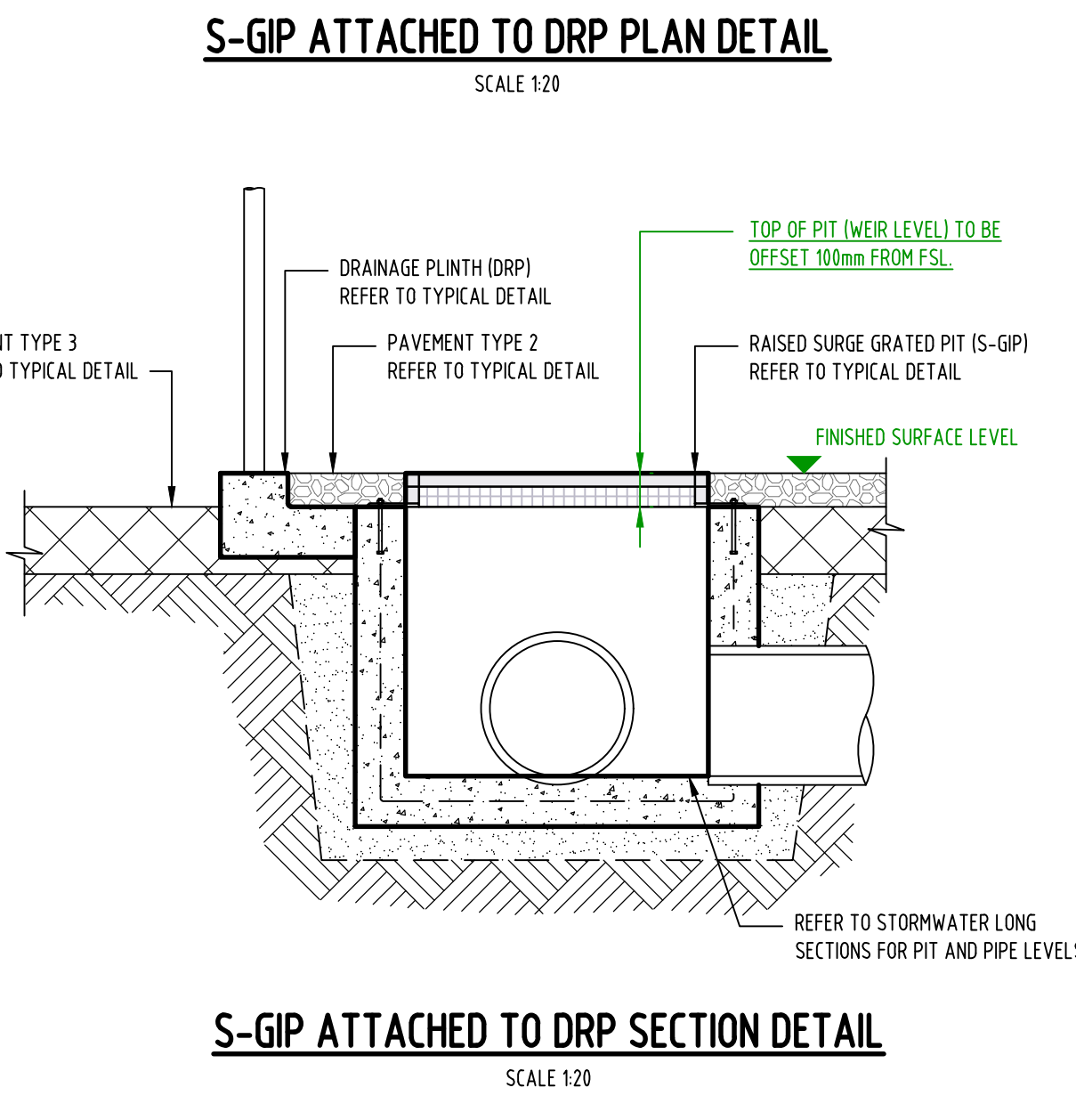
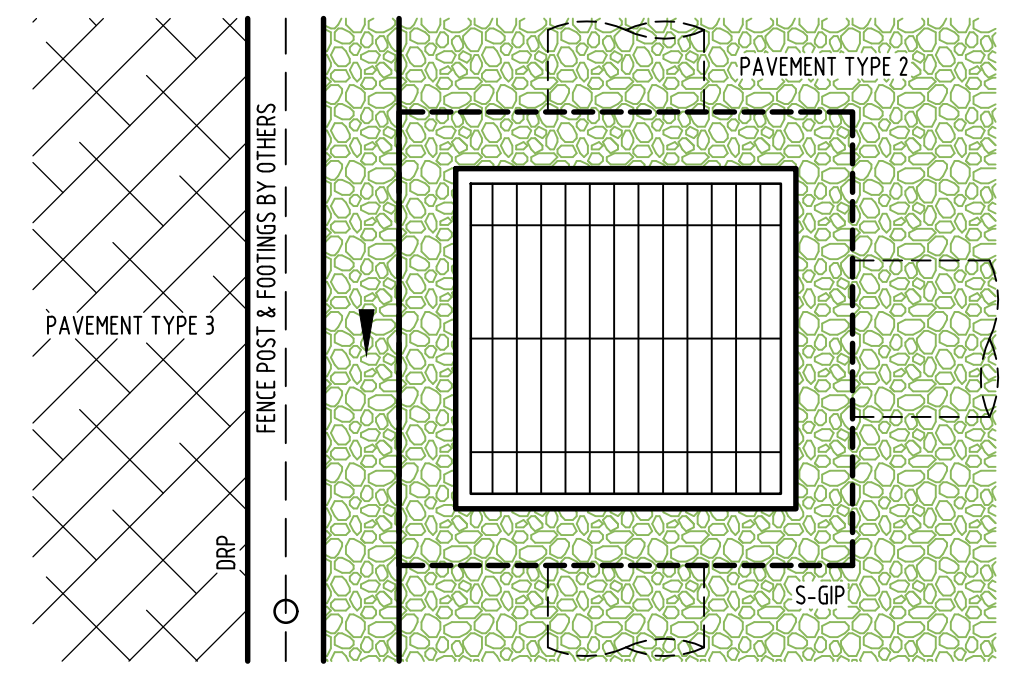
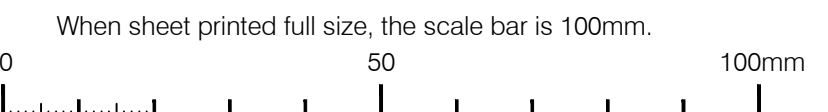
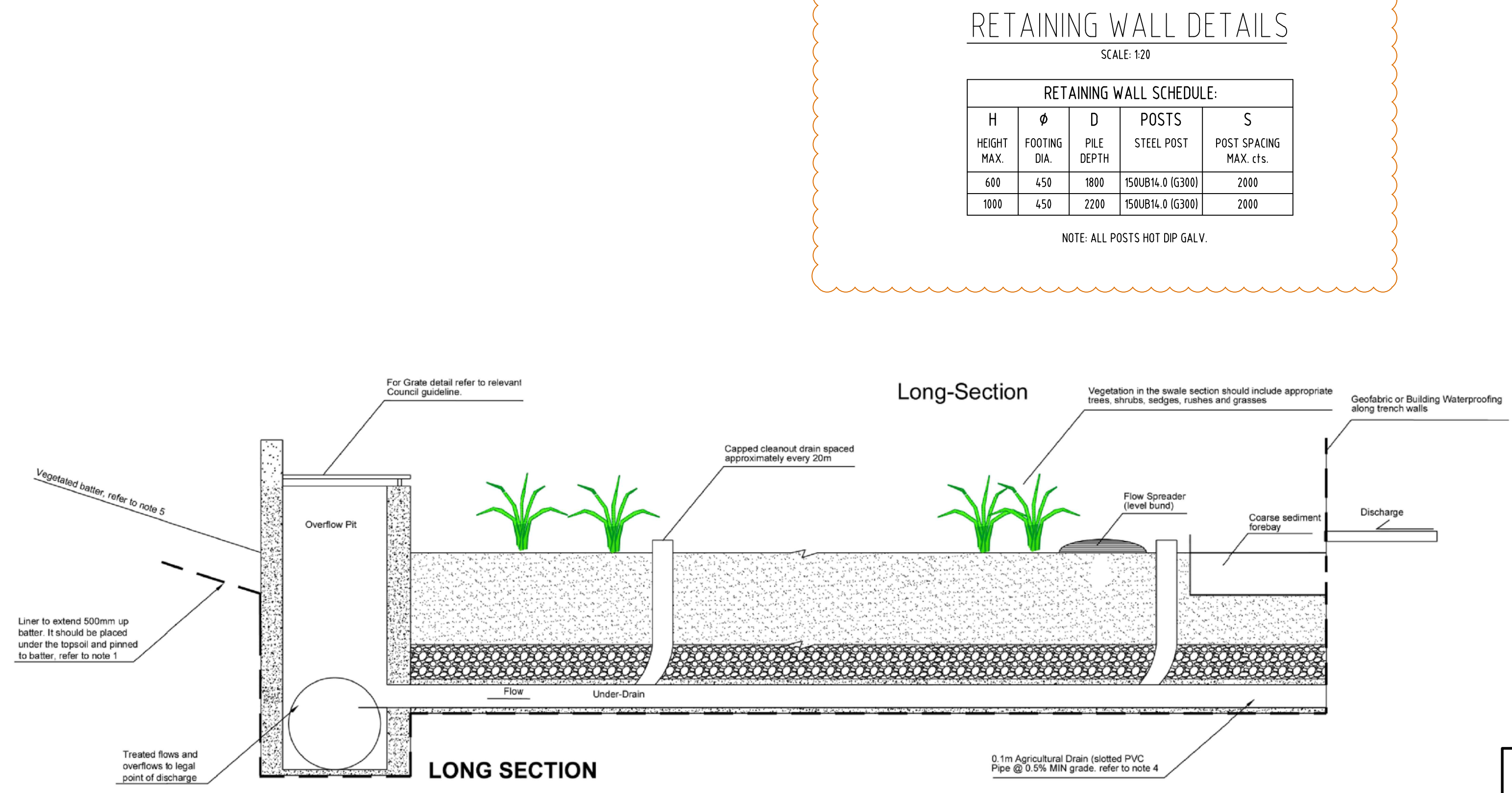
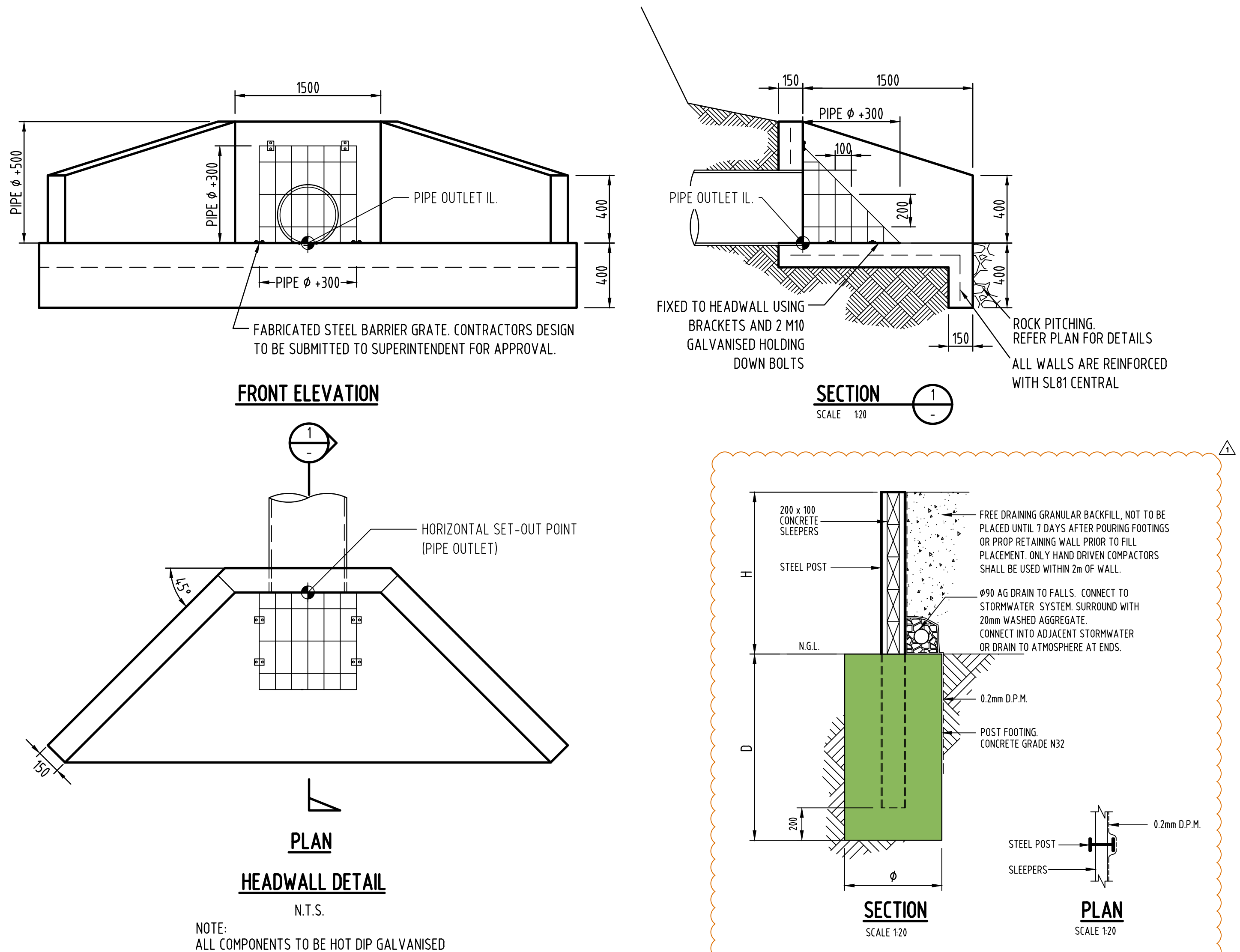
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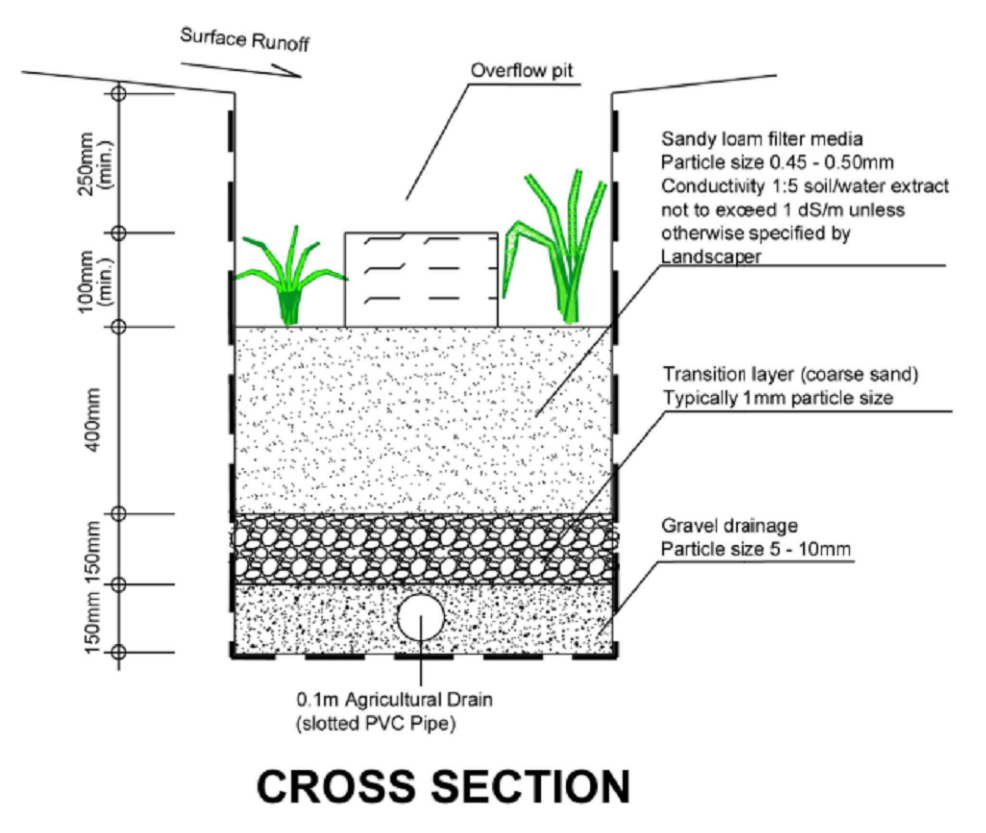
Rev.

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- NOTES:**
- Geofabric filter cloth to be placed along trench walls. The filter cloth is a non woven geotextile material. The filter cloth should not be placed between any filter layers. Impervious liner may be required subject to soil testing requirement in accordance with the Water Sensitive Urban Design technical guidelines.
 - All dimensions are in metres.
 - The under-drain is a slotted rigid pipe (uPVC or similar to AS 2439.1 or approved equivalent) is to be placed at a 0.5% minimum grade. Typically, pipe diameters are Ø100 - 150mm. The pipe should not be installed with a filter sock surrounding the pipe. Under-drainage pipes shall be sealed into pits using grout or other approved watertight seal.
 - Refer to landscape drawings to clarify the following:
The basin finished surface level (typically the top of the filter media).
Surface mulching and planting.
Plant specification and density.
 - Planting and maintenance of bioretention basin remains the responsibility of the landscape contractor until 'off maintenance'
 - Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Established Guidelines - Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances must be noted on project plans. Invert levels of pits, pipes and base levels must be noted on project drawings. Construction tolerances are as follows: Hydraulic Structures (overflow pit, pipe and weirs) +25 mm; Under-drains +25 mm; Earthworks (base of bioretention) +50mm; Drainage and transition layers +25mm; Surface level (filter media surface) +25 mm but a maximum of +40 mm is allowed for system/s greater than 300 mm2; Embankments and bunds -25 mm to +50 mm.
 - During construction of the functional elements of the bioretention basin and during the site development phase, installation of temporary protection measures for the bioretention device need to be installed and can be achieved by using a shallow topsoil (e.g. 25mm).
 - At the completion of the building phase, the temporary measures protecting the functional elements of the BR basin can be removed along with all accumulated sediment and the system should be planted in accordance with the design planting schedule.



REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
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1	18.01.24	CONSTRUCTION ISSUE	APE	APE	MF

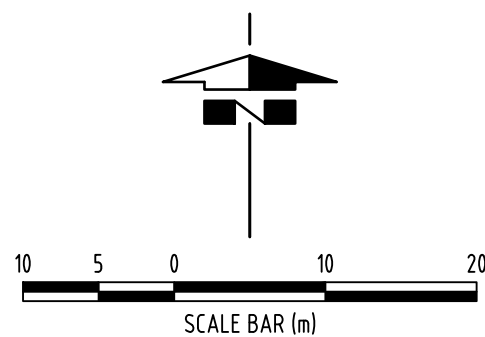
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APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN
CIVIL DETAILS - SHEET 3
A1 DOCUMENT NUMBER
Project Number Sheet No. Rev.
CLIENT DRAWING NUMBER: KFTC207-3
Design Drawn APE APE WGA231007 DR-CV-0014 1

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When sheet printed full size, the scale bar is 100mm.

0 50 100mm



SETOUT POINT	EASTING	NORTHING	RL. (AHD)
1	54941.2857m	70654.2206m	6.966m
2	54955.4164m	70661.0346m	7.217m
3	54972.1604m	70685.0458m	7.416m
4	54983.5424m	70703.8738m	7.567m
5	55025.0047m	70759.8228m	8.942m
6	55045.9964m	70742.7968m	8.402m
7	55032.1291m	70725.6990m	7.962m
8	55032.2797m	70724.2971m	7.980m
9	55069.6147m	70694.1719m	7.533m
10	55073.4944m	70691.0400m	7.205m
11	55068.8315m	70687.0931m	7.230m
12	55064.9420m	70690.2329m	7.385m
13	55046.4038m	70704.0408m	7.688m
14	55043.2804m	70706.5616m	7.737m
15	55028.9077m	70719.3209m	7.804m
16	55027.7282m	70720.2633m	7.762m
17	55000.4220m	70718.2095m	7.568m
18	54989.7504m	70703.8757m	7.444m
19	54990.1844m	70701.0624m	7.452m
20	55004.6093m	70689.3627m	7.858m
21	55017.9677m	70678.5279m	7.944m
22	55020.8521m	70678.9092m	7.977m
23	55023.8588m	70676.2660m	7.858m
24	55015.4480m	70675.4213m	7.824m
25	55002.0895m	70686.2561m	7.738m
26	54987.9277m	70697.7425m	7.334m
27	54985.1969m	70697.4284m	7.386m
28	54976.6693m	70682.8575m	7.266m
29	54965.2975m	70664.0229m	7.115m
30	54948.0687m	70649.6355m	6.965m
31	54944.3668m	70643.8856m	7.083m
32	54941.1432m	70654.9726m	6.988m
33	54954.9499m	70661.6303m	7.236m
34	54961.1464m	70667.0709m	7.265m

SETOUT POINT	EASTING	NORTHING	RL. (AHD)
35	54987.0820m	70709.3388m	7.623m
36	54995.5681m	70720.7981m	7.718m
37	55005.0139m	70733.5313m	8.107m
38	55010.9800m	70741.5612m	8.361m
39	55016.9388m	70749.5921m	8.616m
40	55020.1789m	70753.9797m	8.755m
41	55024.7478m	70760.0346m	8.946m
42	55026.7130m	70762.7650m	8.300m
43	55047.1372m	70741.7964m	8.332m
44	55087.3850m	70709.1522m	7.693m
45	55030.5934m	70661.2773m	7.712m
46	55001.1446m	70685.0910m	7.619m
47	55037.1155m	70728.9611m	8.219m
48	55050.3097m	70730.5121m	8.286m
49	55064.2743m	70719.1858m	7.911m
50	55064.6437m	70716.6551m	7.816m
51	55071.8459m	70709.9982m	7.753m
52	55078.1104m	70701.7331m	7.620m
53	55099.6925m	70716.5536m	6.600m
54	55109.3474m	70719.5189m	6.600m
55	55111.4320m	70712.7318m	6.600m
56	55101.7771m	70709.7665m	6.600m
57	54939.2371m	70661.0920m	6.155m
58	54943.9552m	70659.0860m	6.173m
59	54957.2038m	70669.8999m	6.279m
60	55037.3960m	70780.0266m	7.714m
61	55122.2934m	70711.1681m	6.914m
62	55078.5004m	70695.2773m	7.192m
63	55030.6620m	70654.7846m	7.702m
64	54989.3351m	70688.3040m	7.605m
65	54972.0285m	70664.4683m	7.180m
66	54948.3349m	70644.4385m	7.112m
67	54945.8419m	70638.9376m	7.136m

NOTES

- LEVELS ARE IN METRES TO AHD.
- SETOUT POINTS FROM FINISH SURFACE LEVEL (FSL)
- SURVEY PROVIDED BY OTHERS

REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
0	20.12.23	CONSTRUCTION ISSUE	APE	APE	MF

WGA

CLIENT DRAWING NUMBER: KFTC208-1

APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

SETOUT PLAN

A1

Design APE Drawn APE

DRAWING NUMBER

Job Number Sheet No. Rev.

WGA231007-DR-CV-0015



APD Engineering

Kings Forest Substation

CIVIL DESIGN BASIS REPORT

WGA231007

WGA231007-RP-CV-0001

18/01/2024



Revision History

REV	DATE	ISSUE	ORIGINATOR	CHECKER	APPROVER
A	18/12/2023	95%	MF	MF	MF
0	18/01/2024	IFC	MF	MF	MF

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1 INTRODUCTION

1.1 Project Overview

Essential Energy has proposed to construct a new electrical substation at Kings Forest, New South Wales (NSW).

This project is intended to service the proposed Kings Forest residential development. The residential development is estimated to cost \$5 billion and consists of up to 4,500 dwellings over 869ha of development area. The developers of this project are Leda Living.

The proposed substation site is located at the intersection of the of Secret Land and Depot road at Kings Forest, and is located approximately 3.85km south of Kingscliff, NSW and approximately 12.6km south of the Queensland and New South Wales border. The project site is within the municipality of the Tweed Shire Council.

Refer figure 1-1 for site location.



Figure 1-1 Site Locality Plan

As the project site is part of the greater Kings Forest residential development site, it is noted that Depot Lane shall be demolished to make way for the proposed new Kings Forest Parkway. As such, the site boundary and access will be designed with consideration to the proposed new roadway.

1.2 Scope

Wallbridge Gilbert Aztec (WGA) has been engaged by APD Engineering to provide detailed civil design for the Kings Forest Substation.

The Kings Forest Substation comprises the following main elements:

- Site Layout
- Transformer Pad Areas
- Earthworks Benching
- Internal Roads and Hardstand
- Pavement
- Site Access
- Stormwater

This Design Basis Report has been provided to document the basis informing the detailed design documentation of the Kings Forest Substation.

This includes, but not limited to:

- Criteria informing internal road layout and design
- Criteria informing stormwater drainage and quality design
- Criteria informing pavement design
- Liaison with client during design
- Incorporation of design review comments

2 STANDARDS AND REFERENCES

2.1 General

This section of the report lists the relevant project documents, Australian Standards, International Standards and Guidelines, reference investigations, and assessments that have been used to inform the design for this project.

The following references are applicable to this project:

- Essential Energy – RFQ ZS043 – Project Design Scope – 794004 – KFTR102-1
- Essential Energy – Branch Procedure: Transmission and Zone Substation Guidelines – CEOP8032
- Australian Standards
- Tweed Shire Council Development Design Specification
- Gilbert and Sutherland - Kings Forest Residential Development Detailed Design

2.2 Essential Energy Reference Documents

Table 2-1 Essential Energy Documents

DOCUMENT #	DOCUMENT DESCRIPTION
RFQ ZS043	Project Design Scope
CEOP8032	Branch Procedure: Transmission and Zone Substation Guidelines

2.3 Australian Standards

Table 2-2 Australian Standards

DOCUMENT #	DOCUMENT DESCRIPTION
AS 1141	Methods for sampling and testing aggregates
AS 1289	Methods of Testing Soils for Engineering Purposes
AS 1597	Reinforced Precast Box Culverts
AS 1726	Geotechnical Site Investigations
AS 2350	Methods of testing portland, blended and masonry cements
AS 2870	Residential slabs and footings
AS 2890	Parking facilities Part 1: Off-street car parking Part 2: Off-street commercial vehicle facilities
AS/NZS 3500.3	Plumbing and drainage
AS 3798	Guidelines on earthworks for commercial and residential developments

2.4 Other Standards and Guidelines

Table 2-3 Industry Guidelines

DOCUMENT #	DOCUMENT DESCRIPTION
Austroads	Guide To Pavement Technology Part 2 – Pavement Structural Design
Australian Rainfall & Runoff	ARR - A Guide To Flood Estimation - 2019

Table 2-4 Compliance Codes

DOCUMENT #	DOCUMENT DESCRIPTION
Worksafe NSW	Communication occupational health and safety across languages Workplace amenities and work environment Confined spaces First aid in the workplace Prevention of fall in general construction

2.5 Other Reference Documents

The following documents have been adopted as reference documentation in the design based on information supplied by APD Engineering, or from publicly available sources.

Table 2-5 Other Reference Documents

DOCUMENT #	DOCUMENT DESCRIPTION	AUTHOR	DATE	SOURCE
OD3R8-44Tx – Rev 0	44Tx Kings Forrest – OD Lift and Shift	Modern Transport Engineers Ltd	13/03/2023	APD Engineering
12301-KFP1	Kings Forest Parkway – Civil Design	Mortons Urban Solutions	14/11/2019	APD Engineering
P2-SK01	Precinct 2 – Preliminary Climate Change 100 Year ARI Developed Case Flood Levels	Gilbert and Sutherland	12/10/2022	APD Engineering
210802_12137	Stormwater Quality Management	Gilbert and Sutherland	15/07/2021	APD Engineering
11244	Typical Bioretention Device	Gilbert and Sutherland	19/06/2023	APD Engineering
RGS33650.1 – AB	Geotechnical Report	Regional Geotechnical Solutions	24/10/2023	APD Engineering
Development Design Specification D7	Stormwater Quality – version 1.6	Tweed Shire Council	17/04/2020	Council
S.D.017	Driveway Access to Properties – Fronting Roads with Kerb and Gutter	Tweed Shire Council	Nov 2013	Council

3 DESIGN CRITERIA

3.1 Design Life

The design life for civil infrastructure is not defined within the Essential Energy Transmission Zone Substation Design Guidelines or the Design Scope for the Kings Forest Substation.

However, it is noted that the performance criteria for the substation building is nominated at 40 years within the Transmission Zone Substation Guidelines.

3.2 Design Datum

Survey data has been provided by APD Engineering and is understood to have been sourced from Leda Living and information provided on the civil design documentation of Kings Forest Parkway.

The following datums have been adopted for the design:

DESCRIPTION	PROJECT DATUM
Height	Australian Height Datum (m AHD)
Horizontal Coordinates	Local

Prior to commencing construction, the civil contractor will be required to source the survey datum from the surveyor for set-out purposes.

3.3 Existing Services

Existing services at the site were identified by the following means:

- Before You Dig Australia (BYDA)
- Aerial Imagery
- Google Street View

A BYDA search has been completed noting that existing Telstra Communications Cable has been identified along the southern verge of Depot Road, which runs along the south boundary of the project site.

It is also noted that an existing Essential Energy overhead power line is located along the north verge of Depot Road.

Based upon progress of the neighbouring Kings Forest residential development requiring demolishing Depot Road to make way for the proposed Kings Forest Parade, it is assumed that the developer, Leda Living, will be applying to relocate these existing services to enable the development.

Essential Energy shall confirm with Leda Living as to the status of these services prior to construction.

The BYDA investigation did not indicate if there were additional existing services within the site.

3.4 Environmental Site Constraints

APD Engineering has provided detailed design drawings for the Kings Forest residential development by Mortons Urban Solutions. These design drawings indicate that the project site includes an ecological buffer directly adjacent the northern boundary of the project site. It has been advised by Leda Living that the ecological buffer is to remain un-impacted by the works of the substation.

No other information regarding existing environmental constraints located internally within the project site has been provided.

Additional environmental constraints that have been identified include:

- Flood mapping provided by Tweed Shire Council and Gilbert and Sutherland
- Site Sediment and Erosion Control Measures
- Stormwater Quality Treatment

4 GEOTECHNICAL CONSIDERATIONS

4.1 General

A geotechnical investigation for the project was undertaken by Regional Geotechnical Solutions (RGS33650.1 -AB, 24/10/2023). The results and the and recommendations of this report have been adopted to inform the civil design for this project.

It is noted from the results of the report that the soils comprise mainly of sands across the entirety of the substation investigation area.

As such, the civil contractor for the works shall review the RGS report and be familiar with the recommendations provided for construction for this site.

5 BENCH DESIGN

5.1 General Design

The general arrangement of the Kings Forest Substation Pad area has been designed by WGA taking into account the facility operational requirements.

WGA received the proposed site plan for the substation as a design input for the purpose of undertaking the bulk earthworks (BEW) design. Refer Appendix A for the site layout plan.

The following forms the basis of the bench design intent, taking into consideration the constructability of the bench:

- The bench shall be crowned, taking into consideration the two access points provided to the site, and to optimise protection to site infrastructure from site drainage.
- The ridge line of the bench has been set such that the road crossing of the cable trench is protected from overland stormwater flows. This separates the bench into two main sub-catchments (as shown in Figure 8-1)

5.2 Grading

The following site grading has been adopted for the substation bench:

- A minimum platform slope 1:100 (1%)
- A maximum platform slope of 1:20 (5%)

5.3 Pavement

The following bench pavement has been adopted:

- 100mm thick layer of “Blue Metal” rock aggregate (as required in RFQ ZS043)
- Minimum thickness 200mm pavement base/sub-base
- Road pavement design. Refer section 9.

5.4 Batter Slopes

Engineered fill slopes have been specified as generally 5H:1V around the main substation bench, batters to be topsoiled and naturally vegetated upon completion.

5.5 Earthworks Revegetation

It is a key construction sequencing consideration within the Construction Environment Management Plan (CEMP) to have the finished, graded earthworks batters topsoiled and revegetated as soon as practically possible after acceptance of the BEW formation is completed. This will allow for the promotion of regrowth and stabilisation of the fresh soil surfaces. Dust suppression watering around the site and surrounding earth-worked batters will assist in this regard throughout the construction phase.

5.6 Retaining Walls

Retaining walls have been provided where a height differential occurs between finished surface levels and the existing surface levels. This is limited to areas where the available area is restricted and earthworks batters are unable to make up the level difference.

Extents of proposed retaining walls are provided on drawing WGA231007-DR-CV-0014.

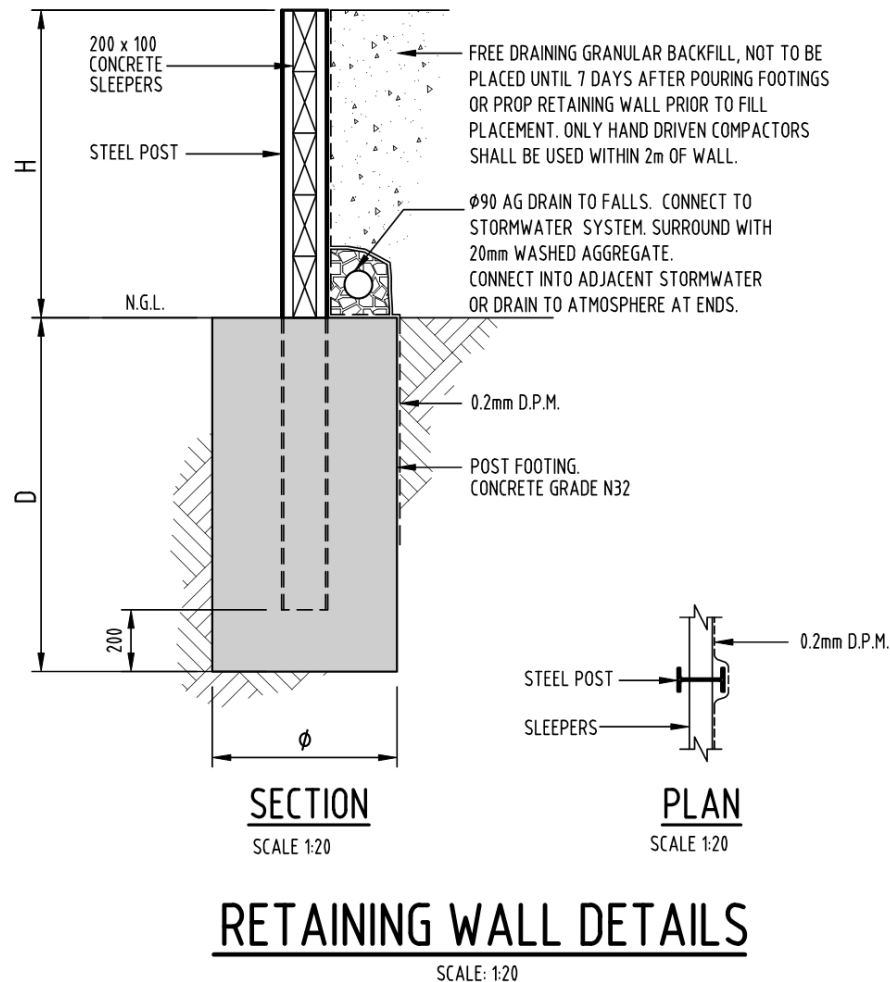


Figure 5-1 - Retaining Wall Detail

RETAINING WALL SCHEDULE:				
H	ϕ	D	POSTS	S
HEIGHT MAX.	FOOTING DIA.	PILE DEPTH	STEEL POST	POST SPACING MAX. cts.
600	450	1800	150UB14.0 (G300)	2000
1000	450	2200	150UB14.0 (G300)	2000

Figure 5-2 - Retaining Wall Footing Dimensions

It is proposed to use Concrete Sleeper Retaining walls for this project.

The following assumptions were made for the Concrete Sleeper Retaining Wall design:

- $C' = 0$ (assumes Cohesionless soil based on geotechnical report)
- Surcharge Load = 5.0 kPa
- No fences or other structures to be fixed to the retaining wall
- The top 450mm of the footing is considered to not contribute to the structural function of the wall

6 ROAD DESIGN

6.1 General

The substation access roads have been designed to provide access for construction plant, supplies, and vehicles around the substation construction site, and access for 4WD service vehicles and periodic heavy vehicle maintenance equipment post construction.

The internal access roads for the substation will consist of a granular unbound pavement, with a spray sealed wearing surface.

The road layout has been informed by the stie provided by APD engineering. WGA's scope includes vertical and horizontal road geometry.

There are two road types included within this substation design:

- 1) Internal Access Road – spray sealed pavement within the substation compound
- 2) Secondary Access Road – spray sealed pavement within the substation compound, but not intended for main traffic.

It should be noted that Secondary Access Roads are not intended for use by the main design vehicle, and for light vehicles. Secondary Access Roads are defined in the site plant provided by APD Engineering.

6.2 Design Requirements

The design requirements for the internal access road are summarised in Table 6-1

Table 6-1 Road Design Requirements

GEOMETRY	REQUIREMENT
Road Width	As per the Essential Energy Standard CEOP8032 "Transmission and Zone Substation Design Guidelines" document provided by APD Engineering, Minimum road widths are as follows: 1) Internal Access Road – 6.0m minimum 2) Secondary Access Road – 4.0m minimum Pavement shoulders have not been adopted in this design. Road widening where required to cater for design vehicle swept path.
Longitudinal Slope	Maximum gradient – 6.7%.
Crossfall	3.0%
Horizontal Curves	Minimum 15m radius (inside curve) Turn path assessment for a 25m trailer vehicle has been verified along the Internal Access Road. Refer section 6.3.
Vertical Curves	None specified.
Design Speed	Substation access road to be 30km/hr

GEOMETRY	REQUIREMENT
Batter Slopes	5H:1V Preferred, 3H:1V max (with erosion protection)

6.3 Design Vehicle

WGA have adopted the road layout provided in the site plan by APD Engineering as the basis for road layout design and have performed turn path checks. Refer Appendix B for turn path assessments.

The access tracks have been checked for a transport trailer capable of carrying a 46T transformer refer sample image below.

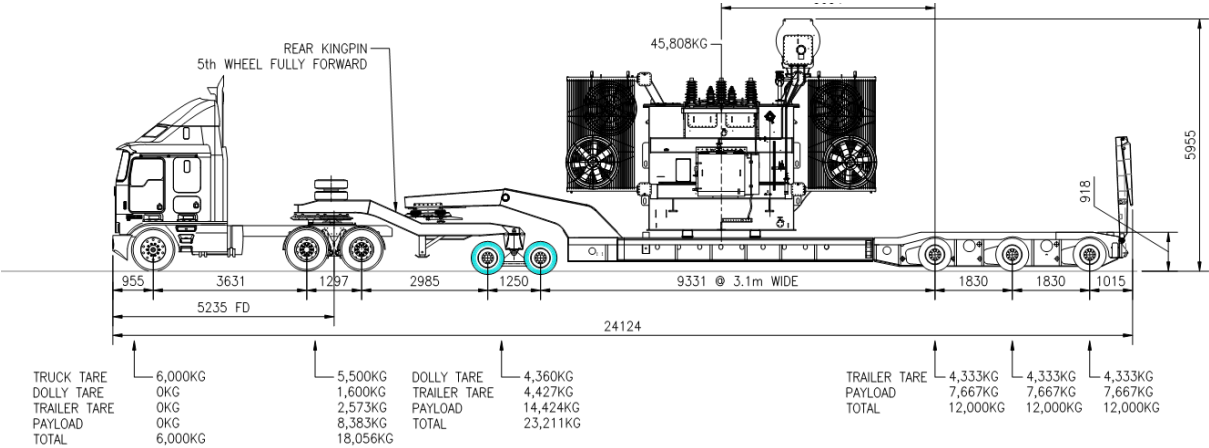
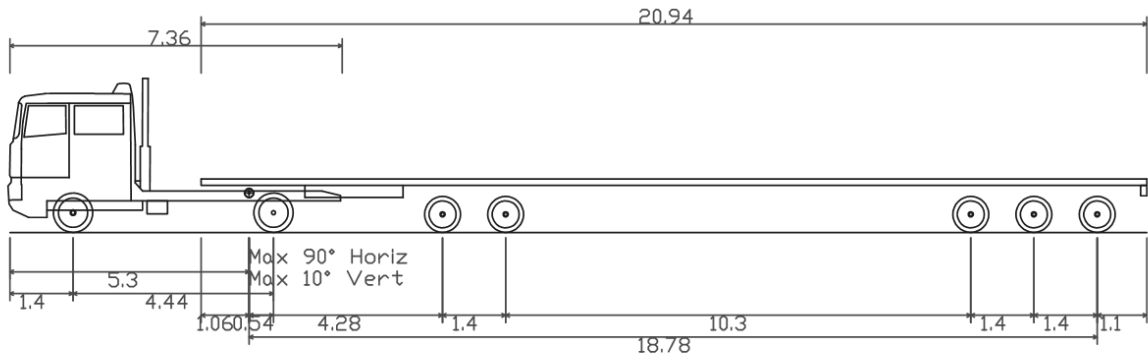


Figure 6-1 46T Transformer Delivery Vehicle

WGA have performed turn path checks based upon the design vehicle. The turn path checks were performed in AutoTURN using an approximate vehicle. Refer Figure 6-2 below.



Convoi + bisselet integrale
Figure 6-2 AutoTURN Design Vehicle

7 SITE ACCESS

7.1 General

Site Access and Egress will be via Secret Lane as the main access to the Kings Forest Substation.

A secondary access point shall also be provided to the substation from the proposed Kings Forest Parade, however it is understood that the secondary access will be shut off via a screening wall in standard operation. As such, this access will only be used in emergencies, or only as required.

Both accesses are proposed to be based upon the Tweed Shire Council's standard detail for driveways for commercial use.

7.2 Design Requirements

The proposed Internal Access Road is designed based upon the 6.0m minimum road as defined in the Essential Energy standard.

- To be designed to cater for all construction traffic and ongoing maintenance use,
- To be designed to cater for the design vehicle (46T Transformer Delivery Vehicle),
- Site Access to be 200mm thick concrete based on Council standard detail,

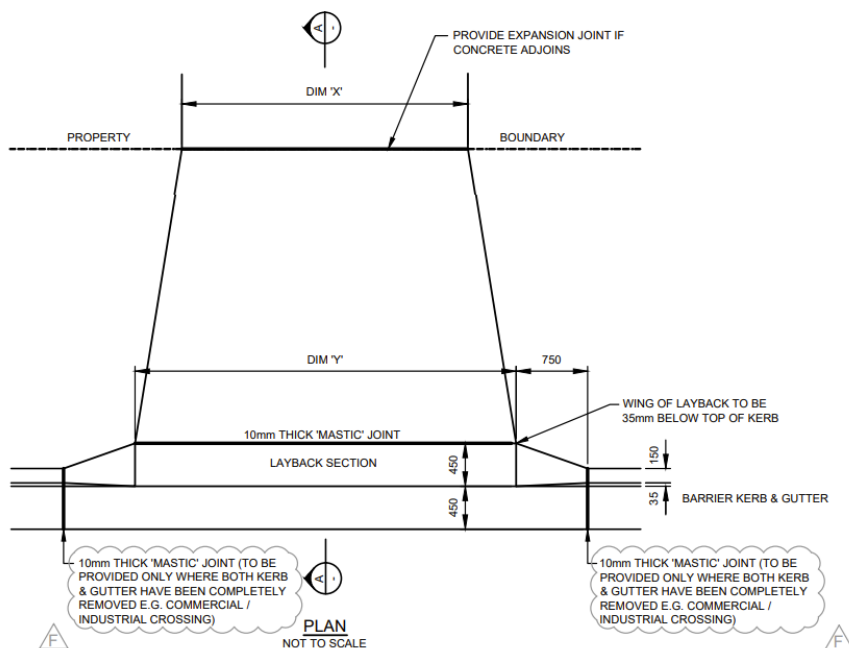


Figure 7-1 Tweed Shire Standard Driveway

TYPE OF DRIVEWAY	WIDTH 'X' (mm) AT BOUNDARY	WIDTH 'Y' (mm) AT KERB LINE	THICKNESS 'T' (mm) & REINFORCEMENT
SINGLE DWELLING OR DUPLEX UNIT	3000 min. 6000 max	3000 min. 6000 max	100mm WITH SL72
UNITS ON LOCAL STREETS	3500	6500	150mm WITH SL72
* UNITS ON COLLECTOR ROADS	6000	9000	175mm WITH SL82
* COMMERCIAL/ INDUSTRIAL	7000	13000	200mm WITH SL82

* THESE WIDTHS ARE INDICATIVE ONLY AND DIFFERENT
WIDTHS MAY BE SPECIFIED IN SECTION 138 APPROVALS



Figure 7-2 Tweed Shire Standard Driveway Specifications

8 STORMWATER DESIGN

8.1 Design Requirements

The stormwater design of the Kings Forest substation has been undertaken within the brief provided in the Essential Energy Civil Scope (ZS043) document and the Essential Energy Substation Design Guidelines.

It is understood that it is required by the Tweed Shire Council for the provision of Stormwater Quality Treatment is provided as part of the delivery of the substation and that Essential Energy has agreed to deliver this component of works via construction of a bio-retention basin.

It is also understood that stormwater detention to restrict post-development flows is not required for this project.

The substation bench is required to be able to withstand a 1% AEP (1 in 100yr flood) or major storm event without significant damage. Control Cubicles for the yard equipment and the buildings floor level must be designed and constructed to be a minimum 500mm above expected flood levels.

The substation drainage design has been undertaken in conjunction with the bench platform design, separating the wider platform into two separate main catchments (refer Figure 8-1). The site is crowned at the same location as the proposed cable trench road crossing, thereby mitigating potential ingress of overland flows into the cable trench.

Stormwater drainage connection points are nominated to connect to Secret Lane (Catchment 1) and the proposed Kings Forest Parade (Catchment 2).

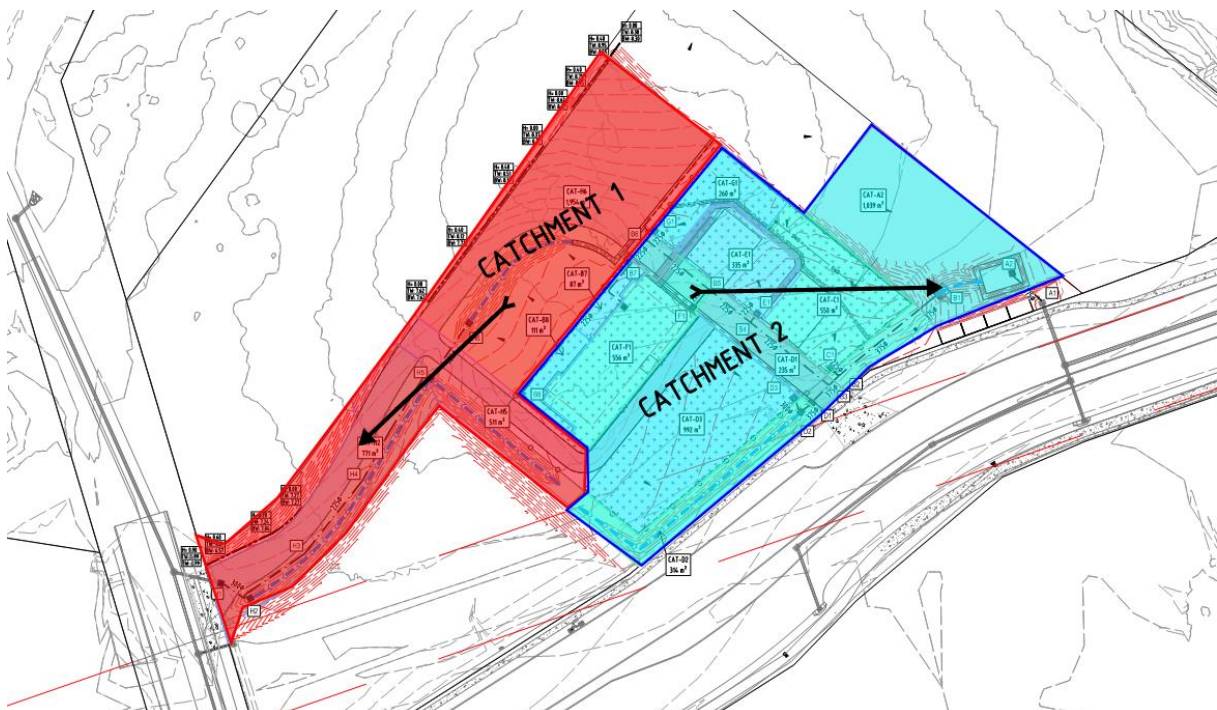


Figure 8-1 Substation Sub-Catchments

A detailed catchment plan demonstrating the separation of the systems is included within Appendix C.

8.2 Site Specific Flood Data

Flood map data has been provided by APD Engineering through information supplied by Leda Living's stormwater consultant, Gilbert and Sutherland.

The flood map data shows peak flood levels (m AHD) for the 100 year ARI (1% AEP) flood within the vicinity of the proposed Kings Forest Substation, and the surrounding regions.

Based on WGA's review of the Gilbert and Sutherland flood map, the extent of flooding does not appear to impact the substation site, with the nearest flood impacted area located approximately 430m north-east of the substation site. Refer figure Figure 8-2.

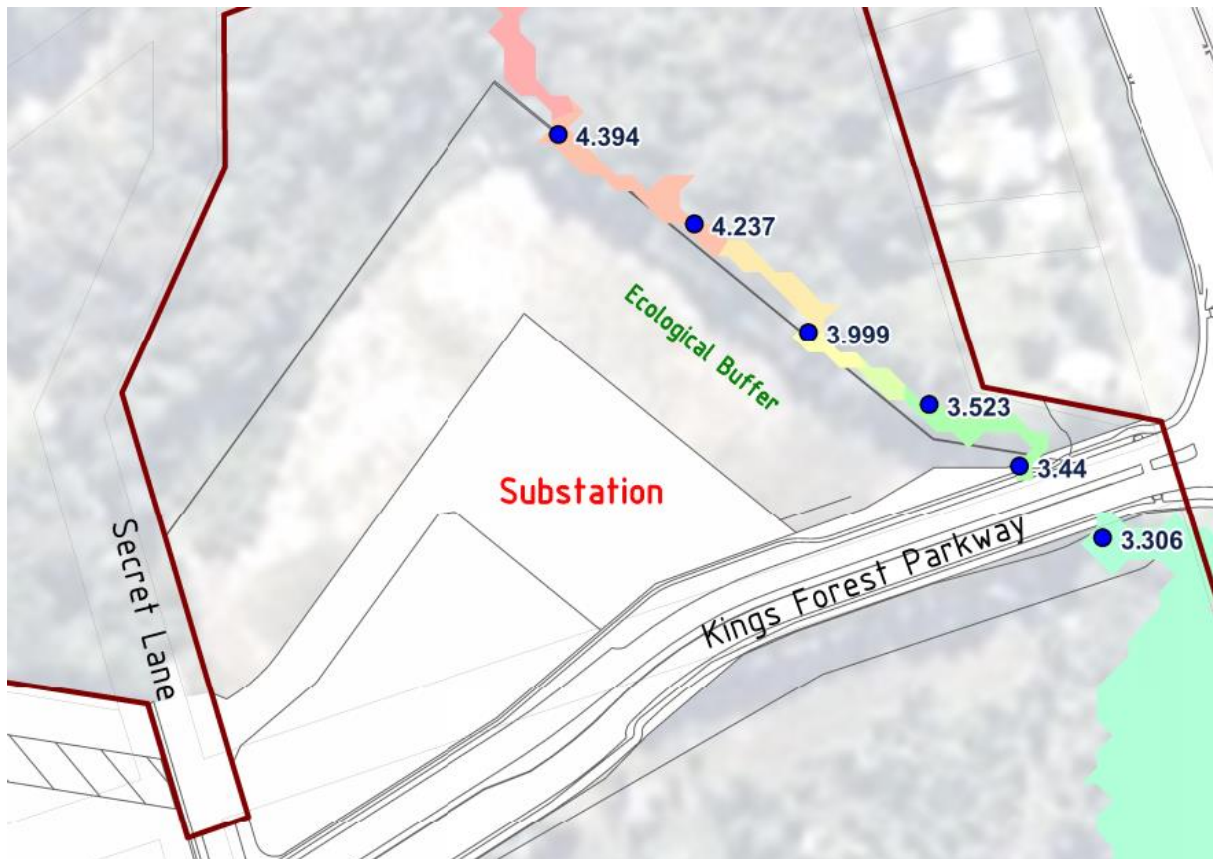


Figure 8-2 1% AEP Flood Level (Gilbert and Sutherland)

Peak flood levels of the impacted areas are shown in Figure 8-2 by the blue dot points as shown above. Along the ecological buffer boundary, the peak flood levels are shown to range from 4.394m AHD and drops 1m to the south to 3.44m AHD.

Based on the proposed bench levels for the Kings Forest Substation, it is noted that the lowest level of the proposed substation bench is 7.2m AHD.

Based on this data, it is noted that the proposed Kings Forest Substation bench is positioned 2.81m - 3.76m above the adjacent flood levels. As such, it is assumed that the substation bench is adequately protected from flood inundation.

8.3 Design Basis Summary

A summary of the key design basis of the site stormwater is as follows:

- Minor Event Stormwater Design – 5% AEP (approximately 20-year ARI)
 - Substation pad provided with crossfall as per bench design. Internal Access Road will be generally one way crossfall
 - Water collected in road-side spoon drains to discharge into grated inlet pits
 - Surface runoff to be collected via grated inlet pits and directed to underground pipework, and drain to end-of-life bio-retention basin
 - Cable Trench and Pit drainage to be collected via drainage pipes and drain via separate drainage network to surface drainage
- Major Event Stormwater Design – 1% AEP (approximately 100-year ARI)
 - The larger design stormwater event flows are directly discharged to the overland flow paths on site and onto the proposed council roads.
 - Openings within the security screen wall on the Kings Forest Parade boundary shall be provided to allow overland flows to discharge into Kings Forest Parkway.
- Floodplain Stormwater Design – 1% AEP (approximately 100-year ARI)
 - Substation bench to be set above the 1% AEP flood level.
- Oily Water Capture
 - All facility infrastructure with the potential for oily water runoff will be self-captured within the allocated concrete bunded area with controlled removal or treatment via a class 1 oil water separator. All associated infrastructure to be designed and documented within the APD Engineering documentation.
- Water Quality Treatment Basin
 - In accordance with Essential Energy's agreement with the Kings Forest residential development, a bio-retention basin is proposed to provide stormwater quality treatment prior to runoff entering into the proposed council stormwater system
 - Water quality treatment has been designed to meet the EPA's Water Sensitive Urban Design Guideline targets for sediment reduction (no allowance for phosphorus and nitrogen reduction) in accordance with Tweed Shire Council Requirements
 - It is understood stormwater detention is not required for this project.
 - Minor storm flows will bypass the basin via a high-level outlet (grated inlet pit)
 - Major storm flows will bypass the basin and should basin capacity be exceeded, overtop via overflow weir and across the north boundary, into the ecological buffer.

8.4 Substation Hydrology

8.4.1 Catchment Definition

The Kings Forest Substation developed catchment is approximately 7,840m² combining a network of underground pipe infrastructure, collector pits and above ground drainage swales. The sub-catchments are separated into two main catchments as per Figure 8-1, which will discharge into separate road reserves.

8.4.2 Hydrologic Model

The hydrological modelling will be carried out using ILSAX to simulate the surface runoff and to predict the impacts of the Bunday Substation development and the sizing and functionality of the associated

basins. The ILSAX hydrological utilises the following runoff parameters to be nominated as input parameter: soil type and depression storage for impervious, supplementary and pervious areas. These parameters are sensitive to both runoff volume and the peak flow rate:

- Impervious area depression storage 1 mm
- Supplementary area depression storage 1 mm
- Pervious area depression storage 5 mm
- Horton Infiltration Curve (soil type) 3
- Antecedent moisture condition (all storms) 2.5

8.4.3 Catchment Parameters

Each catchment was assessed for area of paved, supplementary and impervious land use. Rounded percentages were allocated for each catchment area based on composition. A summary of the percentage breakdown assumed for the various land types can be seen in Table 8-1 below.

Table 8-1 – Catchment Parameters

CATCHMENT	% IMPERVIOUS (DCP)	% IMPERVIOUS (SUPP)	% PERVIOUS (GRASSED)
Substation Hardstand/Access Road	100	0	0
Undeveloped Areas	0	0	100
Other	50 – 70	0	30 - 50

The overflow routes are modelled to represent the road cross sections, or the buried kerb and gutter arrangement.

A nominal 5-minute time of concentration has been applied to all Impervious and supplementary areas, with 10-minutes applied for associated pervious areas. These time of concentration assumptions do not consider the 100mm stone aggregate layer to be placed across the majority of the substation pad. The stone aggregate will typically slow down the surface flows and thus have a detention effect on the flow paths, further reducing the time of concentration and providing additional detention. However, as mentioned previously this has been excluded as part of the modelling and the time of concentrations used for this assessment are considered appropriate given the size of the catchments.

8.5 Substation Hydraulics

8.5.1 Network Design Basis

DRAINS was used for the design of the underground drainage for the substation. Major event flow paths were manually determined and checked in critical areas. Network calculations and results of the modelling are included as Appendix D. Site-specific parameters for the drainage design have been adopted as per the relevant Essential Energy standards.

The pit and pipe drainage within the site will be designed to accommodate runoff from a 5% AEP rainfall event for the minor event including the conveyance of flows through pit and pipe infrastructure and swale drains across the site and sedimentation/water quality treatment end of line bio-retention basin. The overland flow system has been designed to cater for the 1% AEP events, stormwater will discharge via the swale/ grated inlet system, into the adjacent natural flow paths.

The internal drainage network will be designed to convey with 5% AEP (20 Year ARI) or flows safely via the use of stormwater pit and pipe. The inlet pits and underground networks will be sized to cater for the required storm event with no overflow. The following parameters have will be adopted as part of the drainage design:

Table 8-2 Stormwater Parameters

PARAMETER	CRITERIA
Minimum Grade	<ul style="list-style-type: none"> • Pipes – 0.5% Desirable, or 0.33% (AS3500.3) • Swales – 0.5% Desirable, 0.1% minimum
Inlet Blockage Factors	<ul style="list-style-type: none"> • On Grade Pit – 0.2 • Sag Pit – 0.5
Minimum Pipe Size	<ul style="list-style-type: none"> • Reinforced Concrete Pipe (RCP) – 375 mm • BlackMaxx Stormwater Pipe – 225 mm
Minimum Freeboard	<ul style="list-style-type: none"> • Minor Storm – 150 mm from surface level
Pit Covers	<ul style="list-style-type: none"> • Class D – ‘Heavy Duty’

8.5.2 Overland Flow Paths

Beyond the pit and pipe network capability, the bench has been assessed for functionality in higher storm events such as a 1% AEP (1 in 100 year ARI). Overland flow paths are accommodated within the roads and stone aggregate pad areas. These overland flow paths ultimately discharge to Secret Land and Kings Forest Parade.

8.5.3 Bio-Retention Basin

8.5.3.1 Basin Requirements

As part of the substation development, Essential Energy is required to provide stormwater quality treatment in the form of a bio-retention basin.

The bio-retention treatment area and stormwater quality targets for the proposed substation development were addressed by Gilbert and Sutherlands Stormwater Quality Report “210802_12137 Stormwater Quality Management”. This report concluded that 125m² of bio-retention basin treatment area was required to treat a development area of 12,530m² in order to meet the Tween Shire Council’s targets for pollutant reduction.

Upon WGA review of the Gilbert and Sutherland stormwater quality report, it was noted that the proposed treatment of the 125m² bio-retention basin was intended to treat Catchments 1 and 2 in combination as shown in Figure 8-4.

However, the proposed substation is only contained within catchment 1 (as shown in Figure 8-4). Furthermore, the proportion of the substation catchment that is considered as impervious in the Gilbert and Sutherland report is 100%, with pollutant loading’s considered to be similar to that of a commercial development.

MUSIC catchment	Area (ha)	Fraction impervious (%)
Proposed Development		
Catchment 1 – Substation (Commercial Road)	0.714	100
Catchment 2 –Storage Facility (Commercial Road)	0.539	100

Figure 8-3 MUSIC Modelling Catchments Parameters (Gilbert and Sutherland)

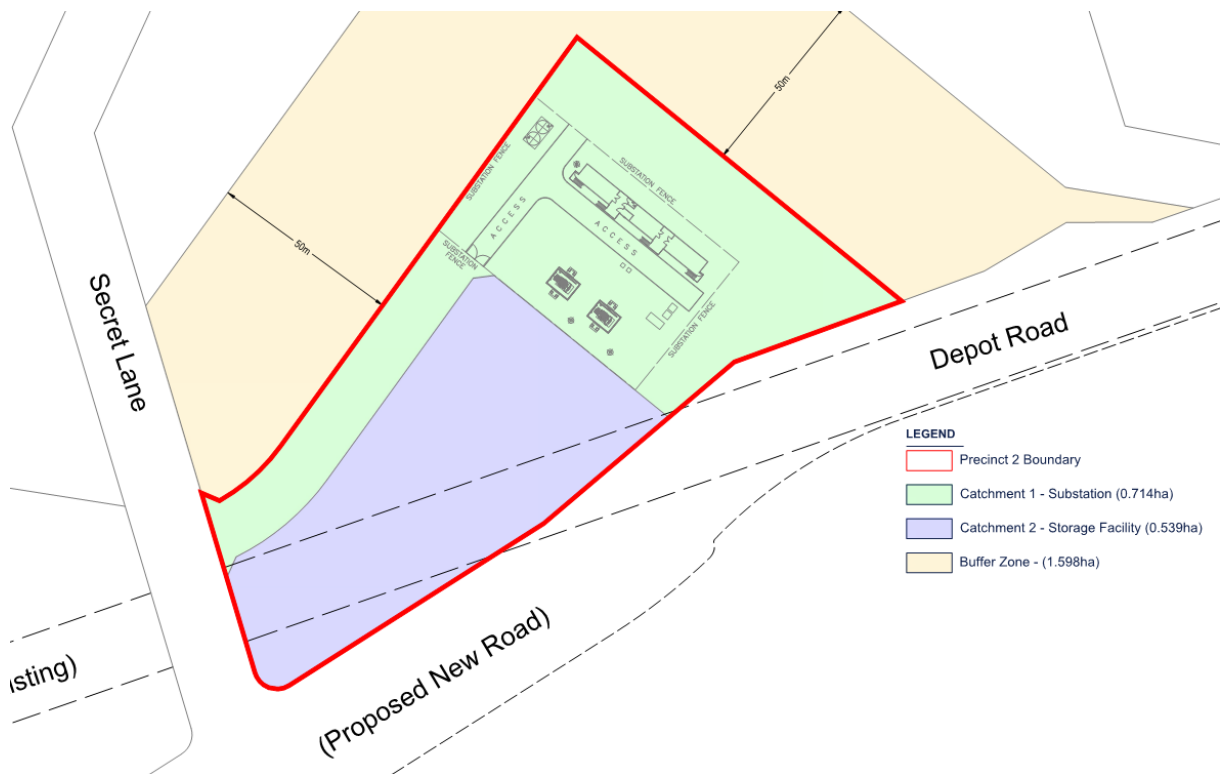


Figure 8-4 Gilbert and Sutherland Stormwater Quality Catchments

Based on detailed design of the substation, the assumed catchment parameters used to inform the Gilbert and Sutherland MUSIC model may be considered as conservative. As such, the treatment area of bio-retention basin may be optimised to suit the actual area of development that requires treatment.

Gilbert and Sutherland supplied a typical detail for bio-retention to APD Engineering/Essential for reference. The details are shown in Figure 8-5 and Figure 8-6.

