#10008690

Notice of Determination (NoD)

Part 5 of the Environmental Planning & Assessment Act 1979

Redevelopment of the Marayong Zone Substation, 2 Raymond Street, Blacktown (lots 240-243 & lots 280-283, DP7875).

This project has been approved pursuant to Part 5 Section 111 of the Environmental Planning and Assessment Act 1979 and has been determined as having no significant impact on the environment.

The works must be carried out in accordance with the attached conditions of approval and review of environmental factors.

Approved under delegated authority

Signed: .....

Name: Danny Asvestas

Title: Manager, Asset Standards and Design
Endeavour Energy

Date: 13 April 2018

Contents

General-Review of Environmental Factors and Determination Documents	1. Prior to any work commencing, the Endeavour Energy Project Manager and the principal contractor's Project Manager must familiarise themselves with this Notice of Determination (NoD) document for the redevelopment of the Marayong Zone Substation and associated feeder connection works. 2. The subject properties include lots 240-243 & lots 280-283, DP7875. 3. The development must be implemented in accordance with the conditions of approval made within this NoD and its attachments including; • approved plans for the redevelopment of the Marayong Zone Substation (Attachment 1) and Associated Feeder Relocation Design (Attachment 2). • the *Review of Environmental Factors Marayong Zone Substation Renewal, January 2018* (REF including its Annexures) (Attachment 3). 4. These conditions of approval as set out in this NoD prepared by Endeavour Energy must be implemented and complied with accordingly throughout the construction period and during operation of the ZS as applicable. 5. All conditions of approval as written in this NoD must be written into the Construction Environmental Management Plan/s (CEMP) for the works. 6. A copy of this NoD and any other pertinent certificates to be relied upon shall be available on site at all times during construction. 7. All workers including Endeavour Energy employees, contractors and sub-contractors are to be made aware of the conditions of this approval and the CEMP that has been developed for the works relevant to their respective activities.

Limits of Determination	8. This NoD approval shall lapse five years after the date on which it is granted, unless the works that are the subject of this approval are physically commenced on or before that time.

Buildings	9. All aspects of the building design shall comply with the applicable performance requirements of the Building Code of Australia so as to achieve and maintain acceptable standards of structural efficiency, safety (including fire safety) and health and amenity for the ongoing benefit of the community. 10. Any building roof within the development is to be a dull, non-reflective surface and colour.

Concept Design Plans	11. The works to redevelop the Marayong ZS must be constructed substantially in accordance with the approved plans. Certified concept plans are listed below and included as attachment in Appendix1 and Appendix A of the REF. • *508488; Cover Sheet; Brewster Murray Architects; February 2018* • *DA001 (F); Photomontage 1; 24/11/2017* • *DA002 (F); Existing View 1; 24/11/2017* • *DA003 (F); Photomontage 2; 24/11/2017* • *DA004 (F); Existing View 2; 24/11/2017* • *508489; Staging Plan 1 & 2; February 2018* • *508490; Staging Plan 3 & 4; February 2018* • *508491; Site Plan/Roof Plan; February 2018* • *508492; Basement Floor Plan; February 2018* • *508493; Ground Floor Plan; February 2018* • *508494; Transformer Bay Plan; February 2018* • *508495; Control Building Elevations; February 2018* • *508496; Control Building Elevations; February 2018* • *508497; Transformer Bay Elevations; February 2018* • *508498; Transformer Bay Elevations; February 2018* • *508499; Control Building Sections; February 2018* • *508500; Transformer Bay Elevations; February 2018* • *508501; Stair Details 1; February 2018* • *508502; Stair Details 2; February 2018* • *508503; Meals Room, WC & CL Plans, Elevations & Sections; February 2018* • *508504; Wall Details 1; February 2018* • *508505; Wall Details 2; February 2018* • *508506; Wall Details 3; February 2018* • *508507; Details 01; February 2018* • *508508; Details 02; February 2018* • *508509; Window, Louvre & Door Schedule; February 2018* • *508510; Door, Louvre, Shutter & Screen Details; February 2018* • *DA005 (F); Design and Character Statement;* • *DA006 (F); Locality Plan; Brewster Murray Architects; 24/11/2017* • *DA007 (F); Site Plan; Brewster Murray Architects; 24/11/2017* • *DA008 (F); Basement Plan; 24/11/2017* • *DA009 (F); Ground Floor Plan; 24/11/2017*

	• *DA110 (F); Roof Plan; 24/11/2017* • *DA111 (F); Building Elevations; 24/11/2017* • *DA112 (F); Street Elevations; 24/11/2017* • *DA113 (F); Sections; 24/11/2017* • *DA114 (F); Shadow Diagrams; 24/11/2017* • *DA115 (F); External Finishes* • *2853-1 (F); Landscape Plan* • *2853-2 (F); Landscape Plan* • *DA1.01; Cover Sheet, Drawing Schedule and Locality Plan; 18/10/2017* • *DA1.02; Specification Notes; 18/10/2017* • *DA1.03; Specification Notes; 18/10/2017* • *DA2.01; Concept Sediment and Erosion Control Plan; 18/10/2017* • *DA2.11; Sediment and Erosion Control Details; 18/10/2017* • *DA3.01; Siteworks and Stormwater Management Plan-Ground Level; 24/11/2017* • *13078-10367.01; Plan Showing Detail & Levels Marayong Zone Substation; Flegg and Isherwood P/L Consulting Surveyors; 26/06/2017* 12. Associated feeder connection and earthing works must be constructed substantially in accordance with the approved route plan listed below and included as Attachment 2. • *509384; Marayong Zone Substation (TS146) Marayong Zone Sub Renewal Cable Layout Plan 28/03/2018* 13. The Network Environmental Assessment section of Endeavour Energy must be notified where any variation or modification from the approved design is proposed during either the detail design or construction stages. Any such variations or modifications may require reassessment and re-notification, and an amendment or revision of this NoD including the Review of Environmental Factors.

Standards	1. All construction shall be carried out for this project in accordance with Endeavour Energy's Environmental Management Standards "*EMS 0001 Environmental Impact Assessment and Environmental Management Plans"* and *EMS 0007 Waste Management* and any other pertinent Endeavour Energy EMS, and the site specific CEMP developed in accordance with Endeavour Energys Environmental Guidelines Handbook that shall be developed by the principal construction contractor for this project. 2. The site specific CEMP must be review and approved by the Network Environmental Assessment section of Endeavour Energy prior to the commencement of works. 3. All aspects of the construction works shall also comply with any relevant Endeavour Energy Standards and or the relevant Australian Standard so as to achieve and maintain acceptable standards of structural efficiency, safety (including fire safety), and health and amenity for the ongoing benefit of the community.

Copies of Documentation	4. All relevant approved plans, specifications, a copy of this Notice of Determination and attached REF, the approved site specific CEMP and any other certificates/permits to be relied upon to carry out these works shall be available on site at all times during the entire period of the construction works.

Signage	5. Construction site contact detail signage must be displayed. One sign must be displayed at the Charles Street Marayong ZS site entrance and one at Corner of the Raymond and Charles Street in a position that can be easily read by pedestrian traffic. 6. The installation of these signs is the responsibility of the principle contactor and must include the following details: a. The name of the principal construction contractor engaged to carry out the construction works. b. The names and telephone contact details of the work site Project Managers for the principal construction contractor and Endeavour Energy. These should include contact numbers for both standard or normal work hours and out of hours /emergencies. c. That unauthorised entry to the work site is prohibited. 7. The above signage is to be installed prior to the commencement of any works and is to remain in place for the full term of the construction works onsite. 8. All construction signage shall be removed by the principle contractor at the completion of the construction works

Notification	9. All occupiers of land adjacent to the ZS site shall be notified in writing by the principle contractor of the intention to commence the substation construction and feeder connection works. 10. The Notification shall include information on when the construction works are to commence and the twenty four hour contact details of the project manager or other appropriate contact person in the event of any complaints. 11. This construction notification shall be delivered at least 14 days prior to works commencing but not more than 28 days prior to works commencing. 12. Additional notification shall be given where noise intensive works such as piling or similar is proposed. This additional notification shall be given by the principal contractor at least 7 days prior to but not more than 14 days prior to the noise intensive works being carried out. 13. Due to potential traffic management constraints for the carrying out of some works, e.g. the delivery of large materials or equipment such as transformers or cable installation along Raymond Street, Charles Street and Frederick Street, some works outside of the normal work hours, may be necessary; see *Noise Management* below.

Environmental Management	14. The relevant principal construction contractor/s must prepare a project site specific CEMP for their component of works, i.e. the construction of the Marayong Zone Substation project and/or the associated underground and overhead Feeder connection works and demolition of the existing Marayong Zone Substation. 15. The project site specific CEMP/s must include or address all conditions as listed in this NoD including the REF (Attachment 3). 16. The project site specific CEMPs must be provided to the Network Environmental Assessment section of Endeavour Energy for review and approval prior to any works commencing. 17. The CEMP/s are to be developed in accordance with: a. The Landcom publication; Managing Urban Stormwater; Soils and Construction 4th Edition, b. Endeavour Energy Environmental Management Standard *EMS 0001 Environmental Impact Assessment and Environmental Management Plans*, c. Endeavour Energy Environmental Management Standard *EMS 0007 Waste Management,* d. Any other relevant Endeavour Energy Standard(s), e. Any local, State and/or Federal laws, regulations and policies. 18. The Endeavour Energy Project Manager is responsible for ensuring that the construction site is managed in accordance with the conditions outlined in the CEMP and any Safety Management Plan prepared for the site.

Site Induction	19. An environmental site induction shall be carried out for all staff who will be working on the site prior to the commencement of any work on the project or site. 20. The project manager must ensure that as part of all site inductions, all persons entering or working on the Zone Substation property or the associated Feeder connection works are made aware of their environmental responsibilities and the environmental conditions of approval pertaining to the site and any surrounds. In addition to other requirements detailed herein, this must include access restrictions and protection measures that apply to the trees being retained on the Zone Substation property.

Dilapidation Assessment / Building Construction Reports	21. A pre-construction dilapidation assessment and report relating to the condition of any assets (e.g. Council footpaths and roadways, nearby or adjacent residences etc) in the vicinity of the zone substation site and feeder construction works route that may be potentially affected by the works must be obtained by the principle contractor/s prior to any project works commencing. 22. Any management recommendations made within the pre-construction dilapidation report must be employed when carrying out construction works so as to protect any assets identified within the pre-construction dilapidation report. 23. A post construction dilapidation assessment and report relating to the condition of those same assets identified within the pre-construction dilapidation report shall be obtained by the principle contractor/s immediately following the works. 24. Should damage have been identified to have occurred to any assets as of a result of the construction works that were not anticipated at the commencement of the works or not included within the pre-construction dilapidation report, then these assets should be included within the post construction dilapidation report.

Restoration	25. Any damage caused to non-Endeavour Energy assets, such as but not limited to roadways, footpaths, or other utilities' assets or residences during construction shall be restored immediately to at least a standard that facilitates safe and effective use or access for all users until the completion of the construction works. 26. At the completion of the construction works, any damage caused to non-Endeavour Energy assets as detailed above shall (if not already completed) be restored to at least the pre-construction standard as indicated by the pre-construction dilapidation assessment report. 27. Should it be agreed by Endeavour Energy that the damage or destruction of any item (including landscaping both hard or soft) has occurred on any property as a result of the construction works, but was unforeseen prior to those works commencing, and therefore not included in any dilapidation report or photographic documentation, then agreement should be reached in consultation with the property owner as to the original condition of the item and accordingly that item should then be restored to that condition at Endeavour Energy's expense unless otherwise agreed.

Heritage	28. All Aboriginal objects and places are protected under the *NSW National Parks and Wildlife Act 1974*. It is an offence to disturb an Aboriginal site without a consent permit issued by the Office of Environment and Heritage (OEH). Should any Aboriginal objects be encountered during works associated with this project, works must cease in the vicinity of the find and the OEH and Aboriginal stakeholders notified. Network Environmental Assessment shall be notified and a qualified archaeologist may also be required to assess the find. 29. Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must: a. Immediately cease all work at that location and do not further move or disturb the remains. b. Notify the NSW Police and OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location. c. Works must not recommence at that location unless authorised in writing by OEH. 30. It is the Endeavour Energy Project Manager's and the construction Project Manager's responsibility to advise all persons working on the site that knowingly disturbing or destroying an aboriginal object is an offence under the *National Parks & Wildlife Act 1974*. 31. Relics are historical archaeological resources of Local or State significance and are protected in NSW under the Heritage Act 1977. Relics cannot be disturbed except with a permit or exception notification. Should unanticipated relics be discovered during the course of the project, work in the vicinity must cease and an archaeologist contacted to make a preliminary assessment of the find. Network Environmental Assessment shall be notified. The Heritage Council will require notification if the find is assessed as a relic.

Landscaping	32. Landscaping of the Zone Substation property shall be carried out in accordance with the approved landscape plan. 33. Protective fencing shall be erected and secured surrounding the area of trees to be retained. 34. Appropriate tree protection measures shall be implemented in accordance with *Australian Standard AS4970—2009; Protection of trees on development sites* for all trees to be retained on the Zone Substation property. 35. Landscaping shall be maintained into the future in the manner in which it has been originally established. 36. Landscaping once installed shall be regularly maintained and watered for a minimum period of at least 6 months to ensure that it is well established. 37. Any dead or dying plants are to be replaced during this initial maintenance period. 38. Access to a water tap shall be provided within the area outside the security fenced area of the Zone Substation to ensure the regular watering of the installed landscaping.

Vegetation Management	39. The clearance distances between any vegetation and any conductors shall be in compliance with Endeavour Energy's Standard, *Clearances to be maintained between Network Assets and Vegetation - MMI 0013*. 40. All vegetation within the confines of the substation and as specified on the concept plans can be removed. 41. Prior to clearing existing vegetation, large trees shall be searched for hollows and nests. Where animals or birds and / or their nests are located, WIRES or an authorised wildlife carer shall be contacted to arrange for their removal and relocation.

Roads, Pedestrian and Vehicular Traffic and Access	42. A traffic management plan shall be developed by the Principal Construction Contractor/s that includes an appropriate suite of measures to ensure the safety of all road users, pedestrians and construction workers and which will also ensure the smooth operation of the road network surrounding the work site. 43. Any type of construction vehicles shall not be parked in a manner that precludes any pedestrian or motorist entering or leaving their premises. Entry to or exit from all properties shall remain accessible at all times unless prior agreement (written) has been reached with the property owners or occupiers. Copies of such documentation must be kept on site at all times. 44. Construction traffic should observe the speed limits along adjoining roads at all times. 45. Where possible all construction or passenger vehicles of any kind shall be parked on the construction site in a safe manner and location rather than in the street. 46. All vehicles, including passenger vehicles related to the construction works stopped or parked in the streets surrounding the work site shall be left in a safe manner that allows the safe and efficient use of those roadways by motorists or pedestrians. 47. Where vehicles servicing or making deliveries to the worksite/s are stopped or parked within the roadways near to the worksite/s, then appropriate traffic control measures must be in place to ensure a safe working environment pertaining to that delivery is maintained. 48. Access to any property that may potentially be restricted due to the construction works shall be determined in advance so that notification of restriction/s can be conveyed to the landowner and/or occupier in advance by the Project Manager. 49. All vehicles servicing or making deliveries to the worksite shall be parked on site. If this is not possible and the vehicle can only stop in the roadways, then the vehicle shall be moved immediately after it has offloaded its delivery and appropriate traffic control management shall be employed for the duration of time that the vehicle is parked on the roadway. 50. Notice must be given to Council and the NSW Roads and Maritime Service if necessary, and appropriate permits obtained where necessary if the temporary or partial closure of any traffic lane or road is required. This would include for example the delivery of major items of equipment such as transformers or where any transmission line works within roadways are required. 51. The appropriate roads authority shall be consulted with for any works in, on or over any public road in accordance with the Roads Act 1993. For any works affecting a "*Classified Road*", that road authority is the Roads and Maritime Service. Any conditions of consent imposed by the road authority or Roads and Maritime Service in relation to the implementation of the works affecting such roads must be complied with as part of the construction works. 52. Any damage to public roadways or footpaths that prevents normal use of these by local residents shall be restored as a priority to at least a level that provides for safe and temporary access for those residents until permanent restoration can be carried out. 53. Notification of damage to infrastructure such as roads or other assets must be provided to the appropriate authority,

	i.e. Council or NSW Roads and Maritime Service, in a reasonable time after the damage has been caused. 54. All vehicular footpath/nature strip crossings are to be constructed in accordance with Blacktown City Council's standard for commercial/industrial footpath/nature strip crossings. The project manager shall seek approval from Blacktown City Council for any such vehicle crossings and for any works within the road reserves required by the *Roads Act 1993.*

Storage	55. A fenced construction site and storage compound shall be established on Endeavour Energy's land adjacent to the substation. This construction compound is to utilise the existing cleared area only and shall not require further removal of any trees. All building, soil and construction materials, plant and other equipment or the like shall be placed or stored within the fenced construction compound. 56. No building, soil or construction materials, plant or other equipment or the like are to be placed or stored at any time on any land not owned by Endeavour Energy (including Council land, road reserve or private property) without the prior written consent of the appropriate landowner. Copies of such documentation must be kept on site at all times.

Fire Safety	57. "Fire extinguishing equipment" must be present on site and adequate for the task at hand. 58. A minimum of one person on site shall be familiar or trained in the use of fire-fighting equipment. 59. Works shall be carried out in accordance with GAM 0011 Work Performed During Bushfire Danger Period and Endeavour Energy Network Management Plan Bushfire Risk Management December 2013 Review.

Erosion and Sediment Control	60. The Construction Environmental Management Plan shall include an Erosion and Sediment Control Plan which shall be developed in accordance with the Landcom publication, *Managing Urban Stormwater; Soils and Construction 4th Edition* and the REF (Attachment 3). 61. No works are to commence on site until after the appropriate sediment controls have been established in accordance with the approved Erosion and Sediment Control Plan. 62. The Principal Construction Contractor shall ensure that all erosion and sediment control measures are maintained in an effective manner throughout the construction phase of the development until the land that was subject to the erosion has been stabilized or where such a surface's ultimate finish has been installed. 63. The Principal Construction Contractor shall ensure that additional erosion and sediment controls are at their cost installed and maintained where necessary or where the existing erosion and sediment controls are identified by Endeavour Energy as being inadequate. 64. Any soil erosion controls employed during construction are to be removed by the Principal Construction Contractor at the completion of the site works or when any disturbed ground has stabilised. 65. The documented erosion and sediment control plan shall be available on-site for inspection at all times. Any additional sediment control measures employed subsequent to the development of the original erosion and sediment control plan shall be shown marked or noted on the original plan. 66. The works or the development must not temporarily or otherwise impede or divert natural surface water runoff so as to cause a nuisance to properties in the vicinity of the site or elsewhere. 67. Soil stockpiles remaining in situ for more than a single day are to be adequately protected with sediment control fencing or adequately covered with a tarpaulin or similar to prevent soil being washed from the stockpile into the stormwater system, drains or onto any adjoining property, including public roads, footpaths and watercourses. 68. Every effort should be made to store any stockpiles of soil or other materials as far away as possible from any watercourse or drain. 69. Care must be taken by the Principal Construction Contractor and all sub-contractors to ensure that soil is not tracked along any nearby roadways from the construction site/s. Any tracked soil must be properly swept up or cleared from the road pavement by the end of each day's work.

Drainage	70. The disposal of stormwater from the site shall be in accordance with the approved plan; see *Concept Design Plans* above. 71. Drainage from the development site must comply with the provisions of the *Protection of the Environment Operations Act 1997* so as not cause water pollution as defined by this Act. 72. The development shall not impede or divert natural surface water runoff so as to cause a nuisance to adjoining properties.

Utilities and Services	73. A Dial Before You Dig (DBYD) search of the Zone Substation site, surrounding streets and Endeavour Energy owned land shall be carried out to determine the location of all utilities before construction commences.

Waste Management	74. The successful contractor/s must prepare a construction waste management plan to be submitted to Endeavour Energy prior to work commencing. This plan should be incorporated within the CEMP for the development works. 75. All waste generated is to be managed in accordance with Endeavour Energy's Environmental Management Standard EMS0007 – *Waste Management*. All waste materials including waste soil stored on-site must be contained in a designated area or by appropriate means to ensure that these waste materials are not allowed to enter the stormwater system, neighboring properties or public roads. 76. The name and address of the waste disposal facility where waste materials will be disposed of shall be supplied to the Project Manager. The relevant contractor will provide supporting documentation (dockets / receipts) to the Endeavour Project Manager who shall provide the receipts on request. 77. Excavated spoil is to be classified prior to disposal and/or reuse. Where excavated spoil is suspected to be contaminated, works will immediately cease and the Project Manager and Health Safety Environment (HS & E) notified. Suspected contaminated spoil will be chemically tested to provide a waste classification for disposal. Spoil may be suspected of being contaminated if it: • has an odour • is discoloured or stained • contains asbestos materials / fragments • contains buried materials such as drums, underground storage tanks etc. • presence of ash or slag 78. It should be noted that if Virgin Excavated Natural Material (VENM) is to be disposed of at a site other than a licensed facility, a copy of the authorization which allows the acceptance of VENM (i.e. an approved Development Application) is to be provided to the Project Manager prior to material being sent off site. 79. No rubbish or disused packaging or other litter including food wrappings, drink bottles or cans shall be left on site at the completion of the works.

EMF	80. Electro Magnetic Field emission levels at the boundary of the substation must not exceed the recognised exposure limit of 2000 milligaus (mG). 81. Electro Magnetic Field emission levels from the underground feeder must not exceed the recognised exposure limit of 2000 milligaus (mG).

Noise Management	82. Any noise generated during the development construction shall not exceed the limits specified in the Protection of the Environment Operations Act 1997. 83. The hours of work for any noise generating construction associated with the development are to be limited to between 7am and 6pm, Mondays to Fridays inclusive, 8am to 1pm Saturdays, with no construction activities to be undertaken outside of these standard hours including on Sundays or public holidays without approval (see below). 84. Due to some traffic management constraints for the carrying out of some works, e.g. the delivery of large materials or equipment such as transformers or transmission line installation along subject roads, some works outside of the normal work hours as specified above, cannot be avoided. 85. Notice of the intention to undertake out of hours works including the justification for such works shall be provided to the Network Environmental Assessment section at least seven days prior to the works commencing and prior to any notification being given to other stakeholders. Appropriate advice will be provided in relation to any additional notification that may be necessary. 86. Noise from the operation of the substation shall comply with the NSW Industrial Noise Policy. Once commissioned, a noise compliance report may be prepared to ensure that noise from the substation is operating in accordance with this Policy. 87. Should power generators be required during any stage of the construction works, the Project Manager is to liaise with Network Environmental Assessment so that additional noise studies can be obtained as considered necessary. 88. Should any substantial variations in the placement of the transformers be considered, the matter is to be referred back to the Network Environmental Assessment section for possible reassessment before such variations can proceed.

Soils and Contamination	89. A contaminated site remediation action plan (RAP) must be developed prior to demolition of old Zone substation works commencing, such that the RAP can be appropriately implemented and associated de-contamination validation/s obtained as and when required. 90. The known site contamination includes; a. asbestos containing materials (ACM) at ground floor, exterior and interior building, yard ,Telstra pit and sub backing board b. lead containing paint and lead containing dust at basement floor, substation building and celling, and c. hazardous materials in existing building structures that must be demolished. 91. Any asbestos containing soil will be classified and disposed of at an appropriately licensed waste facility. All asbestos is to be managed in accordance with Endeavour Energy's Procedure GSY1065. 92. Where acid sulphate soils are encountered, these shall be managed in accordance with Endeavour Energy's *EMS0013- Spoil Management*.

Air Quality	93. Appropriate and effective dust suppression techniques shall be employed as necessary. These may include covering stockpiles, dampening down of the site if dry and windy conditions prevail and the site contains large areas of exposed soils, mulching of any disturbed surfaces or restricting vehicle movements to established access tracks or routes where possible.

Site Illumination	94. Illumination of the site is to be arranged in accordance with the requirements of Australian Standard AS4282 1997 so as not to impact upon the amenity of the occupants of adjoining and nearby residential premises.

Temporary Security Fencing	95. Before the commencement of works on site, a temporary construction fence must be established around the site. 96. All security fencing must be carried out in accordance with the approved plans and Endeavour Energy's SDI524.

Environmental Incidents	97. Environmental risks/incident shall be managed and reported in accordance with Endeavour Energy's Environmental Guidelines Handbook and EMS008- Environmental Incident Response and Management. 98. Spill kits shall be available at the worksite. 99. All accidents and emergencies must be reported by calling Endeavour Energy's Call Centre 131 003.

Attachment 1
Approved concept design plans prepared for tender for the Marayong Zone Substation dated February 2018

MARAYONG ZONE SUBSTATION

D.P. 7875

Corner of Raymond St and Charles St, Blacktown NSW

FEBRUARY 2018

Endeavour Energy

ABBREVIATIONS
GENERAL

CROSS REFER TO FINISHES SCHEDULE FOR DETAIL

110B	110mm BRICKWORK
110B1, 2, ETC	110mm BRICKWORK TYPE 1, 2 ETC
190BLK	190mm REINFORCED BLOCKWORK FR2,3
150STD...ETC	150mm STEEL STUD WALL
A/C	AIR CONDITIONER
AC	ACCESS COVER
AL	ALUMINIUM
AH	ACCESS HATCH
AF	APPLIED FINISH
ARCH	ARCHITECTURAL
AUX TX	AUXILIARY TRANSFORMER
B	BASIN
B/W	BETWEEN
BAL-A, B, ETC	BALUSTRADE TYPE A, B, ETC
BDY	BOUNDARY
BJ	BUILDING JOINT
BL	BLOCKWORK
BOL	BOLLARD
BS	BOOT SCRAPER
CAP	CAPACITY BANK
C/C	CENTRE TO CENTRE
CC	CLOSED CIRCUIT SECURITY CAMERA POLE 4m
CCTV	CLOSED CIRCUIT TELEVISION FIXED CAMERA
CB	COLORBOND
CCP	CONTROL CABLE PITT
CFC	COMPRESSED FIBRE CEMENT
CFT	CERAMIC FLOOR TILES
CJ	CONTROL JOINT
CL	CENTRE LINE
CR	CEMENT RENDER
CST	COVED SKIRTING TILES
CWT	CERAMIC WALL TILES
DCELL	DRAINAGE CELL
DGPO	DOUBLE GENERAL PURPOSE OUTLET
DLOG	DRAINAGE LOG
DO	DRAIN OUTLET
DP	DOWN PIPE
DPC	DAMPPROOF COURSE
DPM	DAMPPROOF MEMBRANE
DS	DELUGE SHOWER
EE	ENDEAVOUR ENERGY
EDB	ELECTRICAL DISTRIBUTION BOARD
EJ	EXPRESSED JOINTS
ENG.	ENGINEER
EPO	EPOXY COATING
EQ	EQUAL
ERL	EXISTING REDUCED LEVEL
FB-1,2,3, ETC	FACE BRICKWORK TYPE 1, 2, 3 ETC
FC	FIBRE CEMENT
FDA	FIRE DAMPER
FE	FIRE EXTINGUISHER
FF	FLOOR FINISH
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FIP	FIRE INDICATOR PANEL
FJ1,2	FEATURE JOINT
FL	FLOOR LEVEL
FR2,3	FIRE RATING 2, 3 HOURS
FRL60/60/60 ETC	FIRE RATED 60/60/60 ETC
FSL	FINISHED STRUCTURAL LEVEL
FT1, 2,ETC	FLOOR TILE TYPE 1, 2
FW	FLOOR WASTE
GALV	GALVANISED
GB	GLASS BLOCKWORK
GPO	GENERAL PURPOSE OUTLET
GTD	GRATED TRENCH DRAIN (HEAVY DUTY)
GMS	GALVANISED MILD STEEL
HC	HOSE COCK
HD	HOT DIPPED
HT	HOSE TAP
HV	HIGH VOLTAGE
HWU	HOT WATER UNIT
HY	HYDRANT
HYD	HYDRAULIC
INS	INSULATION
ISOL. TX	ISOLATING TRANSFORMER
JP	JUNCTION PIT
KOR 60	KORODUR TOPPING (60MM)
LA	LEVELING ANGLE
LAD	LADDER
LP	LIGHT POLE
LCJ	LINTEL CONTROL JOINT
LS	LEVELING STRIP (WHICH IS AN ALUMINUM ANGLE)
LV	LOW VOLTAGE
LVR01, 2, ETC	LOUVRE 1, 2 ETC
MC1, 2	METAL CLADDING TYPE 1, 2
MD	METAL DECK ROOFING - COLORBOND
MDF	MEDIUM DENSITY FIBREBOARD
MECH	MECHANICAL
MEMEPO	MEMBRANE/EPOXY
MR	MIRROR
MS	MILD STEEL
MX	MIXER TAP
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NO	NUMBER
NOSING TF	NOSING TROWEL FINISH
NSG	NON SLIP GRAINS
NTS	NOT TO SCALE
O/A	OVERALL
O/O	OUT OF
OF	OVERFLOW
OFC	OFF FORM CONCRETE
OSD	ONSITE DETENTION TANK
P1, 2, ETC	PAINT TYPE 1,2,ETC
PAV	PAVING COATING
PB	PLASTERBOARD
PBF	PLASTERBOARD FIRE RATED
PC1	POWDERCOATED FINISH TYPE 1
PE	POLYETHYLENE
PFC	PARALLEL FLANGE CHANNEL
PJ	POUR JOINT
PR	PULLING RINGS
PRC	PRECAST CONCRETE
PRD	PRESSURE RELIEF DAMPER
PTD	PAPER TOWEL DISPENSER
PVC	POLYVINYL CHLORIDE
R	RISER
R1, 2...ETC	RAFTERS (STEEL)
RA	ROOF ANCHOR
RC	REINFORCED CONCRETE
REM	REMOVABLE
RF1,2,ETC	ROOF FAN
RL	REDUCED LEVEL
RPR1,2,ETC	ROOF PRESSURE RELIEF
RSD	ROLLER SHUTTER DOOR
RT1,2,ETC	ROOF TURBINE
RV1,2	ROOF VENT
RWO	RAIN WATER OUTLET
SA	SECURITY ARMING BOLLARD
SB	SWITCHBOARD
SC1, 2, 3..ETC	STEEL COLUMN TYPE 1, 2, 3...ETC
SE	SAWCUT EDGE (PRIOR TO TOPPING)
SEW	SEWER DRAIN
SEAL	SEALER
SF	STREAMLINE FILTER CUBICLE
SHS	SQUARE HOLLOW SECTION
SIM	SIMILAR
SJ	SEALANT JOINT
SP	SECURITY PITT
SPEC	SPECIFICATION
SS	STAINLESS STEEL
ST	STEP (THRESHOLD)
STC	STEEL TROWEL CONCRETE
STF/S	STEEL FLOATED FINISH FOR SEALER
STRUC	STRUCTURAL
SU	DRY SUMP
SW	STORMWATER PITT
T	CLEANERS TUB
TBA	TO BE ADVISED
TC1, 2, 3, 4...ETC	TRANSFORMER COLUMN TYPE 1, 2, 3, 4...ETC
TOP60, 100, ETC	TOPPING THICKNESS
TOB	TOP OF BUNDING
TPH	TOILET PAPER HOLDER
TPF	TRENCH PLATE FLOORING
TYP	TYPICAL
UB	UNIVERSAL BEAM
UIS	UNDERSIDE
VB	VAPOUR BARRIER
VM	VERMIN MESH
VOS	VERIFY ON SITE
W/	WITH
WBA	WASTE BASKET
WC	WATER CLOSET
WC1	WALL CLADDING TYPE 1 - COLORBOND MINI ORB
WC2	WALL CLADDING TYPE 2 - TERRACLAD TERRACOTTA
WF	WOOD FLOATED FINISH
WFC	WOOD FLOAT CONCRETE
WH	WEEP HOLES
WM	WATER METER
WPM1,2	WATER PROOF MEMBRANE TYPE 1, 2
WT1,2	WALL TILE TYPE 1,2
WSC1, 2..ETC	WALL STIFFENER COLUMNS TYPE 1,2..ETC

ARCHITECTURAL DRAWING LIST

DWG NO.	DRAWING TITLE
508488	COVER SHEET
508489	STAGING PLAN 1 & 2
508490	STAGING PLAN 3 & 4
508491	SITE PLAN / ROOF PLAN
508492	BASEMENT FLOOR PLAN
508493	GROUND FLOOR PLAN
508494	TRANSFORMER BAY PLAN
508495	CONTROL BUILDING ELEVATIONS
508496	CONTROL BUILDING ELEVATIONS
508497	TRANSFORMER BAY ELEVATIONS
508498	TRANSFORMER BAY ELEVATIONS
508499	CONTROL BUILDING SECTIONS
508500	TRANSFORMER BAY SECTIONS
508501	STAIR DETAILS 1
508502	STAIR DETAILS 2
508503	MEALS ROOM, WC & CL PLANS, ELEVATIONS & SECTIONS
508504	WALL DETAILS 1
508505	WALL DETAILS 2
508506	WALL DETAILS 3
508507	DETAILS 01
508508	DETAILS 02
508509	WINDOW, LOUVRE & DOOR SCHEDULE
508510	DOOR, LOUVRE, SHUTTER & SCREEN DETAILS

STRUCTURAL DRAWING LIST

DWG NO.	DRAWING TITLE
508513	COVER SHEET & DRAWING LIST
508514	SPECIFICATION NOTES SHEET 1
508515	SPECIFICATION NOTES SHEET 2
508516	SPECIFICATION NOTES SHEET 3
508517	FOOTING & BASEMENT PLAN AND DETAILS
508518	GROUND SLAB GENERAL ARRANGEMENT PLAN AND DETAILS
508519	GROUND SLAB TOP AND BOTTOM REINFORCEMENT PLANS
508520	CONCRETE SECTIONS AND DETAILS SHEET 1
508521	CONCRETE SECTIONS AND DETAILS SHEET 2
508522	CONCRETE SECTIONS AND DETAILS SHEET 3
508523	ROOF FRAMING PLANS
508524	STEEL WORK FRAMING ELEVATIONS
508525	STEEL WORK FRAMING SECTIONS AND DETAILS SHEET 1
508526	STEEL WORK FRAMING SECTIONS AND DETAILS SHEET 2
508527	STEEL WORK FRAMING DETAILS
508528	EXTERNAL PAVING PLAN
508529	EXTERNAL DETAILS
508530	OSD TANK PLANS
508531	OSD TANK SECTIONS AND DETAILS
508532	TRANSFORMER 1 FOOTING PLAN AND DETAILS
508533	TRANSFORMER 1 SLAB PLAN AND DETAILS
508534	TRANSFORMER 2 FOOTING PLAN AND DETAILS
508535	TRANSFORMER 2 SLAB PLAN AND DETAILS
508536	TRANSFORMER 3 FOOTING PLAN AND DETAILS
508537	TRANSFORMER 3 SLAB PLAN AND DETAILS
508538	TRANSFORMER DETAILS SHEET 1
508539	TRANSFORMER DETAILS SHEET 2
508540	TRANSFORMER DETAILS SHEET 3

CIVIL DRAWING LIST

DWG NO.	DRAWING TITLE
508543	COVERSHEET, DRAWING SCHEDULE AND LOCALITY PLAN
508544	SPECIFICATION NOTES
508545	CONCEPT SEDIMENT AND EROSION CONTROL PLAN
508546	SEDIMENT AND EROSION CONTROL DETAILS
508547	BULK EARTHWORKS PLAN
508548	BULK EARTHWORKS SECTION SHEET 1 OF 2
508549	BULK EARTHWORKS SECTION SHEET 2 OF 2
508550	SITEWORKS AND STORMWATER MANAGEMENT PLAN -GL
508551	SITEWORKS AND STORMWATER MANAGEMENT PLAN - BL
508552	STORMWATER LONGITUDINAL SECTIONS - SHEET 1 OF 2
508553	STORMWATER LONGITUDINAL SECTIONS - SHEET 2 OF 2
508554	OSD DETAILS SHEET 1 OF 2
508555	OSD DETAILS SHEET 2 OF 2
508556	CIVIL DETAILS SHEET 1 OF 2
508557	CIVIL DETAILS SHEET 2 OF 2
508558	CATCHMENT PLAN

MECHANICAL DRAWING LIST

DWG NO.	DRAWING TITLE
508559	COVER SHEET
508560	LEGENDS, NOTES, & SCHEDULES
508561	GROUND FLOOR PLAN
508562	SECTIONS AND DETAILS SHEET

HYDRAULIC DRAWING LIST

DWG NO.	DRAWING TITLE
508564	COVER SHEET
508565	LEGEND & NOTES
508566	SITE PLAN
508567	CONTROL BUILDING DRAINAGE LAYOUT
508568	BASEMENT PRESSURE LAYOUT
508569	CONTROL BUILDING PRESSURE LAYOUT
508570	ROOF PLAN

SURVEY DRAWING LIST

DWG NO.	DRAWING TITLE
13078-10367.01	SURVEY PLAN

LANDSCAPE DRAWING LIST

DWG NO.	DRAWING TITLE
2853-1	LANDSCAPE PLAN
2853-2	LANDSCAPE PLAN

ENDEAVOUR ENERGY DRAWING LIST

DWG NO.	DRAWING TITLE
508585	CONTROL BUILDING GROUND FLOOR EQUIPMENT SETOUT PLAN
508586	CONTROL BUILDING GROUND FLOOR SLAB SETOUT PLAN, SECTIONS AND DETAILS
508587	CONTROL BUILDING BASEMENT WALL ELEVATIONS AND CONDUIT ARRANGEMENTS
508588	CONDUIT LAYOUT PLAN
508589	CONTROL CABLE & SECURITY CONDUIT TRENCH PROFILES
508590	TYPICAL BACKFILLING DETAILS FOR DISTRIBUTION FEEDER & TRANSFORMER CABLE CONDUIT TRENCH PROFILES
508591	CABLE TRAY FOR CONTROL, POWER & COMMS CABLE LAYOUT AND DETAILS
508592	CONTROL BUILDING BASEMENT CABLE LADDER BRACKET DETAILS
508593	CONTROL BUILDING 11KV SWITCHGEAR BASEMENT CABLE SUPPORTS ARRANGEMENT AND DETAILS - PAGE 1
508594	CONTROL BUILDING 11KV SWITCHGEAR BASEMENT CABLE SUPPORTS ARRANGEMENT AND DETAILS - PAGE 2

ENDEAVOUR ENERGY SECURITY DRAWING LIST

DWG NO.	DRAWING TITLE
508999	SECURITY LAYOUT PLAN

ENDEAVOUR ENERGY LIGHTING & POWER DRAWING LIST

DWG NO.	DRAWING TITLE
507832	SWITCHYARD AND TRANSFORMER LIGHT & POWER LAYOUT
SHEET 1 OF 7	LIGHT AND POWER DRAWING COVERSHEET
SHEET 2 OF 7	LEGEND LIGHT AND POWER
SHEET 3 OF 7	DISTRIBUTION CIRCUIT LIGHT AND POWER
SHEET 4 OF 7	CONTROL BUILDING LIGHT LAYOUT
SHEET 5 OF 7	CONTROL BUILDING POWER LAYOUT
SHEET 6 OF 7	BASEMENT LIGHT AND POWER LAYOUT
SHEET 7 OF 7	SWITCHYARD AND TRANSFORMER LIGHT AND POWER LAYOUT

ENDEAVOUR ENERGY EARTHING & LIGHTING PROTECTION DRAWING LIST

DWG NO.	DRAWING TITLE
509353	EARTH GRID LAYOUT
509356	SWITCHROOM EMBEDDED EARTHING LAYOUT
509357	TRANSFORMER BUNDS EMBEDDED EARTHING LAYOUT
509358	GENERAL EARTHING LAYOUT
509360	EMBEDDED EARTHING DETAILS

ENDEAVOUR ENERGY REFERENCED DRAWING LIST

DWG NO.	DRAWING TITLE
351323	BOOTSCRAPER DETAILS
379753 SHEET 1-3	11kV SWITCHROOM FLOOR FINISHES
351320	BASEMENT CABLE PULLING RING
053439	TRANSFORMER CABLE SUPPORT STAND-ANCHOR BOLTS
351317	TEA/MEALS ROOM STANDARD SINKBENCH
351318	TOILET AND CLEANERS AREA STANDARD DETAILS
EE STANDARD DELUGE SHOWER DETAILS	
052458	VALVE SIGN DETAIL
058204	DELUGE SHOWER MOUNTED UPON PLAIN WALL TYPE B DETAILS
299654	WALL MOUNTED SIGN DETAILS
EE STANDARD ISOLATED PAD, FOOTING, AND PIT DETAILS	
308820	315/500KVA PAD MOUNTED AUXILIARY TRANSFORMER FOOTING DETAIL
365024	ISOLATING TRANSFORMER (2 CONDUITS) FOOTING DETAIL
343988	STREAMLINE FILTER CONCRETE PAD DETAIL
284674	CAPACITOR BANK REINFORCED CONCRETE STIFFENED BASE SLAB
404837	CONTROL CABLE PIT
404972	STORMWATER PIT
	SECURITY PIT - 600X300MM PRECAST CONCRETE PIT
351321	BASEMENT SUB-SOIL STORMWATER PUMPOUT PIT
FOR FIRE EXTINGUISHERS ARRANGEMENT	
366067	TYPICAL ARRANGEMENT OF PORTABLE FIRE EXTINGUISHERS AND RELATED SIGNAGE
FOR 11KV SWITCHROOM FLOOR FINISH STAGING PLAN	
379753	SWITCHROOM FLOOR FINISHED STAGING PLAN SHEET 1 - 3
FOR TYPICAL SUBSTATION SIGNAGE	
3660711	STANDARD DETAIL FOR SUBSTATION SIGNAGE –SHEET 1
3660712	STANDARD DETAIL FOR SUBSTATION SIGNAGE –SHEET 2
SDI 528	SUBSTATION DESIGN INSTRUCTION-SUBSTATION SIGNS AND EQUIPMENT LABELS
EE STANDARD LIGHTING AND SECURITY STANDARD DETAILS	
AUS-376-08-R0	4 M OCTAGONAL POST TOP COLUMN FOR SECURITY
343004	SECURITY CAMERA MOUNTING STEEL POLE M16 @ 195 X 195 CTRS FOOTING DETAIL
503665	SECURITY CARD READER
397882	SQUARE SECURITY BOLLARD DETAIL
507087	ROUND BOLLARD CONCRETE FILLED DETAILS
040071	GROUT DETAIL
AUS 2656-13-D0-R0	3.5M OCTAGONAL LIGHT POLE
379143	3.5M LIGHT POLE MOUNTING M20 @ 220X220 CTRS FOOTING DETAIL
FOR EARTHING OF CONCRETE REINFORCEMENT DETAILS	
384620	SUBSTATION MISCELLANEOUS EQUIPMENT EARTHING DETAIL
385809	SUBSTATION SECURITY FENCE – GATE AND GENERAL EARTHING DETAILS
FOR MISCELLANEOUS FENCE DETAILS	
291608	MOWING STRIP AND GATE BEAM DETAILS
EE STANDARD PALISADE TYPE FENCE & GATES DETAILS	
366070	PALISADE TYPE FENCE & GATES DETAILS
501943	WATER METER ENCLOSURE

AMENDMENTS

1	PRELIMINARY FOR INFORMATION	Date	15/01/2018	2	95% PRELIMINARY ISSUE	Date	24/01/2018	3	ISSUE FOR TENDER	Date	23/02/2018		Date		Date
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FOR TENDER

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ORIGINAL SCALE NTS @ A1

APPROVED

DESIGNED	MB	CH'D	SC
DRAWN	BM		
DATE	FEB.18		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

AUTHORISED

M.BULLEN - DIRECTOR

Marayong Zone Substation

Corner of Raymond St and Charles St, Blacktown

COVER SHEET

A1 | 508488 | Rev. 3

SHEET No **1** OF **23** SHEETS

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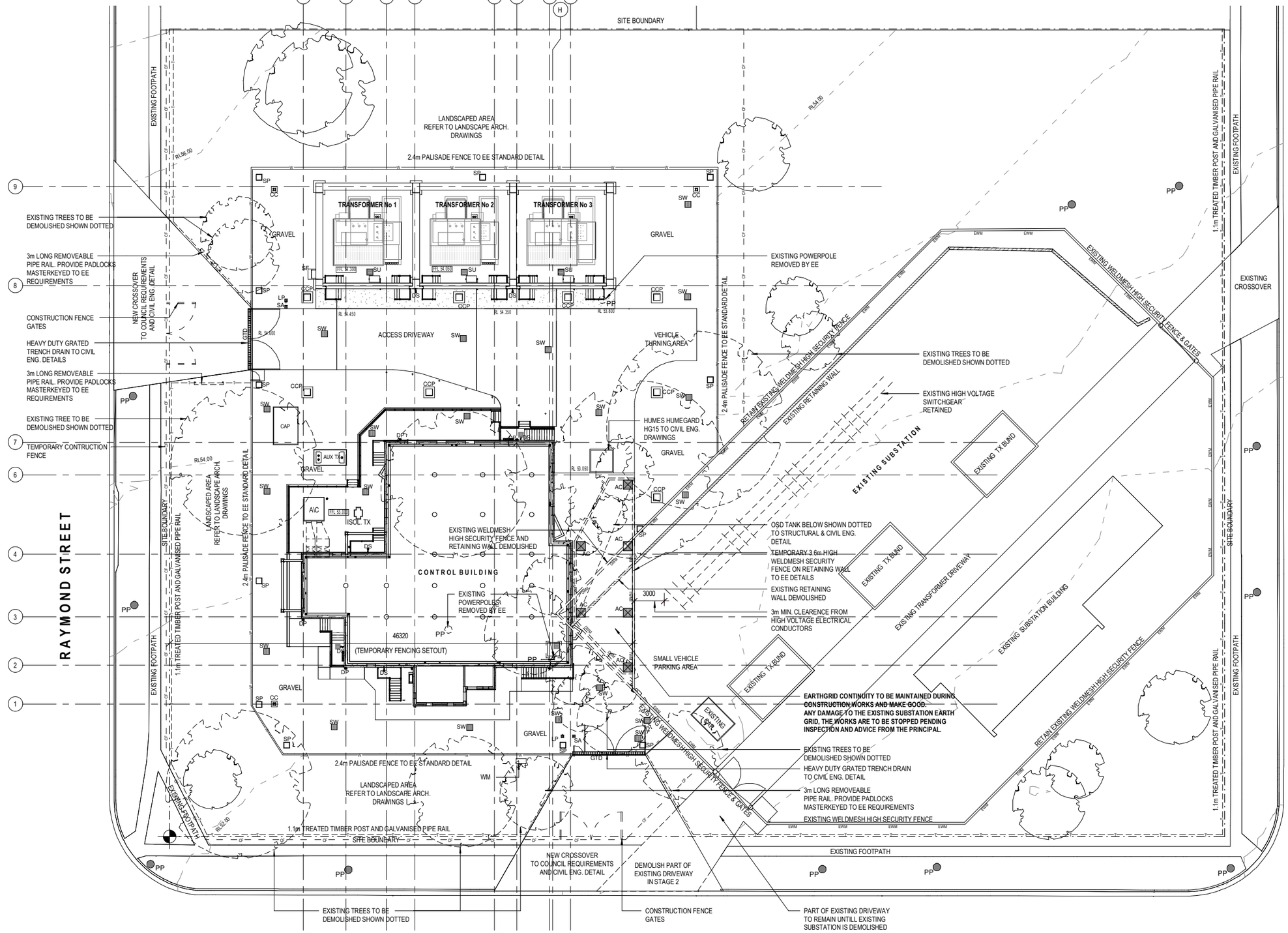
NOTE: EXISTING SUBSTATION SECURITY TO BE MAINTAINED FOR DURATION OF DEMOLITION AND CONSTRUCTION WORKS



1 STAGING PLAN 1 & 2
1 : 200

LEGEND

- SITE BOUNDARY
- 1.1m TREATED TIMBER POST & GALVANISED PIPE RAIL ON SITE BOUNDARY
- 2.4m PALISADE FENCE TO EE DRAWING 366070
- TEMPORARY CONSTRUCTION FENCE -SHOWN INDICATIVE
- TREES RETAINED
- TREES DEMOLISHED
- CC — SECURITY CAMERA POLE 4m AND FOOTING BY CONTRACTOR REFER TO EE STANDARD DRAWING AUS-376-08-R0 AND 343004
- CCP — CONTROL CABLE PIT BY CONTRACTOR -REFER TO DRAWING 404837
- AC — OSD ACCESS COVER BY CONTRACTOR -REFER TO TO CIVIL ENG. DRAWINGS 508550 508554 AND 508555
- SP — SECURITY PIT BY CONTRACTOR -REFER TO EE STANDARD DRAWINGS
- SU — DRY SUMP IN TX BAYS -REFER TO CIVIL ENG. AND EE STANDARD DRAWINGS
- SW — STORMWATER PIT -REFER TO TO CIVIL ENG. DRAWING 404972
- LP — OCTAGONAL LIGHT POLE 3.5m AND FOOTING BY CONTRACTOR REFER TO EE DRAWING NO AUS 2656-13-D0-R0 AND 379143
- SA — SECURITY ARMING BOLLARD FOR SWIPE CARDS BY CONTRACTOR REFER TO DRAWING NO 503665
- PP — POWERPOLE (EXISTING)
- PP — EXISTING POWERPOLE REMOVED -TO BE REMOVED BY EE
- FFL 51.675 — PROPOSED FINISH FLOOR LEVELS
- RL34.50 — EXISTING CONTOUR LEVELS
- RL 51.675 — PROPOSED LEVELS
- A/C — AIR CONDITIONING UNIT TO MECHANICAL ENG. DETAILS (CONTRACTOR TO ALLOW TO BOLT FIX TO CONCRETE PLINTH
- AUX. TX — AUXILIARY TRANSFORMER (EE TO PROVIDE TO SITE, CONTRACTOR TO PROVIDE CONCRETE FOOTING TO EE STANDARD DETAIL DRAWING No. 306820
- CAP — CAPACITOR BANK (CONTRACTOR TO RELOCATE AND PROVIDE CONCRETE FOOTING TO EE STANDARD DETAIL DRAWING No. 284674
- DP — DOWN PIPE TO HYDRAULIC ENG. DETAIL
- DS — DELUGE SHOWERS - REFER TO EE STANDARD DRAWING No. 058204 AND HYDRAULIC ENG. DRAWINGS
- GTD — GRATED TRENCH DRAIN (HEAVY DUTY) TO CIVIL ENG. DETAILS
- ISOL. TX — ISOLATING TRANSFORMER (CONTRACTOR TO PICKUP FROM EE STORAGE. CONTRACTOR TO PROVIDE CONCRETE FOOTING - REFER TO DRAWING No. 365024
- SF — STREAMLINE FILTER SUPPLY CUBICLE PROVIDED BY EE FOOTING BY CONTRACTOR -REFER TO DRAWINGS 343988
- WM — WATER METER ENCLOSURE REFER TO DRAWING No. 501943
- EWM EWM — EXISTING 3.6m HIGH WELDMESH SECURITY FENCE
- DWM DWM — EXISTING 3.6m HIGH WELDMESH SECURITY FENCE & RETAINING WALL DEMOLISHED
- TWM TWM — INSTALL NEW TEMPORARY 3.6m HIGH WELDMESH SECURITY FENCE ON RETAINING WALL
- EXISTING RETAINING WALL
- EXISTING RETAINING WALL DEMOLISHED

STAGE 1
-EE TO REMOVE EXISTING POWERPOLES
-INSTALL TEMPORARY CONSTRUCTION FENCING AND BUILDERS COMPOUND
-DEMOLISH TREES
-DEMOLISH SECURITY FENCING N/E CORNER OF EXISTING SUBSTATION
-INSTALL TEMPORARY RETAINING WALL N/E CORNER AND 3.6m HIGH TEMPORARY SECURITY FENCE

STAGE 2
-CONSTRUCT CONTROL BUILDING
-CONSTRUCT TX BAYS
-CONSTRUCT EXTERNAL WORK & FENCING

STAGE 3
-EE TO FITOUT AND ENERGISE NEW SUBSTATION

STAGE 4
-INSTALL CONSTRUCTION FENCING AROUND OLD SUBSTATION
-DEMOLISH EXISTING SUBSTATION INCLUDING ALL BELOW GROUND STRUCTURES AND FENCING
-REMEDIATE EXISTING SUBSTATION SITE AND CONTOUR SITE
-REMOVE & MAKE GOOD CONSTRUCTION FENCING & BUILDERS YARD
-INSTALL LANDSCAPING
-INSTALL TREATED TIMBER POST AND GALVANISED PIPE RAIL FENCING

AMENDMENTS

		Date
1	PRELIMINARY FOR INFORMATION	15/01/2018
2	95% PRELIMINARY ISSUE	24/07/2018
3	ISSUE FOR TENDER	23/02/2018

FOR TENDER

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North

ORIGINAL SCALE: As indicated @ A1
APPROVED

DESIGNED	MB	CH'D	SC
DRAWN	BM		
DATE	FEB.18		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE DIMENSIONS IN MILLIMETRES

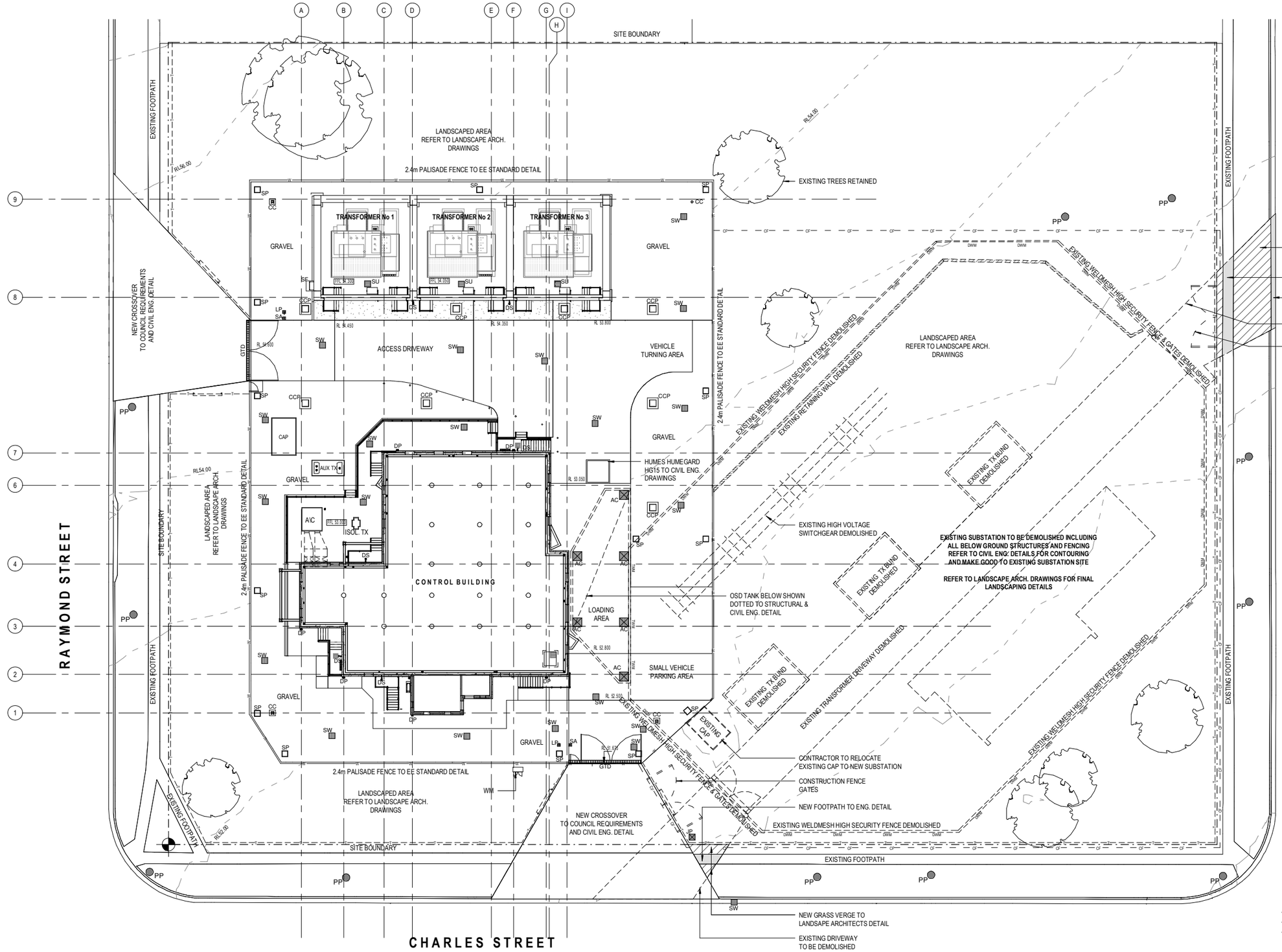
AUTHORISED: M.BULLEN - DIRECTOR

Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
STAGING PLAN 1 & 2

A1 | 508489 | Rev. 3

SHEET No 2 OF 23 SHEETS

NOTE: EXISTING SUBSTATION SECURITY TO BE MAINTAINED FOR DURATION OF DEMOLITION AND CONSTRUCTION WORKS



LEGEND

- SITE BOUNDARY
- 1.1m TREATED TIMBER POST & GALVANISED PIPE RAIL ON SITE BOUNDARY
- 2.4m PALISADE FENCE TO EE DRAWING 366070
- TEMPORARY CONSTRUCTION FENCE -SHOWN INDICATIVE
- EXISTING SUBSTATION DEMOLISHED
- TREES RETAINED
- CC — SECURITY CAMERA POLE 4m AND FOOTING BY CONTRACTOR REFER TO EE STANDARD DRAWING AUS-376-08-R0 AND 343004
- CCP — CONTROL CABLE PIT BY CONTRACTOR -REFER TO DRAWING 404837
- AC — OSD ACCESS COVER BY CONTRACTOR -REFER TO TO CIVIL ENG. DRAWINGS 508550 508554 AND 508555
- JP — JUNCTION PITT BY CONTRACTOR -REFER TO TO CIVIL ENG. DRAWINGS 508550 AND 508556
- SP — SECURITY PIT BY CONTRACTOR -REFER TO EE STANDARD DRAWINGS
- SU — DRY SUMP IN TX BAYS -REFER TO CIVIL ENG. AND EE STANDARD DRAWINGS
- SW — STORMWATER PIT -REFER TO TO CIVIL ENG. DRAWING 404972
- LP — OCTAGONAL LIGHT POLE 3.5m AND FOOTING BY CONTRACTOR REFER TO EE DRAWING NO AUS 2656-13-D0-R0 AND 379143
- SA — SECURITY ARMING BOLLARD FOR SWIPE CARDS BY CONTRACTOR REFER TO DRAWING NO 503665
- PP — POWERPOLE (EXISTING)
- FFL 51.675 — PROPOSED FINISH FLOOR LEVELS
- RL34.50 — EXISTING CONTOUR LEVELS
- RL 51.675 — PROPOSED LEVELS
- A/C — AIR CONDITIONING UNIT TO MECHANICAL ENG. DETAILS (CONTRACTOR TO ALLOW TO BOLT FIX TO CONCRETE PLINTH
- AUX. TX — AUXILIARY TRANSFORMER (EE TO PROVIDE TO SITE, CONTRACTOR TO PROVIDE CONCRETE FOOTING TO EE STANDARD DETAIL DRAWING No. 306820
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- DP — DOWN PIPE TO HYDRAULIC ENG. DETAIL
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- WM — WATER METER ENCLOSURE REFER TO EE DRAWING No. 501943
- DWM DWM — EXISTING 3.6m HIGH WELDMESH SECURITY FENCE & RETAINING WALL DEMOLISHED
- TWM TWM — TEMPORARY 3.6m HIGH WELDMESH SECURITY FENCE & RETAINING WALL DEMOLISHED
- EXISTING RETAINING WALL DEMOLISHED

STAGE 1
-EE TO REMOVE EXISTING POWERPOLES
-INSTALL TEMPORARY CONSTRUCTION FENCING AND BUILDERS COMPOUND
-DEMOLISH TREES
-DEMOLISH SECURTY FENCING N/E CORNER OF EXISTING SUBSTATION
-INSTALL TEMPORARY RETAINING WALL N/E CORNER AND 3.6m HIGH TEMPORARY SECURITY FENCE

STAGE 2
-CONSTRUCT CONTROL BUILDING
-CONSTRUCT TX BAYS
-CONSTRUCT EXTERNAL WORK & FENCING

STAGE 3
-EE TO FITOUT AND ENERGISE NEW SUBSTATION

STAGE 4
-INSTALL CONSTRUCTION FENCING AROUND OLD SUBSTATION
-DEMOLISH EXISTING SUBSTATION INCLUDING ALL BELOW GROUND STRUCTURES AND FENCING
-REMEDIATE EXISTING SUBSTATION SITE AND CONTOUR SITE
-REMOVE & MAKE GOOD CONSTRUCTION FENCING & BUILDERS YARD
-INSTALL LANDSCAPING
-INSTALL TREATED TIMBER POST AND GALVANISED PIPE RAIL FENCING

1 STAGING PLAN 3 & 4
1 : 200

AMENDMENTS

		Date
1	PRELIMINARY FOR INFORMATION	15/01/2018
2	PRELIMINARY 95% ISSUE	24/07/2018
3	ISSUE FOR TENDER	23/02/2018

FOR TENDER

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North

ORIGINAL SCALE As indicated @ A1

APPROVED

DESIGNED	MB	CH'D	SC
DRAWN	BM		
DATE	FEB.18		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE DIMENSIONS IN MILLIMETRES

AUTHORISED M.BULLEN - DIRECTOR

Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
STAGING PLAN 3 & 4

A1 | 508490 | Rev. 3

SHEET No 3 OF 23 SHEETS

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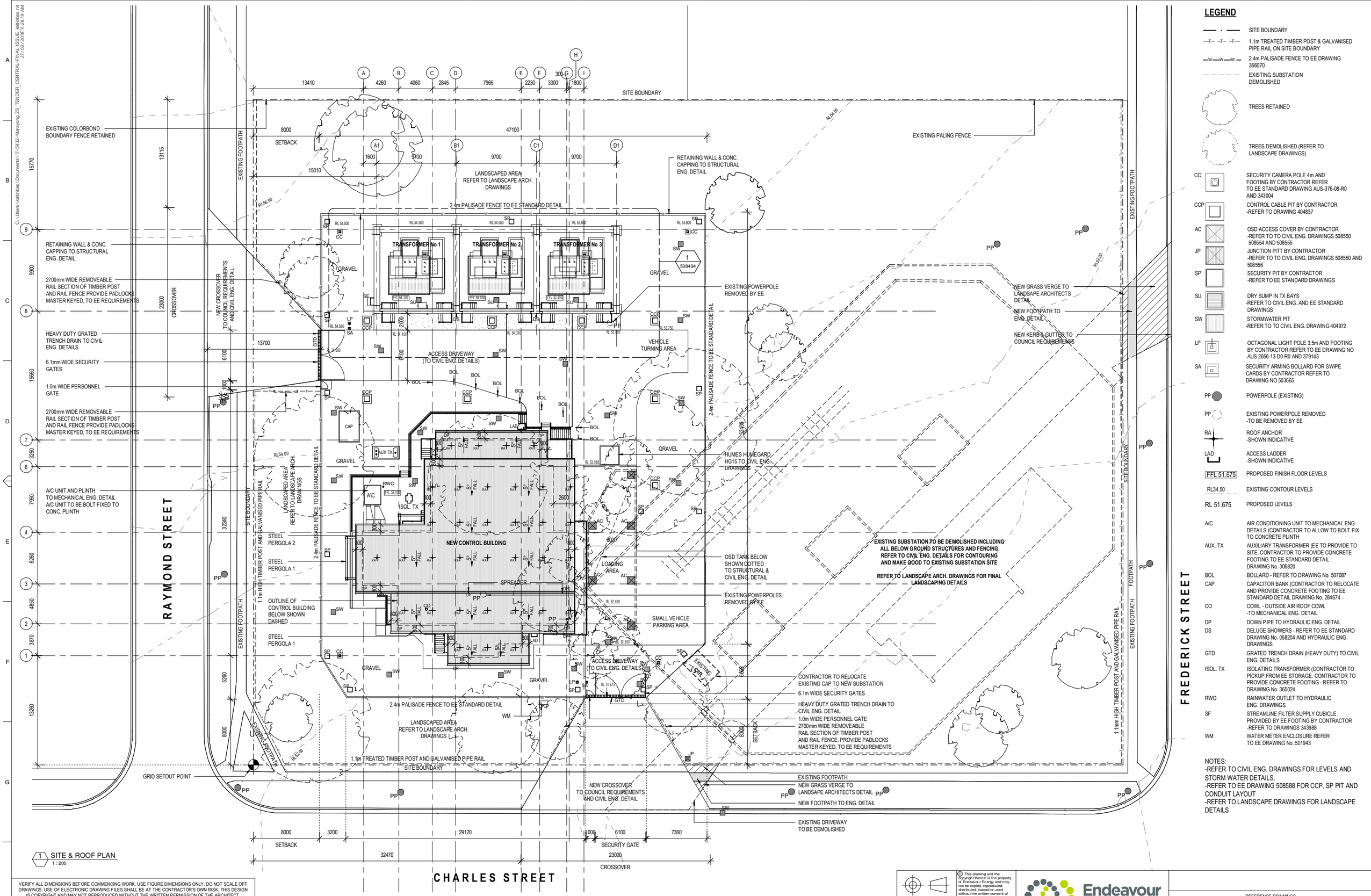

1 SITE & ROOF PLAN
1 : 200

LEGEND

- SITE BOUNDARY
- 1.1m TREATED TIMBER POST & GALVANISED PIPE RAIL ON SITE BOUNDARY
- 2.4m PALISADE FENCE TO EE DRAWING 366070
- EXISTING SUBSTATION DEMOLISHED
- TREES RETAINED
- TREES DEMOLISHED (REFER TO LANDSCAPE DRAWINGS)
- CC — SECURITY CAMERA POLE 4m AND FOOTING BY CONTRACTOR REFER TO EE STANDARD DRAWING AUS-376-08-R0 AND 343004
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- PP — POWERPOLE (EXISTING)
- PP — EXISTING POWERPOLE REMOVED -TO BE REMOVED BY EE
- RA — ROOF ANCHOR -SHOWN INDICATIVE
- LAD — ACCESS LADDER -SHOWN INDICATIVE
- FFL 51.675 — PROPOSED FINISH FLOOR LEVELS
- RL34.50 — EXISTING CONTOUR LEVELS
- RL 51.675 — PROPOSED LEVELS

A/C	AIR CONDITIONING UNIT TO MECHANICAL ENG. DETAILS (CONTRACTOR TO ALLOW TO BOLT FIX TO CONCRETE PLINTH
AUX. TX	AUXILIARY TRANSFORMER (EE TO PROVIDE TO SITE, CONTRACTOR TO PROVIDE CONCRETE FOOTING TO EE STANDARD DETAIL DRAWING No. 306820
BOL	BOLLARD - REFER TO DRAWING No. 507087
CAP	CAPACITOR BANK (CONTRACTOR TO RELOCATE AND PROVIDE CONCRETE FOOTING TO EE STANDARD DETAIL DRAWING No. 284674
CO	COWL - OUTSIDE AIR ROOF COWL -TO MECHANICAL ENG. DETAIL
DP	DOWN PIPE TO HYDRAULIC ENG. DETAIL
DS	DELUGE SHOWERS - REFER TO EE STANDARD DRAWING No. 058204 AND HYDRAULIC ENG. DRAWINGS
GTD	GRATED TRENCH DRAIN (HEAVY DUTY) TO CIVIL ENG. DETAILS
ISOL. TX	ISOLATING TRANSFORMER (CONTRACTOR TO PICKUP FROM EE STORAGE. CONTRACTOR TO PROVIDE CONCRETE FOOTING - REFER TO DRAWING No. 365024
RWO	RAINWATER OUTLET TO HYDRAULIC ENG. DRAWINGS
SF	STREAMLINE FILTER SUPPLY CUBICLE PROVIDED BY EE FOOTING BY CONTRACTOR -REFER TO DRAWINGS 343988
WM	WATER METER ENCLOSURE REFER TO EE DRAWING No. 501943

NOTES:
-REFER TO CIVIL ENG. DRAWINGS FOR LEVELS AND STORM WATER DETAILS.
-REFER TO EE DRAWING 508588 FOR CCP, SP PIT AND CONDUIT LAYOUT
-REFER TO LANDSCAPE DRAWINGS FOR LANDSCAPE DETAILS

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North

ORIGINAL SCALE	As indicated @ A1	APPROVED	
DESIGNED	MB	CH'D	SC
DRAWN	BM		
DATE	FEB.18		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

AUTHORISED
M.BULLEN - DIRECTOR

Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
SITE PLAN / ROOF PLAN

A1 | 508491 | Rev. 3
SHEET No 4 OF 23 SHEETS

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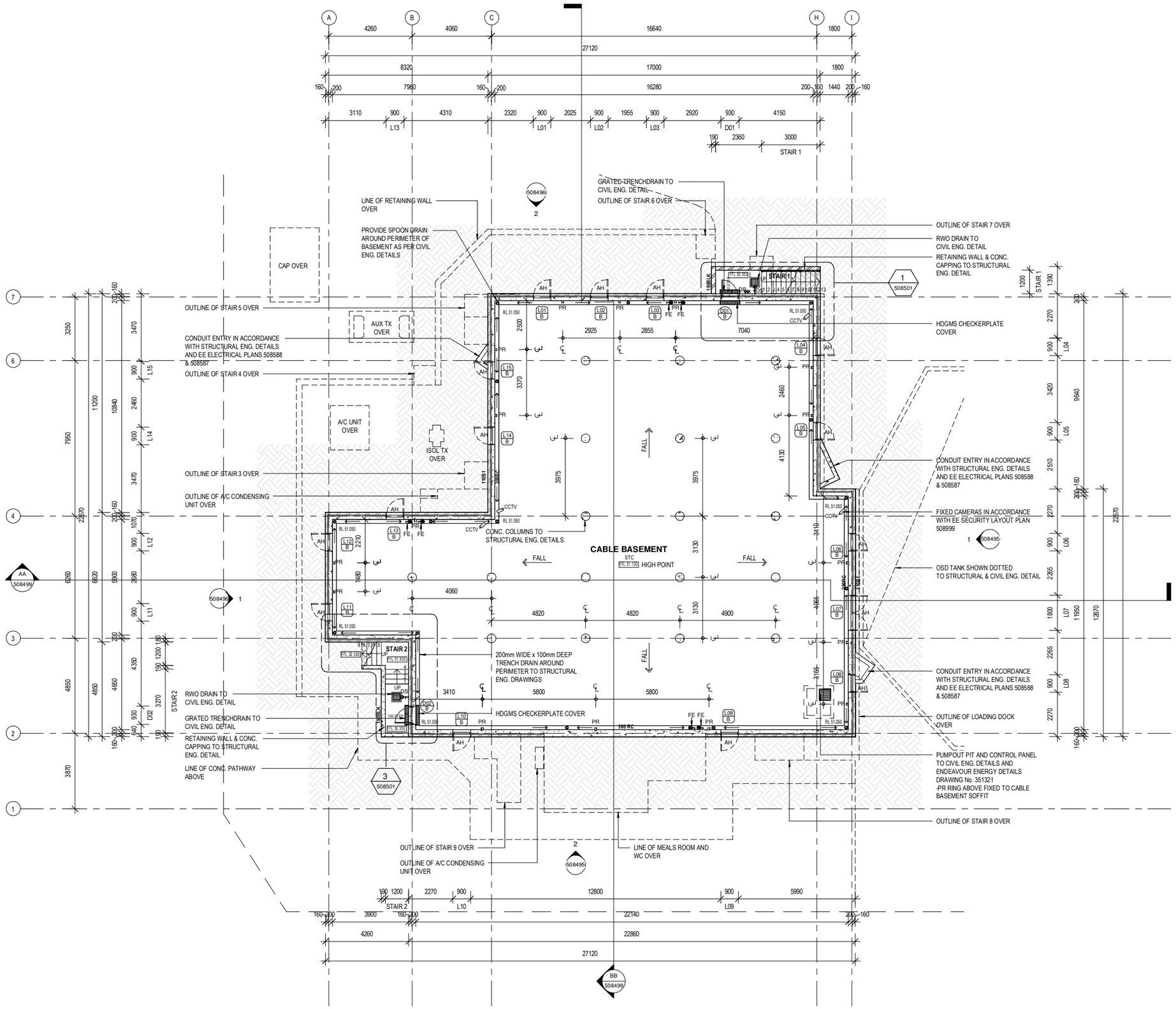
LEGEND

AH	ACCESS HATCH
CCTV	FIXED CAMERAS TO EE SECURITY LAYOUT PLAN 508999
DS	DELUGE SHOWERS - REFER TO EE STANDARD DRAWING No. 058204 AND HYDRAULIC ENG. DRAWINGS
DP	DOWN PIPE - REFER TO HYDRAULIC ENG. DETAILS
FE	FIRE EXTINGUISHER & FIRE BLANKET REFER TO EE STANDARD DRAWING 366067 AND HYDRAULIC ENG. DRAWINGS
PR	PULLING RINGS - TO EE STANDARD DRAWING 351320



1 BASEMENT FLOOR PLAN
1 : 100

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REFERENCE DRAWINGS

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AUTHORISED
M.BULLEN - DIRECTOR

Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
BASEMENT FLOOR PLAN

A1 | 508492 | Rev. 3
SHEET No 5 OF 23 SHEETS

RELOCATED CAPCITOR BANK. CONTRACTOR TO PROVIDE CAP CONC. FOOTING IN ACCORDANCE WITH EE STANDARD DRAWING No. 284674

CONTRACTOR TO PROVIDE AUX TX CONC. FOOTING IN ACCORDANCE WITH EE STANDARD DRAWING No. 306820

RETAINING WALL & CONC. CAPPING TO STRUCTURAL ENG. DETAIL

CONTRACTOR TO PROVIDE ISOL TX CONC. FOOTING IN ACCORDANCE WITH EE STANDARD DRAWING No. 365024

A/C UNIT AND PLINTH TO MECHANICAL ENG. DETAIL A/C UNIT TO BE BOLT FIXED TO CONC. PLINTH

A/C DUCTWORK TO MECHANICAL ENG. DETAILS

PERGOLA 2 OVER TO ENG. DETAIL -PC1 FINISH

LOUVRE SCREEN TO CONSEAL A/C UNIT DUCTWORK TO ENG. DETAIL

ALL HIGH LEVEL WALL PENETRATIONS THROUGHOUT TO BE IN ACCORDANCE WITH MECHANICAL ENG. DETAILS

60mm SETDOWN FOR 45mm TOPPING AND 15mm KORDUR

PERGOLA 1 OVER TO ENG. DETAIL -PC1 FINISH

STAIR 2 FROM CABLE BASEMENT

FLAT PLASTERBOARD CEILING TO B&C ROOM 2 -2700mm ABOVE FFL

FLAT PLASTERBOARD CEILING TO B&C ROOM 1 -2700mm ABOVE FFL

OUTLINE OF ROOF ABOVE

ALL EXTERNAL PATHWAYS IN ACCORDANCE WITH STRUCTURAL ENG. DETAILS

A/C CONDENSING UNIT & PLINTH TO MECHANICAL ENG. DETAIL -A/C UNIT TO BE BOLT FIXED TO CONC. PLINTH

STAIR 1 FROM CABLE BASEMENT

HUMES HUMEGARD HG15 TO CIVIL ENG. DRAWINGS

PB LINING TO ALL INTERNAL WALLS OF CELL 1 & CELL 3 AS SPECIFIED

OUTLINE OF ROOF ABOVE

CONCRETE ACCESS DRIVEWAY (TO CIVIL ENG. DETAILS)

GRATED DRAINS AT ROLLER SHUTTER REVEAL TO CIVIL ENG. DETAIL

OSD TANK BELOW SHOWN DOTTED TO STRUCTURAL & CIVIL ENG. DETAIL

GRATED DRAINS AT ROLLER SHUTTER REVEAL TO CIVIL ENG. DETAIL

ALL FLOOR PENETRATIONS AND VOIDS THROUGHOUT IN ACCORDANCE WITH EE GROUND FLOOR SLAB SETOUT PLAN DRAWING No. 508586

ALL EQUIPMENT BY OTHERS REFER TO EE DRAWING 508585 FOR EQUIPMENT SETOUT PLAN

BASEMENT PUMP-OUT PIT ALARM PANEL.