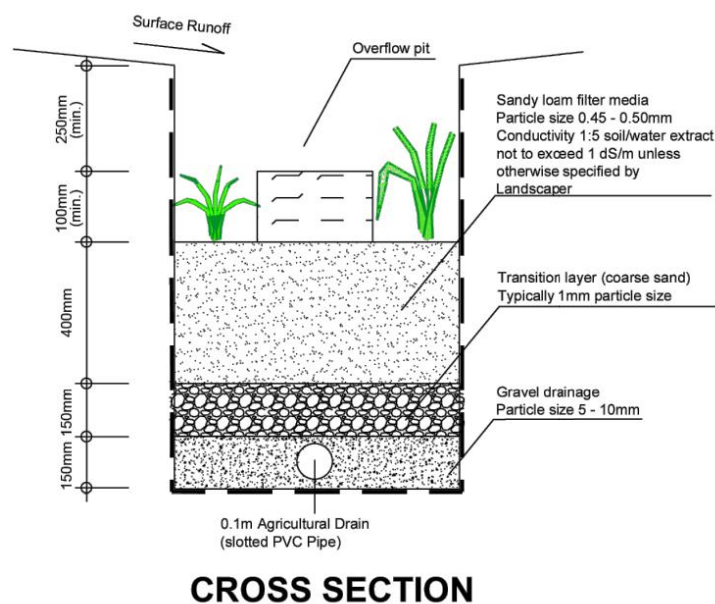


Figure 8-5 Typical Bio-Retention Basin Section (Gilbert and Sutherland)

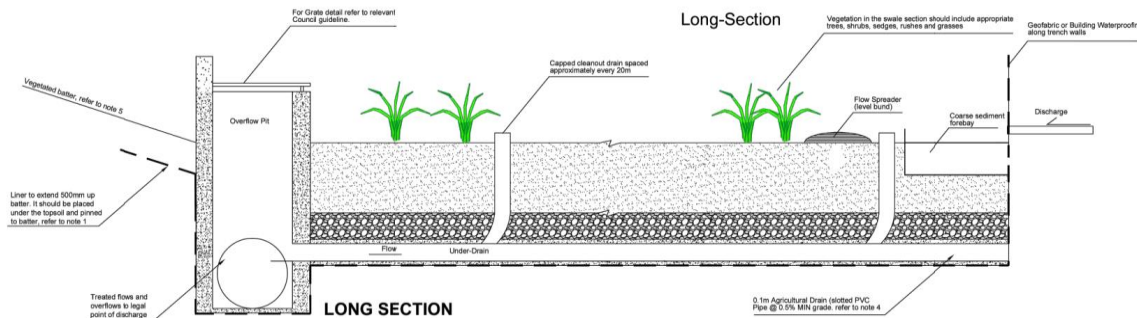


Figure 8-6 Typical Bio-Retention Long Section (Gilbert and Sutherland)

Pollutant reduction targets for the development are required to meet the requirements of the Tweed Shire Council's Water Quality Objectives as outlined in council's Stormwater Quality Development Design Specification – D7. These targets are provided in Figure 8-7

Table D7.07-WQO - Tweed Shire Council Water Quality Objectives	
Pollutant	Minimum reductions in mean annual load from unmitigated development (%)
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (>5mm)	90%

Figure 8-7 Tweed Shire Council Stormwater Quality Targets

8.5.3.2 Stormwater Treatment and Bio-Retention Basin Design

For the design of the bio-retention basin, the Gilbert and Sutherland bio-retention basin details were used as a reference in the WGA's MUSIC modelling.

As noted in Figure 8-1 of this report, the stormwater catchment for the substation is split into two sub-catchments, with a portion of the substation catchment draining to Secret Lane, and the remaining portion draining towards Kings Forest Parade. All sub-catchments have been assumed to have pollutant loads similar to commercial developments, as per the Gilbert and Sutherland report.

Design of stormwater quality treatments will address these two sub-catchments in combination.

The revised sub catchment parameters adopted for WGA's MUSIC model is as follows:

Sub-Catchment 1 - Parameters

- Area = 0.323ha
- Weighted Impervious Area = 56%

Sub-Catchment 1 – Proposed Treatment

Buffers leading into vegetated swales with a vegetation height of 300mm (native grasses and sedges), gradient of 0.5%, and an exfiltration rate of 3.6mm/h (medium clays/sandy clays).

Sub-Catchment 2

- Area = 0.462ha
- Weighted Impervious Area = 63%

Sub-Catchment 2 – Proposed Treatment

Vegetated swale with a vegetation height of 300mm (native grasses and sedges), gradient of 0.5% and an exfiltration rate of 3.6mm/h (medium clays/sandy clays), and a 40m² of treatment by bio-retention basin also including a 10m inlet vegetated swale. The bio-retention basin had the following properties:

- Extended Detention Depth (EDD) 100mm
- Saturated Hydraulic Conductivity 200mm/h
- Filter Depth 400mm
- TN Content of Filter Media 400mg/kg
- Orthophosphate Content of Filter Media 30mg/kg
- Exfiltration Rate 0mm/h (Lined)
- Vegetated with Effective Nutrient Removal Plants

An overview of the stormwater treatment train is provided in Figure 8-8.

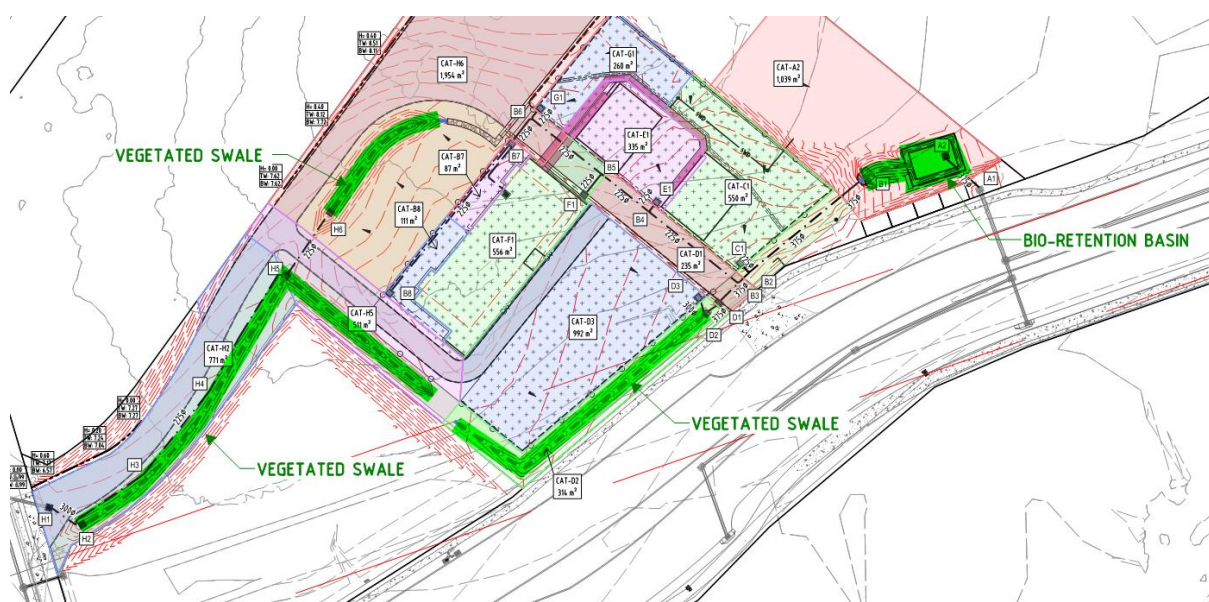


Figure 8-8 Proposed Substation Stormwater Treatment

Results of the pollution reduction targets are as follows, with all targets being met for both sub-catchments:

Table 8-3 Treatment Train Effectiveness

POLLUTANT	REDUCTION TARGET	SUB-CATCHMENT 1	SUB-CATCHMENT 2
TSS	80%	94.3%	82.7%
TP	60%	79.8%	74.3%
TN	45%	45.7%	45.3%
Gross Pollutants	90%	100%	100%

An overview of the MUSIC Model is provided in Appendix E.

9 PAVEMENT DESIGN

9.1 Design Guidelines

Pavement Design for the Kings Forest Substation will be undertaken in accordance with the Essential Energy Transmission and Zone Substation Design Guidelines.

9.2 Road Design Parameters

WGA has reviewed the RGS geotechnical report provided by APD Engineering/Essential Energy to inform the design CBR of the pavement subgrades.

The parameters used for calculation of the design traffic, and pavement design, are provided in Table 9-1.

Table 9-1 Pavement Design Parameters

PARAMETER	CRITERIA	SOURCE
Design Life	50 years	-
Subgrade CBR	10%	RGS Geotechnical Report
Wearing Surface	Spray Seal Bitumen	EE Transmission and Zone Substation Design Guidelines

9.3 Design Traffic

The pavement design of roads must ensure that they are capable of withstanding the traffic load of a delivery truck fully loaded with a 46T transformer, refer Figure 6-1 for the design vehicle.

Allowance for additional construction and ongoing maintenance traffic has been included within the assessment. Traffic assumptions for pavement design are summarised in Appendix F.

9.4 Pavement Design

9.4.1 Design Methodology

The road pavement design is based upon assessment the design traffic and calculating the corresponding Equivalent Standard Axles (ESA's) based upon the Austroads Part 2 Clause 7.6.2 Formula below.

$$ESA_{ij} = \left(\frac{L_{ij}}{SL_i} \right)^4$$

where

ESA_{ij} = number of repetitions of a Standard Axle which causes the same amount of damage as a single passage of axle group type i with load L_{ij}

SL_i = Standard Load for axle group type i (from Table 7.7 and Table 7.8)

L_{ij} = j^{th} load magnitude on the axle group type i

Table 7.7: Loads on axle groups with dual tyres which cause same damage as a Standard Axle

Axle group type	Load (kN)
Single axle with dual tyres (SADT)	80
Tandem axle with dual tyres (TADT)	135
Triaxle with dual tyres (TRDT)	182
Quad-axle with dual tyres (QADT)	226

Figure 9-1 Austroads Design Traffic in terms of ESAs

Pavement thickness will be selected from the Austroads design charts, refer example Figure 9-2 below.

Figure 12.2: Example design chart for lightly-trafficked granular pavements with thin bituminous surfacings

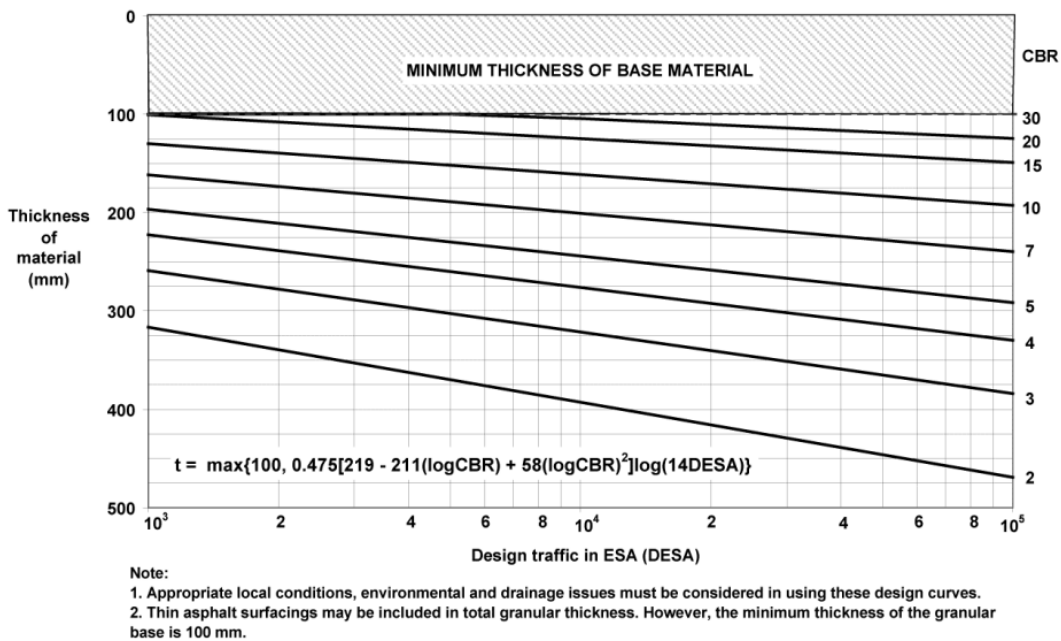


Figure 9-2 Austroads Design Chart for Lightly Trafficked Granular Pavement

9.4.2 Design ESAs

The derivation of the design ESA for substation pavements considers two phases of traffic loading:

- Construction Traffic
- Operations and Maintenance Traffic

The design ESA to be adopted is the combination of these two phases.

During construction, road pavements are typically built upon completion of the substation bench. As such, the pavements are subjected to traffic related to the substation infrastructure, including civil, structural, and primary infrastructure components.

In operation, substations typically experience low and infrequent traffic loading, with one or two light vehicles (4WD utes) accessing the site on a weekly basis, and a three-axle truck or service vehicle accessing the site once monthly.

As such, it is common for construction traffic to provide the majority of the traffic loading over the lifetime of the pavement.

The following design ESAs have been adopted based upon feedback from APD Engineering on operations use, and WGA's experience to estimating construction traffic loading based upon similar projects.

It is noted that estimated construction traffic volume data has not been provided by Essential Energy.

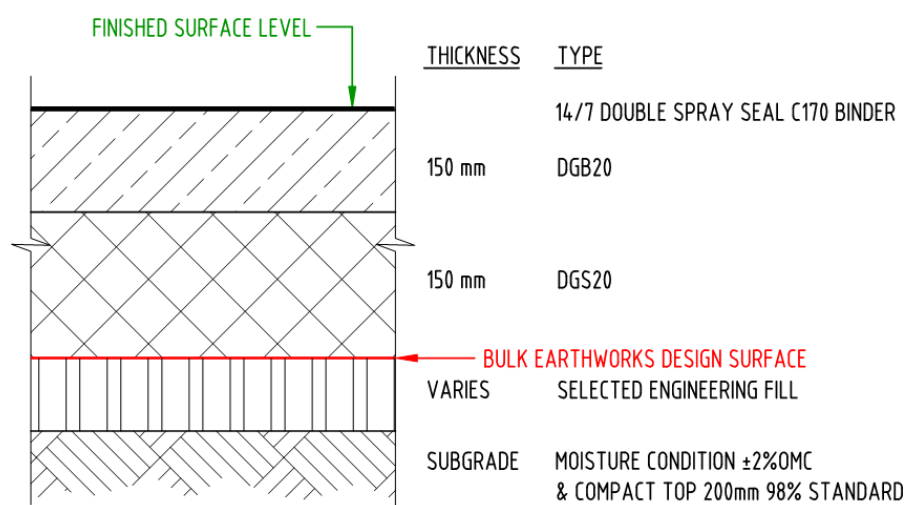
TRAFFIC	PERIOD	DESIGN ESA
Construction	6 months	1×10^4
Operations	50 years	3×10^3
TOTAL	50 years	1.3×10^4

Refer to Appendix F for an example estimation of construction and operations ESA.

9.4.3 Road Pavements

In accordance with Austroads Guide to Pavement Technology Part 2, and the recommended pavement design CBR from the RGS geotechnical report, the following pavements have been selected.

1) Internal and Secondary Internal Access Roads



It should be noted that Spray Seal wearing surfaces may de-grade over time from frequent use and turning movements generated by heavy vehicles in the construction phase of the works. As such, it may be preferred by the civil contractor to defer placement of the spray seal wearing surface until such time as construction traffic is no longer expected.

Until that time, regular maintenance and repairs shall be undertaken along the access roads and internal pavements during the construction phase, when heavy construction traffic is expected to degrade the pavement surface. The application of the spray seal wearing course should not occur until all major construction and restoration works have been completed.

10 SAFETY IN DESIGN

10.1 Overview

In accordance with the Work Health and Safety Act 2012 and Regulation 295 of the Work Health and Safety Regulations 2012 WGA has completed a Safety In Design assessment.

We have obtained the project-wide Safety in Design register and updated the register to capture Civil specific risks. This has been included as **Error! Reference source not found..**

As designers, Regulation 295 requires us to provide a written report to our client that specifies the hazards of our design, as far as we are reasonably aware that, create a risk to the health or safety of persons who are involved in the construction, operation, maintenance and decommissioning of the project; and that are specific to this project.

This report does not seek to identify all construction site hazards commonly encountered with projects of this nature, for which the identification and management remains the responsibility of the Contractor.

The client must provide a copy of this report to the principal contractors tendering on this project, maintenance personnel and building users.

10.2 Design Elements of the Project

Design elements undertaken in the project by WGA include the civil design of roads and stormwater infrastructure required for the substation

10.3 Relevant Project Stakeholders

- Client – Essential Energy
- Design Manager – APD Engineering
- Local Government - Tweed Shire Council

10.4 Objectives of Safety Report

The purpose of the Safety-in-Design Report is as follows

- Identify any risks or hazards associated with the particular design of this project.
- Summarise the design changes implemented by WGA to eliminate or minimise risks involved with the project.
- Identify additional work required to be undertaken by either the client or the Contractor to ensure WGA can complete their assessment of the project.
- Summarise the residual risks that need to be managed by the contractor, operator, maintenance personnel or demolisher as appropriate.

10.5 Assumptions and Exclusions

10.5.1 Assumptions

- The Scope of WGA assessment is limited to hazards that are reasonably foreseeable at the time of design and that could result from design aspects of the project that WGA are responsible for.
- Any work undertaken in the project under the contractor will be carried out by suitably qualified personnel with appropriate experience and competence to undertake such tasks.
- Any additional hazards or risks that may arise during the project life not covered in this report should be brought to the attention of WGA for review and direction on resolution.

10.5.2 Exclusions

- This report excludes any hazards or risks arising due to normal site construction, maintenance or operation as covered by SafeWork NSW, Australian Codes and Standards. Local Codes and Guidelines Etc.
- Design of the following elements have not been undertaken by WGA:
 - Structural design of any auxiliary footings, gantries, buildings, or other structures.
 - Oily Water discharge infrastructure.
 - Architectural design aspects including safe access provisions such as roof access ladders, harness points, hand rails and the like.
 - Temporary work such as formwork, propping, precast lifting points etc.
 - Electrical design aspects of the substation project.

10.6 Hazard Identification

Please refer to the hazard identification table attached as **Error! Reference source not found.**, for a summary of the unique design hazards associated with the project. Each hazard was identified, and its consequence assessed.

The risks were then rated using the risk tool enclosed in **Error! Reference source not found.**

The risks/hazards identified in this section that remain open shall be addressed prior to mobilisation and construction commencing on-site. The Project and Contractor Construction and Environmental Management Plan (CEMP) shall fully detail the measures, procedures, methodologies and processes to be adopted on-site to mitigate issues during the execution and completion of the works.

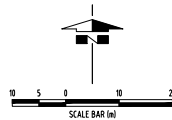
APPENDIX A

SITE LAYOUT PLAN



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PRELIMINARY ISSUE
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REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHWD
A	2.11.23	PRELIMINARY ISSUE	APE	APE	MF
B	01.12.23	PRELIMINARY ISSUE	APE	APE	MF
C	15.12.23	PRELIMINARY ISSUE	APE	APE	MF

WGA

APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

CIVIL WORKS & DRAINAGE PLAN

A1

DRAWING NUMBER

Job Number

Sheet No.

Rev.

CLIENT DRAWING NUMBER:
KFTC204-1

Design
APE

Drawn
APE

WGA231007-DR-CV-0006 C

LEGEND:

- 100m --- EXISTING CONTOURS
- 100m --- DESIGN CONTOURS (100mm INTERVALS)
- NEW SECURITY FENCE WITH ACCESS GATES
- PLINTH AND PERIMETER FENCE
- DRAINAGE PLINTH AND PERIMETER FENCE
- KERB & GUTTER
- EDGE KERB ONLY
- SPOON DRAIN
- SPOON DRAIN (BURIED)
- SPOON DRAIN (WITH BURIED KERB & GUTTER)
- SLEEPER RETAINING WALL
- RETAINING WALL HEIGHT TO TOP OF WALL DESIGN LEVEL (TW) / BOTTOM OF WALL DESIGN LEVEL (BW)
- FALL DIRECTION
- CABLE TRENCH
- AG --- STORMWATER PIPE - HOPE AG DRAIN
- STORMWATER PIPE - BLACKMAX
- STORMWATER PIPE - PVC UNDR S&B
- CABLE TRENCH DRAINAGE
- INSTALL @ MIN. 0.5% GRADE (WITH INSPECTION POINTS WITH TRAFFICABLE LOS)
- RAISED SURGE GRATED PIT (1000x900)
- S-GP --- VEE-GRATE INLET PIT
- GP --- STORMWATER GRATED INLET PIT
- JB --- STORMWATER JUNCTION BOX
- STORMWATER DRAINAGE PIT No.
- SWALE DRAIN: HEADWALL OUTLET AND ROCK SCOUR PROTECTION, REFER DETAIL.
- SPRAY SEAL PAVEMENT TYPE 1
- PAVEMENT TYPE 2 (UNSEALED)
- LANDSCAPE TYPE 3 (UNSEALED)
- CONCRETE PAVEMENT

NOTES

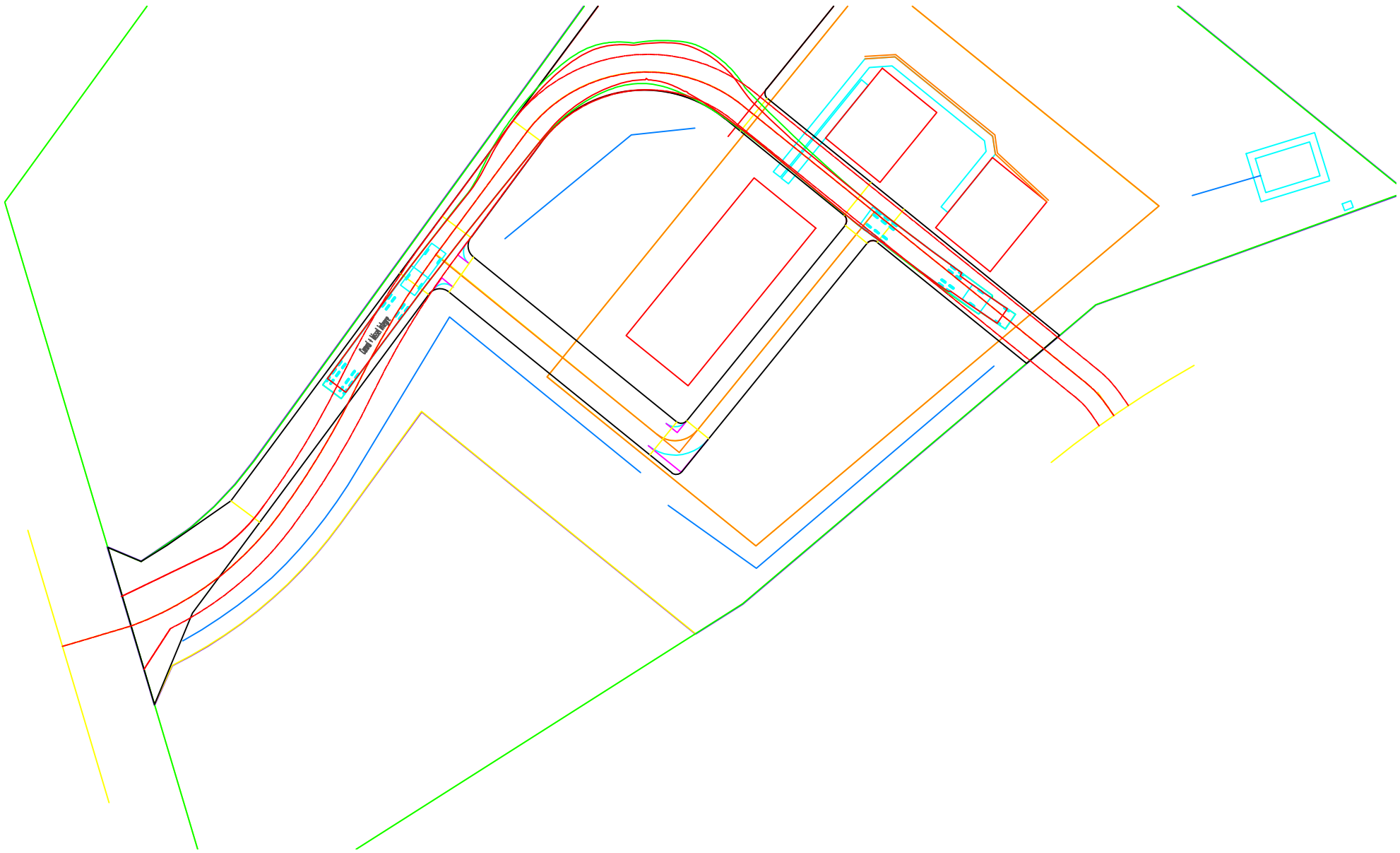
- CONTRACTOR TO VERIFY ALL STORMWATER PIT INVERT LEVELS AND TOP LEVELS.
- REFER DRAINAGE LONGITUDINAL SECTIONS FOR ROAD CHAINAGES OF STORMWATER PITS.
- ALL CROSSOVER DETAILS REFER TO TWEED SHIRE COUNCIL STANDARDS DRAWINGS.

APPENDIX B

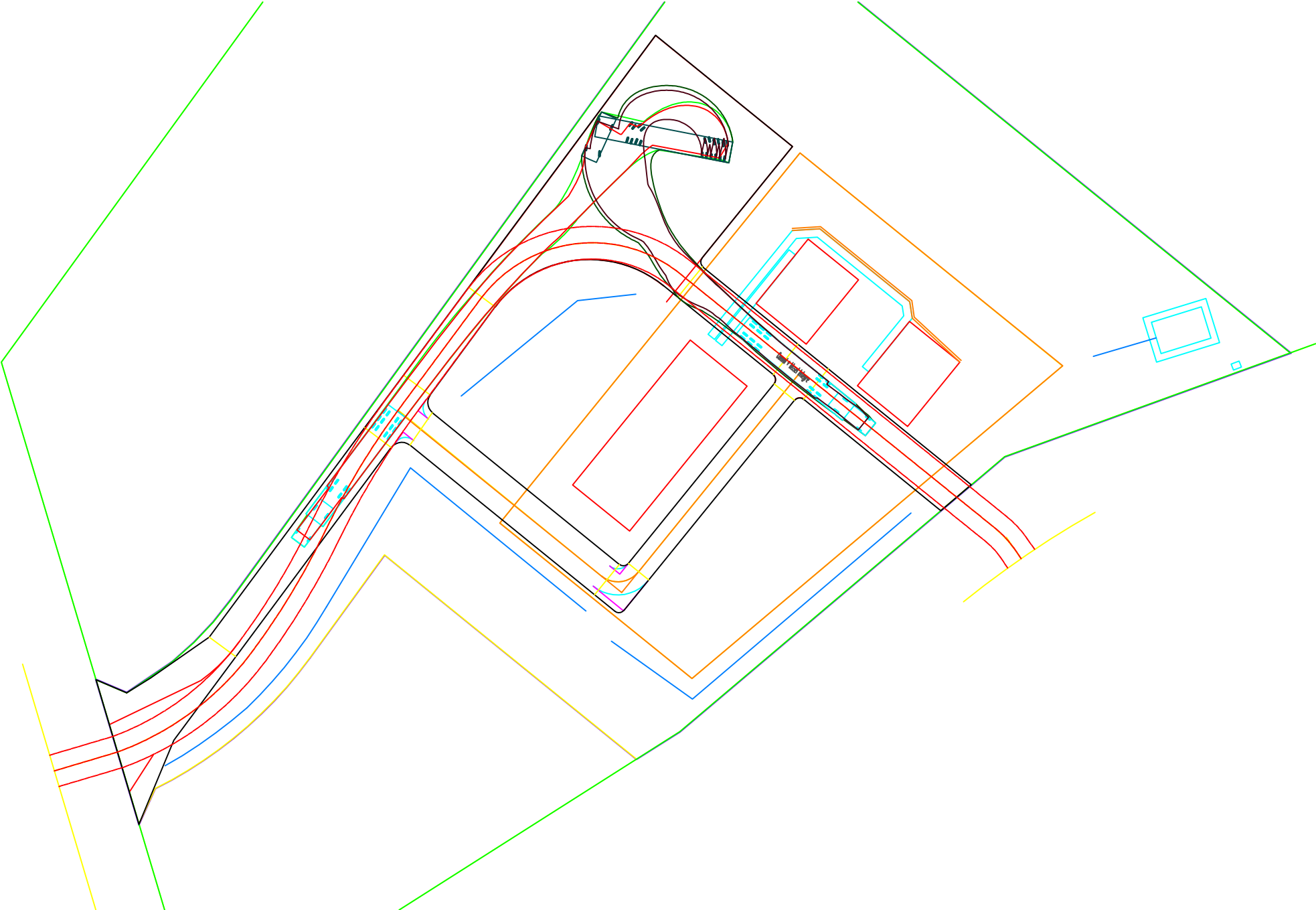
TURN PATH ASSESSMENTS



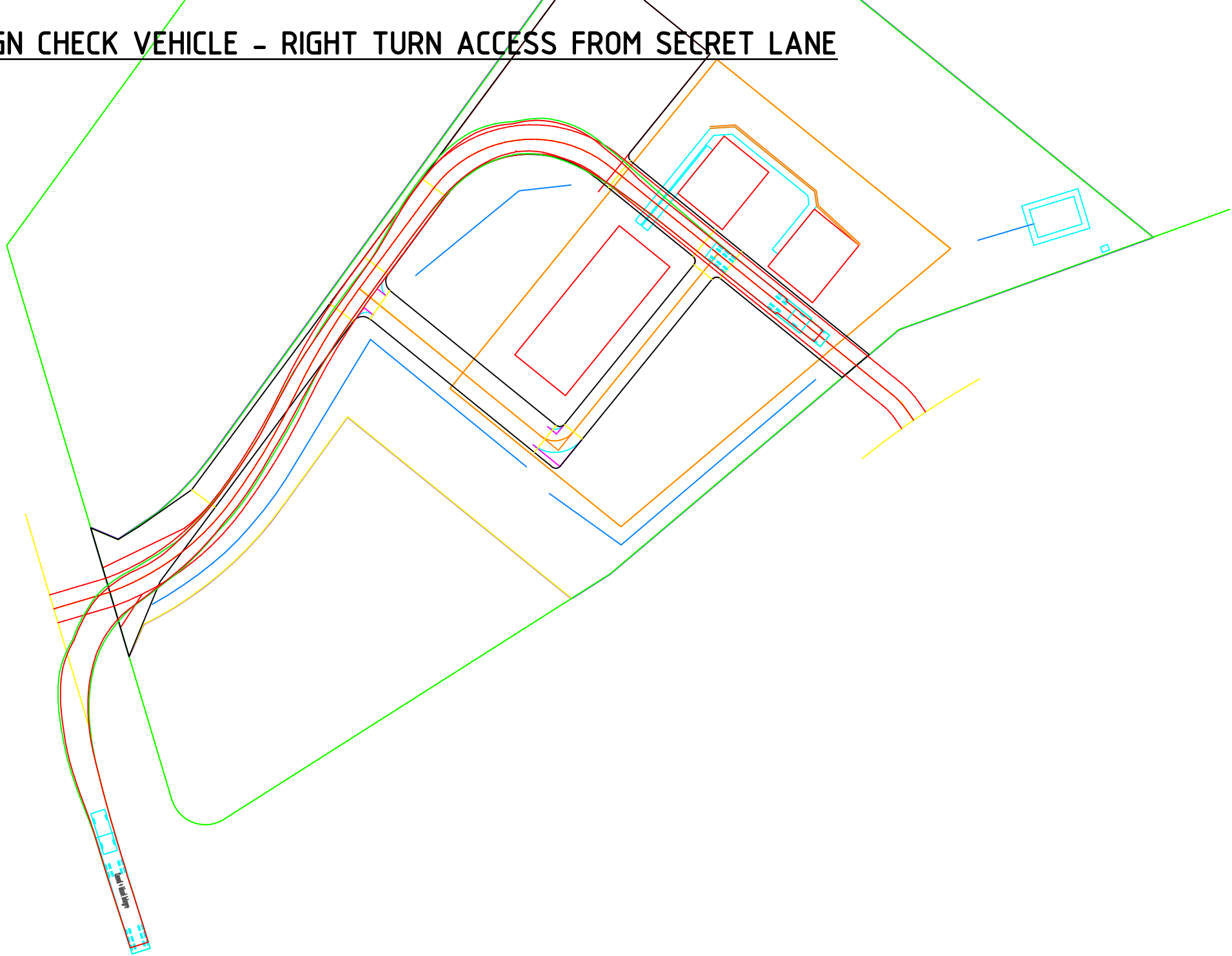
25m DESIGN CHECK VEHICLE – TURN PATH CHECK ON INTERNAL ROAD



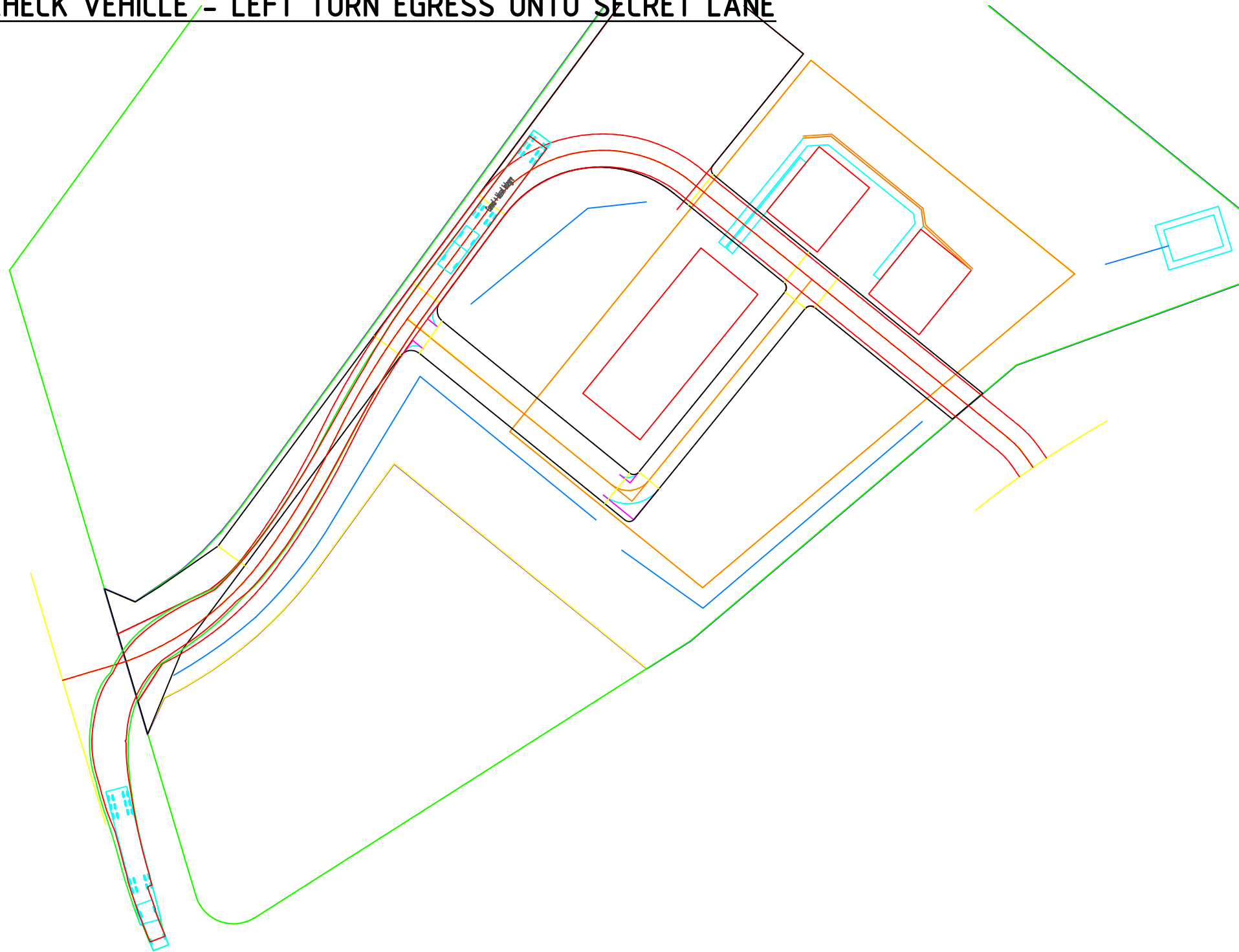
25m DESIGN CHECK VEHICLE - REVERSE AND EXIT TO SECRET LANE



25m DESIGN CHECK VEHICLE - RIGHT TURN ACCESS FROM SECRET LANE



25m DESIGN CHECK VEHICLE - LEFT TURN EGRESS ONTO SECRET LANE



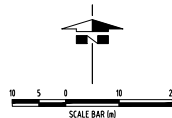
APPENDIX C

CATCHMENT PLAN



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PRELIMINARY ISSUE
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REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHRD
A	10.11.23	PRELIMINARY ISSUE	APE	APE	MF
B	01.12.23	PRELIMINARY ISSUE	APE	APE	MF
C	15.12.23	PRELIMINARY ISSUE	APE	APE	MF

WGA

APD ENGINEERING
KINGS FOREST SUBSTATION - CIVIL DESIGN

STORMWATER MANAGEMENT PLAN

A1

DRAWING NUMBER

CLIENT DRAWING NUMBER: KFTC206-1

Design APE

Drawn APE

Job Number

Sheet No.

Rev.

WG231007-DR-CV-0009 C

LEGEND:

- EXISTING CONTOURS
- DESIGN CONTOURS (100mm INTERVALS)
- FALL DIRECTION
- CABLE TRENCH
- STORMWATER PIPE - HDPE AG DRAIN @ MIN 0.5% GRADE
- STORMWATER PIPE - BLACKMAX
- STORMWATER PIPE - PVC DWD8 S88
- CABLE TRENCH DRAINAGE INSTALL @ MIN 0.5% GRADE
- RAISED SURGE GRATED PIT (900x900)
- VEE-GRATE INLET PIT
- STORMWATER GRATED INLET PIT
- STORMWATER JUNCTION BOX
- STORMWATER CATCHMENT AREA
- STORMWATER DRAINAGE PIT No.
- SWALE DRAIN
- HEADWALL OUTLET AND ROCK SCOUR PROTECTION, REFER DETAIL.

NOTES

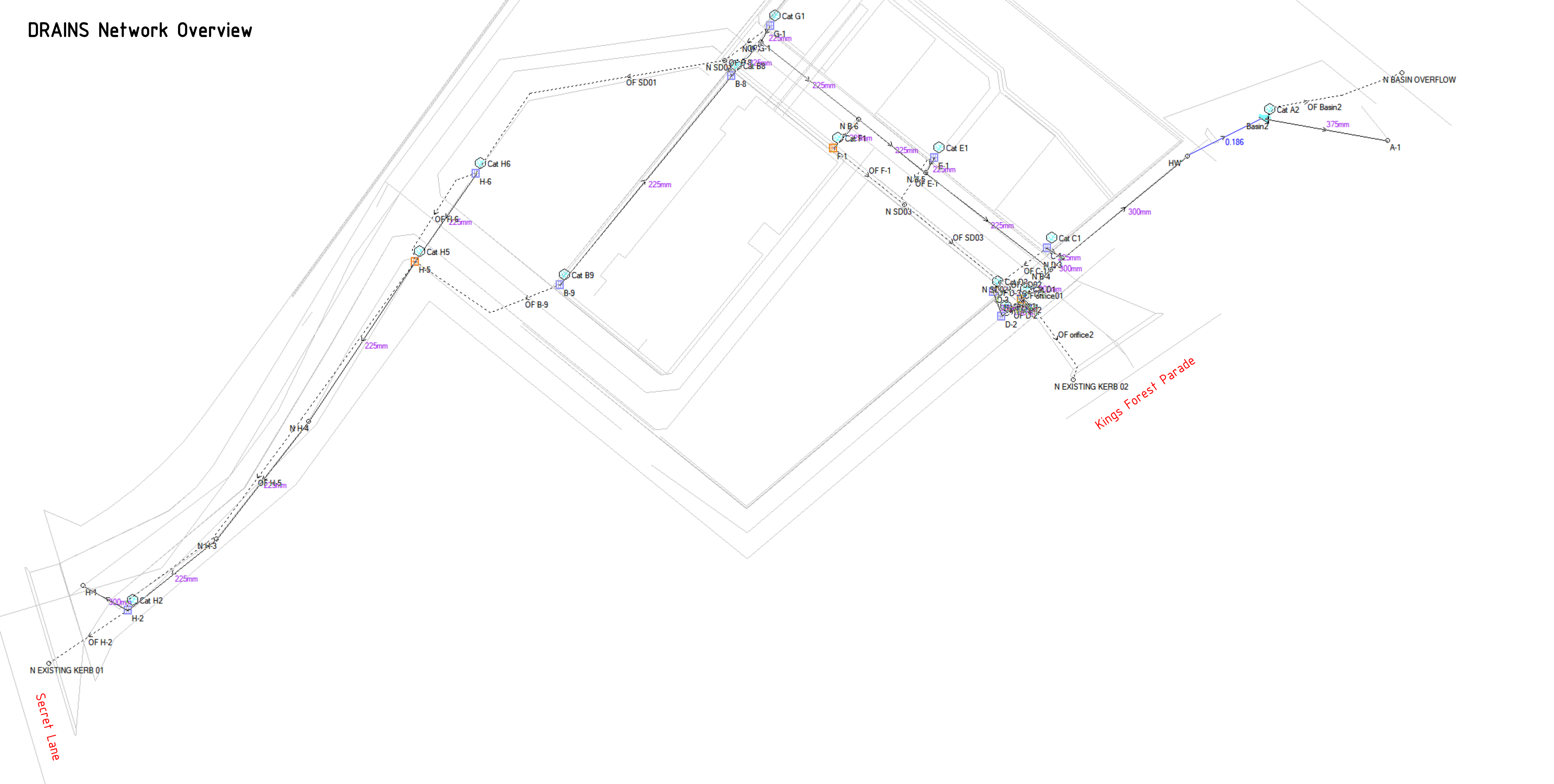
- CONTRACTOR TO VERIFY ALL STORMWATER PIT INVERT LEVELS AND TOP LEVELS.
- REFER TO DRAWING WG231007-DR-CV-0010 FOR DRAINAGE LONGITUDINAL SECTIONS.
- REFER TO DRAWING WG231007-DR-CV-0006 FOR KERBS AND SPOONDRAIN LOCATION.

APPENDIX D

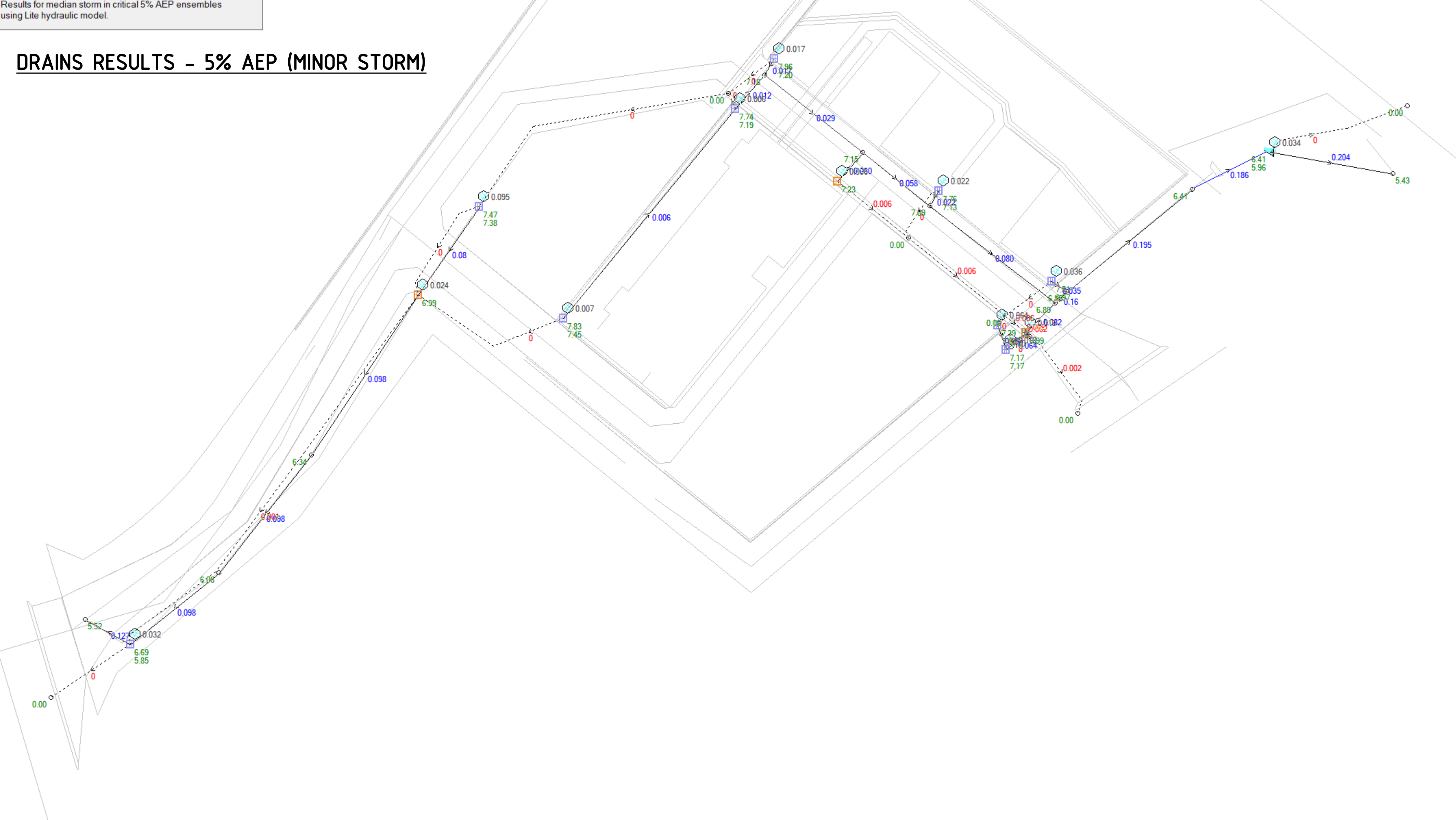
DRAINS RESULTS

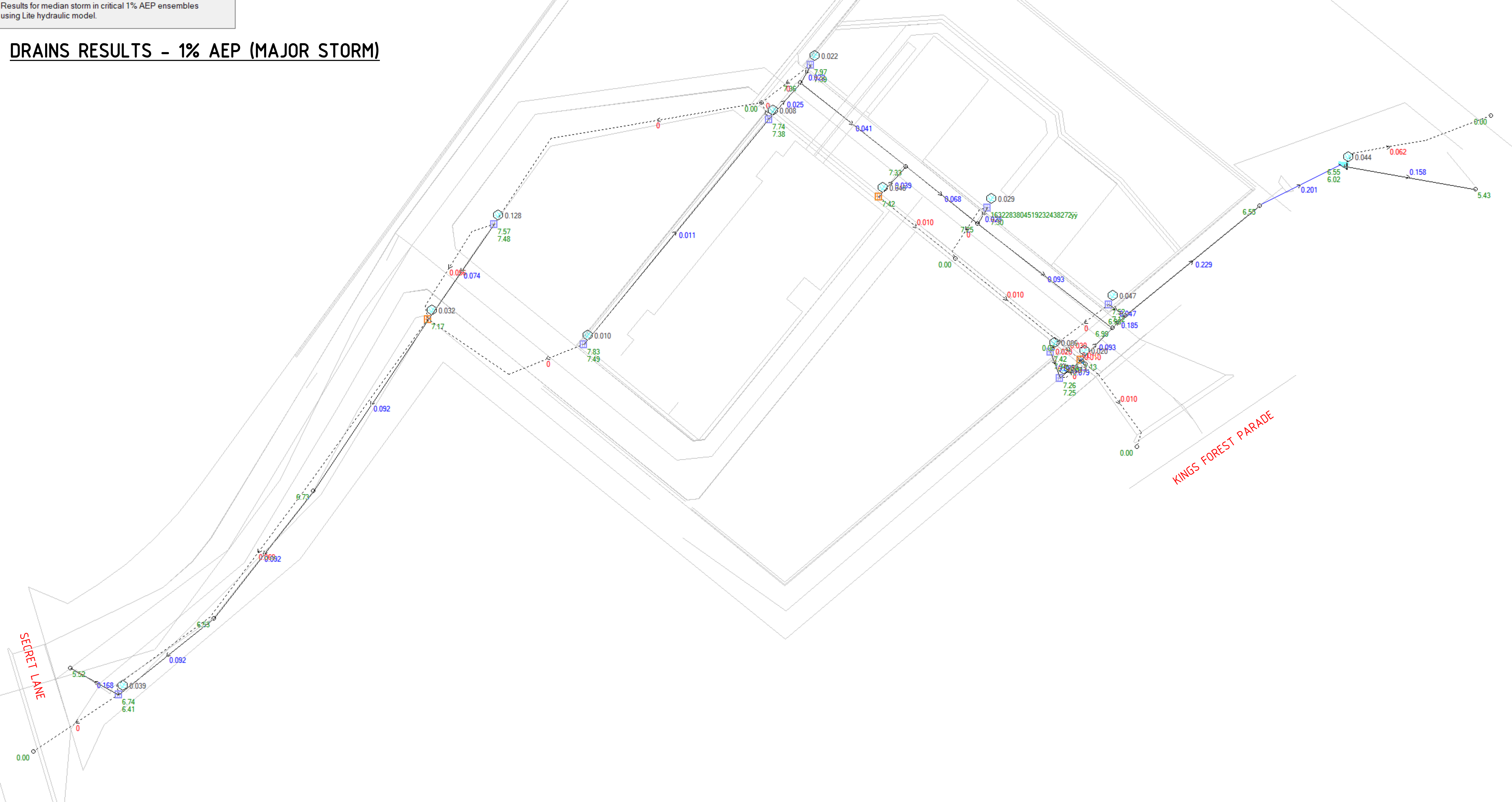


DRAINS Network Overview



DRAINS RESULTS - 5% AEP (MINOR STORM)

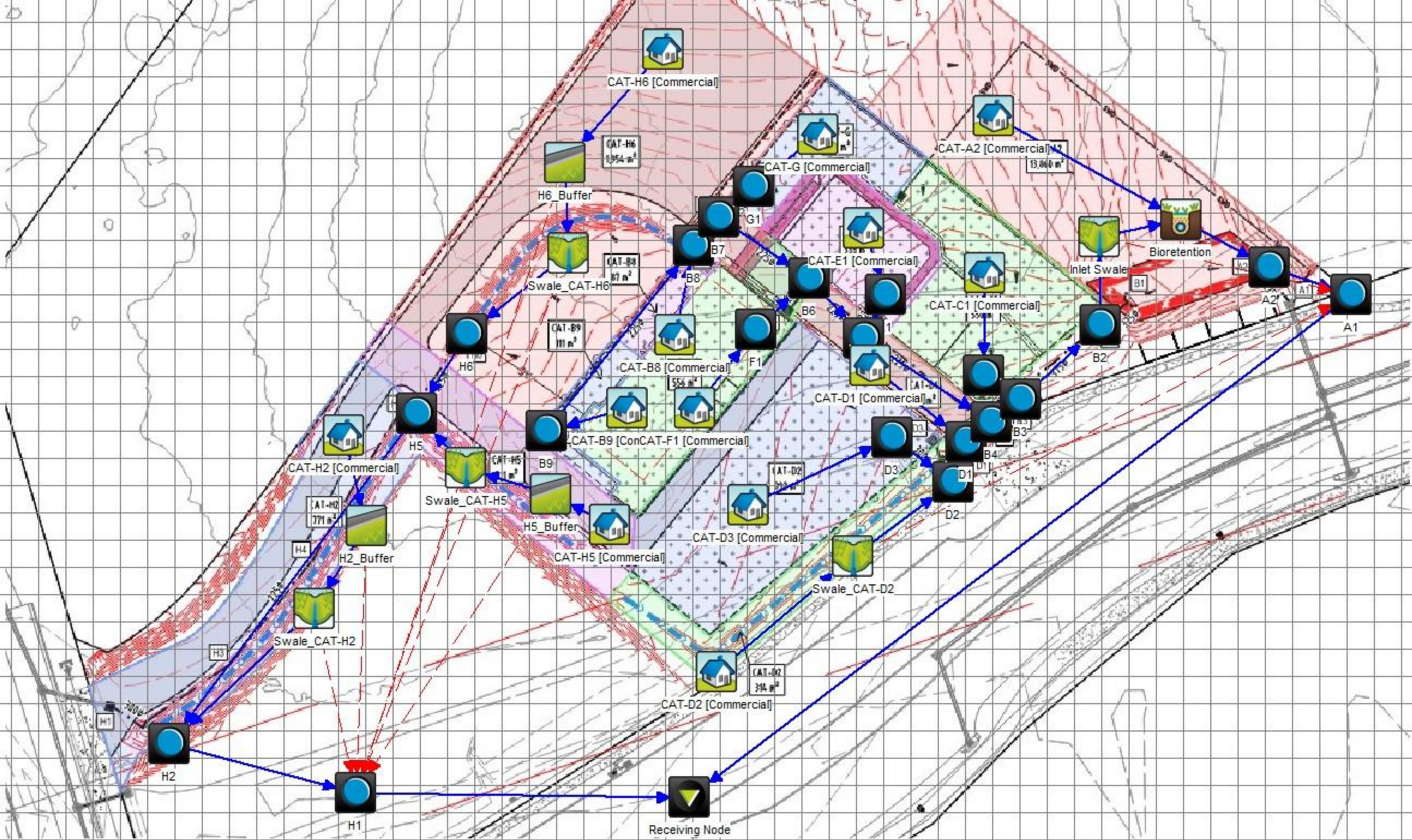




APPENDIX E

MUSIC MODELLING





APPENDIX F

TRAFFIC ESTIMATES



ROAD: Kings Forest Substation - Example Traffic Estimation

Construction	6 months
Construction days/wk	5.5 days
Construction days Total	150 days
Design Life	50 years



GENERAL ASSUMPTIONS				SITE ACCESS ROAD			
		Movements / No of Deliveries		Total Movements	ESA/ Movement	Design ESA's	Comment
CONSTRUCTION							
4WD's		30	per day	4500	0.2	900	Staff
Three Axle Truck	Concrete - onsite delivery 5m3/ truck. Misc Foundations	40	total	40	4.09	164	Estimate, minor concrete works only
	Steel Reo - 20t / truck	10	total	10		41	Estimate, minor concrete works only
	Water Cart	2	per day	300		1227	General construction estimation
	O&M Deliveries	10	total	10		41	N/A
	Compound Construction	10	total	10		41	General compound construction estimation
	Misc. Deliveries during construction	150	total	150		614	Allowance for additional deliveries
Six Axle Semi	O&M Construction Deliveries	5	total	5	7.22	36	General compound construction estimation
	Compound Construction	5	total	5		36	General compound construction estimation
	Machinery Equipment Delivery	15	total	15		108	General construction estimation
	Misc. Deliveries	20	total	20		144	Allowance for additional deliveries
Truck & Dog 7axle	Quarry Deliveries - road & hardstands	30	total	30	7.79	234	Estimate, based on previous windfarm requirements
RAV							
Oversize Transformer		3	transformer install	3	243.3	730	General construction estimation
CRANE							
100T Assist Crane		3	over full period	3	75.6	227	General construction estimation for transformers
25T Franna Crane		100	total	100	18.8	1875	General construction estimation for gantries
OPERATION							
4WD's	General operations and maintenance	2	per week	5200	0.2	1040	
Three Axle Truck	Misc. Deliveries	1	per month	600	4.1	2454	
Six Axle Semi	Large Deliveries	0	per week	0	7.22	0	
						9911	
						9.9E+03	

APPENDIX G

SAFETY IN DESIGN



CIVIL DESIGN HAZARD REGISTER												
Hazard Identification			Initial Risk Rating			Controls		Residual Risk Rating			Status	
Item (No.)	Risk Description	Possible causes	Consequence	Likelihood	Risk score	Control measures	Action owner (s)	Consequence	Likelihood	Risk score	Completion Status	Comments / Follow Up
1	Design for safe construction											
1-1	Open trenches during construction. Injury to construction workers due to sandy soils	open/un managed trenches	Major (D)	Possible (3)	High	Contractor to ensure that trenching works are undertaken safely and to required standards Review recommendations of the RGS geotechnical report	Contractor	Moderate (C)	Unlikely (2)	Medium	Open	Contractor to follow up
1-2	Due to sandy soils, batter slopes may be subject to erosion or 'sand flow'	Exposed batter slopes, particularly due to rain/groundwater	Moderate (C)	Possible (3)	Medium	Contractor to ensure batter slopes are adequately protected or stabilised from rain fall per the RGS geotech report Contractor to consider topsoiling and revegetating batters where able to stabilise	Contractor	Minor (B)	Unlikely (2)	Low	Open	Contractor to follow up
1-3	Construction within existing road may expose workers to conflict to live traffic	Installation of Council Driveways for site access	Major (D)	Possible (3)	High	Contractor to have traffic management plan in place and apply to council for relevant works permits	Contractor	Minor (B)	Unlikely (2)	Low	open	Contractor to follow up
1-4	Coordinating construction with concurrent site works leading to potential conflicts working within other works sites	Access to substation through site while works are continuing on Kings Forest residential development	Moderate (C)	Possible (3)	Medium	Contractor to liaise with residential development contractor and coordinate safe access management to site	Contractor	Minor (B)	Unlikely (2)	Low	open	Contractor to follow up
1-5	Crane lifts - Given existing ground conditions onsite that crane operator/designer does not appreciate subsoil condition in assessing crane platforms - risk of roll over etc	Existing soil conditions indicate low bearing capacities	Major (D)	Likely (4)	Very High	Contractor to ensure adequate supports for crane struts to be provided Consider undertaking crane lift study to confirm lifting requirements on sandy soils.	Contractor	Moderate (C)	Unlikely (2)	Medium	Open	Contractor to follow up
2	Design for Safe Use											
2-1	Access limitations for oversized deliveries utilising Kings Forest Parkway access	Restricted movements out of emergency access point to Kings Forest Parkway may cause conflict with through traffic.	Major (D)	Possible (3)	High	Design could consider wider driveway to cater for turn path movements of oversized vehicles. Driver's of vehicles may require traffic management when using this access	Designer / Client / Contractor	Minor (B)	Unlikely (2)	Low	Open	Design of Driveway to Kings Forest Parkway could be revised to accommodate safer movements in and out of access. In lieu of design changes, Contractor and Operators will need to consider traffic management when using this access.
2-2	Vehicle impacts to retaining wall	Tight turnparths for design vehicle suggest there is a risk of impact to retaining wall structures in the hardstand/manoeuvring area	Minor (B)	Possible (3)	Medium	Design could consider bringing in kerb line as driver prompt. Bollards could be installed as warning Operator may require spotter when circulating	Designer / Client / Operator	Minor (B)	Unlikely (2)	Low	Open	Extra protections can be added if required. In lieu of design changes, operators may require use of a spotter.

CIVIL DESIGN HAZARD REGISTER

	Hazard Identification		Initial Risk Rating			Controls		Residual Risk Rating			Status	
Item (No.)	Risk Description	Possible causes	Consequence	Likelihood	Risk score	Control measures	Action owner (s)	Consequence	Likelihood	Risk score	Completion Status	Comments / Follow Up
2-3	Vehicles rolling off road edge and rolling vehicle	Roads in fill may become hazardous to vehicles if they inadvertently travel over the edge, may be more risk at night	Major (D)	Possible (3)	High	Guide posts with reflectors could be installed at road edge as a visual cue. Additional lighting could be provided to light access road during night	Designer / Client	Minor (B)	Unlikely (2)	Low	Open	Guide posts not currently on drawings, but can be added by the designer. Provision for additional lighting subject to the client
3	Design for safe maintenance											
3-1	Vehicles could become bogged in accessing bi-retention basin	No formalised access track or provisions made to access bio-filtration presents risks of access, particularly in wet weather	Moderate (C)	Possible (3)	Medium	Provision of rubble access track could limit risk of vehicles getting bogged.	Designer / Client	Minor (B)	Unlikely (2)	Low	Open	Consider provisions for access to bio-retention basin, such as formalised track
4	Modification											
5	Demolition and dismantling											

REFERENCES

Risk Rating Matrix						
Consequence		Likelihood				
		Very Unlikely (1)	Unlikely (2)	Possible (3)	Likely (4)	Very Likely (5)
		Conceivable, but only in extreme circumstances.	Known to occur, but only rarely.	May occur, and has occurred in a minority of similar projects.	Is likely to occur during the project, or has occurred on similar projects.	Expected to occur at least once during the project.
Insignificant (A)	Insignificant impact to health and safety resulting in minor injuries not requiring medical assistance.	Low	Low	Low	Medium	Medium
Minor (B)	Minor impact to health and safety resulting in injuries requiring first aid assistance.	Low	Low	Medium	Medium	High
Moderate (C)	Moderate impact to health and safety resulting in injuries requiring medical assistance.	Medium	Medium	Medium	High	Very High
Major (D)	Major impact to health and safety resulting in lost time due to injury or illness.	Medium	Medium	High	Very High	Extreme

Catastrophic (E)	Catastrophic impact to health and safety resulting in fatality.	Medium	High	Very High	Extreme	Extreme
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FOR FURTHER INFORMATION CONTACT:

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WGANZ.CO.NZ



Appendix B – Building, Footings and Trenching Plans

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A

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STRUCTURAL DESIGN FOR ESSENTIAL ENERGY - SUBSTATION BUILDING

ARCHITECTURAL NOTES

SITEWORK NOTES:

1. CONTRACTORS MUST VERIFY ALL DIMENSIONS & EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK.

2. ALL WORK TO BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS, SPECIFICATIONS & THE DIRECTIONS OF THE ESSENTIAL ENERGY REPRESENTATIVE.

3. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR.

4. CARE IS TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATIONS ARE TO BE UNDERTAKEN OVER TELSTRA OR ELECTRICAL SERVICES. HAND EXCAVATION IN THESE AREAS.

5. ALL SERVICE TRENCHES UNDER VEHICULAR PAVEMENTS SHALL BE BACKFILLED WITH SAND OR AN APPROVED GRANULAR MATERIAL & COMPACTED TO 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 E1.1.

6. ALL TRENCH BACKFILL MATERIAL SHALL BE COMPACTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.

7. ON COMPLETION OF PIPE INSTALLATION, ALL DISTURBED AREAS MUST BE RESTORED TO ORIGINAL, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL & GRASSED AREAS & ROAD PAVEMENTS.

8. CONTRACTOR TO OBTAIN ALL AUTHORITY APPROVALS.

CONSTRUCTION NOTES:

1. ALL INTERNAL WALLS UNLESS OTHERWISE NOTED, TO BE PAINTED WITH FLAT ACRYLIC PAINT. COLOUR IN ACCORDANCE WITH PAINTING & COLOUR SCHEDULE.

2. ALL EXTERNAL WALLS, UNLESS OTHERWISE NOTED, TO BE PAINTED WITH A DURABLE MINERAL SILICATE MASONRY PAINT, COLOUR IN ACCORDANCE WITH PAINTING & COLOUR SCHEDULE.

3. WET AREAS OF THE BUILDING i.e. NEW BATHROOMS ARE TO BE PROTECTED BY THE INSTALLATION OF A WATER PROOFING SYSTEM COMPLYING WITH AS 3740 - WATERPROOFING OF WET AREAS.

4. PROVIDE MECHANICAL VENTILATION TO WC AREA AS PER AS 1668.2.

5. BUILDING TO BE PROTECTED AGAINST SUBTERRANEAN TERMITES, IN ACCORDANCE WITH AS 3660.

6. WALL FRAME BRACING, ROOF BRACING & ALL TIE DOWN FIXING DETAILS TO BE AS SPECIFIED & DETAILED BY ENGINEERS.

7. ROOF & SURFACE WATER TO BE COLLECTED & DISCHARGED TO STORMWATER DISPOSAL SYSTEM ON SITE AS SHOWN & DETAILED ON STORMWATER DESIGN DRAWINGS & SPECIFICATIONS.