BASEMENT LINE BELOW

LEGEND

BOL	BOLLARD - REFER TO DRAWING No. 507087
BS	BOOT SCRAPER REFER TO EE STANDARD DETAILS SHEET 351323 FOR DETAILS
CCTV	FIXED CAMERAS TO EE SECURITY LAYOUT PLAN 508999
DS	DELUGE SHOWERS - REFER TO EE STANDARD DRAWING No. 058204 AND HYDRAULIC ENG. DRAWINGS
DP	DOWN PIPE - REFER TO HYDRAULIC ENG. DETAILS
FE	FIRE EXTINGUISHER & FIRE BLANKET REFER TO EE STANDARD DRAWING 366067 AND HYDRAULIC ENG. DRAWINGS
LAD	ACCESS LADDER
RWO	RAINWATER OUTLET TO HYDRAULIC ENG. DRAWINGS

MISCELLANEOUS EE EQUIPMENT:
(REFER TO EE EQUIPMENT SETOUT PLAN DRAWING No. 508585)

CH.	CHARGER
F.	FILING CABINET
FCCP.	FIBRE COMMUNICATIONS PANEL
FP.	FIRE PANEL
ISOL	ISOLATION PANEL
L&P	LIGHT AND POWER
NBD.	NOTICE BOARD
P.	A1 PLAN STORAGE CABINET
PH.	PHONE
ST.	STORAGE CABINET

NOTES:
REFER TO ENDEAVOUR ENERGY DRAWING No. 508586 FOR ALL GROUND FLOOR SLAB PENETRATIONS, VOIDS, SETOUTS AND DETAILS

1 GROUND FLOOR PLAN
1 : 100

AMENDMENTS

1	PRELIMINARY FOR INFORMATION	Date	15/01/2018	2	95% PRELIMINARY ISSUE	Date	24/01/2018	3	ISSUE FOR TENDER	Date	23/02/2018			Date		Date	
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ORIGINAL SCALE 1 : 100 @ A1

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DESIGNED	MB	CH'D	SC
DRAWN	BM		
DATE	FEB.18		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

AUTHORISED

M.BULLEN - DIRECTOR

Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
GROUND FLOOR PLAN

A1 | 508493 | Rev. 3

SHEET No 6 OF 23 SHEETS

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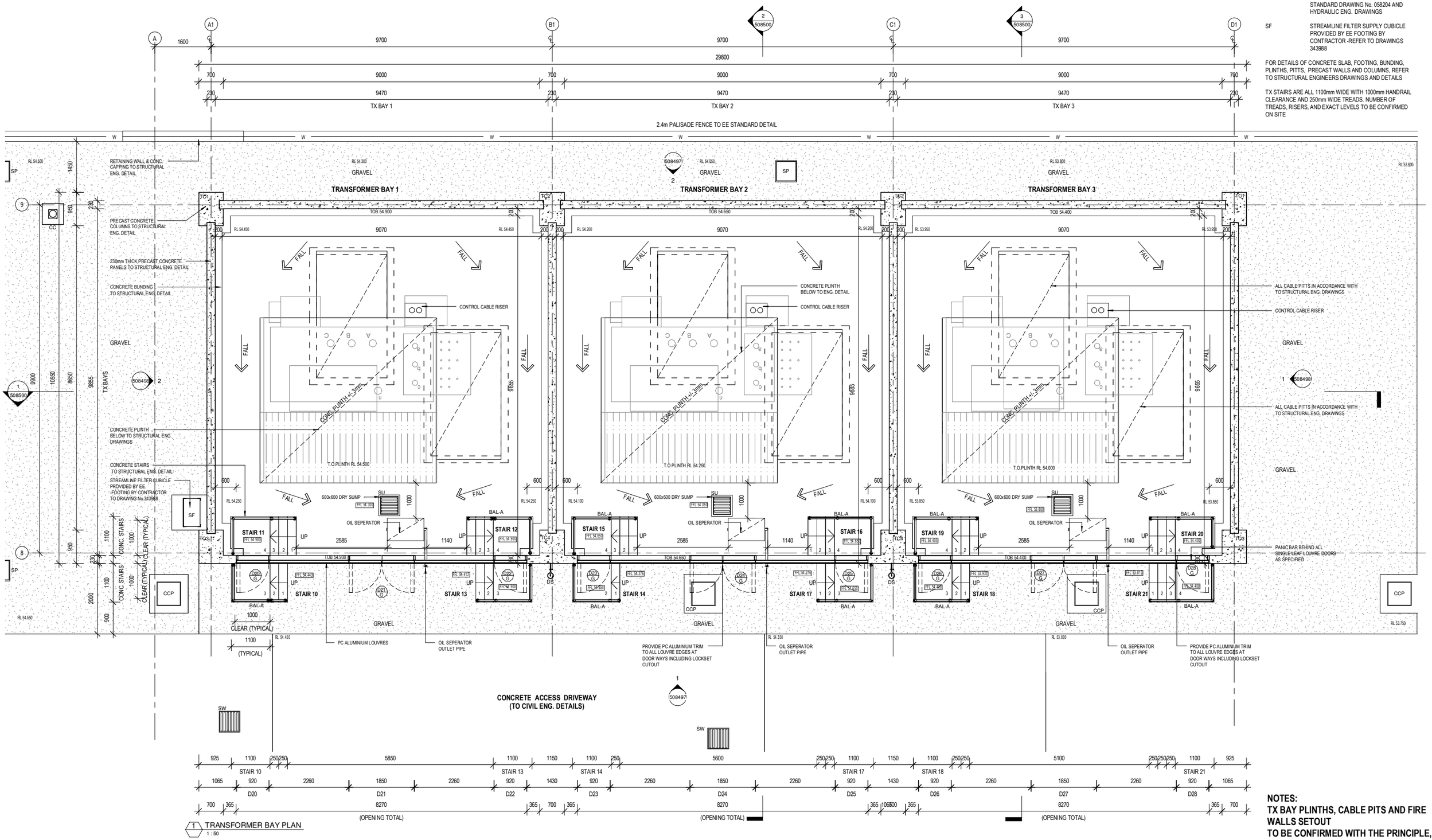
LEGEND

DS — DELUGE SHOWERS - REFER TO EE STANDARD DRAWING No. 058204 AND HYDRAULIC ENG. DRAWINGS

SF — STREAMLINE FILTER SUPPLY CUBICLE PROVIDED BY EE FOOTING BY CONTRACTOR -REFER TO DRAWINGS 343988

FOR DETAILS OF CONCRETE SLAB, FOOTING, BUNDING, PLINTHS, PITTS, PRECAST WALLS AND COLUMNS, REFER TO STRUCTURAL ENGINEERS DRAWINGS AND DETAILS

TX STAIRS ARE ALL 1100mm WIDE WITH 1000mm HANDRAIL CLEARANCE AND 250mm WIDE TREADS. NUMBER OF TREADS, RISERS, AND EXACT LEVELS TO BE CONFIRMED ON SITE



1 TRANSFORMER BAY PLAN
1 : 50

NOTES:
TX BAY PLINTHS, CABLE PITS AND FIRE WALLS SETOUT TO BE CONFIRMED WITH THE PRINCIPLE, PRIOR TO CONSTRUCTION

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REFERENCE DRAWINGS

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M.BULLEN - DIRECTOR

Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
TRANSFORMER BAY PLAN

A1 | 508494 | Rev. 3

SHEET No 7 OF 23 SHEETS

TOP OF ROOF
RL 59.700
(APPROX)

CONTROL ROOM LEVEL
RL 54.100

CABLE BASEMENT
RL 51.100
(HIGH POINT)

5600

3000

COLORBOND FASCIA AND GUTTER
DELUGE SHOWER
MD METAL DECK ROOFING
FB1 BRICK BANDING
HDGMS PLATE
STEEL SUPPORT POST SC3, TO STRUCTURAL ENG. DETAIL
FB1 BRICK BANDING
ACCESS DRIVEWAY TO CIVIL ENG. DETAILS
APPROX LOCATION OF EXISTING NATURAL GROUND LINE
OUTLINE OF AMENITIES

MD METAL DECK ROOFING
FB3 BANDING
CB CAPPING AS SPECIFIED
FB3 BANDING
SPREADER
WC1 COLORBOND CUSTOM ORB
CB CAPPING AS SPECIFIED
WC2 TERRACLAD TERRACOTTA CLADDING
MD METAL DECK ROOFING
DELUGE SHOWER
FB3 BANDING
BOL
150MM HIGH KICK RAIL TO STAIR 7 TO COMPLY WITH AS-1657 (3.4.3) -BASE CLEARENCE SHALL NOT EXCEED 10MM.
OUTLINE OF CABLE BASEMENT

OUTLINE OF CONDUIT ENTRY POINT IN ACCORDANCE WITH STRUCTURAL ENG. DETAILS AND EE ELECTRICAL PLANS 508588 & 508587

OUTLINE OF CONDUIT ENTRY POINT IN ACCORDANCE WITH STRUCTURAL ENG. DETAILS AND EE ELECTRICAL PLANS 508588 & 508587

STAIR 8

RL 52.800 RL 53.054

1 SOUTH ELEVATION TO FREDERICK STREET
1 : 50

TOP OF ROOF
RL 59.700
(APPROX)

CONTROL ROOM LEVEL
RL 54.100

MEALS ROOM
RL 52.320

CABLE BASEMENT
RL 51.100
(HIGH POINT)

CB CAPPING AS SPECIFIED
SPREADER
WC 2 TERRACLAD TERRACOTTA CLADDING
COLORBOND FASCIA AND GUTTER
SPREADER
DELUGE SHOWER
FB3 BRICK BANDING

PERGOLA 1 TO STRUCTURAL ENG. DETAIL -PC1 FINISH
FB3 BRICK BANDING
RETAINING WALL & CONC. CAPPING TO STRUCTURAL ENG. DETAIL
OUTLINE OF CABLE BASEMENT

RETAINING WALL & CONC. CAPPING TO STRUCTURAL ENG. DETAIL
FB1 BANDING
A/C CONDENSING UNIT & PLINTH TO MECHANICAL ENG. DETAIL. A/C UNIT TO BE BOLT FIXED TO CONC. PLINTH
GLASS BLOCK WINDOWS
FB1 BANDING
BOOT SCRAPER
STEEL SUPPORT POST SC3, TO STRUCTURAL ENG. DETAIL
BOOT SCRAPER
FB1 BANDING
ACCESS DRIVEWAY TO CIVIL ENG. DETAILS
APPROX LOCATION OF EXISTING NATURAL GROUND LINE

STAIR 9
STAIR 8

RL 52.550 RL 52.430 RL 52.200 RL 54.010 RL 52.200 RL 52.500

2 WEST ELEVATION TO CHARLES STREET
1 : 50

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REFERENCE DRAWINGS

AUTHORISED

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Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
CONTROL BUILDING ELEVATIONS

A1 | 508495 | Rev. 3

SHEET No 8 OF 23 SHEETS

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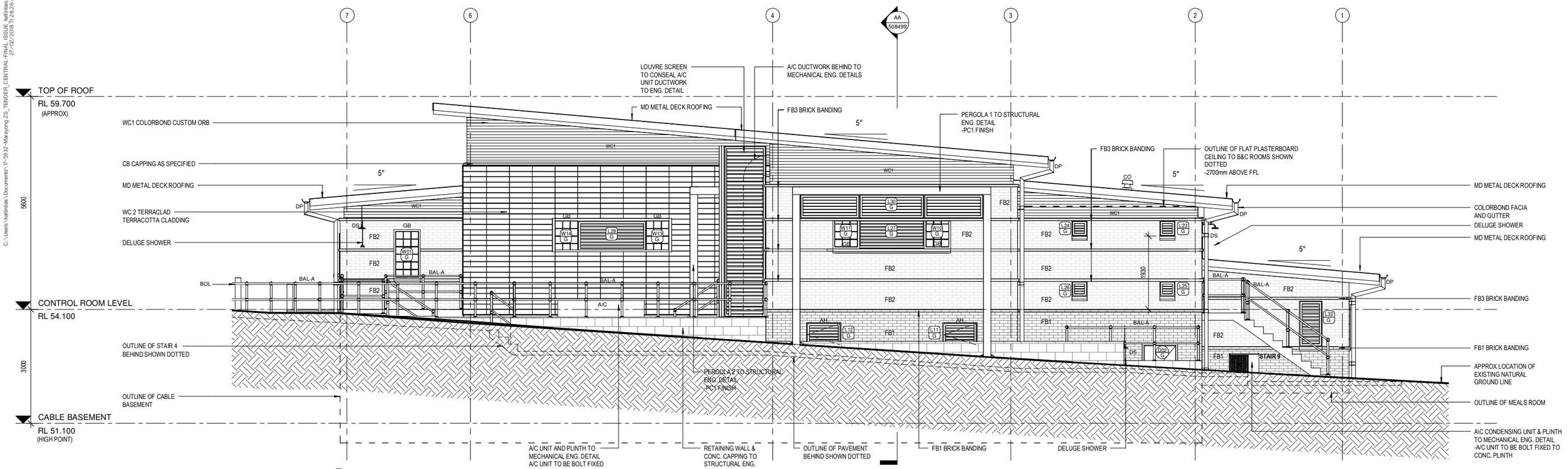
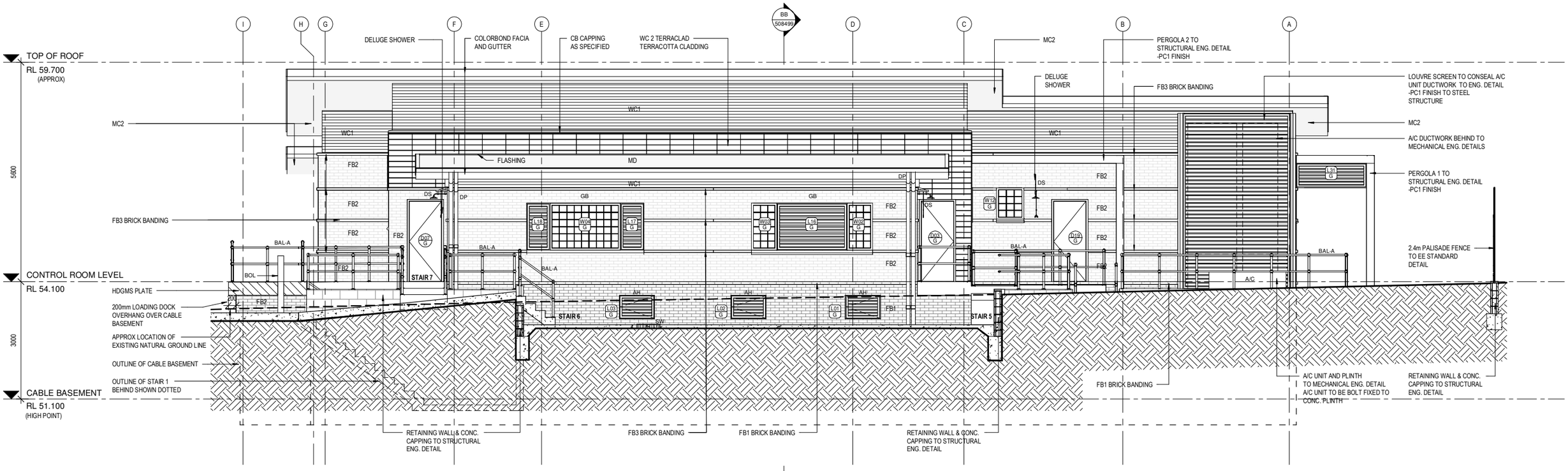


1 NORTH ELEVATION TO RAYMOND STREET
1 : 50



2 EAST ELEVATION
1 : 50

AMENDMENTS

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REFERENCE DRAWINGS

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DIMENSIONS IN MILLIMETRES

AUTHORISED

M.BULLEN - DIRECTOR

Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
CONTROL BUILDING ELEVATIONS

A1 | 508496 | Rev. 3

SHEET No 9 OF 23 SHEETS

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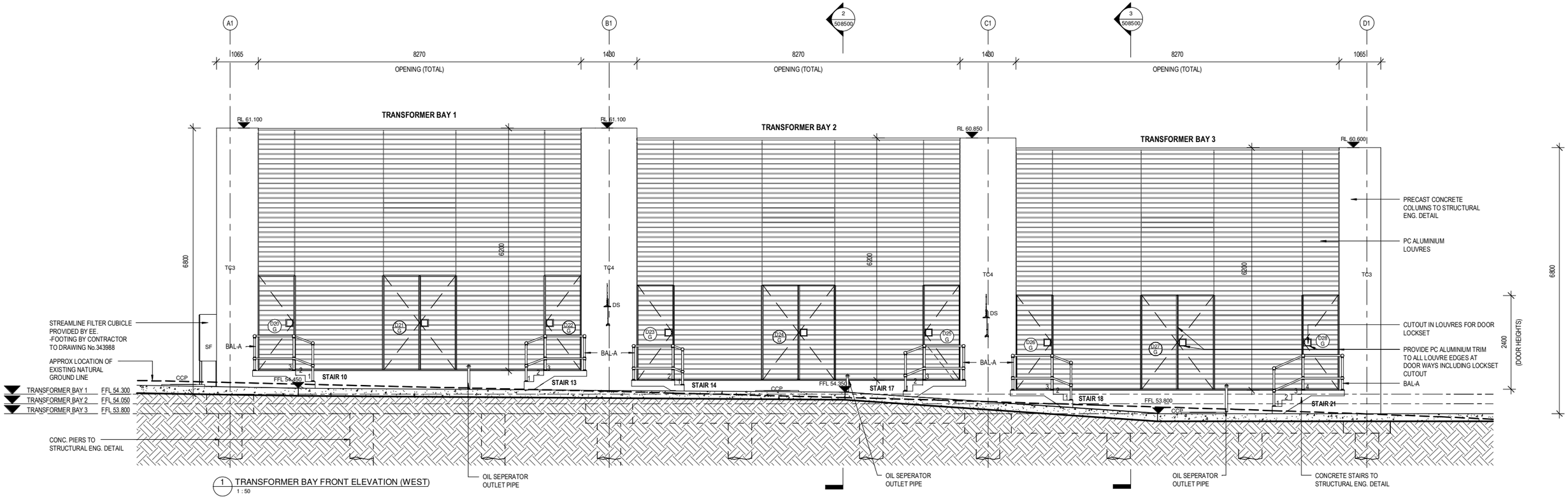
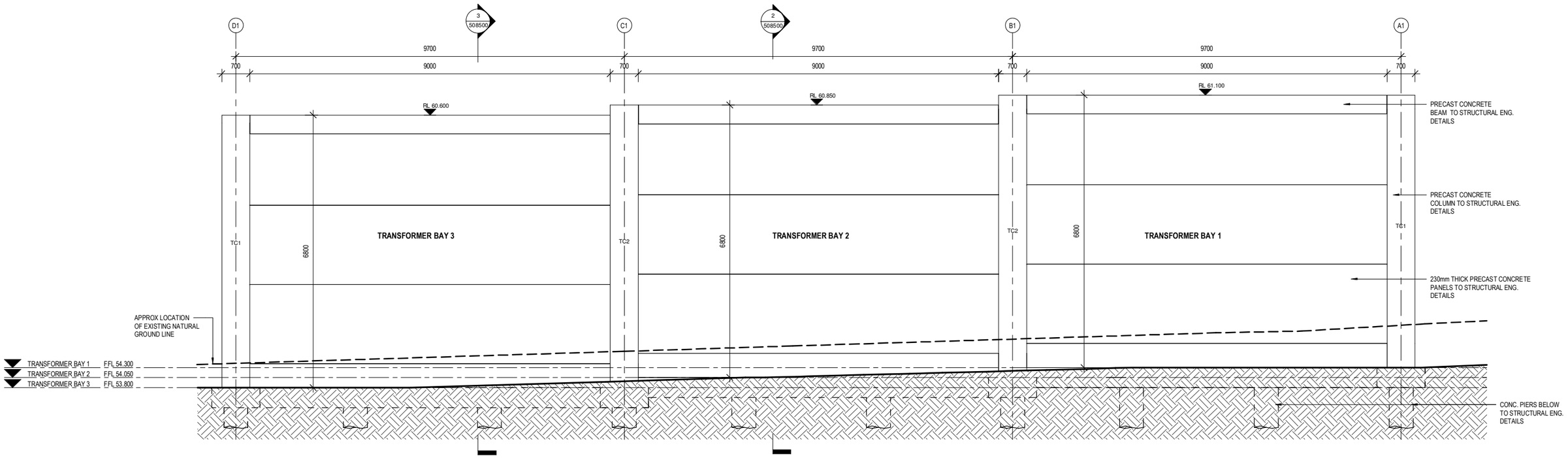


1 TRANSFORMER BAY FRONT ELEVATION (WEST)
1 : 50



2 TRANSFORMER BAY REAR ELEVATION (EAST)
1 : 50

AMENDMENTS

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Corner of Raymond St and Charles St, Blacktown

TRANSFORMER BAY ELEVATIONS

A1 | 508497 | Rev. 3

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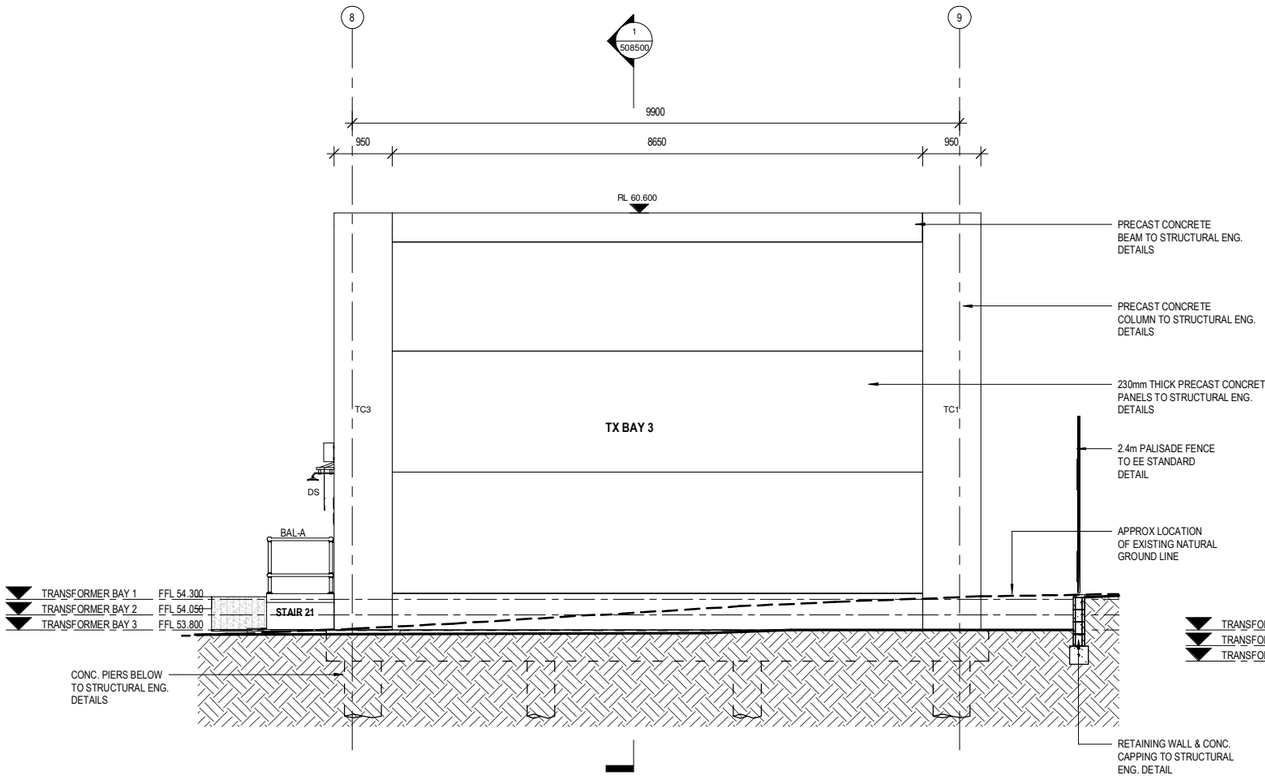
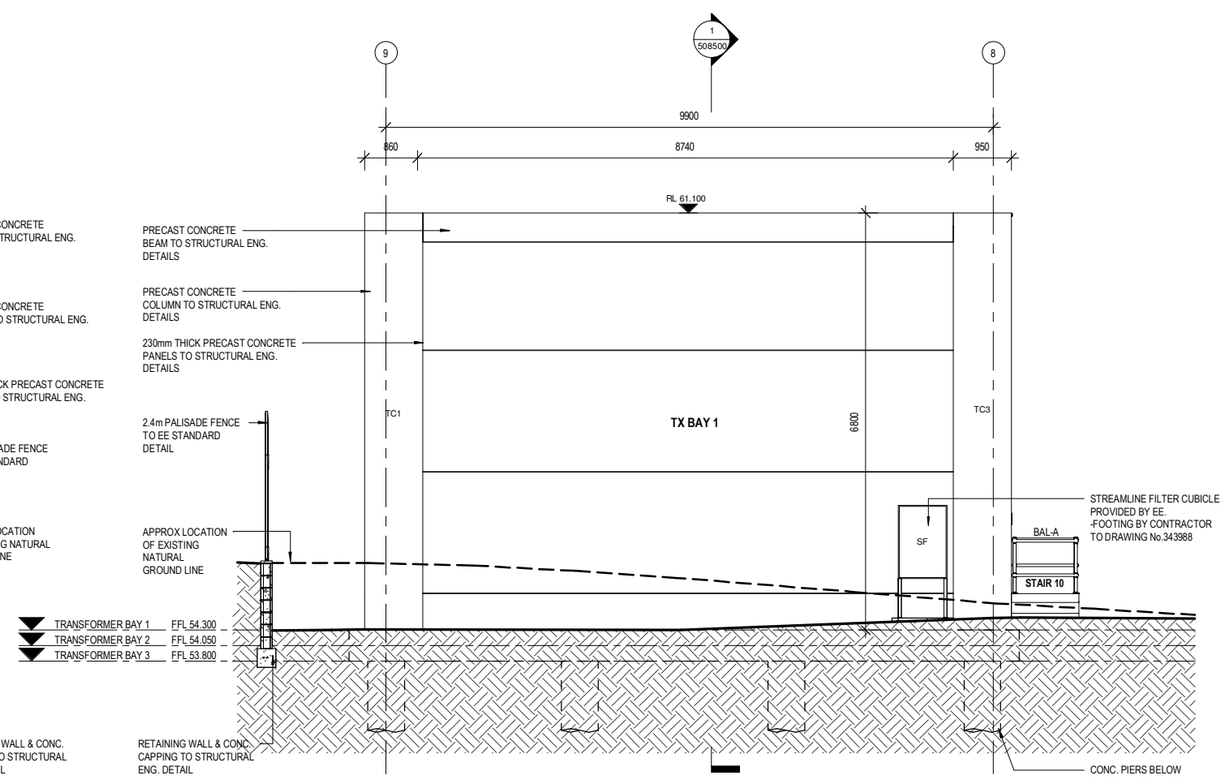


1 TRANSFORMER BAY SOUTH ELEVATION
1 : 50



2 TRANSFORMER BAY NORTH ELEVATION
1 : 50

AMENDMENTS

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REFERENCE DRAWINGS

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DIMENSIONS IN MILLIMETRES

AUTHORISED

DESIGNED	MB	CH'D	SC
DRAWN	BM		
DATE	FEB.18		

Marayong Zone Substation

Corner of Raymond St and Charles St, Blacktown

TRANSFORMER BAY ELEVATIONS

M.BULLEN - DIRECTOR

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SHEET No **11** OF **23** SHEETS

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AA CONTROL BUILDING SECTION 1
1 : 50

TOP OF ROOF
RL 59.700
(APPROX)

CONTROL ROOM LEVEL
RL 54.100

CABLE BASEMENT
RL 51.100
(HIGH POINT)

COLORBOND FASCIA
MC2
WC1 COLORBOND CUSTOM ORB
2.4m PALISADE FENCE TO EE STANDARD DETAIL
PERGOLA 1 TO STRUCTURAL ENG. DETAIL -PC1 FINISH
FB2
BAL-A
RETAINING WALL & CONC. CAPPING TO STRUCTURAL ENG. DETAIL
RETAINING WALL & CONC. CAPPING TO STRUCTURAL ENG. DETAIL
DRAINING BACKFILL TO ENGINEERS DETAILS.
AG DRAIN TO ENG. DETAILS
1X16MM FIRECHECK PB ON CEILING BATTEN
1X16MM FIRECHECK PB ON FURRING CHANNEL
PAINTED SKIRTING AS SPECIFIED
300mm FEATHERING ZONE
STEEL RAFTERS TO STRUCTURAL ENG. DETAIL
11 KV. SWITCHROOM
CABLE BASEMENT
200X100MM PERIMETER DRAIN
FALL
2650 (HIGH POINT)
WPM TO ENG. DETAILS
MD METAL DECK ROOFING
CB FASCIA & CAPPING
WC1 ON TOP HAT FRAMING WITH MEMBRANE
CB CAPPING AS SPECIFIED
PFC DOOR SURROUND TO ENG. DETAIL
RSD
BAL-B
CONC SLAB TO ENG. DETAIL
APPROX EXISTING GROUND LINE
ACCESS DRIVEWAY TO CIVIL ENG. DETAILS
DRAINAGE CELL
DRAINING BACKFILL TO ENGINEERS DETAILS.
AG DRAIN TO ENG. DETAILS
CONC. SLAB AND FOOTING TO STRUCTURAL ENG. DETAILS
CABLE BASEMENT COLUMNS TO ENG DETAIL
PAD FOOTING BEYOND TO STRUCTURAL ENG. DETAIL
INTERNAL BEAM TO STRUCTURAL ENG. DETAIL

BB CONTROL BUILDING SECTION 2
1 : 50

TOP OF ROOF
RL 59.700
(APPROX)

CONTROL ROOM LEVEL
RL 54.100

CABLE BASEMENT
RL 51.100
(HIGH POINT)

COLORBOND FASCIA AND GUTTER
WC1 ON TOP HAT FRAMING WITH MEMBRANE
WC2 TERRACLAD TERRACOTTA CLADDING
1X16MM FIRECHECK PB ON CEILING BATTEN
1X16MM FIRECHECK PB ON FURRING CHANNEL
OUTLINE OF FLAT PLASTERBOARD CEILING TO B&C ROOMS SHOWN DOTTED -2700mm ABOVE FFL
EYE WASH TO HYD ENG. DETAIL
11 KV. SWITCHROOM
CONTROL ROOM
MEALS ROOM
33 KV. SWITCHROOM
AUX SW.RM.
PAINTED SKIRTING AS SPECIFIED
300mm FEATHERING ZONE
FB2
FB1 BANDING
CWT TO INTERNAL WALLS OF ALL AMENITIES
FB1 BRICK SILL
FB1
SKIRTING TILE AS SPECIFIED
2.4m PALISADE FENCE TO EE STANDARD DETAIL
2400
2500
3800
4300
2700
PZ PILE BEYOND TO STRUCTURAL ENG. DETAIL
RETAINING WALL & CONC. CAPPING TO STRUCTURAL ENG. DETAIL
DRAINAGE CELL
DRAINING BACKFILL TO ENGINEERS DETAILS
AG DRAIN TO ENG. DETAILS
WPM TO ENG. DETAILS
200X100MM PERIMETER DRAIN
FALL
2650 (HIGH POINT)
CABLE BASEMENT
VOID
CABLE BASEMENT COLUMNS TO ENG. DETAIL
APPROX EXISTING GROUND LINE
INTERNAL BEAM TO STRUCTURAL ENG. DETAIL
PAD FOOTING BEYOND TO STRUCTURAL ENG. DETAIL
CONDUIT ENTRY IN ACCORDANCE WITH STRUCTURAL ENG. DETAILS AND EE ELECTRICAL PLANS 508368 & 508597
MD METAL DECK ROOFING
CB FASCIA & CAPPING
MC2
WC1 ON TOP HAT FRAMING WITH MEMBRANE
CB CAPPING AS SPECIFIED
WC2 TERRACLAD TERRACOTTA CLADDING
COLORBOND FASCIA AND GUTTER
WC1
FB2
CONC. SLAB TO ENG. DETAIL
RETAINING WALL & CONC. CAPPING TO STRUCTURAL ENG. DETAIL
DRAINAGE CELL
DRAINING BACKFILL TO ENGINEERS DETAILS.
AG DRAIN TO ENG. DETAILS
CONC. SLAB AND FOOTING TO STRUCTURAL ENG. DETAILS

AMENDMENTS

		Date
1	PRELIMINARY FOR INFORMATION	15/01/2018
2	PRELIMINARY 95% ISSUE	24/01/2018
3	ISSUE FOR TENDER	23/02/2018

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DATE	FEB.18		

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Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
CONTROL BUILDING SECTIONS

A1 | 508499 | Rev. 3

SHEET No 12 OF 23 SHEETS

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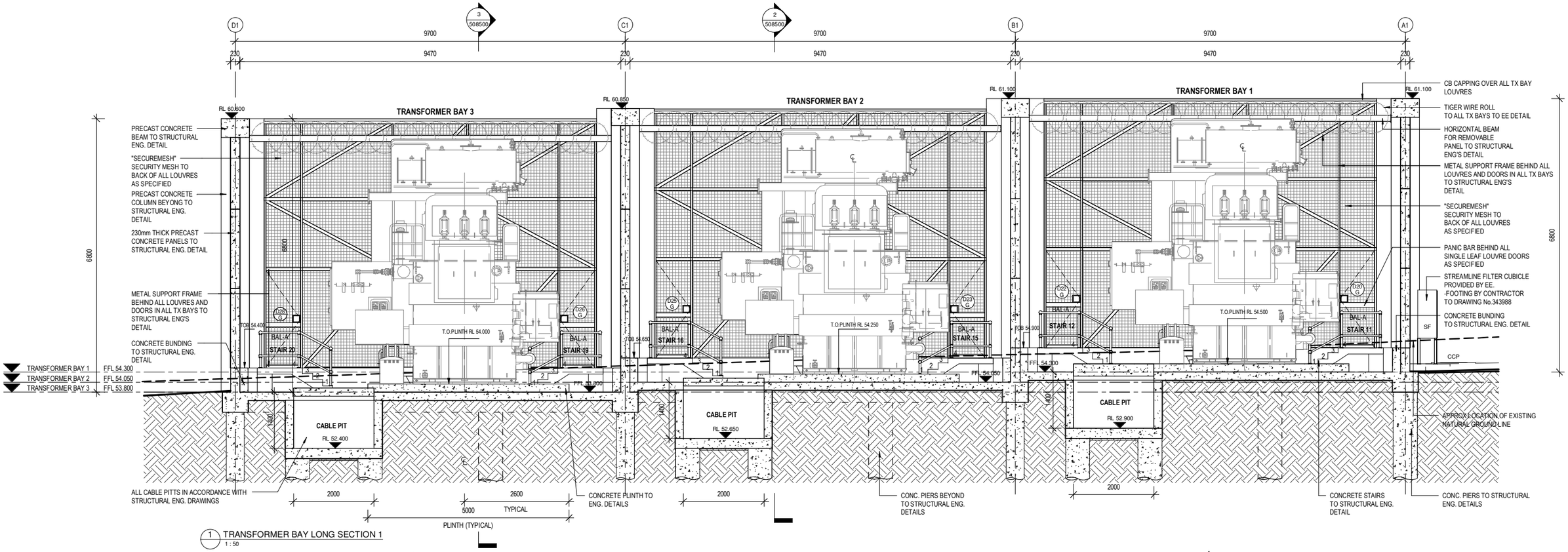

1 TRANSFORMER BAY LONG SECTION 1
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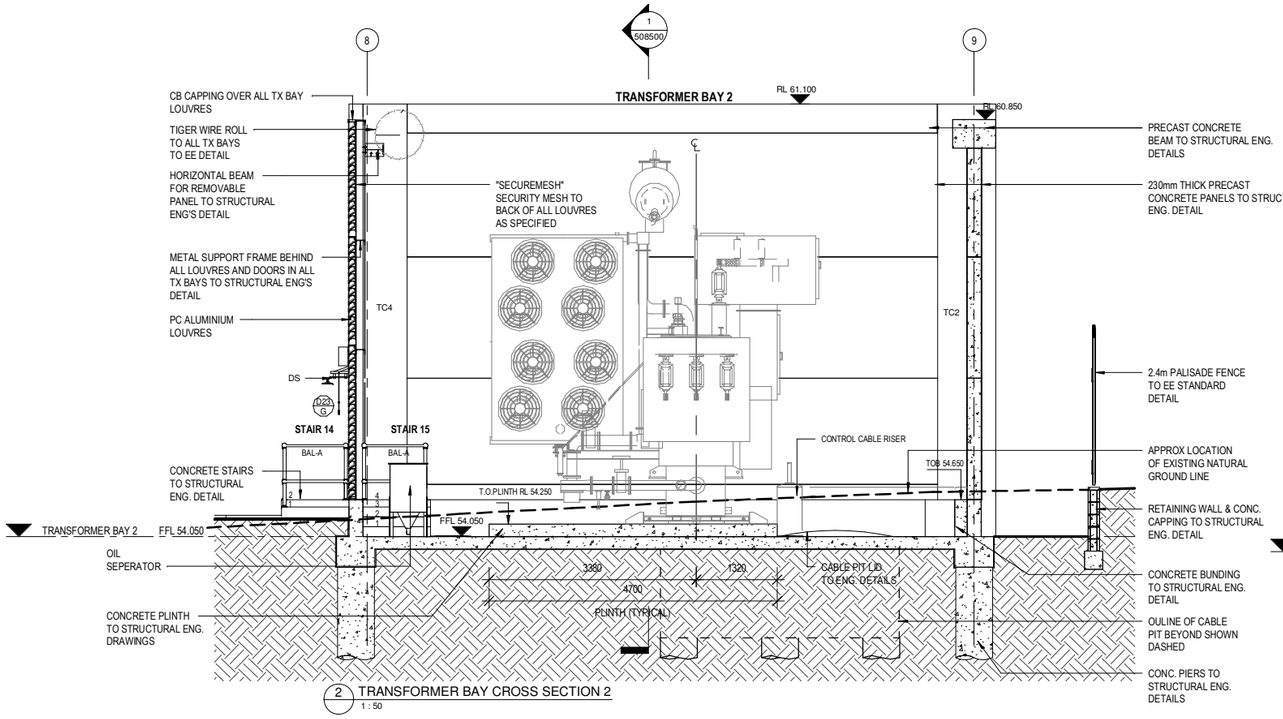

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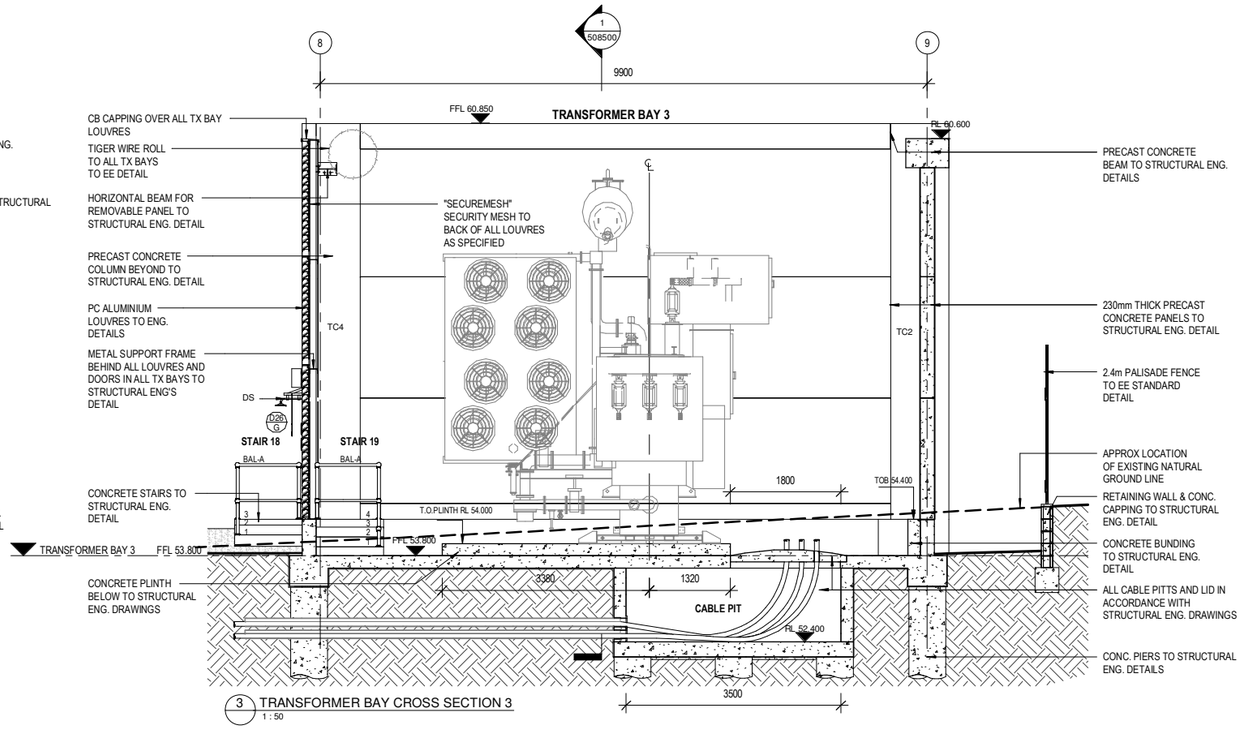

3 TRANSFORMER BAY CROSS SECTION 3
1 : 50

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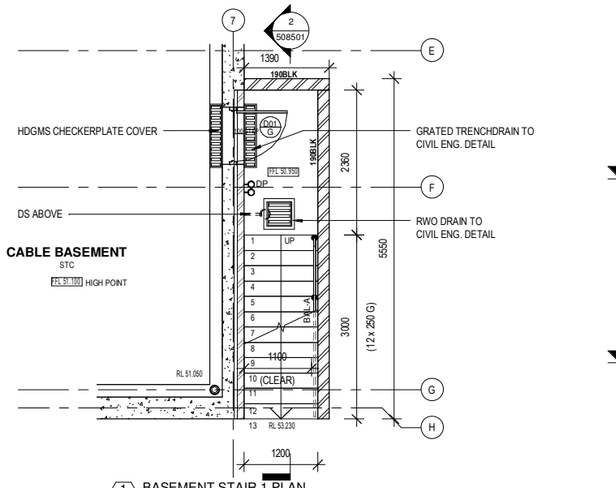
TRANSFORMER BAY SECTIONS

A1 | 508500 | Rev. 3

SHEET No 13 OF 23 SHEETS



1 BASEMENT STAIR 1 PLAN
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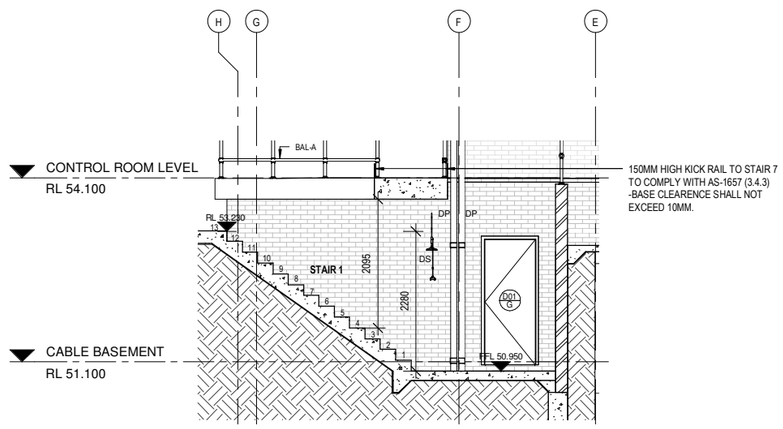

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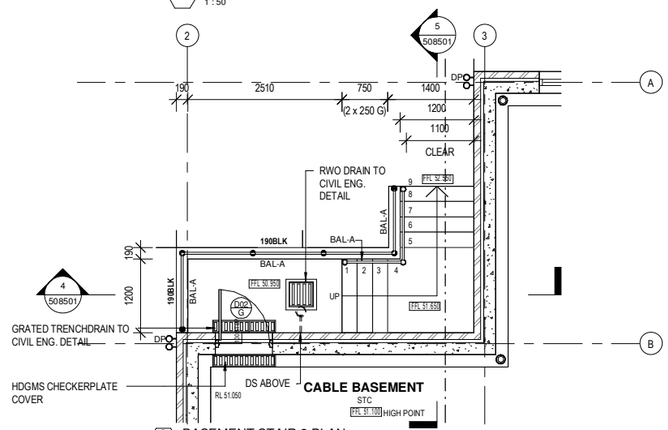

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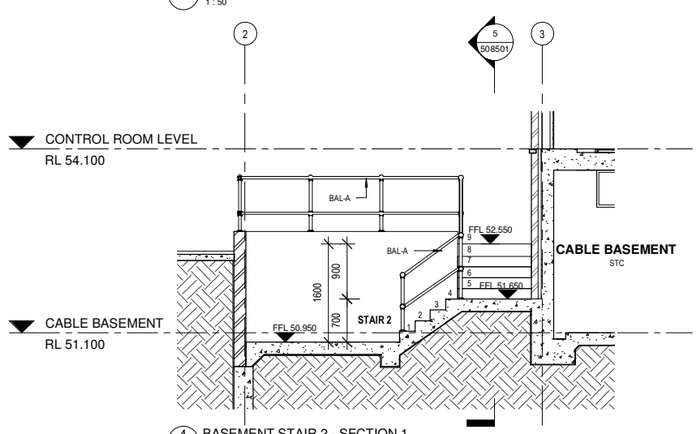

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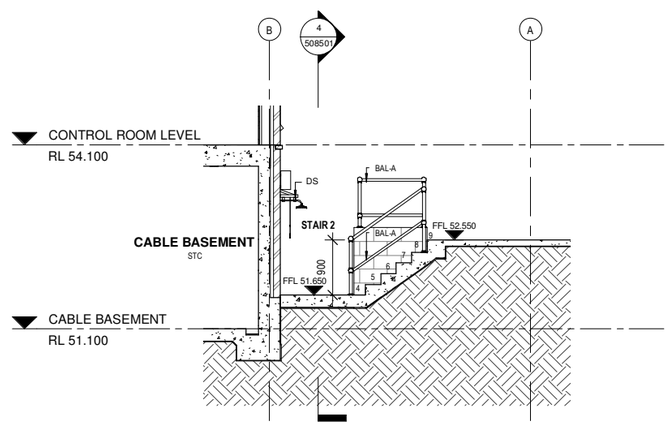

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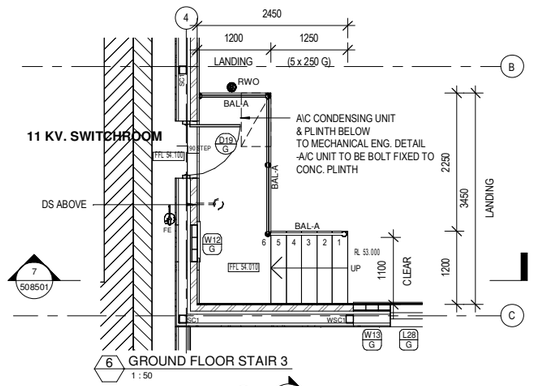

6 GROUND FLOOR STAIR 3
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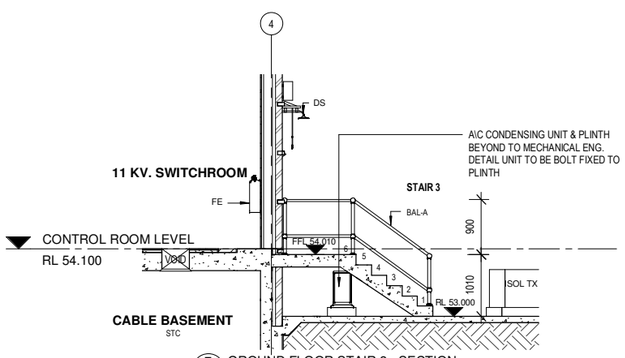

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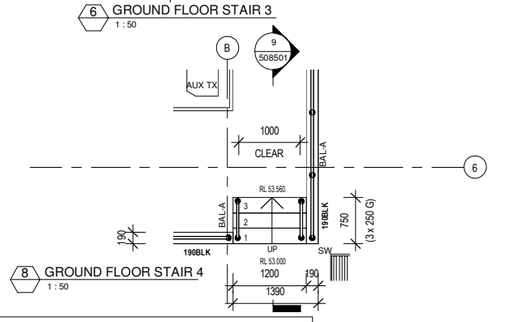

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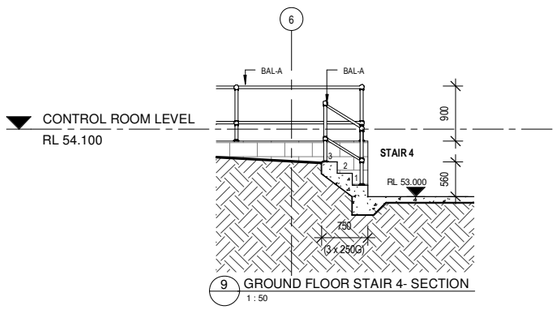

9 GROUND FLOOR STAIR 4- SECTION
1 : 50

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A1 | 508501 | Rev. 3

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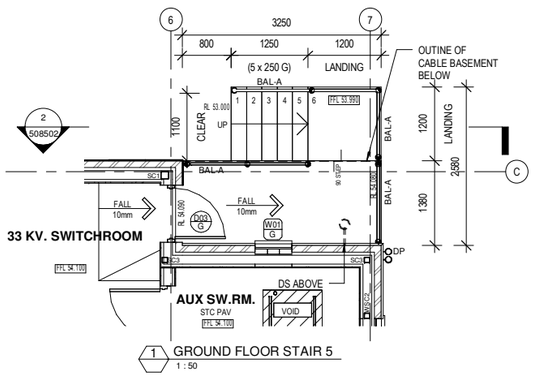

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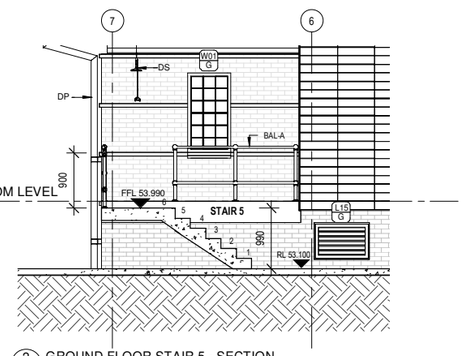

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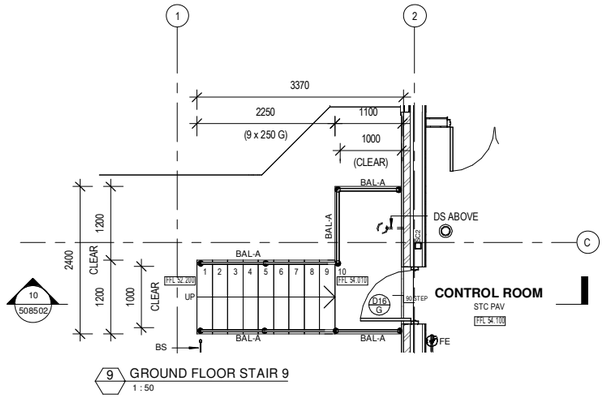

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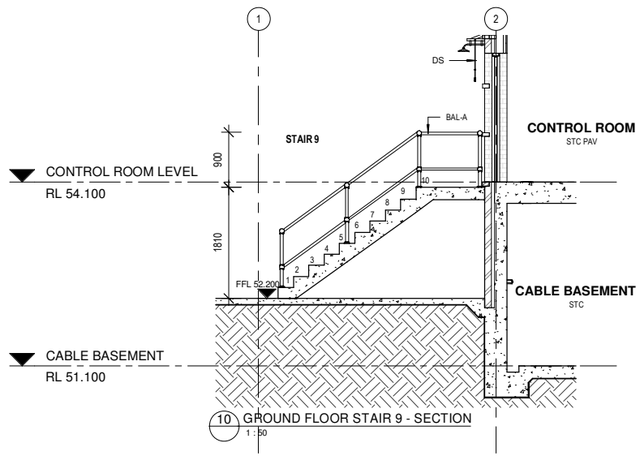

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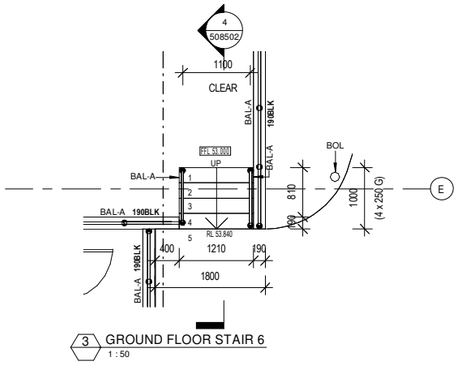

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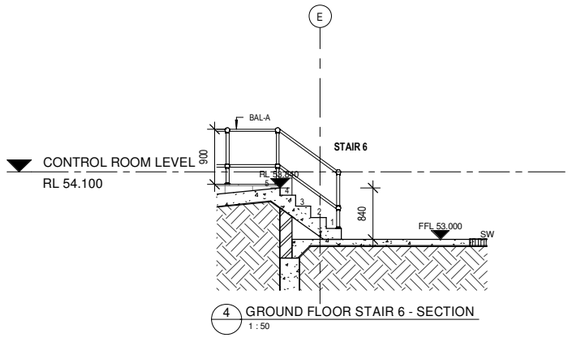

4 GROUND FLOOR STAIR 6 - SECTION
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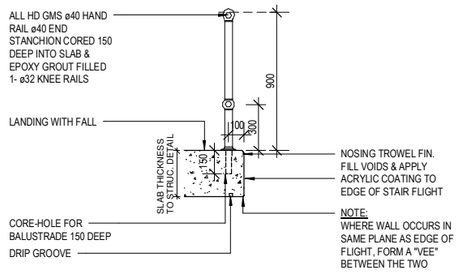

11 BALUSTRADE TYPE A -FIXED DETAIL
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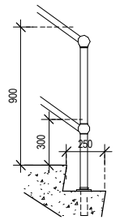
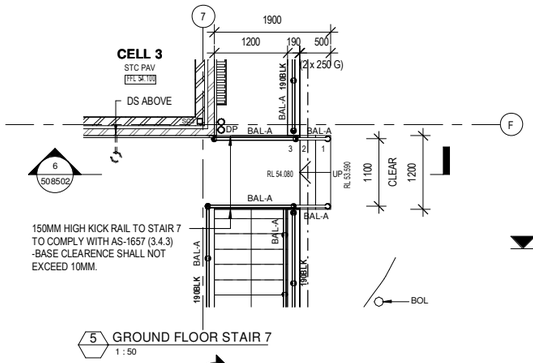


12 BALUSTRADE TYPE A - FIXED - ELEVATION
1 : 20



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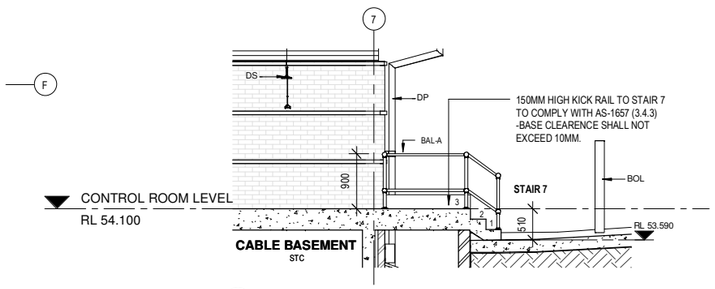

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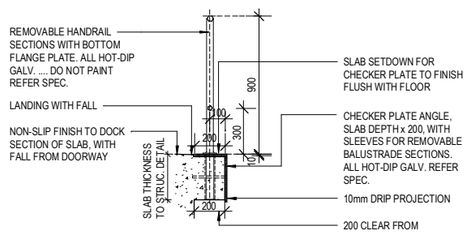

13 BALUSTRADE TYPE B - REMOVABLE DETAIL
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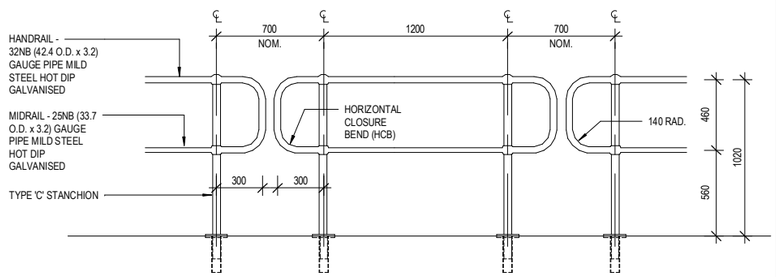

14 BALUSTRADE TYPE B - REMOVEABLE BALUSTRADE
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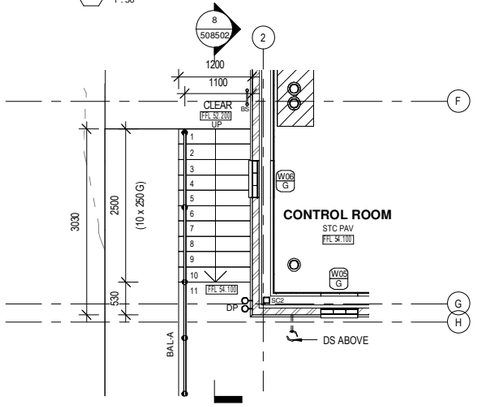

7 GROUND FLOOR STAIR 8
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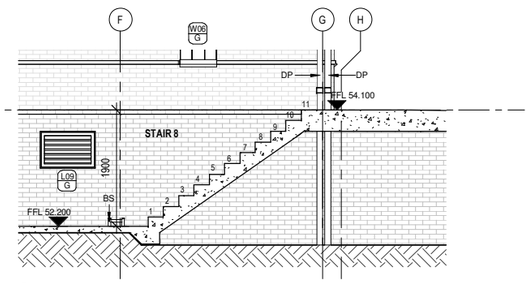

8 GROUND FLOOR STAIR 8 - SECTION
1 : 50

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1	PRELIMINARY FOR INFORMATION	2	PRELIMINARY ISSUE	3	ISSUE FOR TENDER					
Date	15/01/2018	Date	95% 24/01/2018	Date	23/02/2018	Date		Date		Date

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DATE	FEB.18		

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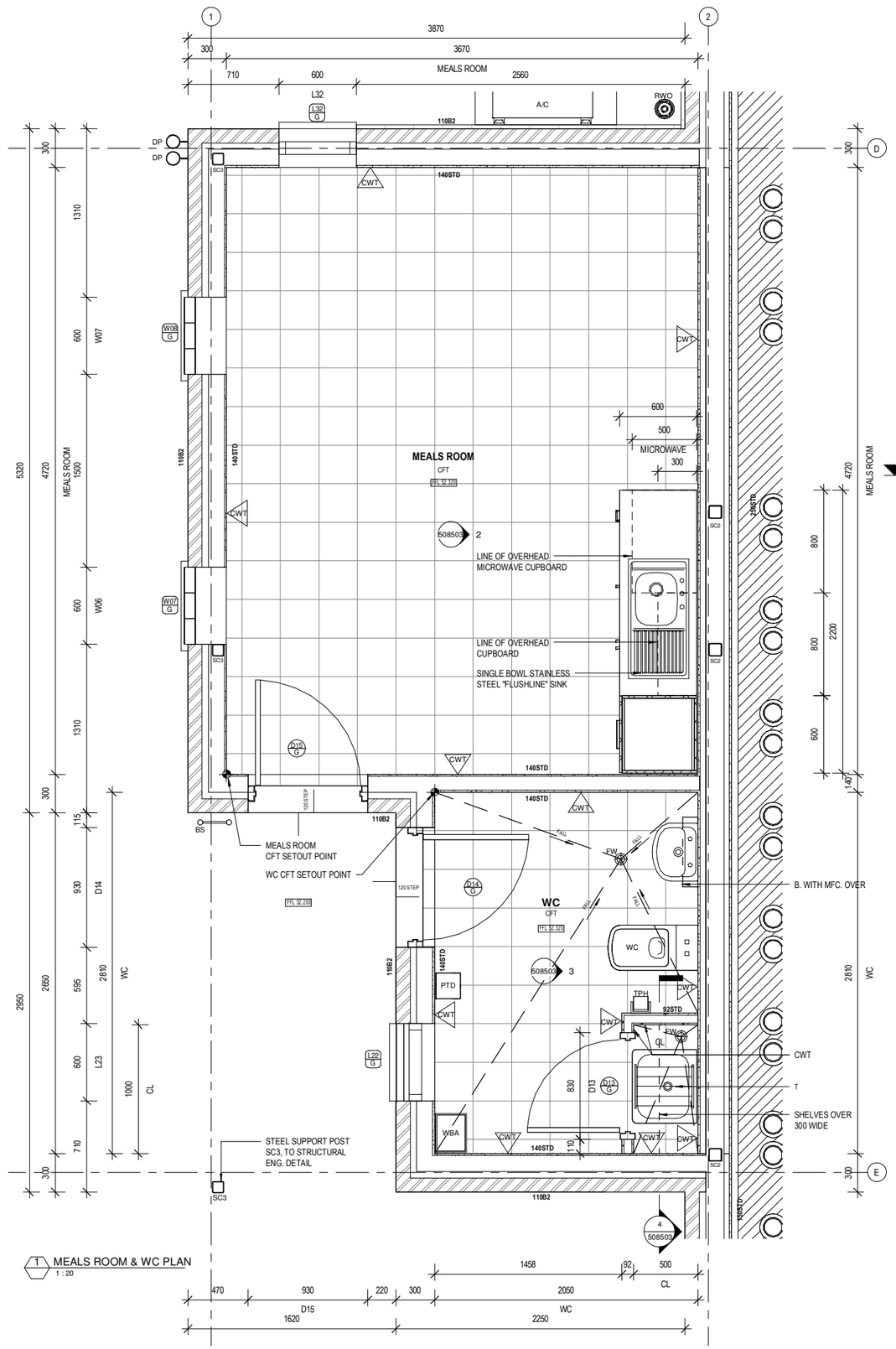
A1 | 508502 | Rev. 3

SHEET No 15 OF 23 SHEETS



1 MEALS ROOM & WC PLAN
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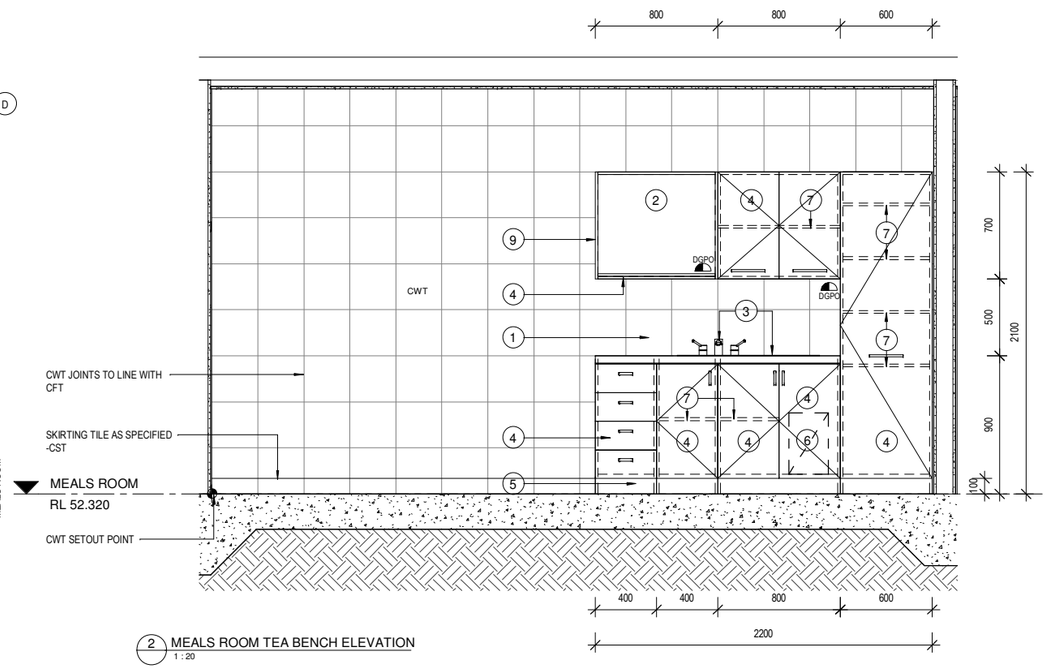

2 MEALS ROOM TEA BENCH ELEVATION
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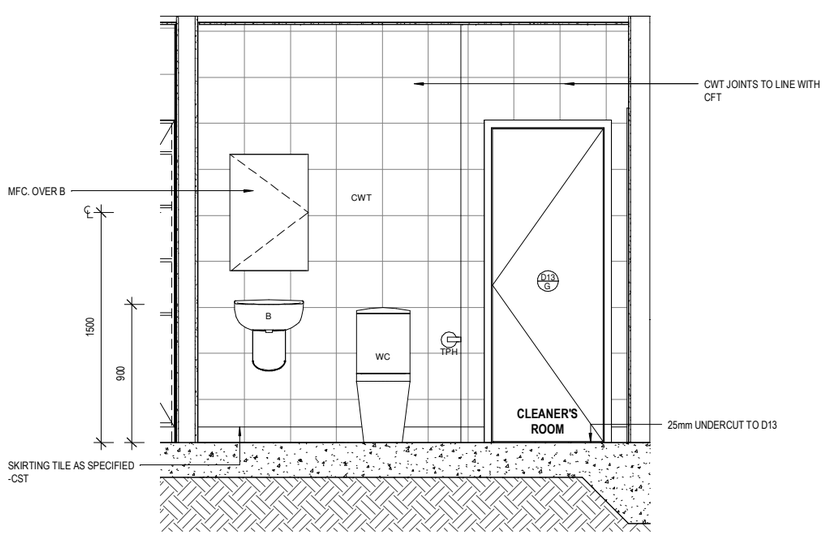

3 WC & CL ELEVATION
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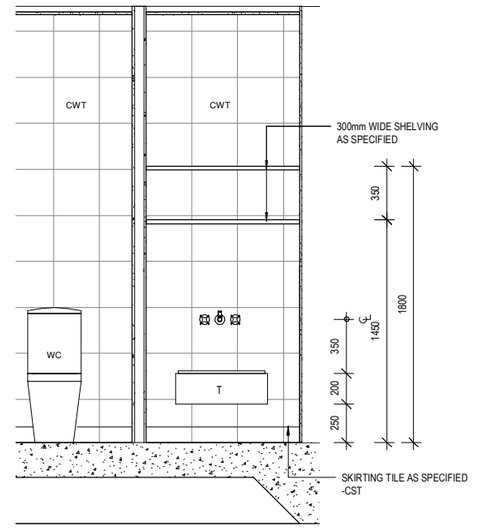

4 CL SECTION
1 : 20

LEGEND

B	BASIN
BS	BOOT SCRAPER
CL	CLEANERS CUPBOARD
CFT	CERAMIC FLOOR TILES
CWT	CERAMIC WALL TILES
CST	COVED SKIRTING TILES
DP	DOWNPIPES
FW	FLOOR WASTE
PTD	PAPER TOWEL DISPENSER
TPH	TOILET PAPER HOLDER
T	CLEANERS TUB
WC	WATER CLOSET
WBA	WASTE BASKET
DGPO	DGPO (DOUBLE GENERAL PURPOSE OUTLET)
1	CERAMIC TILE PLASHBACK
2	MELAMINE FINISHED BACKING
3	SINGLE BOWL. STAINLESS STEEL "FLUSHLINE" TYPE SINK WITH HOT AND COLD TAPS AND SPOUT. POST FORMED NOSING TO TOP
4	DOOR AND DRAWER FRONT PANELS WITH SELECTED LAMINATED PLASTIC FINISH BOTH SIDES, WITH 100mm "D" HANDLES. TOP DRAWER WITH CUTLERY INSERTS
5	TOEBOARD TILED AS FOR FLOOR SKIRTING
6	UNDERBENCH INSTANTANEOUS HOT WATER HEATER (PROVIDE 3 PHASE POWER THERTO)
7	MID SHELF
8	MICROWAVE UNIT TO BE 500mm DEEP

NOTES:
REFER TO EE STANDARD DETAILS SHEETS
351317 FOR TEA/MEALS ROOM STANDARD SINKBENCH
351318 FOR TOILET AND CLEANERS AREA

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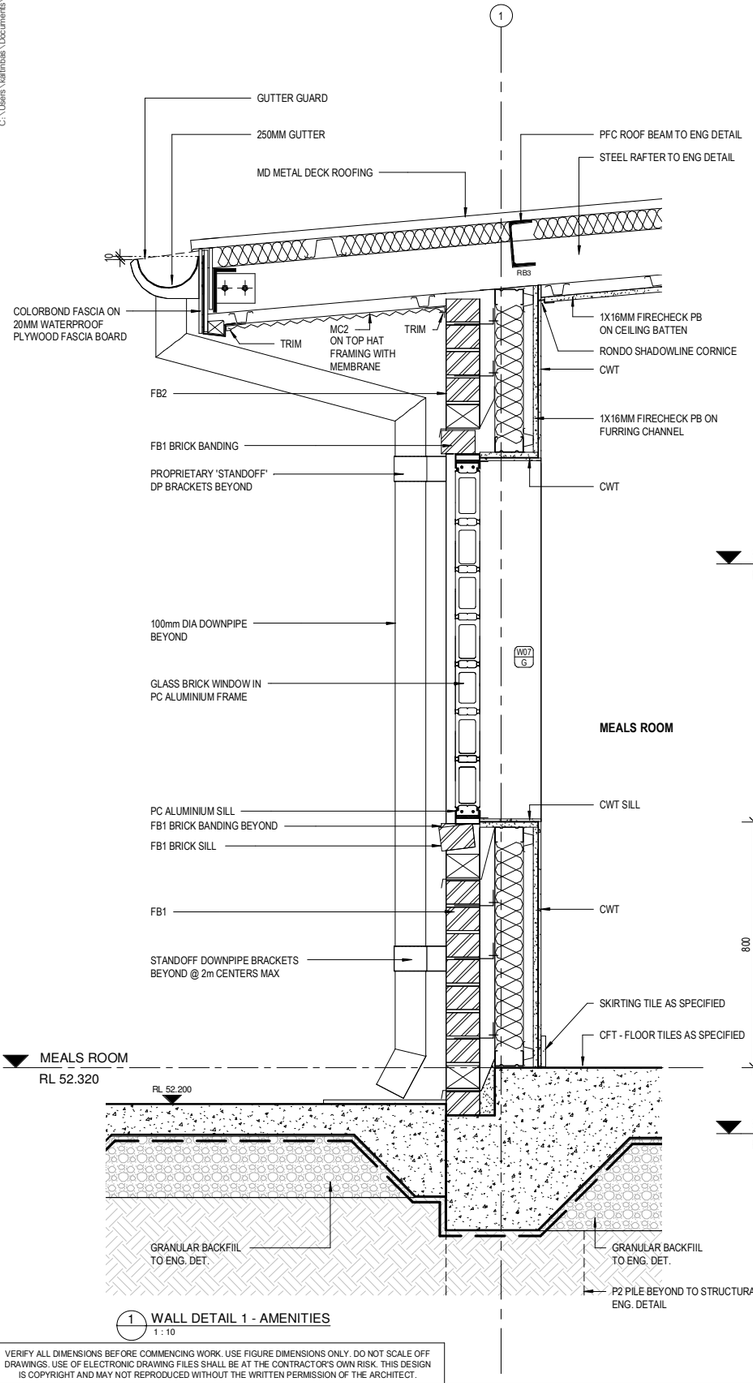
Marayong Zone Substation
Corner of Raymond St and Charles St, Blacktown
MEALS ROOM, WC & CL PLANS, ELEVATIONS & SECTIONS

A1 | 508503 | Rev. 3
SHEET No **16** OF **23** SHEETS



1 WALL DETAIL 1 - AMENITIES
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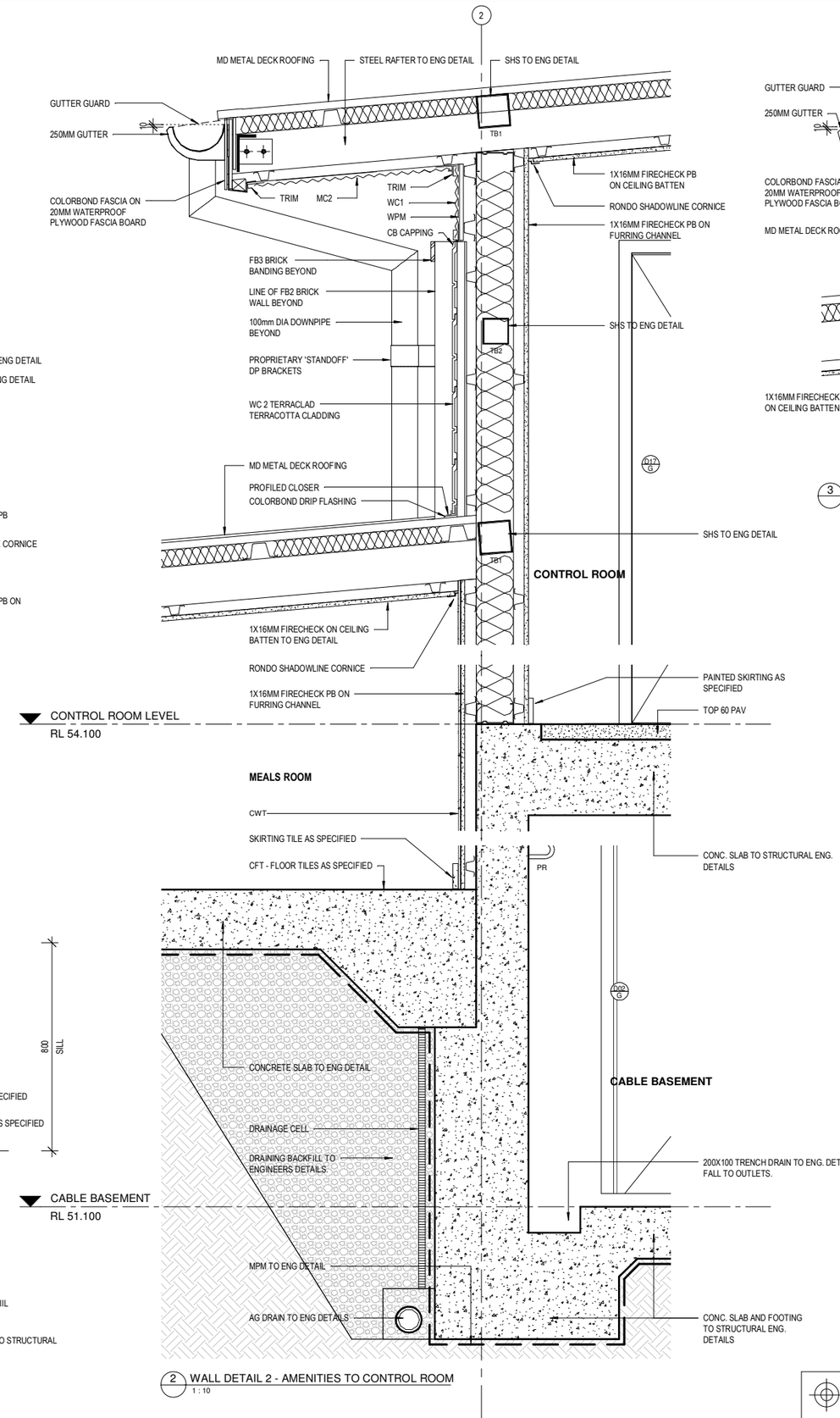

2 WALL DETAIL 2 - AMENITIES TO CONTROL ROOM
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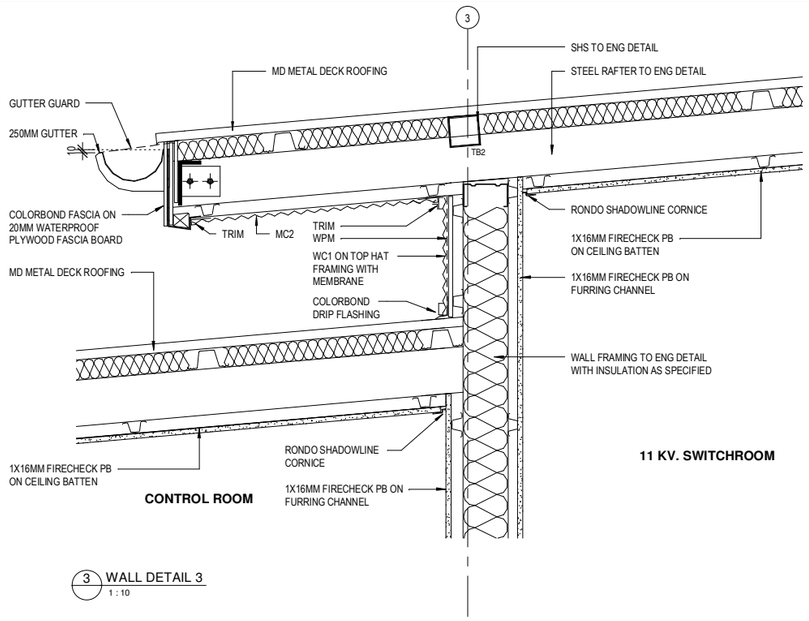

3 WALL DETAIL 3
1 : 10

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WALL DETAILS 1

A1 | 508504 | Rev. 3

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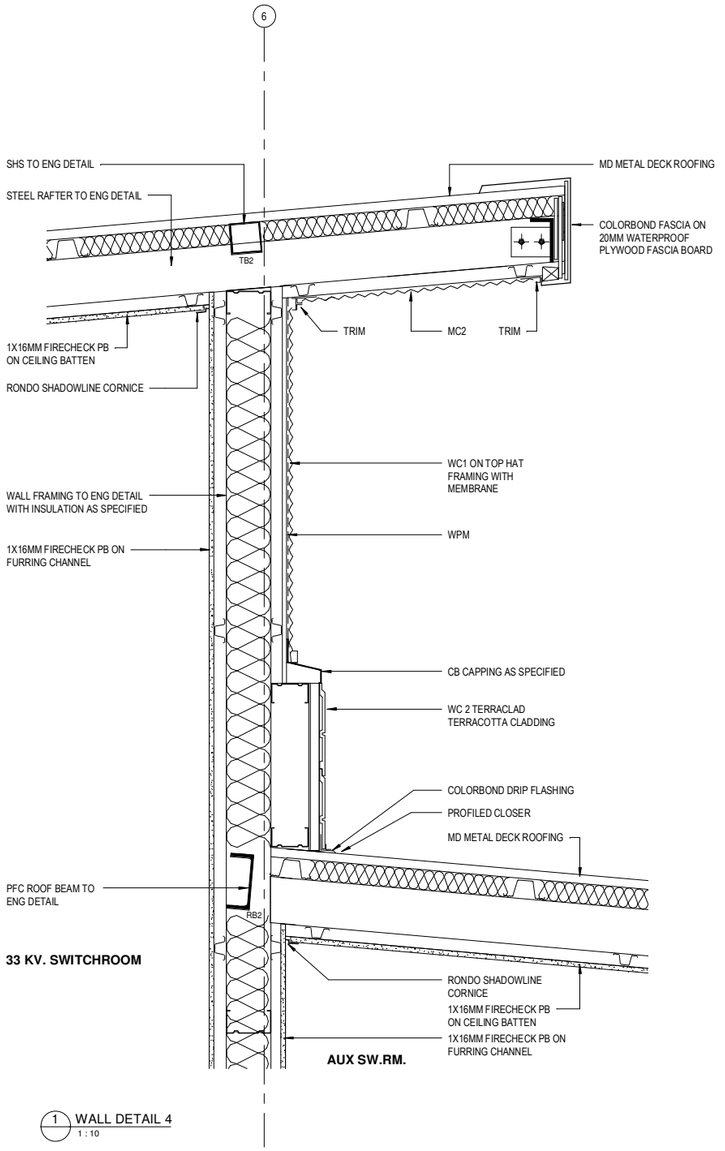
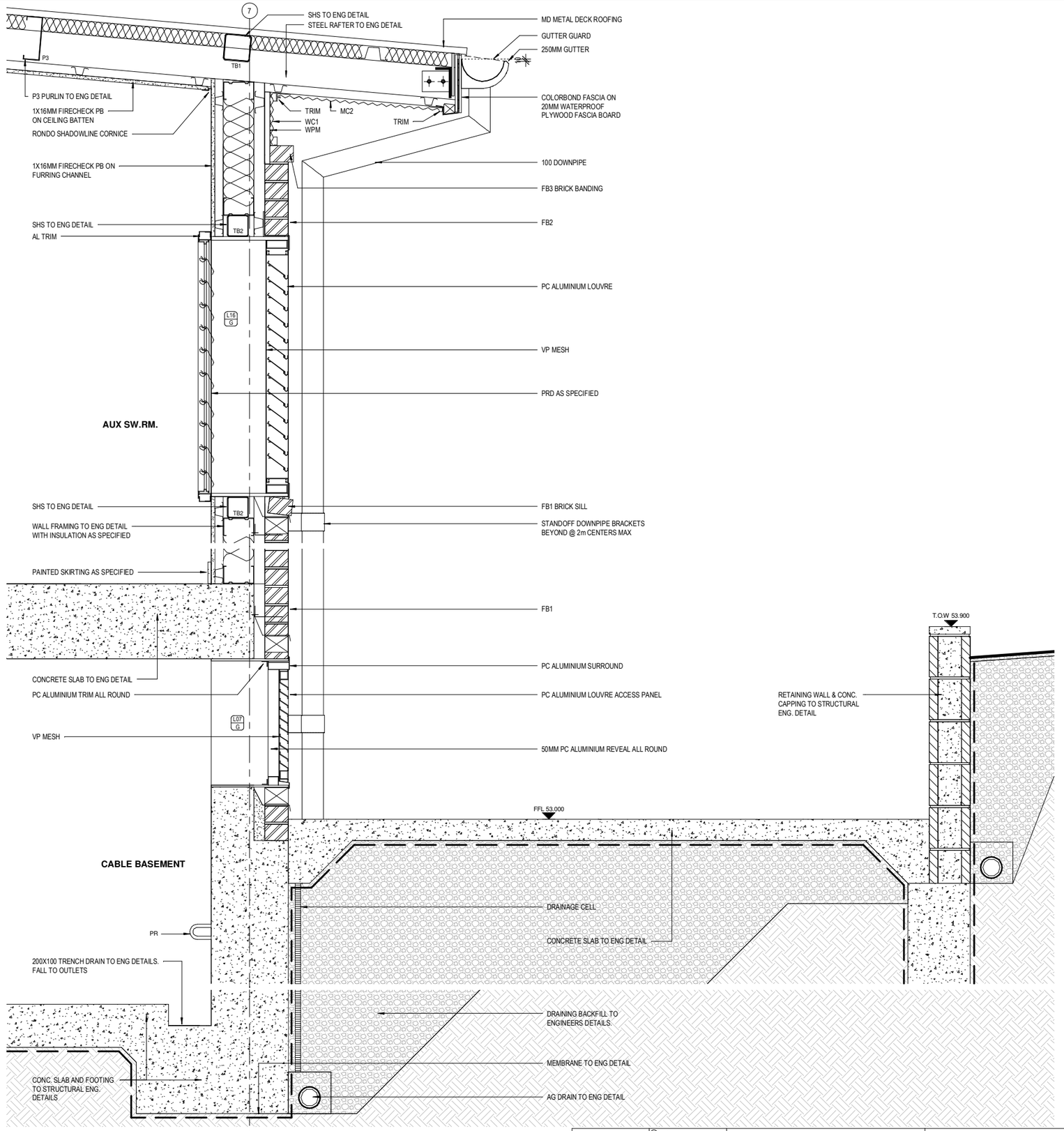