8. THE TOP OF THE BUILDINGS OVERFLOW RELIEF GULLY SHALL BE:
- A MIN. 150mm BELOW THE LOWEST SANITARY FIXTURE IN THE BUILDING &
- A MIN. 75mm ABOVE THE SURROUNDING FINISHED SURFACE LEVEL.

9. FIRE SERVICE REQUIREMENTS TO BE CARRIED OUT IN ACCORDANCE WITH B.C.A. & ESENTIAL ENERGY.

10. ARTIFICIAL LIGHTING TO BE IN ACCORDANCE WITH SECTION F4.4 OF THE B.C.A. & CEOP8032.

11. MECHANICAL VENTILATION TO BE IN ACCORDANCE WITH SECTION F4.5 OF THE B.C.A. & CEOP8032.

FIRE SERVICES NOTES:

1. FOR MORE INFORMATION REGARDING ELECTRICAL SPECIFICATION, REFER TO ESSENTIAL ENERGY 'CEOP8032' - TRANSMISSION & ZONE SUBSTATION DESIGN GUIDELINES - SECTION 5.4.10 BUILDING SERVICES ELECTRICAL.

2. ILLUMINATED EXIT SIGNS ABOVE DOORS TO COMPLY WITH SECTION E4.5 OF THE BCA, VOL. 1, & AS 2293.

3. EMERGENCY LIGHTING IS TO BE INSTALLED THROUGHOUT & COMPLY WITH SECTION E4.2 OF THE BCA, VOL. 1, & AS 2293.1.

4. SMOKE DETECTORS & ALARM SYSTEMS ARE TO COMPLY WITH SECTION E2.2a OF THE BCA, VOL. 1, & AS 1670.1.

5. THE BUILDING MUST BE PROVIDED WITH AUTOMATIC SHUTDOWN OF ANY AIR CONDITIONING SYSTEM ON THE ACTIVATION OF SMOKE DETECTORS IN ACCORDANCE WITH ESSENTIAL ENERGY CEOP8032 - TRANSMISSION & ZONE SUBSTATION DESIGN GUIDELINES - SECTION 5.4.10 BUILDING SERVICES ELECTRICAL.

6. PORTABLE FIRE EXTINGUISHERS TO BE PROVIDED IN ACCORDANCE WITH TABLE E1.6 OF THE BCA, VOL. 1, & SELECTED, LOCATED & DISTRIBUTED IN ACCORDANCE WITH SECTIONS 1, 2, 3 & 4 OF AS 2444.

7. FOR ALL PORTABLE EXTINGUISHER TYPES, AS 2444 ALLOWS HIGHER MOUNTING IF THE UNIT IS LIKELY TO BE DISLODGED - REFER TO CODE FOR DETAILS.

GENERAL NOTES:

1. ALL WORKMANSHIP, MATERIALS & CONSTRUCTION TO BE IN ACCORDANCE WITH RELEVANT S.A.A. CODES: 'BUILDING CODE OF AUSTRALIA' VOL. 1 & POLICY REQUIREMENTS OF ESSENTIAL ENERGY.

2. ALL LEVELS, DIMENSIONS, SITE CONDITIONS & SERVICES TO BE CHECKED & CONFIRMED ON SITE & WITH RELEVANT SERVICE AUTHORITIES, PRIOR TO CONSTRUCTION.

3. STATED DIMENSIONS TO BE USED ONLY. DO NOT SCALE. ALL DIMENSIONS ARE NOMINAL. i.e. DIMENSIONS ARE TO STRUCTURAL ELEMENTS & DO NOT INCLUDE FINISHED SURFACES SUCH AS PLASTERBOARD, TILING ETC.

4. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH RELEVANT STRUCTURAL & CIVIL ENGINEERS DETAILS & SPECIFICATIONS AT CONSTRUCTION STAGE.

5. A SECURE ANCHORAGE POINT OR SYSTEM OF ANCHORAGE POINTS SHALL BE INSTALLED ON THE ROOF OF THE BUILDING, TO WHICH A FALL ARREST DEVICE OR LANYARD ASSEMBLY OR RESTRAINT LINE MUST BE SECURED IN ACCORDANCE WITH AS 2626. ANCHORAGE POINTS TO BE CAPABLE OF WITHSTANDING A FORCE OF 15kN 1500kg.

6. ALL CONNECTORS BETWEEN RESTRAINT LINE & ANCHORAGE POINTS OR BETWEEN RESTRAINT LINE & BELT OR HARNESS, SHALL MEET THE REQUIREMENTS OF ATTACHMENT HARDWARE.

7. AN ANCHORAGE SYSTEM MUST BE INSPECTED ON A REGULAR BASIS, AT LEAST ONCE EVERY 6 MONTHS.

PAINTING & COLOUR SCHEDULE:

ROOF

ITEM	DESCRIPTION	COLOUR
ROOF SHEETING	LYSAGHT TRIMDEK	COLORBOND - SOUTHERLY
RIDGE CAPPING		SOUTHERLY
BARGE CAPPING		MONUMENT
GUTTERS		MONUMENT
DOWNPIPES & BRACKETS		MONUMENT
FASCIA		MONUMENT
EAVES LINING	COLORBOND CUSTOM MINI ORB	COLORBOND - SOUTHERLY

DOORS

ITEM	DESCRIPTION	COLOUR
DOOR FRAMES	COLORBOND STEEL FACING	MONUMENT
DOORS	COLORBOND STEEL FACING	MONUMENT

WINDOWS

ITEM	DESCRIPTION	COLOUR
WINDOW FRAMES & SHUTTERS		MONUMENT

PAINTING

ITEM	DESCRIPTION	COLOUR
INTERNAL WALLS	PRIMER: DULUX ACRYLIC SEALER UNDERCOAT	TINTED
	FIRST COAT: DULUX WASH & WEAR 101 ADV FLAT	DULUX WHISPER WHITE 'W'
	SECOND COAT: DULUX WASH & WEAR 101 ADV FLAT	DULUX WHISPER WHITE 'W'
EXTERNAL WALLS	PRIMER: DULUX WEATHERSHIELD LOW SHEEN ACRYLIC	TINTED
	UPPER WALLS DULUX WEATHERSHIELD LOW SHEEN ACRYLIC	SHALE GREY
	BASE TO SLAB DULUX WEATHERSHIELD LOW SHEEN ACRYLIC	BASALT
CONTROL ROOM FLOOR	DULUX LUXAFLOOR ROLLCOAT PC227 INSTALLED TO MANUFACTURERS SPECIFICATIONS	DULUX - LIGHT GREY

1. COATING SYSTEM MUST BE APPLIED IN STRICT ACCORDANCE WITH AS/NZ 2310 & MANUFACTURERS WRITTEN REQUIREMENTS.

2. PREPARE ALL SUBSTRATES TO RECEIVE THE PAINTING SYSTEMS IN ACCORDANCE WITH AS/NZ 2311 & THE PAINT MANUFACTURERS RECOMMENDATIONS.

3. SUBSTRATE MUST BE FREE OF DIRT, DUST, GREASE, OIL, RELEASE AGENTS, BONDBREAKERS, LAITANCE & SIMILAR. FRESH CEMENTITIOUS SURFACES SHALL BE CURED AT LEAST 14 DAYS PRIOR TO APPLICATION. MOISTURE LEVEL SHALL NOT EXCEED 15% IN SUBSTRATE.

4. FILL CRACKS & HOLES WITH FILLERS, SEALANTS, PUTTIES OR GROUTING CEMENTS AS APPROPRIATE FOR THE FINISHING SYSTEM & SUBSTRATE & SAND SMOOTH.

5. BEFORE APPLICATION TO VERY SMOOTH CONCRETE, BRICK OR MASONRY, EITHER ACID ETCH, MECHANICALLY GRIND OR ABRASIVE TRACK BALST THE SURFACE AS APPROPRIATE TO PROVIDE A SUITABLE KEY FOR SUBSEQUENTLY APPLIED COATING & TO REMOVE LOOSE FRIABLE MATTER BEFORE FILLING SURFACE DISCONTINUITIES.

6. MAKE GOOD SUBSTRATE IF NECESSARY TO ELIMINATE SURFACE IMPERFECTIONS.

7. DURING PREPARATION OF SURFACES, PAINTING & INSPECTION, MAINTAIN LIGHT LEVELS SUCH THAT THE LUMINANCE (PHOTOMETRIC BRIGHTNESS) OF THE SURFACE IS EQUAL TO THE SPECIFIED PERMANENT ARTIFICIAL ILLUMINATION CONDITIONS OR 400 LUX, WHICHEVER IS THE GREATER.

8. APPLY FIRST COAT IMMEDIATLEY AFTER SUBSTRATE PREPARATION & BEFORE CONTAMINATION OF THE SUBSTRATE CAN OCCUR. APPLY SUBSEQUENT COATS AFTER MANUFACTURERS RECOMMENDED DRYING PERIOD HAS ELAPSED.

9. DO NOT PAINT IN DUSTY CONDITIONS OR OTHERWISE UNSUITABLE WEATHER AS FOLLOWS
UNLESS PAINT IS SUITABLE & RECOMMENDED FOR SUCH CONDITIONS.
REALTIVE HUMIDITY > 85% SURFACE TEMPERATURE < 10°C OR ≥ 35°C.

ALL DIMENSIONS ARE IN mm U.N.O.
DO NOT SCALE

PROJECT No. -

COMMENTS

DESIGNED

DRAWN

REVIEWED

APPROVED

ISSUED FOR CONSTRUCTION

DATE OF ISSUE 18/01/24

PURPOSE OF ISSUE CONSTRUCTION

APD
ENGINEERING

PRO'T No W APD07785

DRAWN AS

VERIFIED AN

DATE 21-12-2023

DES'G'D APD

APP'D PT

KINGS FOREST
33/11KV ZONE SUBSTATION
CONTROL BUILDING
ARCHITECTURAL NOTES
BUILDING DRAWING

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SUPERSEDES:

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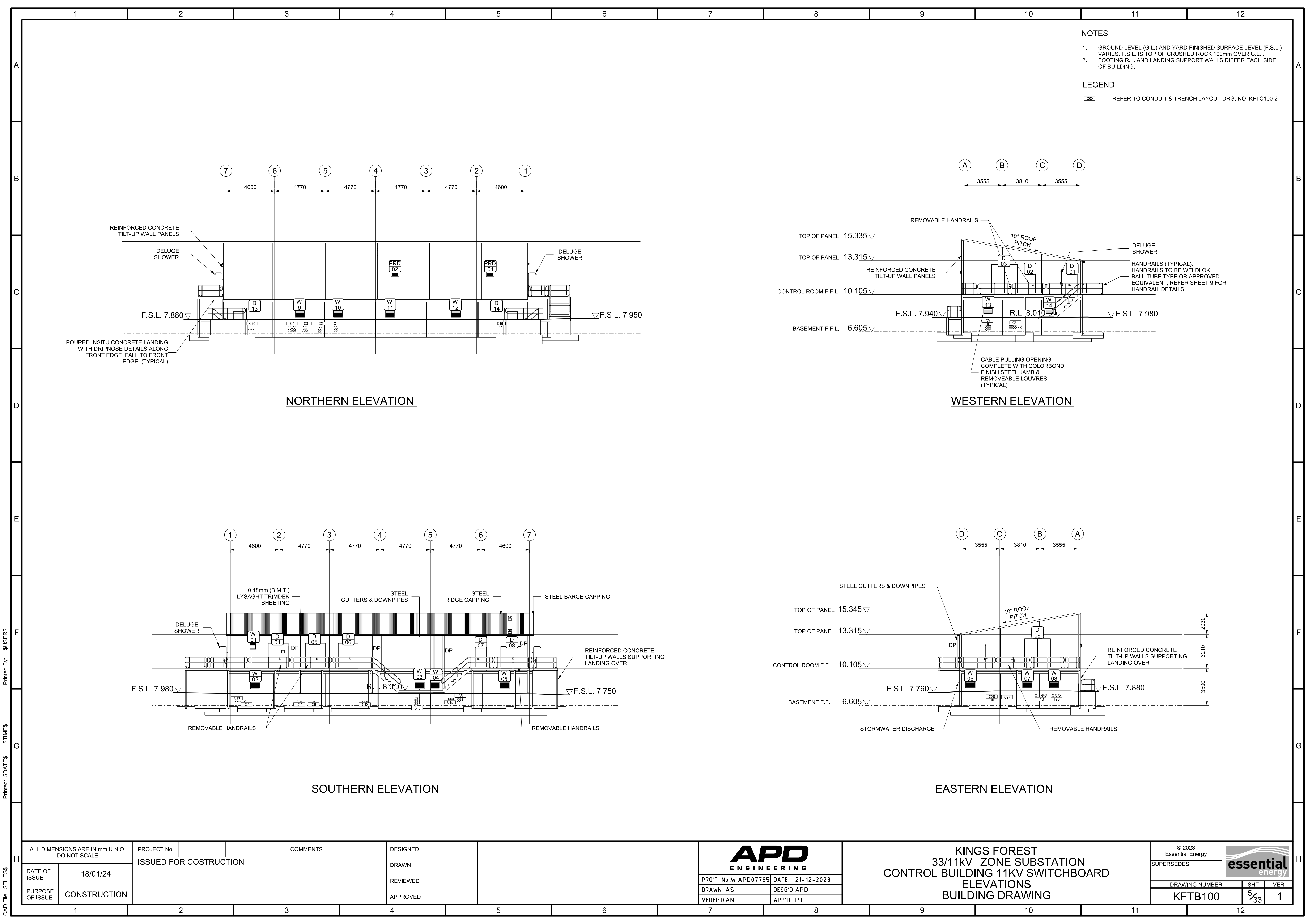
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A	<div>STRUCTURAL DESIGN FOR ESSENTIAL ENERGY - SUBSTATION BUILDING</div> <div>CONSTRUCTION NOTES</div>											A
B	<div>LOADING NOTES:</div> <div>1. ALL LOADS ARE ACCORDING TO AS 1170.</div> <div>2. ROOF DEAD LOADS: A - SELF WEIGHT OF STEELWORK & CONCRETE STRUCTURE INCLUDING ROOF SHEETING & INSULATION.</div> <div>3. ROOF LIVE LOADS: A - 0.25kPa NON TRAFFICABLE ROOF LOADING TO AS 1170.1 B - 0.25kPa SERVICES LOADING TO AS 1170.1.</div> <div>4. FIRST FLOOR DEAD LOADS: A - SELF WEIGHT OF STEELWORK & CONCRETE STRUCTURE. B - PRECAST PANEL PARTITIONS. C - 0.5kPa CABLE TRAY LOADING.</div> <div>5. FIRST FLOOR LIVE LOADS: A - 10kPa FLOOR LOADING AS ADVISED BY ESSENTIAL ENERGY. B - 2.0kPa TOILET FLOOR LOADING TO AS 1170.1.</div> <div>6. BASEMENT FLOOR DEAD LOADS: A - SELF WEIGHT OF STEELWORK & CONCRETE STRUCTURE. B - PRECAST PANEL PARTITIONS.</div> <div>7. BASEMENT FLOOR LIVE LOADS: A - 5.0kPa LIGHT INDUSTRIAL FLOOR LOADING TO AS 1170.1. B - 2.5kPa STAIRS</div> <div>8. EXTERNAL STRUCTURE LIVE LOADS: A - 10.0kPa SURCHARGE LOADING AROUND BUILDING TO AS 1170.1. B - 2.0kPa STAIR & LANDING LOADING TO AS 1170.1.</div> <div>9. WIND LOADS: A - REGION B, TERRAIN CATEGORY 2.0 TO AS 1170.2. B - MI=Ms=1.0, STRUCTURAL IMPORTANCE LEVEL 4 TO AS 1170.2.</div> <div>10. EARTHQUAKE LOADS: A - DETERMINED IN ACCORDANCE WITH AS 1170.4. B - SITE SOIL SUB-SOIL CLASS = C_e, SHALLOW SOIL AND HAZARD FACTOR, z=0.08 C - STRUCTURAL IMPORTANCE LEVEL 4 TO AS1170.0. D - PROBABILITY FACTOR, k_p=1.8. E - EARTHQUAKE DESIGN CATEGORY EDC II.</div>											B
C	<div>SALT DAMP SITES:</div> <div>1. IN AREAS ADVISED BY THE LOCAL AUTHORITY TO BE SALT DAMP, THE FOLLOWING MINIMUM REQUIREMENTS ARE TO BE TAKE PRECEDENCE OVER ANY NOTATION WITHIN THE DRAWING SET. A - CONCRETE IS TO BE GRADE N40 (40MPa COMPRESSIVE STRENGTH AT 28 DAYS MIN.) B - DAMP PROOFING MEMBRANE IS TO BE HIGH IMPACT RESISTANCE IN ACCORDANCE WITH AS 2870.</div>											C
D	<div>GENERAL NOTES:</div> <div>1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH OTHER WORKING DRAWINGS & SPECIFICATIONS RELEVANT TO THIS PROJECT. ANY DISCREPANCIES SHALL BE REFERRED TO AN EE REPRESENTATIVE PRIOR TO PROCEEDING.</div> <div>2. DO NOT SCALE FROM THESE DRAWINGS. WORK TO DIMENSIONS.</div> <div>3. MATERIALS & WORKMANSHIP SHALL BE IN ACCORDANCE WITH RELEVANT S.A.A. CODES & LOCAL AUTHORITY REGULATIONS.</div> <div>4. THE CONTRACTOR SHALL OBTAIN A COPY OF THE SITE GEOTECHNICAL REPORT PRIOR TO CONSTRUCTION. TO FAMILIARISE THEMSELF WITH THE EXPECTED NATURALLY OCCURRING FOUNDATION SOILS.</div> <div>5. IF SOIL IS ENCOUNTERED DURING CONSTRUCTION THAT IS DIFFERENT TO THAT REFERRED TO IN THE GEOTECHNICAL REPORT, CONTACT THE ESSENTIAL ENERGY REPRESENTATIVE PRIOR TO FURTHER WORK TAKING PLACE.</div> <div>6. DURING CONSTRUCTION, THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION & NO PART SHALL BE OVERSTRESSED.</div> <div>7. ALL CARE SHALL BE TAKEN TO ENSURE THAT ADEQUATE SITE DRAINAGE IS PROVIDED TO ENSURE THAT WATER IS DIVERTED AWAY FROM THE BUILDING.</div> <div>8. ALL FORM WORK SHALL BE IN ACCORDANCE WITH AS3610.</div> <div>9. PRE-POUR INSPECTIONS FOR ALL FOOTINGS & SLABS SHALL BE CARRIED OUT BY AN EE REPRESENTATIVE OR THE CERTIFYING AUTHORITY. 24 HOURS NOTICE FOR INSPECTIONS IS REQUIRED, NO CONCRETE IS TO BE POURED WITHOUT ATTAINING APPROVAL.</div> <div>10. FOR SLAB ON GROUND, FINISHED SLAB HEIGHTS ABOVE EXTERNAL FINISHED SURFACES MUST NOT BE LESS THAN: A - 150mm ABOVE FINISHED GROUND LEVEL. B - 100mm ABOVE SANDY, WELL DRAINED AREAS. C - 50mm ABOVE EXTERNAL SEALED AREAS THAT HAVE A SLOPE OF NOT LESS THAN 50mm OVER THE FIRST 1m FROM THE BUILDING.</div> <div>11. SLABS & FOOTINGS HAVE BEEN DESIGNED BASED ON STANDARD DESIGNS CONTAINED IN SECTION 3 & ENGINEERING PRINCIPALS CONTAINED IN AS 2870 & ENGINEERING PRINCIPLES FROM AS 3600.</div> <div>12. DIMENSIONS GIVEN FOR BEAMS & STRIP FOOTINGS ARE THE MINIMUM REQUIRED AS PER DESIGN PRINCIPLES NOTED ABOVE. IF THERE ARE SITE SPECIFIC REQUIREMENTS TO WIDEN OR DEEPEN BEAMS OR STRIP FOOTINGS, IT SHALL BE PERFORMED AS FOLLOWS: A - WHERE BEAMS OR STRIP FOOTINGS ARE WIDER THAN THAT SPECIFIED, AN EXTRA BOTTOM BAR OR EQUIVALENT OF THE SAME BAR SIZE IS REQUIRED FOR EACH 100mm ADDITION WIDTH. B - WHERE BEAMS OR STRIP FOOTINGS ARE DEEPER THAN THAT SPECIFIED, THE BOTTOM REINFORCEMENT SPECIFIED IN AS 2870 FOR THE GREATER BEAM OR STRIP FOOTING DEPTH IS TO BE USED.</div>											D
E	<div>EXCAVATION:</div> <div>1. TOPSOIL CONTAINING GRASS ROOTS OR VEGETATION SHALL BE REMOVED FROM THE FOUNDATION AREA, IT SHALL THEN BE PROOF ROLLED PRIOR TO FILLING.</div> <div>2. FOOTING EXCAVATIONS MUST BE FREE OF LOOSE EARTH, TREE ROOTS, MUD OR DEBRIS IMMEDIATELY BEFORE POURING CONCRETE.</div> <div>3. EXCAVATION FOR FOOTINGS, INCLUDING THICKENING FOR SLABS & PADS MUST BE CLEAN CUT WITH VERTICAL SIDES WHEREVER POSSIBLE.</div> <div>4. FOR EXCAVATION REQUIREMENTS ON SLOPING SITES WHERE STEPPED BEAMS OR STEPPED STRIP FOOTINGS ARE TO BE USED, CONFIRMATION OF THIS DESIGN IS REQUIRED.</div> <div>5. AN EE REPRESENTATIVE SHOULD BE CONSULTED BEFORE COMMENCING ANY EXCAVATIONS NEAR THE EDGE OF A BUILDING.</div> <div>6. WHERE PROPOSED FOOTINGS ARE NEAR EXISTING BUILDINGS OR SERVICES, AN EE REPRESENTATIVE MUST BE CONTACTED AS DESIGN CHANGES MAY BE NECESSARY.</div>											E
F	<div>GEOTECHNICAL NOTES:</div> <div>1. GEOTECHNICAL INVESTIGATION REPORT HAS BEEN PREPARED BY 'REGIONAL GEOTECHNICAL SOLUTIONS' DATED OCTOBER 2023. FINDINGS FROM THE REPORT CONCLUDE THE SITE SOIL REACTIVITY IS 'MILD' FOR CONCRETE AND 'NON-AGGRESSIVE' FOR STEEL.</div> <div>2. SOIL CONDITIONS CONSIST OF LOOSE SANDS IN THE UPPER PROFILE AND CAN BE CLASSIFIED AS 'P' IN ACCORDANCE WITH AS2780-2011.</div> <div>3. FOOTINGS HAVE BEEN DESIGNED FOR THE FOLLOWING ALLOWABLE BEARING PRESSURES; A - BASEMENT SLAB ON GROUND, Q_a = 100kPa.</div>											F
G	<div>STRUCTURAL STEELWORK NOTES:</div> <div>1. ALL WORKMANSHIP & MATERIALS SHALL BE IN ACCORDANCE WITH AS 4100.</div> <div>2. BOLTS NOT DESIGNATED SHALL BE GRADE 8.8/S BOLTS TO AS 1252. TIGHTENED TO A SNUG TIGHT FIT. BOLTS DESIGNATED 8.8/TF & 8.8/TB SHALL BE HIGH STRENGTH STEEL BOLTS TO AS 1252, FULLY TENSIONED IN ACCORDANCE WITH AS 4100.</div> <div>3. ALL WELDING SHALL BE PERFORMED BY AN EXPERIENCED OPERATOR IN ACCORDANCE WITH AS 1554.</div> <div>4. EXCEPT WHERE OTHERWISE NOTED, WELDS TO BE 6mm CONTINUOUS FILLET SP GRADE.</div> <div>5. ENDS OF ALL TUBULAR MEMBERS ARE TO BE SEALED WITH NOMINAL THICKNESS PLATES & CONTINUOUS FILLET WELDED UNLESS OTHERWISE NOTED.</div> <div>6. CAMBER TO BE AS NOTED ON DRAWINGS.</div> <div>7. UNLESS OTHERWISE NOTED, ALL STEELWORK SHALL BE HOT DIP GALVANISED TO AS 4680.</div> <div>8. MEMBERS ENCASED IN CONCRETE, FIRE SPRAYED OR HSTF BOLTED CONNECTIONS MUST NOT BE PAINTED.</div> <div>9. CONCRETE ENCASED STEELWORK SHALL BE WRAPPED WITH SL62 MESH UNLESS OTHERWISE NOTED.</div> <div>10. THE CONTRACTOR SHALL PROVIDE & LEAVE IN PLACE UNTIL PERMANENT BRACING ELEMENTS ARE CONSTRUCTED SUCH TEMPORARY BRACING AS IS NECESSARY TO STABILISE THE STRUCTURE DURING ERECTION.</div> <div>11. BEFORE FABRICATION IS COMMENCED THE CONTRACTOR SHALL SUBMIT COPIES OF THE SHOP DRAWINGS TO AN EE REPRESENTATIVE FOR REVIEW. REVIEW DOES NOT INCLUDE CHECKING OF DIMENSIONS.</div>											G
H	<div>ALL DIMENSIONS ARE IN mm U.N.O. DO NOT SCALE</div> <div>PROJECT No. - COMMENTS</div> <div>ISSUED FOR CONSTRUCTION</div> <div>DESIGNED</div> <div>DRAWN</div> <div>REVIEWED</div> <div>APPROVED</div> <div>APD ENGINEERING</div> <div>PROJ No W APD07785 DATE 21-12-2023</div> <div>DRAWN AS DESG'D APD</div> <div>VERIFIED AN APP'D PT</div> <div>KINGS FOREST 33/11KV ZONE SUBSTATION CONTROL BUILDING CONSTRUCTION NOTES BUILDING DRAWING</div> <div>© 2019 Essential Energy</div> <div>essential energy</div> <div>SUPERSEDES:</div> <div>DRAWING NUMBER KFTB100</div> <div>SHT 2/33</div> <div>VER 1</div>											H
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NOTES

- GROUND LEVEL (G.L.) AND YARD FINISHED SURFACE LEVEL (F.S.L.) VARIES. F.S.L. IS TOP OF CRUSHED ROCK 100mm OVER G.L.
- FOOTING R.L. AND LANDING SUPPORT WALLS DIFFER EACH SIDE OF BUILDING.

LEGEND

REFER TO CONDUIT & TRENCH LAYOUT DRG. NO. KFTC100-2

NORTHERN ELEVATION

WESTERN ELEVATION

SOUTHERN ELEVATION

EASTERN ELEVATION

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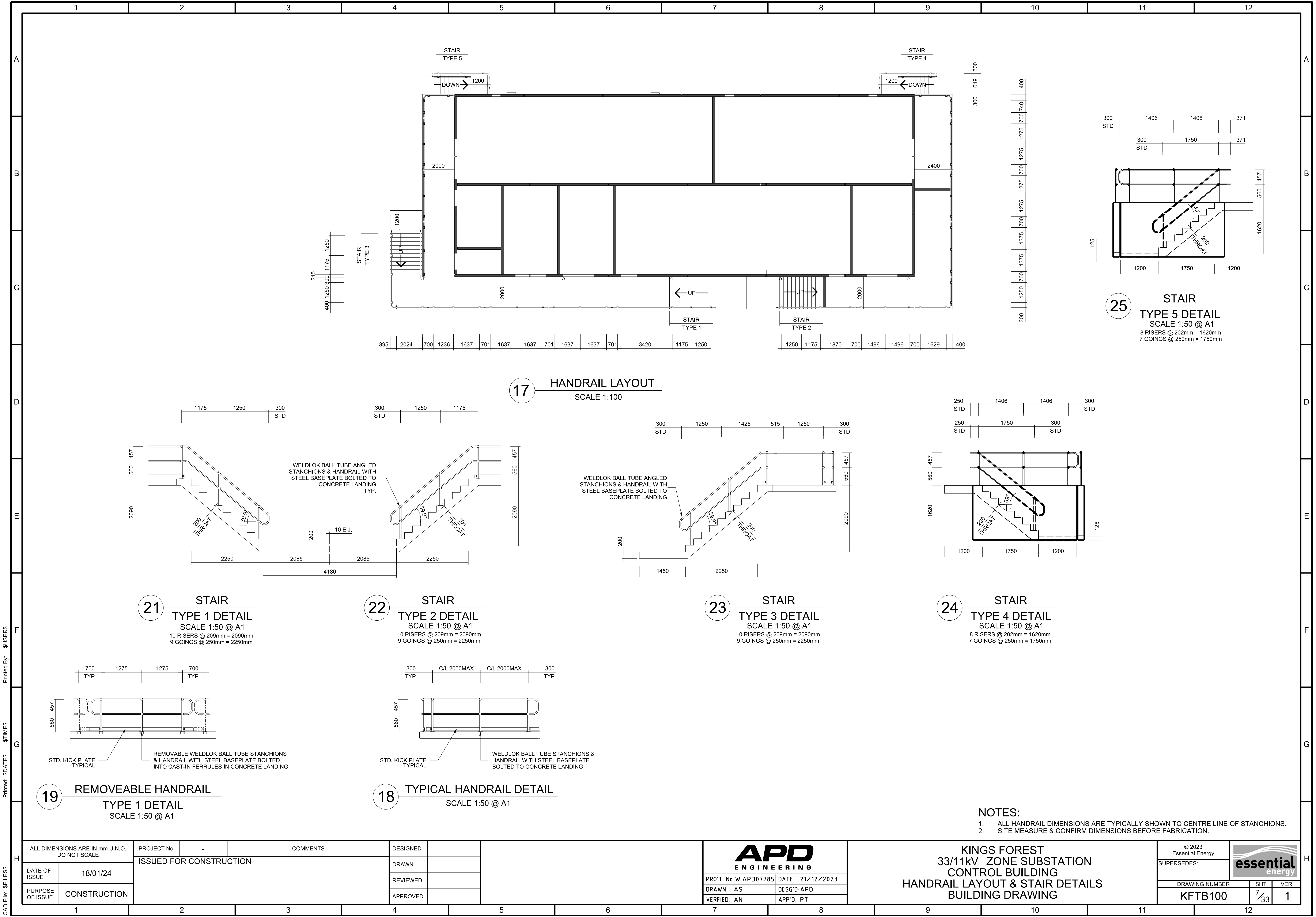
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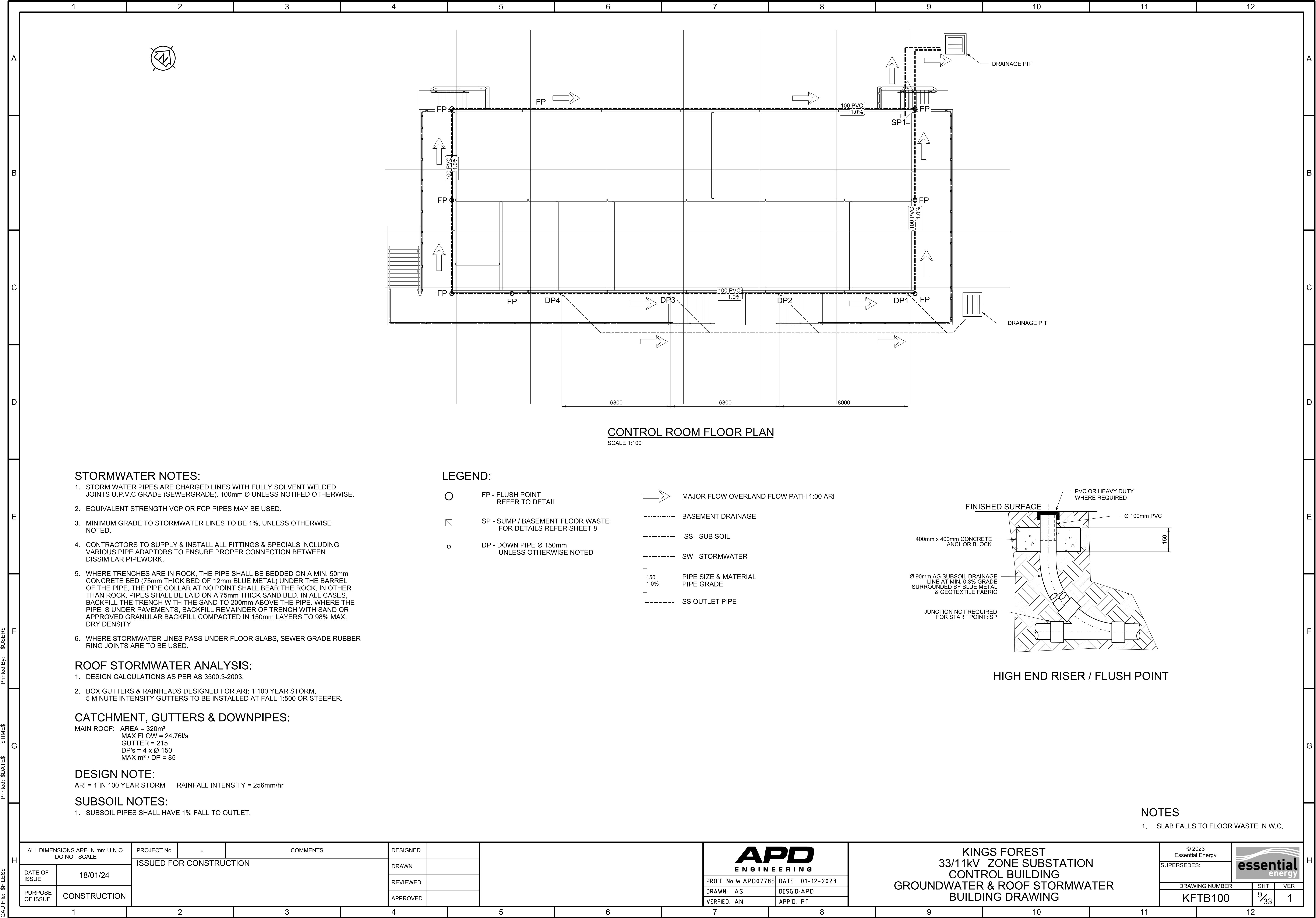
APD ENGINEERING	
PRO'T No W APD07785	DATE 21-12-2023
DRAWN AS	DES'G'D APD
VERIFIED AN	APP'D PT

KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING 11KV SWITCHBOARD
ELEVATIONS
BUILDING DRAWING

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SUPERSEDES:		
DRAWING NUMBER	SHT	VER
KFTB100	5/33	1







CONTROL ROOM FLOOR PLAN
SCALE 1:100

- STORMWATER NOTES:**
- STORM WATER PIPES ARE CHARGED LINES WITH FULLY SOLVENT WELDED JOINTS U.P.V.C GRADE (SEWERGRADE). 100mm Ø UNLESS NOTIFIED OTHERWISE.
 - EQUIVALENT STRENGTH VCP OR FCP PIPES MAY BE USED.
 - MINIMUM GRADE TO STORMWATER LINES TO BE 1%, UNLESS OTHERWISE NOTED.
 - CONTRACTORS TO SUPPLY & INSTALL ALL FITTINGS & SPECIALS INCLUDING VARIOUS PIPE ADAPTORS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.
 - WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN. 50mm CONCRETE BED (75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR THE ROCK. IN OTHER THAN ROCK, PIPES SHALL BE LAID ON A 75mm THICK SAND BED. IN ALL CASES, BACKFILL THE TRENCH WITH THE SAND TO 200mm ABOVE THE PIPE. WHERE THE PIPE IS UNDER PAVEMENTS, BACKFILL REMAINDER OF TRENCH WITH SAND OR APPROVED GRANULAR BACKFILL COMPACTED IN 150mm LAYERS TO 98% MAX. DRY DENSITY.
 - WHERE STORMWATER LINES PASS UNDER FLOOR SLABS, SEWER GRADE RUBBER RING JOINTS ARE TO BE USED.

- ROOF STORMWATER ANALYSIS:**
- DESIGN CALCULATIONS AS PER AS 3500.3-2003.
 - BOX GUTTERS & RAINHEADS DESIGNED FOR ARI: 1:100 YEAR STORM, 5 MINUTE INTENSITY GUTTERS TO BE INSTALLED AT FALL 1:500 OR STEEPER.

CATCHMENT, GUTTERS & DOWNPIPES:

MAIN ROOF: AREA = 320m²
MAX FLOW = 24.76l/s
GUTTER = 215
DP's = 4 x Ø 150
MAX m² / DP = 85

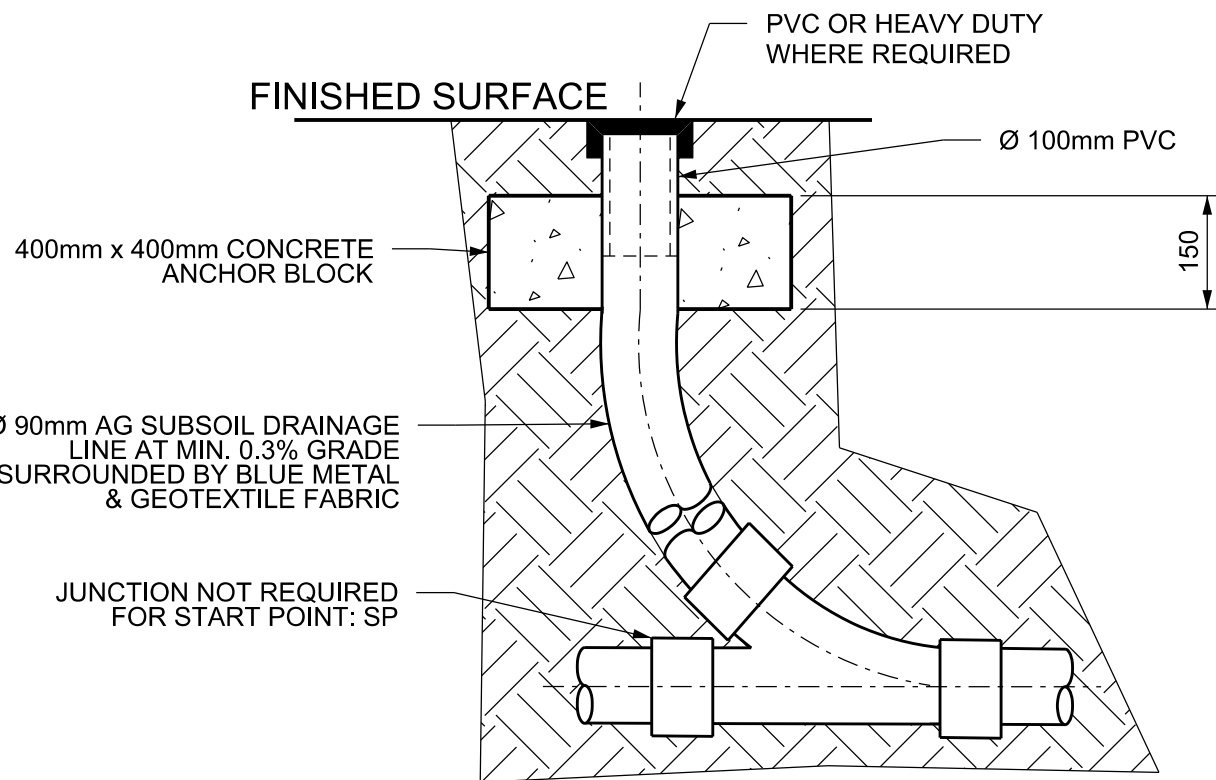
DESIGN NOTE:

ARI = 1 IN 100 YEAR STORM RAINFALL INTENSITY = 256mm/hr

SUBSOIL NOTES:

- SUBSOIL PIPES SHALL HAVE 1% FALL TO OUTLET.

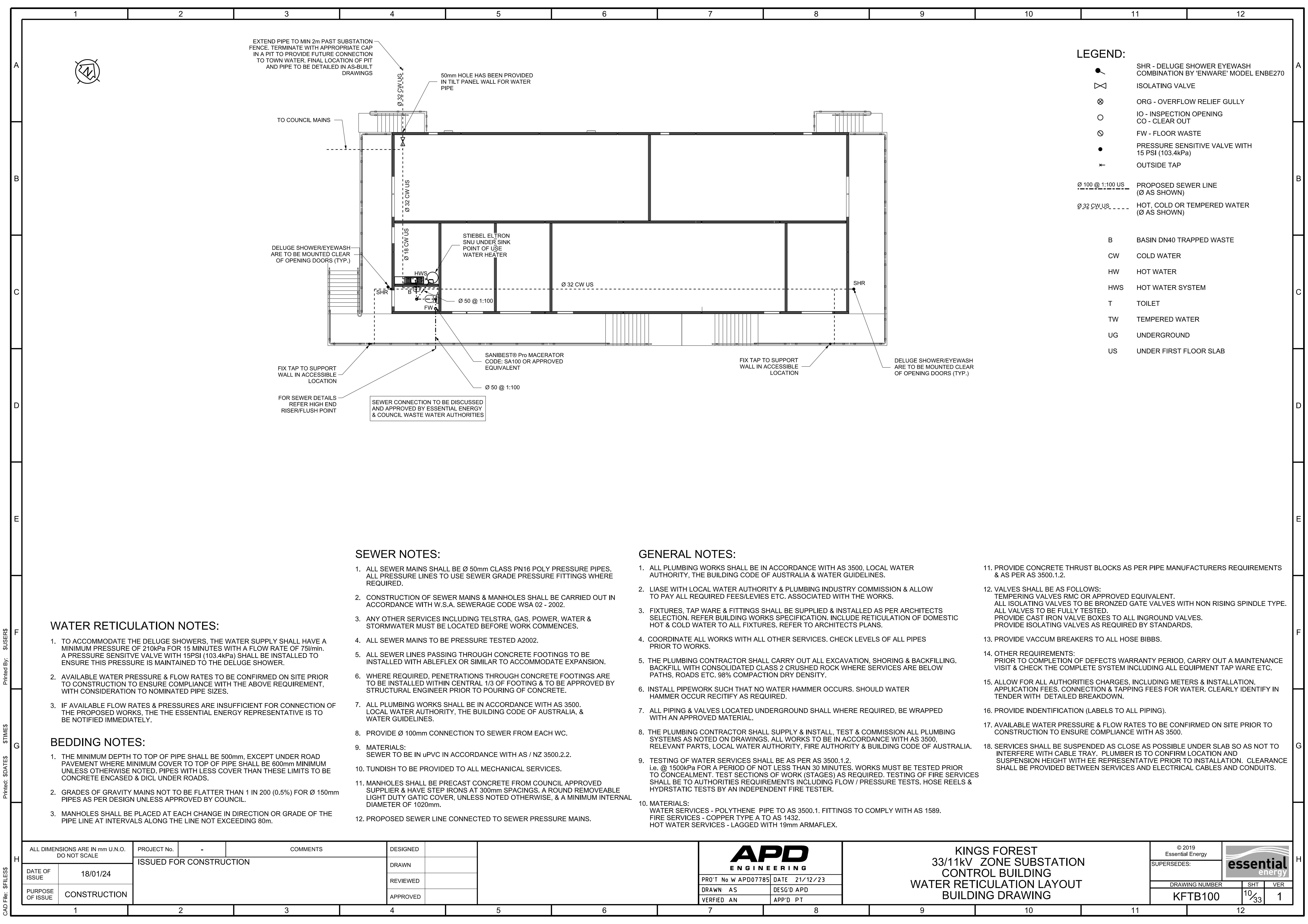
- LEGEND:**
- FP - FLUSH POINT
REFER TO DETAIL
 - ⊠ SP - SUMP / BASEMENT FLOOR WASTE
FOR DETAILS REFER SHEET 8
 - DP - DOWN PIPE Ø 150mm
UNLESS OTHERWISE NOTED
 - ➡ MAJOR FLOW OVERLAND FLOW PATH 1:00 ARI
 - BASEMENT DRAINAGE
 - SS - SUB SOIL
 - SW - STORMWATER
 - 150 1.0% PIPE SIZE & MATERIAL
PIPE GRADE
 - SS OUTLET PIPE



HIGH END RISER / FLUSH POINT

- NOTES**
- SLAB FALLS TO FLOOR WASTE IN W.C.

ALL DIMENSIONS ARE IN mm U.N.O. DO NOT SCALE		PROJECT No.	-	COMMENTS		DESIGNED		<div>APD ENGINEERING</div> <div>PROJ No W APD07785 DATE 01-12-2023</div> <div>DRAWN AS DESG'D APD</div> <div>VERIFIED AN APP'D PT</div>	KINGS FOREST 33/11kV ZONE SUBSTATION CONTROL BUILDING GROUNDWATER & ROOF STORMWATER BUILDING DRAWING				© 2023 Essential Energy		<div>essential energy</div>	
DATE OF ISSUE		18/01/24		ISSUED FOR CONSTRUCTION		DRAWN			SUPERSEDES:							
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WATER RETICULATION NOTES:

1. TO ACCOMMODATE THE DELUGE SHOWERS, THE WATER SUPPLY SHALL HAVE A MINIMUM PRESSURE OF 210kPa FOR 15 MINUTES WITH A FLOW RATE OF 75l/min. A PRESSURE SENSITIVE VALVE WITH 15PSI (103.4kPa) SHALL BE INSTALLED TO ENSURE THIS PRESSURE IS MAINTAINED TO THE DELUGE SHOWER.
2. AVAILABLE WATER PRESSURE & FLOW RATES TO BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION TO ENSURE COMPLIANCE WITH THE ABOVE REQUIREMENT, WITH CONSIDERATION TO NOMINATED PIPE SIZES.
3. IF AVAILABLE FLOW RATES & PRESSURES ARE INSUFFICIENT FOR CONNECTION OF THE PROPOSED WORKS, THE THE ESSENTIAL ENERGY REPRESENTATIVE IS TO BE NOTIFIED IMMEDIATELY.

BEDDING NOTES:

1. THE MINIMUM DEPTH TO TOP OF PIPE SHALL BE 500mm, EXCEPT UNDER ROAD PAVEMENT WHERE MINIMUM COVER TO TOP OF PIPE SHALL BE 600mm MINIMUM UNLESS OTHERWISE NOTED. PIPES WITH LESS COVER THAN THESE LIMITS TO BE CONCRETE ENCASED & DICL UNDER ROADS.
2. GRADES OF GRAVITY MAINS NOT TO BE FLATTER THAN 1 IN 200 (0.5%) FOR Ø 150mm PIPES AS PER DESIGN UNLESS APPROVED BY COUNCIL.
3. MANHOLES SHALL BE PLACED AT EACH CHANGE IN DIRECTION OR GRADE OF THE PIPE LINE AT INTERVALS ALONG THE LINE NOT EXCEEDING 80m.

SEWER NOTES:

1. ALL SEWER MAINS SHALL BE Ø 50mm CLASS PN16 POLY PRESSURE PIPES. ALL PRESSURE LINES TO USE SEWER GRADE PRESSURE FITTINGS WHERE REQUIRED.
2. CONSTRUCTION OF SEWER MAINS & MANHOLES SHALL BE CARRIED OUT IN ACCORDANCE WITH W.S.A. SEWERAGE CODE WSA 02 - 2002.
3. ANY OTHER SERVICES INCLUDING TELSTRA, GAS, POWER, WATER & STORMWATER MUST BE LOCATED BEFORE WORK COMMENCES.
4. ALL SEWER MAINS TO BE PRESSURE TESTED A2002.
5. ALL SEWER LINES PASSING THROUGH CONCRETE FOOTINGS TO BE INSTALLED WITH ABLEFLEX OR SIMILAR TO ACCOMMODATE EXPANSION.
6. WHERE REQUIRED, PENETRATIONS THROUGH CONCRETE FOOTINGS ARE TO BE INSTALLED WITHIN CENTRAL 1/3 OF FOOTING & TO BE APPROVED BY STRUCTURAL ENGINEER PRIOR TO POURING OF CONCRETE.
7. ALL PLUMBING WORKS SHALL BE IN ACCORDANCE WITH AS 3500. LOCAL WATER AUTHORITY, THE BUILDING CODE OF AUSTRALIA, & WATER GUIDELINES.
8. PROVIDE Ø 100mm CONNECTION TO SEWER FROM EACH WC.
9. MATERIALS:
SEWER TO BE IN uPVC IN ACCORDANCE WITH AS / NZ 3500.2.2.
10. TUNDISH TO BE PROVIDED TO ALL MECHANICAL SERVICES.
11. MANHOLES SHALL BE PRECAST CONCRETE FROM COUNCIL APPROVED SUPPLIER & HAVE STEP IRONS AT 300mm SPACINGS. A ROUND REMOVEABLE LIGHT DUTY GATIC COVER, UNLESS NOTED OTHERWISE, & A MINIMUM INTERNAL DIAMETER OF 1020mm.
12. PROPOSED SEWER LINE CONNECTED TO SEWER PRESSURE MAINS.

GENERAL NOTES:


1. ALL PLUMBING WORKS SHALL BE IN ACCORDANCE WITH AS 3500, LOCAL WATER AUTHORITY, THE BUILDING CODE OF AUSTRALIA & WATER GUIDELINES.
2. LIASE WITH LOCAL WATER AUTHORITY & PLUMBING INDUSTRY COMMISSION & ALLOW TO PAY ALL REQUIRED FEES/LEVIES ETC. ASSOCIATED WITH THE WORKS.
3. FIXTURES, TAP WARE & FITTINGS SHALL BE SUPPLIED & INSTALLED AS PER ARCHITECTS SELECTION. REFER BUILDING WORKS SPECIFICATION. INCLUDE RETICULATION OF DOMESTIC HOT & COLD WATER TO ALL FIXTURES. REFER TO ARCHITECTS PLANS.
4. COORDINATE ALL WORKS WITH ALL OTHER SERVICES. CHECK LEVELS OF ALL PIPES PRIOR TO WORKS.
5. THE PLUMBING CONTRACTOR SHALL CARRY OUT ALL EXCAVATION, SHORING & BACKFILLING. BACKFILL WITH CONSOLIDATED CLASS 2 CRUSHED ROCK WHERE SERVICES ARE BELOW PATHS, ROADS ETC. 98% COMPACTION DRY DENSITY.
6. INSTALL PIPEWORK SUCH THAT NO WATER HAMMER OCCURS. SHOULD WATER HAMMER OCCUR RECITIFY AS REQUIRED.
7. ALL PIPING & VALVES LOCATED UNDERGROUND SHALL WHERE REQUIRED, BE WRAPPED WITH AN APPROVED MATERIAL.
8. THE PLUMBING CONTRACTOR SHALL SUPPLY & INSTALL, TEST & COMMISSION ALL PLUMBING SYSTEMS AS NOTED ON DRAWINGS. ALL WORKS TO BE IN ACCORDANCE WITH AS 3500, RELEVANT PARTS, LOCAL WATER AUTHORITY, FIRE AUTHORITY & BUILDING CODE OF AUSTRALIA.
9. TESTING OF WATER SERVICES SHALL BE AS PER AS 3500.1.2. i.e. @ 1500kPa FOR A PERIOD OF NOT LESS THAN 30 MINUTES. WORKS MUST BE TESTED PRIOR TO CONCEALMENT. TEST SECTIONS OF WORK (STAGES) AS REQUIRED. TESTING OF FIRE SERVICES SHALL BE TO AUTHORITIES REQUIREMENTS INCLUDING FLOW / PRESSURE TESTS. HOSE REELS & HYDRSTATIC TESTS BY AN INDEPENDENT FIRE TESTER.
10. MATERIALS:
WATER SERVICES - POLYTHENE PIPE TO AS 3500.1. FITTINGS TO COMPLY WITH AS 1589.
FIRE SERVICES - COPPER TYPE A TO AS 1432.
HOT WATER SERVICES - LAGGED WITH 19mm ARMAFLEX.

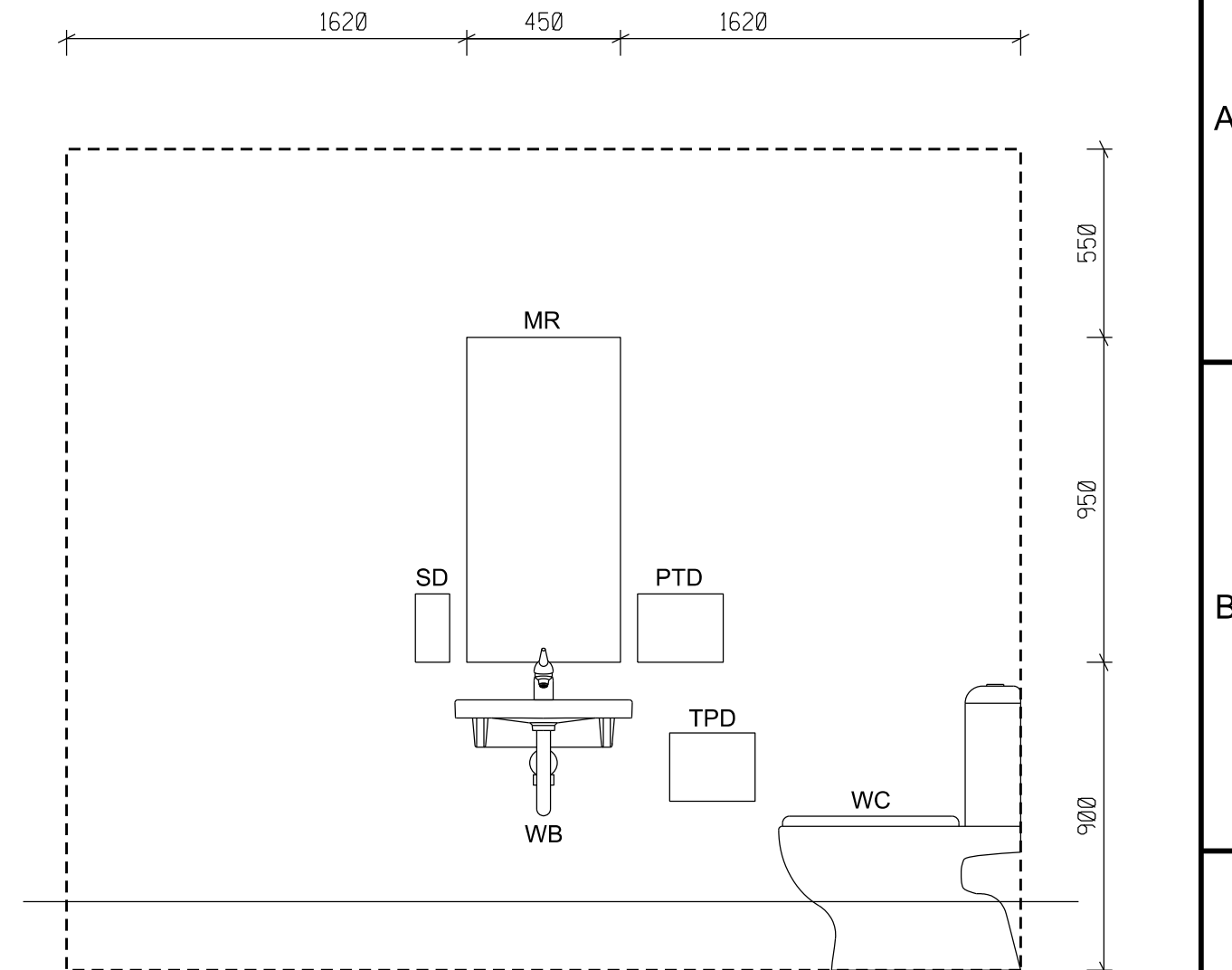
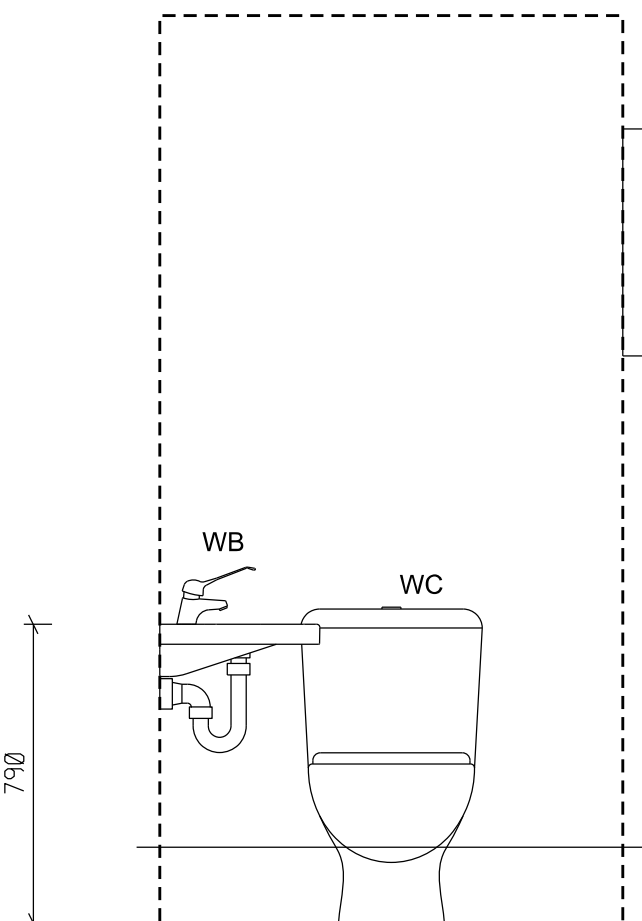
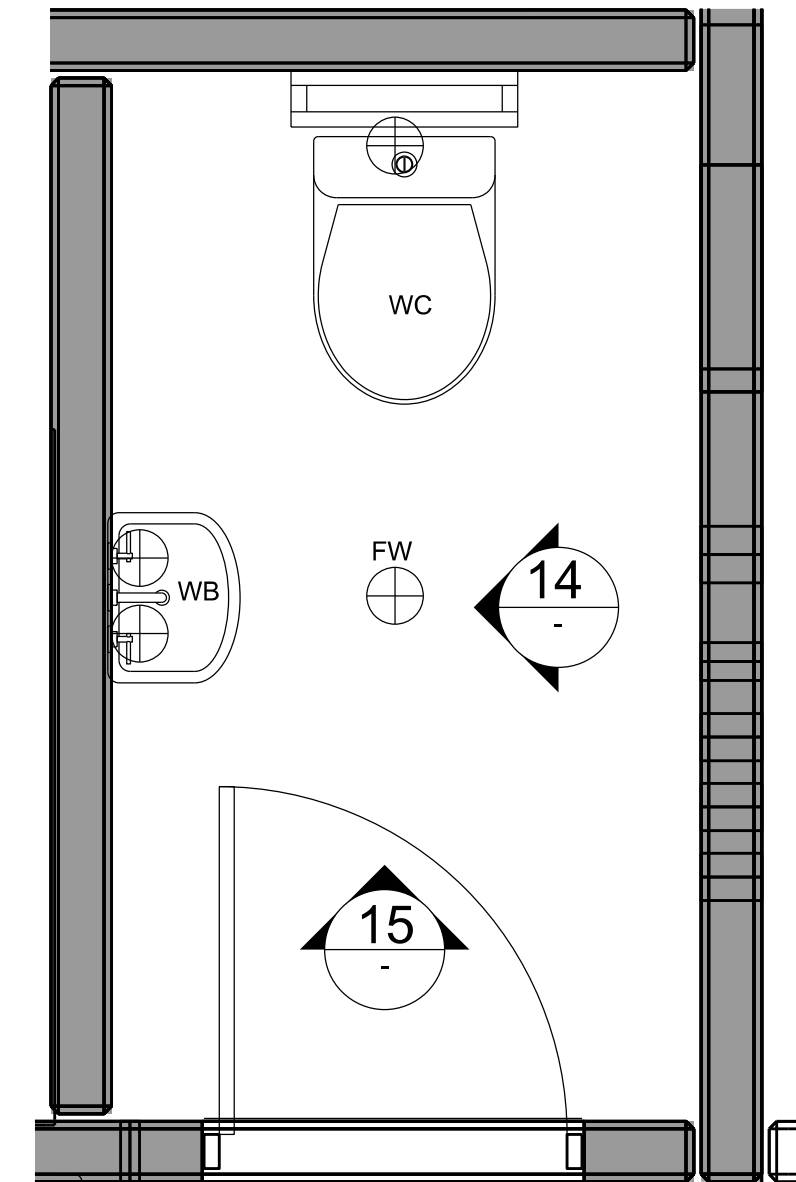
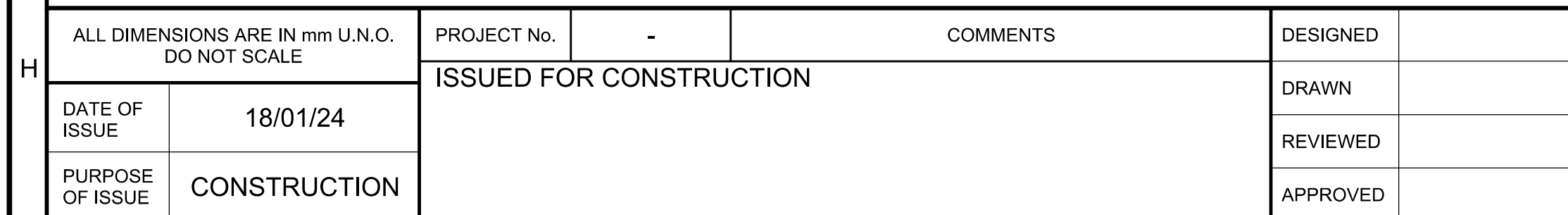
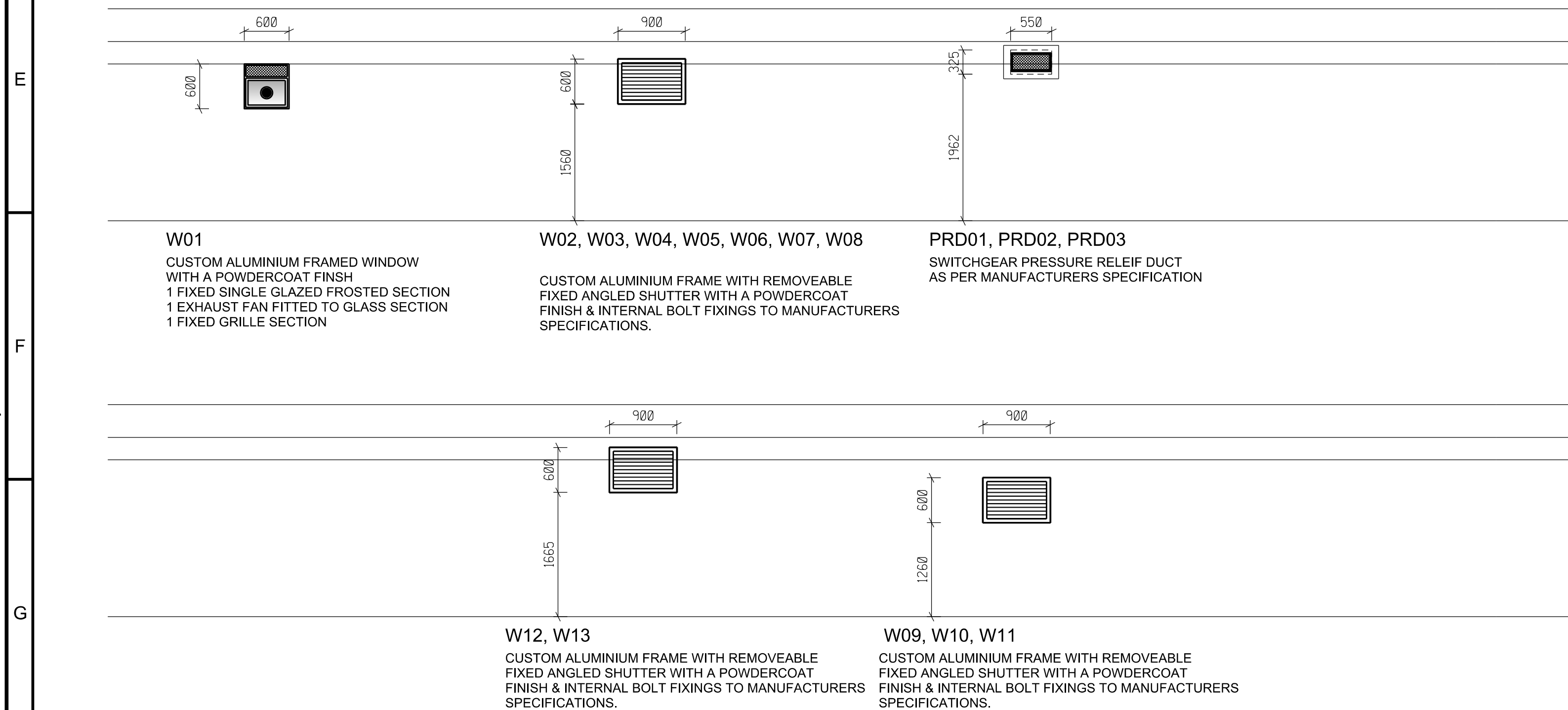
11. PROVIDE CONCRETE THRUST BLOCKS AS PER PIPE MANUFACTURERS REQUIREMENTS & AS PER AS 3500.1.2.
12. VALVES SHALL BE AS FOLLOWS:
TEMPERING VALVES RMC OR APPROVED EQUIVALENT.
ALL ISOLATING VALVES TO BE BRONZED GATE VALVES WITH NON RISING SPINDLE TYPE.
ALL VALVES TO BE FULLY TESTED.
PROVIDE CAST IRON VALVE BOXES TO ALL INGROUND VALVES.
PROVIDE ISOLATING VALVES AS REQUIRED BY STANDARDS.
13. PROVIDE VACCUM BREAKERS TO ALL HOSE BIBBS.
14. OTHER REQUIREMENTS:
PRIOR TO COMPLETION OF DEFECTS WARRANTY PERIOD, CARRY OUT A MAINTENANCE VISIT & CHECK THE COMPLETE SYSTEM INCLUDING ALL EQUIPMENT TAP WARE ETC.
15. ALLOW FOR ALL AUTHORITIES CHARGES, INCLUDING METERS & INSTALLATION. APPLICATION FEES. CONNECTION & TAPPING FEES FOR WATER. CLEARLY IDENTIFY IN TENDER WITH DETAILED BREAKDOWN.
16. PROVIDE INDENTIFICATION (LABELS TO ALL PIPING).
17. AVAILABLE WATER PRESSURE & FLOW RATES TO BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION TO ENSURE COMPLIANCE WITH AS 3500.
18. SERVICES SHALL BE SUSPENDED AS CLOSE AS POSSIBLE UNDER SLAB SO AS NOT TO INTERFERE WITH CABLE TRAY. PLUMBER IS TO CONFIRM LOCATION AND SUSPENSION HEIGHT WITH EE REPRESENTATIVE PRIOR TO INSTALLATION. CLEARANCE SHALL BE PROVIDED BETWEEN SERVICES AND ELECTRICAL CABLES AND CONDUITS.

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APD ENGINEERING	
PRO'T No W APD07785	DATE 21/12/23
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VERIFIED AN	APP'D PT

KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
WATER RETICULATION LAYOUT
BUILDING DRAWING

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SUPERSEDES:			
DRAWING NUMBER		SHT	VER
KFTB100		10/33	1



LEGEND:

WC - CAROMA OPAL WALL FACED CC TOILET SUITE - 987063.

WB - CAROMA COSMO WALL BASIN 1 TAP HOLE - 861515
WITH A CAROMA NORDIC CARE BASIN MIXER CHROME - 90965C5A.

PTD - JD MACDONALD ROVAL SURFACE MOUNTED PAPER TOWEL DISPENSER.

SD - JD MACDONALD SURFACE MOUNTED VERTICAL SOAP DISPENSER.

MR - JD MACDONALD ROVAL SURFACE ANGLED FRAMED MIRROR
WITH TEMPERED GLASS.

TPD - CAROMA COSMO METAL TOILET ROLL HOLDER CHROME - 303128C.

FW - BRASS PLATED CHROME DROP IN FLOOR WASTE.

HW - STIEBEL ELTRON SNU UNDER SINK POINT OF USE WATER HEATER.

NOTES:

1. WET AREAS OF THE BUILDING i.e. NEW BATHROOMS ARE TO BE PROTECTED BY THE INSTALLATION OF A WATER PROOFING SYSTEM COMPLYING WITH AS 3740 - WATERPROOFING OF WET AREAS.
2. PROVIDE MECHANICAL VENTILATION TO WC AREA AS PER AS 1668.2.

DOOR NOTES:

D
01

 DOOR NUMBER

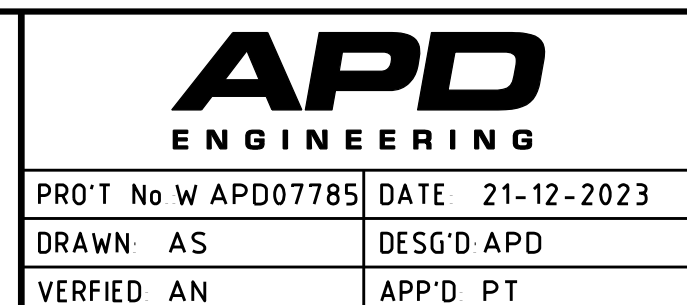
1. TILT-UP PANEL OPENINGS TO HAVE MIN. 5mm CLEARANCE AROUND FRAME SIZE TO BE CONFIRMED WITH DOOR MANUFACTURER PRIOR TO CONSTRUCTION.
2. DOOR FRAME HEIGHTS TO BE 2100mm ABOVE FINISHED FLOOR LEVEL UNLESS OTHERWISE NOTED.
3. ALL DOOR FURNITURE TO BE FITTED AT A HEIGHT OF 1030mm ABOVE F.F.L.
4. INTERNAL & EXTERNAL DOORS TO BE SEALED USING RUBBER COMPRESSIVE STRIPS WHICH WILL RESTRICT AIR & DUST FILTRATION IN ACCORDANCE WITH B.C.A. SECTION J3.4.
5. A 'LOCKWOOD - 7726 SLIDE ARM PUSH SLIDE SURFACE MOUNTED DOOR CLOSER IS TO BE FITTED TO EACH DOOR TO ENABLE IT TO BE HELD IN THE OPEN POSITION WHEN REQUIRED.
6. EXTERNAL DOORS TO BE FITTED WITH A RAVEN - RP38 HEAVY DUTY AUTOMATIC SPRING LOADED BOTTOM SEAL.
7. ESSENTIAL ENERGY STANDARD LOCKS TO BE FITTED TO ALL EXTERNAL DOORS. ESSENTIAL ENERGY WILL PROVIDE FINAL CYLINDERS TO ALL DEADLOCKS.
8. DOOR FURNITURE TO BE CONFIRMED BY SUPPLIERS PRIOR TO ORDERING
9. ALL INTERNAL DOORS TO BE FIRE RATED AS PER AS1905.1
10. FIRE RATED STEEL DOOR FRAMES BY SUPPLIER TO SUIT TILT UP PANELS AND DOORS

WINDOW NOTES:

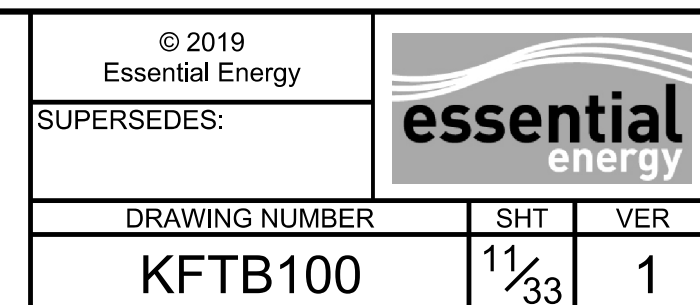
W
01

 WINDOW NUMBER

1. TILT-UP PANEL OPENINGS TO HAVE MIN. 5mm CLEARANCE AROUND FRAME SIZE TO BE CONFIRMED WITH WINDOW MANUFACTURER PRIOR TO CONSTRUCTION.
2. ALL GLASS IS TO BE SELECTED & INSTALLED IN ACCORDANCE BUT NOT EXCLUSIVELY WITH THE FOLLOWING AS / NZ STANDARDS.
AS 1288 - GLASS IN BUILDINGS SELECTION & INSTALLATION
AS 1170 - MINIMUM WIND LOADS ON STRUCTURES
AS / NZ 2208 - SAFETY GLAZING MATERIALS IN BUILDINGS
AS / NZ 4666 - INSULATING GLASS UNITS
AS / NZ 4667 - QUALITY REQUIREMENTS FOR CUT-TO-SIZE & PROCESSED GLASS.
3. CONFIRM DIMENSIONS ON SITE PRIOR TO FABRICATION.
4. ALL ALUMINIUM FRAMED WINDOWS TO HAVE A SELECTED POWDERCOAT FINISH.
5. THESE WINDOWS TO BE EXPLOSION TYPE, INCORPORATING PRESSURE RELIEF SHUTTERS & FIXED GLAZED PANELS, PROVIDE WITH MESH OR GRATE COVER TO PREVENT VANDALISM OF WINDOWS.
6. EXTERNAL WINDOWS TO BE SEALED USING RUBBER COMPRESSIVE STRIPS WHICH WILL RESTRICT AIR INFILTRATION IN ACCORDANCE WITH B.C.A. VOL.1 SECTION J3.4.



KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
DOOR & WINDOW SCHEDULE
BUILDING DRAWING



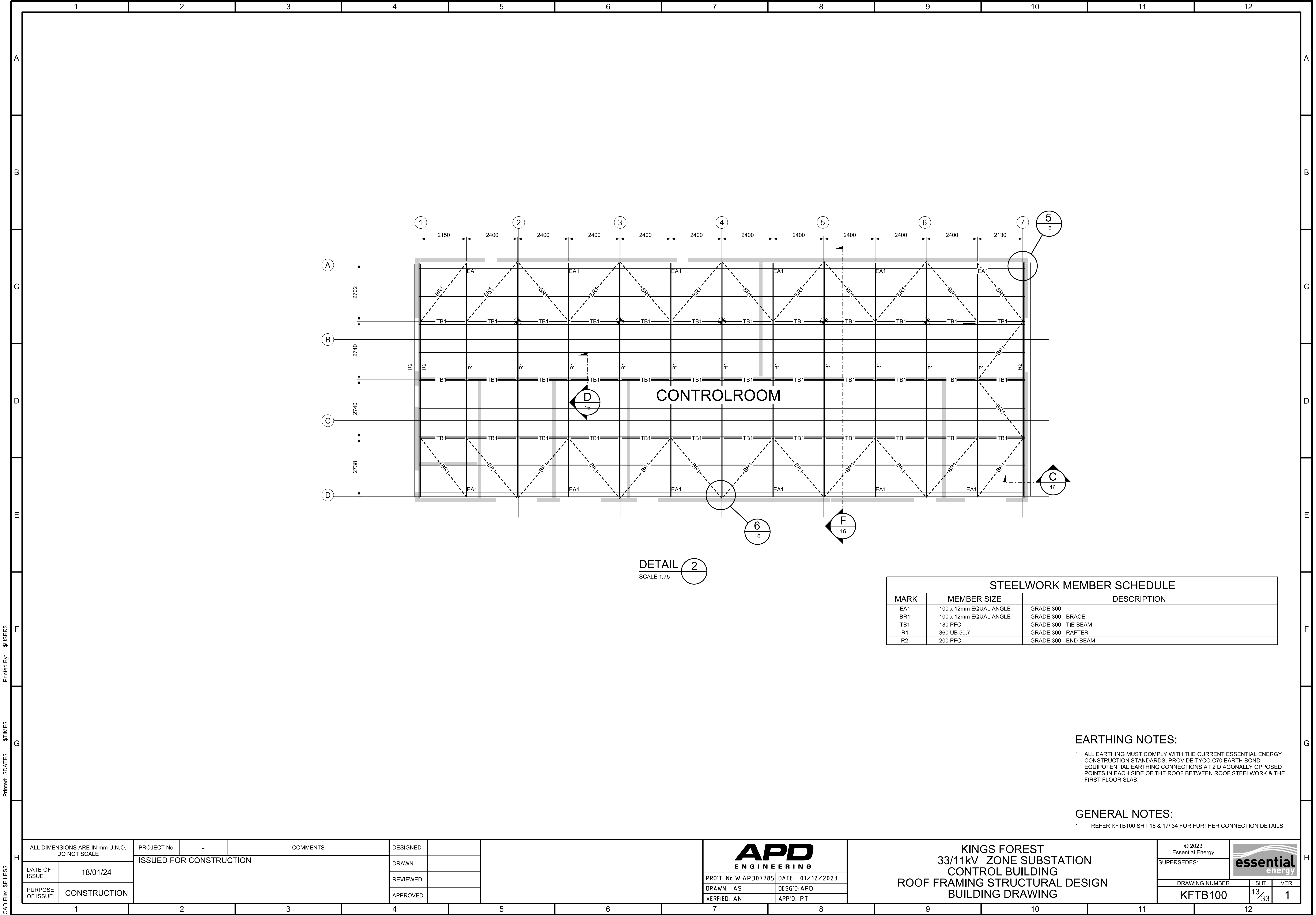


LEGEND

REFER TO DRG KFTB100-6

1. REFER TO GENERAL NOTES ON DRG. NO. KFTB100-1/2
2. BFL DENOTES BASEMENT FLOOR LEVEL





STEELWORK MEMBER SCHEDULE		
MARK	MEMBER SIZE	DESCRIPTION
EA1	100 x 12mm EQUAL ANGLE	GRADE 300
BR1	100 x 12mm EQUAL ANGLE	GRADE 300 - BRACE
TB1	180 PFC	GRADE 300 - TIE BEAM
R1	360 UB 50.7	GRADE 300 - RAFTER
R2	200 PFC	GRADE 300 - END BEAM

EARTHING NOTES:

1. ALL EARTHING MUST COMPLY WITH THE CURRENT ESSENTIAL ENERGY CONSTRUCTION STANDARDS. PROVIDE TYCO C70 EARTH BOND EQUIPOTENTIAL EARTHING CONNECTIONS AT 2 DIAGONALLY OPPOSED POINTS IN EACH SIDE OF THE ROOF BETWEEN ROOF STEELWORK & THE FIRST FLOOR SLAB.


GENERAL NOTES:

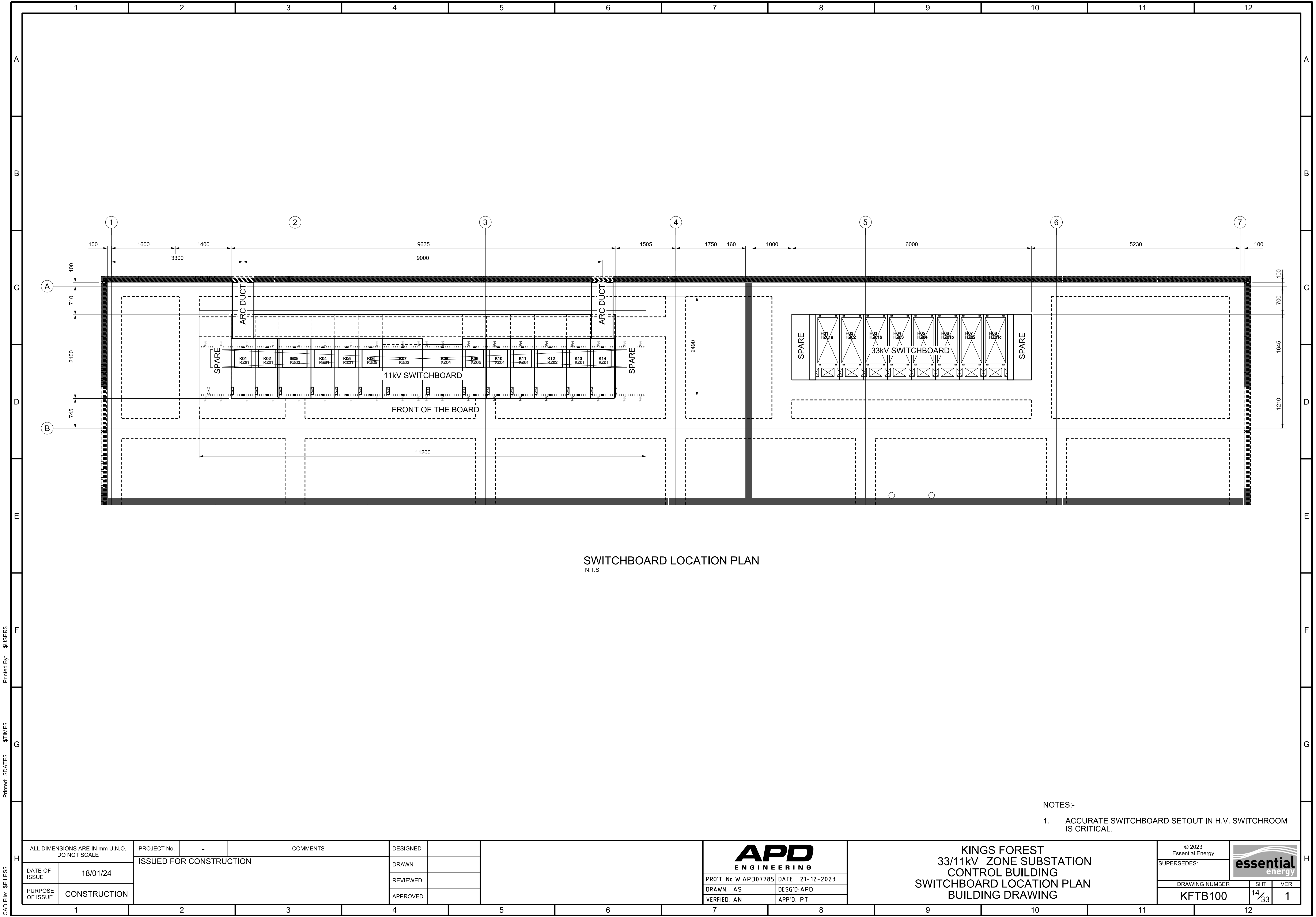
1. REFER KFTB100 SHT 16 & 17/ 34 FOR FURTHER CONNECTION DETAILS.

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APD ENGINEERING	
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KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
ROOF FRAMING STRUCTURAL DESIGN
BUILDING DRAWING

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SWITCHBOARD LOCATION PLAN
N.T.S

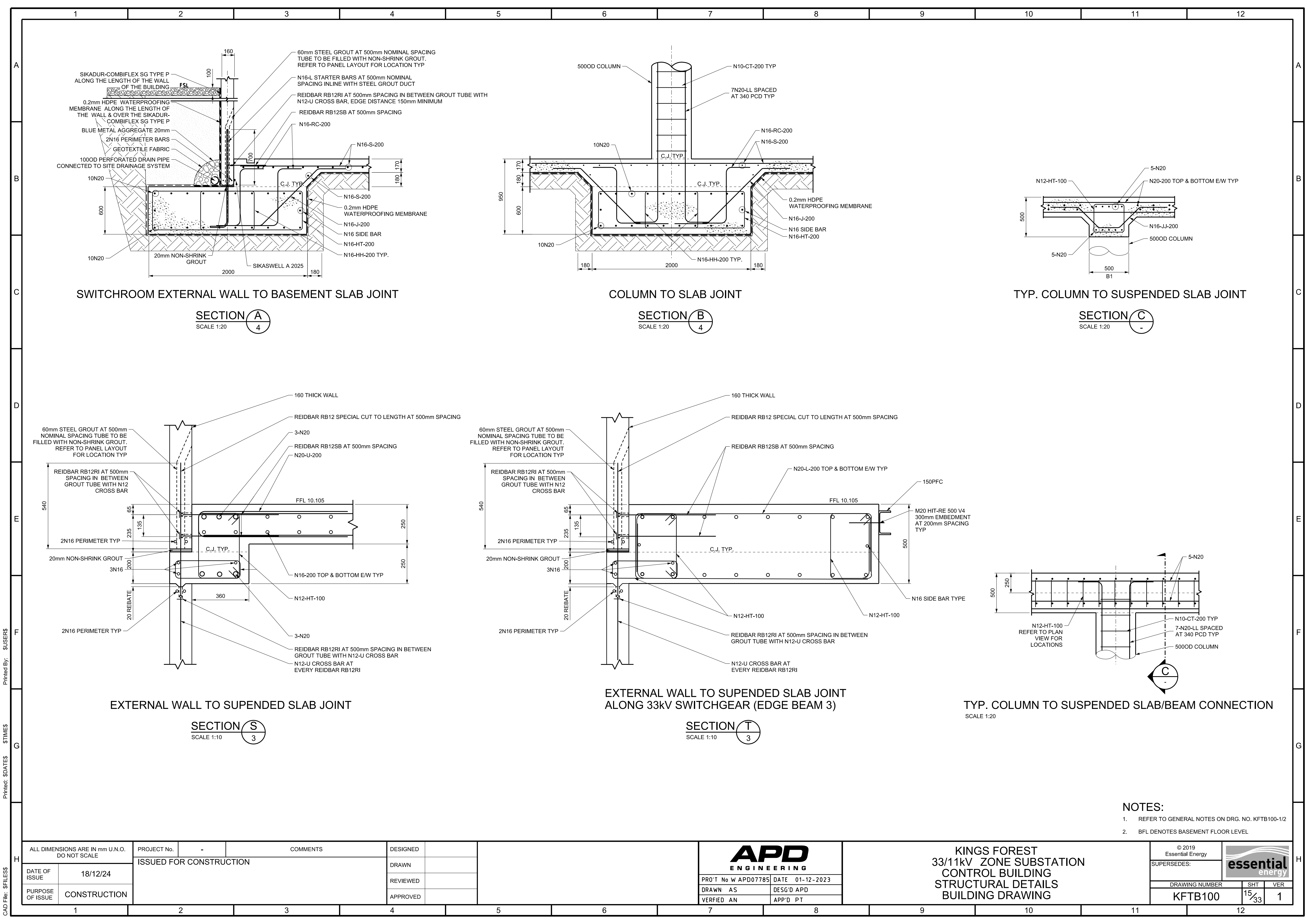
- NOTES:-
1. ACCURATE SWITCHBOARD SETOUT IN H.V. SWITCHROOM IS CRITICAL.

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KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
SWITCHBOARD LOCATION PLAN
BUILDING DRAWING

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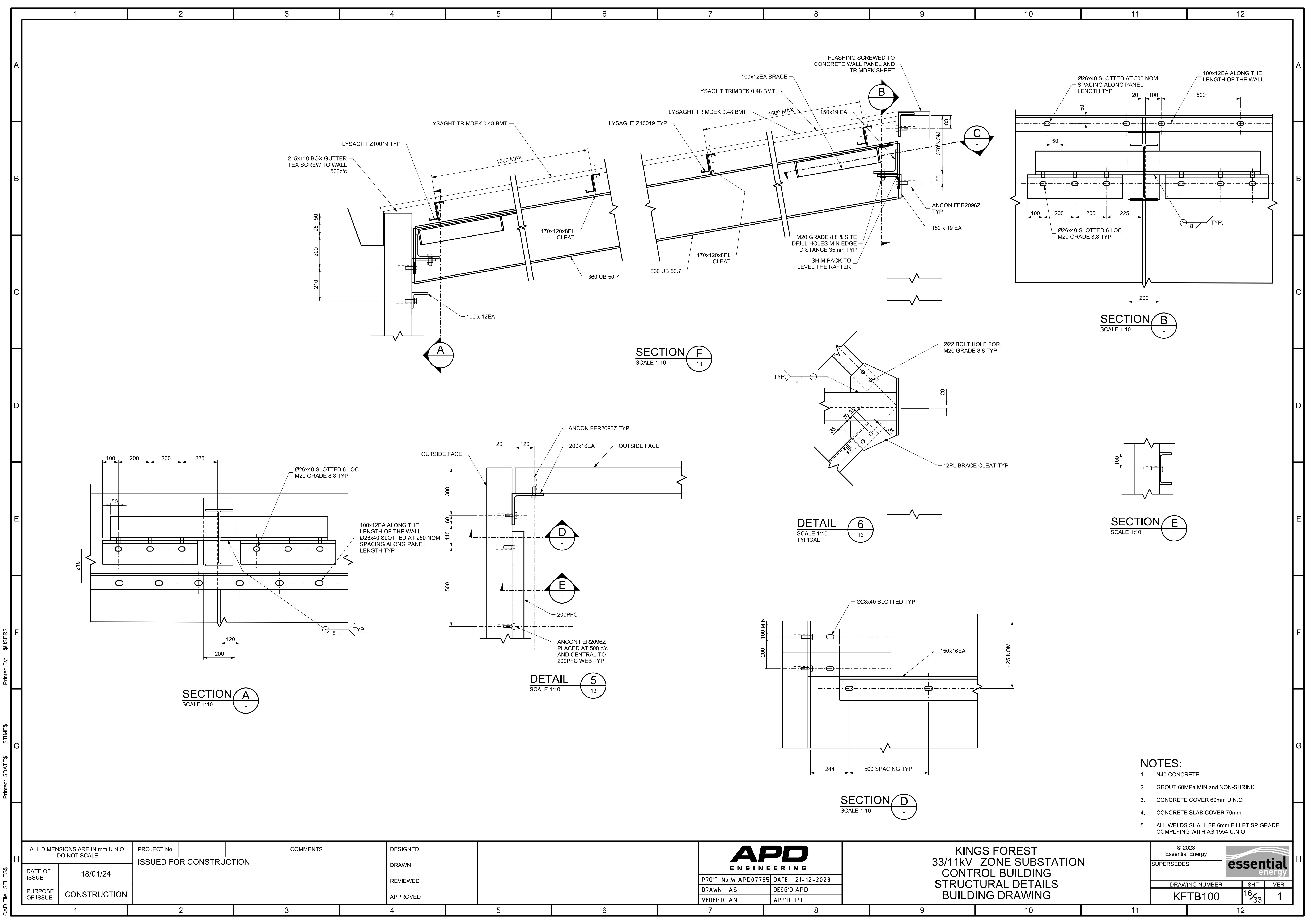
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KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
STRUCTURAL DETAILS
BUILDING DRAWING

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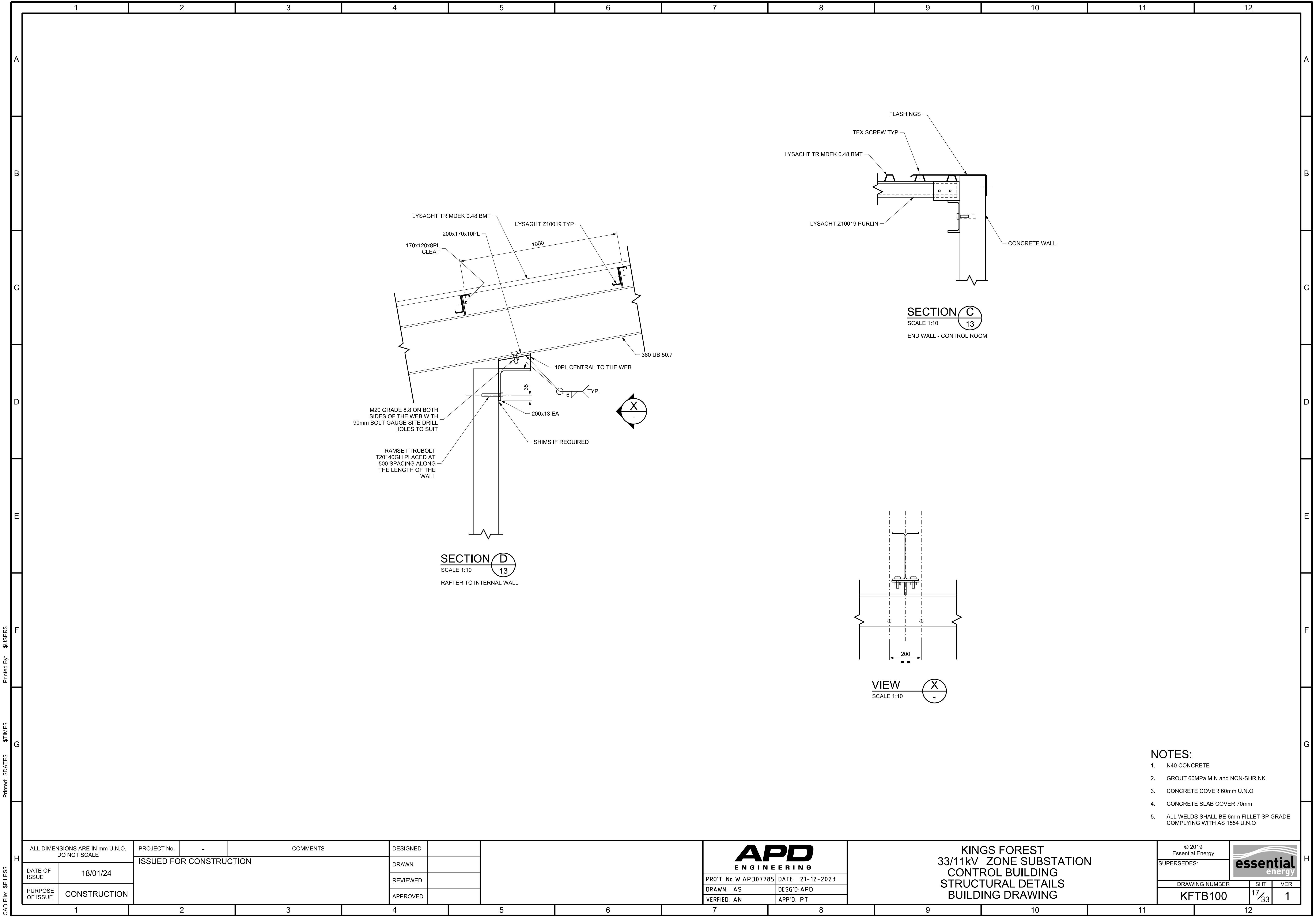
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KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
STRUCTURAL DETAILS
BUILDING DRAWING

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DRAWING NUMBER	SHT	VER
KFTB100	16/33	1

- NOTES:
- N40 CONCRETE
 - GROUT 60MPa MIN and NON-SHRINK
 - CONCRETE COVER 60mm U.N.O
 - CONCRETE SLAB COVER 70mm
 - ALL WELDS SHALL BE 6mm FILLET SP GRADE
COMPLYING WITH AS 1554 U.N.O



- NOTES:
- N40 CONCRETE
 - GROUT 60MPa MIN and NON-SHRINK
 - CONCRETE COVER 60mm U.N.O
 - CONCRETE SLAB COVER 70mm
 - ALL WELDS SHALL BE 6mm FILLET SP GRADE COMPLYING WITH AS 1554 U.N.O

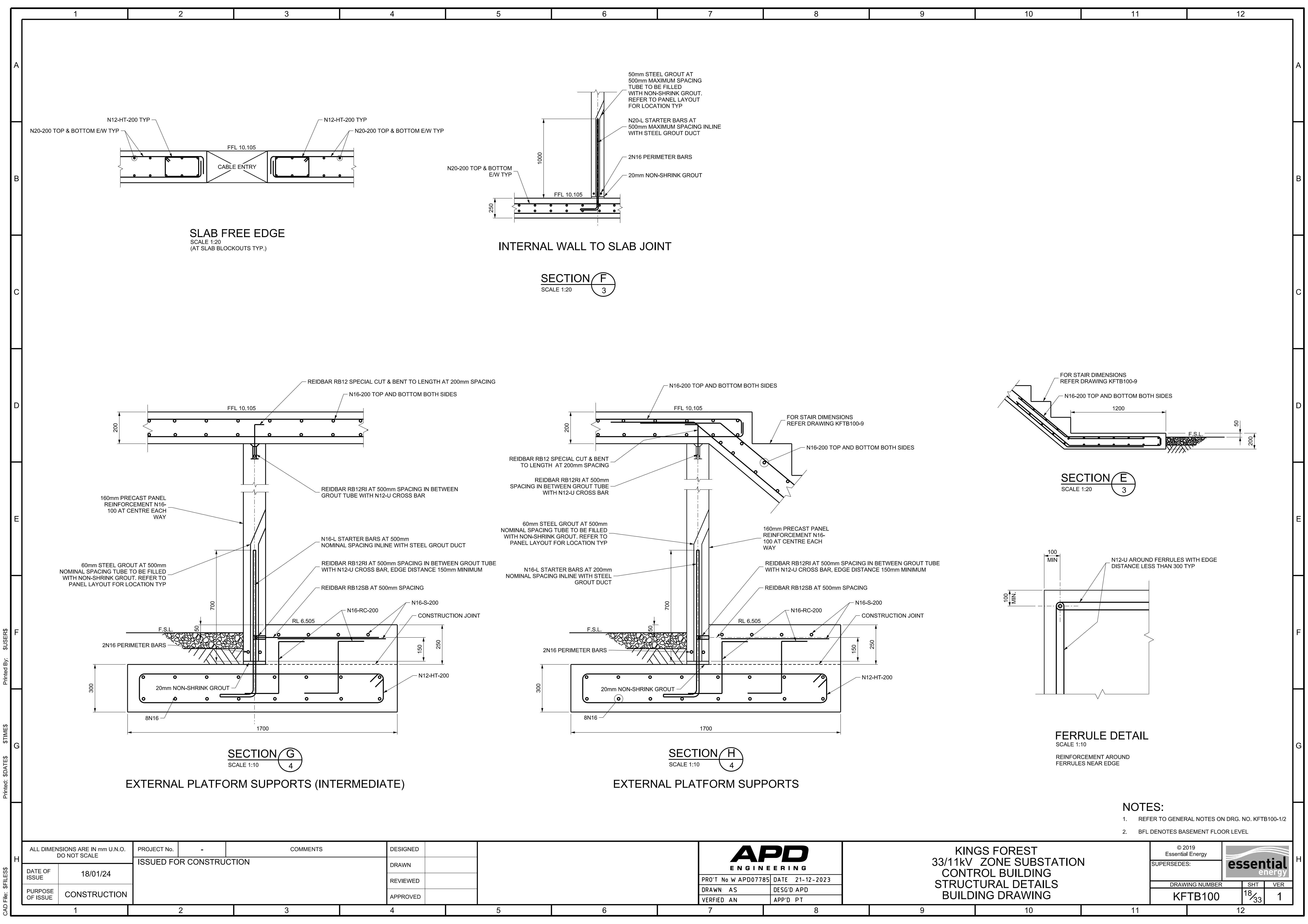
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KINGS FOREST
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CONTROL BUILDING
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BUILDING DRAWING

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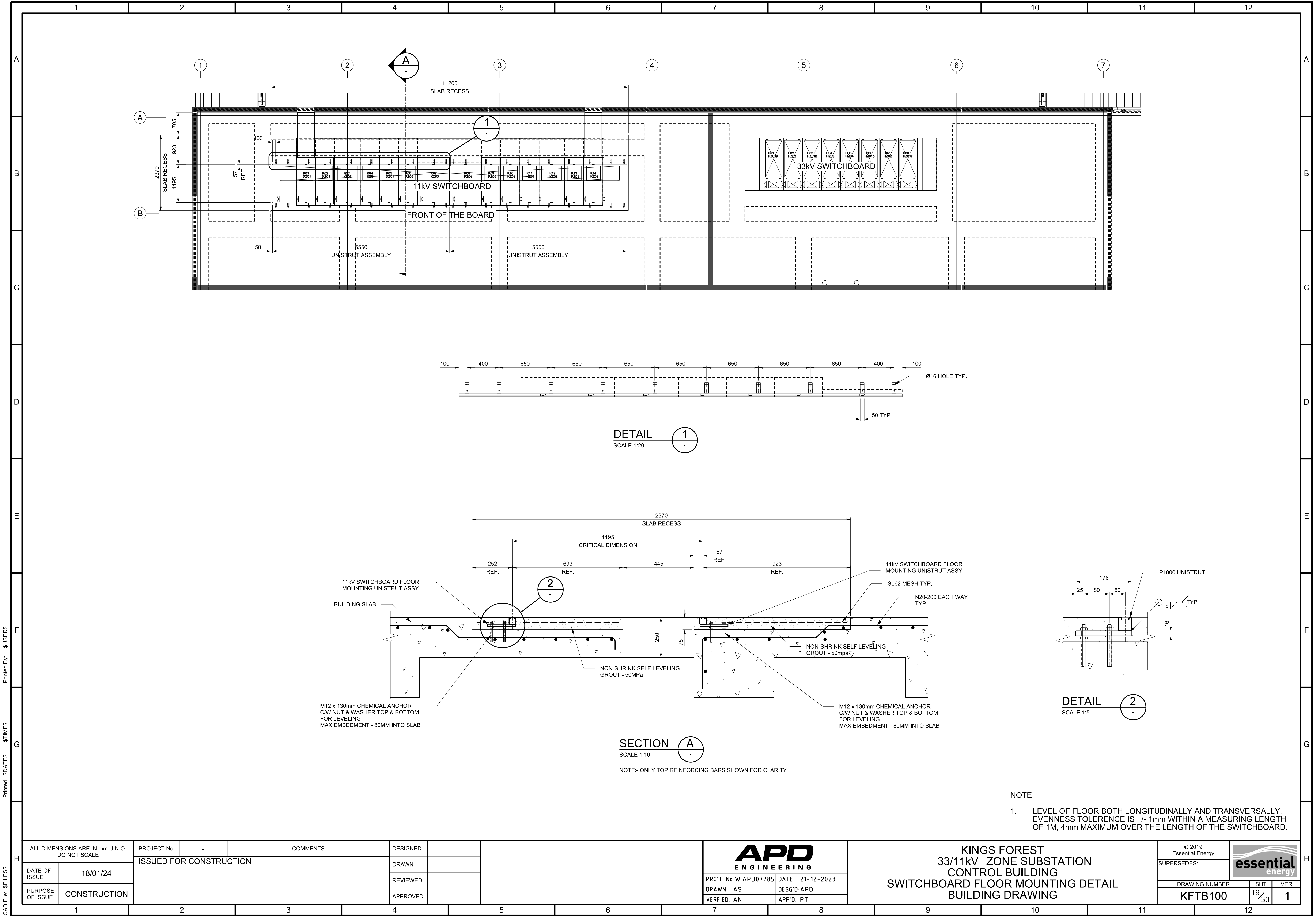
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KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
STRUCTURAL DETAILS
BUILDING DRAWING

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KFTB100		18/33	1

- NOTES:
- REFER TO GENERAL NOTES ON DRG. NO. KFTB100-1/2
 - BFL DENOTES BASEMENT FLOOR LEVEL



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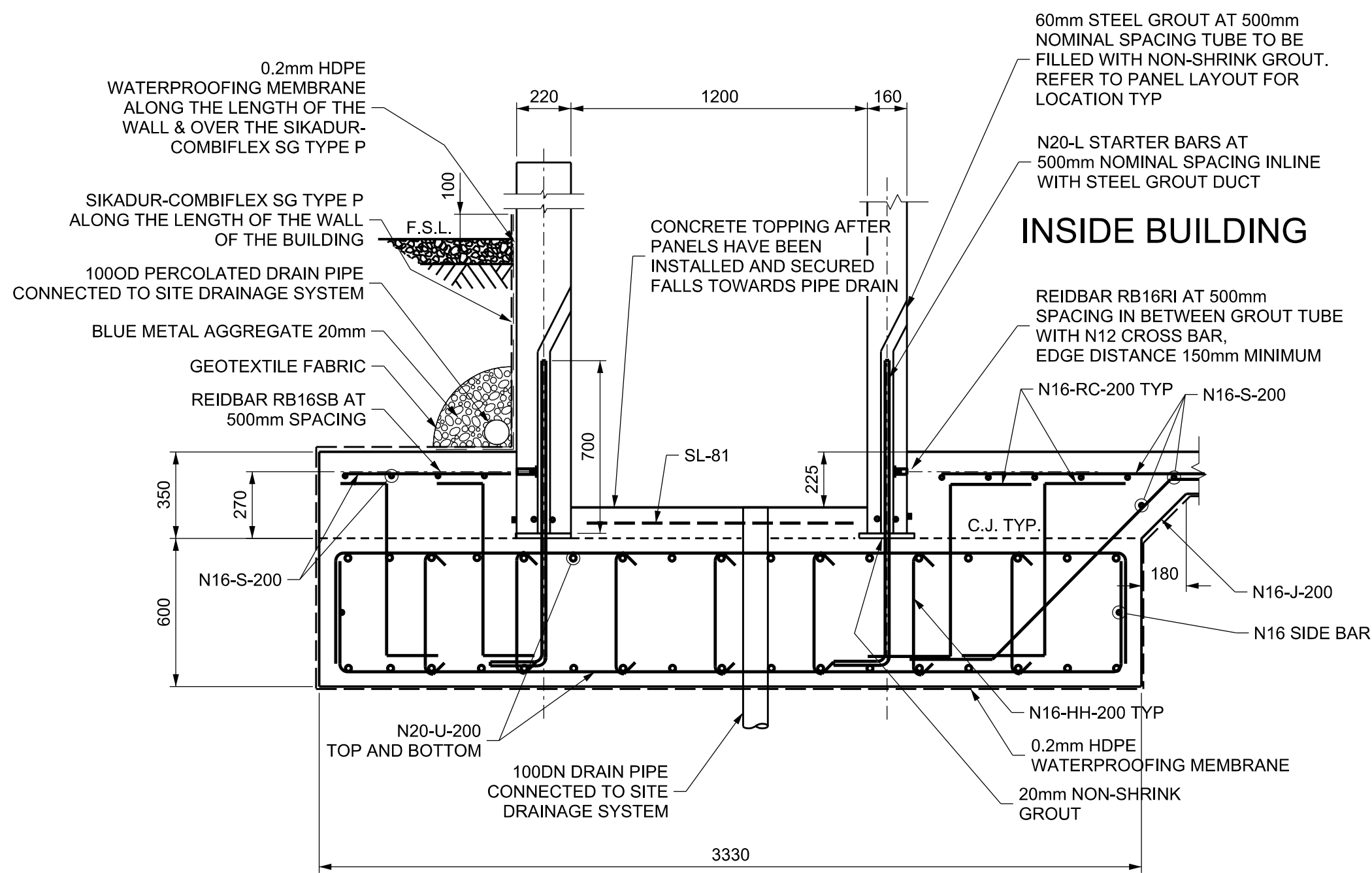
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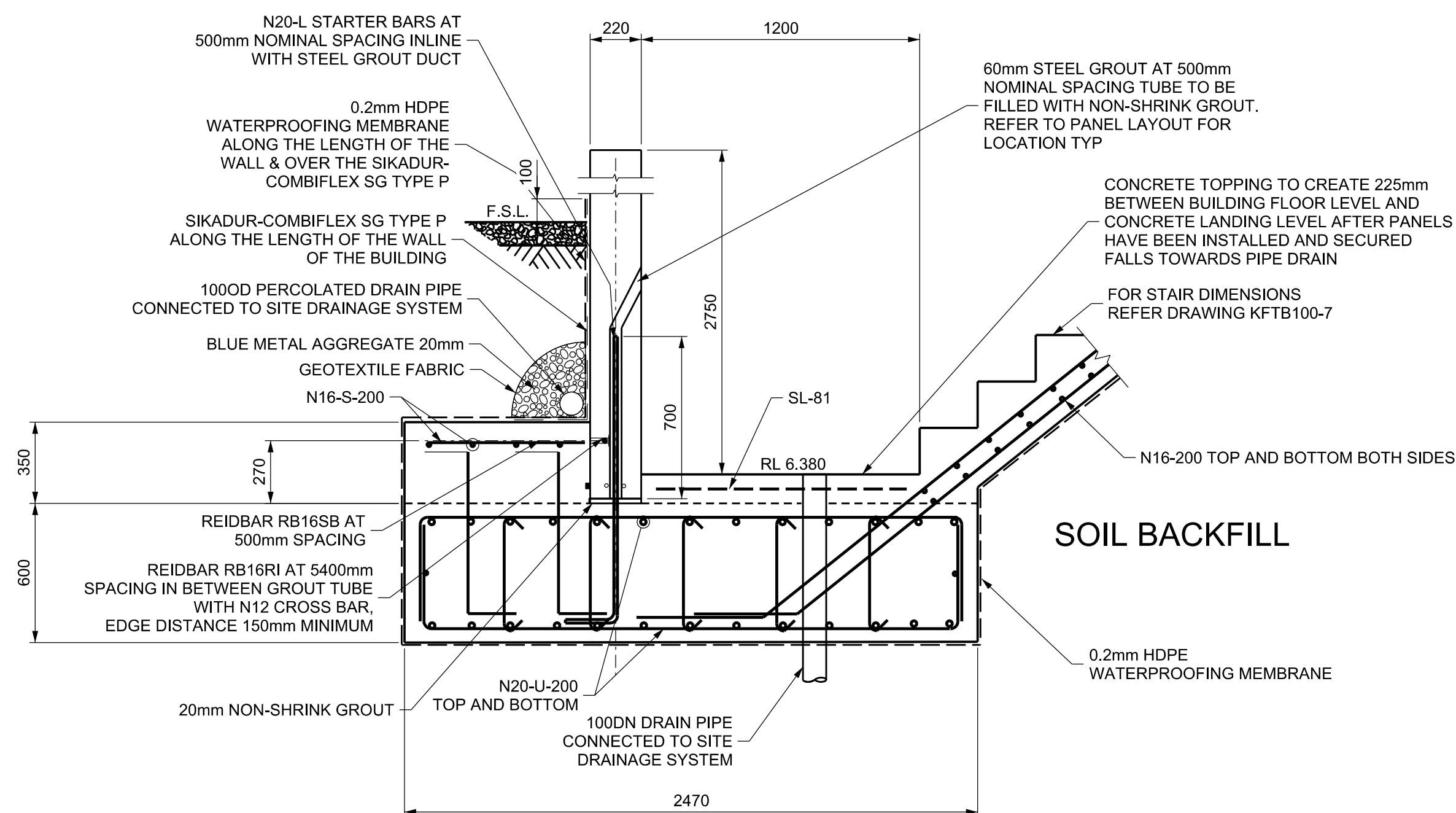
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KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
SWITCHBOARD FLOOR MOUNTING DETAIL
BUILDING DRAWING

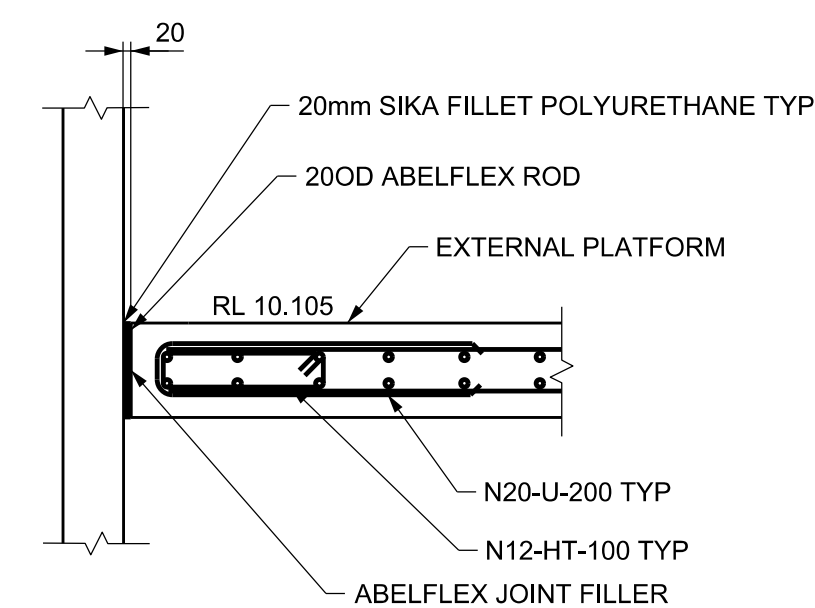
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SECTION P
SCALE 1:20
4



SECTION J
SCALE 1:20
4



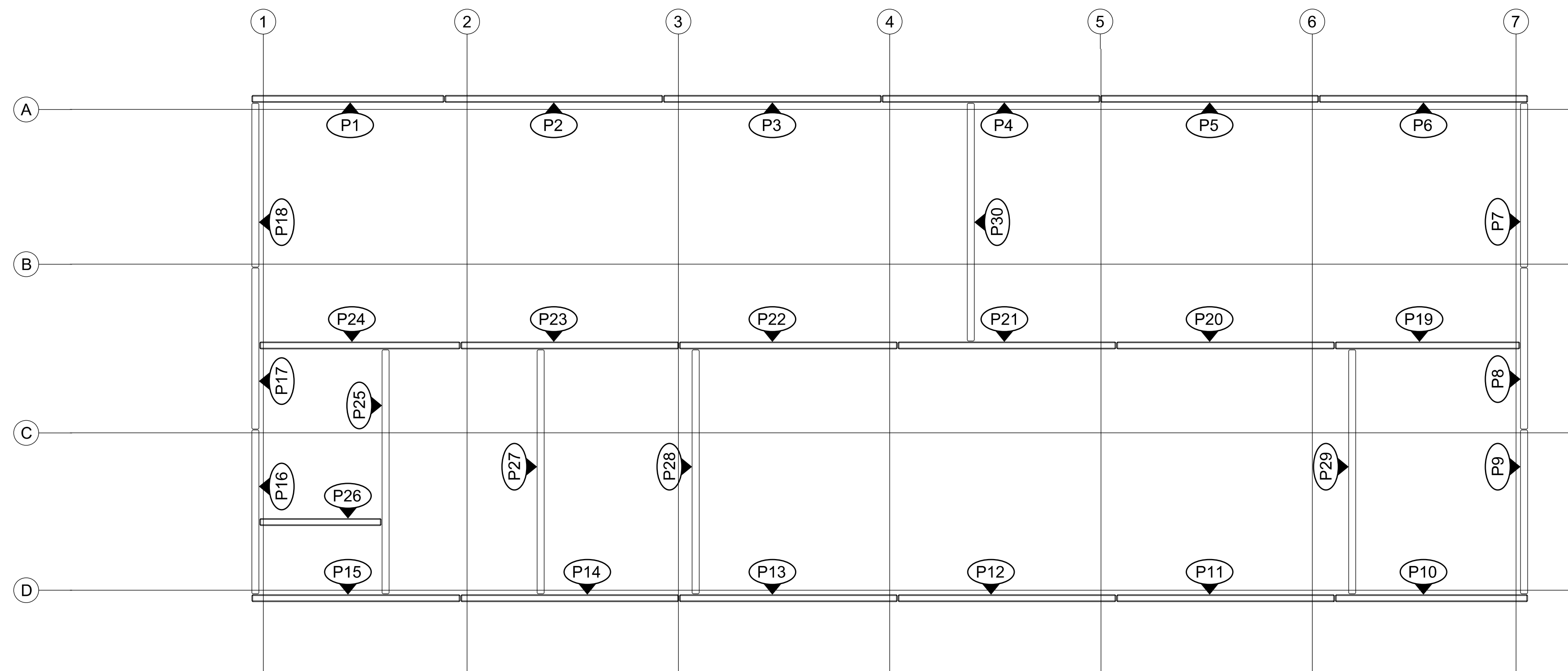
SECTION L
SCALE 1:10
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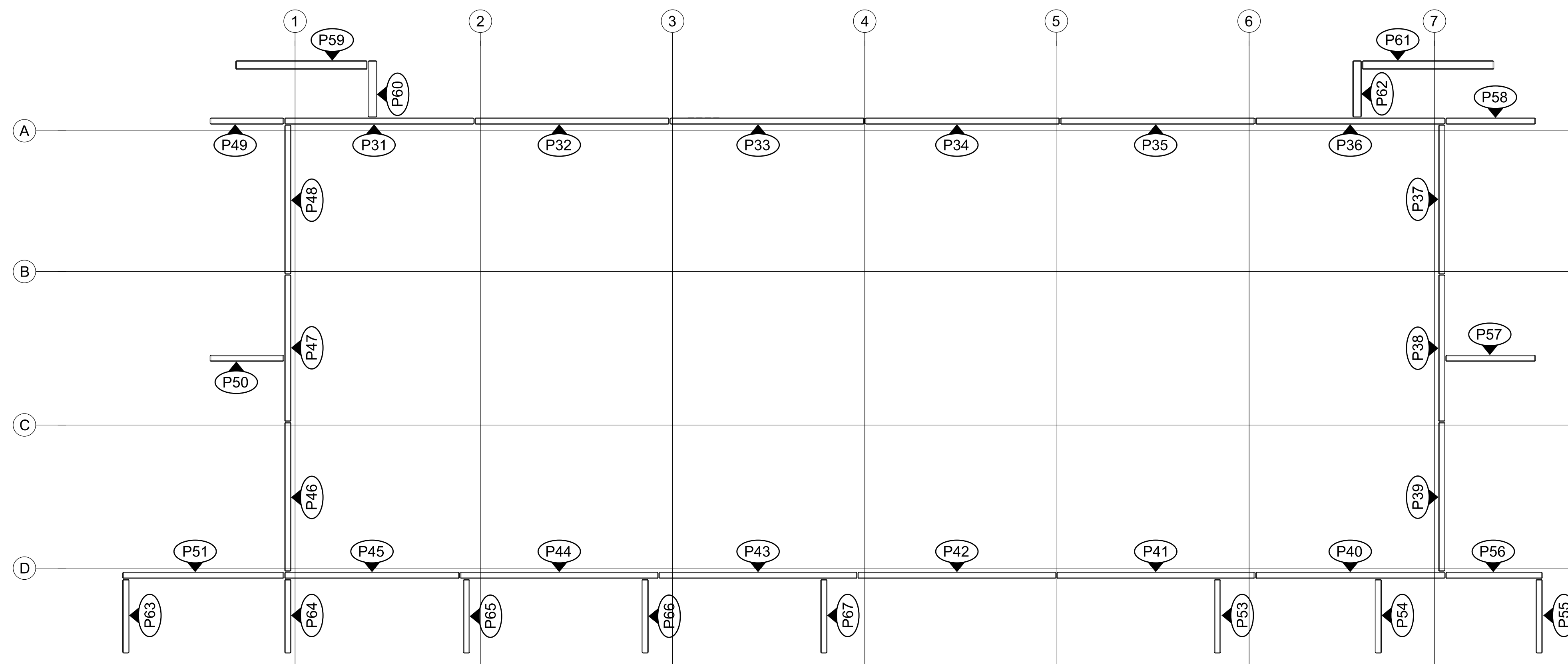
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KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
STRUCTURAL DETAILS
BUILDING DRAWING

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FIRST FLOOR - PRECAST PANEL STRUCTURAL DESIGN PLAN



GROUND FLOOR - PRECAST PANEL STRUCTURAL DESIGN PLAN

GENERAL NOTES:

1. ALL PENETRATIONS SHALL BE SEALED BY A WATERPROOF & FIREPROOF SEAL (VERMICULITE / CEMENT MIXTURE) OR FIRE PROOF SEALANT (DOW CORNING 3-6548 SILICONE RTV) FORM OR EQUIVALENT MIN. THICKNESS 150mm U.O.N.
2. ALL EARTHING MUST COMPLY WITH CURRENT ESSENTIAL ENERGY CONSTRUCTION STANDARDS, PROVIDE TYCO C70 EARTHING BOND EQUIPOTENTIAL EARTHING CONNECTIONS AT 2 DIAGONALLY OPPOSED POINTS IN ALL INTERNAL & EXTERNAL WALL AREAS GREATER THAN 5m² & 1 FOR ALL OTHER AREAS.
3. CONTRACTORS TO PROVIDE TEMPORARY PROPPING OF PANELS UNTIL COMPLETED STRUCTURE IS INSPECTED AND APPROVE BY STRUCTURAL ENGINEER.

PRECAST CONCRETE TILT-UP PANEL NOTES:

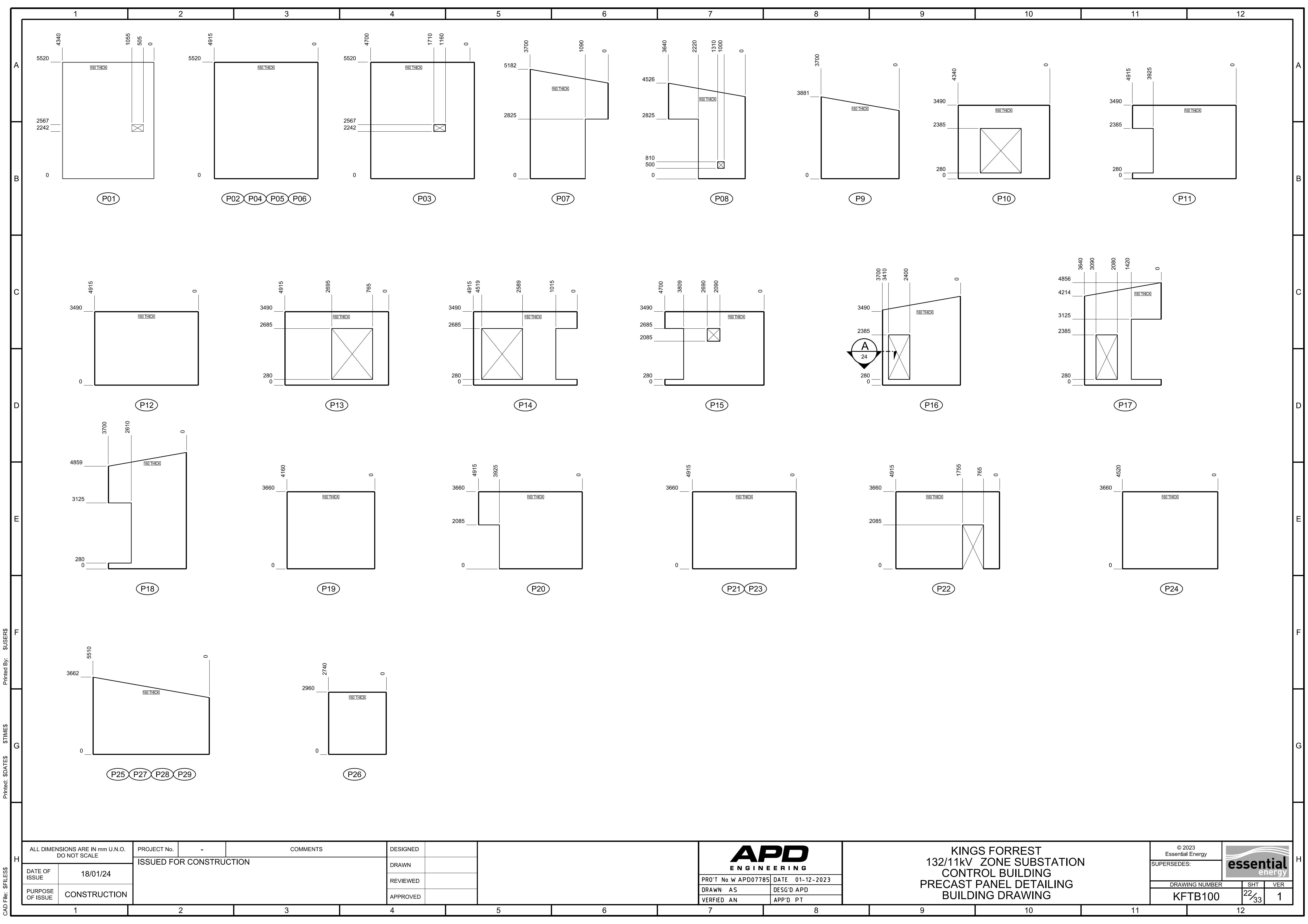
1. ALL WORKMANSHIP & MATERIALS SHALL BE IN ACCORDANCE WITH AS 3850.
2. CONCRETE EXPOSURE CLASSIFICATION = B1 TO AS 3600.
3. CONCRETE IS SHALL BE GRADE N40 (40MPa STRENGTH AT 28 DAYS).
4. ALL PRECAST PANELS TO BE REINFORCED AS SPECIFIED ON PRECAST PANEL REINFORCEMENT DETAIL DRAWINGS.
5. REINFORCEMENT AS SPECIFIED IN THIS DESIGN SET REFERS TO THAT REQUIRED ONLY FOR WHEN THE PRECAST PANELS HAVE BEEN ERECTED & ARE IN THEIR FINAL LOCATION. ADDITIONAL REINFORCEMENT SHALL BE INCLUDED AS PART OF LIFTING. DESIGN SHALL BE ASCERTAINED BY A STRUCTURAL ENGINEER IN CONJUNCTION WITH PROVIDED DIMENSIONAL INFORMATION FROM PREPARED WORKSHOP DRAWINGS, NOT INCLUDED IN THIS DRAWING SET.
6. PRIOR TO CONSTRUCTION, THE CONTRACTOR/S SHALL SUBMIT COPIES OF THE WORKSHOP DRAWINGS, INCLUDING LIFTING DESIGN TO ESSENTIAL ENERGY FOR REVIEW & APPROVAL. REVIEW DOES NOT INCLUDE CHECKING OF DIMENSIONS.
7. PRECAST PANELS SHALL NOT BE LIFTED:
 - A - WITHIN 7 DAYS OF CASTING.
 - B - UNTIL CONCRETE HAS REACHED MIN. 24MPa STRENGTH, AS DETERMINED BY SAMPLE CYLINDER TESTING BY A NATA REGISTERED LABORATORY.
8. PRECAST PANEL CONSTRUCTION:
 - A - PANEL DIMENSION TOLERANCES AS PER AS 3850.
 - WIDTH = +0, - 6mm
 - HEIGHT = +0, - 6mm
 - THICKNESS = +/- 3mm
 - B - ALL PRECAST PANELS SHALL BE SEPARATED BY A 20mm WIDE JOINT FILLED WITH APPROVED FIRE PROOF SEAL WITH A 2HR FIRE RATING. (VERMICULITE / CEMENT MIXTURE) OR FIRE PROOF SEALANT (DOW CORNING 3-6548 SILICONE RTV) FORM OR EQUIVALENT. MIN. 150mm THICKNESS U.O.N.
 - C - ANY STRUCTURAL STEEL WORK BEARING ON, OR CONNECTED TO PRECAST PANELS SHALL BE INSPECTED & APPROVED BY AN ENGINEER PRIOR TO REMOVAL OF TEMPORARY PROPS / BRACING.
9. FIRE DESIGN:
 - A - PRECAST PANEL (INTERNAL) DESIGN F.R.L. = 120/120/120.
 - B - PRECAST PANEL DESIGN & FIXINGS COMPLY WITH B.C.A. CLAUSE C.1.11 FOR PANELS TO COLLAPSE INWARDS WITH AN INTERNAL FIRE.
10. REFER ARCHITECTURAL DRAWINGS FOR ALL PRECAST PANEL CUTOUT POSITIONS FOR WINDOWS, DOORS ETC. & ANY FEATURES TO BE INCLUDED DURING CASTING.
11. ANY ARCHITECTURAL GROOVES ADDED INTO THE FACE OF PANELS ARE TO BE MAXIMUM 15mm x 15mm REBATE TYPE.
12. SHOP DRAWINGS TO BE REVIEWED BY ESSENTIAL ENERGY
13. FERRULE LOCATIONS TO BE INCLUDED IN COMBINED STEELWORK & CONCRETE SHOP DRAWINGS

LEGEND:



DENOTES PRECAST PANEL NUMBER.
REFER SHEETS 21, 22 & 23 FOR CASTING DETAILS.