1 WALL DETAIL 4
1 : 10



2 WALL DETAIL 5 - CELL ROOM
1 : 10

AMENDMENTS

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Corner of Raymond St and Charles St, Blacktown
WALL DETAILS 2

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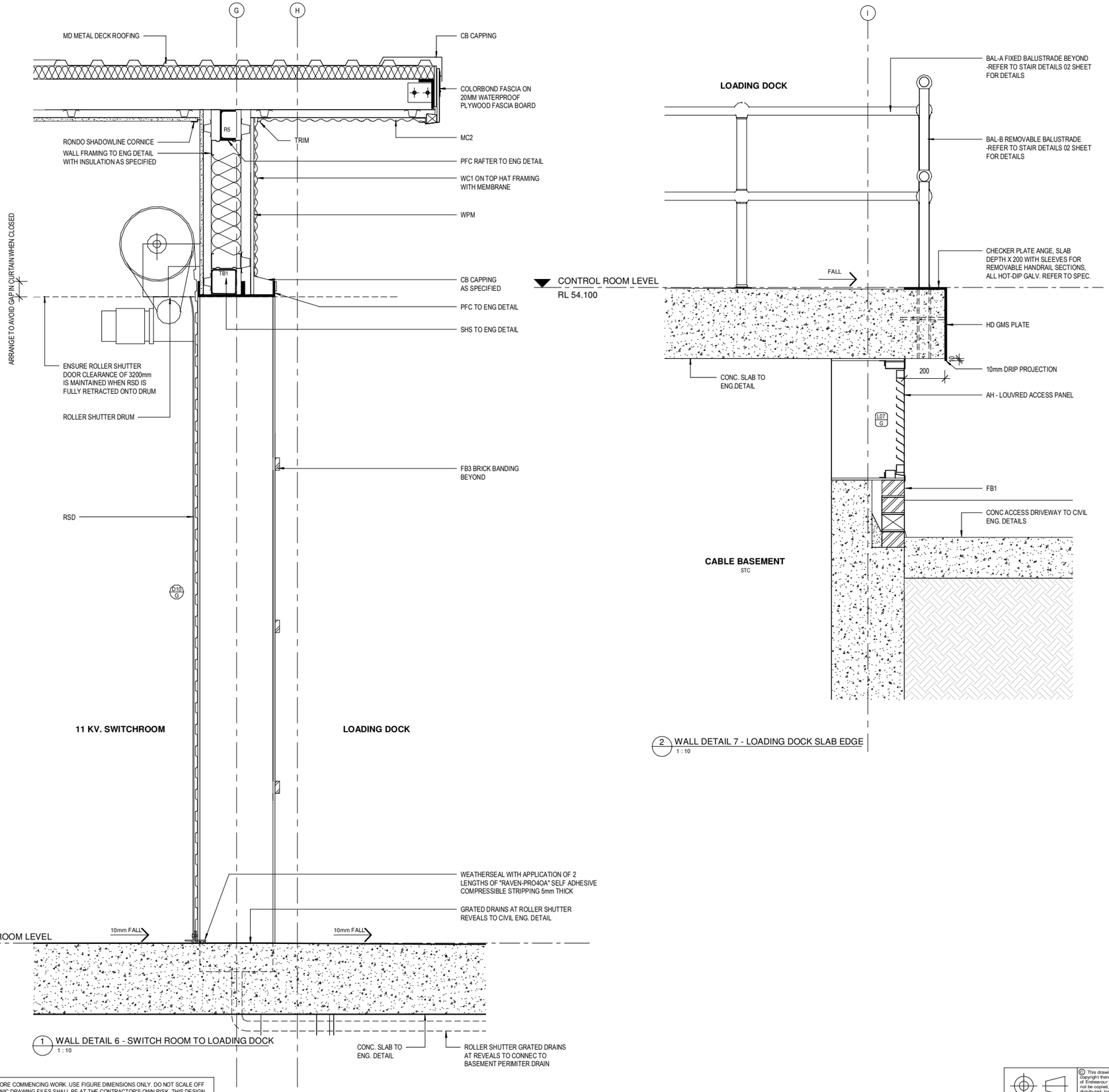
SHEET No **18** OF **23** SHEETS



1 WALL DETAIL 6 - SWITCH ROOM TO LOADING DOCK
1 : 10

2 WALL DETAIL 7 - LOADING DOCK SLAB EDGE
1 : 10

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AMENDMENTS

1	PRELIMINARY FOR INFORMATION	Date	15/01/2018				Date
2	95% PRELIMINARY ISSUE	Date	24/01/2018				Date
3	ISSUE FOR TENDER	Date	23/02/2018				Date

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WALL DETAILS 3

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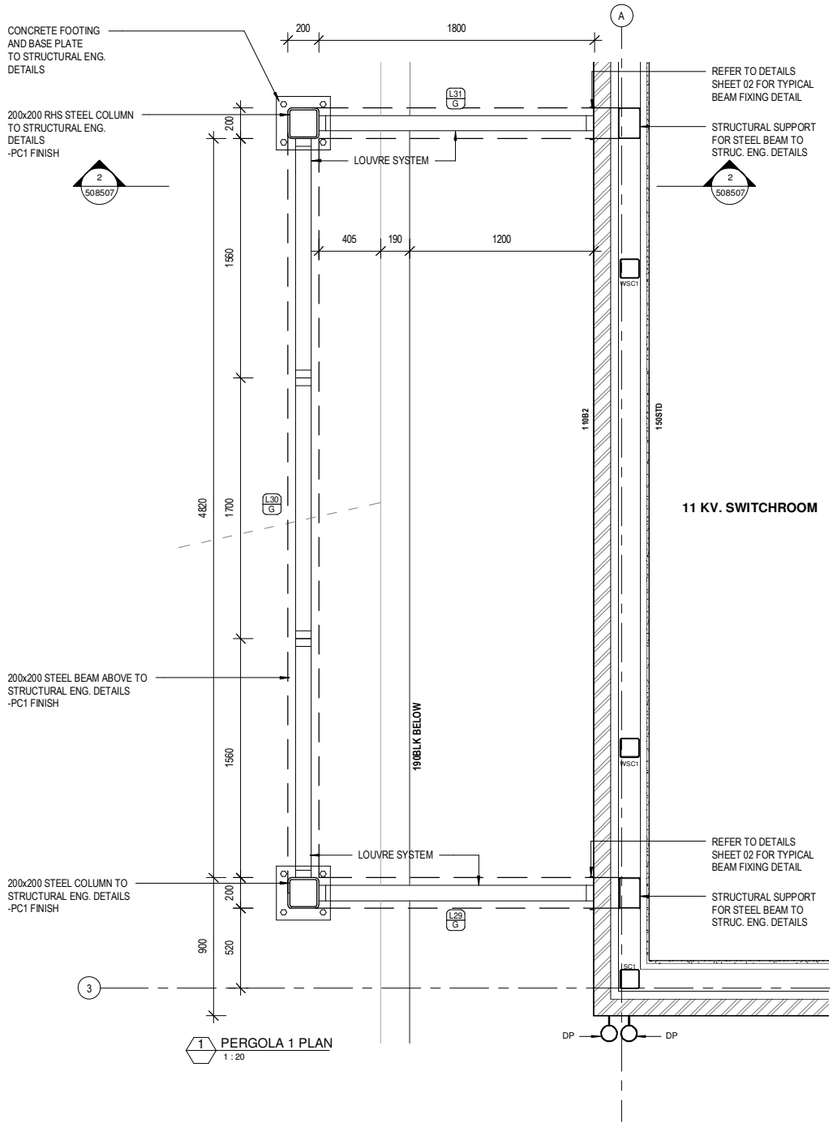
SHEET No **19** OF **23** SHEETS



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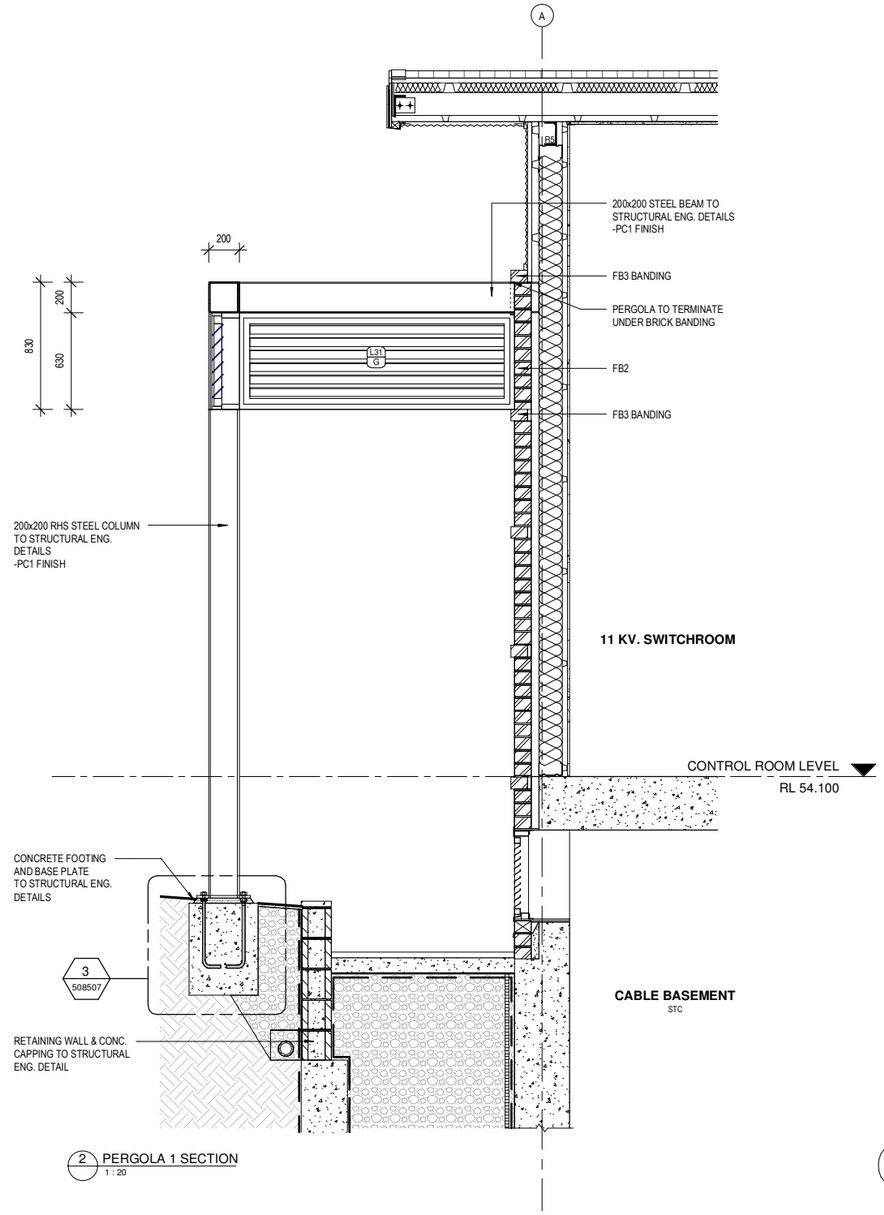

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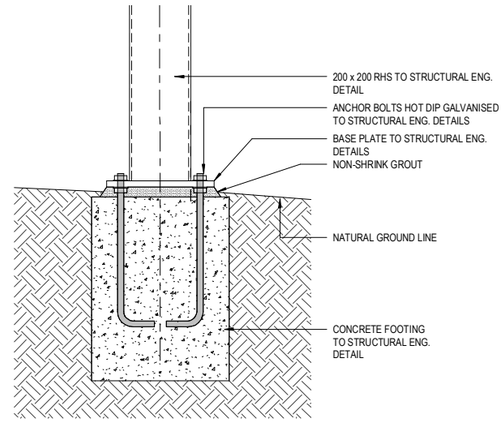

3 PERGOLA 1 FOOTING DETAIL
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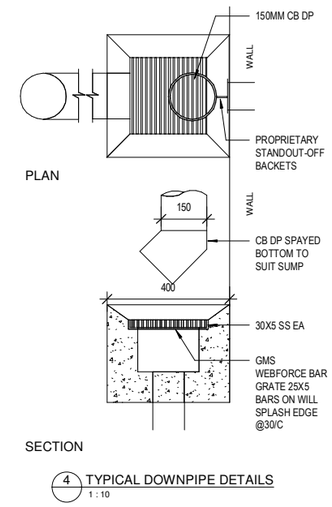

4 TYPICAL DOWNPIPE DETAILS
1 : 10

AMENDMENTS

1	PRELIMINARY FOR INFORMATION	Date 15/01/2018
2	95% PRELIMINARY ISSUE	Date 24/07/2018
3	ISSUE FOR TENDER	Date 23/02/2018
		Date
		Date
		Date

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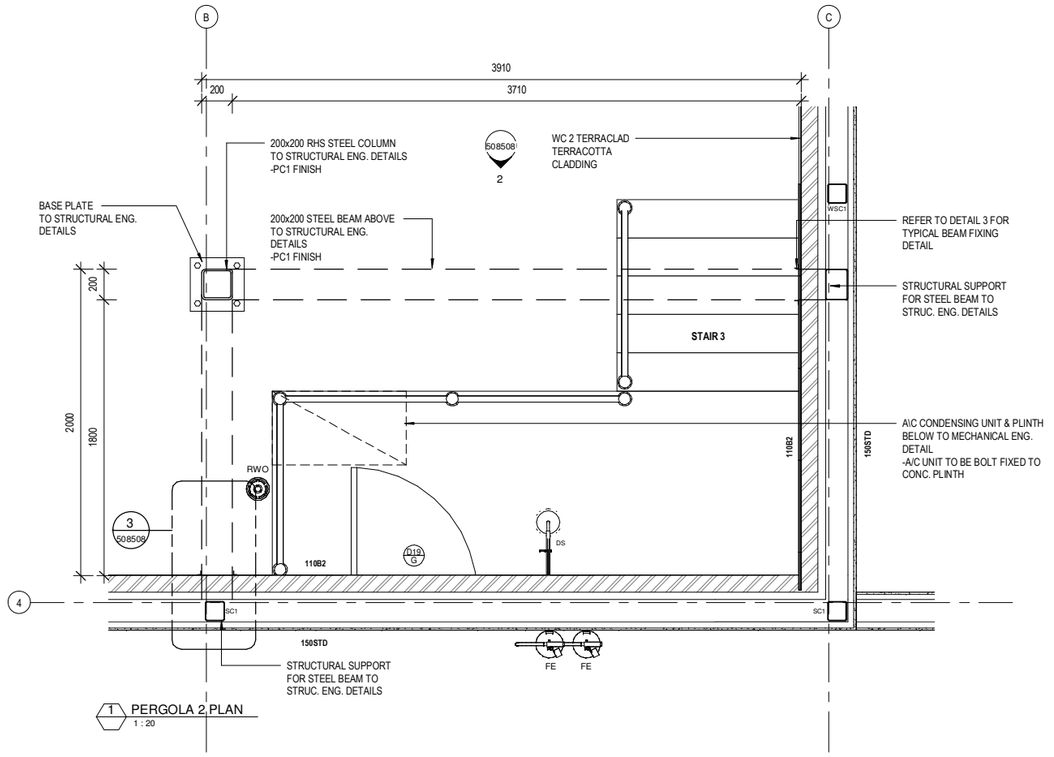
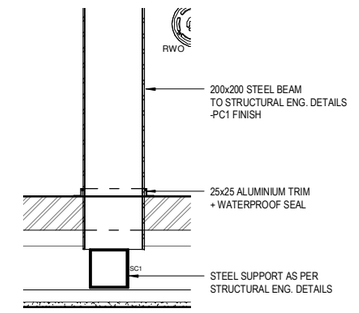


1 PERGOLA 2 PLAN
1 : 20



3 PERGOLA FIXING DETAIL - TYPICAL
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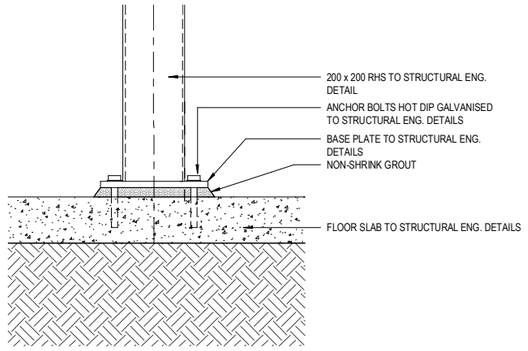
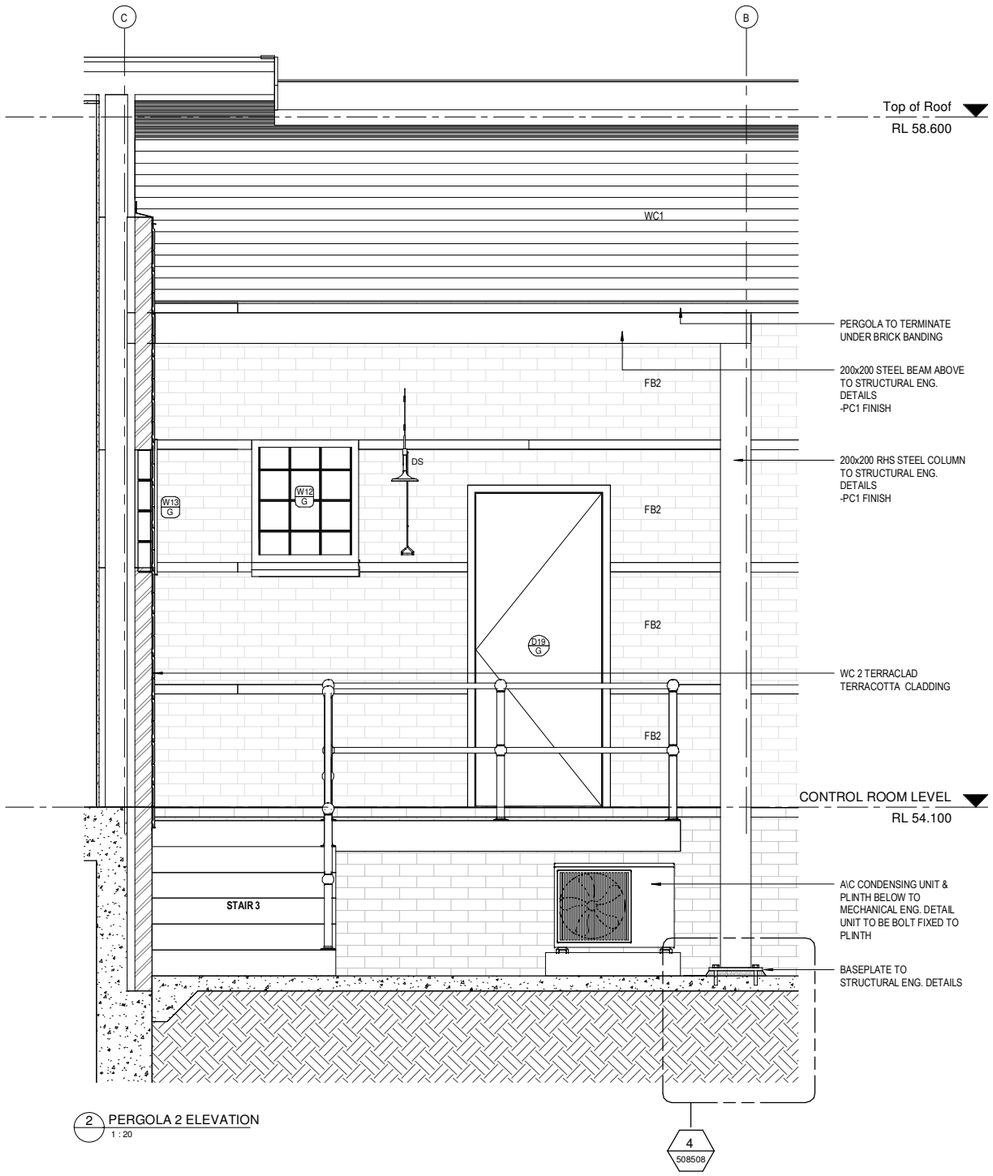


4 PERGOLA 2 FOOTING DETAIL
1 : 10



2 PERGOLA 2 ELEVATION
1 : 20

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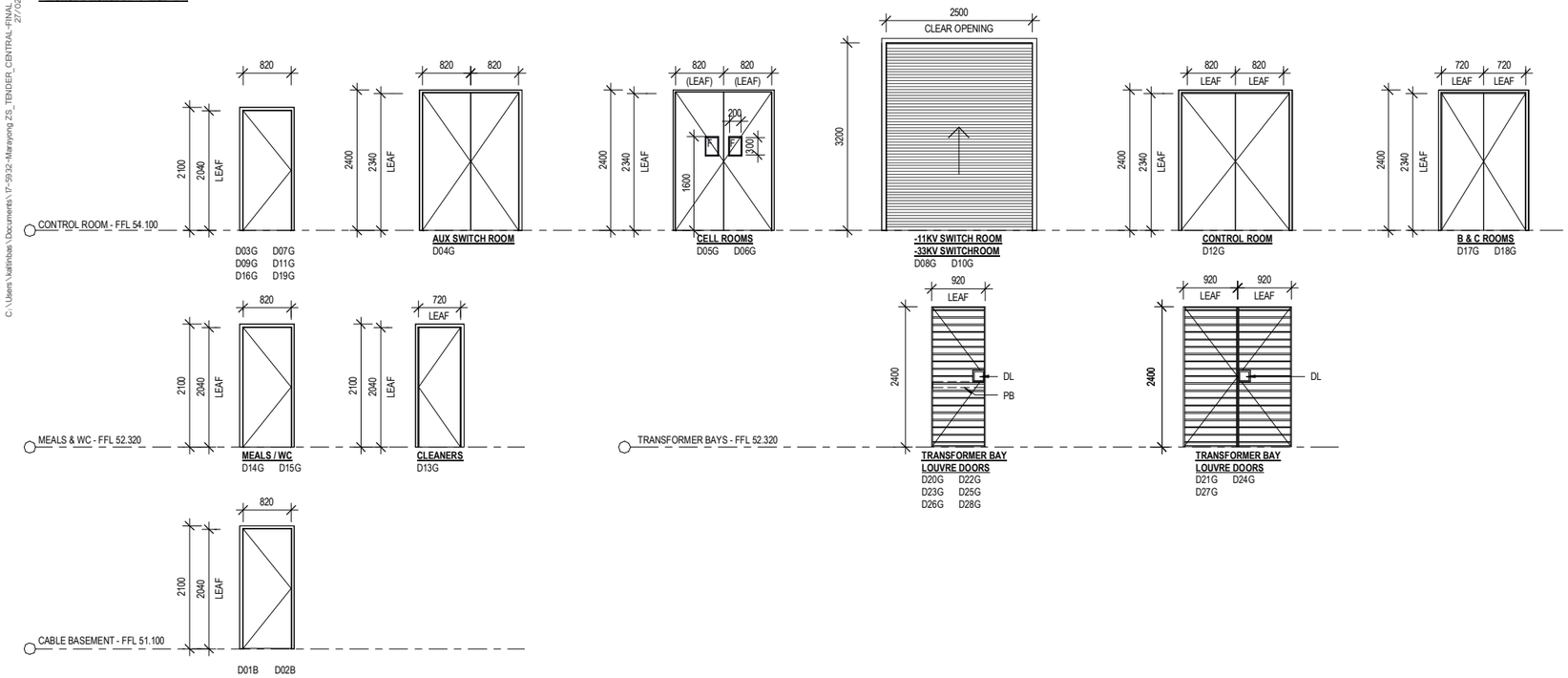
DOOR SCHEDULE



DOOR SCHEDULE

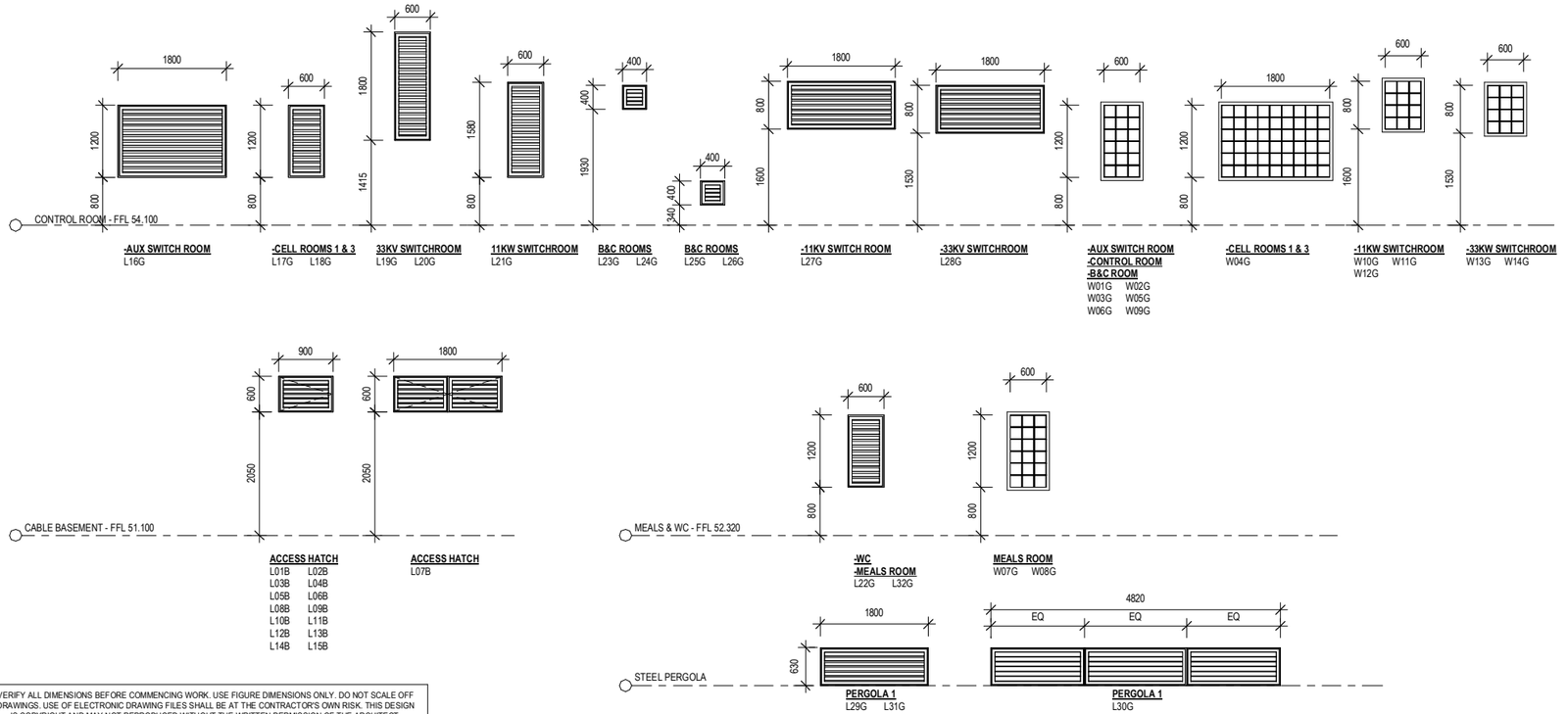
Number		Location	Door Size & Type	Frame Material	Finish	Fire Rating	Remarks
D01	B	CABLE BASEMENT	820W x 2100H	STEEL	PAINT FINISH		
D02	B	CABLE BASEMENT	820W x 2100H	STEEL	PAINT FINISH		
D03	G	33KV SWITCHROOM	820W x 2100H	STEEL	PAINT FINISH		
D04	G	AUX SWITCH ROOM	2x820W x 2400H	STEEL	PAINT FINISH		
D05	G	CELL 1	2x820W x 2400H + VIEWING PANELS	STEEL	PAINT FINISH		
D06	G	CELL 3	2x820W x 2400H + VIEWING PANELS	STEEL	PAINT FINISH		
D07	G	33KV SWITCHROOM	820W x 2100H	STEEL	PAINT FINISH		
D08	G	33KV SWITCHROOM	2500W x 3200H ROLLER DOOR	STEEL	ALUMINIUM - POWDERCOATED PAINT FINISH		
D09	G	11KV SWITCHROOM	820W x 2100H	STEEL	PAINT FINISH		
D10	G	11KV SWITCHROOM	2500W x 3200H ROLLER DOOR	STEEL	ALUMINIUM - POWDERCOATED PAINT FINISH		
D11	G	CONTROL ROOM	820W x 2100H	STEEL	PAINT FINISH		
D12	G	CONTROL ROOM	2x820W x 2400H	STEEL	PAINT FINISH		
D13	G	CLEANERS	720W x 2100H	STEEL	PAINT FINISH		
D14	G	WC	820W x 2100H	STEEL	PAINT FINISH		
D15	G	MEALS ROOM	820W x 2100H	STEEL	PAINT FINISH		
D16	G	CONTROL ROOM	820W x 2100H	STEEL	PAINT FINISH		
D17	G	B&C 1	2x720W x 2400H	STEEL	PAINT FINISH		
D18	G	B&C 2	2x720W x 2400H	STEEL	PAINT FINISH		
D19	G	11KV SWITCHROOM	820W x 2100H	STEEL	PAINT FINISH		
D20	G	TX BAY 1	920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		EMERGENCY ACCESS DOOR - AS SPECIFIED
D21	G	TX BAY 1	2x920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		
D22	G	TX BAY 1	920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		EMERGENCY ACCESS DOOR - AS SPECIFIED
D23	G	TX BAY 2	920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		EMERGENCY ACCESS DOOR - AS SPECIFIED
D24	G	TX BAY 2	2x920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		
D25	G	TX BAY 2	920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		EMERGENCY ACCESS DOOR - AS SPECIFIED
D26	G	TX BAY 3	920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		EMERGENCY ACCESS DOOR - AS SPECIFIED
D27	G	TX BAY 3	2x920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		
D28	G	TX BAY 3	920W x 2400H	ALUMINIUM	ALUMINIUM - POWDERCOATED PAINT FINISH		EMERGENCY ACCESS DOOR - AS SPECIFIED

NOTES:
-LOUVRES VIEWED FROM OUTSIDE. - SHOP DRAWINGS TO BE PROVIDED FOR APPROVAL INCLUDING TX BAY LOUVRE SCREENS AND DOORS
-ALL SIZES ARE APPROX. MASONARY & OTHER OPENINGS WHICH MUST BE VERIFIED ON SITE.
-ALLOWANCES MUST BE MADE FOR MANUFACTURED UNIT SIZES & CONSTRUCTION TOLERANCES.

ABBREVIATIONS

F	FIXED GLASS VIEWING PANEL
FDA	FIRE DAMPER
DL	DOOR LOCKSET CUTOUT
PB	PANIC BAR (INTERNAL SIDE OF TX BAY'S) AS SPECIFIED
PRD	PRESSURE RELIEF DAMPER
VP MESH	VERMIN PROOF MESH

LOUVRE / GLASS BLOCK WINDOW SCHEDULE



LOUVRE SCHEDULE

Number		Level	Location	Size (W x H mm)	Sill Height (APPROX.)	VP MESH	FILTER	FDA	PRD	Remarks & Louvre TYPE	Frame Material & Finish
L01	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L02	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L03	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L04	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L05	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L06	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L07	B	CABLE BASEMENT		1800W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L08	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L09	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L10	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L11	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L12	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L13	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L14	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L15	B	CABLE BASEMENT		900W x 600H	2050	YES	–	–	–	ACCESS HATCH -LOUVRE TYPE 3	PC ALUMINIUM
L16	G	CONTROL ROOM LEVEL	AUX SW	1800W x 1200H	800	YES	–	–	YES	LOUVRE TYPE 2	PC ALUMINIUM
L17	G	CONTROL ROOM LEVEL	CELL 1	600W x 1200H	800	YES	YES	–	–	LOUVRE TYPE 1	PC ALUMINIUM
L18	G	CONTROL ROOM LEVEL	CELL 3	600W x 1200H	800	YES	YES	–	–	LOUVRE TYPE 1	PC ALUMINIUM
L19	G	CONTROL ROOM LEVEL	33KV SWITCHROOM	600W x 1800H	1415	YES	–	–	YES	LOUVRE TYPE 2	PC ALUMINIUM
L20	G	CONTROL ROOM LEVEL	33KV SWITCHROOM	600W x 1800H	1415	YES	–	–	YES	LOUVRE TYPE 2	PC ALUMINIUM
L21	G	CONTROL ROOM LEVEL	11KV SWITCHROOM	600W x 1580H	800	YES	–	–	YES	LOUVRE TYPE 2	PC ALUMINIUM
L22	G	MEALS ROOM	WC	600W x 1200H	800	YES	YES	–	–	LOUVRE TYPE 1	PC ALUMINIUM
L23	G	CONTROL ROOM LEVEL	B&C 1	400W x 400H	1930	YES	YES	–	–	LOUVRE TYPE 1	PC ALUMINIUM
L24	G	CONTROL ROOM LEVEL	B&C 2	400W x 400H	1930	YES	YES	–	–	LOUVRE TYPE 1	PC ALUMINIUM
L25	G	CONTROL ROOM LEVEL	B&C 1	400W x 400H	340	YES	YES	–	–	LOUVRE HEAD TO TERMINATE AT BRICK BANDING - LOUVRE TYPE 1	PC ALUMINIUM
L26	G	CONTROL ROOM LEVEL	B&C 2	400W x 400H	340	YES	YES	–	–	LOUVRE HEAD TO TERMINATE AT BRICK BANDING - LOUVRE TYPE 1	PC ALUMINIUM
L27	G	CONTROL ROOM LEVEL	11KV SWITCHROOM	1800W x 800H	1600	YES	–	–	YES	LOUVRE TYPE 2	PC ALUMINIUM
L28	G	CONTROL ROOM LEVEL	33KV SWITCHROOM	1800W x 800H	1530	YES	–	–	YES	LOUVRE TYPE 2	PC ALUMINIUM
L29	G	CONTROL ROOM LEVEL	PERGOLA 1	1800W x 630H	2395	–	–	–	–		PC ALUMINIUM
L30	G	CONTROL ROOM LEVEL	PERGOLA 1	4820Wx630H	2395	–	–	–	–		PC ALUMINIUM
L31	G	CONTROL ROOM LEVEL	PERGOLA 1	1800W x 630H	2395	–	–	–	–		PC ALUMINIUM
L32	G	MEALS ROOM	MEALS ROOM	600W x 1200H	800	YES	YES	–	–	LOUVRE TYPE 1	PC ALUMINIUM

WINDOW SCHEDULE

Number		Level	Location	Size (W x H mm)	Sill Height (APPROX.)	VP Mesh	Filter	FDA	PRD	Remarks & Window Type	Frame Material & Finish
W01	G	CONTROL ROOM LEVEL	AUX SW	600W x 1200H	800	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W02	G	CONTROL ROOM LEVEL	AUX SW	600W x 1200H	800	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W03	G	CONTROL ROOM LEVEL	AUX SW	600W x 1200H	800	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W04	G	CONTROL ROOM LEVEL	CELL 1 & CELL 3	1800W x 1200H	800	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W05	G	CONTROL ROOM LEVEL	CONTROL ROOM	600W x 1200H	800	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W06	G	CONTROL ROOM LEVEL	CONTROL ROOM	600W x 1200H	800	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W07	G	MEALS ROOM	MEALS ROOM	600W x 1200H	800	–	–	–	–	GLASS BLOCK WINDOW	PC ALUMINIUM
W08	G	MEALS ROOM	MEALS ROOM	600W x 1200H	800	–	–	–	–	GLASS BLOCK WINDOW	PC ALUMINIUM
W09	G	CONTROL ROOM LEVEL	B&C 1	600W x 1200H	800	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W10	G	CONTROL ROOM LEVEL	11KV SWITCHROOM	600W x 800H	1600	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W11	G	CONTROL ROOM LEVEL	11KV SWITCHROOM	600W x 800H	1600	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W12	G	CONTROL ROOM LEVEL	11KV SWITCHROOM	600W x 800H	1600	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W13	G	CONTROL ROOM LEVEL	33KV SWITCHROOM	600W x 800H	1530	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM
W14	G	CONTROL ROOM LEVEL	33KV SWITCHROOM	600W x 800H	1530	–	–	–	–	FALSE - GLASS BLOCK WINDOW TYPE 1	PC ALUMINIUM

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WINDOW, LOUVRE & DOOR SCHEDULE

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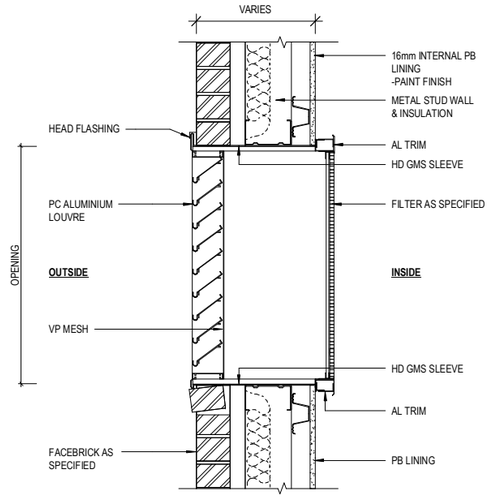
SHEET No **22** OF **23** SHEETS