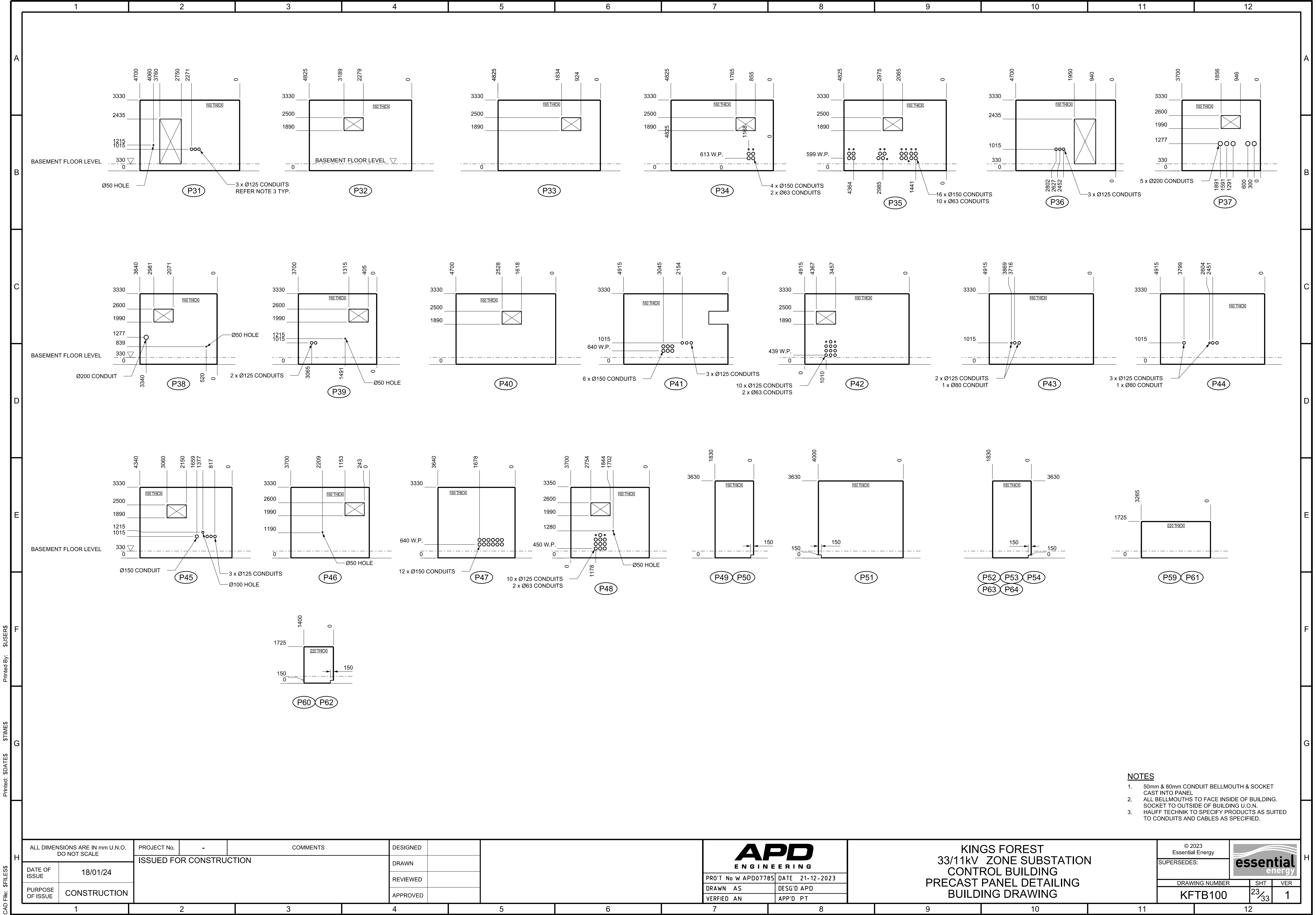
ALL DIMENSIONS ARE IN mm U.N.O. DO NOT SCALE		PROJECT No.	-	COMMENTS	DESIGNED		<p>KINGS FOREST 33/11kV ZONE SUBSTATION CONTROL BUILDING PRECAST PANEL STRUCTURAL PLAN BUILDING DRAWING</p>	© 2023 Essential Energy		
		ISSUED FOR CONSTRUCTION			DRAWN			SUPERSEDES:		
DATE OF ISSUE	18/01/24				REVIEWED					
PURPOSE OF ISSUE	CONSTRUCTION				APPROVED					
						PRO'T No W APD07785 DATE 21/12/2023 DRAWN AS DES'G'D APD VERIFIED AN APP'D PT	DRAWING NUMBER		SHT	VER
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NOTES

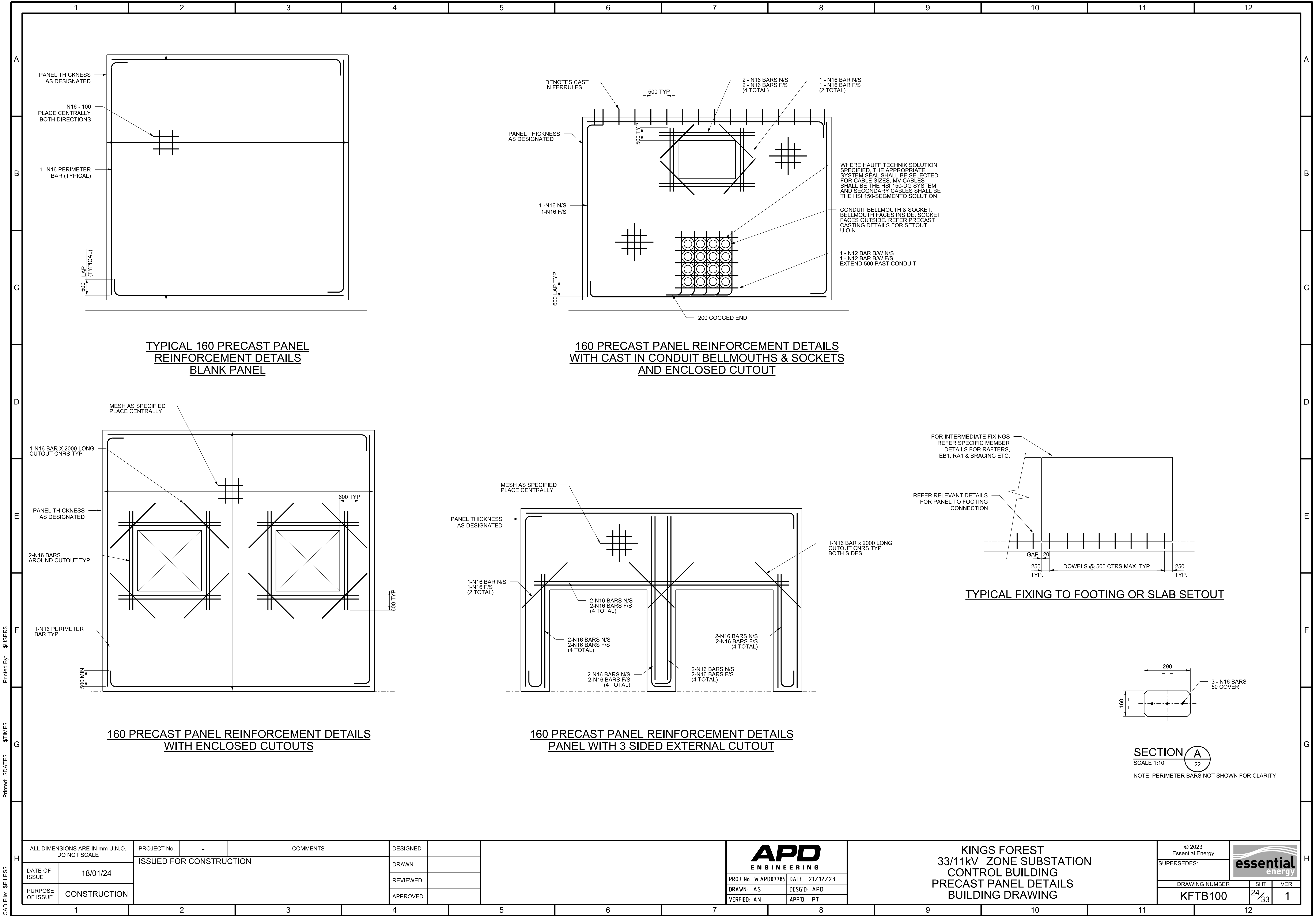
- 50mm & 80mm CONDUIT BELLMOUTH & SOCKET CAST INTO PANEL
- ALL BELLMOUTHS TO FACE INSIDE OF BUILDING. SOCKET TO OUTSIDE OF BUILDING U.O.N.
- HAUFF TECHNIK TO SPECIFY PRODUCTS AS SUITED TO CONDUITS AND CABLES AS SPECIFIED.

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					APPROVED		

APD ENGINEERING	
PROJ No W APD07785	DATE 21-12-2023
DRAWN AS	DESIGN APD
VERIFIED AN	APP'D PT

KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
PRECAST PANEL DETAILING
BUILDING DRAWING

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SUPERSEDES:			
DRAWING NUMBER	SHT	VER	
KFTB100	23/33	1	



TYPICAL 160 PRECAST PANEL
REINFORCEMENT DETAILS
BLANK PANEL

160 PRECAST PANEL REINFORCEMENT DETAILS
WITH CAST IN CONDUIT BELLMOUTHS & SOCKETS
AND ENCLOSED CUTOUT

160 PRECAST PANEL REINFORCEMENT DETAILS
WITH ENCLOSED CUTOUTS

160 PRECAST PANEL REINFORCEMENT DETAILS
PANEL WITH 3 SIDED EXTERNAL CUTOUT

TYPICAL FIXING TO FOOTING OR SLAB SETOUT

SECTION A
SCALE 1:10

NOTE: PERIMETER BARS NOT SHOWN FOR CLARITY

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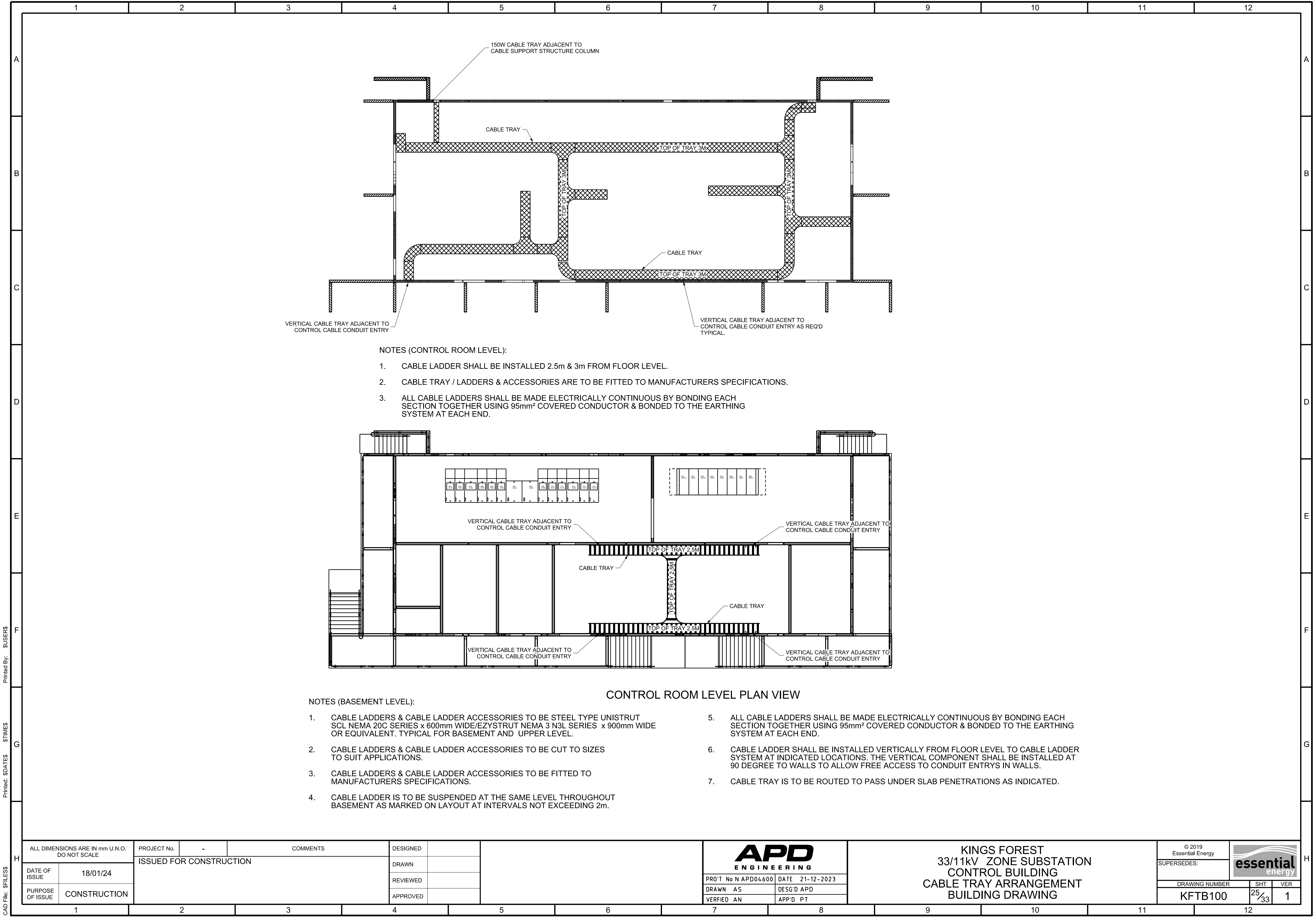
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DATE OF ISSUE	18/01/24	ISSUED FOR CONSTRUCTION			DRAWN	
PURPOSE OF ISSUE	CONSTRUCTION				REVIEWED	
					APPROVED	

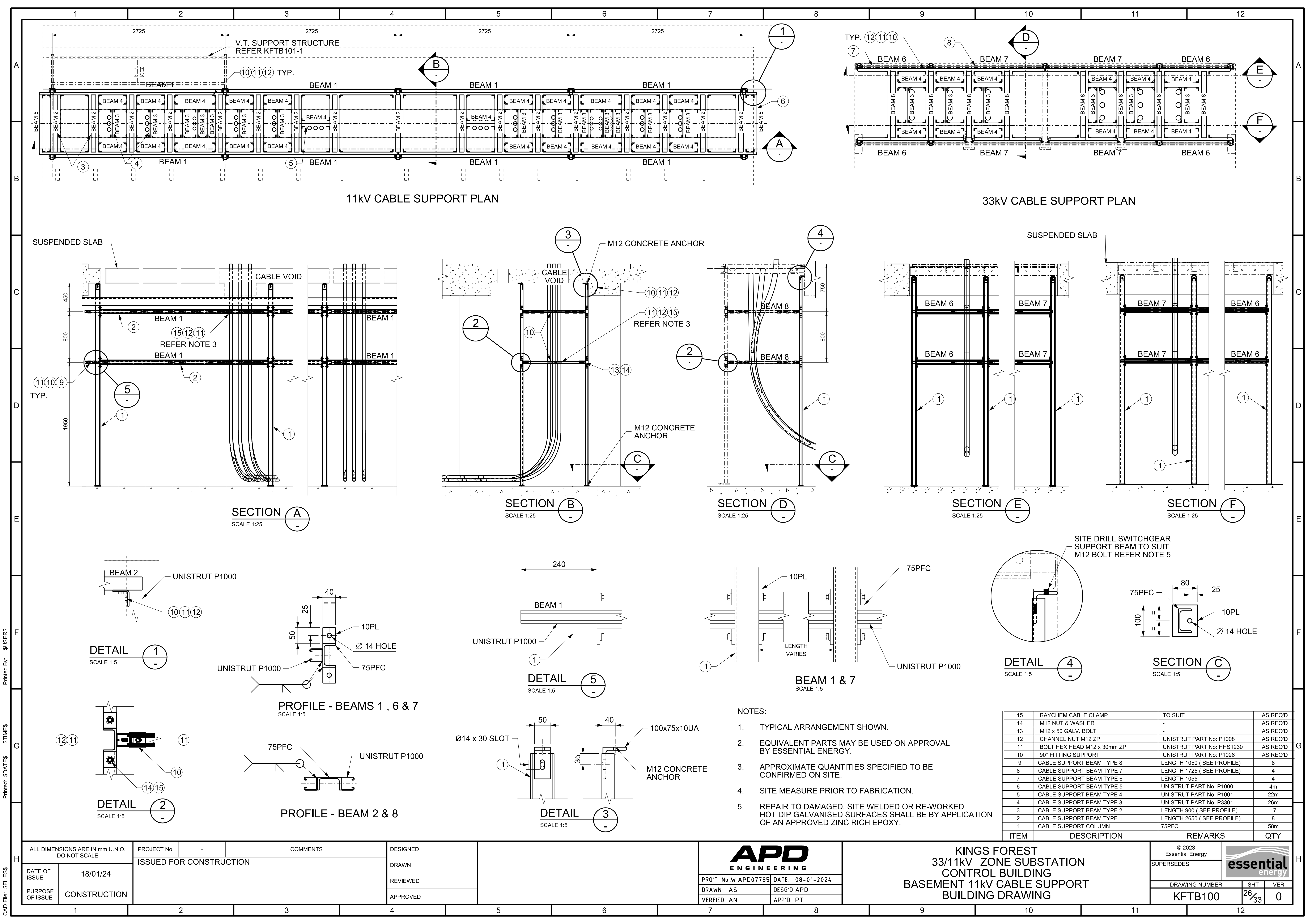
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PROJ No	W APD07785
DATE	21/12/23
DRAWN	AS
DES'G'D	APD
VERIFIED	AN
APP'D	PT

KINGS FOREST
33/11KV ZONE SUBSTATION
CONTROL BUILDING
PRECAST PANEL DETAILS
BUILDING DRAWING

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11kV CABLE SUPPORT PLAN

33kV CABLE SUPPORT PLAN

SECTION A
SCALE 1:25

SECTION B
SCALE 1:25

SECTION D
SCALE 1:25

SECTION E
SCALE 1:25

SECTION F
SCALE 1:25

DETAIL 1
SCALE 1:5

PROFILE - BEAMS 1, 6 & 7
SCALE 1:5

DETAIL 2
SCALE 1:5

PROFILE - BEAM 2 & 8

DETAIL 5
SCALE 1:5

BEAM 1 & 7
SCALE 1:5

DETAIL 4
SCALE 1:5

SECTION C
SCALE 1:5

NOTES:

1. TYPICAL ARRANGEMENT SHOWN.
2. EQUIVALENT PARTS MAY BE USED ON APPROVAL BY ESSENTIAL ENERGY.
3. APPROXIMATE QUANTITIES SPECIFIED TO BE CONFIRMED ON SITE.
4. SITE MEASURE PRIOR TO FABRICATION.
5. REPAIR TO DAMAGED, SITE WELDED OR RE-WORKED HOT DIP GALVANISED SURFACES SHALL BE BY APPLICATION OF AN APPROVED ZINC RICH EPOXY.

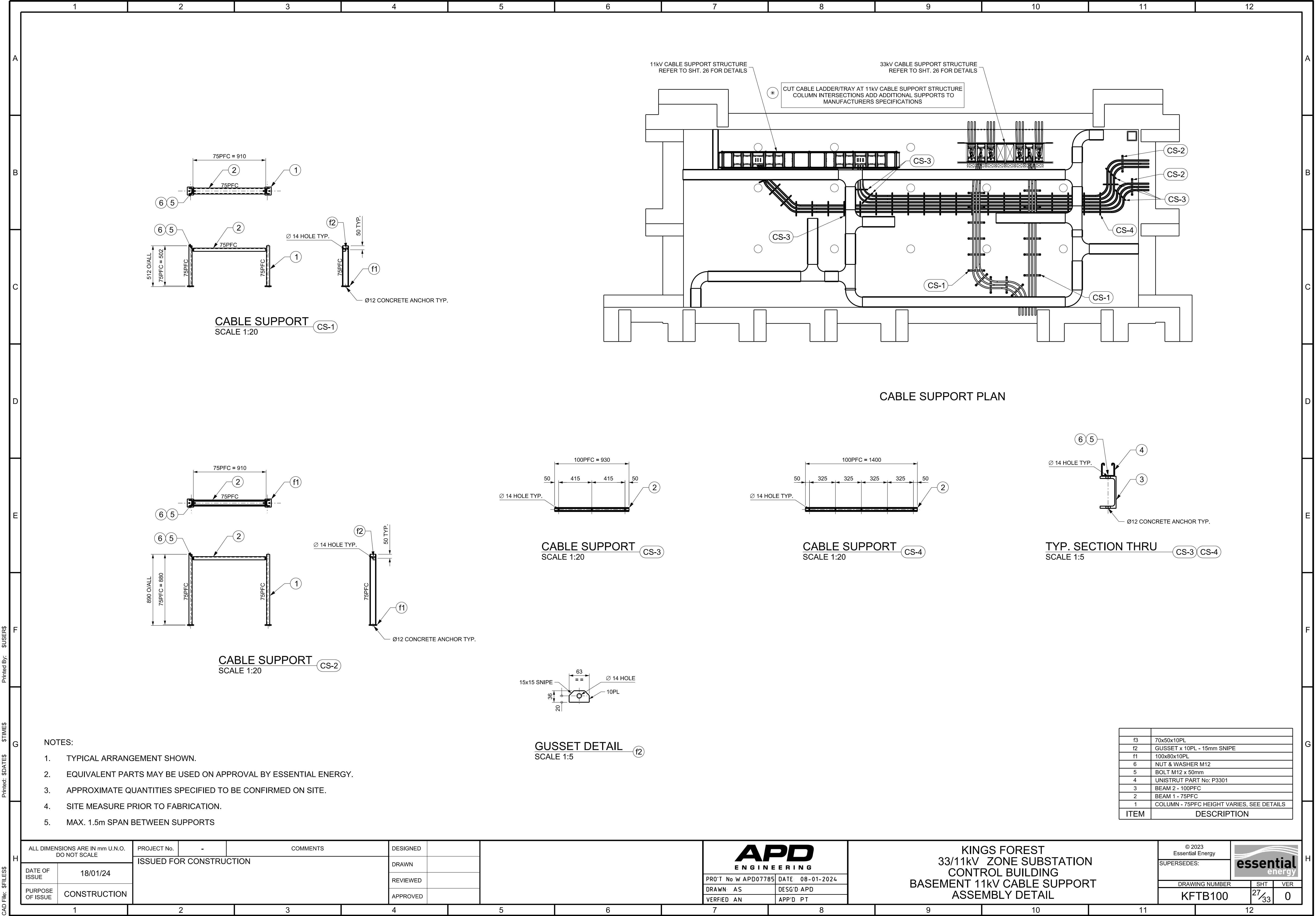
15	RAYCHEM CABLE CLAMP	TO SUIT	AS REQ'D
14	M12 NUT & WASHER	-	AS REQ'D
13	M12 x 50 GALV. BOLT	-	AS REQ'D
12	CHANNEL NUT M12 ZP	UNISTRUT PART No: P1008	AS REQ'D
11	BOLT HEX HEAD M12 x 30mm ZP	UNISTRUT PART No: HHS1230	AS REQ'D
10	90° FITTING SUPPORT	UNISTRUT PART No: P1026	AS REQ'D
9	CABLE SUPPORT BEAM TYPE 8	LENGTH 1050 (SEE PROFILE)	8
8	CABLE SUPPORT BEAM TYPE 7	LENGTH 1725 (SEE PROFILE)	4
7	CABLE SUPPORT BEAM TYPE 6	LENGTH 1055	4
6	CABLE SUPPORT BEAM TYPE 5	UNISTRUT PART No: P1000	4m
5	CABLE SUPPORT BEAM TYPE 4	UNISTRUT PART No: P1001	22m
4	CABLE SUPPORT BEAM TYPE 3	UNISTRUT PART No: P3301	26m
3	CABLE SUPPORT BEAM TYPE 2	LENGTH 900 (SEE PROFILE)	17
2	CABLE SUPPORT BEAM TYPE 1	LENGTH 2650 (SEE PROFILE)	8
1	CABLE SUPPORT COLUMN	75PFC	58m
ITEM	DESCRIPTION	REMARKS	QTY

ALL DIMENSIONS ARE IN mm U.N.O. DO NOT SCALE		PROJECT No.	-	COMMENTS	DESIGNED	
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PURPOSE OF ISSUE	CONSTRUCTION					REVIEWED
						APPROVED

APD ENGINEERING	
PROJ No W APD07785	DATE 08-01-2024
DRAWN AS	DES'G'D APD
VERIFIED AN	APP'D PT

KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
BASEMENT 11kV CABLE SUPPORT
BUILDING DRAWING

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SUPERSEDES:		
DRAWING NUMBER	SHT	VER
KFTB100	26/33	0



- NOTES:
1. TYPICAL ARRANGEMENT SHOWN.
 2. EQUIVALENT PARTS MAY BE USED ON APPROVAL BY ESSENTIAL ENERGY.
 3. APPROXIMATE QUANTITIES SPECIFIED TO BE CONFIRMED ON SITE.
 4. SITE MEASURE PRIOR TO FABRICATION.
 5. MAX. 1.5m SPAN BETWEEN SUPPORTS

ITEM	DESCRIPTION
f3	70x50x10PL
f2	GUSSET x 10PL - 15mm SNIPER
f1	100x80x10PL
6	NUT & WASHER M12
5	BOLT M12 x 50mm
4	UNISTRUT PART No: P3301
3	BEAM 2 - 100PFC
2	BEAM 1 - 75PFC
1	COLUMN - 75PFC HEIGHT VARIES, SEE DETAILS

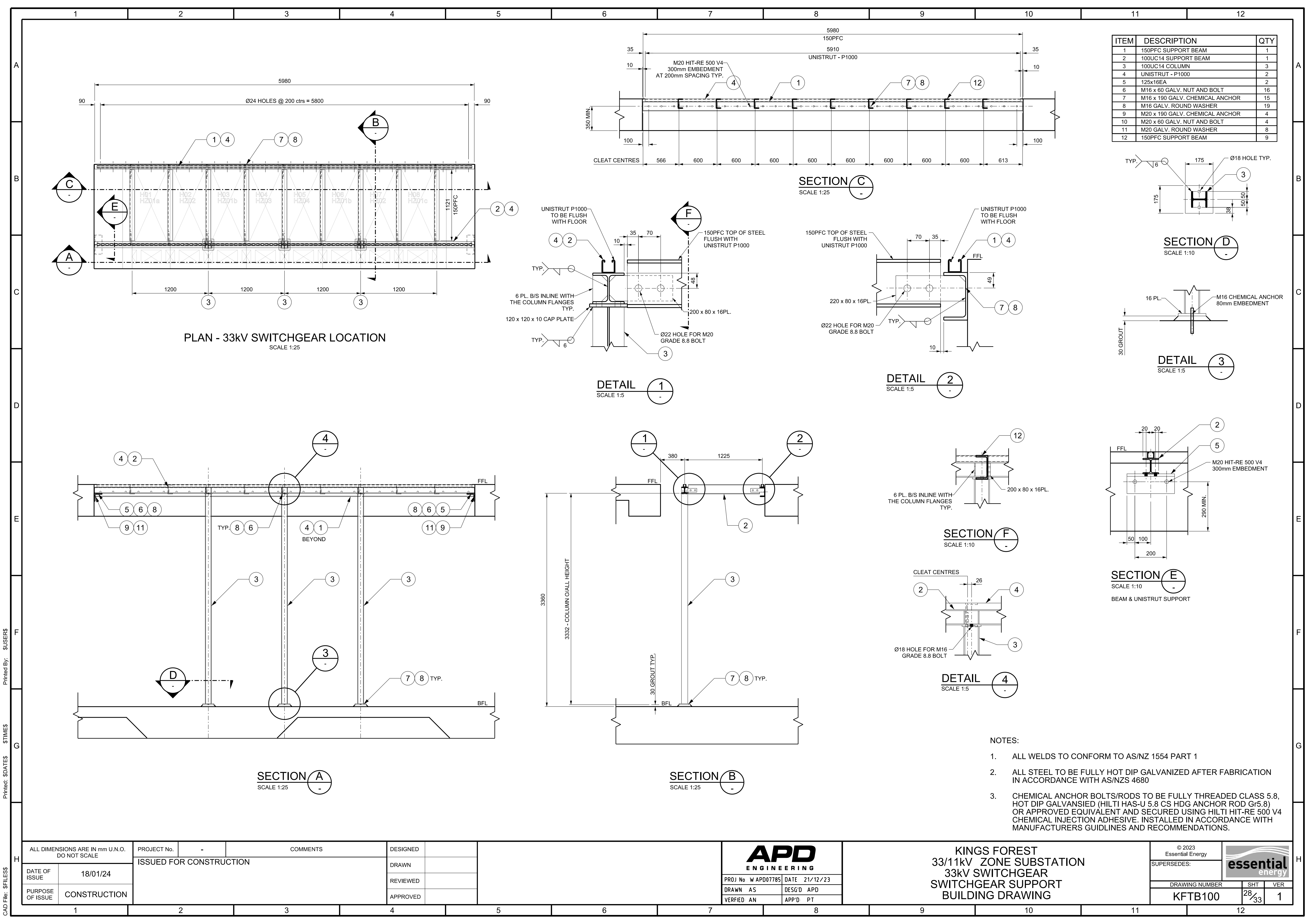
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DATE OF ISSUE	18/01/24	ISSUED FOR CONSTRUCTION			DRAWN	
PURPOSE OF ISSUE	CONSTRUCTION				REVIEWED	
					APPROVED	

APD ENGINEERING	
PROJ No W APD07785	DATE 08-01-2024
DRAWN AS	DESIGN APD
VERIFIED AN	APP'D PT

KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
BASEMENT 11kV CABLE SUPPORT
ASSEMBLY DETAIL

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SUPERSEDES:		
DRAWING NUMBER	SHT	VER
KFTB100	27/33	0





ITEM	DESCRIPTION	QTY
1	150PFC SUPPORT BEAM	1
2	100UC14 SUPPORT BEAM	1
3	100UC14 COLUMN	3
4	UNISTRUT - P1000	2
5	125x16EA	2
6	M16 x 60 GALV. NUT AND BOLT	16
7	M16 x 190 GALV. CHEMICAL ANCHOR	15
8	M16 GALV. ROUND WASHER	19
9	M20 x 190 GALV. CHEMICAL ANCHOR	4
10	M20 x 60 GALV. NUT AND BOLT	8
11	M20 GALV. ROUND WASHER	8
12	150PFC SUPPORT BEAM	9

- NOTES:
- ALL WELDS TO CONFORM TO AS/NZ 1554 PART 1
 - ALL STEEL TO BE FULLY HOT DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AS/NZS 4680
 - CHEMICAL ANCHOR BOLTS/RODS TO BE FULLY THREADED CLASS 5.8, HOT DIP GALVANIZED (HILTI HAS-U 5.8 CS HDG ANCHOR ROD Gr5.8) OR APPROVED EQUIVALENT AND SECURED USING HILTI HIT-RE 500 V4 CHEMICAL INJECTION ADHESIVE. INSTALLED IN ACCORDANCE WITH MANUFACTURERS GUIDLINES AND RECOMMENDATIONS.

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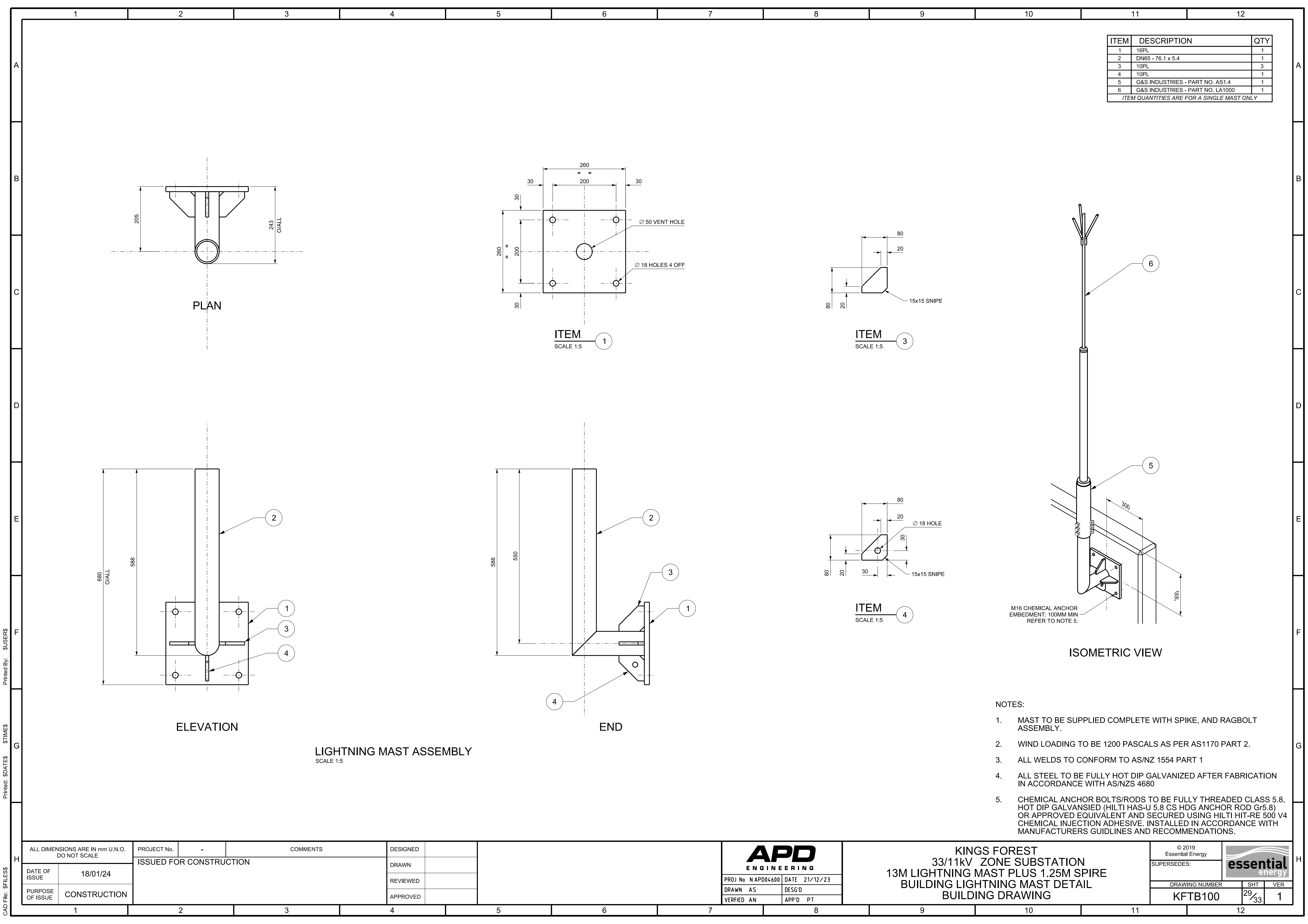
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PURPOSE OF ISSUE	CONSTRUCTION					REVIEWED
						APPROVED

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		REVIEWED	
		APPROVED	

APD ENGINEERING	
PROJ No	W APD07785
DATE	21/12/23
DRAWN	AS
DES'G'D	APD
VERIFIED	AN
APP'D	PT

KINGS FOREST 33/11kV ZONE SUBSTATION 33kV SWITCHGEAR SWITCHGEAR SUPPORT BUILDING DRAWING		
DRAWING NUMBER	SHT	VER
KFTB100	28/33	1

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SUPERSEDES:			
DRAWING NUMBER		SHT	VER
KFTB100		28 /33	1



ITEM	DESCRIPTION	QTY
1	16PL	1
2	DN65 - 76.1 x 5.4	1
3	10PL	3
4	10PL	1
5	G&S INDUSTRIES - PART NO. AS1.4	1
6	G&S INDUSTRIES - PART NO. LA1000	1
ITEM QUANTITIES ARE FOR A SINGLE MAST ONLY		

- NOTES:
- MAST TO BE SUPPLIED COMPLETE WITH SPIKE, AND RAGBOLT ASSEMBLY.
 - WIND LOADING TO BE 1200 PASCALS AS PER AS1170 PART 2.
 - ALL WELDS TO CONFORM TO AS/NZ 1554 PART 1
 - ALL STEEL TO BE FULLY HOT DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AS/NZS 4680
 - CHEMICAL ANCHOR BOLTS/RODS TO BE FULLY THREADED CLASS 5.8, HOT DIP GALVANSIED (HILTI HAS-U 5.8 CS HDG ANCHOR ROD Gr5.8) OR APPROVED EQUIVALENT AND SECURED USING HILTI HIT-RE 500 V4 CHEMICAL INJECTION ADHESIVE. INSTALLED IN ACCORDANCE WITH MANUFACTURERS GUIDLINES AND RECOMMENDATIONS.

ALL DIMENSIONS ARE IN mm U.N.O. DO NOT SCALE		PROJECT No.	-	COMMENTS	DESIGNED	
DATE OF ISSUE	18/01/24	ISSUED FOR CONSTRUCTION				DRAWN
PURPOSE OF ISSUE	CONSTRUCTION					REVIEWED
						APPROVED

APD ENGINEERING	
PROJ No	N APD04.600
DATE	21/12/23
DRAWN	AS
DES'G'D	
VERIFIED	AN
APP'D	PT

KINGS FOREST
33/11kV ZONE SUBSTATION
13M LIGHTNING MAST PLUS 1.25M SPIRE
BUILDING LIGHTNING MAST DETAIL
BUILDING DRAWING

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DRAWING NUMBER	SHT	VER	
KFTB100	29/33	1	

LIGHTING

- POWER

- ## EMERGENCY ESCAPE LIGHTING

- FIRE

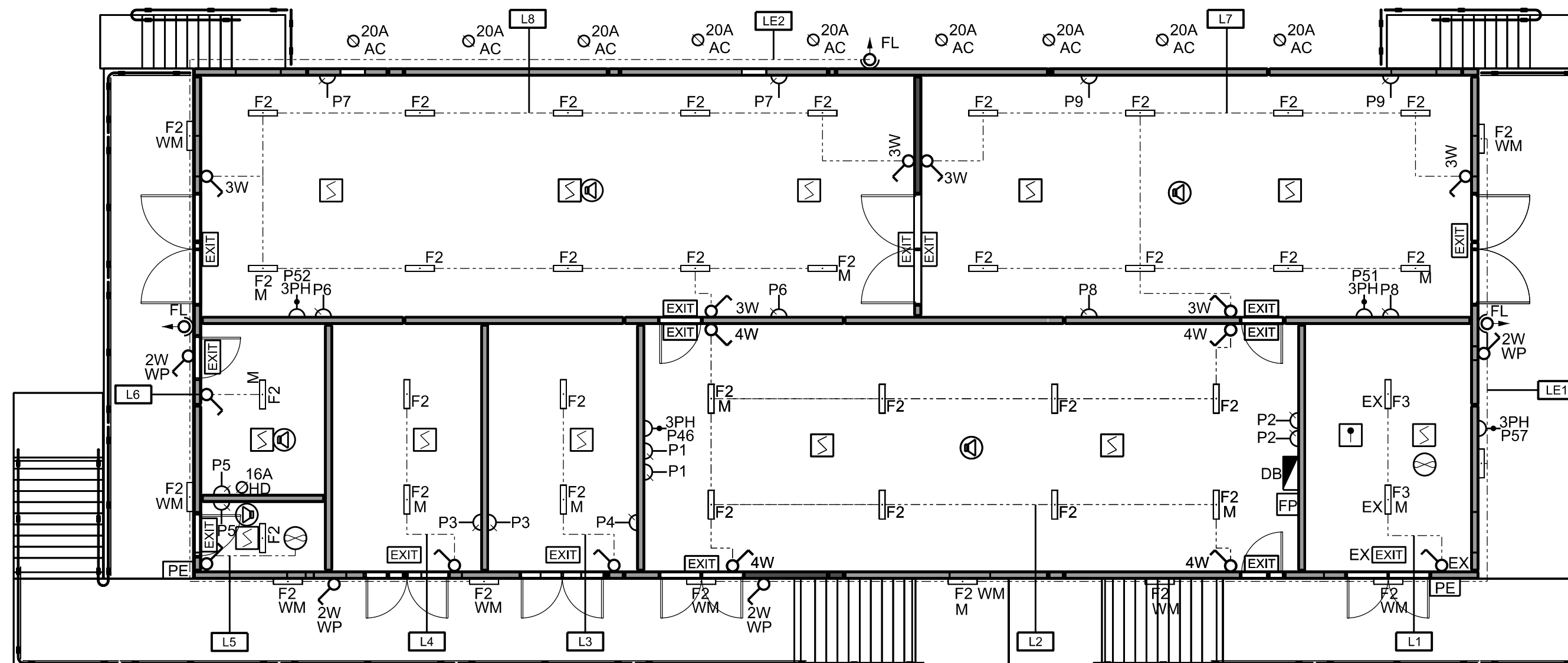
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|-------------------------------------------------|--------------|-------------------------|---|----------|----------|--|
| ALL DIMENSIONS ARE IN mm U.N.O.
DO NOT SCALE | | PROJECT No. | - | COMMENTS | DESIGNED | |
| | | ISSUED FOR CONSTRUCTION | | | DRAWN | |
| DATE OF
ISSUE | 22/12/23 | | | | REVIEWED | |
| PURPOSE
OF ISSUE | CONSTRUCTION | | | | APPROVED | |

1. DRAWINGS SHOWING EQUIPMENT LAYOUTS ARE DIAGRAMMATIC ONLY.
2. BEFORE COMMENCING WORK, DETERMINE EXACT POSITIONS OF THE EQUIPMENT & ACCESSORIES IN CONJUNCTION WITH THE PROJECT MANAGER. HAVING REGARD TO BUILDING FEATURES, OTHER SERVICES, & THE REQUIREMENT OF THE REGULATORY AUTHORITIES.
3. LIGHT SWITCHES AND POWER OUTLETS ARE TO BE MOUNTED 80mm FROM DOOR FRAMES IN THE CONTROL ROOM.
4. EXTERIOR LIGHTING CIRCUIT SHALL BE CONTROLLED BY AN EXTERNALLY MOUNTED PE CELL & AN AUTO-OFF-MANUAL SWITCH MOUNTED TO THE DISTRIBUTION BOARD. CONTROL IS TO BE BY A SUFFICIENTLY RATED RELAY OR CONTACTOR. INDIVIDUAL LIGHTS AND BANKS OF LIGHTS ON THIS CIRCUIT SHALL THEN BE SWITCHED AS INDICATED.
5. LABEL ALL POWER OUTLETS, LIGHT SWITCHES & ISOLATORS WITH ENGRAVED TRAFFOLYTE LABELS TO IDENTIFY SOURCE OF SUPPLY & CIRCUIT BREAKER AT SOURCE OF SUPPLY.
6. PERMANENT CABLING SHALL BE CONTINUOUS WITHOUT JOINS OR EXTENSIONS.
7. ALL INSTALLATION WORKS IN THE BATTERY ROOMS SHALL COMPLY WITH THE REQUIREMENTS FOR CLASS 1 ZONE 1 HAZARDOUS AREAS.
8. COMMON ABBREVIATIONS USED ON THIS DRAWING.
 - AC - AIR-CONDITIONER
 - AFFL - ABOVE FINISHED FLOOR LEVEL
 - GPO - LOW VOLTAGE GENERAL PURPOSE OUTLET
 - HWU - HOT WATER UNIT
 - K-EXT - RELAY CONTACT CONTROLLED BY P.E. CELL AND AUTO/MANUAL/OFF SWITCH. REFER NOTE 4.
 - WP - WEATHER PROOF
 - WM - WALL MOUNTED
9. INDOOR LIGHTING IS TO BE SUSPENDED FROM THE CEILING AT A THE FOLLOWING HEIGHTS FOR EACH AREA OF FROM THE FLOOR BY CHAIN OR UNISTRUT UNLESS NOTIFIED OTHERWISE.
 - a. 11kV SWITCHROOM - 3.5m
 - b. CABLE BASEMENT - 3m
 - c. CONTROL ROOM AND OTHERS - 2.5m
 - d. WALL MOUNTED LED - 2.5m
10. LIGHTS IN BATTERY ROOMS TO BE FITTED TO PLASTERBOARD CEILING.

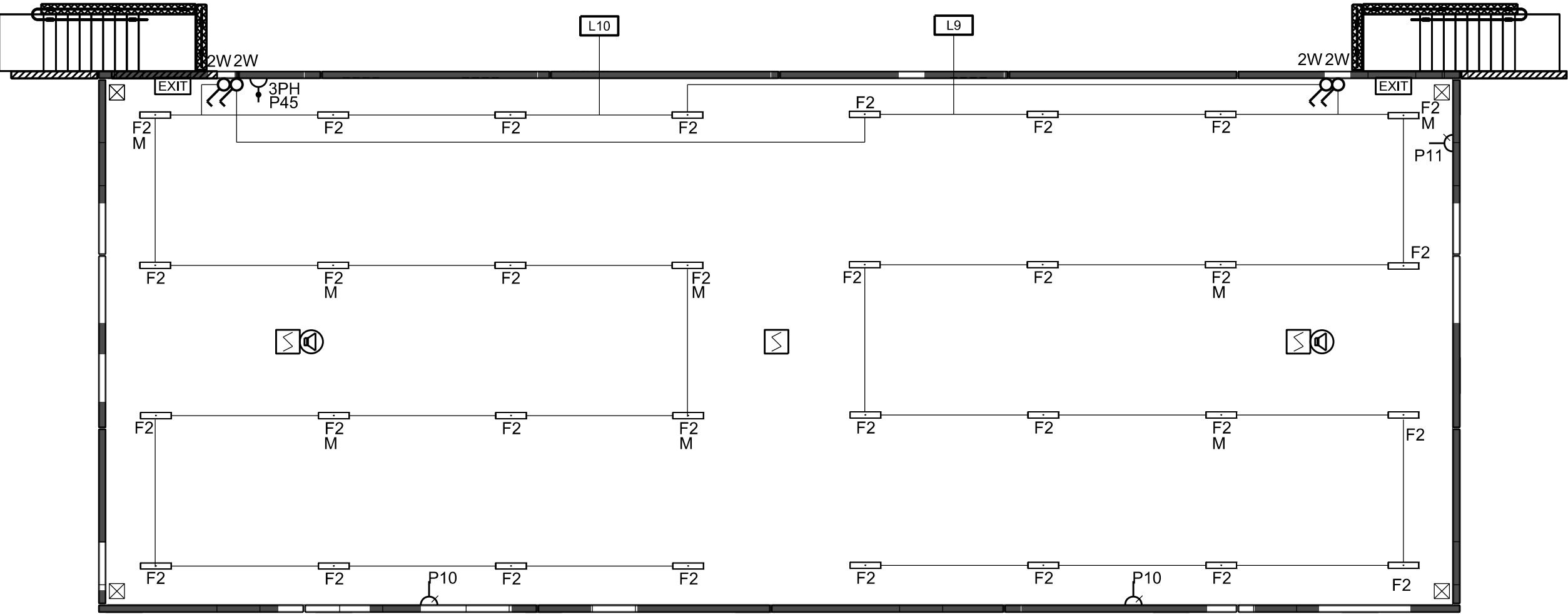
1. PROVIDE A BROOKS FIRE TRACKER 1 FT1-SB PANEL FOR CONNECTION OF ALL SMOKE & THERMAL DETECTORS.
2. PROVIDE ONE BROOKS SOUNDER BASE IN EACH ROOM FOR OCCUPANT WARNING
3. THE FIRE ALARM SYSTEM SHALL INCLUDE TWO PAIRS OF VOLT FREE CONTACTS. ONE FOR REMOTE INDICATION VIA THE STATION SCADA SYSTEM. THE OTHER TO SHUTDOWN ALL AIR-CONDITIONING SYSTEMS

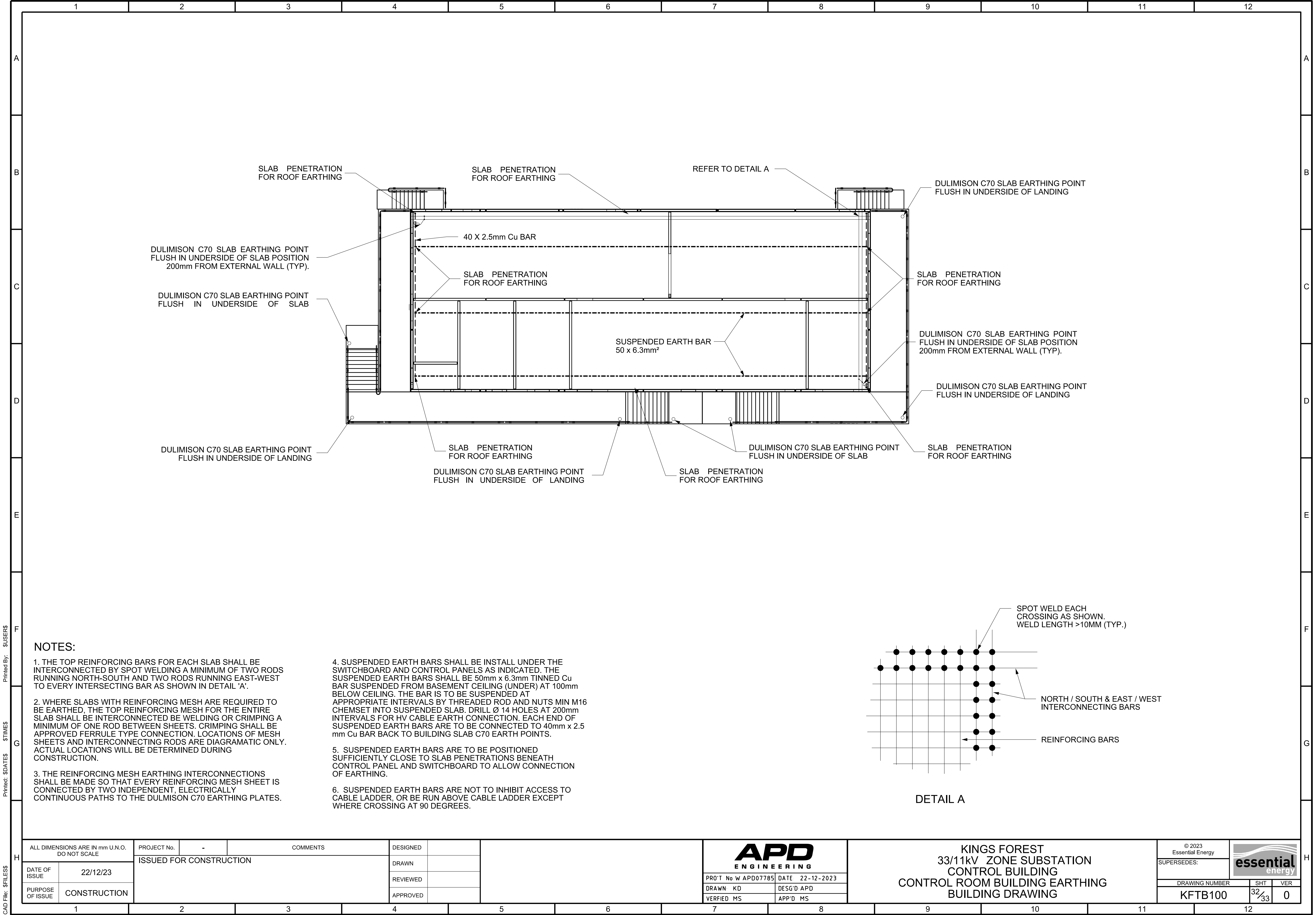
1. THE DISTRIBUTION BOARD IS TO BE LOCATED AS CLOSE TO THE CORNER OF THE ROOM AS INDICATED TO ALLOW FOR FURTHER EQUIPMENT TO BE MOUNTED ADJACENT TO IT AT A LATER DATE.

1. ALL WORK SHALL COMPLY WITH THE FOLLOWING STANDARDS & CODES:
AS 2293:2005 - EMERGENCY EVACUATION LIGHTING FOR BUILDINGS
(PARTS AS APPLICABLE)
AS/NZS 3000:2007 - WIRING RULES
AS/NZS 3008:1.1:2009 - ELECTRICAL INSTALLATIONS - SELECTION OF CABLES
AS/NZS 3080:2003 - TELECOMMUNICATIONS INSTALLATIONS
THE LATEST ISSUE OF THE LOCAL SUPPLY AUTHORITY SERVICE & INSTALLATION RULES



11KV & 33KV SWITCHROOM, CONTROL ROOM, BATTERY ROOM & OTHERS, SWITCHING, POWER & FIRE DETECTION LAYOUT





NOTES:

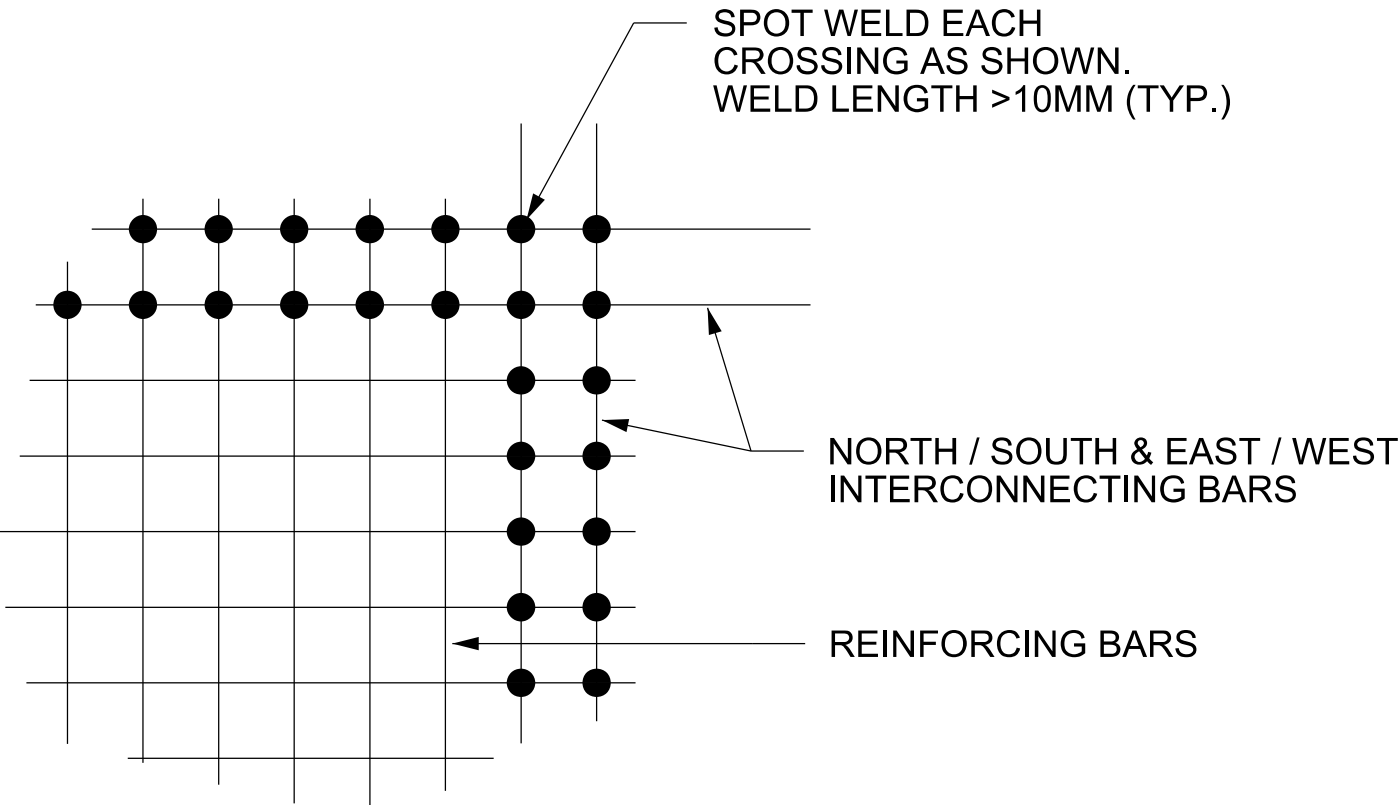
1. THE TOP REINFORCING BARS FOR EACH SLAB SHALL BE INTERCONNECTED BY SPOT WELDING A MINIMUM OF TWO RODS RUNNING NORTH-SOUTH AND TWO RODS RUNNING EAST-WEST TO EVERY INTERSECTING BAR AS SHOWN IN DETAIL 'A'.

2. WHERE SLABS WITH REINFORCING MESH ARE REQUIRED TO BE EARTHED, THE TOP REINFORCING MESH FOR THE ENTIRE SLAB SHALL BE INTERCONNECTED BE WELDING OR CRIMPING A MINIMUM OF ONE ROD BETWEEN SHEETS. CRIMPING SHALL BE APPROVED FERRULE TYPE CONNECTION. LOCATIONS OF MESH SHEETS AND INTERCONNECTING RODS ARE DIAGRAMATIC ONLY. ACTUAL LOCATIONS WILL BE DETERMINED DURING CONSTRUCTION.

3. THE REINFORCING MESH EARTHING INTERCONNECTIONS SHALL BE MADE SO THAT EVERY REINFORCING MESH SHEET IS CONNECTED BY TWO INDEPENDENT, ELECTRICALLY CONTINUOUS PATHS TO THE DULMISON C70 EARTHING PLATES.
4. SUSPENDED EARTH BARS SHALL BE INSTALL UNDER THE SWITCHBOARD AND CONTROL PANELS AS INDICATED. THE SUSPENDED EARTH BARS SHALL BE 50mm x 6.3mm TINNED Cu BAR SUSPENDED FROM BASEMENT CEILING (UNDER) AT 100mm BELOW CEILING. THE BAR IS TO BE SUSPENDED AT APPROPRIATE INTERVALS BY THREADED ROD AND NUTS MIN M16 CHEMSET INTO SUSPENDED SLAB. DRILL Ø 14 HOLES AT 200mm INTERVALS FOR HV CABLE EARTH CONNECTION. EACH END OF SUSPENDED EARTH BARS ARE TO BE CONNECTED TO 40mm x 2.5 mm Cu BAR BACK TO BUILDING SLAB C70 EARTH POINTS.

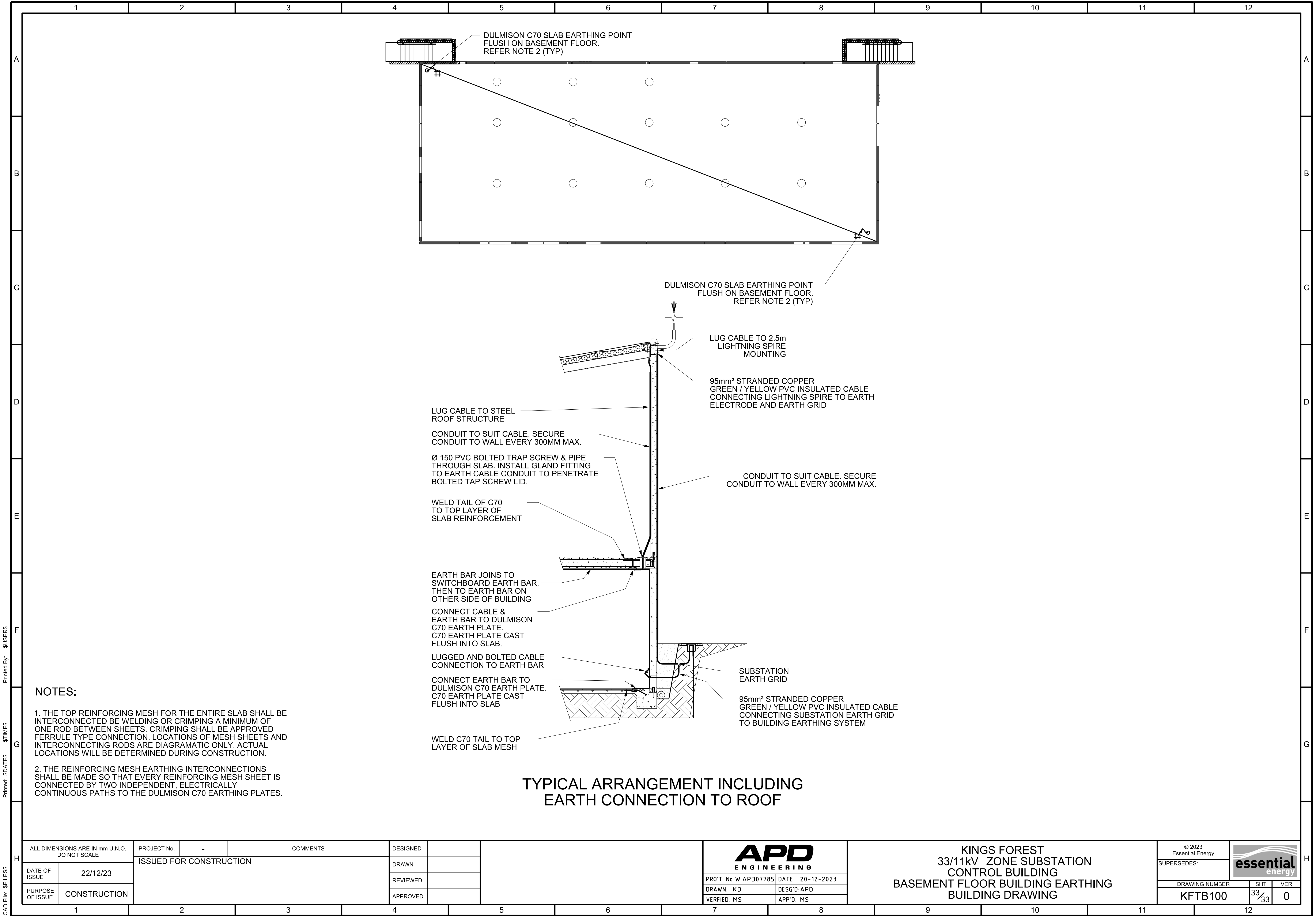
5. SUSPENDED EARTH BARS ARE TO BE POSITIONED SUFFICIENTLY CLOSE TO SLAB PENETRATIONS BENEATH CONTROL PANEL AND SWITCHBOARD TO ALLOW CONNECTION OF EARTHING.

6. SUSPENDED EARTH BARS ARE NOT TO INHIBIT ACCESS TO CABLE LADDER, OR BE RUN ABOVE CABLE LADDER EXCEPT WHERE CROSSING AT 90 DEGREES.



DETAIL A

ALL DIMENSIONS ARE IN mm U.N.O. DO NOT SCALE		PROJECT No.	-	COMMENTS		DESIGNED		<div><div>APD</div><div>ENGINEERING</div></div> <div>PROJ No W APD07785 DATE 22-12-2023</div> <div>DRAWN KD DESG'D APD</div> <div>VERIFIED MS APP'D MS</div>		KINGS FOREST 33/11kV ZONE SUBSTATION CONTROL BUILDING CONTROL ROOM BUILDING EARTHING BUILDING DRAWING				© 2023 Essential Energy		<div>essential energy</div>	
DATE OF ISSUE	22/12/23	ISSUED FOR CONSTRUCTION				DRAWN				SUPERSEDES:							
PURPOSE OF ISSUE	CONSTRUCTION					REVIEWED				DRAWING NUMBER				SHT	VER		
						APPROVED				KFTB100				32/33	0		



NOTES:

1. THE TOP REINFORCING MESH FOR THE ENTIRE SLAB SHALL BE INTERCONNECTED BE WELDING OR CRIMPING A MINIMUM OF ONE ROD BETWEEN SHEETS. CRIMPING SHALL BE APPROVED FERRULE TYPE CONNECTION. LOCATIONS OF MESH SHEETS AND INTERCONNECTING RODS ARE DIAGRAMATIC ONLY. ACTUAL LOCATIONS WILL BE DETERMINED DURING CONSTRUCTION.
2. THE REINFORCING MESH EARTHING INTERCONNECTIONS SHALL BE MADE SO THAT EVERY REINFORCING MESH SHEET IS CONNECTED BY TWO INDEPENDENT, ELECTRICALLY CONTINUOUS PATHS TO THE DULMISON C70 EARTHING PLATES.

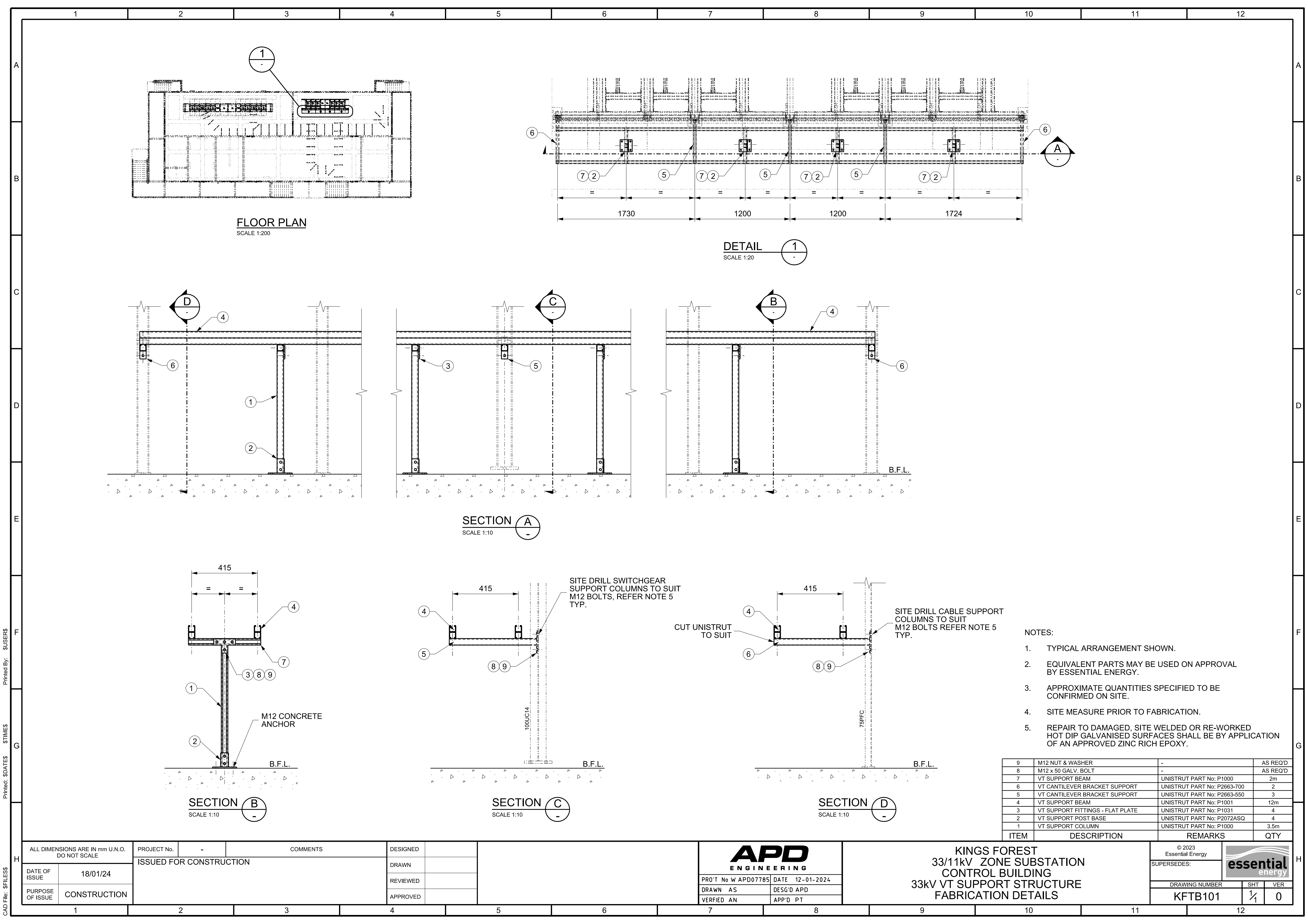
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DATE OF ISSUE	22/12/23	ISSUED FOR CONSTRUCTION			DRAWN	
PURPOSE OF ISSUE	CONSTRUCTION				REVIEWED	
					APPROVED	

APD ENGINEERING	
PRO'T No W APD07785	DATE 20-12-2023
DRAWN KD	DES'G'D APD
VERIFIED MS	APP'D MS

KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
BASEMENT FLOOR BUILDING EARTHING
BUILDING DRAWING

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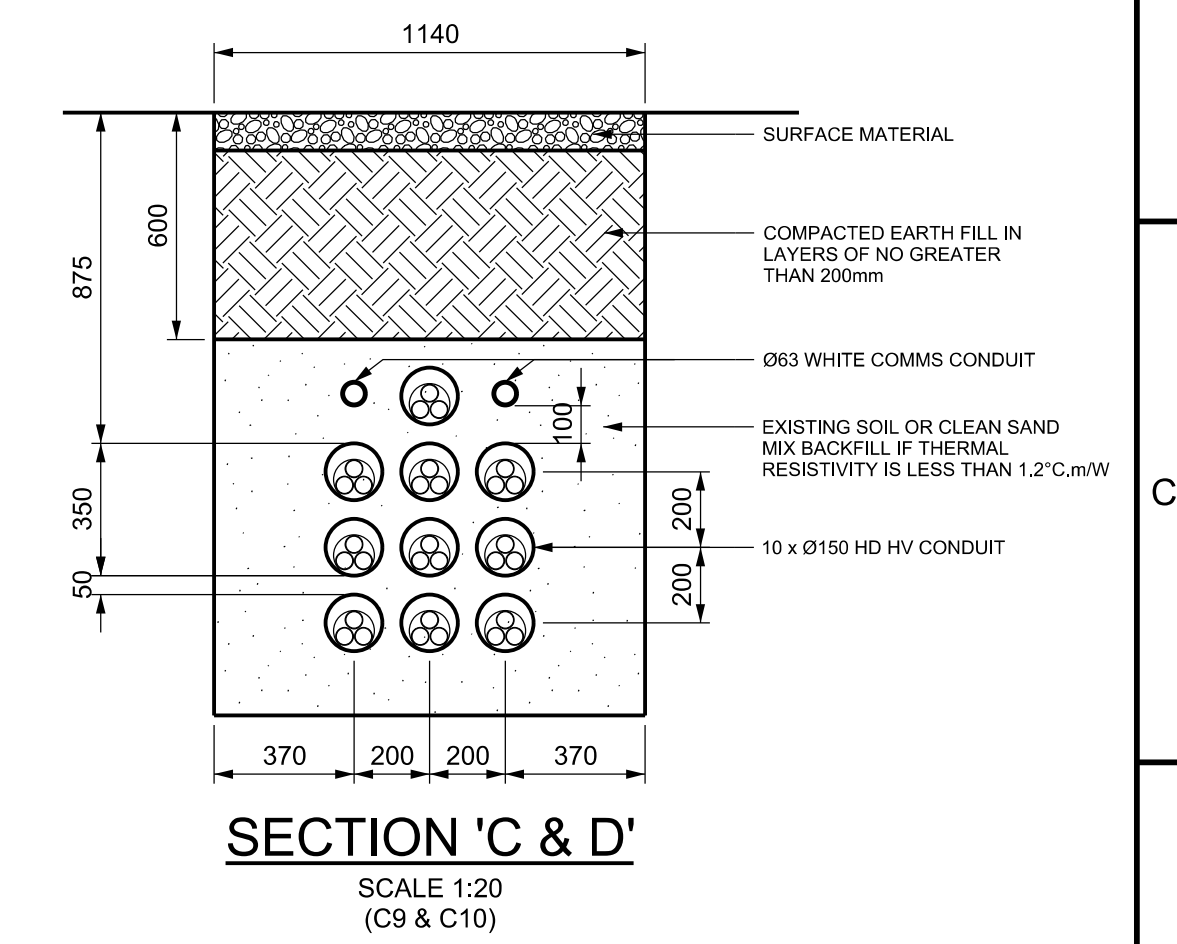
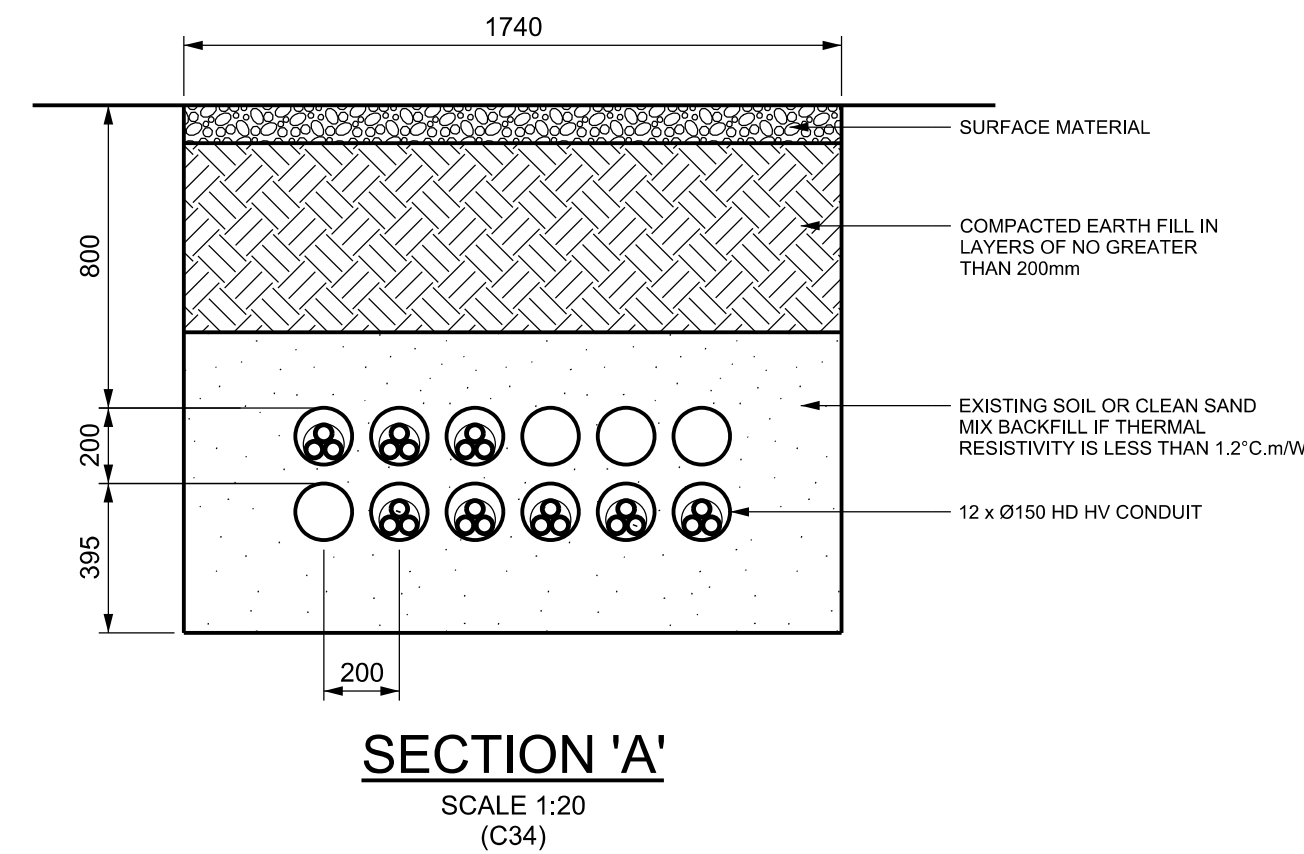
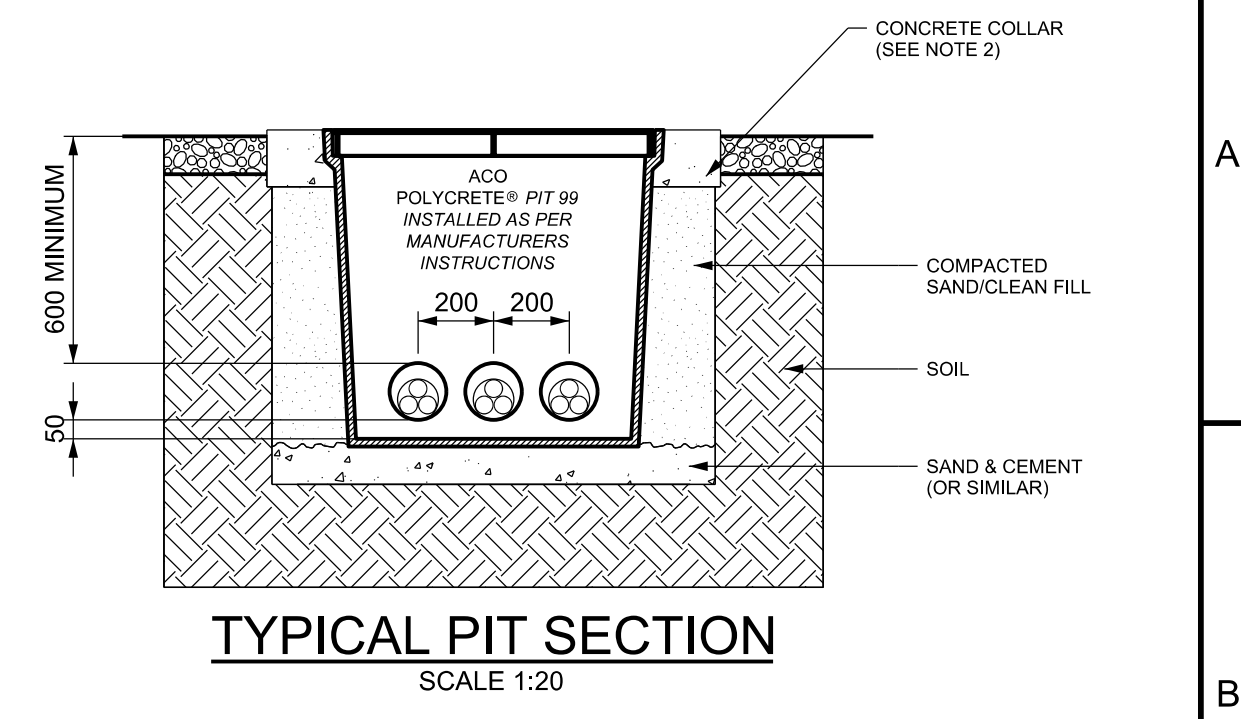
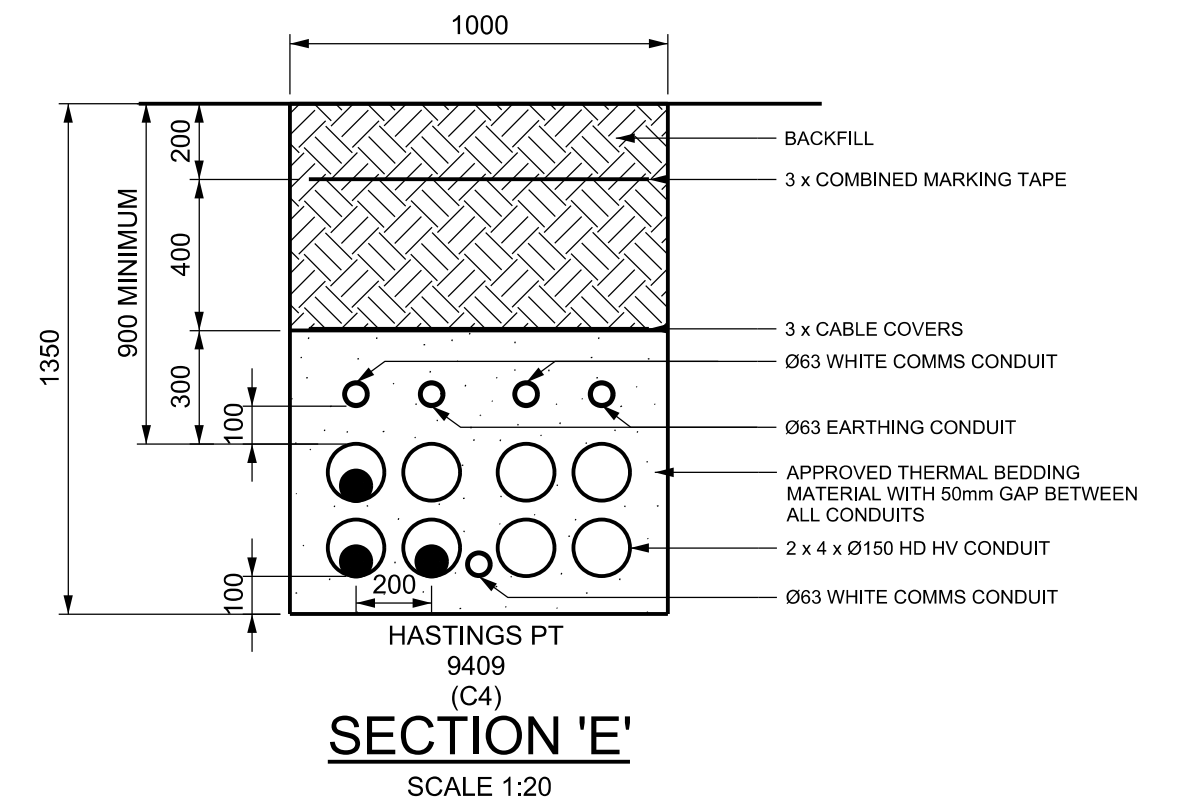
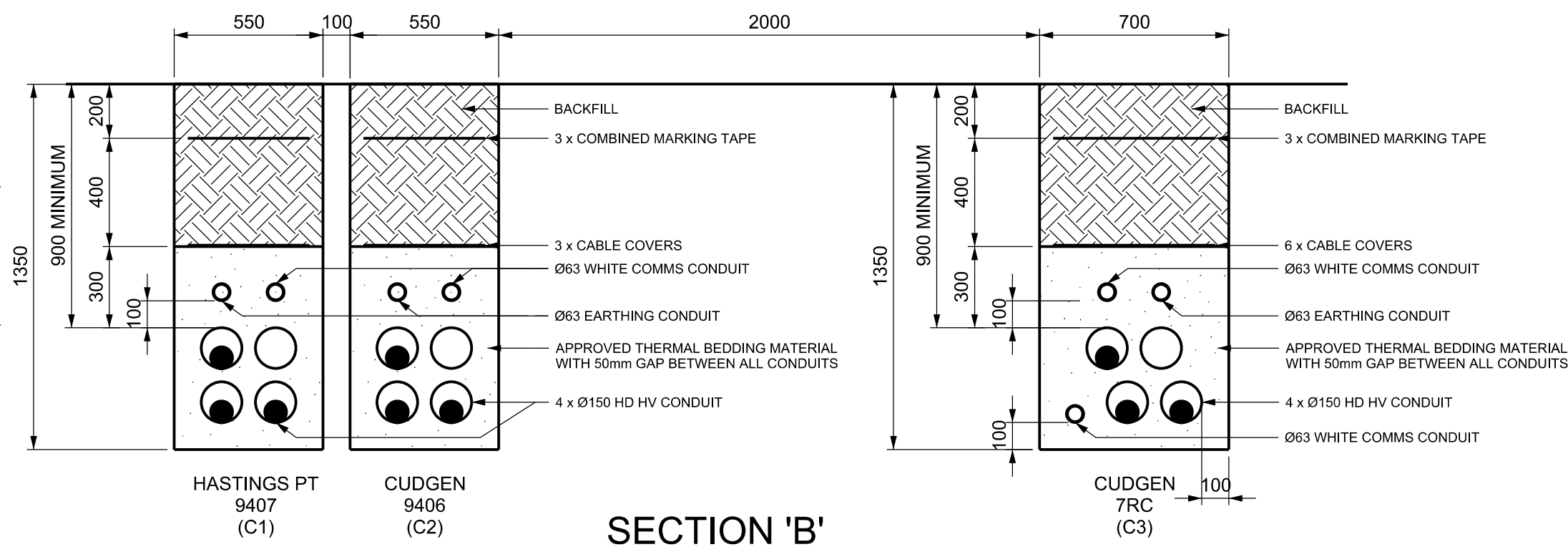
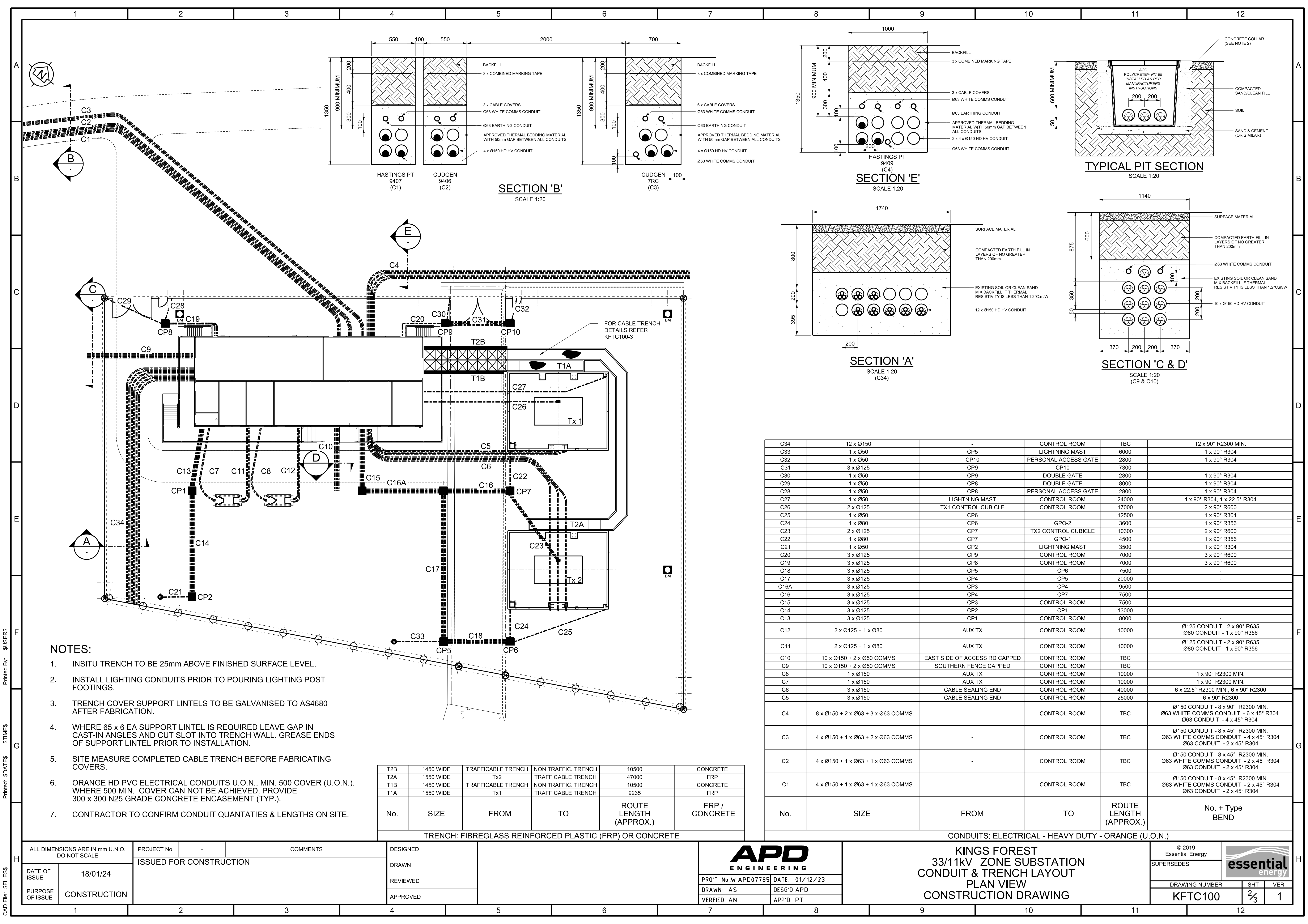
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DATE OF ISSUE	18/01/24	ISSUED FOR CONSTRUCTION				DRAWN
PURPOSE OF ISSUE	CONSTRUCTION					REVIEWED
						APPROVED

APD ENGINEERING	
PROJ No W APD07785	DATE 12-01-2024
DRAWN AS	DESIGNED APD
VERIFIED AN	APPROVED PT

KINGS FOREST
33/11kV ZONE SUBSTATION
CONTROL BUILDING
33kV VT SUPPORT STRUCTURE
FABRICATION DETAILS

9	M12 NUT & WASHER	-	AS REQ'D
8	M12 x 50 GALV. BOLT	-	AS REQ'D
7	VT SUPPORT BEAM	UNISTRUT PART No: P1000	2m
6	VT CANTILEVER BRACKET SUPPORT	UNISTRUT PART No: P2663-700	2
5	VT CANTILEVER BRACKET SUPPORT	UNISTRUT PART No: P2663-550	3
4	VT SUPPORT BEAM	UNISTRUT PART No: P1001	12m
3	VT SUPPORT FITTINGS - FLAT PLATE	UNISTRUT PART No: P1031	4
2	VT SUPPORT POST BASE	UNISTRUT PART No: P2072ASQ	4
1	VT SUPPORT COLUMN	UNISTRUT PART No: P1000	3.5m
ITEM	DESCRIPTION	REMARKS	QTY
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SUPERSEDES:			
DRAWING NUMBER		SHT	VER
KFTB101		1/1	0





- NOTES:**
- INSITU TRENCH TO BE 25mm ABOVE FINISHED SURFACE LEVEL.
 - INSTALL LIGHTING CONDUITS PRIOR TO POURING LIGHTING POST FOOTINGS.
 - TRENCH COVER SUPPORT LINTELS TO BE GALVANISED TO AS4680 AFTER FABRICATION.
 - WHERE 65 x 6 EA SUPPORT LINTEL IS REQUIRED LEAVE GAP IN CAST-IN ANGLES AND CUT SLOT INTO TRENCH WALL. GREASE ENDS OF SUPPORT LINTEL PRIOR TO INSTALLATION.
 - SITE MEASURE COMPLETED CABLE TRENCH BEFORE FABRICATING COVERS.
 - ORANGE HD PVC ELECTRICAL CONDUITS U.O.N., MIN. 500 COVER (U.O.N.). WHERE 500 MIN. COVER CAN NOT BE ACHIEVED, PROVIDE 300 x 300 N25 GRADE CONCRETE ENCASEMENT (TYP.).
 - CONTRACTOR TO CONFIRM CONDUIT QUANTITIES & LENGTHS ON SITE.

T2B	1450 WIDE	TRAFFICABLE TRENCH	NON TRAFFIC. TRENCH	10500	CONCRETE
T2A	1550 WIDE	Tx2	TRAFFICABLE TRENCH	47000	FRP
T1B	1450 WIDE	TRAFFICABLE TRENCH	NON TRAFFIC. TRENCH	10500	CONCRETE
T1A	1550 WIDE	Tx1	TRAFFICABLE TRENCH	9235	FRP

No.	SIZE	FROM	TO	ROUTE LENGTH (APPROX.)	FRP / CONCRETE
TRENCH: FIBREGLASS REINFORCED PLASTIC (FRP) OR CONCRETE					

C34	12 x Ø150	-	CONTROL ROOM	TBC	12 x 90° R2300 MIN.
C33	1 x Ø50	CP5	LIGHTNING MAST	6000	1 x 90° R304
C32	1 x Ø50	CP10	PERSONAL ACCESS GATE	2800	1 x 90° R304
C31	3 x Ø125	CP9	CP10	7300	-
C30	1 x Ø50	CP9	DOUBLE GATE	2800	1 x 90° R304
C29	1 x Ø50	CP8	DOUBLE GATE	8000	1 x 90° R304
C28	1 x Ø50	CP8	PERSONAL ACCESS GATE	2800	1 x 90° R304
C27	1 x Ø50	CP8	LIGHTNING MAST	24000	1 x 90° R304, 1 x 22.5° R304
C26	2 x Ø125	TX1 CONTROL CUBICLE	CONTROL ROOM	17000	2 x 90° R600
C25	1 x Ø50	CP6	CONTROL ROOM	12500	1 x 90° R304
C24	1 x Ø80	CP6	GPO-2	3600	1 x 90° R356
C23	2 x Ø125	CP7	TX2 CONTROL CUBICLE	10300	2 x 90° R600
C22	1 x Ø80	CP7	GPO-1	4500	1 x 90° R356
C21	1 x Ø50	CP2	LIGHTNING MAST	3500	1 x 90° R304
C20	3 x Ø125	CP9	CONTROL ROOM	7000	3 x 90° R600
C19	3 x Ø125	CP8	CONTROL ROOM	7000	3 x 90° R600
C18	3 x Ø125	CP5	CP6	7500	-
C17	3 x Ø125	CP4	CP5	20000	-
C16A	3 x Ø125	CP3	CP4	9500	-
C16	3 x Ø125	CP4	CP7	7500	-
C15	3 x Ø125	CP3	CONTROL ROOM	7500	-
C14	3 x Ø125	CP2	CP1	13000	-
C13	3 x Ø125	CP1	CONTROL ROOM	8000	-
C12	2 x Ø125 + 1 x Ø80	AUX TX	CONTROL ROOM	10000	Ø125 CONDUIT - 2 x 90° R635 Ø80 CONDUIT - 1 x 90° R356
C11	2 x Ø125 + 1 x Ø80	AUX TX	CONTROL ROOM	10000	Ø125 CONDUIT - 2 x 90° R635 Ø80 CONDUIT - 1 x 90° R356
C10	10 x Ø150 + 2 x Ø50 COMMS	EAST SIDE OF ACCESS RD CAPPED	CONTROL ROOM	TBC	
C9	10 x Ø150 + 2 x Ø50 COMMS	SOUTHERN FENCE CAPPED	CONTROL ROOM	TBC	
C8	1 x Ø150	AUX TX	CONTROL ROOM	10000	1 x 90° R2300 MIN.
C7	1 x Ø150	AUX TX	CONTROL ROOM	10000	1 x 90° R2300 MIN.
C6	3 x Ø150	CABLE SEALING END	CONTROL ROOM	40000	6 x 22.5° R2300 MIN. 6 x 90° R2300
C5	3 x Ø150	CABLE SEALING END	CONTROL ROOM	25000	6 x 90° R2300
C4	8 x Ø150 + 2 x Ø63 + 3 x Ø63 COMMS	-	CONTROL ROOM	TBC	Ø150 CONDUIT - 8 x 90° R2300 MIN. Ø63 WHITE COMMS CONDUIT - 6 x 45° R304 Ø63 CONDUIT - 4 x 45° R304
C3	4 x Ø150 + 1 x Ø63 + 2 x Ø63 COMMS	-	CONTROL ROOM	TBC	Ø150 CONDUIT - 8 x 45° R2300 MIN. Ø63 WHITE COMMS CONDUIT - 2 x 45° R304 Ø63 CONDUIT - 2 x 45° R304
C2	4 x Ø150 + 1 x Ø63 + 1 x Ø63 COMMS	-	CONTROL ROOM	TBC	Ø150 CONDUIT - 8 x 45° R2300 MIN. Ø63 WHITE COMMS CONDUIT - 2 x 45° R304 Ø63 CONDUIT - 2 x 45° R304
C1	4 x Ø150 + 1 x Ø63 + 1 x Ø63 COMMS	-	CONTROL ROOM	TBC	Ø150 CONDUIT - 8 x 45° R2300 MIN. Ø63 WHITE COMMS CONDUIT - 2 x 45° R304 Ø63 CONDUIT - 2 x 45° R304
No.	SIZE	FROM	TO	ROUTE LENGTH (APPROX.)	No. + Type BEND

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ALL DIMENSIONS ARE IN mm U.N.O. DO NOT SCALE

DATE OF ISSUE18/01/24

PURPOSE OF ISSUECONSTRUCTION

PROJECT No.-

ISSUED FOR CONSTRUCTION

COMMENTS

DESIGNED

DRAWN

REVIEWED

APPROVED

APDENGINEERING

PROT No W APD07785

DRAWN AS

VERIFIED AN

DATE 01/12/23

DESIG'D APD

APP'D PT

KINGS FOREST33/11kV ZONE SUBSTATION

CONDUIT & TRENCH LAYOUT

PLAN VIEW

CONSTRUCTION DRAWING

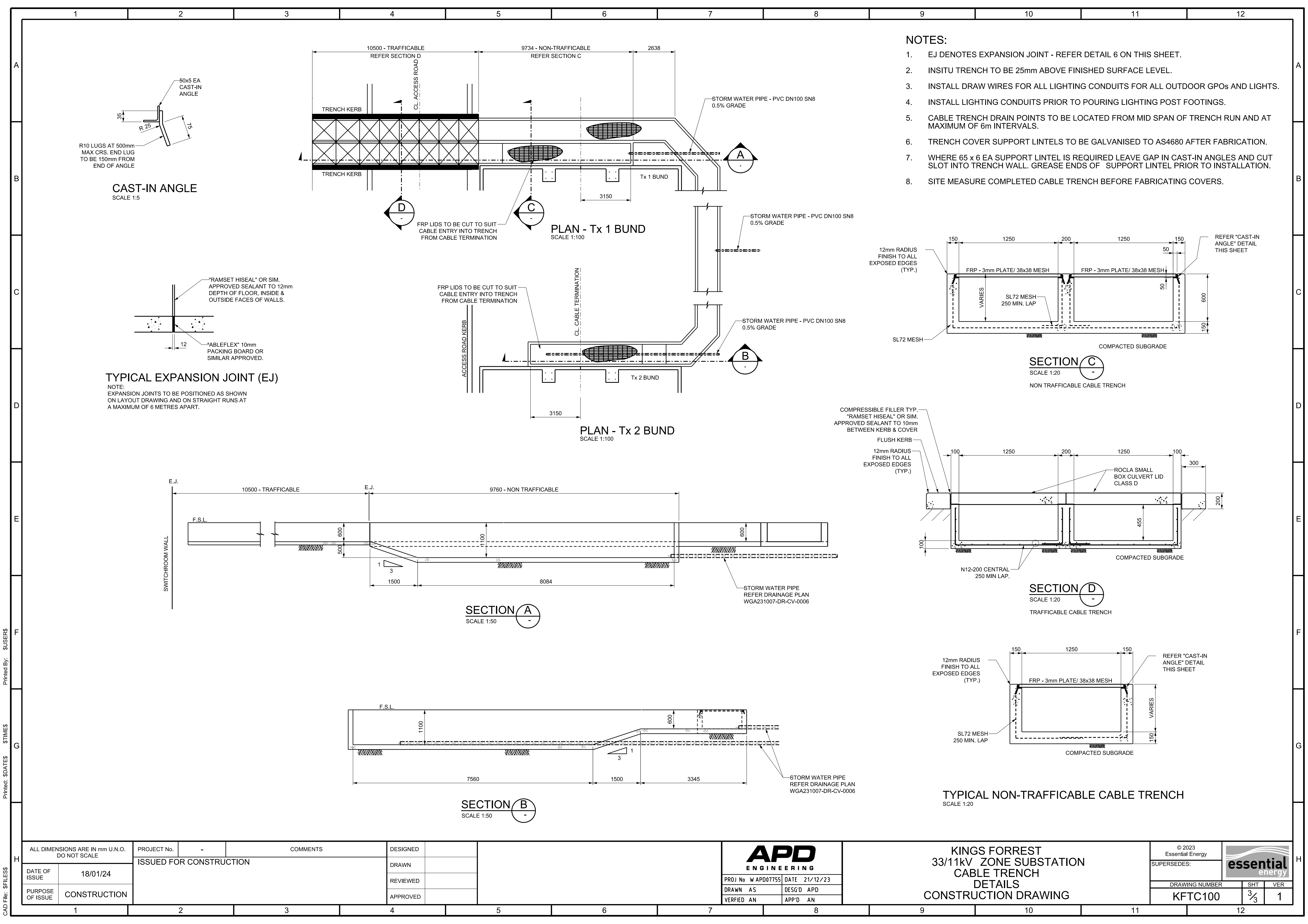
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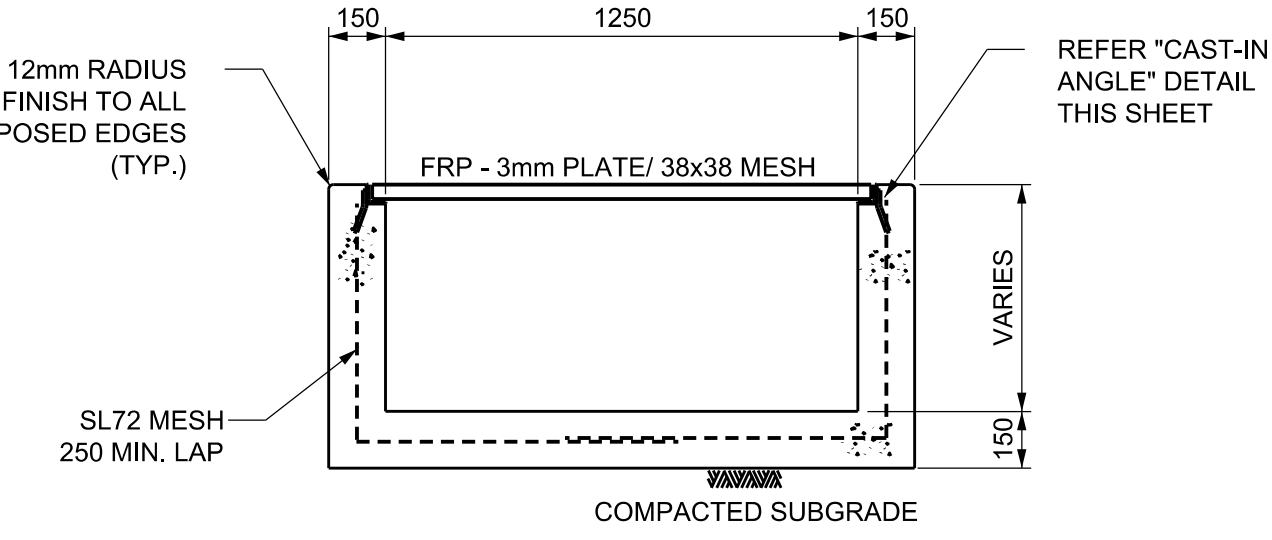
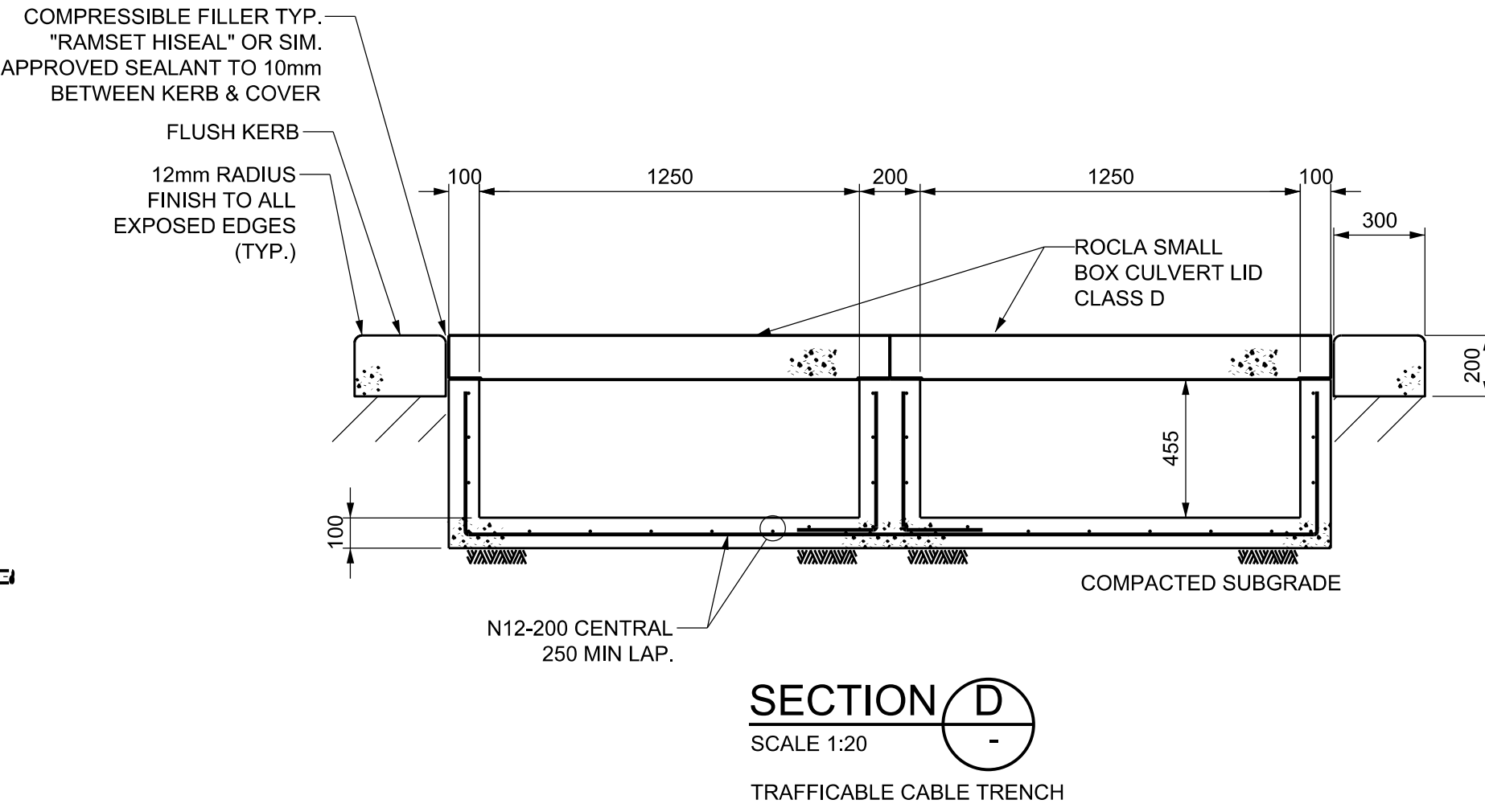
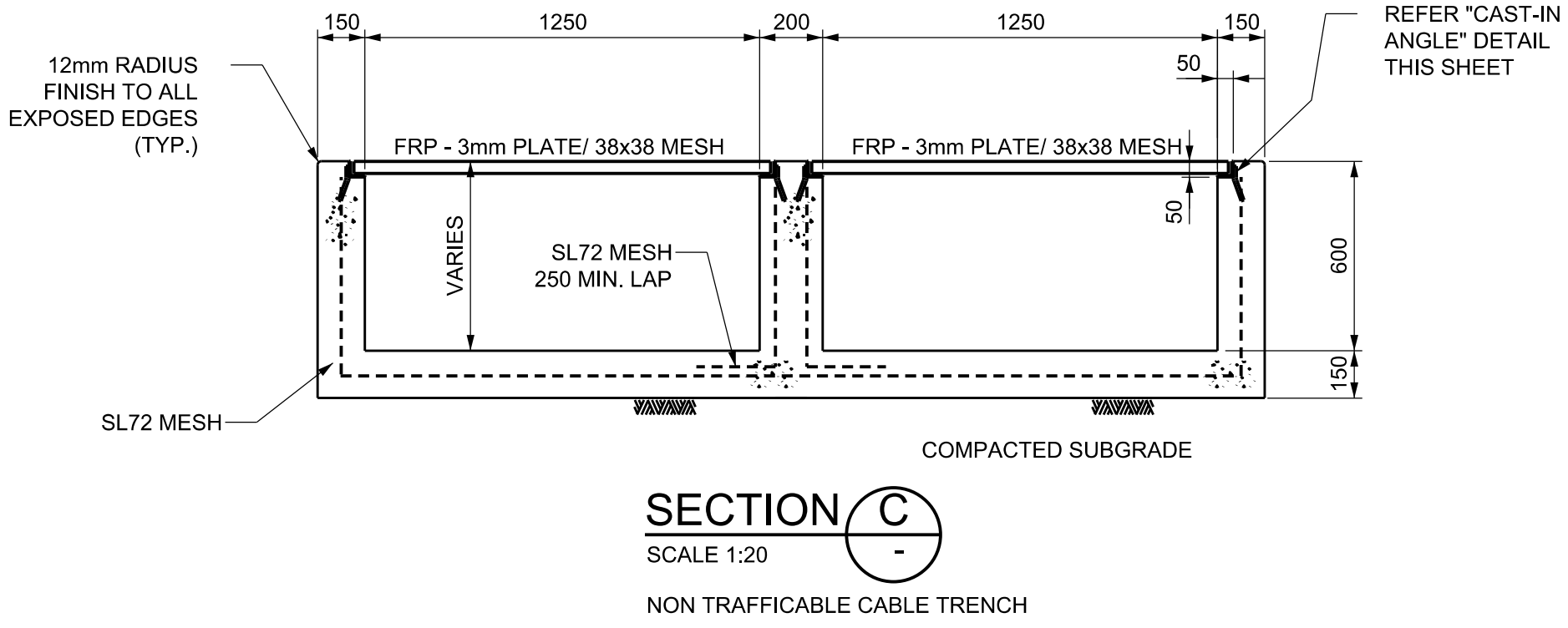
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SHT2/3

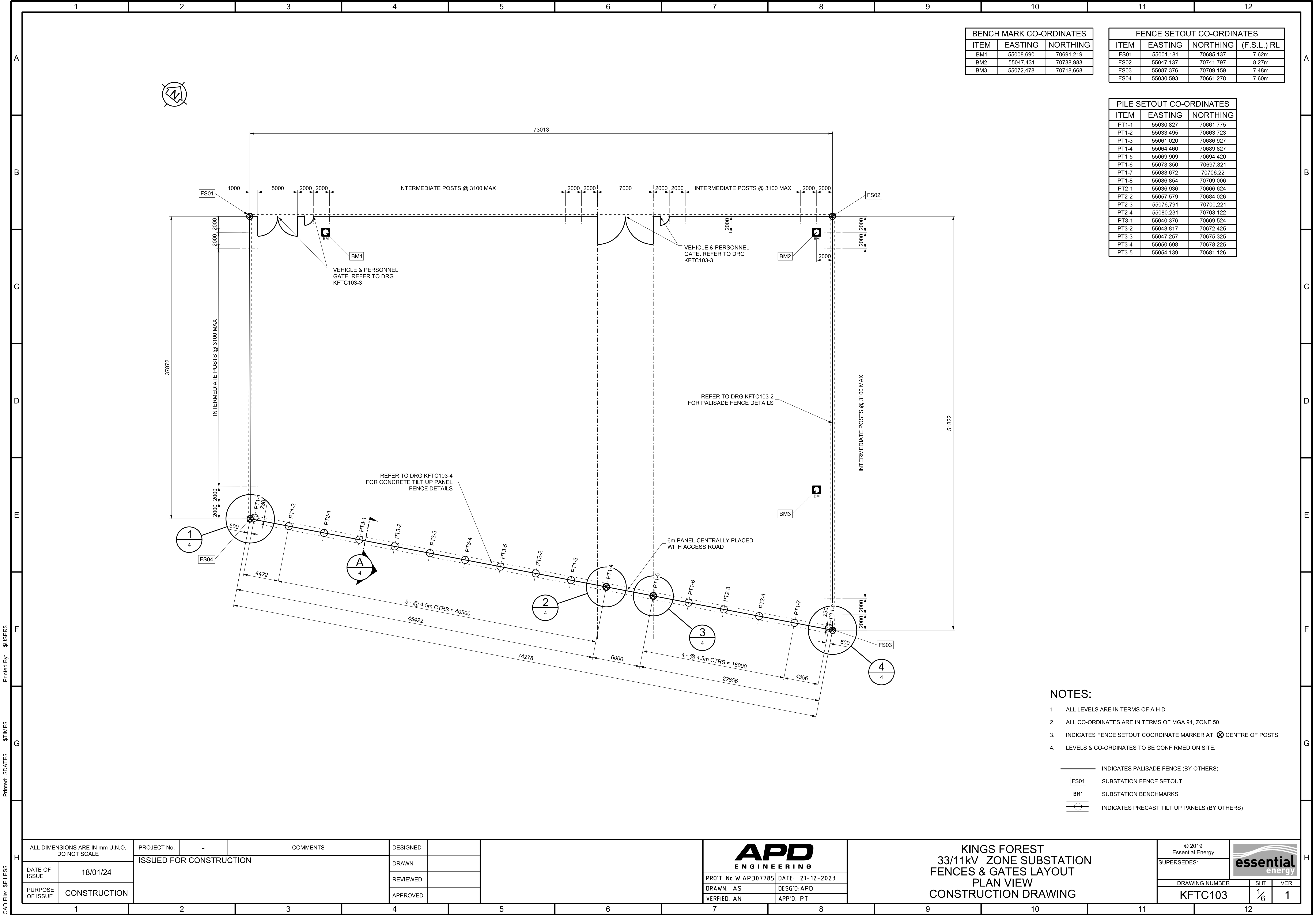
VER1



- NOTES:
- EJ DENOTES EXPANSION JOINT - REFER DETAIL 6 ON THIS SHEET.
 - INSITU TRENCH TO BE 25mm ABOVE FINISHED SURFACE LEVEL.
 - INSTALL DRAW WIRES FOR ALL LIGHTING CONDUITS FOR ALL OUTDOOR GPOs AND LIGHTS.
 - INSTALL LIGHTING CONDUITS PRIOR TO POURING LIGHTING POST FOOTINGS.
 - CABLE TRENCH DRAIN POINTS TO BE LOCATED FROM MID SPAN OF TRENCH RUN AND AT MAXIMUM OF 6m INTERVALS.
 - TRENCH COVER SUPPORT LINTELS TO BE GALVANISED TO AS4680 AFTER FABRICATION.
 - WHERE 65 x 6 EA SUPPORT LINTEL IS REQUIRED LEAVE GAP IN CAST-IN ANGLES AND CUT SLOT INTO TRENCH WALL. GREASE ENDS OF SUPPORT LINTEL PRIOR TO INSTALLATION.
 - SITE MEASURE COMPLETED CABLE TRENCH BEFORE FABRICATING COVERS.



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DATE OF ISSUE	18/01/24	ISSUED FOR CONSTRUCTION				DRAWN								SUPERSEDES:			
PURPOSE OF ISSUE	CONSTRUCTION					REVIEWED								DRAWING NUMBER		SHT	VER
						APPROVED								KFTC100		3/3	1



BENCH MARK CO-ORDINATES		
ITEM	EASTING	NORTHING
BM1	55008.690	70691.219
BM2	55047.431	70738.983
BM3	55072.478	70718.668

FENCE SETOUT CO-ORDINATES			
ITEM	EASTING	NORTHING	(F.S.L.) RL
FS01	55001.181	70685.137	7.62m
FS02	55047.137	70741.797	8.27m
FS03	55087.376	70709.159	7.48m
FS04	55030.593	70661.278	7.60m

PILE SETOUT CO-ORDINATES		
ITEM	EASTING	NORTHING
PT1-1	55030.827	70661.775
PT1-2	55033.495	70663.723
PT1-3	55061.020	70686.927
PT1-4	55064.460	70689.827
PT1-5	55069.909	70694.420
PT1-6	55073.350	70697.321
PT1-7	55083.672	70706.22
PT1-8	55086.854	70709.006
PT2-1	55036.936	70666.624
PT2-2	55057.579	70684.026
PT2-3	55076.791	70700.221
PT2-4	55080.231	70703.122
PT3-1	55040.376	70669.524
PT3-2	55043.817	70672.425
PT3-3	55047.257	70675.325
PT3-4	55050.698	70678.225
PT3-5	55054.139	70681.126

NOTES:

- ALL LEVELS ARE IN TERMS OF A.H.D
- ALL CO-ORDINATES ARE IN TERMS OF MGA 94, ZONE 50.
- INDICATES FENCE SETOUT COORDINATE MARKER AT CENTRE OF POSTS
- LEVELS & CO-ORDINATES TO BE CONFIRMED ON SITE.

- INDICATES PALISADE FENCE (BY OTHERS)
- SUBSTATION FENCE SETOUT
- SUBSTATION BENCHMARKS
- INDICATES PRECAST TILT UP PANELS (BY OTHERS)

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PURPOSE OF ISSUE	CONSTRUCTION				REVIEWED	
					APPROVED	

APD ENGINEERING	
PRO'T No W APD07785	DATE 21-12-2023
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VERIFIED AN	APP'D PT

KINGS FOREST
33/11kV ZONE SUBSTATION
FENCES & GATES LAYOUT
PLAN VIEW
CONSTRUCTION DRAWING

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DRAWING NUMBER	SHT	VER
KFTC103	1/6	1



1. ALL STEELWORK TO BE HOT DIPPED GALVANISED.
- 1A. BOLTS & NUTS TO BE HOT DIP GALVANISED UNLESS NOTED OR SPECIFIED OTHERWISE.
2. SECURE ALL NUTS AGAINST LOOSENING BY USE OF CAPILLARY 'LOCK-TIGHT' APPLIED AFTER SHEARING NUTS

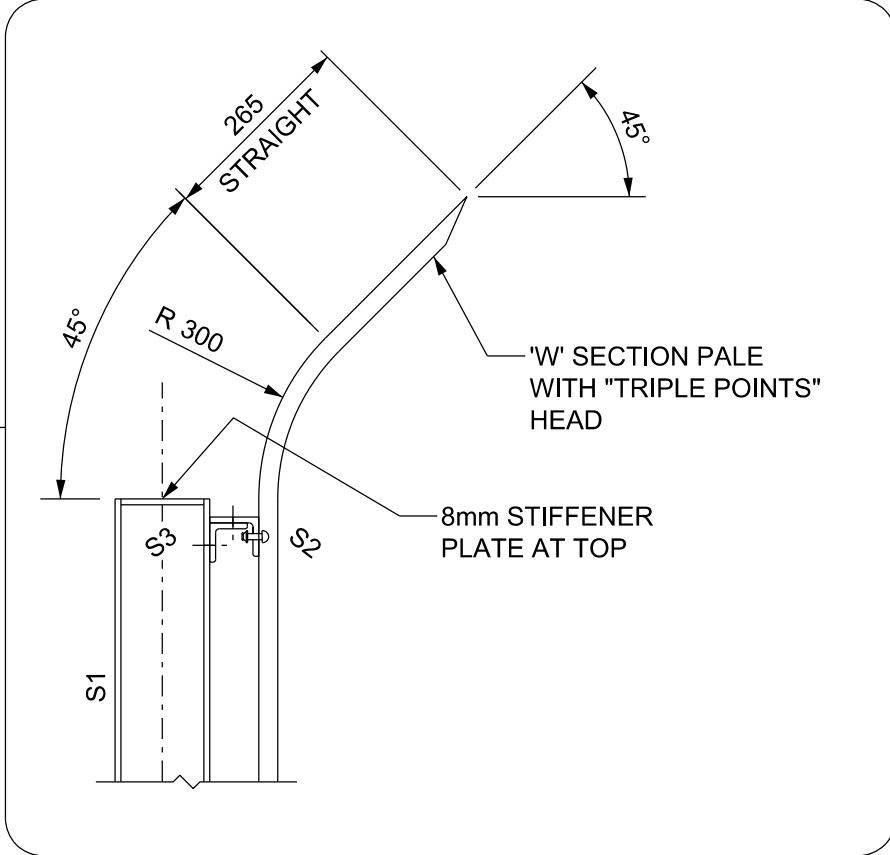


Technical drawing of a mechanical part with dimensions and a label. The drawing shows a cross-section of a component with the following dimensions:

- Overall width: 69
- Top flange width: 15
- Top flange thickness: 15
- Top flange inner width: 54
- Overall height: 116
- Inner height: 101
- Bottom flange thickness: 5

A label "8mm PLATE" points to the right side of the component.

STIFFENER PLATE DETAIL



THE STEEL PALISADE SHALL BE MANUFACTURED IN ACCORDANCE WITH BS1722-12: "SPECIFICATION FOR STEEL PALISADE FENCES" TYPE SP-

PALES: 70mm NOMINAL WIDTH ex 100 x 3 mm
HOT DIP GALVANISED TO AS 4680 WITH
CURVED "TRIPLE POINT" TOP

YIELD STRESS:	200-280 MPa
TENSILE STRESS:	300-380 MPa
ELONGATION ON 80mm	30% MINIMUM



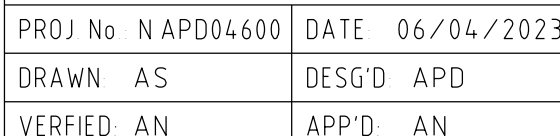
PIER / SILL SCHEDULE



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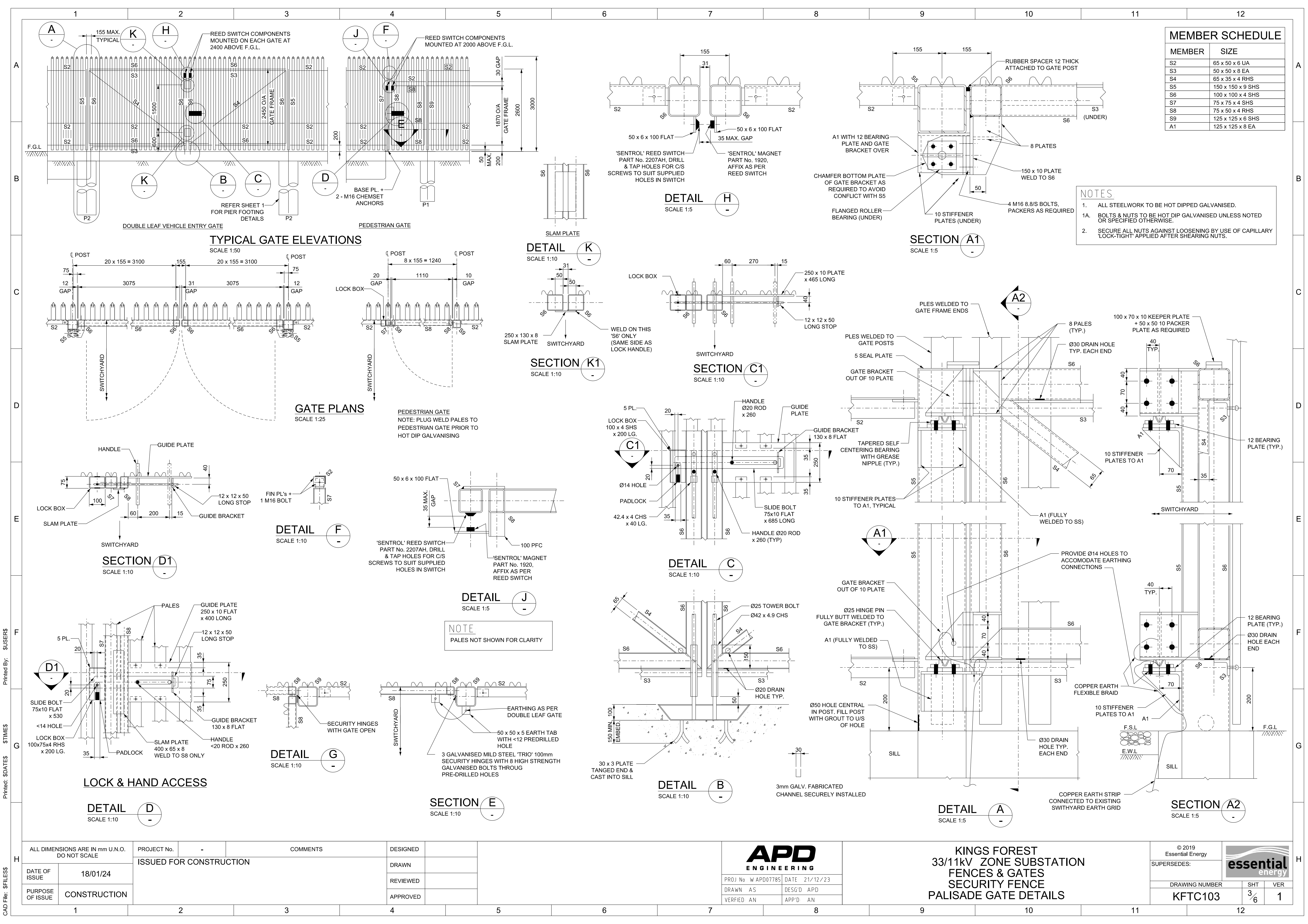
KINGS FOREST 33/11kV ZONE SUBSTATION FENCES & GATES SECURITY FENCE PALISADE FENCE DETAILS

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SUPERSEDES:

DRAWING NUMBER

SHT	VE
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MEMBER SCHEDULE	
MEMBER	SIZE
S2	65 x 50 x 6 UA
S3	50 x 50 x 8 EA
S4	65 x 35 x 4 RHS
S5	150 x 150 x 9 SHS
S6	100 x 100 x 4 SHS
S7	75 x 75 x 4 SHS
S8	75 x 50 x 4 RHS
S9	125 x 125 x 6 SHS
A1	125 x 125 x 8 EA

- NOTES
- ALL STEELWORK TO BE HOT DIPPED GALVANISED.
 - BOLTS & NUTS TO BE HOT DIP GALVANISED UNLESS NOTED OR SPECIFIED OTHERWISE.
 - SECURE ALL NUTS AGAINST LOOSENING BY USE OF CAPILLARY 'LOCK-TIGHT' APPLIED AFTER SHEARING NUTS.