LOUVRE TYPE DETAILS



1 LOUVRE TYPE 1 - LOUVRE + FILTER DETAIL
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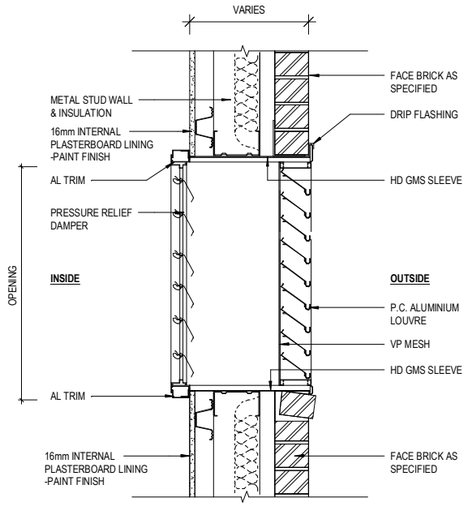

2 LOUVRE TYPE 2 - PRD + LOUVRE DETAIL
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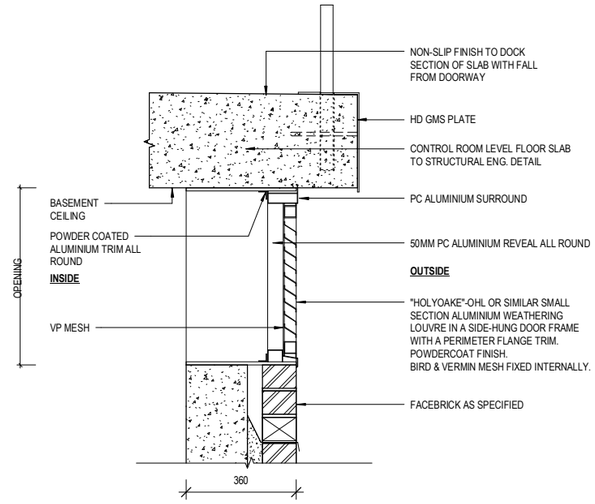
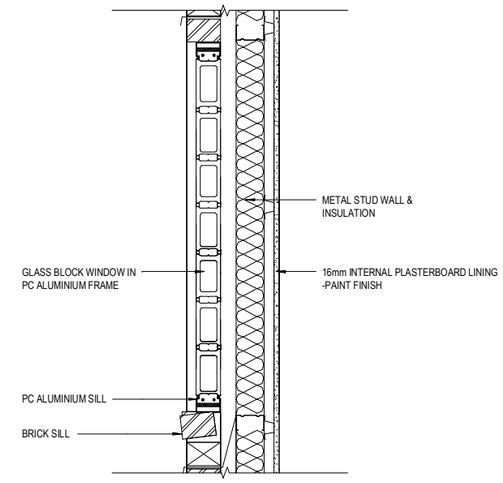


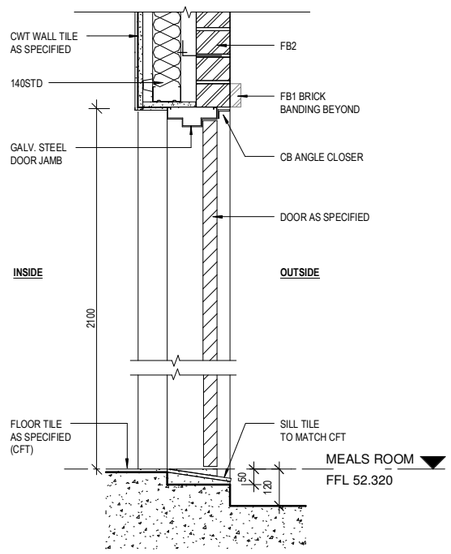
3 LOUVRE TYPE 3 - TYPICAL ACCESS HATCH
1 : 10

WINDOW TYPE DETAILS



4 WINDOW TYPE 1 DETAIL
1 : 10

DOOR / SHUTTER DETAILS



5 AMENITY DOOR THRESHOLD DETAIL
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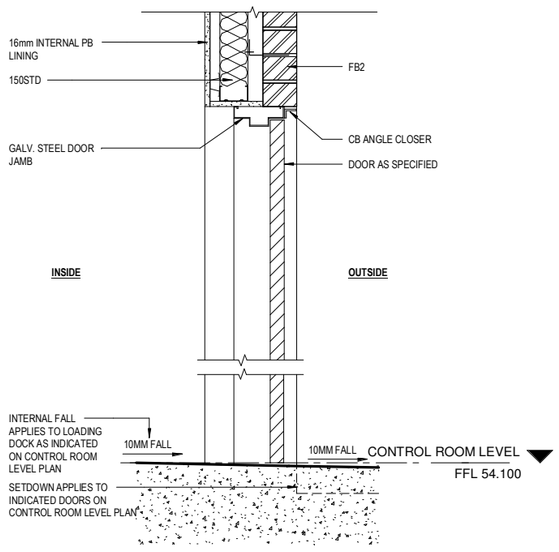
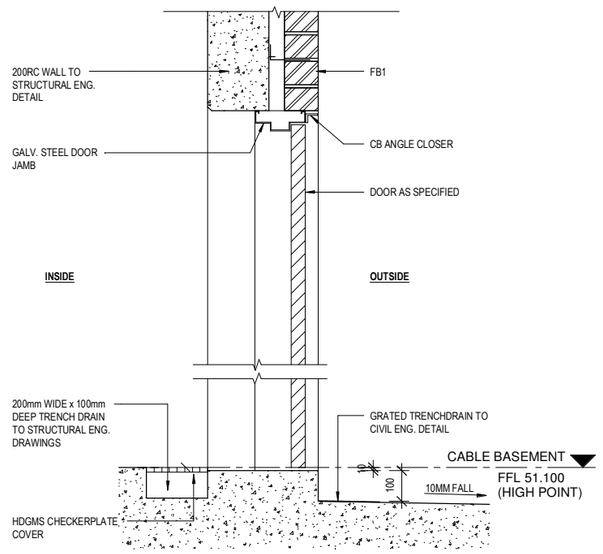
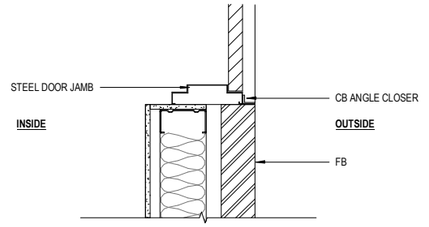


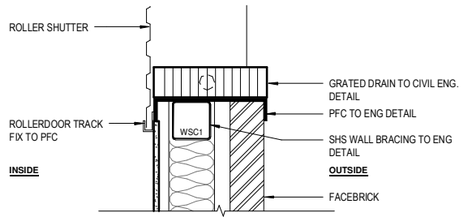
6 TYPICAL DOOR THRESHOLD-CONTROL ROOM LEVEL
1 : 10



7 TYPICAL DOOR THRESHOLD-CABLE BASEMENT LEVEL
1 : 10



8 TYPICAL DOOR JAM
1 : 10



9 TYPICAL ROLLER SHUTTER JAM
1 : 10

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DOOR, LOUVRE, SHUTTER & SCREEN DETAILS

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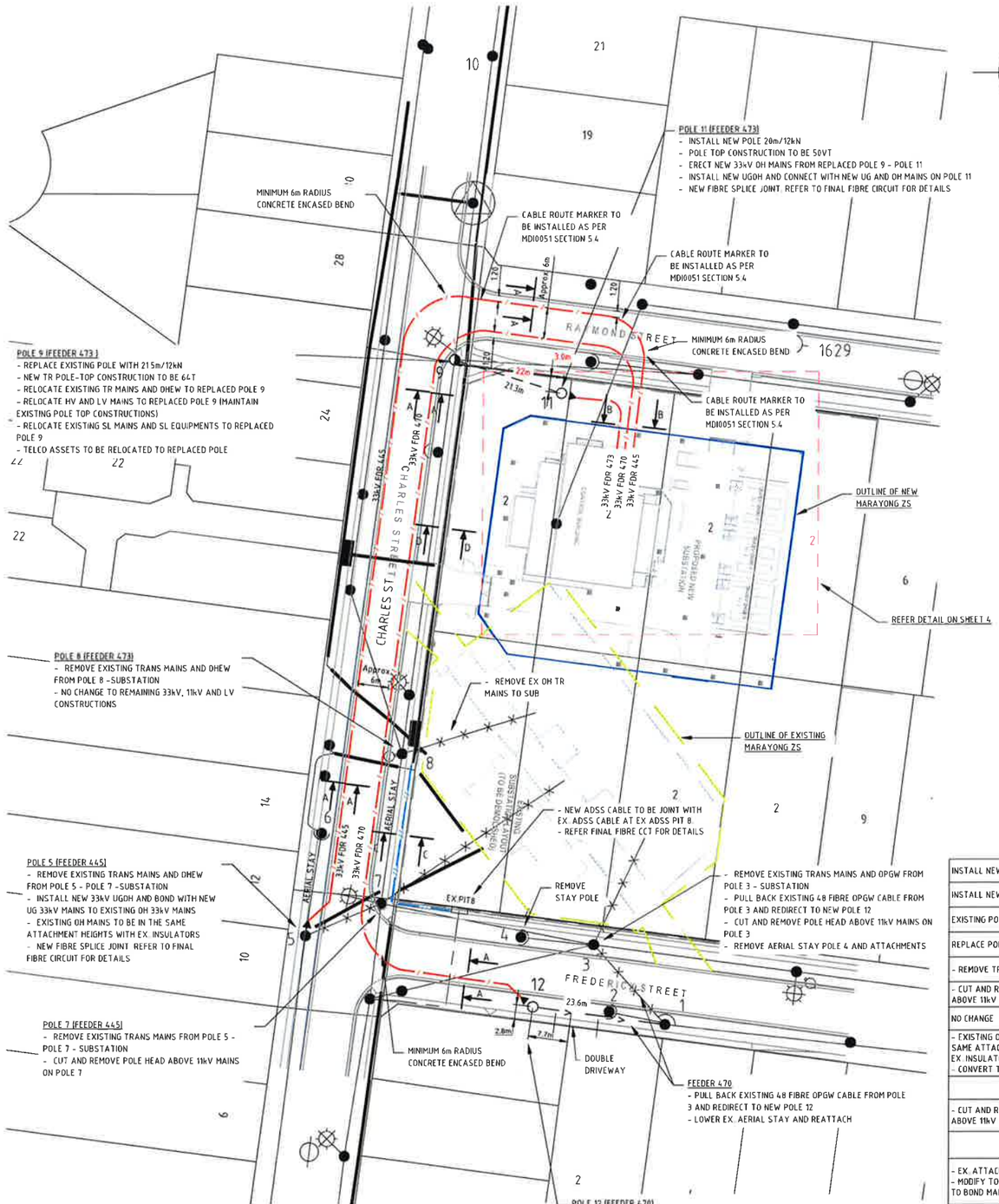
SHEET No **23** OF **23** SHEETS

Attachment 2
Marayong Zone Substation Cable layout and Earthing plan March 2018



SITE PLAN

SCALE 1:500

LEGEND

- NEW POLE
- EXISTING POLE
- REPLACE POLE
- REMOVE POLE
- NEW UGOH
- AIR BREAK SWITCH OPEN
- AIR BREAK SWITCH CLOSED
- UNDER SLUNG LINK CLOSED
- EXISTING DUCT
- NEW 33kV 800mm² CU SC XLPE CABLE + 240mm² CU XLPE/PVC EARTH CABLE + 144C FIBRE OPTIC CABLE IN TRENCH
- NEW TRENCHING FOR FIBRE CABLE
- EXISTING OVERHEAD MAINS
- EXISTING UG MAINS
- REMOVE OVERHEAD TRANSMISSION MAINS
- STRING NEW OVERHEAD MAINS (1 X 61/3.25 AAC PER PHASE + 19/3.25 AAC OHEW)
- STRING NEW 33kV MAINS (1 X 61/3.25 AAC PER PHASE) AND TRANSFER EX OPGW TO NEW POLE 12
- EXISTING AERIAL STAY

NOTES - DESIGN

1. ENDEAVOUR ENERGY DESIGNS HAVE GIVEN CONSIDERATION TO PARTICULAR EXISTING SERVICES, HOWEVER, IT IS THE RESPONSIBILITY OF THE CIVIL CONTRACTOR TO VERIFY THE LOCATION OF ALL SERVICES AND EXISTING SURVEY MARKERS (BY APPROVED MEANS) BEFORE ANY CIVIL WORKS COMMENCE ON SITE. NO RESPONSIBILITY OR LIABILITY WILL BE ACCEPTED BY INTEGRAL ENERGY FOR DAMAGE TO EXISTING SERVICES.
2. THE ACCURACY AND/OR COMPLETENESS OF SERVICE INFORMATION CAN NOT BE GUARANTEED AND ACCORDINGLY ALL LOCATION OF SERVICES ON THIS PLAN ARE INDICATIVE ONLY.
3. FINAL HOT MIX RESTORATION TO ROAD OWNER'S SPECIFICATION IS REQUIRED WHERE THE CONDUIT BANKS ARE INSTALLED IN EXISTING ROADS.
4. ALL SERVICES ARE TO BE LOCATED WITH NON DESTRUCTIVE MEANS PRIOR TO ANY EXCAVATION COMMENCING.
5. ALL AUTHORITIES ARE TO BE ADVISED OF THE PROPOSED COMMENCEMENT OF THE WORKS PRIOR TO STARTING ANY CIVIL WORKS ON SITE.
6. ALL TRENCHING CONDUIT LEVELS, PROFILES AND TRENCH LOCATION DATA IS TO BE CAPTURED BY THE CIVIL CONTRACTOR PRIOR TO COMMENCING ANY BACKFILLING.
7. ALL FOREIGN SERVICES TO BE IDENTIFIED AND LOCATED PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION WORK. ALL DBYD SERVICE SEARCHES ARE TO BE ACQUIRED BY THE CONTRACTOR PRIOR TO ANY CIVIL WORKS ON SITE.
8. FOR ALL FOREIGN SERVICE CROSSINGS OF THE HIGH VOLTAGE TRENCH CONDUITS, THE CONDUITS SHALL BE CONCRETE ENCASED ALL-ROUND WITH 15MPa CONCRETE FOR 1 METRE BEYOND EITHER SIDE OF THE CROSSING.
9. THE CONTRACTOR SHALL REFER TO THE ENDEAVOUR ENERGY, RELEVANT CITY COUNCIL, E.P.A. AND ANY SITE SPECIFIC ENVIRONMENTAL IMPACT STATEMENT BEFORE CONSTRUCTION COMMENCES. ALL NOMINATED MITIGATION MEASURES MUST BE IMPLEMENTED.
10. ALL CONDUITS TO BE INSTALLED IN ACCORDANCE WITH THE RELEVANT DESIGN DRAWINGS AND THE "GUIDED FOR THE INSTALLATION OF TRANSMISSION CONDUITS".
11. CABLE TRENCH ROUTE MARKERS ARE TO BE INSTALLED IMMEDIATELY AFTER THE CONDUIT INSTALLATION AND SHALL BE IN ACCORDANCE WITH INTEGRAL ENERGY TRANSMISSION MAINS MAINTENANCE INSTRUCTION (M.M.I.).
12. ALL CONDUIT JOINTS ARE TO BE SEALED WITH APPROVED PVC SOLVENT CEMENT SUPPLIED BY THE CONTRACTOR.
13. ALL CONDUITS TO BE PROVIDED WITH GREEN DRAW ROPE. DRAW ROPE IS TO BE TO ENDEAVOUR ENERGY STANDARDS.
14. UNLESS OTHERWISE ADVISED, ALL CONDUITS, CONDUIT BENDS, ASSOCIATED CONDUIT FITTINGS, CONDUIT DRAW ROPE AND TRENCH CONSUMABLES ARE TO BE SUPPLIED BY THE CIVIL CONTRACTOR. ALL CONDUITS AND FITTINGS ARE TO BE IN ACCORDANCE WITH ENDEAVOUR ENERGY REQUIREMENTS AND/OR AS NOMINATED BY THE ENDEAVOUR ENERGY INSPECTOR/REPRESENTATIVE. FURTHER, ALL CONDUITS TO BE PROVIDED WITH APPROVED END CAPS WITH THE INSTALLED DRAW ROPE RETAINED AT THE CONDUIT END CAP.
15. ALL CONDUIT BENDS SHALL HAVE A MINIMUM RADIUS OF 6 METRES, UNLESS OTHERWISE SPECIFIED, AND ARE TO BE CONCRETE ENCASED ALL-ROUND AND 75MM BETWEEN CONDUITS WITH 15MPa CONCRETE.
16. TRENCH PROFILES FOR THE CONDUIT INSTALL SHALL BE IN ACCORDANCE WITH THE RELEVANT DESIGN PROFILES, UNLESS OTHERWISE ADVISED BY THE ENDEAVOUR ENERGY INSPECTOR.
17. ALL CONDUITS SHALL BE PROVEN INTERNALLY WITH AN APPROVED MANDREL TEST PRIOR TO THE INSTALLATION OF ANY CABLES. THE MANDREL TEST IS TO BE PERFORMED BY THE CIVIL CONTRACTOR AND WITNESSED BY THE ENDEAVOUR ENERGY INSPECTOR.
18. WORKS AS EXECUTED DRAWINGS ARE TO BE FORWARDED TO THE ENDEAVOUR INSPECTOR WITHIN 7 DAYS OF THE CONDUIT INSTALLATION.
19. ALL CONDUIT INSTALLATION WORK IS TO BE APPROVED BY THE ENDEAVOUR ENERGY INSPECTOR. ALL DEFECTIVE WORK SHALL BE REPAIRED IMMEDIATELY BY THE CIVIL CONTRACTOR.
20. ALL EXCAVATION WORK SHALL BE IN ACCORDANCE WITH THE ENDEAVOUR ENERGY INSPECTOR, CITY AND LOCAL COUNCILS, STATUTORY AUTHORITIES, RTA, EPA, AND WORK COVER REQUIREMENTS.
21. CONDUITS ENTERING THE BASEMENT OF SUBSTATIONS AND EXTERNAL PITS SHALL BE PROVIDED WITH BELLMOUTH FITTINGS.
22. CONTINUOUS CONDUIT UTILISED FOR DIRECTIONAL BORING SHALL BE BUTT WELDED, THEN DERIDGED INTERNALLY WITH THE END OF EACH CONDUIT LENGTH DEBURED.
23. ATTENTION IS DRAWN TO SAFE WORKING METHODS & THE POSSIBILITY OF TRANSFER OF INDUCED VOLTAGES WHEN INSTALLING UNDERGROUND CONDUITS IN SWITCHYARDS AND REMOTE FROM SUBSTATIONS.

ANR - STRAIN ASSEMBLY MOUNTED ON POLE FOR OVERHEAD TO UNDERGROUND
PS40 - STRAIN ASSEMBLY MOUNTED ON POLE WITH 40m COIL
PS - STRAIN ASSEMBLY MOUNTED ON POLE - LINE DEVIATION > 60 DEG, SPAN UP TO 350m

REMARKS	NEW	EXISTING	X EASTING	Y NORTHING	Z ELEVATION	SPAN LENGTH	LINE DEV DEGREES	LV	HV	ADSS	OHEW OPGW	TR	DIA mm	DEPTH m	TYPE	STAY	FOOTING	RELOCATE	REPLACE	NEW	EXISTING	REMOVE	FEEDER	STRUCTURE NUMBER	NUMBER
	FIELD POLE NUMBER					CONSTRUCTION							HOLE		POLE										
INSTALL NEW POLE 20/12kN	950024		307143.49	6263360.47	50.5					ANR +PS40	OPGW4	50VT	2.5	750	20m/12kN		C			X			470	98A	12
INSTALL NEW POLE 20/12kN	950025		307147.32	6263480.12	52.4					ANR +PS40	OHEW4	50VT	2.5	750	20m/12kN		C			X			473	85A	11
EXISTING POLE		532108						EX	EX	EX	EX	EX			EX						X		473		10
REPLACE POLE WITH 21.5/12kN	950026	532077	307126.39	6263487.17	52.7			B03	B21	PS	OHEW2+OHEW4	63T	2.65	750	21.5/12kN		C		X				473	85	9
- REMOVE TR OH SPAN TO SUB		532065						EX	EX	REMOVE	EX	EX + REMOVE ONE SPAN	EX	EX	EX						X		473	86	8
- CUT AND REMOVE POLE HEAD ABOVE 11kV MAINS		532066						EX	EX	REMOVE	REMOVE	REMOVE	EX	EX	EX						X		445	102	7
NO CHANGE		532057						EX	EX	-	-	-	EX	EX	EX	X					X			101S	6
- EXISTING OH MAINS TO BE IN THE SAME ATTACHMENT HEIGHTS WITH EX. INSULATORS - CONVERT TO 50VT		532064							EX	ANR +PS40	OPGW4	MODIFIED TO 50VT	EX	EX	EX						X		445	101	5
		750328								-	-	-	EX	EX	EX	X						X		99S	4
- CUT AND REMOVE POLE HEAD ABOVE 11kV MAINS		785943						EX	EX	REMOVE	REMOVE	REMOVE	EX	EX	EX						X		470	99	3
		904876								-	-	-	EX	EX	EX	X					X		470	98S	2
- EX. ATTACHMENT HEIGHTS - MODIFY TO LINE POST INSULATORS TO BOND MAINS		532068							EX	-	EX	MODIFIED TO 64T	EX	EX	EX						X		470	98	1

FOR CONSTRUCTION

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE DIMENSIONS IN MILLIMETRES

AUTHORISED

ORIGINAL SCALE

APPROVED

		CH'D	R L
DESIGNED	RANGIKA V		
DRAWN	RANGIKA V		
DATE	28/03/2018		

MARAYONG ZONE SUBSTATION
TS146
MARAYONG ZONE SUB RENEWAL
CABLE LAYOUT PLAN

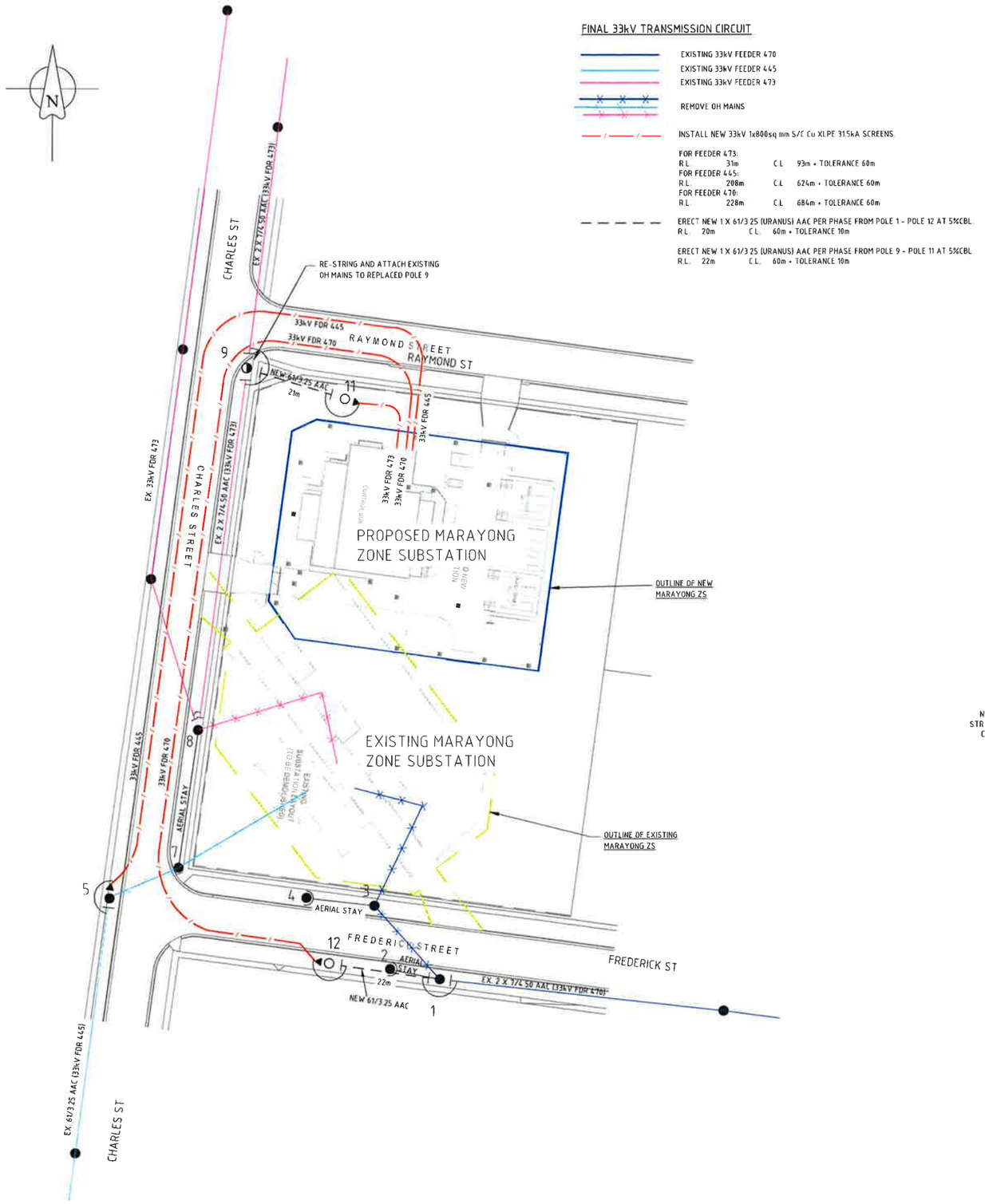
MAINS & CIVIL DESIGN MANAGER

A1 | 509384 | Rev. A

SHEET No 1 OF 7 SHEETS

AMENDMENTS

A	ORIGINAL ISSUE	TS146



FINAL 33kV TRANSMISSION CIRCUIT

- EXISTING 33kV FEEDER 470
- EXISTING 33kV FEEDER 445
- EXISTING 33kV FEEDER 473
- REMOVE OH MAINS
- INSTALL NEW 33kV 1x800sq mm S/C Cu XLPE 31.5kA SCREENS

FOR FEEDER 473:
R.L. 31m C.L. 93m + TOLERANCE 60m
FOR FEEDER 445:
R.L. 208m C.L. 624m + TOLERANCE 60m
FOR FEEDER 470:
R.L. 228m C.L. 684m + TOLERANCE 60m

- ERECT NEW 1 X 61/3.25 (URANUS) AAC PER PHASE FROM POLE 1 - POLE 12 AT 5%CBL
R.L. 20m C.L. 60m + TOLERANCE 10m

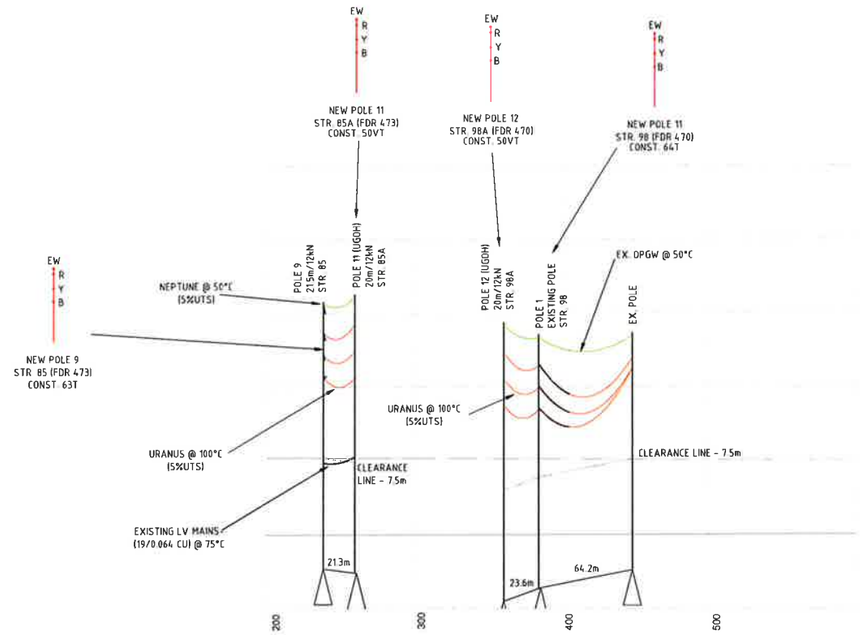
ERECT NEW 1 X 61/3.25 (URANUS) AAC PER PHASE FROM POLE 9 - POLE 11 AT 5%CBL
R.L. 22m C.L. 60m + TOLERANCE 10m

OVERHEAD MAINS STRINGING TABLE								
DESIGN SPAN:	POLE 9	TO	POLE 11	RULING SPAN (m)	22m	VOLTAGE	33kV	
STRAIN POINTS:	POLE 9	TO	POLE 11	CABLE TENSION	5% UTS	MAX. DESIGN TEMP	100°C	
CABLE DETAIL:	61/3.25 AAC (URANUS)							
AMBIENT TEMP:	5	10	15	20	25	30	35	40
TENSION (kN no wind)	3.76	3.16	2.76	2.47	2.25	2.08	1.94	1.83

OVERHEAD MAINS STRINGING TABLE								
DESIGN SPAN:	POLE 1	TO	POLE 12	RULING SPAN (m)	20m	VOLTAGE	33kV	
STRAIN POINTS:	POLE 1	TO	POLE 12	CABLE TENSION	5% UTS	MAX. DESIGN TEMP	100°C	
CABLE DETAIL:	61/3.25 AAC (URANUS)							
AMBIENT TEMP:	5	10	15	20	25	30	35	40
TENSION (kN no wind)	3.76	3.27	2.92	2.66	2.45	2.28	2.15	2.03

OVERHEAD MAINS STRINGING TABLE								
DESIGN SPAN:	POLE 9	TO	POLE 11	RULING SPAN (m)	22m	VOLTAGE	OHEW	
STRAIN POINTS:	POLE 9	TO	POLE 11	CABLE TENSION	5% UTS	MAX. DESIGN TEMP	50°C	
CABLE DETAIL:	19/3.25 AAC (NEPTUNE)							
AMBIENT TEMP:	5	10	15	20	25	30	35	40
TENSION (kN no wind)	1.29	1.07	0.93	0.83	0.75	0.69	0.64	0.60

OVERHEAD MAINS STRINGING TABLE								
DESIGN SPAN:	POLE 1	TO	POLE 12	RULING SPAN (m)	20m	VOLTAGE	OPGW	
STRAIN POINTS:	POLE 1	TO	POLE 12	CABLE TENSION	2% UTS	MAX. DESIGN TEMP	50°C	
CABLE DETAIL:	EXISTING 48 FIBRE OPGW CABLE							
AMBIENT TEMP:	5	10	15	20	25	30	35	40
TENSION (kN no wind)	1.49	1.33	1.20	1.10	1.00	0.94	0.89	0.84



PLSCADD OVERHEAD LINE PROFILE

10.0m HORIZ. SCALE
1.0m VERT. SCALE

FOR CONSTRUCTION

AMENDMENTS			
	ORIGINAL ISSUE	TS146	
A			

	ORIGINAL SCALE	APPROVED	
DESIGNED	RANGIKA V.	CH'D	R.L.
DRAWN	RANGIKA V.		
DATE	28/03/2018		

Endeavour Energy

DO NOT SCALE DIMENSIONS IN MILLIMETRES

REFERENCE DRAWINGS

AUTHORISED

MAINS & CIVIL DESIGN MANAGER:

MARAYONG ZONE SUBSTATION
TS146
MARAYONG ZONE SUB RENEWAL
FINAL CIRCUIT DIAGRAMS

A1 509384 Rev A

SHEET No 2 OF 7 SHEETS

FINAL 33kV EARTHING CIRCUIT

EXISTING 33kV FEEDER 470 - EARTH WIRE

EXISTING 33kV FEEDER 445 - EARTH WIRE

EXISTING 33kV FEEDER 473 - EARTH WIRE

REMOVE OH MAINS - EARTH WIRE

INSTALL NEW 240mm² CU XLPE/PVC EARTH CONTINUITY CABLE (ECC).

FOR FEEDER 473:
R.L. 31m C.L. 31m +TOLERANCE 30m
FOR FEEDER 445:
R.L. 208m C.L. 208m +TOLERANCE 30m
FOR FEEDER 470:
R.L. 228m C.L. 228m +TOLERANCE 30m

ERECT NEW 1 X 19/3.25 (NEPTUNE) AAC FROM POLE 9 - POLE 11 AT 5%CBL.
R.L. 20m C.L. 23m

FIBRE OPTICAL CABLE INSTALL NOTES

1. THE OPICAL FIBRE CABLE IS TO BE INSTALLED FROM THE UGOH POLES TO THE CONTROL BUILDING TERMINATION CUBICLE. THE OPTICAL FIBRE CABLE IS TO BE INSTALLED BY ENDEAVOUR ENERGY CABLE INSTALLERS.
2. THE OPTICAL FIBRE CABLE IS TO BE INSTALLED WITHIN A 100mm CONDUIT WITHIN TRENCHES AND WHITE 50mm CONDUIT CABLE CULVERTS AND OPEN AREAS. THE CONDUIT SHALL BE CONTINUOUS FROM THE UGOH POLE CONNECTION TO THE CONTROL BUILDING TERMINATION CUBICLE. FLEXIBLE CORRUGATED WHITE CONDUIT MAY BE UTILISED TO ACHIEVE SUITABLE BENDING RADIUS WITHIN CABLE CULVERTS ONLY. THE WHITE CONDUIT IS TO BE MECHANICALLY PROTECTED WHEN NOT ENCLOSED.
3. THE TRENCH EXCAVATION AND CONDUIT INSTALLATION ASSOCIATED WITH THE OPTICAL FIBRE ROUTES TO THE CONTROL ROOM SHALL BE PERFORMED BY A CIVIL CONTRACTOR. WHERE 2 X 150MM CONDUITS ARE TO BE INSTALLED, ONE OF THE 150MM CONDUITS SHALL BE SUB DUCTED WITH 3 X 50MM CONDUITS.
4. ALL NECESSARY TERMINATING, JOINTING AND TESTING OF OPTICAL FIBRE CABLE IS TO BE PERFORMED BY AN APPROVED CONTRACTOR.
5. AT JOINT BAYS THE OPTICAL FIBRE CABLE IS TO BE INSTALLED IN CONDUIT THROUGH THE JOINT BAY AND POSITIONED TO SUIT JOINTING WORKS. FINAL POSITION OF CONDUIT TO BE RECORDED PRIOR TO BACKFILLING OF THE JOINT BAY. AT SITES WHERE THE OPTICAL FIBRE IS TO BE JOINTED, THE OPTICAL FIBRE CABLE JOINT IS TO BE MOUNTED IN A SEPARATE JOINTING PIT ADJACENT TO THE CABLE SHEATH LINK BOX.

RE-STRING AND ATTACH EXISTING OH MAINS TO REPLACED POLE 9

NEW 19/3.25 AAC

NEW 240mm² CU XLPE/PVC EARTH CABLE (ECC)

EX. HARDEX PILOT (33kV FOR 473)

EX. 33kV FOR 473

NEW 240mm² CU XLPE/PVC EARTH CABLE (ECC)

PROPOSED MARAYONG ZONE SUBSTATION

OUTLINE OF NEW MARAYONG ZS

EXISTING MARAYONG ZONE SUBSTATION

OUTLINE OF EXISTING MARAYONG ZS

- PULL BACK EXISTING 48 FIBRE OPGW CABLE FROM POLE 3 AND REDIRECT TO NEW POLE 12
- RESTRING 12% CBL) AND TERMINATE ON POLE 12

EX. 48 FIBRE OPGW (33kV FOR 470)

EX. 19/3.25 AAC (OHEW) - 33kV FOR 445)

CHARLES ST

RAYMOND STREET

RAYMOND ST

FREDERICK ST

PULL BACK EXISTING OH ADSS CABLE BETWEEN POLE 8 AND 10 AND REDIRECT TO NEW POLE 11 AND TERMINATE ON NEW POLE 11

EX. 144C -FIBRE LINK OP0021 (BELLA VISTA TO MARRAYONG ZS)

NEW FIBRE SPLICE JOINT ON POLE 11 WITH 40m COIL

NEW 144 FIBRE OPTIC CABLE (UNDERGROUND)

NEW FIBRE SPLICE JOINT ON POLE 5 WITH 40m COIL

NEW ADSS CABLE TO BE JOINT WITH EX. ADSS CABLE WITH 40m COIL

EX. PIT 8

EX. 144C UNDERGROUND- FIBRE LINK OP0017 (NEWTON TO MARAYONG ZS)

EX. 48C - FIBRE LINK OP0067 (SEVEN HILLS TO MARAYONG ZS)

EX. 144C -FIBRE LINK OP0015 (KINGS PARK DEPOT TO MARRAYONG ZS)

EX. 144C OVERHEAD- FIBRE LINK OP0017 (NEWTON TO MARAYONG ZS)

PULL BACK EXISTING 48 FIBRE OPGW CABLE FROM POLE 3 AND REDIRECT TO NEW POLE 12 AND TERMINATE ON POLE 12

NEW FIBRE SPLICE JOINT ON POLE 12 WITH 40m COIL

FINAL FIBRE CIRCUIT

EXISTING FIBRE LINK OP0067 (SEVEN HILLS TO MARAYONG ZS)

EXISTING FIBRE LINK OP0015 (KING PARK DEPORT TO MARAYONG ZS)

EXISTING FIBRE LINK OP0017 (NEWTON TO MARAYONG ZS) - OVERHEAD

EXISTING FIBRE LINK OP0017 (NEWTON TO MARAYONG ZS) - UNDERGROUND

EXISTING FIBRE LINK OP0021 (BELLA VISTA TO MARRAYONG ZS)

REMOVE ADSS FIBRE CABLES

INSTALL NEW 144C FIBRE OPTIC CABLE (UNDERGROUND)

FOR FIBRE LINK OP0021 :
R.L. 31m C.L. 31m +TOLERANCE 100m
FOR FIBRE LINK OP00015
R.L. 208m C.L. 208m +TOLERANCE 100m
FOR FIBRE LINK OP0067:
R.L. 208m C.L. 208m + TOLERANCE 100m
FOR FIBRE LINK OP0017:
R.L. 130m C.L. 130m +TOLERANCE 60m

FOR CONSTRUCTION

AMENDMENTS
A ORIGINAL ISSUE 28/06 TS146

ORIGINAL SCALE

APPROVED

DESIGNED	RANGIKA V	CH'D	R.L.
DRAWN	RANGIKA V		
DATE	28/03/2018		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

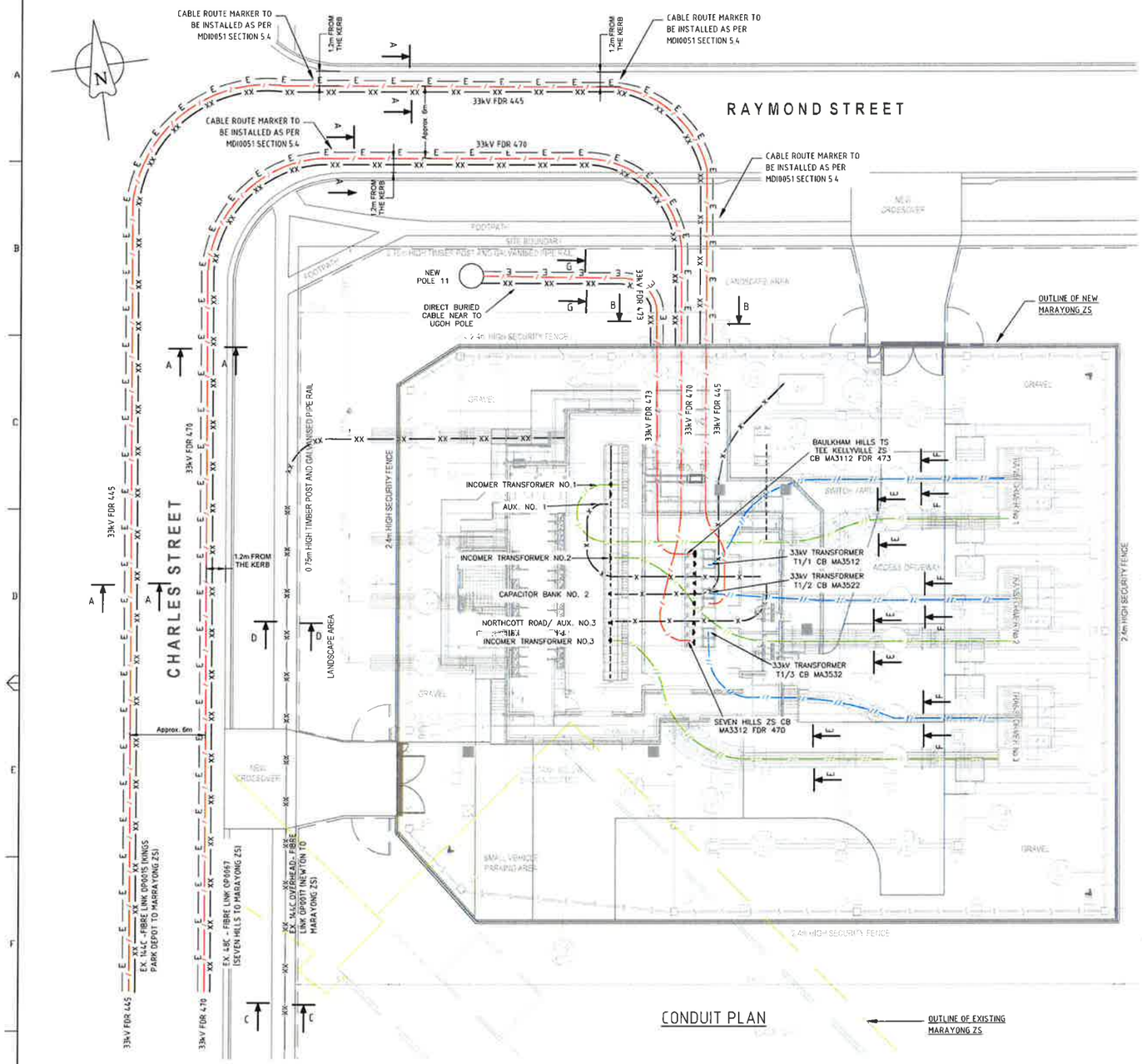
AUTHORISED

MAINS & CIVIL DESIGN MANAGER

MARAYONG ZONE SUBSTATION
TS146
MARAYONG ZONE SUB RENEWAL
FINAL CIRCUIT DIAGRAMS

A1 509384 Rev A

SHEET No 3 OF 7 SHEETS



CONDUIT PLAN

OUTLINE OF EXISTING MARAYONG ZS

MARAYONG ZONE SUBSTATION CONDUIT LAYOUT PLAN

SCALE 1:100

LEGEND

INSTALL NEW 33kV 1x800sq mm S/C Cu XLPE 315kA SCREENS.
CABLES MINIMUM BENDING RADIUS 1.72m INSTALL 1.0m SET

FOR FEEDER 473:
R.L. 31m C.L. (31m + TOLERANCE 20m) x 3
FOR FEEDER 445:
R.L. 208m C.L. (228m + TOLERANCE 20m) x 3
FOR FEEDER 470:
R.L. 228m C.L. (208m + TOLERANCE 20m) x 3

INSTALL NEW 33kV 1x630sq mm S/C Cu XLPE 26kA SCREEN
CABLES MINIMUM BENDING RADIUS 1.6m INSTALL 0.96m SET

FOR TRANSFORMER 1
R.L. 27m C.L. (27m +TOLERANCE 10m) x 3
FOR TRANSFORMER 2:
R.L. 25m C.L. (25m + TOLERANCE 10m) x 3
FOR TRANSFORMER 3:
R.L. 29m C.L. (29m + TOLERANCE 10m) x 3

INSTALL NEW 11kV 2x800sq mm S/C Cu XLPE 20kA SCREENS (2 CABLES PER PHASE).
CABLES MINIMUM BENDING RADIUS 1.49m INSTALL 1.0m SET

FOR TRANSFORMER 1:
R.L. 42m C.L. (42m +TOLERANCE 10m) x 6
FOR TRANSFORMER 2:
R.L. 35m C.L. (35m + TOLERANCE 10m) x 6
FOR TRANSFORMER 3:
R.M. 37m C.L. (37m + TOLERANCE 10m) x 6

INSTALL NEW 144C FIBRE OPTIC CABLE (UNDERGROUND)

FOR FIBRE LINK OP0021:
R.L. 19m C.L. 19m +TOLERANCE 100m
FOR FIBRE LINK OP00015:
R.L. 190m C.L. 190m +TOLERANCE 100m
FOR FIBRE LINK OP0067:
R.L. 208m C.L. 208m + TOLERANCE 100m
FOR FIBRE LINK OP0017:
R.L. 130m C.L. 130m +TOLERANCE 60m

INSTALL NEW 240mm² CU XLPE/PVC EARTH CONTINUITY CABLE (ECC).

FOR FEEDER 473:
R.L. 19m C.L. 19m +TOLERANCE 30m
FOR FEEDER 445:
R.L. 190m C.L. 190m +TOLERANCE 30m
FOR FEEDER 470:
R.L. 208m C.L. 208m +TOLERANCE 30m

INSTALL NEW 11kV 240mm² CU 3C XLPE/PVC/HDPE

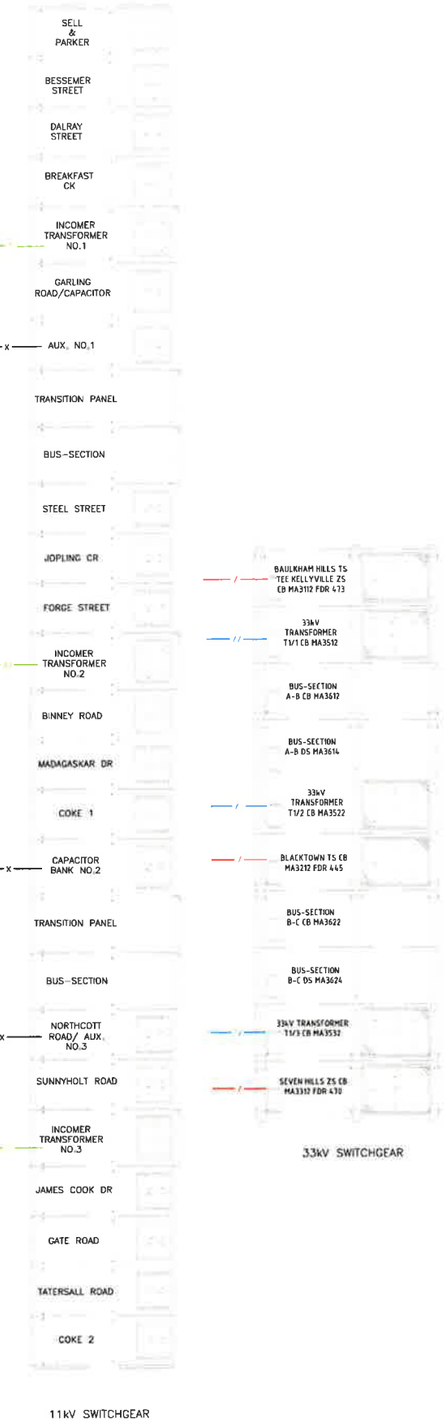
FROM CIRCUIT BREAKER MA1312 TO AUX BUS ISOLATOR MA1861 (AUX NO. 3)
R.L. 15m C.L. 20m

FROM CIRCUIT BREAKER MA1172 TO AUX BUS ISOLATOR MA1821 (AUX NO. 1):
R.L. 20m C.L. 25m

FROM CIRCUIT BREAKER MA1272 TO CAPACITOR BANK:
R.L. 27m C.L. 30m

INSTALL NEW 11kV 35mm² SC CU XLPE.

FROM AUX BUS ISOLATOR MA1831 TO AUX TRANSFORMER:
R.L. 8m C.L. 36m



AMENDMENTS

A	ORIGINAL ISSUE	TS145	

FOR CONSTRUCTION

ORIGINAL SCALE		APPROVED	
DESIGNED	RANGIKA V	CH'D	R.L
DRAWN	RANGIKA V		
DATE	28/03/2018		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE DIMENSIONS IN MILLIMETRES

AUTHORISED

MAINS & CIVIL DESIGN MANAGER

MARAYONG ZONE SUBSTATION
TS146
MARAYONG ZONE SUB RENEWAL
CABLE LAYOUT PLAN

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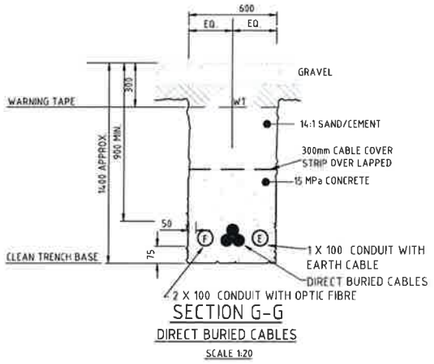
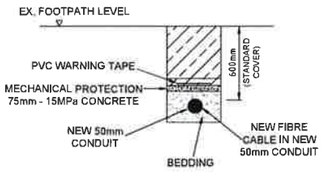
SHEET No 4 OF 7 SHEETS

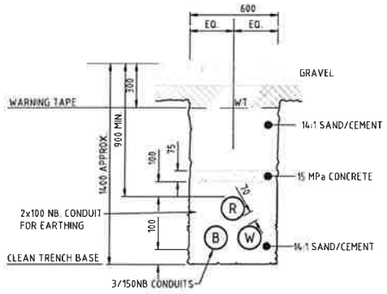


SECTION G-G
DIRECT BURIED CABLES

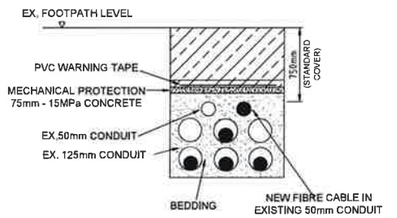
SCALE 1:20



SECTION C-C
NOT TO SCALE



SECTION F-F
NOT TO SCALE



SECTION D-D (EXISTING CONDUITS)
NOT TO SCALE

SECTION A-A
NOT TO SCALE

SECTION E-E
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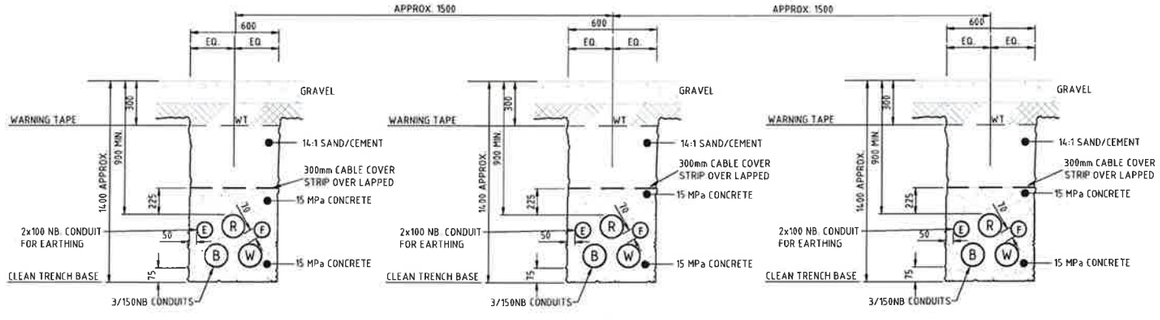

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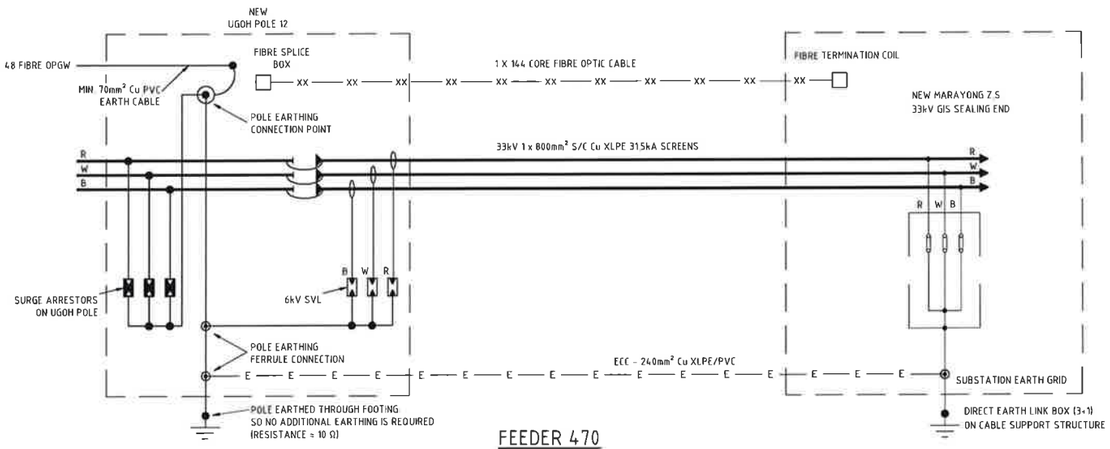
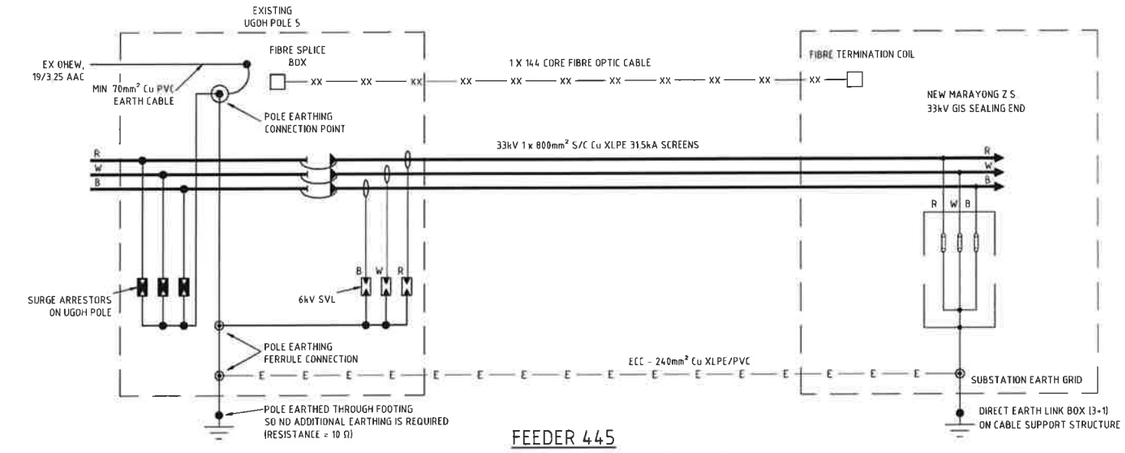
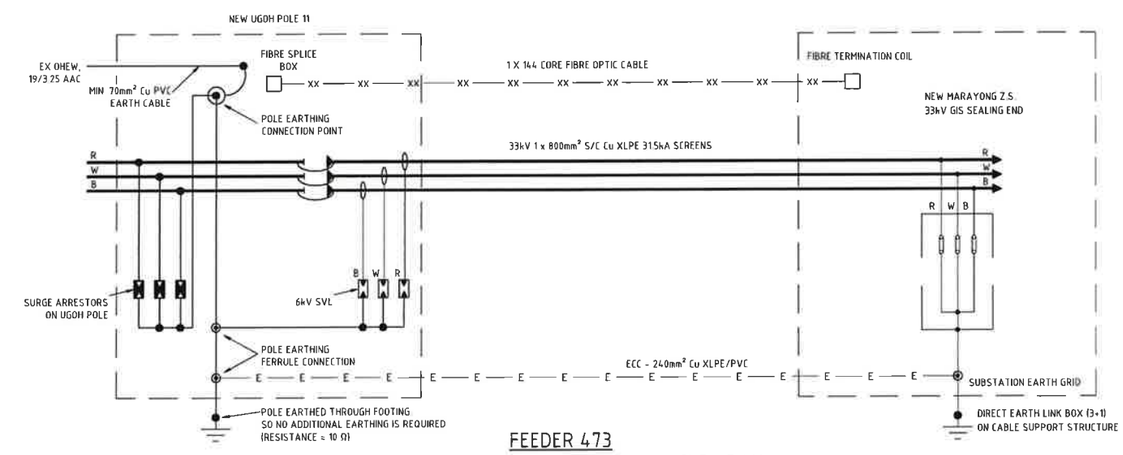


FEEDER 470
PROPOSED END POINT SYSTEM - SINGLE SPAN



FEEDER 445
PROPOSED END POINT SYSTEM - SINGLE SPAN



FEEDER 473
PROPOSED END POINT SYSTEM - SINGLE SPAN

FOR CONSTRUCTION

AMENDMENTS
A ORIGINAL ISSUE TS146

ORIGINAL SCALE

APPROVED

DESIGNED	RANGIKA V	CH'D	R.L.
DRAWN	RANGIKA V		
DATE	26/03/2018		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE DIMENSIONS IN MILLIMETRES

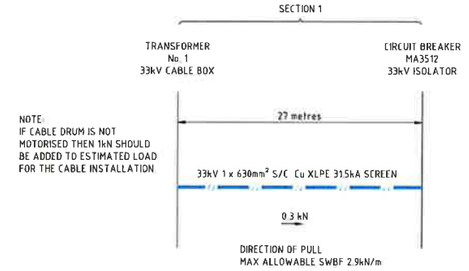
AUTHORISED

MAINS & CIVIL DESIGN MANAGER

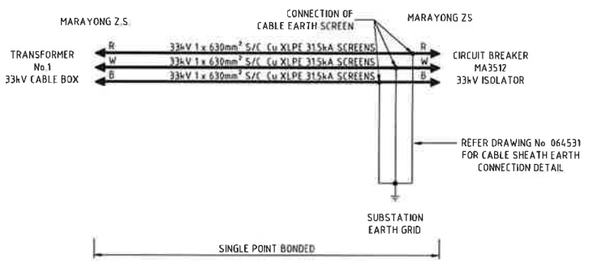
MARAYONG ZONE SUBSTATION
TS146
MARAYONG ZONE SUB RENEWAL
CROSS SECTIONS AND EARTHING

A1 509384 Rev. A

SHEET No 5 OF 7 SHEETS



TRANSFORMER 1 - 33kV TRANSFORMER CABLE PULLING TENSION



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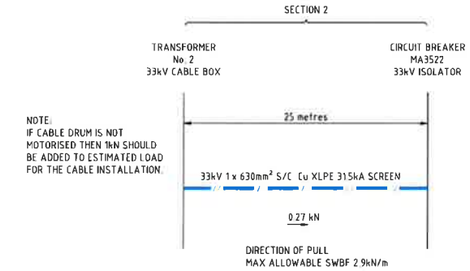

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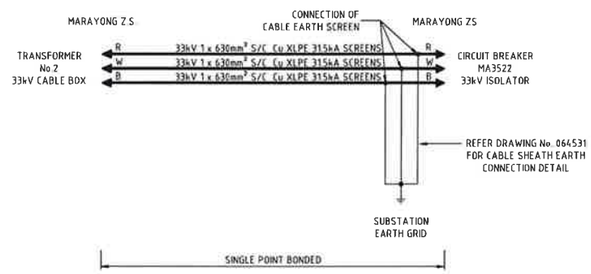
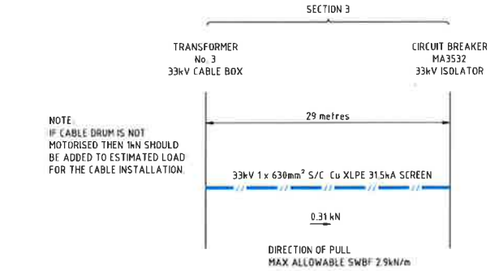
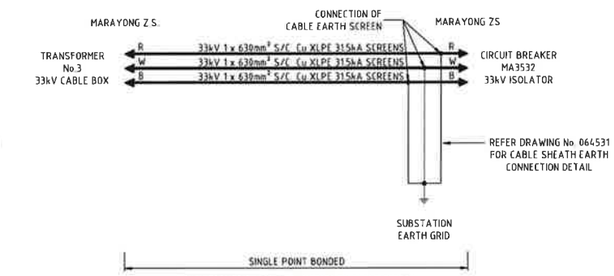


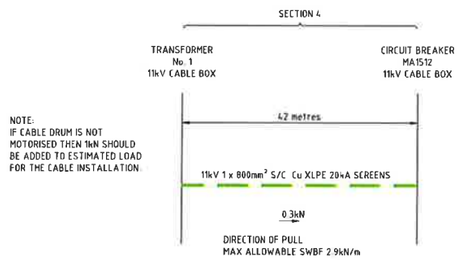
TRANSFORMER 2 - 33kV TRANSFORMER CABLE SCREEN EARTH ARRANGEMENT



TRANSFORMER 3 - 33kV TRANSFORMER CABLE PULLING TENSION



TRANSFORMER 3- 33kV TRANSFORMER CABLE SCREEN EARTH ARRANGEMENT



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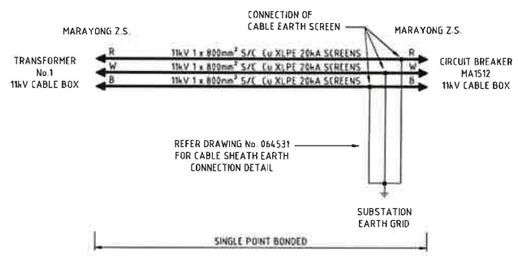

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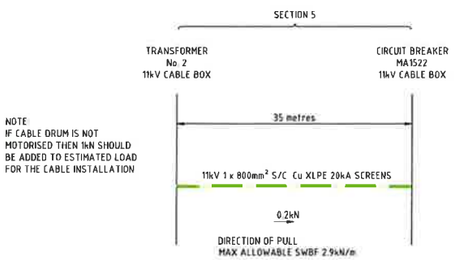

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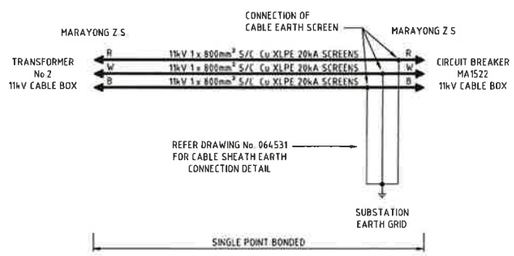

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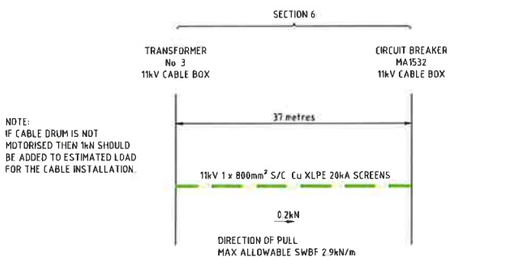

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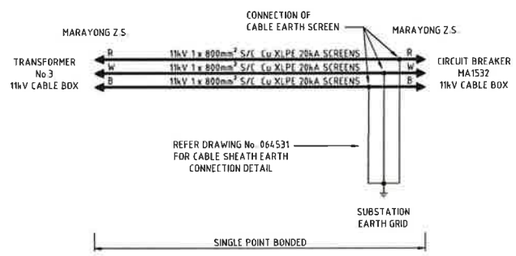
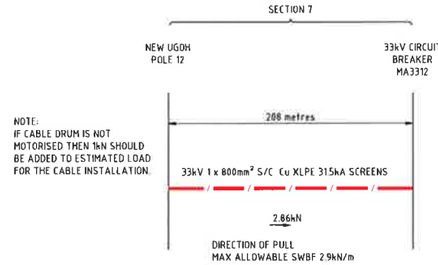
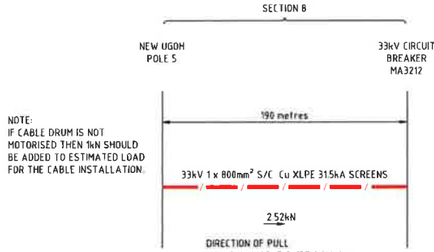


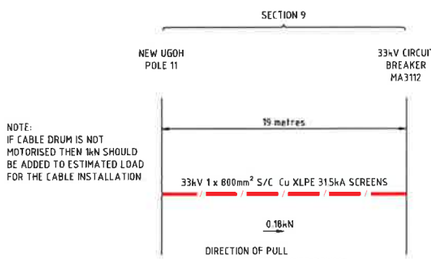
TRANSFORMER 3 - 11kV TRANSFORMER CABLE SCREEN EARTH ARRANGEMENT



33kV FEEDER CABLE - FEEDER 470 CABLE PULLING TENSION



33kV FEEDER CABLE - FEEDER 445 CABLE PULLING TENSION



33kV FEEDER CABLE - FEEDER 473 CABLE PULLING TENSION

FOR CONSTRUCTION

AMENDMENTS			
A	ORIGINAL ISSUE	TS145	Job No.

ORIGINAL SCALE

APPROVED

DESIGNED	RANGIKA V.	CH'D	R.L.
DRAWN	RANGIKA V.		
DATE	28/03/2018		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

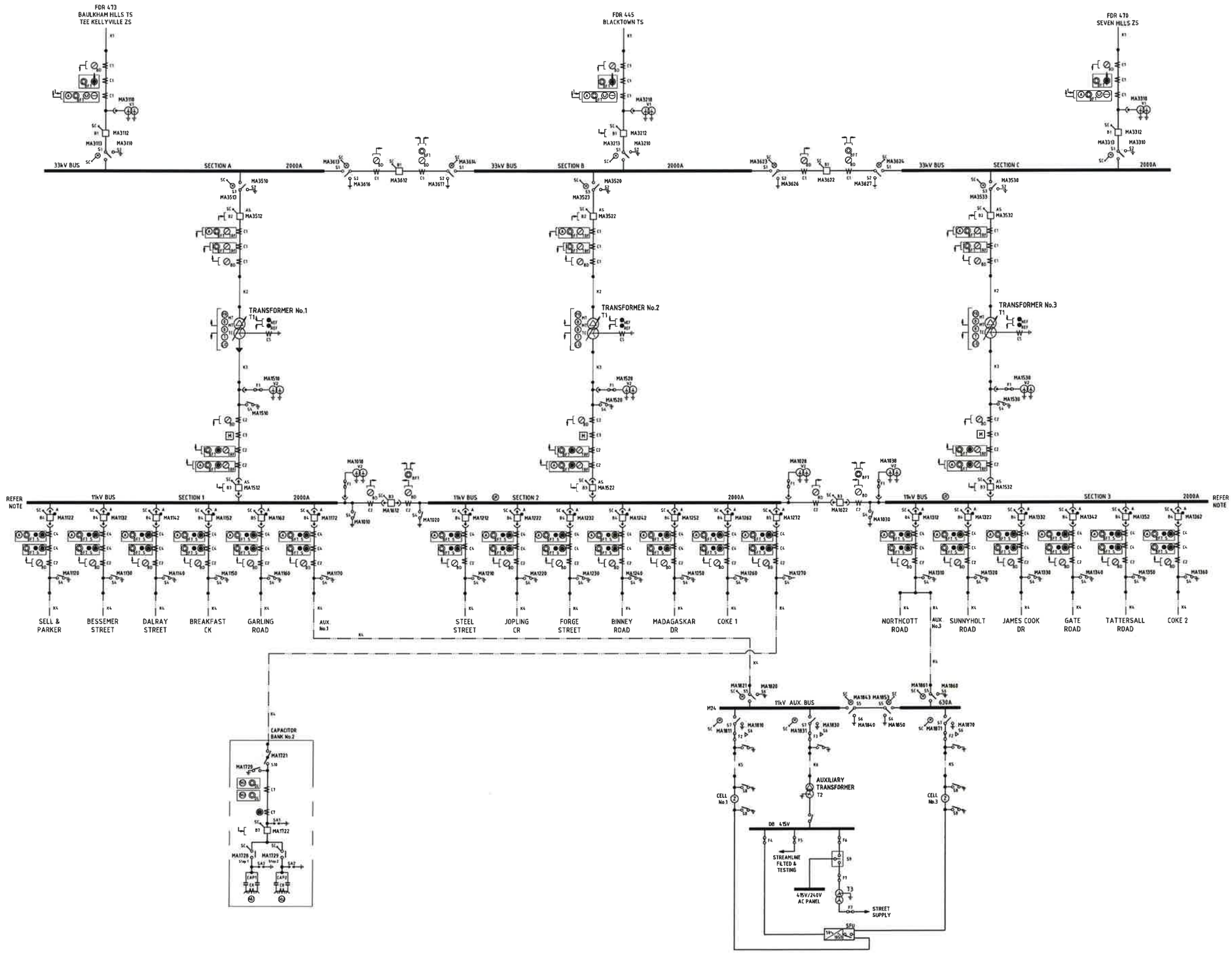
AUTHORISED

MAINS & CIVIL DESIGN MANAGER

MARAYONG ZONE SUBSTATION
TS146
MARAYONG ZONE SUB RENEWAL
EARTHING & DUCT PULLING CALCULATIONS

A1	509384	Rev. A

SHEET No. 6 OF 7 SHEETS



Z	1050Hz INJECTION CELL 11kV
V2	VOLTAGE TRANSFORMER 11kV/110V 0.5M/3.0P 50VA
V1	VOLTAGE TRANSFORMER 33kV/110V 0.5M/2P 100VA
T3	ISOLATING TRANSFORMER 433V/433V 40kVA YNyn0
T2	AUXILIARY TRANSFORMER 11kV/433V 315kVA ONAN Dyn11
T1	MAIN TRANSFORMER 33/11kV 15/19/25 MVA ONAN/ODAN/OFDAF Dyn1
SFU	STATIC FREQUENCY UNIT (DUAL OUTPUT)
SA2	SURGE ARRESTER POL IN - 10
SA1	SURGE ARRESTER 11kV MWK10
S10	DISCONNECTOR/EARTH SWITCH - ABB TYPE NAL-12-6C-210RE
S9	CHANGEOVER CONTACTOR 415V
S8	SWITCH 11kV EARTHING 1050Hz INJECTION CELL
S7	SWITCH 11kV FUSE COMBINATION 200A 20kA
S6	SWITCH 11kV EARTHING 20kA
S5	SWITCH 11kV 630A 20kA
S4	SWITCH 11kV EARTHING 25kA
S3	SWITCH 33kV 1250A 31.5kA (3 sec)
S2	SWITCH 33kV EARTHING 31.5kA (3 sec)
S1	SWITCH 33kV 2000A 31.5kA (3 sec)
M24	11kV SWITCHGEAR AREVA TYPE M24 630A 20kA
K6	CABLE 11kV 35 sq mm Cu XLPE
K5	CABLE 11kV 70 sq mm Cu XLPE
K4	CABLE 11kV 240 sq mm Cu 3 CORE XLPE
K3	CABLE 11kV 800 sq mm Cu SINGLE CORE XLPE WITH 20kA SCREENS (2 CABLES PER PHASE) 30.9MVA (37.15 2HR EMERGENCY)
K2	CABLE 33kV 630 sq mm Cu SINGLE CORE XLPE WITH 31.5kA SCREENS (47.9MVA SUMMER/50.3 WINTER)
K1	CABLE 33kV 800 sqmm Cu SINGLE CORE XLPE WITH 31.5kA SCREENS
F7	FUSE 440V 100A
F6	FUSE 440V 160A
F5	FUSE 440V 250A
F4	FUSE 440V 160A (ULTRA RAPID)
F3	FUSE 11kV 50A
F2	FUSE 11kV 100A
F1	FUSE 11kV 3.15A
DB	AUXILIARY TRANSF. DISTRIBUTION BOARD (630A BUSBAR)-415V AC
CAP2	2.5MVAr POWERFACTOR CAPACITOR CHD 503B 503kVA 7.2kV
CAP1	2.5MVAr POWERFACTOR CAPACITOR CHD 503B 503kVA 7.2kV
CB	CT 33kV 1000/800/500/1 0.05PL700R4 ON 1000/1
C7	CT 800/400/1 CL 10PS 0F20 CL IM 15V- SADTEM SW47
C6	CT 2kV 10/0.003 5P30 (IP54)
C5	CT 0.72/3kV 2000/1 0.15PX100(Rct+3)
C4	CT 11kV 500/1 2.5VA 10P30
C3	CT 11kV 2000/1000/1 5VA CLASS 0.5S F10 ON ALL RATIOS
C2	CT 11kV 2000/1 0.15PX100(Rct+1)
C1	CT 33kV 2000/1000/500/300/1 0.05PX200(Rct+2) ON 2000/1
B7	CB 11kV 630A 519MVA ABB VD4 12.06 25M
B6	CB 24kV 630A 16kA
B5	CB 11kV 630A 25kA (CAPACITOR)
B4	CB 11kV 630A 25kA
B3	CB 11kV 2000A 25kA
B2	CB 33kV 1250A 31.5kA (3sec)
B1	CB 33kV 2000A 31.5kA (3 sec)
ITEM	DESCRIPTION

MARAYONG ZONE SUBSTATION - SINGLE LINE DIAGRAM (FINAL PROPOSED)

FOR CONSTRUCTION

AMENDMENTS		
Job No.	ISSUE	
TS146	ORIGINAL	A

ORIGINAL SCALE		APPROVED	
DESIGNED	RANGIKA V	CH'D	R.L.
DRAWN	RANGIKA V		
DATE	28/03/2018		

Endeavour Energy

REFERENCE DRAWINGS

DO NOT SCALE
DIMENSIONS IN MILLIMETRES

AUTHORISED

MAINS & CIVIL DESIGN MANAGER

MARAYONG ZONE SUBSTATION
TS146
MARAYONG ZONE SUB RENEWAL
SINGLE LINE DIAGRAM - PROPOSED

A1	509384	Rev. A

SHEET No 7 OF 7 SHEETS

Attachment 3
Review of Environmental Factors, Marayong Zone Substation renewal, January 2018

REVIEW OF ENVIRONMENTAL FACTORS

Marayong Zone Substation Renewal

In accordance with Part 5 of the Environmental Planning & Assessment Act 1979 & State Environmental Planning Policy (Infrastructure) 2007.

April 2018

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EXECUTIVE SUMMARY

This Review of Environmental Factors has been prepared to assess the environmental impacts for renewal of the 33/11kV Marayong Zone Substation (ZS). Many of the ZS components have reached the end of their service lives and require renewal or replacement. The ZS supplies electricity to the suburbs of Marayong, Kings Park, Kings Langley and Lalor Park.

The existing Marayong Zone Substation, owned and operated by Endeavour Energy (EE) and located at the corner of Charles and Frederick Streets, Blacktown will be replaced with a new ZS facility adjacent to the existing facility. The existing ZS will remain in service until the replacement ZS is commissioned.

The replacement indoor ZS will maintain the existing capacity at a firm 50MVA, with a building to accommodate indoor 33kV and 11kV switchgear, protection and control panels and auxiliary equipment. Three new 33/11kV 25MVA low noise transformers will replace the existing transformers within fire containment walls constructed between and at the rear of the transformers.

Once the new ZS has been commissioned, the existing ZS will be decommissioned and the redundant equipment, including the control building demolished and removed. The area occupied by the existing ZS facility will be remediated to ensure the site is safe to remain unfenced or accessible to the public similar to the vacant area proposed to accommodate the new ZS facility.

This Review of Environmental Factors details the potential environmental impacts and identifies mitigating measures to be incorporated into the design, construction and operation of the replacement Marayong ZS to appropriately ameliorate environmental impacts.

EE is the Determining Authority for these works. The works are subject to the provisions of The Code of Practice (The Code) for Authorised Network Operators (ANO), State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) and require assessment and approval under Part 5 of the Environmental Planning and Assessment (EP&A) Act, 1979. No significant environmental constraints to the proposal were identified by the environmental assessment. Relative to this proposal, EE has concluded that there are no aspects of this proposal that have the potential to lead to, or result in, significant adverse impacts on the environment.

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND GLOSSARY OF TERMS

Term	Meaning
A	amp: the unit of measure for current (or load) which is the amount
Aboriginal Heritage	Any deposit, object, place or material evidence relating to Aboriginal habitation or places having significance to Aboriginal culture as declared by the Minister which is protected under the NPW Act and EPBC Act
ABS	Air Break Switch
AHIMS	Aboriginal Heritage Information Management System
ANO	Authorised Network Operator under the *Electricity Networks Assets (Authorised Transactions) Act 2015*
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASP	Accredited Service Provider
CBD	Central Business District
CEMP	Construction Environmental Management Plan
Climate Change	Describes both changed average climatic conditions, such as increased temperature and lower average rainfall, as well as changes in the patterns of extreme events, including increased frequency and intensity of storms
Determining Authority	Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out.
DBYD	Dial Before You Dig
DC	Direct Current
DECC	Department of Environment and Climate Change
EE	Endeavour Energy
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields: are part of the natural environment and are also produced wherever electricity or electrical equipment is in use. Power lines, electrical wiring, household appliances and electrical equipment all produce EMF. The electric field is proportional to the voltage and remains constant. The magnetic field is proportional to the load and varies continually depending on the time of day, week and year. As electric fields are naturally shielded, the electricity network generally contributes very little to the electrical fields measured inside a home or office building. For this reason most discussion on EMF usually focuses on magnetic fields.
EMS	Environmental Management Standard
Environmental Impact	Any change in the environment whether adverse or beneficial, wholly or partially resulting from organisation activities, products or services
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EP&A Regulations	*Environmental Planning and Assessment Regulation 2000*
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*

Term	Meaning
	(Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ES Act	*Electricity Supply Act 1995*
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically sustainable development: is development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
Feeder	A set of electric conductors that distribute electricity
Hz	hertz
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers
Joint bay	Concrete bay constructed in various locations along a feeder route which is used for jointing lengths of cable together
km	Kilometre
kV	Kilovolts
LEP	Local Environmental Plan: a type of EPI made under Part 3 of the EP&A Act.
LGA	Local Government Area
Local Heritage Item	A place, building, work, relic, tree, archaeological site or Aboriginal object that is identified as a heritage item (or by a similar description) in a local or regional environmental plan; or an item of local heritage significance, as defined by the *Heritage Act 1977*, that is the subject of an interim heritage order in force under that Act or is listed as an item of local heritage significance in the State Heritage Inventory under that Act
m	metre
mG	milligaus
MVA	Mega volt ampere
MNES	Matter of National Environmental Significance
NEA	Network Environmental Assessment
NECF	National Energy Customer Framework
NHMRC	National Health and Medical Research Council
Non-Aboriginal Heritage	Any deposit, object or material evidence which relates to the settlement of NSW, not being Aboriginal settlement, with local or state significance under the *Heritage Act 1977*
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service (OEH)
OEH	Office of Environment and Heritage
OH	Overhead
POEO Act	*Protection of the Environment Operations Act 1997*
REF	Review of Environmental Factors

Term	Meaning
RMS	Roads and Maritime Services
Road	Includes the airspace above the surface of the road, the soil beneath the surface of the road and any bridge, tunnel, causeway, road-ferry, ford or other work or structure forming part of the road. The road reserve is inclusive of the carriageway and the footpath.
SCADA	Supervisory Control and Data Acquisition
SEPP	State Environmental Planning Policy: a type of EIP made under Part 3 of the EP&A Act
Infrastructure SEPP	*State Environmental Planning Policy (Infrastructure) 2007*
SER	Summary Environmental Report
SIS	Species Impact Statement
The Code	The Code of Practice for Authorised Network Operators (ANO) designed to regulate the ANOs decision making process as to the appropriate level of environmental assessment required relative to the impacts of a proposed project.
TMP	Traffic Management Plan
TS	Transmission Substation
TSC Act	*Threatened Species Conservation Act 1995*
UG	Underground
UGOH	Underground to overhead construction- a structure which facilitates the transition of underground cabling to aerial (overhead) construction
V	volt: the unit of measure for voltage which is the pressure that electricity is pushed through the wire
WMP	Waste Management Plan
ZS	Zone Substation

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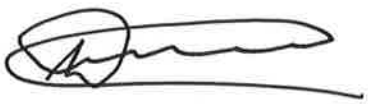
Document Control

Revision	Prepared by and Company Name	Date	Reviewed by and Company Name	Comments
V1	Mohammad Alam Endeavour Energy	21 November 2017	Pat Woodbury Endeavour Energy	Initial review
V2	Mohammad Alam Endeavour Energy	19 December 2017	Pat Woodbury Endeavour Energy	Draft review
V3	Mohammad Alam Endeavour Energy	17 January 2018	Clinton Jurd Endeavour Energy	Draft for consultation
V4	Mohammad Alam Endeavour Energy	11 April 2018	Pat Woodbury Danny Asvestas Endeavour Energy	Final

Document Approval

To the best of the knowledge of the below signatories, this REF has been prepared to be neither false nor misleading and is in accordance with The Code of practice for Authorised Network Operators approved under clause 244K of the Environmental Planning and Assessment Regulation 2000.