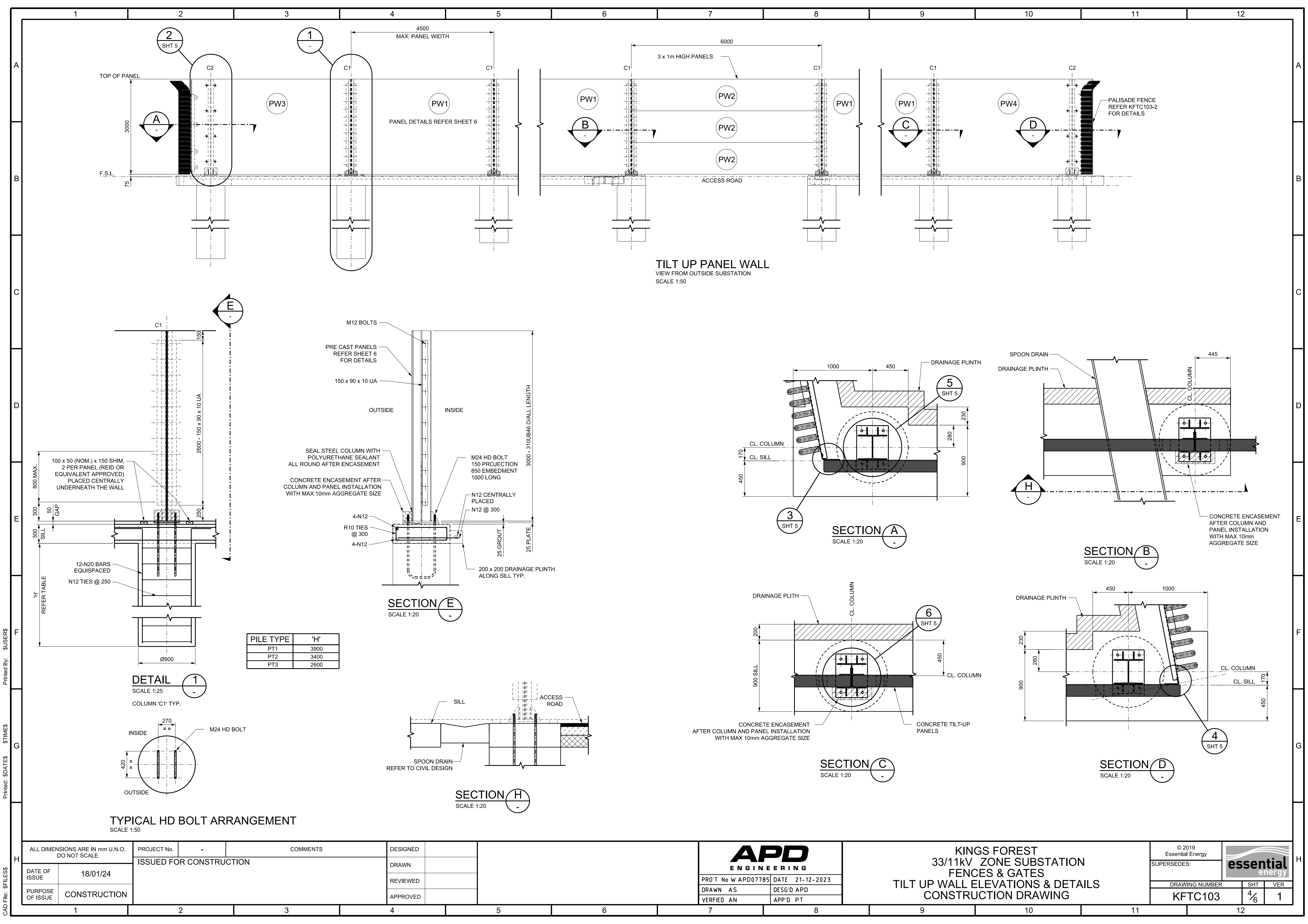
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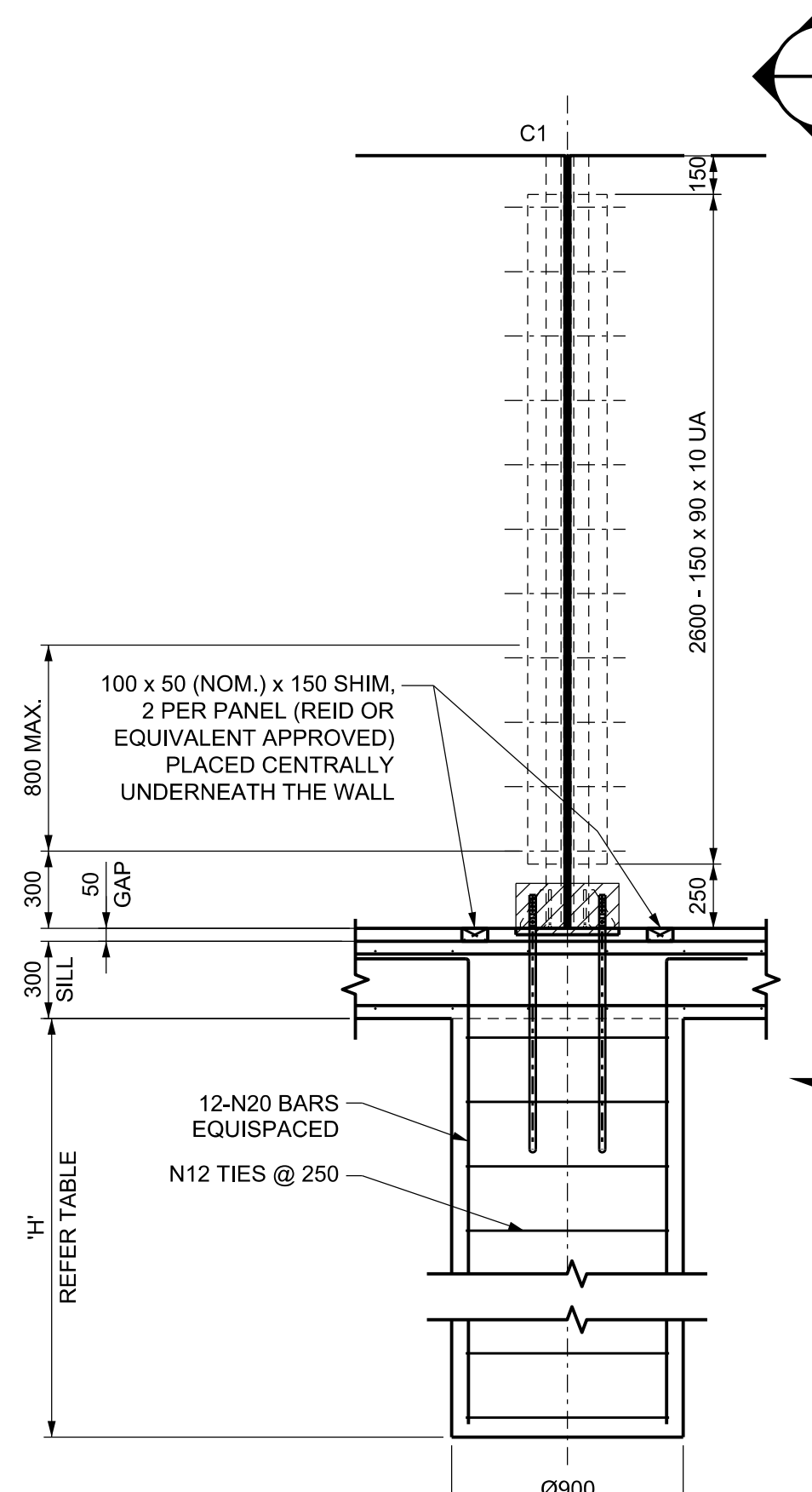
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PROJ No	W APD07785
DATE	21/12/23
DRAWN	AS
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VERIFIED	AN
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KINGS FOREST
33/11kV ZONE SUBSTATION
SECURITY FENCE
PALISADE GATE DETAILS

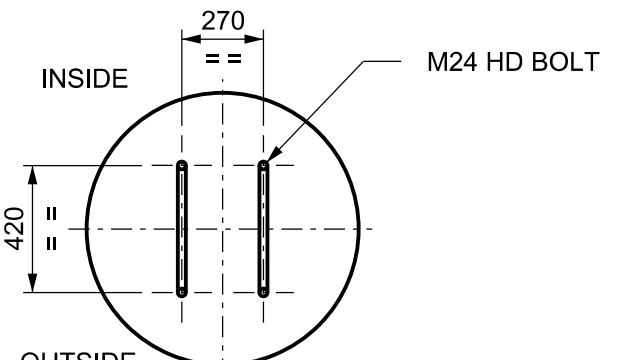
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KFTC103	3/6	1



TILT UP PANEL WALL
VIEW FROM OUTSIDE SUBSTATION
SCALE 1:50

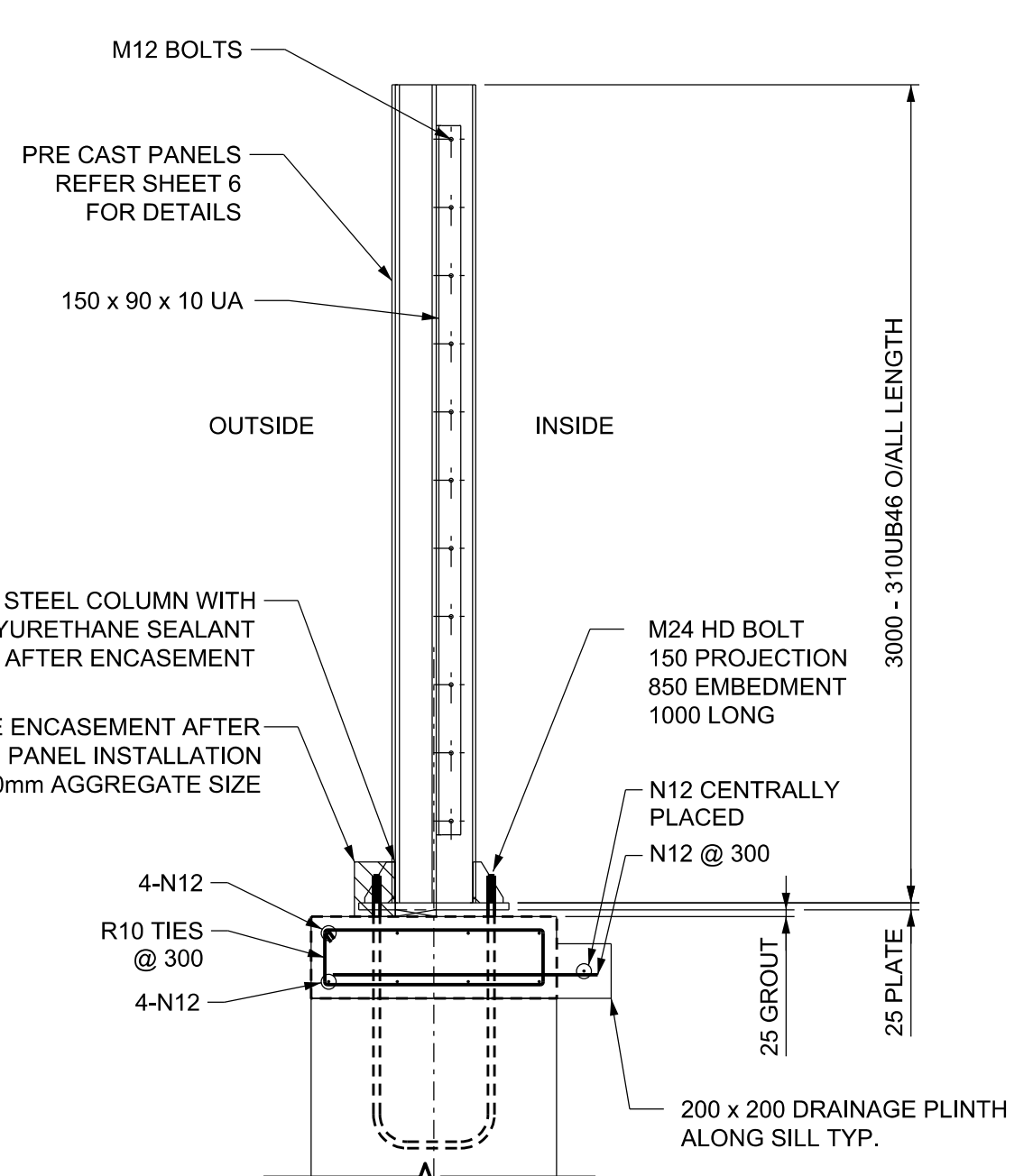


DETAIL 1
SCALE 1:25
COLUMN 'C1' TYP.

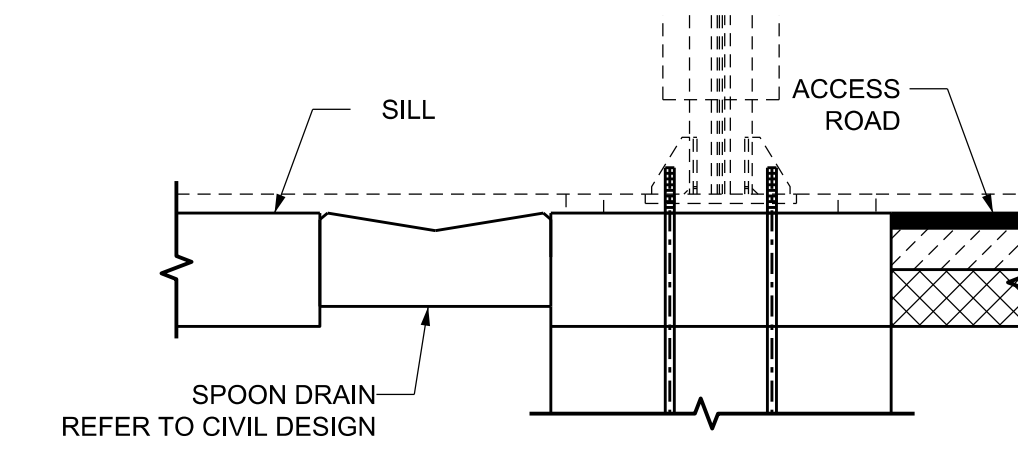


TYPICAL HD BOLT ARRANGEMENT
SCALE 1:50

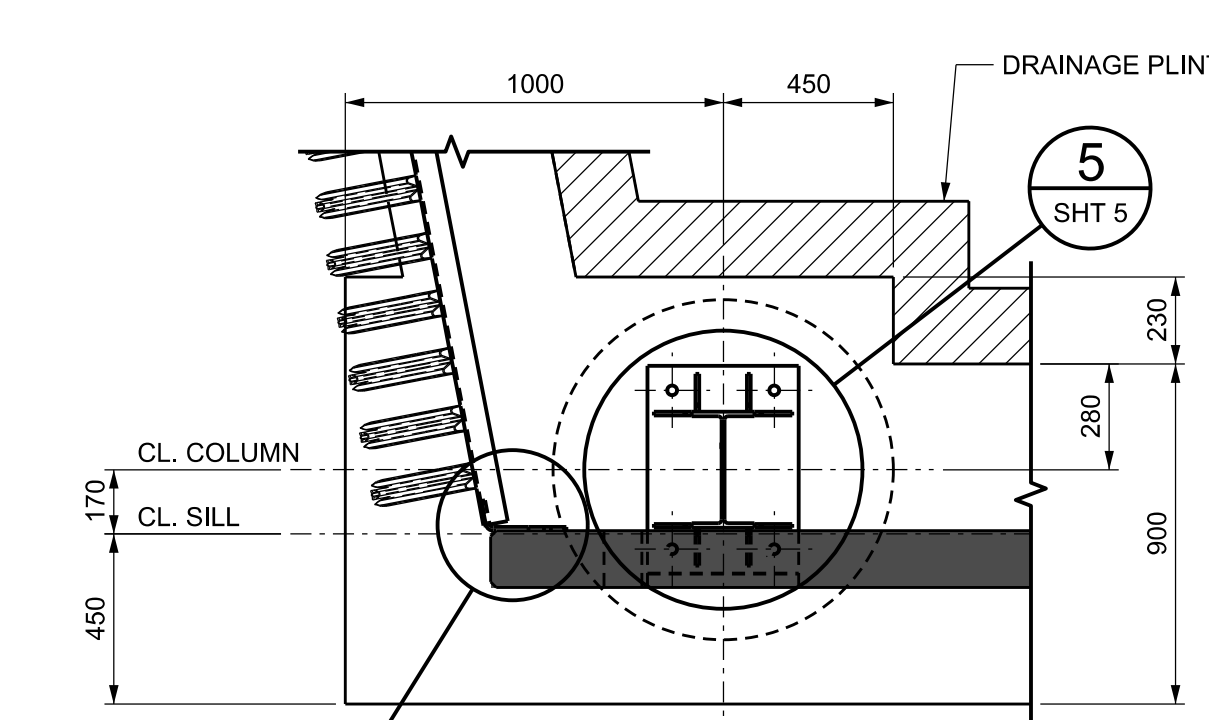
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PT2	3400
PT3	2600



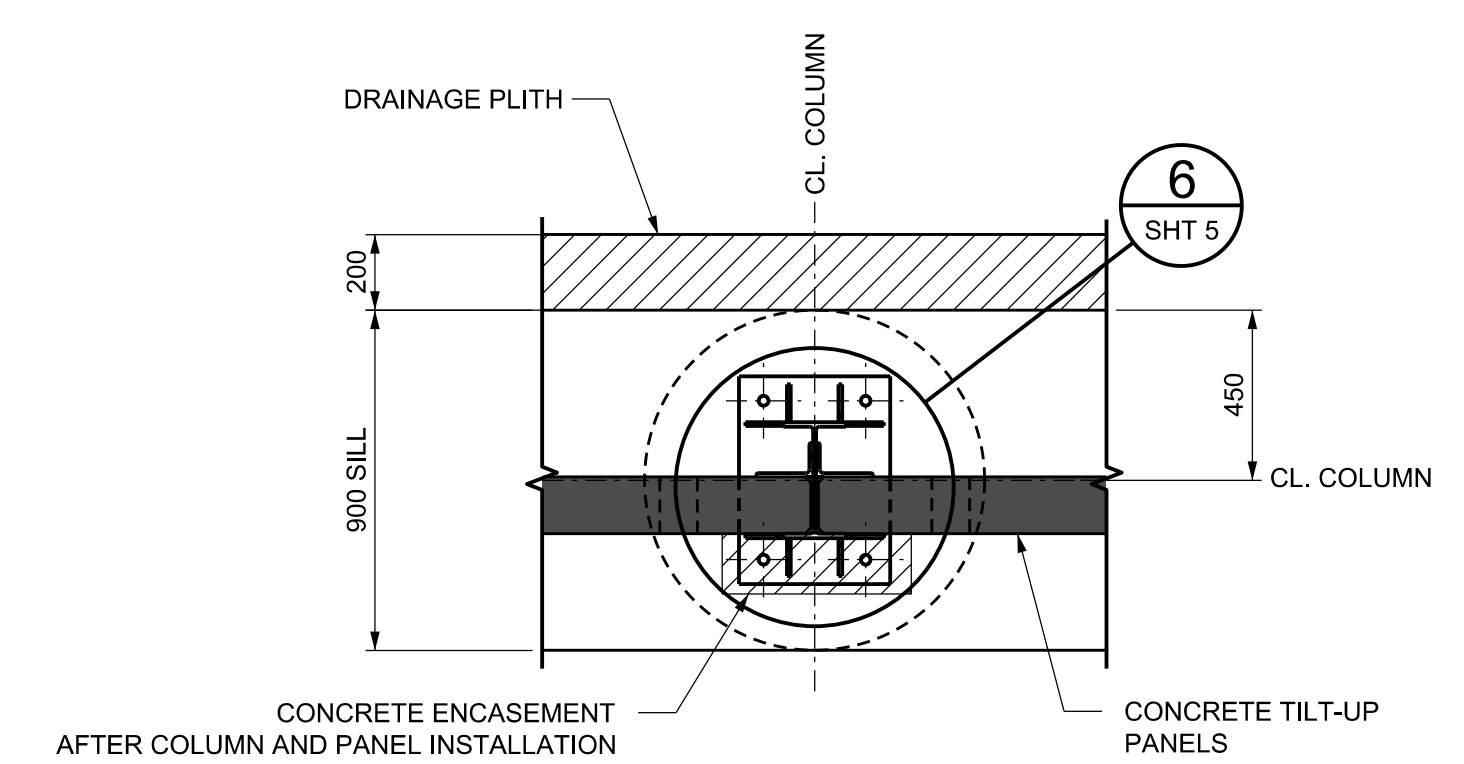
SECTION E
SCALE 1:20



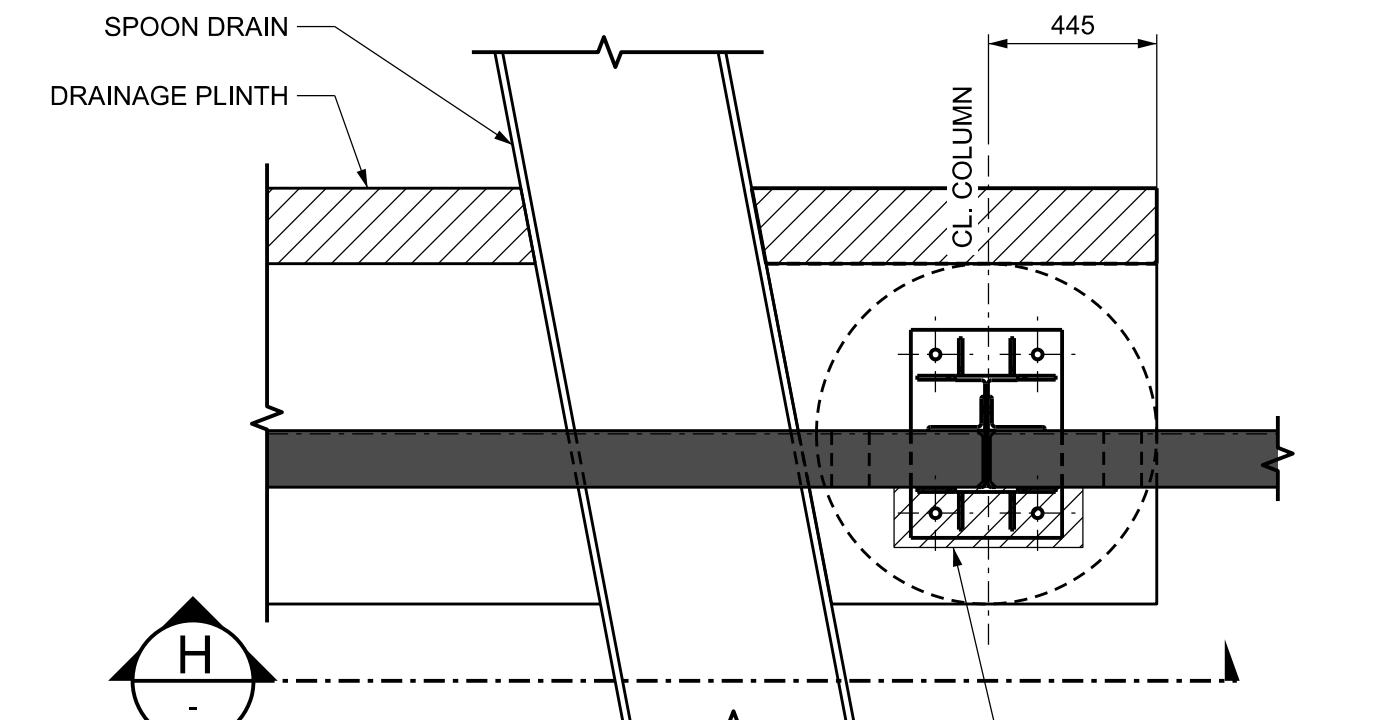
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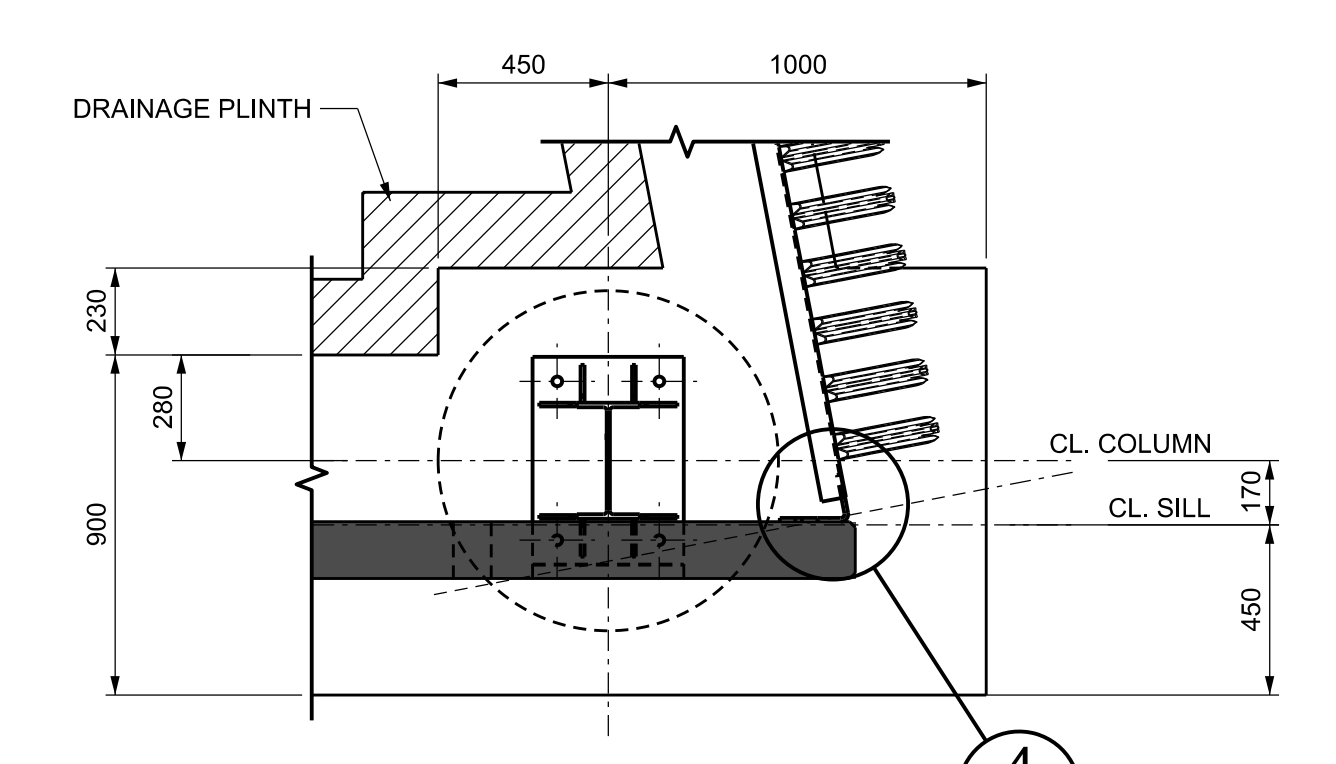
SECTION A
SCALE 1:20



SECTION C
SCALE 1:20



SECTION B
SCALE 1:20



SECTION D
SCALE 1:20

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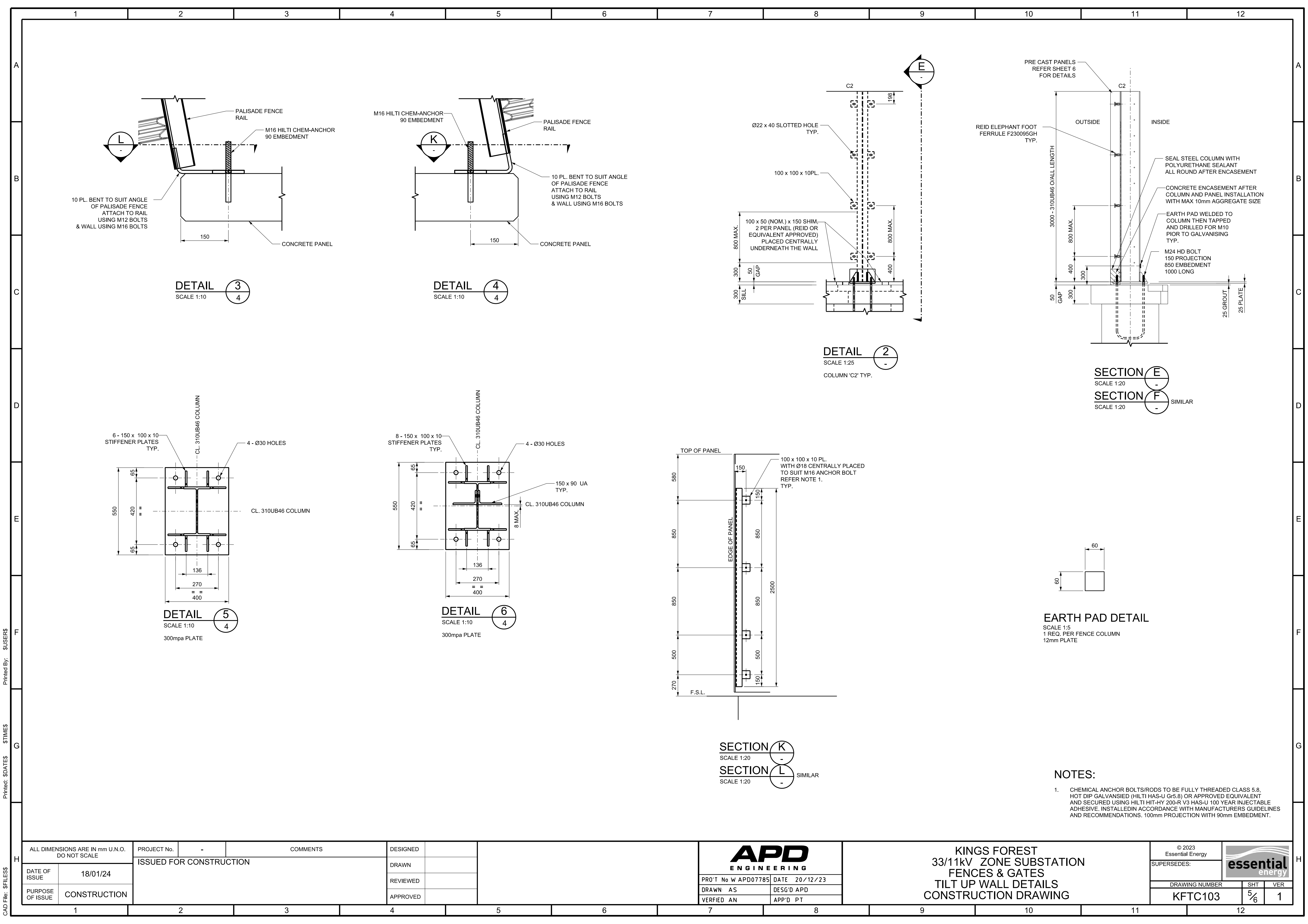
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PURPOSE OF ISSUE	CONSTRUCTION			

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PROJ No W APD07785	DATE 21-12-2023
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KINGS FOREST
33/11kV ZONE SUBSTATION
FENCES & GATES
TILT UP WALL ELEVATIONS & DETAILS
CONSTRUCTION DRAWING

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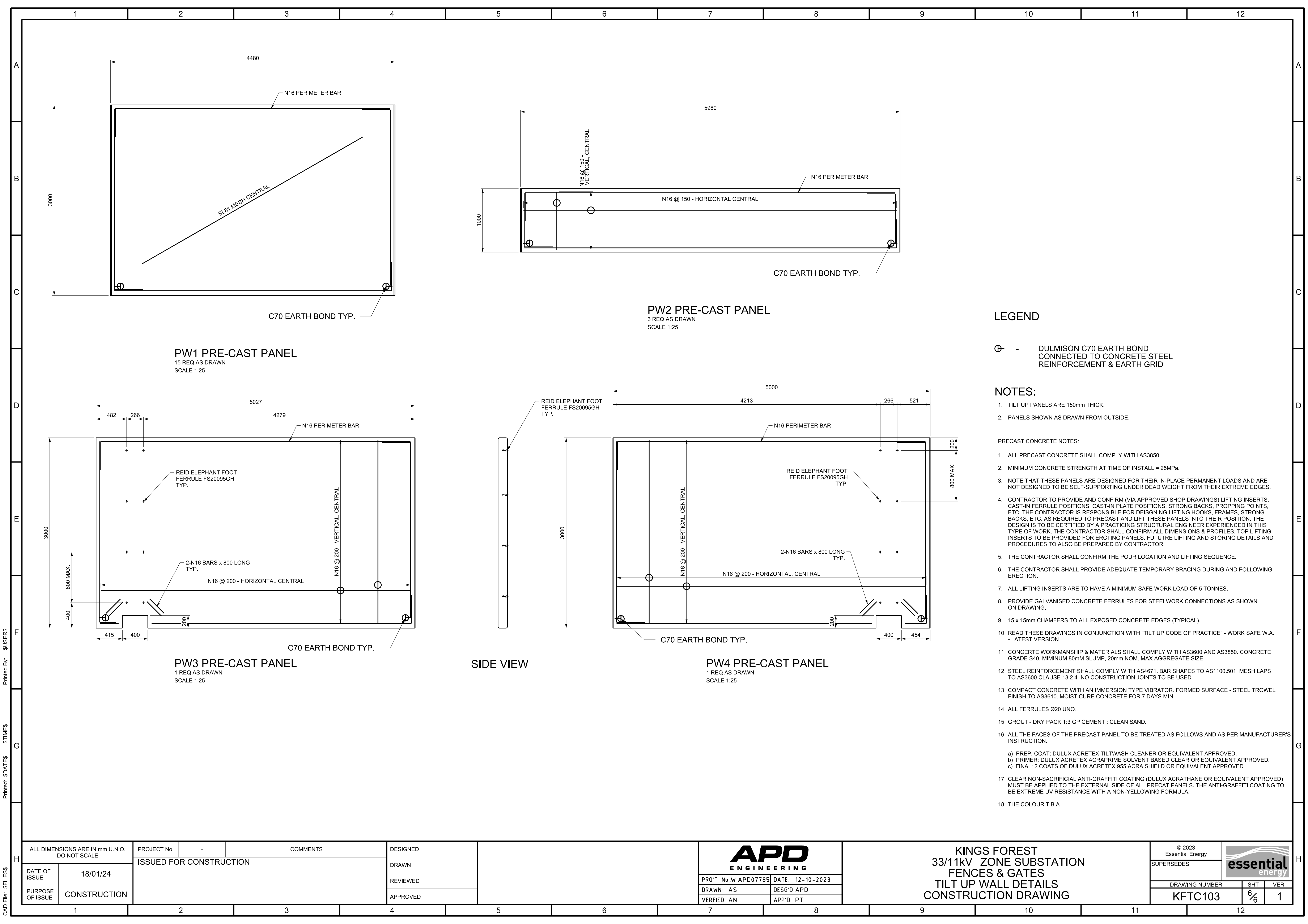
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						APPROVED

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KINGS FOREST
33/11kV ZONE SUBSTATION
FENCES & GATES
TILT UP WALL DETAILS
CONSTRUCTION DRAWING

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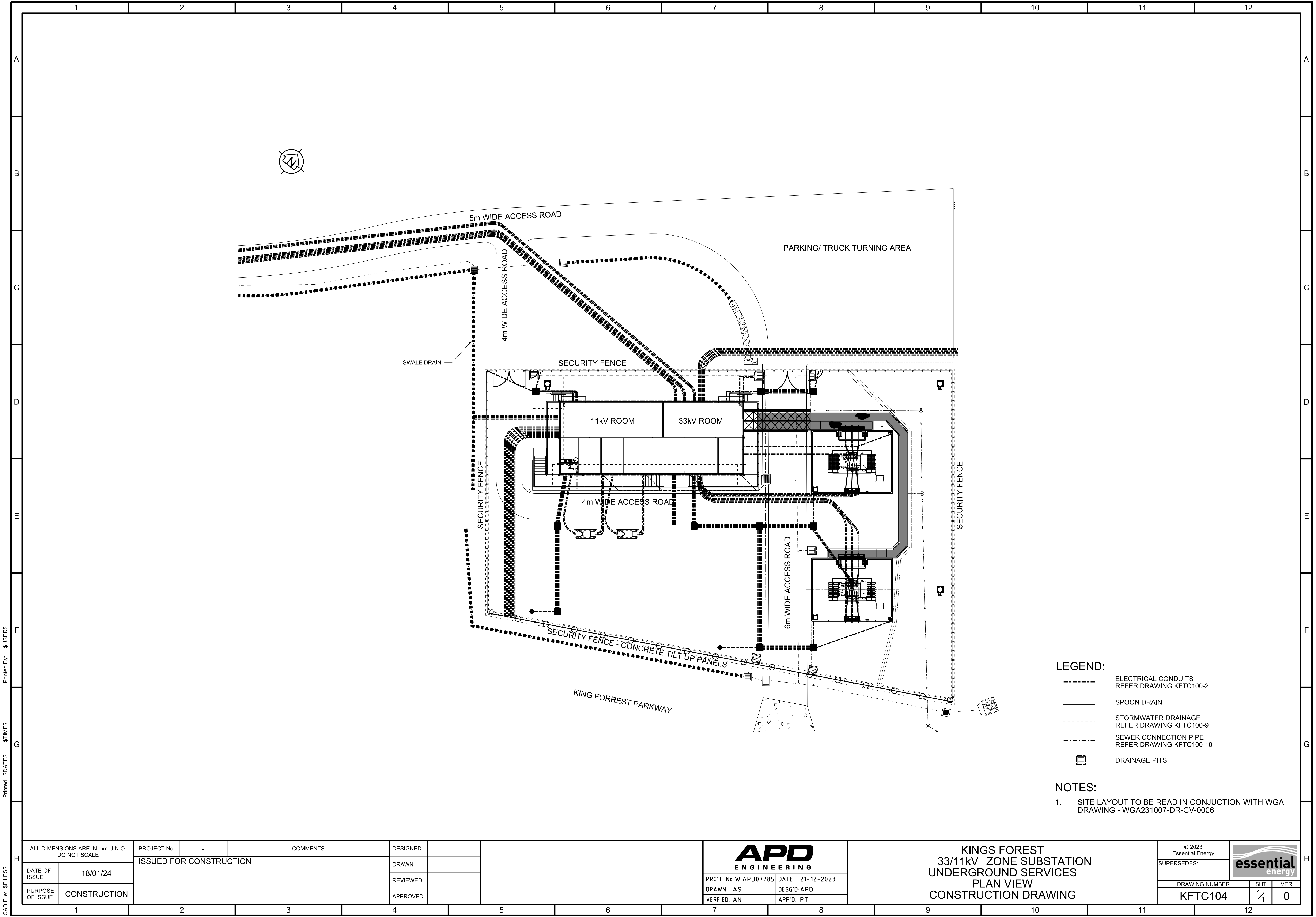
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PURPOSE OF ISSUE	CONSTRUCTION				APPROVED	

APD ENGINEERING	
PRO'T No W APD07785	DATE 12-10-2023
DRAWN AS	DES'G'D APD
VERIFIED AN	APP'D PT

KINGS FOREST
33/11kV ZONE SUBSTATION
FENCES & GATES
TILT UP WALL DETAILS
CONSTRUCTION DRAWING

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Appendix C – EPBC Act Protected Matters Search



Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 12-Feb-2024

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	100
Listed Migratory Species:	56

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	86
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	1
Regional Forest Agreements:	1
Nationally Important Wetlands:	1
EPBC Act Referrals:	9
Key Ecological Features (Marine):	None
Biologically Important Areas:	5
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occurIn buffer area only within area	
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species

[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area	In feature area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Critically Endangered	Species or species habitat may occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Erythroriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In buffer area only
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
FISH			
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Seriolella brama Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In buffer area only
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat known to occur within area	In buffer area only
FROG			
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat known to occur within area	In feature area
Mixophyes fleayi Fleay's Frog [25960]	Endangered	Species or species habitat may occur within area	In feature area
INSECT			
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
MAMMAL			
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Chalinolobus dwyeri			
Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat may occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area	In feature area
Eubalaena australis			
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Xeromys myoides			
Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area	In feature area
PLANT			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat known to occur within area	In feature area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat may occur within area	In feature area
Davidsonia johnsonii Smooth Davidsonia, Smooth Davidson's Plum, Small-leaved Davidson's Plum [67178]	Endangered	Species or species habitat may occur within area	In buffer area only
Diospyros mabacea Red-fruited Ebony, Silky Persimmon, Ebony [18548]	Endangered	Species or species habitat likely to occur within area	In feature area
Diploglottis campbellii Small-leaved Tamarind [21484]	Endangered	Species or species habitat may occur within area	In feature area
Endiandra floydii Floyd's Walnut, Crystal Creek Walnut [52955]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Endiandra hayesii Rusty Rose Walnut, Velvet Laurel [13866]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Fontainea australis Southern Fontainea [24037]	Vulnerable	Species or species habitat may occur within area	In feature area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat may occur within area	In buffer area only
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat may occur within area	In feature area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Ochrosia moorei Southern Ochrosia [11350]	Endangered	Species or species habitat likely to occur within area	In feature area
Owenia cepiodora Onionwood, Bog Onion, Onion Cedar [11344]	Vulnerable	Species or species habitat may occur within area	In feature area
Pedleya acanthoclada listed as Desmodium acanthocladum Thorny Pea [93275]	Vulnerable	Species or species habitat may occur within area	In feature area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat likely to occur within area	In feature area
Rhodamnia maideniana Smooth Scrub Turpentine [20665]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Syzygium moorei Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple [12284]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
SHARK			
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Galeorhinus galeus School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
SNAIL			
Thersites mitchellae Mitchell's Rainforest Snail [66774]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sousa sahalensis as Sousa chinensis Australian Humpback Dolphin [87942]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]	
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pachyptila turtur Fairy Prion [1066]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]		Species or species habitat may occur within area	In buffer area only
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]		Species or species habitat likely to occur within area overfly marine area	In feature area
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Fish			
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area	In buffer area only
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area	In buffer area only
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area	In buffer area only
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area	In buffer area only
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In buffer area only
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In buffer area only
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area	In buffer area only
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area	In buffer area only
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area	In buffer area only
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In buffer area only
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In buffer area only
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area	In buffer area only
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In buffer area only
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area	In buffer area only
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area	In buffer area only
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area	In buffer area only
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area	In buffer area only
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In buffer area only
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In buffer area only
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In buffer area only
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area	In buffer area only
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In buffer area only
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In buffer area only
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In buffer area only
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In buffer area only

Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area	In buffer area only
Hydrophis platurus as Pelamis platurus Yellow-bellied Sea Snake [93517]		Species or species habitat may occur within area	In buffer area only
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Whales and Other Cetaceans [Resource Information]			
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]	Endangered	Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]		Species or species habitat may occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Eubalaena australis Southern Right Whale [40]		Species or species habitat likely to occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Sousa sahalensis Australian Humpback Dolphin [87942]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Cudgen	Nature Reserve	NSW	In buffer area only

Regional Forest Agreements	[Resource Information]
Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.	

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
Cudgen Nature Reserve	NSW	In feature area

EPBC Act Referrals					[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status	
Kings Forest Residential Development	2012/6328		Post-Approval	In feature area	

Controlled action				
Staged commercial, industrial and residential development	2002/715	Controlled Action	Completed	In buffer area only
Tugun Bypass	2004/1861	Controlled Action	Post-Approval	In buffer area only
Tugun Bypass Four-lane Dual Motorway	2003/1122	Controlled Action	Completed	In feature area

Not controlled action

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
construction of two sports fields, car park, amenities block and access road fro	2004/1376	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Koala Beach Estate -Stage 7	2003/1306	Not Controlled Action	Completed	In buffer area only
Tourist resort and public recreation area	2002/805	Not Controlled Action	Completed	In buffer area only

Referral decision				
Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed	In buffer area only

Biologically Important Areas				
Scientific Name		Behaviour	Presence	Buffer Status
Dolphins				
Sousa chinensis				
Indo-Pacific Humpback Dolphin [50]		Foraging	Likely to occur	In buffer area only
Tursiops aduncus				
Indo-Pacific/Spotted Bottlenose Dolphin [68418]		Breeding	Likely to occur	In buffer area only

Marine Turtles				
Caretta caretta				
Loggerhead Turtle [1763]		Nesting	Known to occur	In buffer area only

Sharks				
Carcharias taurus				
Grey Nurse Shark [64469]		Foraging	Known to occur	In buffer area only

Whales				
Megaptera novaeangliae				
Humpback Whale [38]		Foraging	Known to occur	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact us](#) page.

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Appendix D – Threatened Species Likelihood of Occurrence Assessment

Table D-1: Threatened Species Likelihood of Occurrence Assessment at the Proposal Site

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
Amphibians								
<i>Crinia tinnula</i>	Wallum Froglet	V	-	Y	Typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. Foraging habitat extends outside core habitat when conditions are favourable (i.e., wet).	Potential	The southern portion of the proposal site (i.e., along the boundary with Depot Road, and what will become Kings Forest Parkway), is at lower elevation, and could be inundated after heavy rain.	Y
<i>Litoria olongburensis</i>	Wallum Sedge Frog	-	V	N	Wholly or largely restricted to lowland sand plains, dunes and sand islands of coastal south-east Qld and NSW (including coastal 'wallum'). All breed in oligotrophic (nutrient poor) acidic (pH < 6.0) coastal swamps and/or lakes.	Potential	The southern portion of the proposal site may represent a very degraded form of grasslands, which under wet conditions (i.e., resulting from significant rainfall events), the Wallum Sedge Frog is known to utilise.	Y
<i>Mixophyes fleayi</i>	Fleay's Frog	-	V	N	A ground-dwelling frog inhabiting montane rainforest and adjoining wet sclerophyll forest habitat. An obligate stream breeding species relying on permanent and semi-permanent freshwater streams for breeding habitat	Unlikely	Proposal site cleared, with no permanent freshwater streams. Not preferred habitat.	N
Birds								
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	N	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak.	Unlikely	Proposal site cleared and not preferred habitat.	N
<i>Ardenna grisea</i>	Sooty Shearwater	-	V	N	Large seabird, which forages in cold water zones with upwellings, especially around the subtropical, subantarctic and polar fronts. Breeds on offshore islands off New South Wales.	Unlikely	Proposal site not preferred habitat.	N
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	N	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.).	Unlikely	Proposal site is cleared and does not contain permanent freshwater.	N
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1	-	Y	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	V	N	The species utilises fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland	Unlikely	Proposal site is cleared and does not contain freshwater or hypersaline environments.	N

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
					wetlands, and sewage ponds.			
<i>Calidris canutus</i>	Red Knot	-	V	N	Whilst in Australia, the species mainly inhabits intertidal mudflats, sandflats, and sandy beaches of sheltered coasts, estuaries, bays, inlets, lagoons, and harbours. They are occasionally seen on terrestrial saline wetlands near the coast and have been recorded on sewage ponds.	Unlikely	Proposal site is not preferred habitat.	N
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE	N	Generally occupies littoral and estuarine habitats, and in NSW is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. Proposal site not preferred habitat.	Unlikely	Proposal site not preferred habitat.	N
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	V	Y	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	V	N	Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Unlikely	Proposal site is not preferred habitat.	N
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (south-eastern)	V	V	N	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Circus assimilis</i>	Spotted Harrier	V	-	Y	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Cyclopsitta diophthalma coxeni</i>	Coxen's Fig-Parrot	CE	CE	N	Usually recorded from drier rainforests and adjacent wetter eucalypt forest but rarely seen due to its small size and cryptic habits. Also found in the wetter lowland rainforests that are now largely cleared in NSW.	Unlikely	Proposal site is cleared and not preferred habitat.	N

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	V	N	The majority of birds breed on Antipodes Island, with a small number of pairs breeding on Campbell Island. Regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter where they feed on cuttlefish.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Diomedea antipodensis gibsoni</i>	Gibson's Albatross	V	V	N	Essentially endemic to the Auckland Islands of New Zealand. The non-breeding range is poorly known however the species probably disperses across the southern Pacific. The species is regularly encountered on trans-Tasman shipping routes and at seas off Sydney, and regularly occurs off the NSW coast usually between Green Cape and Newcastle.	Unlikely	Marine bird species, nesting on islands off NZ. Proposal site is not preferred habitat.	N
<i>Diomedea epomophora</i>	Southern Royal Albatross	-	V	N	Breeds only on Campbell island and Auckland Islands, in New Zealand. Circumpolar distribution, generally between 30-55°S, predominately around New Zealand (NZ), south eastern Australia and southern South America	Unlikely	Marine bird species, nesting on islands off NZ. Proposal site is not preferred habitat.	N
<i>Diomedea exulans</i>	Wandering Albatross	E1	E	N	Visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. It has been recorded along the length of the NSW coast. In Australia, the species breeds on Macquarie Island	Unlikely	Marine bird species, in Australian territory only nesting on Macquarie Island. Proposal site is not preferred habitat.	N
<i>Erythrotriorchis radiatus</i>	Red Goshawk	E1	E	N	Inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Falco hypoleucos</i>	Grey Falcon	V	V	N	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found	Unlikely	Proposal site is cleared and not preferred habitat.	N

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
					in open woodlands near the coast.			
<i>Fregetta grallaria grallaria</i>	White-bellied Storm-Petrel	V	V	N	A wide oceanic distribution in the south Pacific and Atlantic Oceans, ranging into tropical waters from various breeding grounds. Known to breed at various island groups including Lord Howe Island. In Australia breeds only on offshore islands in the Lord Howe Island group.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Gallinago hardwickii</i>	Latham's Snipe	-	V	N	Migratory species, which when in Australia, feed in soft mudflats or shallow water typically at night, early morning, or evening. . They shelter during the day in small wetlands including urban water bodies, saltmarshes, as well as creek edges, where there is adequate shallow flooded or inundated substrate.	Unlikely	Proposal site does not contain mudflats or any permanent water bodies. Proposal site is not preferred habitat.	N
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	Y	Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	Unlikely	Level of disturbance and lack of preferred prey species at proposal site not conducive with preferred habitat.	N
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V	N	Occur in most types of habitat, but most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearing. In coastal areas, they have been observed flying over sandy beaches or mudflats and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Lathamus discolor</i>	Swift Parrot	E1	CE	N	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months. Migrates to the Australian south-east mainland between February and October in habitats where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Limosa lapponica baueri</i>	Nunivak Bar-tailed Godwit		E	N	A migratory species, which when in Australia usually forage near the edge of water or in	Unlikely	Proposal site does not contain any permanent water or sandy or soft	N

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					shallow water within tidal estuaries and harbours. Most feeding takes place on exposed sandy or soft mud substrates on intertidal flats and beaches.		mud flats. Proposal site is not preferred habitat.	
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	Y	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Macronectes giganteus</i>	Southern Giant-Petrel		E	N	Within Australia, the Southern Giant Petrel is limited to breeding colonies on Heard and Macquarie Islands and in Australian Antarctic Territory	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Macronectes halli</i>	Northern Giant-Petrel	V	V	Y	Circumpolar pelagic distribution, usually between 40-64°S in open oceans. Their range extends into subtropical waters (to 28°S) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Breeding in Australian territory is limited to Macquarie Island.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Numenius madagascariensis</i>	Eastern Curlew		CE	N	A migratory species, which during the non-breeding season, mainly forages around sheltered intertidal sandflats or mudflats that are open and without vegetation or seagrass. The species often also forages near mangroves, on salt flats or saltmarsh, around rockpools, amongst rubble on coral reefs, and on ocean beaches near the tideline	Unlikely	Proposal site does not contain any permanent water, or intertidal environments. Proposal site is not preferred habitat.	N
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)		V	N	Circumpolar distribution, and probably frequents subtropical waters during the non-breeding period. Breeding is currently known from only from two rock stacks off Macquarie Island, with a second location on Bishop and Clerk Islands nearby.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Pandion cristatus</i>	Eastern Osprey	V	-	Y	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Unlikely	Proposal site is cleared and not preferred habitat.	N

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<i>Phoebastria fusca</i>	Sooty Albatross	V	V	N	Pelagic or ocean-going species which inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea, and rarely occurs in continental shelf waters. In Australian waters, this species is generally recorded in winter off the south coast from Tasmania to Western Australia, while there are occasional sightings off the NSW coast, north of Grafton.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V	-	Y	Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. Feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit.	Unlikely	Proposal site is cleared and not preferred habitat.	N
<i>Pterodroma leucoptera leucoptera</i>	Gould's Petrel	V	E	N	The non-breeding range and feeding areas of Gould's Petrel is unknown, but it appears that the species forages predominantly within the Tasman Sea. The species is known to breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel	V	V	N	Ranges over subtropical and tropical waters of the South Pacific. Balls Pyramid (near Lord Howe Island) and Phillip Island (near Norfolk Island) are the only known breeding sites in Australian waters.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E	N	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	Unlikely	Proposal site does not contain any permanent water bodies, including swamps, dams or marshy areas. Proposal site is not preferred habitat.	N
<i>Stagonopleura guttata</i>	Diamond Firetail	V	V	N	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Unlikely	Proposal site is cleared and heavily disturbed. Not preferred habitat.	N

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<i>Sternula nereis nereis</i>	Australian Fairy Tern		V	N	Utilise a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands, beaches and spits.	Unlikely	Proposal site does not contain any permanent water bodies, or beach habitats. Not preferred habitat.	N
<i>Thalassarche carteri</i>	Indian Yellow-nosed Albatross		V	N	Breed on island groups off France and South Africa. Australia is within the foraging range of the species	Unlikely	Marine bird species, nesting on offshore islands of France and South Africa. Proposal site is not preferred habitat.	N
<i>Thalassarche cauta</i>	Shy Albatross	E1	E	N	Pelagic or ocean-going species, which inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. Breed on islands off Australia and New Zealand. In Australian waters the species is commonly recorded off southeast NSW, but uncommon north of Sydney.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Thalassarche impavida</i>	Campbell Albatross, Campbell Black-browed Albatross		V	N	Endemic to Campbell Island (New Zealand) with two breeding sites on the island Australia is within the foraging range of the Campbell Albatross	Unlikely	Marine bird species, nesting on Campbell Islands off NZ. Proposal site is not preferred habitat.	N
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	V	N	Inhabits antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park.	Unlikely	Marine bird species, nesting on offshore islands. Proposal site is not preferred habitat.	N
<i>Thalassarche salvini</i>	Salvin's Albatross	-	V	N	Endemic to New Zealand with 12 breeding sites on the Bounty Islands, and Snares Islands Australia is within the foraging range of the species	Unlikely	Marine bird species, nesting on offshore islands of NZ. Proposal site is not preferred habitat.	N
<i>Thalassarche steadi</i>	White-capped Albatross	-	V	N	Endemic to New Zealand with five breeding sites on the Auckland Islands, and Antipodes Islands. Australia is within the foraging range of the species	Unlikely	Marine bird species, nesting on offshore islands of NZ. Proposal site is not preferred habitat.	N
<i>Tringa nebularia</i>	Common Greenshank		E	N	A migratory species. In New South Wales, the species is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling-Baaka River drainage basin, including the	Unlikely	Proposal site does not contain any permanent water bodies, or mangrove or other fringing vegetation habitats. Not preferred habitat.	N

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					Macquarie Marshes, and north-west Regions. The species forages at the edge of wetlands, in soft mud on mudflats, in channels, or within shallows around the edge of waterbodies. These locations are often situated near or among mangroves or other sparse, emergent or fringing vegetation such as sedges or saltmarsh			
<i>Turnix melanogaster</i>	Black-breasted Button-quail	CE	V	N	Preferred habitat includes drier low closed forests, including dry rainforests, vine forest and vine thickets, often in association with Hoop Pine, and Bottle tree scrubs. The understorey may be dense or sparse, but a deep, moist leaf-litter layer, in which the birds forage, is an important component of habitat.	Unlikely	Proposal site cleared. Not preferred habitat.	N
<i>Tyto longimembris</i>	Eastern Grass Owl	V	-	Y	Found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	Potential	Proposal site is grassy, but unlikely to be preferred habitat due to level of historical and ongoing disturbance.	N
Fish								
<i>Epinephelus daemelii</i>	Black Rockcod		V	N	Black Rockcod generally inhabit near-shore rocky and offshore coral reefs at depths down to 50m	None	Marine fish species. Proposal site does not include marine environments.	N
<i>Hippocampus whitei</i>	White's Seahorse		E	N	Occur in estuaries from St Georges Basin, NSW to Hervey Bay in Qld. Juveniles prefer gorgonian habitats whilst adults prefer sponges and soft coral habitats	None	Estuarine species of Seahorse. Proposal site does not include estuarine environments.	N
<i>Seriola lalandi</i>	Blue Warehou		CD	N	Marine fish species. Globally, the blue warehou is confined to Australian and New Zealand waters. Within the Australian Exclusive Economic Zone, the species occurs predominantly in coastal shelf, upper continental slope and seamount waters offshore from New South Wales, Tasmania, Victoria and South Australia	None	Marine fish species. Proposal site does not include marine environments.	N
<i>Thunnus maccoyii</i>	Southern Bluefin Tuna		CD	N	A highly migratory marine fish species that occurs globally in waters between 30°S and 50°S, though is mainly found in the eastern Indian Ocean and in the south western Pacific Ocean. In Australian waters, SBT	None	Marine fish species. Proposal site does not include marine environments.	N

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					ranges from northern Western Australia, around the southern region of the continent, to northern New South Wales. The southernmost portion of the spawning ground lies within Australia's Exclusive Economic Zone			
Insects								
<i>Argynnis hyperbius inconstans</i>	Australian Fritillary	E1	CE	N	A species of butterfly, the Australian fritillary has been recorded in scattered locations across south-eastern Queensland and north-eastern New South Wales. The subspecies appears to have had a core distribution between Gympie in Queensland and Port Macquarie in NSW. Usually occurs around river estuaries or open, swampy coastal regions. Eggs are laid singly on a leaf of the caterpillar's food plant, the Arrowhead Violet (<i>Viola betonicifolia</i>)	Unlikely	Proposal site is cleared and heavily disturbed. No preferred habitat.	N
Mammals								
<i>Balaenoptera musculus</i>	Blue Whale	-	E	N	Global distribution, which includes Australian waters during migratory paths and feeding periods.	None	Marine mammal species. Proposal site does not include marine environments.	N
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Y	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	E	N	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features	Unlikely	Proposal site is cleared and does not include caves, cliff crevices, old mine working or disused nests of Fair Martin. No preferred habitat.	N
<i>Dasyurus maculatus maculatus</i>	Spot-tailed Quoll	E1	E	N	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs,	Unlikely	Proposal site is cleared and does not include habitat types conducive of dens.	N

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					other animal burrows, small caves and rock outcrops as den sites			
<i>Eubalaena australis</i>	Southern Right Whale		V	N	Migrate between summer feeding grounds in Antarctica and winter breeding grounds around the coasts of southern Australia, New Zealand, South Africa and South America. They feed in the open ocean in summer.	None	Marine mammal species. Proposal site does not include marine environments.	N
<i>Megaptera novaeangliae</i>	Humpback Whale	V	V	Y	Migratory marine mammal, which migrate through NSW coastal waters between May and July, when heading north to subtropical breeding grounds of the QLD Coast, and from September to November, when heading south to feeding grounds off Antarctica.	None	Marine mammal species. Proposal site does not include marine environments.	N
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	Y	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	Y	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Unlikely	Proposal site is cleared and does not contain caves or man-made structures. Not preferred habitat.	N
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V	-	Y	Lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Y	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Petaurus australis australis</i>	Yellow-bellied Glider (south-eastern)	V	V	Y	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Phascolarctos cinereus</i>	Koala	E1	E	Y	Inhabit eucalypt woodlands and forests. Given the cleared nature of the proposal site, it is unlikely to represent foraging habitat or shelter.	Potential	Given Koala records in nearby cleared habitat, and vegetated areas, the proposal site may be used from time to time for transitional purposes.	Y

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<i>Planigale maculata</i>	Common Planigale	V	-	Y	Inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover.	Unlikely	The proposal site is devoid of vegetation, except for exotic and native grasses. No rocky habitat present at the site. High level of existing disturbance. Not preferred habitat.	N
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo (northern)	V	V	N	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	N	Known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes	Unlikely	Proposal site is cleared and heavily disturbed. Not preferred habitat.	N
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Y	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	Y	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	Unlikely	Proposal site cleared and highly disturbed and unlikely to contain mammal burrows. Not preferred habitat.	N
<i>Xeromys myoides</i>	Water Mouse				Only known to occur in three disparate locations (2 in Qld and 1 in NT). Habitat is considered to extend into northern NSW, which includes intertidal and supratidal areas, and subcoastal brackish to freshwater wetlands and floodplains up to 30 km inland. Does not occur in urban developments or agricultural fields	Unlikely	Proposal site is cleared and does not contain permanent water bodies or wetlands. Not preferred habitat.	N
Mollusc								
<i>Thersites mitchellae</i>	Mitchell's Rainforest Snail	CE	CE	N	Found in remnant vegetation on the coastal plain between the Richmond River and Tweed River on the NSW north coast. Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground around the edges of wetlands with palms and fig trees are	Unlikely	Proposal site is cleared. Not preferred habitat.	N

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					particularly favoured habitat. Typically found amongst leaf litter on the forest floor, and occasionally under bark in trees.			
Reptiles								
<i>Caretta caretta</i>	Loggerhead Turtle	-	E	N	Open marine environment. Females use beaches to lay and incubate eggs.	None	Proposal site not a marine or beach environment.	N
<i>Chelonia mydas</i>	Green Turtle	-	V	N	Marine environment. Females use beaches to lay and incubate eggs.	None	Proposal site not a marine or beach environment.	N
<i>Delma torquata</i>	Adorned Delma,	-	V	N	A legless lizard. Normally inhabits eucalypt dominated woodland and open forest where it is associated with suitable micro-habitats (exposed rocky outcrops)..	Unlikely	No rocky outcrops at the proposal site. Not preferred habitat.	N
<i>Dermochelys coriacea</i>	Leatherback Turtle	-	E	N	Marine environment. Females use beaches to lay and incubate eggs.	None	Proposal site not a marine or beach environment.	N
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	-	V	N	Marine environment. Females use beaches to lay and incubate eggs.	None	Proposal site not a marine or beach environment.	N
<i>Furina dunmalli</i>	Dunmall's Snake		V	N	Small to medium sized snake found in open forest, particularly brigalow <i>Acacia harpophylla</i> forest and woodland growing on floodplains of deep-cracking black clay and clay loam soils.	Unlikely	Proposal site is cleared. Not preferred habitat.	N
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle		E	N	Marine environment. Females use beaches to lay and incubate eggs.	None	Proposal site not a marine or beach environment.	N
<i>Natator depressus</i>	Flatback Turtle		V	N	Marine environment. Females use beaches to lay and incubate eggs.	None	Proposal site not a marine or beach environment.	N
Sharks								
<i>Carcharias taurus</i> (east coast population)	Grey Nurse Shark (east coast population)	-	CE	N	Marine environment, mainly in inshore coastal distribution primarily in sub-tropical to cool temperate waters on the continental shelf	None	Proposal site not a marine environment.	N
<i>Carcharodon carcharias</i>	White Shark	-	V	N	Open marine environment, but commonly found in inshore waters in the vicinity of islands, and often near seal colonies	None	Proposal site not a marine environment.	N
<i>Galeorhinus galeus</i>	School Shark	-	CD	N	Primarily a deep water demersal (bottom-dwelling) species, although individuals have been recorded undertaking daily vertical migrations	None	Proposal site not a marine environment.	N
<i>Rhincodon typus</i>	Whale Shark	-	V	N	Inhabit tropical and warm marine temperate	None	Proposal site not a marine	N

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					waters. In Australia, the species occurs mainly off the Northern Territory, Queensland, and northern Western Australia. Isolated records exist off the coast of NSW		environment.	
<i>Sphyrna lewini</i>	Scalloped Hammerhead	-	CD	N	Circum-global distribution in tropical and sub-tropical marine waters. In Australia extends from NSW (approximately from Wollongong, where it is less abundant), around the north of the continent and then south into Western Australia to approximately Geographe Bay, t	None	Proposal site not a marine environment.	N
Plants								
<i>Acronychia littoralis</i>	Scented Acronychia	E1	E	Y	Small tree to 6 m high. Occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Arthraxon hispidus</i>	Hairy-joint Grass	V	V	N	Creeping grass with branching, erect to semi-erect purplish stems. Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	Unlikely	Proposal site is cleared, heavily disturbed and open environment, with no shade. Not preferred habitat, and not identified during site visit.	N
<i>Baloghia marmorata</i>	Marbled Balogia	V	V	N	A shrub or small tree growing up to 8 m tall. Found in subtropical rainforest, notophyll vine forest and wet sclerophyll forest on soils derived from basalt between 150m and 550m above sea level.	Unlikely	Proposal site is cleared (no tree or shrubs), heavily disturbed and below 150m AHD. Not preferred habitat.	N
<i>Bosistoa transversa</i>	Three-leaved Bosistoa	V	V	N	A crooked tree up to 22 m tall. Grows in wet sclerophyll forest, dry sclerophyll forest and rainforest including highly disturbed habitat up to 300 m in altitude.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Cryptocarya foetida</i>	Stinking Laurel	V	V	N	A small to medium-sized tree growing to 20 m tall. Found in littoral, warm temperate and subtropical rainforest, wet sclerophyll forest and Camphor laural forest usually on sandy soils, but mature trees are also known on basalt soils.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	N	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and	Unlikely	Proposal site is cleared of all woody vegetation, so no host trees present. Not preferred habitat.	N

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					woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).			
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E1	E	N	A climber or twiner with a highly variable form. Usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree <i>Leptospermum laevigatum</i> – Coastal Banksia <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> coastal scrub; Forest Red Gum <i>Eucalyptus tereticornis</i> aligned open forest and woodland; Spotted Gum <i>Corymbia maculata</i> aligned open forest and woodland; and Bracelet Honey Myrtle <i>Melaleuca armillaris</i> scrub to open scrub.	Unlikely	Proposal site is cleared of all woody vegetation, so no host trees present. Not preferred habitat.	N
<i>Desmodium acanthocladum</i>	Thorny Pea	V	V	Y	Sprawling shrub. Occurs in dry rainforest and fringes of riverine subtropical rainforest, On basalt-derived soils at low elevations.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Davidsonia johnsonii</i>	Smooth Davidsonia,	E1	E	N	A bushy, well-branched tree 5 to 12 m tall. Occurs in lowland subtropical rainforest and wet eucalypt forest at low altitudes (below 300m).	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Diospyros mabacea</i>	Red-fruited Ebony	E1	E	N	Generally a small tree, though it can grow to 25 m tall. Usually grows as an understorey tree in lowland subtropical rainforest, often close to rivers. Soils are generally basalt-derived or alluvial.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Diploglottis campbellii</i>	Small-leaved Tamarind	E1	E	N	A large straight tree to 30 m tall. Confined to the warm subtropical rainforests of the NSW-Queensland border lowlands and adjacent low ranges. The forest types in which the species occurs vary from lowland subtropical rainforest to drier subtropical rainforest with a	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
					Brush Box open overstorey. Occurs on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite.			
<i>Endiandra floydii</i>	Floyd's Walnut	E1	E	N	A small tree to 15 m tall. Occurs in warm temperate, subtropical rainforest or wet sclerophyll forest with Brush Box overstorey, and in and Camphor Laurel forest. The species can occur in disturbed and regrowth sites.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Endiandra hayesii</i>	Rusty Rose Walnut	V	V	N	Often a small crooked tree, but it can grow to 35 m tall. Occurs in sheltered moist gullies in lowland subtropical and warm temperate rainforest on alluvium or basaltic soils. The species occurs in regrowth and highly modified forms of these habitats.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Fontainea australis</i>	Southern Fontainea	V	V	N	A shrub or small tree growing to 5 m ta. found in lowland subtropical rainforest, usually on basaltic alluvial flats, and also in cooler subtropical rainforest in the Nightcap Range.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	E1	-	Y	A ground orchid that flowers in December and January and is dormant (the plant is not visible above the ground) during winter. Occurs in dry eucalypt forest, coastal swamp forest, and coastal dune shrublands at lower altitudes, often on sand.	Unlikely	Proposal site is cleared and heavily disturbed. Not preferred habitat, and not identified during site visit.	N
<i>Gossia fragrantissima</i>	Sweet Myrtle	E1	E	N	A multi-stemmed shrub or small tree, about 4 –10 m tall. Occurs in dry subtropical and riverine rainforest. As it can coppice from roots left in the ground when rainforest is cleared, it is found at several sites as isolated plants in paddocks or regrowth.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Hicksbeachia pinnatifolia</i>	Monkey Nut	V	V	N	A small tree to 10 m tall. Occurs in subtropical rainforest, moist eucalypt forest and Brush Box forest.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Macadamia integrifolia</i>	Macadamia Nut	-	V	N	Medium sized tree that grows to 2 m in height with a 20m wide crown. Grows in remnant rainforest, including complex mixed	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
					notophyll forest, and prefers partially open areas such as rainforest edges			
<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	V	V	N	A small to medium-sized tree. Usually densely bushy, tree growing up to 18m tall. Found in subtropical rainforest, usually near the coast.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Marsdenia longiloba</i>	Clear Milkvine	E1	V	N	Occurs in subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops. Associated species include <i>Eucalyptus crebra</i> , <i>E. microcorys</i> , <i>E. acmenoides</i> , <i>E. saligna</i> , <i>E. propinqua</i> , <i>Corymbia intermedia</i> and <i>Lophostemon confertus</i>	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Ochrosia moorei</i>	Southern Ochrosia	E1	E	N	A small tree, sometimes crooked with several stems, growing up to 11 m tall. Found in riverine and lowland subtropical rainforest in north-east NSW north from the Richmond River, and in south-east Queensland. It is very sparsely distributed within this range.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Owenia cepidora</i>	Onionwood		V		A tall evergreen tree, up to 30m. Occurs in subtropical and dry rainforest on or near soils derived from basalt, north from the Richmond River in north-east NSW extending just across the border into Queensland.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees or shrubs). Not preferred habitat.	N
<i>Oldenlandia galioides</i>	Sweet False Galium	E1	-	Y	Delicate, inconspicuous annual herb, that either hugs the ground or stands erect. Found at margins of seasonally inundated wetlands in paperbark swamps and Forest Red Gum (<i>Eucalyptus tereticornis</i>) woodlands.	Unlikely	Proposal site is cleared and heavily disturbed and not at the margins of wetlands. Not preferred habitat, and not identified during site visit.	N
<i>Phaius australis</i>	Lesser Swamp-orchid	E1	E	N	An orchid with flower stems up to 2 m tall and large broad leaves. Occurs in Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas of Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther	Unlikely	Proposal site is cleared and heavily disturbed and not at the margins of wetlands. Not preferred habitat, and not identified during site visit.	N

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
					south, to Port Macquarie.			
<i>Randia moorei</i>	Spiny Gardenia	E1	E	N	A tall shrub or small tree to about 8 m tall. Occurs in subtropical, riverine, littoral and dry rainforest. In NSW, Hoop Pine and Brush Box are common canopy species. It is found along moist scrubby water courses at altitudes up to 360 m asl, with most records below 100 m asl.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees of shrubs). Not preferred habitat.	N
<i>Rhodamnia maideniana</i>	Smooth Scrub Turpentine	CE	CE	N	A bushy shrub, commonly 1.5–3 m high. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees of shrubs). Not preferred habitat.	N
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	N	Shrub or small tree to 25 m high with reddish/brown, fissured bark. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees of shrubs). Not preferred habitat.	N
<i>Rhodomyrtus psidioides</i>	Native Guava	CE	CE	N	A shrub or small tree to 12 m high with brown scaly bark. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust.	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees of shrubs). Not preferred habitat.	N
<i>Syzygium hodgkinsoniae</i>	Smooth-bark Rose Apple	V	V	N	A small tree to about 11 m tall. Occurs within a restricted range from the Richmond River in north-east NSW to Gympie in Queensland. Locally common in some parts of its range, but otherwise sparsely distributed. Usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils	Unlikely	Proposal site is cleared of all woody vegetation (i.e., no trees of shrubs). Not preferred habitat.	N
<i>Syzygium</i>	Durobby	V	V	Y	Tree growing up to 40 m tall. Found in	Unlikely	Proposal site is cleared of all woody	N

Scientific Name	Common Name	BC Act Status ¹	EPBC Act Status ²	BioNet record in 1500m? Y/N	Preferred Habitat	Likelihood of occurrence at proposal site ³	Why?	Test / Assessment Of Significance Completed? Y/N
<i>moorei</i>					subtropical and riverine rainforest at low altitude. It often occurs as isolated remnant paddock trees.		vegetation (i.e., no trees or shrubs). Not preferred habitat.	
<i>Thesium australe</i>	Austral Toadflax	V	V	N	A small, straggling herb to 40 cm tall. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	Unlikely	Proposal site is cleared and heavily disturbed. Not identified during site visit.	N
<i>Tylophora woollsii</i>	Cryptic Forest Twiner	E1	E	N	A slender woody climber that grows to 3 m long. Grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.	Unlikely	Proposal site is cleared of all woody vegetation, so no host trees present. Not preferred habitat.	N

Notes:

- BC Act Status
CE – Critically Endangered
E1 – Endangered
E2 – Endangered population
V – Vulnerable
- EPBC Act Status
CE – Critically Endangered
CD – Conservation Dependent
E – Endangered
V – Vulnerable
- Likelihood of Occurrence Assessment
“None” = The proposal site does not represent habitat of any aspect of a species lifecycle. A test of significance under the EPBC or BC Act is not required for this species.
“Unlikely” = There is a very low to low probability a species uses habitat at the proposal site. A test of significance under the EPBC or BC Act is not required for this species.
“Potential” = There is a low to medium probability a species uses habitat at the proposal site. Taking a precautionary approach, a test of significance under the EPBC or BC Act is required for the species.
“Likely” = there is a medium or high probability the species uses habitat at the proposal site. I.e., the species was or has been observed in, or very near, the proposal site. A test of significance under the EPBC and / or BC Act is required for this species.

Appendix E – BC Act Tests of significance and EPBC Act Assessments of Significance

BC Act Tests of Significance

BC Act Threatened Species Test of Significance for mammal species:	
<ul style="list-style-type: none"> <i>Phascolarctos cinereus</i> (Koala) 	
Significant impact criteria - An action is likely to have a significant impact on a protected matter if there is a real chance or possibility that it will have:	
Statement	Response
Adverse effects on the life cycle of a species (a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The proposal is unlikely to disrupt the lifecycle of the Koala such that a viable local population will be placed at risk of extinction. No populations were observed within the impact footprint during the site visit. The proposal occurs on previously cleared and disturbed land and will impact groundcover species only. The proposal provides limited to no value for the Koala, aside from occasional transitional purposes.
Adverse effects on ecological communities (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: <ul style="list-style-type: none"> (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction 	N/A
Adverse effects on habitats (c) in relation to the habitat of a threatened species or ecological community: <ul style="list-style-type: none"> (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality 	The proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Koala is likely to decline. The proposal occurs on previously cleared and disturbed land and will impact groundcover species only. The proposal provides limited to no value for the Koala, aside from occasional transitional purposes. More suitable habitat is available in the surrounding areas.
Adverse effects on areas of outstanding biodiversity value (d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	The proposal will not have an adverse effect on any declared area of outstanding biodiversity value.
Key threatening processes (e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process	The proposal may exacerbate removal of some native grasses and potentially contribute to invasion of native plant communities by exotic perennial grasses, but this will not be significant.
Summary statement: The proposal will not result in a significant impact to Koala. No woody vegetation removal will occur, with impacts limited to groundcover species only. More favourable habitat is available outside the impact footprint.	

In determining the nature and magnitude of an impact, matters were considered such as:

- pre-construction, construction and occupation/maintenance phases
- all on-site and off-site impacts, including location, installation, operation and maintenance of auxiliary infrastructure and fire management zones
- all direct and indirect impacts
- the frequency and duration of each known or likely impact/action
- the total impact which can be attributed to that action over the entire geographic area affected, and over time
- the sensitivity of the receiving environment
- the degree of confidence with which the impacts of the action are known and understood.

BC Act Threatened Species Test of Significance for amphibian species:	
<ul style="list-style-type: none"> <i>Crinia tinnula</i> (Wallum Froglet) 	
Significant impact criteria - An action is likely to have a significant impact on a protected matter if there is a real chance or possibility that it will have:	
Statement	Response
<p>Adverse effects on the life cycle of a species</p> <p>(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>	<p>The proposal is unlikely to disrupt the lifecycle of the Wallum Froglet such that a viable local population will be placed at risk of extinction. The proposal occurs on previously cleared and disturbed land associated with previous land use activities and current construction activities associated with the Kings Forest development. Impacts to more sensitive wetland and vegetated land which would provide more suitable habitat for the species will be avoided.</p>
<p>Adverse effects on ecological communities</p> <p>(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	N/A
<p>Adverse effects on habitats</p> <p>(c) in relation to the habitat of a threatened species or ecological community:</p> <p>(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</p> <p>(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</p> <p>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality</p>	<p>The proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that Wallum Froglet is likely to decline. The proposal occurs on previously cleared and disturbed land, and will not be undertaken in nearby wetland and vegetated land, where more suitable habitat for the frog species is available.</p>
<p>Adverse effects on areas of outstanding biodiversity value</p> <p>(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</p>	<p>The proposal will not have an adverse effect on any declared area of outstanding biodiversity value.</p>
<p>Key threatening processes</p> <p>(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process</p>	<p>The proposal may exacerbate removal of some native grasses and potentially contribute to invasion of native plant communities by exotic perennial grasses, but this will not be significant.</p>
<p>Summary statement:</p> <p>The proposal will not result in a significant impact to the Wallum Froglet. Impacts are limited to disturbance to groundcover species only. More favourable habitat is available outside the impact footprint.</p>	

In determining the nature and magnitude of an impact, matters were considered such as:

- pre-construction, construction and occupation/maintenance phases
- all on-site and off-site impacts, including location, installation, operation and maintenance of auxiliary infrastructure and fire management zones
- all direct and indirect impacts
- the frequency and duration of each known or likely impact/action
- the total impact which can be attributed to that action over the entire geographic area affected, and over time
- the sensitivity of the receiving environment
- the degree of confidence with which the impacts of the action are known and understood.

EPBC Act Assessments of Significance

MNES – Endangered mammal species considered:

- *Phascolarctos cinereus* (Koala)

Significant impact criteria

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Statement	Response
<ul style="list-style-type: none"> • lead to a long-term decrease in the size of a population 	The proposal is unlikely to result in a long-term decrease in the population size of the Koala given the subject land contains no foraging habitat or shelter. The proposal site is cleared of woody vegetation. There is more suitable habitat in forested areas to the north, east and south.
<ul style="list-style-type: none"> • reduce the area of occupancy of the species 	The proposal is unlikely to reduce the area of occupancy of the Koala given habitat for these species is well represented outside the proposal site, which would only be used occasionally for transitional purposes.
<ul style="list-style-type: none"> • fragment an existing population into two or more populations 	The proposal is unlikely to fragment an existing population into two or more populations. No Koalas were observed during the site inspection and more favourable habitat for this species is available outside the proposal site.
<ul style="list-style-type: none"> • adversely affect habitat critical to the survival of a species 	The proposal is unlikely to adversely affect habitat critical to the survival of the Koala. The proposal site may only currently be used occasionally for transitional purposes. Habitat for the species is well represented outside the proposal site. No woody vegetation will be removed, with disturbance limited to groundcover species
<ul style="list-style-type: none"> • disrupt the breeding cycle of a population 	The proposal will not disrupt the breeding cycle of Koala. No Koalas were observed during the site visit and more favourable habitat for this species is available outside the proposal site.
<ul style="list-style-type: none"> • modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline 	The proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Koala is likely to decline. The proposal will occur in previously cleared and disturbed land. No woody vegetation will be removed, with disturbance limited to groundcover species. Habitat is better represented outside the proposal site.
<ul style="list-style-type: none"> • result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat 	The proposal is unlikely to result in invasive species becoming established in the threatened species' habitat, any more than is already occurring.
<ul style="list-style-type: none"> • introduce disease that may cause the species to decline, or 	The proposal is unlikely to result in disease that is harmful to the Koala becoming established in the threatened species' habitat. The proposal site is already highly altered and disturbed.
<ul style="list-style-type: none"> • interfere substantially with the recovery of the species. 	The proposal will not interfere substantially with the recovery of the Koala. Koalas were not observed at the proposal site, with more suitable habitat available elsewhere.
Summary statement: The proposal will not result in a significant impact to Koala. More suitable habitat available outside the impact footprint.	

MNES – Vulnerable species considered:

- ***Litoria olongburensis* (Wallum Sedge Frog)**

Significant impact criteria

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Statement	Response
<ul style="list-style-type: none">• lead to a long-term decrease in the size of an important population of a species	The proposal is unlikely to result in a long-term decrease in the population size of the Wallum Sedge Frog given the proposal site contains minimal suitable habitat, is historically fragmented and disturbed, and there is more suitable habitat in wetland areas outside the proposal site.
<ul style="list-style-type: none">• reduce the area of occupancy of an important population	The proposal is unlikely to reduce the area of occupancy of the Wallum Sedge Frog given that impacts will be limited to disturbed areas outside the more preferred wetland and vegetated areas. Habitat for the species is well represented outside the proposal site.
<ul style="list-style-type: none">• fragment an existing important population into two or more populations	The proposal is unlikely to fragment an existing population into two or more populations. The proposal site does not represent core habitat. No wetland areas will be fragmented as a result of the proposal.
<ul style="list-style-type: none">• adversely affect habitat critical to the survival of a species	The proposal is unlikely to adversely affect habitat critical to the survival of the Wallum Sedge Frog. Habitat for the species is well represented outside the proposal site. No wetland areas will be impacted.
<ul style="list-style-type: none">• disrupt the breeding cycle of a population	The proposal will not disrupt the breeding cycle of the Wallum Sedge Frog. Breeding habitat for this species is well represented in wetland environments outside the proposal site.
<ul style="list-style-type: none">• modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Wallum Sedge Frog is likely to decline. The proposal will occur in previously cleared and disturbed land. No wetland areas will be impacted, with disturbance limited to groundcover species on more elevated and cleared ground. Habitat is better represented outside the proposal site.
<ul style="list-style-type: none">• result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposal is unlikely to result in invasive species becoming established in the threatened species' habitat, any more than is already occurring.
<ul style="list-style-type: none">• introduce disease that may cause the species to decline, or	The proposal is unlikely to result in disease that is harmful to the Wallum Sedge Frog becoming established in the threatened species' habitat. The proposal site is already highly altered and disturbed.
<ul style="list-style-type: none">• interfere substantially with the recovery of the species.	The proposal will not interfere substantially with the recovery of the Wallum Sedge Frog. More suitable habitat available elsewhere.

Summary statement:

The proposal will not result in a significant impact to the Wallum Sedge Frog. More suitable habitat available outside the impact footprint.

Appendix F – EPBC Act Referral Assessments for the Koala and Wallum Sedge Frog

EPBC Act Referral Assessment: Koala

Introduction

Phascolarctos cinereus (Koala) populations in Queensland (QLD), New South Wales (NSW) and the Australian Capital Territory (ACT) have been listed as endangered under the EPBC Act. The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) has prepared guidelines to assist proponents in deciding whether a proposed action is likely to have a significant impact on the Koala. In assessing the potential negative impacts of an action on the Koala, the following points must be considered:

- the scale of the action and its impacts;
- the intensity of the action and its impacts;
- the duration and frequency of the action and its impacts;
- the environmental context, for example, the sensitivity, value, quality and size of the environment, the site's connectivity to other habitats in the broader landscape and its importance in the conservation of the environment;
- the nature of the potential impacts that are likely to result from your actions; and
- whether mitigation measures will avoid or reduce these impacts.

Referral Guidance:

These considerations should be analysed in the context of the endangered species criteria outlined in the Significant Impact Guidelines 1.1. In undertaking an assessment, a proponent must document their analysis and retain any records. Impacts to the environment must be avoided wherever possible. If environmental impacts resulting from a project are unavoidable, proposed mitigation measures and offset strategies need to be described as part of the assessment process. The National Recovery Plan for the Koala provides information on direct threats and ecologically threatening processes for the Koala.

Significant Impact on the Listed Koala

The Significant Impact Guidelines 1.1 provide overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the EPBC Act. To determine if an action is likely to have a significant impact on an endangered species, a proponent must consider if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

Such an assessment was carried out for the Koala (refer **Appendix E** of this REF) and concluded the proposal will not result in a significant impact to the threatened species.

Projects Not Requiring Referral

Types of actions that involve clearing of Koala habitat, but which do not generally need to be referred include:

- an action that has been granted an EPBC Act exemption on the grounds that the action is being undertaken to preserve human life or property or prevent those risks;
- clearing land for fire emergencies;
- clearing works to reduce the risk of bushfire outside of emergency situations, where the impact is not likely to have a significant impact on a matter of national environmental significance;
- clearing of individual or small groups (less than 10) of paddock trees, provided that these are not the only dispersal link between patches of habitat;
- certain agricultural activities;
- other minister issued exemptions.

Koala Habitat Identification

For the purposes of the EPBC Act Koala listing, locally important Koala tree species can be used as a starting point to determine whether an area is likely to contain Koala habitat. The Review of Koala Habitat Assessment Criteria and Methods guide includes information on feed trees in different regions, as well as survey methods to assess habitat. As Koalas typically travel between trees via the ground, it too forms an essential component of Koala habitat, as without the ground, movement between trees would be hindered or impossible.

Depending on the site and the extent of the proposed impact, surveys for Koala by suitably qualified specialists may be necessary to identify sensitive areas and may help planning and engineering design teams to avoid or mitigate potential impacts. The survey methods and level of survey effort required will depend on the size and nature of the action and the availability and quality of information already available.

Referral Assessment

The BioNet Atlas database search returned 62 records of the Koala within a 1500m buffer of the proposal site, including 29 within 500m buffer of the proposal site. This indicates that the habitats more widely around the study area support a local population of the species. The National Recovery Plan for the Koala defines Koala habitat by the availability and nutritional quality of food trees, presence of suitable resting trees and microclimates, age structure of vegetation, history, and impediments to dispersal. These factors differ regionally because they are strongly influenced by local climatic and landform attributes. While precise requirements vary regionally and locally, Koala habitat can be considered in terms of the following multi-scale resource requirements in space and time:

- the selection by Koalas of individual trees for food and shelter and other resources within their home range;
- patch size, form, and context of home ranges within the landscape, including patches of forest, riparian, linear and roadside vegetation associations, open ground, corridors, and scattered paddock trees used for breeding or dispersal;
- at larger scales, the regional landscape in which a metapopulation exists; and
- the geographic range of the Koala.

The proposal site is located in the North Coast NSW Koala Management Biogeographic Region, as per the distribution of the Koala map in Review of Koala habitat assessment criteria and methods (Australian National University, 2021). The proposal site is not located within mapped Koala habitat. There will be no impacts to Koala habitat trees. No woody vegetation is proposed to be removed, with impacts to groundcover species only to occur within the existing cleared land. Consequently, the proposal site provides little to no resources available to Koalas.

It is possible that the proposal site may be used on occasion by Koalas for transitional purposes, but this is likely to be significantly reduced due to the degree of existing disturbance and construction activities currently occurring as part of the broader Kings Forest development, which includes the progressive installation of fauna exclusion fencing.

Conclusion

Given the factors considered above, in conjunction with the Significant Impact Assessment undertaken in **Appendix E**, it is considered unlikely that the proposal would significantly impact the Koala or a local population's survival. Referral to the Federal Minister for Environment and Water is not required.

EPBC Act Referral Assessment: Wallum Sedge Frog

Introduction

Litoria olongburensis (Wallum Sedge Frog), also known as the sharp-snouted reed frog or the Olongburra tree frog, is a small species belonging to the tree-frog family. It is found in wallum swamps and surrounding vegetation types in coastal south-east Queensland and north-east New South Wales. The number of Wallum Sedge Frogs, and the extent and overall quality of species' habitat, is estimated to have greatly diminished with increasing human activity across its distribution. With the species confined to coastal wallum environments, populations are becoming increasingly isolated as a result of habitat loss, fragmentation and degradation. Populations along the mainland coast are becoming highly fragmented and may be at greater risk of local extinction because of the decreasing likelihood of immigration, genetic influx and reduced resilience against the effects of adverse environmental events (e.g. fire, flood or drought).

Referral Guidance

The then Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPC) prepared *draft referral guidelines for the vulnerable wallum sedge frog, Litoria olongburensis* in 2011. It is Essential Energy's understanding that these guidelines still remain as draft. The draft referral guidelines should also be analysed in the context of the endangered species criteria outlined in the Significant Impact Guidelines 1.1. In undertaking an assessment, a proponent must document their analysis and retain any records.

Significant Impact on the Listed Wallum Sedge Frog

The Significant Impact Guidelines 1.1 provide overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the EPBC Act. To determine if an action is likely to have a significant impact on an endangered species, a proponent must consider if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

Such an assessment was carried out for the Wallum Sedge Frog (refer **Appendix E** of this REF) and concluded the proposal will not result in a significant impact to the threatened species.

Referral Assessment

The draft referral guide provides a series of questions and supporting information to assist proponents in determining whether a proposed action needs to be referred to the Minister for Environment and Water. An assessment against the relevant questions is provided in the **Table F-1** below, while a copy of the decision tree from the draft referral guide is presented as **Figure F-1**.

Table F-1: Assessment of proposed action against the referral questions for the Wallum Sedge Frog

Question	Answer	Justification
Could the impacts of your action occur within the modelled distribution of the wallum sedge frog (see section 2 of the guide)? If yes, continue to next question. If no, no further assessment and referral may not be required..	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	The proposal site is located within the mapped distribution of the Wallum Sedge Frog, which occurs along a narrow coastal area between Fraser Island, Queensland, and Woolgoolga, New South Wales
Could the impacts of your action affect any wallum sedge frog habitat (see Section 3 of the guide) or individuals? If yes, continue to next question.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	The proposal site will be located outside of nearby freshwater wetland environments, on highly modified and disturbed land. The proposal site is not located within mapped core acid frog habitat, as mapped by James Warren and Associates (2011) It is possible that the southern portion of the proposal site may represent degraded forms of grasslands, which under wet

Question	Answer	Justification
If no, no further assessment and referral may not be required.		conditions (i.e. resulting from significant rainfall events), the Wallum Sedge Frog is known to utilise, and therefore possible that the proposal could impact on this habitat or individuals when utilising this adjoining habitat.
<p>Have you surveyed for the wallum sedge frog using the recommended methods (see Section 4 of the guide)?</p> <p>If yes, continue to next question.</p> <p>If no Assume your project may impact on an important population of the wallum sedge frog (see Section 5 of the guide) or the species as a whole (see Section 6 of the guide).</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Individual Wallum Sedge Frogs were recorded within regenerating heath communities to south and east of the proposal site, and within the Cudgen Nature Reserve southeast of the proposal site (James Warren and Associates, 2011).
<p>Could your action impact on an important population of the wallum sedge frog (see Section 5) or the species as a whole (see Section 6)</p> <p>If yes, continue to next question.</p> <p>If no, no further assessment and referral may not be required.</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The recording of several Wallum Sedge Frogs during a survey of suitable habitat for the species meets the Department's criteria to (i.e., a single individual) to indicate the presence of a population. An important population of a species listed as vulnerable under the EPBC Act, such as the Wallum Sedge Frog, is one that is necessary for the species' long-term survival and recovery. The Wallum Sedge Frog is highly restricted in terms of its habitat requirements: populations and suitable habitats are extensively isolated across the species' distribution. It is therefore possible that the Wallum Sedge Frog population in the vicinity of the proposal site may meet the important population criteria outlined on page 11 of EPBC Act Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance. While the presence of individual Wallum Sedge Frog and possibly an important population of the species is located in the wetland habitats near the proposal, the Assessment of significance for the vulnerable species and population prepared in accordance with the EPBC Act Matters of National Environmental Significance (refer Appendix E of this REF) concluded that the proposal could be undertaken without significantly impacting any threatened species or populations. As such referral is not required.
<p>Is your impact mitigation best practice so that it may reduce the significance of your impacts on the wallum sedge frog (see Section 7 of the guide)?</p> <p>If yes, continue to next question.</p> <p>If no, or unsure referral is recommended.</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Could your action require a referral to the federal environment minister for significant impacts on the wallum sedge frog (see Section 8 of the guide)?	<input type="checkbox"/> High Risk <input type="checkbox"/> Uncertainty <input type="checkbox"/> Low Risk	<p>Referral recommended</p> <p>Referral recommended or contact the department</p> <p>Referral may not be required.</p>

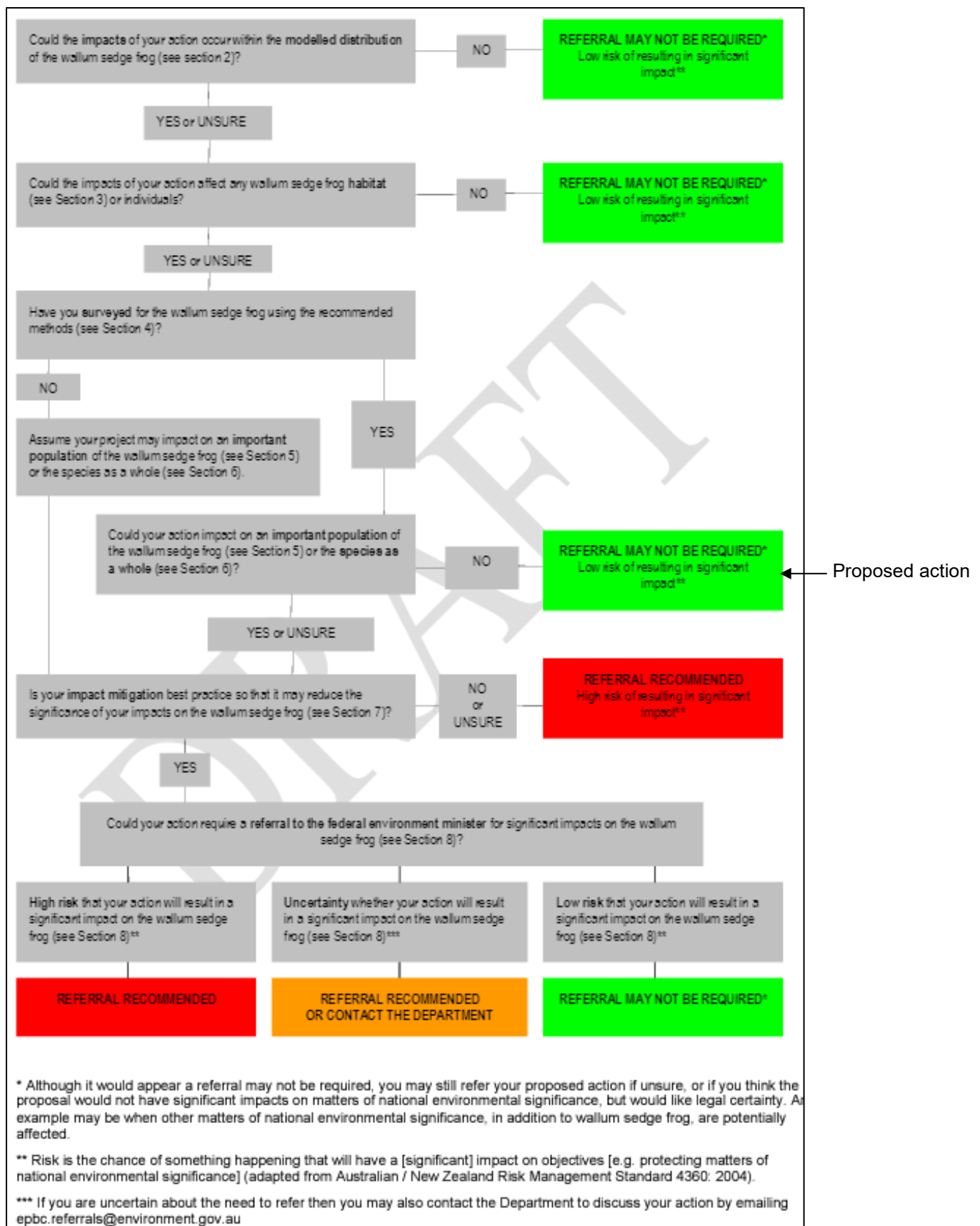


Figure F-1 Referral Guidance Decision Tree

Conclusion

Following the referral guidance, in conjunction with the results of the Significant Impact Assessment undertaken in **Appendix E**, it is considered unlikely that the proposal would significantly impact the Wallum Sedge Frog species or important populations. Referral to the Federal Minister for Environment and Water is not required.

Appendix G – AHIMS Searches and Site Cards

Essential Energy Land & Routes Port Macquarie

Date: 19 February 2024

8 Buller St

Port Macquarie New South Wales 2444

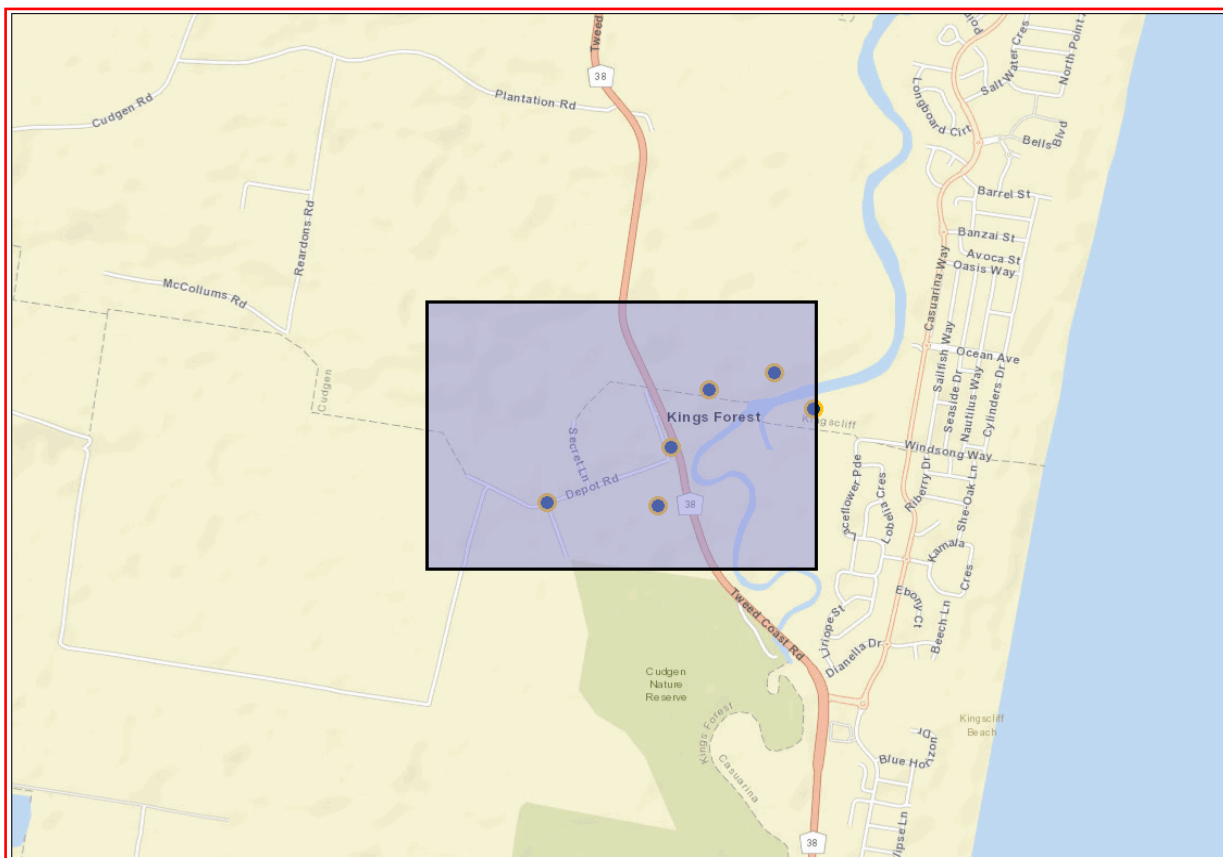
Attention: Nathan Hegerty

Email: nathan.hegerty@essentialenergy.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -28.2921, 153.5538 - Lat, Long To : -28.2826, 153.5692, conducted by Nathan Hegerty on 19 February 2024.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

8	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
04-2-0188	Kings Forest 13	GDA	56	555405	6871014	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>	Everick Heritage Pty Ltd, Everick Heritage Pty Ltd					<u>Permits</u>		
04-2-0106	Kings Forest 3	AGD	56	555100	6870370	Open site	Valid	Shell : -, Artefact : -	Midden	
	<u>Contact</u>	<u>Recorders</u>	Mr. Adrian Piper					<u>Permits</u>		
04-2-0223	Cudgen Ridge South East Tweed ACH Artefacts	GDA	56	555657	6871078	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Ian Fox					<u>Permits</u>		
04-2-0111	seaside city 1	AGD	56	555700	6870750	Open site	Valid	Shell : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Adrian Piper					<u>Permits</u>		
04-2-0112	sea side city a	AGD	56	555700	6870750	Open site	Valid	Shell : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Adrian Piper					<u>Permits</u>		
04-2-0098	Cudgen; Old Bogangar Rd	AGD	56	555150	6870600	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>	<u>Recorders</u>	Mr. Adrian Piper					<u>Permits</u>		
04-2-0187	King Forest 12	GDA	56	554775	6870575	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>	Ms. Claire Everett, Everick Heritage Pty Ltd					<u>Permits</u>		
04-2-0093	Cudgen	AGD	56	555150	6870600	Open site	Valid	Artefact : -	Open Camp Site	4065
	<u>Contact</u>	<u>Recorders</u>	Mr. Adrian Piper					<u>Permits</u>	1130	

** Site Status

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified



Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville NSW 2220



Office Use Only

Site Number

Date received / / Date entered into system / / Date catalogued / /

Entered by (I.D.)

Information Access

☐ Gender/male ☐ Gender/female ☐ Location restriction ☐ General restriction ☐ No access

For Further Information Contact:

☐ Nominated Trustee

Title Surname First Name Initials

Organisation

Address

Phone number Fax

☐ Knowledge Holder

Title Surname First Name Initials

Organisation

Address

Phone number Fax

Aboriginal Heritage Unit or Cultural Heritage Division Contacts

Office Use
Only

Client on
system

☐

Client on
system

☐

Geographic Location

Site Name

Easting Northing AGD/GDA

Mapsheet

Zone Location Method

Other Registration

Primary Recorder

Title Surname First Name Initials

Organisation

Address

Phone number Fax

Date recorded

Client on
system

☐

A blank 10x10 grid map. The grid is composed of 10 columns and 10 rows of squares. The cardinal directions are labeled at the corners: 'N' (North) at the top center, 'S' (South) at the bottom center, 'E' (East) at the right center, and 'W' (West) at the left center. A compass rose is located on the right side of the grid, consisting of a vertical line with a horizontal tick mark and an arrowhead pointing upwards, labeled 'N'.

General Site Information

Closed Site

Shelter/Cave Formation

- ☐ Boulder
☐ Wind erosion
☐ Water erosion
☐ Rock collapse

Rock Surface Condition

- ☐ Boulder
☐ Sandstone platform
☐ Silica gloss
☐ Tessellated
☐ Weathered
☐ Other platform

Condition of Ceiling

- ☐ Boulder
☐ Sandstone platform
☐ Silica gloss
☐ Tessellated
☐ Weathered
☐ Other platform

Shelter Aspect

- ☐ North
☐ North East
☐ East
☐ South East
☐ South
☐ South West
☐ West
☐ North West

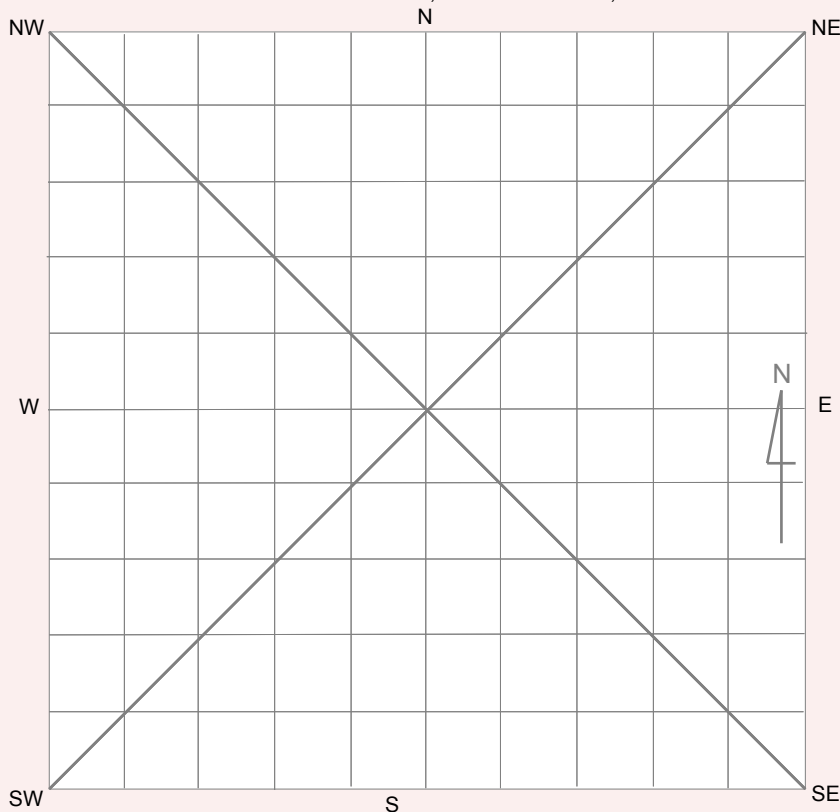
Open Site

Site Orientation

- ☐ N-S
☐ NE-SW
☐ E-W
☐ SE-NW
☐ N/A

Features

- ☐ 1. Aboriginal Ceremony & Dreaming
☐ 2. Aboriginal Resource & Gathering
☐ 3. Art
☐ 4. Artefact
☐ 5. Burial
☐ 6. Ceremonial Ring
☐ 7. Conflict
☐ 8. Earth Mound
☐ 9. Fish Trap
☐ 10. Grinding Groove
☐ 11. Habitation Structure
☐ 12. Hearth
☐ 13. Non Human Bone & Organic Material
☐ 14. Ochre quarry
☐ 15. Potential Archaeological Deposit
☐ 16. Stone Quarry
☐ 17. Shell
☐ 18. Stone Arrangement
☐ 19. Modified Tree
☐ 20. Water Hole

Site Plan Indicate scale, boundaries of site, features

Site Dimensions

Closed Site Dimensions (m)

- Internal length
 Internal width
 Shelter height
 Shelter floor area

Open Site Dimensions (m)

- Total length of visible site
 Average width of visible site
 Estimated area of visible site
 Length of assessed site area

[illegible]

Site Cultural & Scientific Analysis and Preliminary Management Recommendations

[illegible]

Endorsed by: ☐ Knowledge Holder ☐ Nominated Trustee ☐ Native Title Holder ☐ Community Consensus

Initials

--	--	--

[illegible][illegible]

--	--

[illegible][illegible][illegible][illegible]

Comments

- | | |
|--------------------------|----------------------|
| <input type="checkbox"/> | A4 location map |
| <input type="checkbox"/> | B/W photographs |
| <input type="checkbox"/> | Colour photographs |
| <input type="checkbox"/> | Slides |
| <input type="checkbox"/> | Aerial photographs |
| <input type="checkbox"/> | Site plans, drawings |
| <input type="checkbox"/> | Recording tables |
| <input type="checkbox"/> | Other |
| <input type="checkbox"/> | Feature inserts-No. |

[illegible]

Aboriginal Site Impact Recording Form

1. This form must be completed following impacts to AHIMS sites that are authorised by an Aboriginal Heritage Impact Permit (AHIP) or a Part 3A project approval (under the *Environmental Planning and Assessment Act 1979*).
2. Completed forms must be submitted to the AHIMS Registrar.
3. This form is intended to complement (not replace) the AHIMS Site Recording Form. Where there is a need to provide detailed information about the nature of a site, use the AHIMS Site Recording Form.
4. This form does not replace the need to submit reports to the DECCW office (as specified by a condition of an AHIP or Part 3A approval). This form must be submitted *in addition* to any reports.

AHIMS site ID:

Site impact authorisation (select one)

s.87 AHIP (the impacts to this site were authorised by a s.87 AHIP)

s.90 AHIP (the impacts to this site were authorised by a s.90 AHIP)

s.87/s.90 AHIP (the impacts to this site were authorised by a combined s.87/s.90 AHIP)

Part 3A approval (the impacts to this site were authorised by a Part 3A project approval)

Reference numbers, dates

AHIP number :

Date issued/signed:

AHIMS permit ID/number:

Major project number:

Date of approval:

G]h'ghLi g'Z`ck]b[`]a dUWg

Not a site (the investigations concluded that this is *not* a site)

Valid site (the investigations confirmed that this *is* an Aboriginal site)

Partially destroyed (the site was partially destroyed following authorised impacts; a portion of the site remains in situ)

Destroyed (the site was completely destroyed following authorised impacts)

Geographic location

Site name:

Easting:

Northing:

Coordinates must be in GDA (MGA)

Map sheet:

Zone:

Location method:

Primary recorder

(The person responsible for the completion and submission of this form)

Title	Surname	First name
Organisation:		
Address:		
Phone:	E-mail:	
Date recorded:	Fax:	

Site information

Open/closed site:

Features:

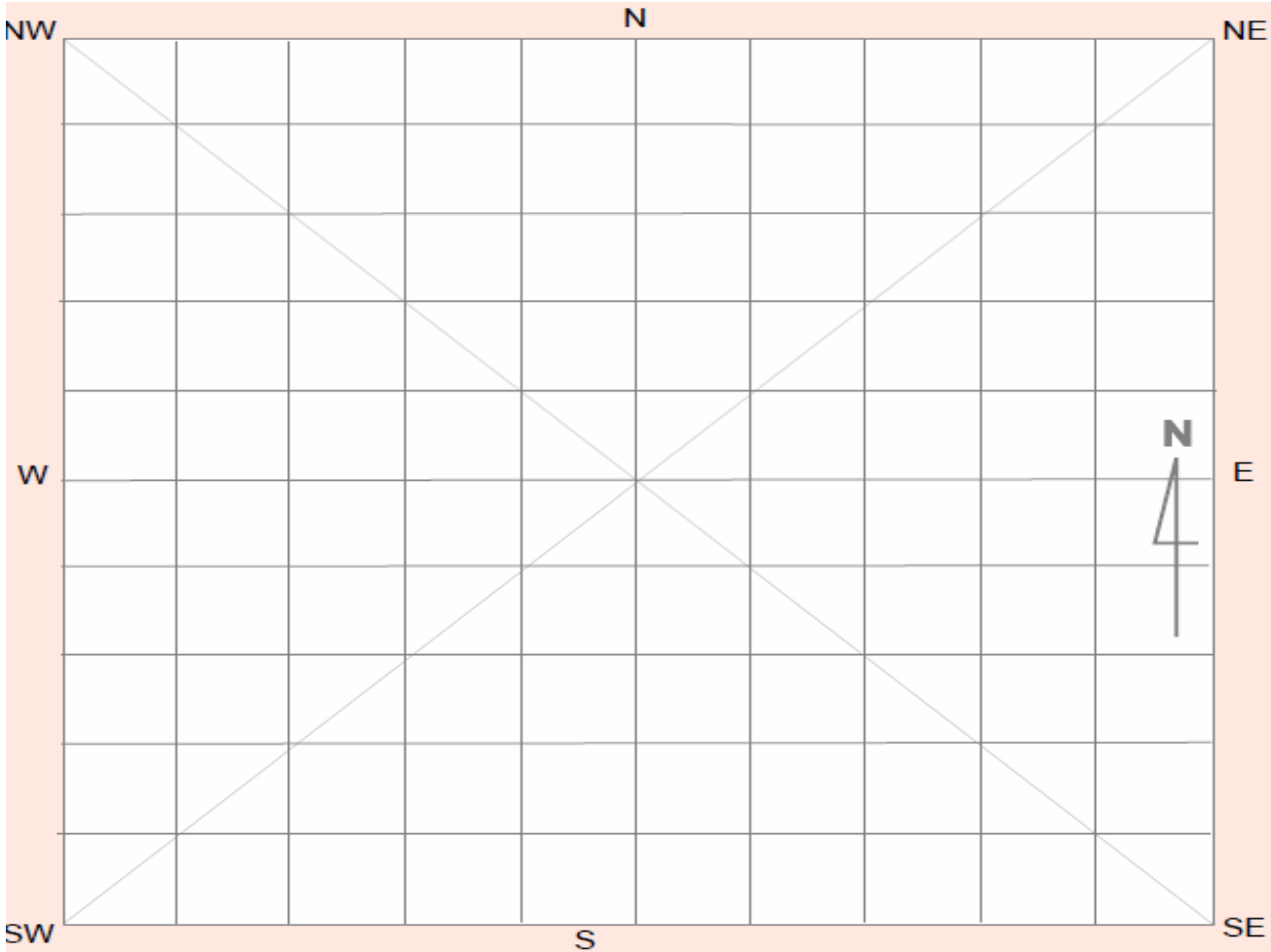
1. Aboriginal ceremony and dreaming	11. Habitation structure
2. Aboriginal resource and gathering	12. Hearth
3. Art	13. Non-human bone and organic material
4. Artefact	14. Ochre quarry
5. Burial	15. Potential archaeological deposit
6. Ceremonial ring	16. Stone quarry
7. Conflict	17. Shell
8. Earth mound	18. Stone arrangement
9. Fish trap	19. Modified tree
10. Grinding groove	20. Water hole

Site condition

Written description of the condition of the AHIMS site (including relevant features) following the authorised impact of the site

Site map

Clearly demarcate the original AHIMS site boundary, show the boundaries of impacted areas and the areas where the site remains in situ. Display map coordinates.



Methodology and results

Summary of the methodology and results of the activity or works undertaken through the authorised impacts, as relevant to the AHIMS site

Management recommendations

Summary of any management recommendations for the AHIMS site

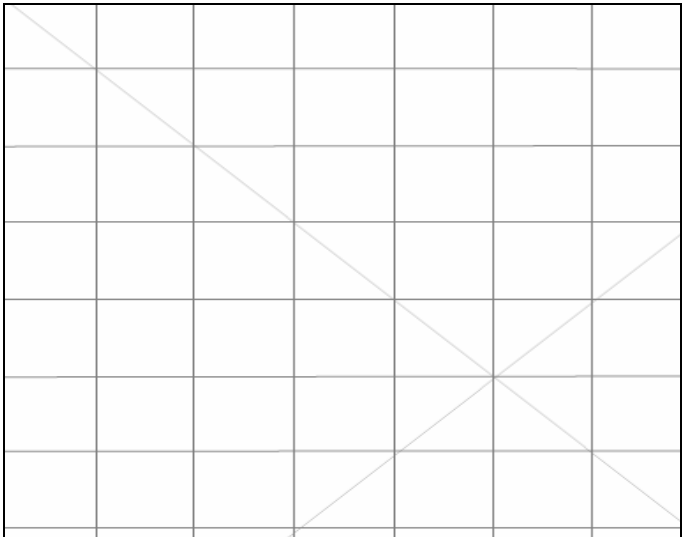
Post-investigation significance

Discuss if the scientific/archaeological or cultural significance of the site has changed in light of the results of the investigations or works conducted at the site.

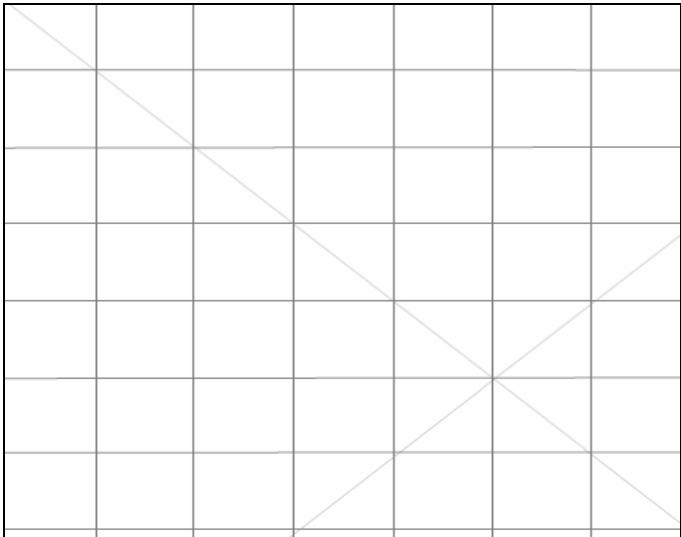
Additional comments

Site photographs

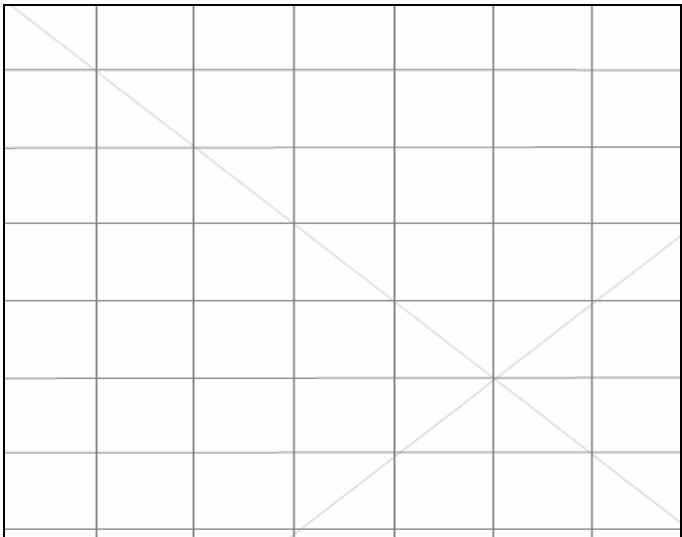
Include photographs of the authorised impacts activity, as relevant to the AHIMS site. Please keep photo size to a maximum of 200 kb.



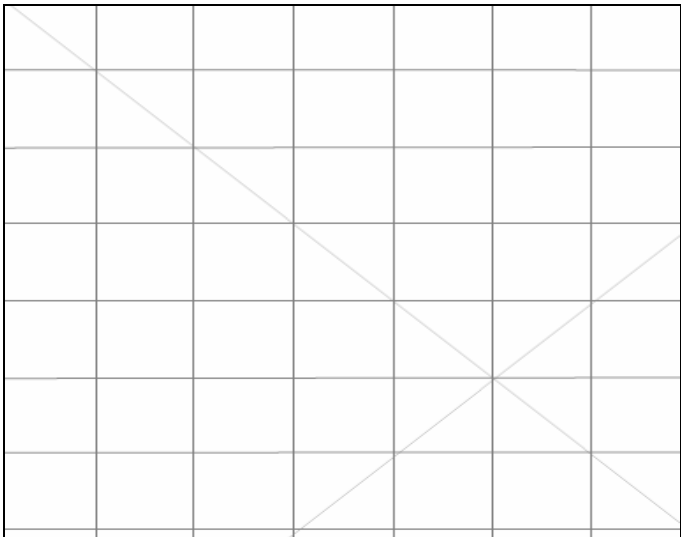
Description:



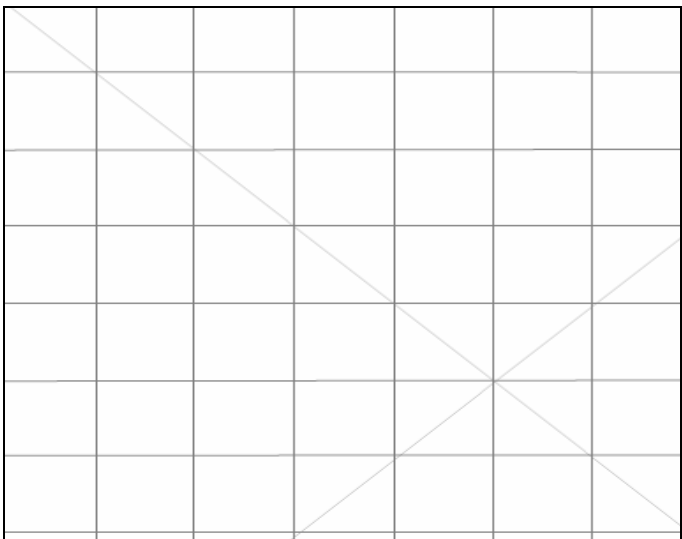
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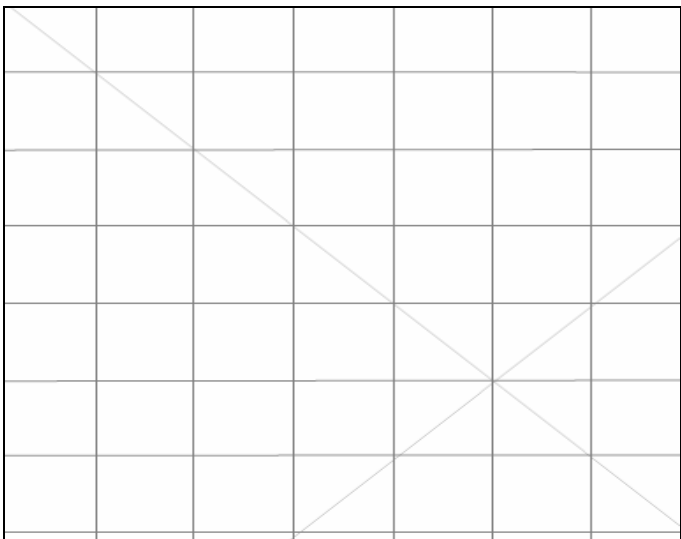
Description:



Description:



Description:

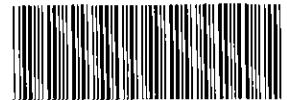


Description:

☒ New recording☐ Additional Info

National Parks and Wildlife Service

Box 1967, Hurville NSW 2220. Tel: (02) 585 8444

Standard Site Recording Form ~~Revised 12/92~~ Revised 12/92

04-2-0106

1:250,000 map sheet: TWEED HEADS SH 56-3 P. 4

NPWS Code

AMG Grid reference

Full references - please include leading digits

250K 250K
 555100 mE 6876370 mN
 25K 25K

Scale of map used for grid reference

☒ 25K, 50K ☐ 100K ☐ 250K
 Please use largest scale available (preferred)
1:25K, 50K, 100K map name: CUDGEN, 9641-3-N

HEAD OFFICE USE ONLY:

NPWS Site no: 4-2-0106

Site types:

Assessed by: _____ Date: _____

Data entered by: UK Date: 24/1/00Owner/Manager: NARUI GOLD COAST

Address: PO Box 1371
KINGSCLIFF
NSW 2487

Site name: KINGS FOREST 3 Locality/property name: KINGS FOREST, KINGSCLIFFNPWS District: LISMORE Region: NORTHEASTReason for investigation: ARCHAEOLOGICAL SURVEY IN SUPPORT OF A ZONING AND DA APPLICATION FOR A TWEED SHIRE COUNCIL.

Portion no:

Parish: CUDGEN CTY: RONS.Photos taken? YES IN REPORTHow many attached? NIL

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff).

(Draw diagram on separate sheet.) TAKE DEPOT ROAD OFF OLD BOGANGRA ROAD. PROCEED APPROX 400M TO GATE ON LEFT SIDE. THROUGH GATE FOLLOW SANDTRACK EAST UNTIL TRACK TURNS SOUTH.

Other sites in locality? YESAre sites in NPWS Register? YESSite Types include: Open Campsite, Midden Quarry, Ochre Source.Have artefacts been removed from site? No

By whom?

When? _____
Deposited where? _____Is site important to local Aborigines? YES

Give contact(s) name(s) + address(es)

MR CLARENCE PHILLIPS (Coordinator)
TWEED BYRON LALC
PO BOX 6160
SOUTH TWEED HEADS, NSW 2486

Contacted for this recording? YES

(Attach additional information separately if not, why not?)

Verbal/written reference sources (including full title of accompanying report)

NPWS Report

AN ARCHAEOLOGICAL ASSESSMENT AT THE KINGS FOREST DEVELOPMENT, KINGSCLIFF, NORTH COAST, NSW.

Checklist:

surface visibility,
 damage/disturbance/
 threat to site

Condition of site: SURFACE DISTURBANCE, DEPTH AND EXTENT UNCERTAIN. MAY CONTAIN IN SITU MATERIAL.

Recommendations for management & protection (attach separate sheet if necessary):

SITE REMAIN IN SITU. BUFFER 20M TO CONSTRUCTION 30-40M BE IMPLEMENTED. PROPONENT MAKE APPLICATION FOR PRELIMINARY RESEARCH PERMIT PRIOR TO ANY WORKS. SITE BE RETAINED. SKIPPED

Site recorded by: A. PIPERDate: 25.1.00Address/institution: (CONSULTANT ARCHAEOLOGIST)

54 THE QUARTERDECK
TWEED HEADS, NSW 2487

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form: a. beach/hill slope/ridge top, etc: *Sand Dune*.b. site aspect: *EASTERNLY & top of level*.

d. mark on diagram provided or on your own sketch the position of the site:

e. Describe briefly:



Pipi (highly fragmented) is visible in a riding trail on the crest of a dune bordering Cudger Creek on the west side

f. Local rock type: *GREYNACKE/BASALT*. g. Land use/affected: *FORESTRY PLANTATION*2. Distance from drinking water: *On site*. Source: *Swamp*.3. Resource Zone associated with site (estuarine, riverine, forest etc): *Estuarine creek/coastal*
& sand heath.4. Vegetation: *Mangrove, melaleuca forest, coastal heath*.5. Edible plants noted: *Bungwahl Fern*.6. Faunal resources (include shellfish): *Pipi, oyster, whelk, crustacea, mussels, murex, etc.*7. Other exploitable resources (river pebbles, ochre, etc): *Ochre, Greynacke*

Site type:

Hidden.

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

1x edge ground stone axe, greynacke material. Dimensions: 16.5cm x 6.5cm x 3.5cm. Blade edge: 4cm.

1x core/scrapper, chalcedony, 22mm x 20mm x 20mm. Retouch and use wear on bare margins. No cortex evident.

Fragments of ochre. 3-4 pieces. Colour: red.

1x hammerstone. Unspecified number of small smooth beach pebbles.

These materials are found closest to the stream which runs west-east through the site. Surface sands are grey. The deposit may have depth up to 5cm.

CHECKLIST TO HELP:
length, width, depth,
height of site, shelter,
deposit, structure,
element up, tree scar,
grooves in rock.

DEPOSIT: colour,
texture, estimated
depth, stratigraphy,
contents-shell, bone,
stone, charcoal, density
& distribution of these,
stone types, artefact
types.

ART: area of surface
decorated, motifs,
colours, wet, dry
pigment, technique of
engraving, no. of
figures, sizes,
pattern.

BURIALS: number &
condition of bone,
position, age, sex,
associated artefacts.

TREES: number, alive,
dead, likely age, scar
shape, position, size,
patterns, axe marks,
reproduction.

QUARRIES: rock type,
debit, recognisable
artefacts, percentage
quarried.

OTHER SITES EG.
structures (fish traps,
stone arrangements,
bone rings, mile miss),
mythological sites, rock
holes, engraved grooves
chert, correct sites
(intentional structures
cemetery) as
appropriate

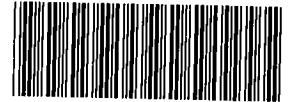
Attach sketches etc. eg. plan & section of shelter, show relation between site contents,
indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.



National Parks and Wildlife Service

Box 1967, Hurstville NSW 2220. Tel: (02) 585 6444

Standard Site Recording Form ~~Revised 12/92~~ Revised 12/92

04-2-0098

1:250,000 map sheet:

TWEED HEADS

NPWS Code

AMG Grid reference

Full reference - please include leading digits

250K

555150 mE

25K

5/6

250K

6870600 mN

25K

Scale of map used for grid reference

Please use largest scale available

[✓] 25K, 50K (preferred)

[] 100K

[] 250K

(125K, 50K, 100K map name: CUDGEN. 9641-3-N.2 mE)

HEAD OFFICE USE ONLY:

NPWS Site no: 4-2-18

Site types: open Camp Site

Accessioned by: R

Date: 3.8.98

Data entered by: L. Gony

Date: 22.3.97

Owner/Manager: CROWN LAND, TWEED SHIRE COUNCIL.

Address:

Site name: CUDGEN

Locality/property name: OLD BOGAN GARD, CUDGEN, NSW.

NPWS District: LISMORE

Region: NORTHERN.

Reason for investigation: ARCHAEOLOGICAL SURVEY in relation to realignment of OLD BOGAN GARD ROAD.

Portion no: PT 43.

Parish: CUDGEN

Photos taken?

How many attached?

How to get to the site (refer to permanent features, give best approach to site eg. from above, below, along cliff. (Draw diagram on separate sheet.)

FOLLOW OLD BOGAN GARD ROAD FROM CUDGEN VILLAGE, TO END OF INTERSECTION WITH DEPOT ROAD. SITE IS ON EASTERN SIDE OF INTERSECTION

Other sites in locality? YES.

Site Types include: QUARRY, OPEN, MIDDEN.

Are sites in NPWS Register? Not all registered.

Have artefacts been removed from site? Unknown when?

By whom?

Deposited where?

Is site important to local Aborigines? YES.

Give contact(s) name(s) + address(es) TWEED BYRON ABORIGINAL LAND COUNCIL PH. 066 743600.

Contacted for this recording? YES.

(Attach additional information separately) If not, why not?

Verbal/written reference sources (including full title of accompanying report)

A Preliminary Investigation of Aboriginal Sites in Kings Forest, Cudgen, N.S.W. 1989. A Nicholson and S. Clare.

NPWS Report Catalogue #

Checklist:
surface visibility,
damage/disturbance/
threat to site

Condition of site: severe disturbance, clearance, rubbish dumping. Visibility moderate.

Road realignment.

Recommendations for management & protection (attach separate sheet if necessary).

Site recorded by: R. PIPER

Date: 26.11.96.

Address/institution: 54 THE QUARTERDECK
TWEED HEADS.

SITE POSITION & ENVIRONMENT

OFFICE USE ONLY: NPWS site no:

1. Land form a. beach/hill slope/ridge top, etc: *remnant beach dune (inner barrier)*
- b. site aspect: *east.*
- c. slope: *level*
- d. mark on diagram provided or on your own sketch the position of the site:
- e. Describe briefly:



- f. Local rock type: *Basalt.*
- g. Land use/effect: *Road easement.*

2. Distance from drinking water: *50m from*
Approx 50m.
- Source: *WETLAND.*

3. Resource Zone associated with site (estuarine, riverine, forest etc): *Remnant barrier sand dune/wetland/subtropical rainforest.*

4. Vegetation: *Melaleuca forest, rainforest littoral or sub tropical*

5. Edible plants noted: *BUNGHAN FERN.*

6. Faunal resources (include shellfish): *BEACH SHELLFISH, PIP, COCKLE CRAB, FISH, SNAKE, MADAMELON, SCARF TURKEY, ECHIDNA etc.*

7. Other exploitable resources (river pebbles, ochre, etc): *OCNAG - OCNAG IN RED BASALT SOIL - CLUDGEN*

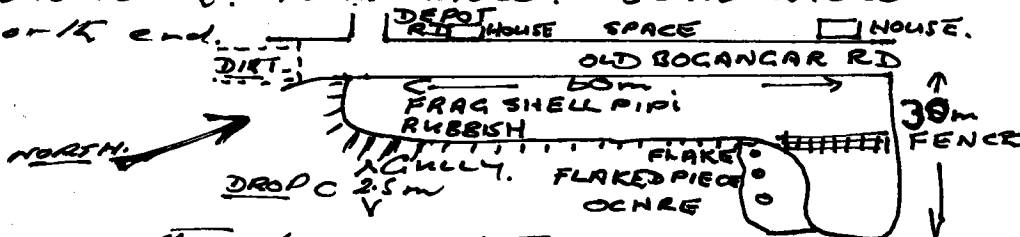
Site type:

OPEN SITE.

DESCRIPTION OF SITE & CONTENTS.

Note state of preservation of site & contents. Do NOT dig, disturb, damage site or contents.

Exposed eastern edge of dune bordering Cludgen Creek wetland. Area approx 60m north to south. 15m wide. 30m wide at north end.



Surface scatter low density pipi fragments with rock platform (curb) (1) some possibly may be introduced shell from houses across road. Artefactual material observed 26.11.96. 1 flaked piece, 1 ochre piece, 1 flake - Flakes on chertedony. Material reported in 1989 report - one broken edge ground axe, 1 backed blade, 1 flaked piece. Site in white to grey sand, no apparent depth to site. Artefactual material visible in north east corner of site through fence in horse paddock. Material in isolated form probably extends to north and along dune line bordering wetland. Artefactual material exposed by horses at drinking trough

CHECKLIST TO HELP:

length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of surface decorated, motifs, colours, wet, dry pigment, technique of engraving, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried.

OTHER SITES EG. structures (fish traps, stone arrangements, bora rings, mia mias), mythological sites, rock holes, engraved groove channels, contact sites (missions massacres cemeteries) as appropriate

Attach sketches etc, eg. plan & section of shelter, show relation between site contents, indicate north, show scale.

Attach annotated photos (stereo where useful) showing scale, particularly for art sites.