Prepared by	Mohammad Alam
Signed	
Date	12/04/2018
Title	Environmental Specialist
Reviewed by	Pat Woodbury
Signed	
Date	12/04/2018
Title	Network Environmental Assessment Manager
Approved By	Danny Asvestas
Signed	
Date	13 APRIL 2018
Title	Manager Asset Standards & Design

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1.0 INTRODUCTION

The purpose of this Review of Environmental Factors (REF) report is to assess the likely environmental impacts associated with the construction and operation of a new or redeveloped zone substation (ZS) to replace the existing Marayong ZS (see Figures 1-3 below and Appendix A & Appendix C).

The Marayong ZS is located within an area zoned for low density residential (R2) development, with the property adjoining Raymond, Charles and Frederick Streets at Blacktown (Figure 1). The Substation supplies electricity to the suburbs of Marayong, Kings Park, Kings Langley and Lalor Park. The redeveloped ZS will be owned and operated by Endeavour Energy (EE) on the existing ZS property.

Marayong ZS, being approx. 57 years of old, has a number of components or pieces of equipment that have reached the end of their effective service life and require renewal. EE is proposing to construct a new indoor ZS adjacent to the existing outdoor ZS on the northern area of the ZS property. This will ensure a safe and reliable electricity supply. The three new transformers will be installed adjacent to the new control building. Concrete fire walls will be installed between and to the rear of the transformers. The detail scope of the proposed substation renewal (Figure 2) and associated works (Figure 3) are outlined below.

Following temporary rearrangement of the existing overhead (OH) Feeder connections [for the duration of the new ZS construction], underground to overhead (UGOH) poles will replace several OH poles adjacent to the ZS, with short underground feeder connections established into the new Substation along Frederick, Charles and Raymond Streets.

This REF report provides a description of the proposal, how the works are to be completed, the likely effects on the environment and the proposed mitigating measures.

Figure 1: Marayong ZS and proposed approx. location of the redevelopment site for the construction of the new ZS (Six Maps).

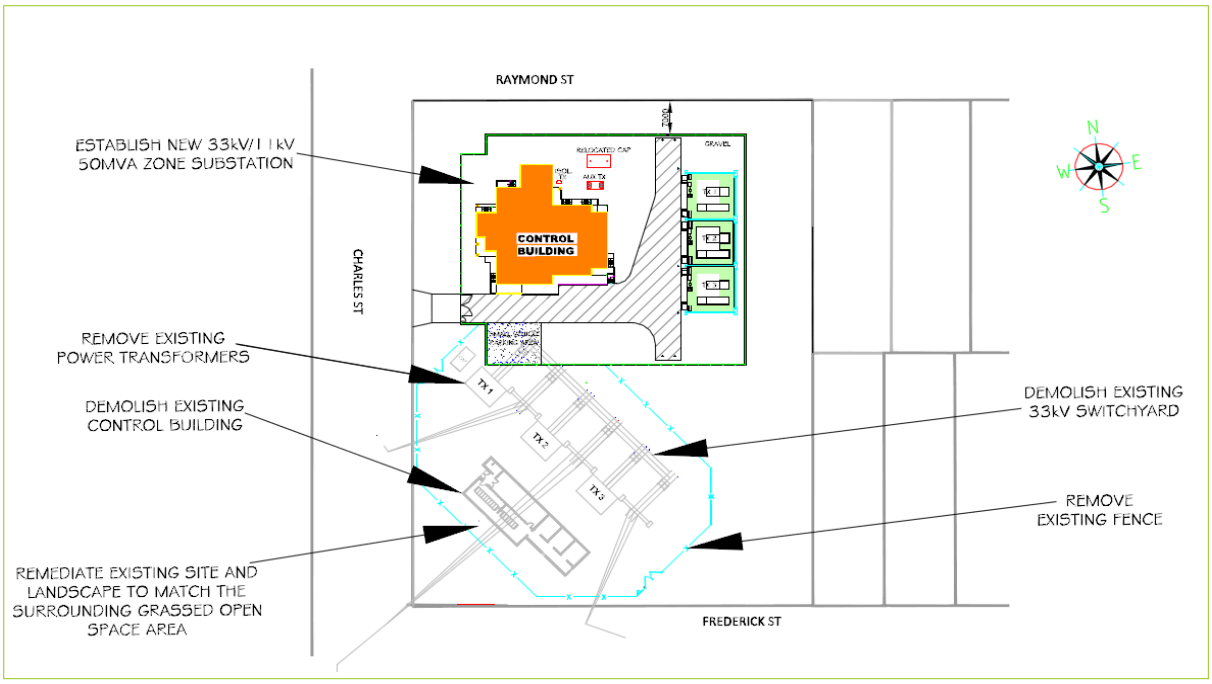

Figure 2: Marayong ZS redevelopment- diagram of the new Substation location and the proposed general arrangement (site layout).

Figure 3: Marayong ZS redevelopment - associated feeder design.

2.0 BACKGROUND

Marayong ZS was initially constructed during the early 1960s by the Electricity Commission of NSW and later transferred to the ownership of Endeavour Energy (formerly Prospect County Council). It was augmented (electricity supply capacity increased) in 1965, 1974 and again around 1980.

Marayong ZS is a 33kV/11kV ZS with a firm 50MVA capacity. The ZS is normally supplied at 33kV from Blacktown Transmission Substation (TS) via 33kV Feeder 445. Alternative 33kV supplies are available from Baulkham Hills TS via Feeder 473 (tee Kellyville ZS) and Feeder 470 (via Seven Hills ZS).

The ZS supplies electricity to 6,500 customers, with a customer load spread of 85% residential and 15% commercial/industrial.

A number of components within the ZS including the 11kV switchboard, the auxiliary switchboard and the transformers have reached the end of their service lives and require renewal or replacement.

EE is proposing to establish a new ZS with a firm capacity of 50MVA, with three 33/11kV 25MVA transformers on the vacant area of the ZS property directly adjacent to the north of the existing ZS facility. This ZS property is owned and maintained by EE. Once the new ZS has been commissioned, the existing ZS facility shall be demolished and the area remediated and landscaped.

3.0 DESCRIPTION

3.1 Site Location

Redevelopment of the Marayong ZS will be carried out on the existing ZS site at 2 Raymond Street Blacktown, NSW. EE owns several lots that comprise the ZS property adjoining Raymond Street, Charles Street and Frederick Street known as lots 240-243 & Lots 280-283, DP7875. The existing Substation is located at the corner of Charles and Frederick streets and the new Substation will be constructed immediately north next to the existing ZS at the corner of Raymond and Charles Streets.

The subject site is located within a residential area and is relatively level and flat. The ZS site adjoins residential properties to the east. An established footpath is present along the Raymond, Charles and Frederick Streets. Established vegetation screening surrounds the existing ZS fence and there are several scattered native trees on the vacant area adjacent to the existing ZS facility where the new ZS will be built. Stormwater drains are located in adjoining streets.

Access to the new ZS will utilise the existing driveway off Charles Street and a secondary access will be established off Raymond Street.

The existing ZS facility, including the control building, switchyard and transformers will be decommissioned and the area remediated to a suitable standard after completion of the construction and commissioning of the new substation.

Figure 4: A southeast view of the subject ZS site from the corner of Raymond and Charles Street (photo by design consultant).

Figure 5: A northerly view of the subject site from Frederick Street.

Figure 6: A northerly view of the Marayong ZS from Frederick Street.

Figure 7: A southerly view of the existing Marayong ZS Control Building that is to be demolished.

3.2 Land Use Zoning

Marayong ZS is located within the Blacktown City Council Local Government Area. The Marayong ZS property is within an area zoned for R2 Low Density Residential under *Blacktown City Local Environmental Plan (LEP) 2015*. The *Infrastructure SEPP* removes the requirement for development consent to be obtained from council. The construction of new indoor ZS is permissible within these land zonings in accordance with EE's authority under the *Infrastructure SEPP*.

3.3 Property Matters

The EE owned Marayong ZS site has an area of approximately 8480 m².

Residential properties are located adjacent to the eastern boundary and also opposite along the three adjacent streets.

The existing Marayong ZS property is of adequate size to accommodate the new indoor ZS facility adjacent whilst the old facility remains operational until the new substation is commissioned.

EE established the existing ZS more than 50 years ago. The ZS site is ideally located to provide electricity supply to the area serviced. Relocating the ZS to an alternative site would require EE to purchase another property in the Marayong area and also establish feeder connections to the site.

The new ZS control building will be located on northern side of the site and will be positioned approximately 8m from both the Raymond Street and Charles Street site boundaries. There will be a 13.6m buffer to the east at the rear of the ZS between the security fence and the nearest residential property boundary. A 1m high timber post and galvanised pipe rail fence will be constructed along the boundaries surrounding the site.

Once the new indoor ZS is commissioned, the old ZS, outdoor switchyard including the transformers will be decommissioned and demolished and the area landscaped. One of the objectives of redeveloping the ZS was to ensure the substation fits within the existing context of the residential urban environment.

4.0 PROJECT JUSTIFICATION

The ZS renewal project is predominantly driven by network safety and reliability.

Many of the original components of the Marayong ZS are more than 50 years old. The 11kV switchboard, the auxiliary switchgear and Transformer No. 3 have reached the end of their effective service life. The remaining two transformers and other electrical equipment are also nearing the end of their service lives (Table 1) and require renewal to ensure safe and reliable operation of the substation.

4.1 Network Safety and Risk

EE's Network Strategy and Planning Branch have identified a number of matters at Marayong ZS that require addressing from a safety perspective. These include-

- The 11kV switchboard with is an aging bulk oil type switchboard that could fail.
- The 11kV auxiliary switchgear is the epoxy insulated type that is known to experience insulation degradation, causing switchgear failure that could possibly trigger an electrical fire.
- The transformers, specifically including Transformer No. 3 located in the switchyard are in poor condition and at or approaching the end of their lives with an increased risk of failure.
- The cable basement height under the Control Building is restricted and lower than the EE standard for cable maintenance.
- The protection relays are located within a tunnel-board that have exposed live components which present a hazard for the protection technicians whom are required to work on this equipment.

4.2 Renewal of Assets

EE has assessed the age and condition of the existing Marayong ZS and concluded it is necessary to renew at least the most vulnerable assets to ensure reliability of electricity supply.

Whilst some of the ZS components, such as the 33kV outdoor switchyard, control building, protection and auxiliary systems are in serviceable condition, the majority of other ZS components are nearing the end of their serviceable life.

Transformers 1 and 2 are currently in a serviceable condition, however they are approaching the end of their service lives and will require replacement in the near future. All the transformers were manufactured in 1973 and are currently 44 years old.

The oil filled 11kV switchboard and auxiliary switchgear was commissioned in 1964 and is prone to failure and prolonged supply outage.

The ZS components that are aging and in poor condition include:

- Transformer No. 3,
- the 11kV switchboard,
- auxiliary switchgear,
- 11kV circuit breakers, and
- network monitoring and communication equipment.

The table below shows the age (as at 2017) of the various Marayong ZS components compared to their effective service life.

Asset description	Asset age (years)	Effective service life (years)
33/11kV Power Transformers	44	50
33kV CBs	13	45
	5	45
11 KV switchgear	57	51
	53	51
	37	51
Protection relays	4-48	51

Supervisory Control and Data Acquisition (SCADA)	16	10
Auxiliary transformer & switchgear	54	45
Busbars and switchyard structures	46	45
Control building	37-57	45

Table 1: The above table lists the equipment or component age of the Marayong ZS.

5.0 PROJECT DESIGN REQUIREMENTS

Based on the identified constraints at the Marayong ZS site and the context within which the project is to be carried out, the following factors have been identified as key to meeting the project purpose. All of these factors need to be addressed by each project option and the ideal outcome is intended to satisfy all of these requirements.

Supply Security- ensuring that customers receive the supply security level as detailed in EE planning standards.

Licence Condition Compliance- ensuring that Department of Water and Energy licence conditions relating to design planning criteria are complied with.

Financial/economic Feasibility- ensuring that the requirements of the Regulatory Test are met.

Demand Growth- ensuring that the chosen solution continues to be appropriate into the future, given the forecast levels of demand growth.

Long Term Network Strategy- the solution must support and be supported by the long term plan for network development in the area.

Environmental Feasibility- ensuring that the project does not result in a worse environmental impact than currently exists. Where this is not possible, the project must aim to minimise the additional environmental impact.

Technical Suitability- all relevant design standards must be met.

Network Utilisation- the solution proposed must make the best use of the existing capacity of the network.

Network Safety- the proposed solution does not present any future safety issues for operations and maintenance personnel or members of the public. It addresses any identified current safety concerns.

6.0 OPTIONS

A number of options were considered as part of the EE's network investment assessment process.

6.1 Do Nothing

The "Do Nothing" option does not address the asset renewal needs identified for Marayong ZS, nor does it satisfy either the principal or secondary objectives for this project. Therefore, the "Do Nothing" option was not considered further.

6.2 Demand Management Options

EE investigates demand management (DM) options for all major projects that meet the criteria as stipulated in the NSW Demand Management Code of Practice. The DM Code of Practice states that all major distribution network capital investment projects that have an annualised cost of $200,000 or more and pass the reasonableness test.

The reasonableness test is a test applied to ascertain whether it is reasonable to expect that the number and type of electricity customers driving the identified electricity network limit will respond to demand management initiatives.

Since this project is driven by asset condition and a need for asset replacement rather than a requirement to meet load growth requirements, a Demand Management solution was not considered to be an appropriate response to this situation, and therefore not considered further.

6.3 Substation Renewal Options

Two renewal strategies were considered by EE to address the options for the asset renewal and network needs identified at Marayong ZS.

6.3.1 Replacement of Transformers

Transformer No. 3 will require renewal in the short term and Transformers 1 and 2 are serviceable, however these transformers have approximately five years of service life remaining. Given the timeframe for the construction of new ZS, it is likely that these transformers will require replacement around the time of completion of the ZS redevelopment works.

Furthermore, retention of the existing transformers will require construction of fire walls surrounding the transformers and major refurbishments. Given the limited lifespan the Transformers 1 and 2, this investment is not considered to be prudent. Therefore all options considered for the redevelopment of the Marayong ZS include the replacement of all three transformers.

6.3.2 Renewal of the Substation

Two fundamental approaches have been considered to address the renewal of the ZS:

1. Undertake minimal works and continue like for like piecemeal replacement of components as required.
2. Redevelopment of the existing outdoor ZS to a new indoor 33/11kV ZS including:
    a. A staged redevelopment approach.
    b. Rebuild the substation.

The minimal works option would include sufficient work to address only the highest priority renewal needs and will retain much of the original outdoor ZS, with a view to continuing to maintain and renew those assets in a like for like manner as they reach the end of their service lives. This strategy involves an extension to the existing control building to accommodate new 11kV switchgear and protection control equipment and retention the outdoor 33kV switchyard and undertaking like for like asset replacement as required.

The second approach is a strategy to redevelop the site into a completely new indoor ZS, with a range of sub-options to advance the concept from the first stage, including a new 11kV switchroom through to a completely new indoor ZS. The works could either be staged by redeveloping parts of the ZS when required or complete redevelopment in a single stage in the short term.

Three ZS renewal options were considered as described below.

Option A: Extend the control building and retain the outdoor 33kV switchyard

This option proposes to extend the existing control building to include a new 11kV switchroom to house the new 11kV switchboard. The current 11kV switchroom would be used to house new auxiliary switchgear. There is enough room at the site to build them in a new 11kV room with 19 feeder circuit breaker at the front of the existing control building at the corner of Charles and Frederick Streets. Should more 11kV circuit breakers be required in future, they will need to be doubled with the existing circuit breaker, which is not an ideal situation.

Figure 8: Marayong ZS Renewal Option A – extend control building.

This option retains the existing 33kV outdoor switchyard as it is operating now, however the three existing 25MVA transformers require replacement. There is insufficient space in the existing transformer bays for standard sized new transformers to be installed. Therefore the new transformers would need to be located outside of the existing switchyard to the north. The area currently occupied by the 11kV circuit breakers will be used as battery rooms. The other equipment would remain in service with some refurbishment work to improve safety around the protection and control tunnel board.

The landing span of 33kV Feeder 445 which currently passes over the roof of the control building would be replaced by an underground cable to allow for the construction of the building extension.

Live 11kV feeder cables are located towards the south-west corner of the site. These cables would be supported in situ while the new building is constructed around them. This approach presents heightened risks for crews digging and performing construction work near the live cables. The risk management required would add to the complexity and cost of this option.

Option B: New 11kV switchroom, retain 33kV outdoor switchyard and control building
This option proposes to construct a new building towards the north of the existing ZS to accommodate the new 11kV switchboard. The current switchroom would be used to house new auxiliary switchgear.

The 11kV transformer circuit breakers would be removed and their rooms would be available for use as battery rooms. The other equipment would remain in service with some refurbishment work to improve safety around the protection and control board. As in Option A, the 33kV switchyard would remain in service and the transformers would be replaced to the north of the switchyard.

The landing span of 33kV Feeder 445 could also be placed underground to improve maintenance accessibility to the control building roof. Note; there is no building construction works proposed in this option that would necessitate the relocation of this feeder.

This approach involves construction on vacant EE land to the north of the existing ZS facility.

Figure 9: Marayong ZS Renewal Option B – new 11kV switchroom building to the north of the existing ZS.

Option C: New indoor substation; demolish existing control building
This option proposes to replace the entire existing outdoor ZS with a new indoor ZS constructed on the land to the north of the existing 33kV switchyard.

The existing ZS site including the control building, three transformers and 33kV outdoor switchyard will be removed and demolished. The site will be remediated to an appropriate standard to ensure the safety of EE staff and and the cummunity.

Figure 10: Marayong ZS Renewal Option C – new indoor ZS.

6.3.3 Further Consideration of Renewal Options

The above three renewal options (described in 4.2.2 Options- A, B, C) are further assessed and categorised into two further sub-options as summarised in Table 2 below.

Sub-Option 1 is the minimal works option and involves installing a new 11kV switchroom and three new power transformers. Future works in this option may include piecemeal replacement of the 33 kV assets or complete redevelopment into a new indoor substation.

Sub-Option 2 involves complete redevelopment into a new indoor substation immediately.

Option	Redevelopment works
Sub-Option 1 - Staged redevelopment approach	• Underground the landing span of 33kV Feeder 445 • Construct a new 11kV building to the north of the existing

Option	Redevelopment works
	switchyard • Install a new 11kV switchboard in the new building • Replace auxiliary switchboard • Refurbish the protection and control tunnel board and replace all aged relays • Install differential feeder protection over the optical fibre network for 33kV feeders 445 and 473 • Replace the SCADA RTU • Relocate the battery bank to one of the ex 11kV TX CB rooms and provide ventilation for the battery rooms • Dispose of the Westinghouse HQ switchboard, the three 11kV transformer circuit breakers • Retain the existing 33kV switchyard • Replace the first sections of 11kV feeder cables out of the substation • Replace all three TXs • Dispose of the replaced transformers
Sub-Option 2 - Complete redevelopment approach	• Build a complete new indoor 33kV substation • Replace the first sections of 11kV feeder cables out of the substation • Underground the incoming 33kV feeders • Dispose of the existing 33kV switchyard and control building and switchgear and remediate the land • Replace all TXs • Dispose of the replaced transformers

Table 2: Describing minimal works and complete redevelopment options.

6.3.4 Preferred Option Assessment

In comparison of Options A & B (above), extending the control building to accommodate the new 11kV switchboard will cost a similar amount to constructing a new 11 kV switchroom towards the north of the existing substation. Additional cabling costs to connect the new switchroom will be marginally more expensive but it will provide some additional benefits and reduced risks over extending the control building but both options are rejected as not being a viable option for long term solution because these options will increase risks of performing construction work near the live cables and will not meet the renewal needs for all electrical equipment in long terms and will occupy more vacant land than usual.

Under Option C (above), sub-Option 1 involved replacement of substation assets in a like for like basis and sub-Option 2 involved constructing a new indoor ZS. Whilst sub-Option 1 provides a slightly lower present cost, sub-Option 2 provides an efficient solution which presents significantly lower risks than sub-Option 1 and supports EE's strategic objectives of improving safety outcomes, reducing maintenance costs and providing better customer reliability.

Generally both sub-Options 1 and 2 were considered viable and an options assessment process identifying key risks was undertaken. These risks (summarised in Table 3 below) include safety

impact, environmental impact, construction feasibility, operating and maintenance requirements, reliability and supply security impacts and sustainability impact.

Option	Option detail	Safety	Environment	Construction	Operating & maintenance	Reliability	Sustainability
1	New 11kV building and replace all TXs						
2	New indoor substation and replace all TXs						
Code	Extreme risk	High risk	Moderate risk	Low risk			

Table 3: Marayong ZS- risk assessment (Source: NIO, Asset Strategy and Planning).

6.3.5 Preferred Option

The results of this assessment process concluded that Sub -Option 2 had the lowest risk profile and provided better outcomes in all categories and accordingly this option was selected as the preferred option. The concept design is included in Attachment 1 and Appendix A of the REF.

7.0 CONSULTATION

Endeavour Energy has notified and consulted various parties in relation to the redevelopment of Marayong ZS. The residents of Marayong in Raymond, Charles and Frederick Streets are key stakeholders of this renewal proposal and have been notified accordingly.

Consultation notification regarding the environmental assessment was provided to a range of stakeholders including;

- nearby residences within Raymond, Charles and Frederick Streets, Marayong,
- Blacktown City Council including all the Mayor and relevant Councillors,
- Federal Member of Parliament (MP), Member for Greenway,
- State Member of Parliament (MP), Member for Blacktown,
- Telstra and NBN
- Jemena, and
- Sydney Water.

An advertisement regarding the environment assessment was published in the Blacktown City Sun inviting residents to comment on the proposal.

Endeavour Energy received one submission from a resident endorsing the plan. Copies of all correspondence are contained in Appendix B.

The works to redevelop the Marayong ZS must be constructed substantially in accordance with the certified concept plans prepared for tender dated Feb 2018 included as Attachment 1 and the concept plans prepared for consultation included in Appendix A of the REF dated Nov 2017.

8.0 PROJECT DESCRIPTION

Main design objective for the redevelopment was to ensure the ZS design is appropriate to the surrounding residential location in which the substation is sited. Refer photomontages, elevations and landscape plan contained in Appendix A. The design incorporates natural ventilation systems, improved thermal massing, and roof ventilation. It also utilises high quality, durable, low maintenance, and long life construction materials, to ensure it addresses environmental sustainability issues by reducing energy and resource consumption over the life of the building.

The various parts of the proposed ZS have been carefully considered and articulated in order to minimise potential impacts on the amenity of neighbouring properties and the landscape. The design utilises residential style design features to create a ‘community’ architectural form that minimises bulk

and scale, particularly when viewed from Charles and Raymond Streets. Physical characteristics of the building including height, size and scale are designed to accommodate the electrical equipment housed within. The standard setback from the property boundary has been maintained. A new black palisade fence and landscaping will surround the new substation are proposed to screen the development when viewed from the adjoining Streets.

Works at the Marayong ZS and other substations

- Electricity transmission network reconfiguration;
    - Installation of new UGOH poles (replacing existing poles), and
    - Installation of UG feeder sections within the surrounding roads (beneath the out outside edges of the paved road surface) from the existing 33kV feeders (via new UGOH poles) to provide transmission feeder connects (Appendix C).

- Temporary and permanent electricity distribution network reconfiguration works to maintain supply from the ZS to the surrounding electricity distribution network (Appendix C).

- Construction of a new indoor 33/11kV [three 25MVA transformer] ZS with firm 50MVA capacity and including a new control building to accommodate 33kV and 11kV switchgear, protection / control / auxiliary equipment, meal room and toilet.
    - Construction of transformer enclosures and associated transformer oil containment bunds, oil water separators, and fire/blast walls.
    - Construction of a cable basement area beneath the control building.
    - Relocation the existing outdoor capacitor bank to the new ZS area.
    - Installation of control, security and fire systems.
    - Installation of security fencing around the ZS perimeter.
    - Installation of stormwater drainage.
    - Landscaping pf the redeveloped ZS.
    - Establish landscaping, palisade and post and rail fencing on the remediated site to compliment the redeveloped ZS and surrounds.

- Demolition and removal of the exsiting ZS, including the control building, 11kV and 33kV switchyard, power transformers and associated foundations.

- Appropriate remediation of the existing ZS area or site.

- Replacement of associated feeder protection relay equipment within the Blacktown TS, Baulkham Hills TS and Kellyville ZS.

Transmission Feeder Reconfiguration Works

Transmission feeder reconfiguration works will be carried out to supply power to the new substation utilising existing 33kV Feeders 445, 470 and 473 (Figure 3 and Appendix A and C).

The feeder reconfiguration works include replacing three existing poles in the vicinity of the ZS with UGOH poles and installing UG cables from these new UGOH poles into the ZS. The three UG feeder cables sections vary in length and traverse along Raymond, Charles and Frederick Streets within the typical transmission feeder asset allocation*, i.e. within a 0.6m wide by 1.4m deep trench at the outside edge of the paved road surface or carriage way. *UG transmission feeders are typically installed beneath the road surface to minimise the potential for these critical assets to be damaged by excavation works that is common within roadside verge areas. The UG feeder cables will enter the ZS from Charles and Raymond Streets.

Distribution Feeder Reconfiguration Works (temporary and permanent)

Distribution feeder reconfiguration works are necessary to maintain supply and ensure safety during the ZS works (see Figure 11 and Appendix A & C).

The sections of distribution Feeders 1949 and 1957 that traverse the ZS will be temporarily redirected OH utilising existing and temporary poles. Three new temporary poles along the rear of the property will temporarily support Feeder 1957 from Raymond Street. Existing poles will support a section of distribution Feeder 1949 from Charles Street. This temporary OH connection will provide adequate electrical safety clearance to construct the new ZS building.

Existing Air Break Switch (ABS) [No. 76532 on Pole 5] at Raymond Street adjacent to the rear side boundary of the ZS site will be replaced. The replacement new ABS will be installed in Raymond Street on a proposed new replacement Pole (11).

Other 11kV distribution feeder works proposed outside the ZS property and not detailed above will be assessed separately as required.

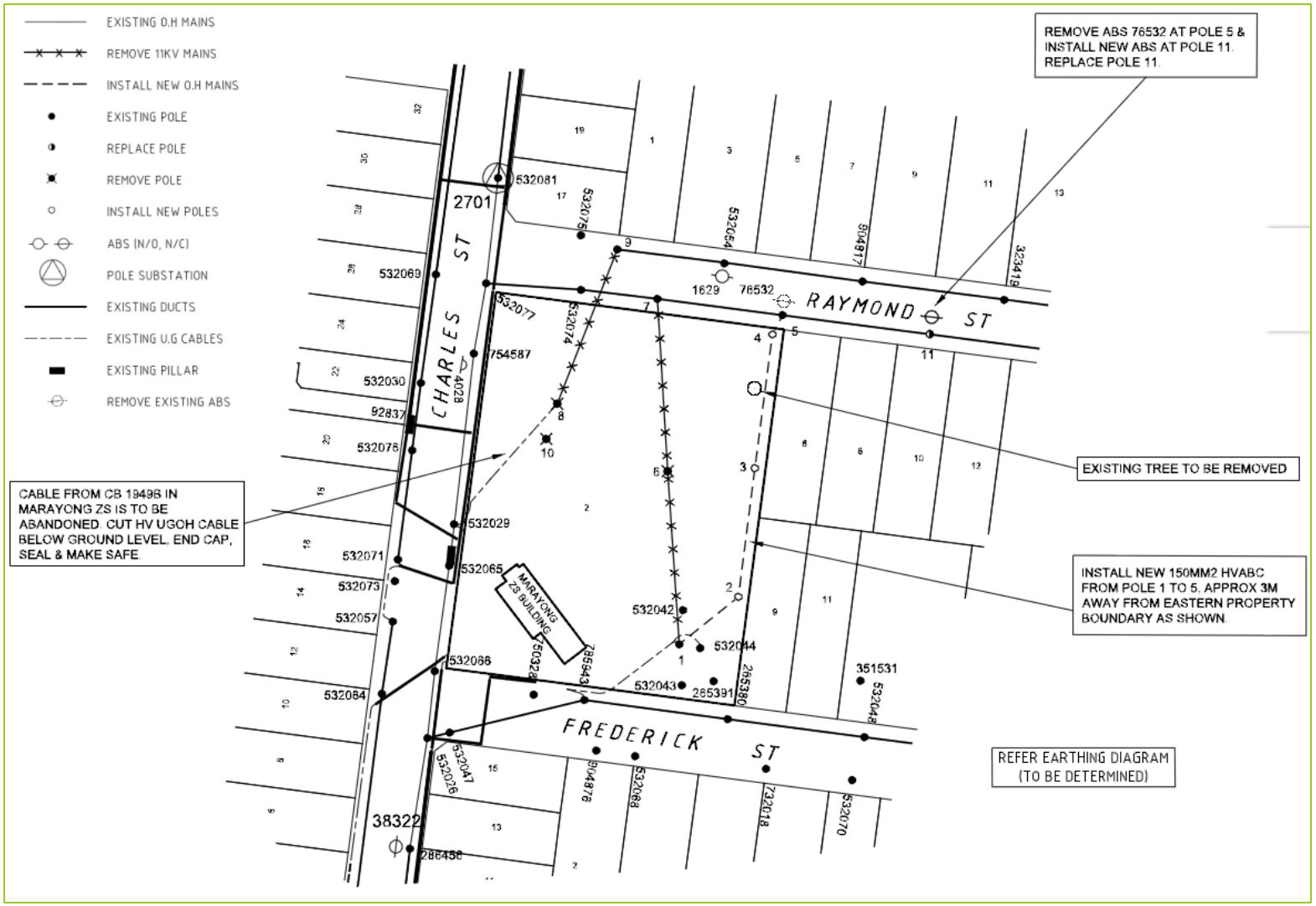

Figure 11: Renewal of Marayong ZS –11KV Feeder relocation diagram

8.2 Control Building

The ZS has been architecturally designed, with consideration of its corner position and proximity to residential development to fit within the surrounding residential environment. Careful consideration was given to the building form and choice of materials and finishes to fulfil the requirements of a functional suburban ZS while corresponding with the residential context of the area. The majority of the ZS equipment will be within the control building.

The ZS control building has been designed to utilise natural ventilation to maintain an appropriate internal temperature to minimum use of air conditioning. It has been designed to be secure against unauthorised entry, vandalism, and theft and to provide a safe environment for staff.

8.3 Cable Basement

The cable basement will extend beneath the control building to a depth of 2.5 m. The ceiling height of the basement shall be partially above ground level so as to allow for natural ventilation. The height of the basement is influenced by the need to minimise the bending radius of the large electricity cables that connect into the underside of equipment within the switchroom area.

All electrical components to be installed in the basement are fully insulated and will not be affected by water.

8.4 Security System and Fire rating Information

The ZS has been designed to minimise the risk of causing a fire external to the facility.

The ZS control building will be fitted with an intruder alarm, fire hydrant system and other fire suppression features, and portable fire extinguishers.

The external walls of the ZS control building will have a fire resistance rating of 120/120/30. Walls and doors between switchrooms and the control room will have a rating of 120/120/120 and 120/120/30 respectively. All switchroom ventilators and pressure relief panels will have fire dampers rated to 2 hours and operate in conjunction with the fire system.

8.5 Substation Safety

The ZS has been designed to the relevant Australian Safety Standards, *Building Code of Australia* requirements and will include the following safety devices as required by EE standards *SDI 510* and *SDI 538*.

- Medical Emergency signalling system.
- Deluge showers installed in accordance with EE Standard.
- Telephone.
- Fire Blankets.
- Fire Extinguishers,
- Low voltage Rescue Hooks.

Fire exit doors, and general access to and egress from the control and switchrooms have been designed or positioned to ensure compliance with the relevant standards.

8.6 Transformer Information

Three new 33/11kV 25MVA transformers will be installed at ZS. These transformers will have a maximum sound power level of 65dBA at 66% maximum loading (which relates to the transformers having a sound power level of 62dBA at no load). Once installed and operating, these transformers will be complaint with the *Industrial Noise Policy*. Refer below (*Noise Management*) for detail relating to noise mitigation measures.

The transformers will be located within bunded or secondary liquid containment areas or bays. The transformers will be surrounded by and separated from each other on three sides by noise/fire/blast walls. The walls will partially return across the front of the bunded transformer bays to be open towards the ZS Control Building. The walls will extend 300mm above the highest point of the transformers.

Each bunded transformer bay will be fitted with an oil water separator. The pre-treated water from the bunded area will be discharged onto the gravel surface of the substation yard adjacent to the transformer bays.

8.7 Substation Lighting

The ZS control building will have lighting levels in accordance with EE standard *SDI 529*. The level of illumination in the ZS yard will be a minimum of 64 LUX at 1 metre above the ground in accordance

with EE standard *SDI 529*. Under normal operating circumstances the ZS will not be illuminated at night.

8.8 Vehicle Access

The ZS has been designed to allow unrestricted 24 hour all weather access for all vehicles and staff that may be required to carry out maintenance (including emergency repairs) and operational activities.

The ZS facility will generally be unmanned. Occasionally staff will attend for the purpose of carrying out routine operational and maintenance checks. These visits usually involve 2 staff members using a car, utility vehicle or van and site visits are usually occur at monthly intervals in accordance with EE inspection and maintenance standards.

Where operational access was previously off Charles and Frederick Streets, operational access will now be off an alternate Charles Street access location and through the ZS to Raymond Street. Construction access for the duration of the works including demolition works will be off the Raymond, Charles and Frederick Street entrances. Construction access-ways will be suitably established or stabilised to prevent soil discharge or tracking off-site during construction.

The access way entrances have been designed to allow sufficient setback for maintenance trucks to safely clear the road whilst the gates are being opened or shut.

There is sufficient room for all vehicles visiting the site to park within the ZS yard.

8.9 Substation Fencing

The redeveloped ZS facility will be surrounded by 2.4m high black palisade fencing (Appendix A) The land surrounding the substation will be landscaped at the conclusion of works. A 1m high timber post and rail fence will be established at the site property boundary, to surround the entire property including the redeveloped ZS facility and what will be the vacant area currently occupied by the existing ZS facility.

9.0 ENVIRONMENTAL LEGISLATION

9.1 Environmental Planning

9.1.1 The Code of Practice for Authorised Network Operators and the Environmental Planning and Assessment Act, 1979

The Code for Authorised Network Operators (ANO) and the Environment Planning and Assessment (EP&A) Act provides the statutory planning context for environmental assessment and approval of works to be undertaken by an ANO.

The EP&A Act defines two approval processes depending on whether a proposal, or components of it, is considered an “Activity” (addressed under Part 5 of the EP&A Act) or a “Development” (addressed under Part 4 of the EP&A Act).

The Code requires an ANO to classify its proposals into one of six possible assessment classes. The Code applies to Class 3, 4, 5 and 6 proposals, only.

Class 3: requires the preparation of a Summary Environmental Report (SER) refers to projects which are expected on a reasonable basis to be minor and neither extensive or complex.

Class 4: requires the preparation of an REF and refers to projects which are expected on a reasonable basis to have impacts which go beyond minor, can be extensive and/or complex and at the discretion of the ANO be a project for which it is deemed appropriate to prepare, such as a project which may generate considerable public interest.

Class 5: refers to projects as defined in Class 4 above, but also require the preparation of a Species Impact Statement (SIS).

Class 6: refers to projects which are “likely to significantly affect the environment” and therefore an EIS is required.

On 14 June 2017 EE was transacted and became an ANO. This means that EE is now a privately managed network business in accordance with the Electricity Networks Assets (Authorised Transactions) Act 2015, and is subject to “The Code of Practice for Authorised Network Operators” gazetted in September 2015 under Clause 244k of the Environmental Planning and Assessment

Regulation, 2000 (EP&A Regs). The Code is deemed to be in force until it is revoked or varied in accordance with the EP&A Regs.

The NSW Government has prescribed the ANOs as a "prescribed Determining Authorities" for the purposes of Part 5 Section 111A of the EP&A Act and the definition of "public authority" under section 4(1) of that Act.

This prescription allows an ANO to be a Part 5 Determining Authority for the purposes of an electricity transmission or distribution network.

While Part 5 Activities do not require development consent under Part 4 of the EP&A Act, consideration of an Activity's environmental impact is required under Section 111 of that Act. This is accompanied by Section 112, which requires an EIS to be prepared if an Activity is likely to likely to significantly affect the environment.

The Authorised Transactions Act inserted Division 9 into Part 14 of the EP&A Regs. Clause 244K in Division 9 provides that The Code may make provision for or with respect to the exercise by an ANO of its functions under Part 5 Section 111 of the EP&A Act in respect of "an activity for the purposes of a transacted electricity transmission or distribution network". These words are defined non-exhaustively in Clause 244J as including:

…….activities (within the meaning of Part 5 of the EP&A Act), for any one or more of the following purposes:

a. Development for the purposes of the construction, maintenance or operation of a transacted electricity transmission or distribution network
b. Geotechnical investigations relating to a transacted electricity transmission or distribution network
c. Environmental management and pollution control relating to a transacted electricity transmission or distribution network
d. Access for the purposes of the construction, maintenance or operation of a transacted electricity transmission or distribution network
e. Temporary construction sites and storage areas, including batching plants, the storage of plant and equipment and the stockpiling of excavated material.

As a Determining Authority an ANO can assess and self-determine Activities that are not likely to significantly affect the environment and are conducted for and on behalf of the ANO for the purposes of electricity transmission or distribution.

By virtue of an ANO's status under the Infrastructure SEPP, certain of its activities will be subject to Part 3 Division 5 Subdivision 1- Electricity Transmission or Distribution Networks - of the Infrastructure SEPP for the purposes of development connected with electricity transmission or distribution.

These are outlined below:

Under "Clause 41 Development permitted without consent"

(1) "Development for the purpose of an electricity 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….." excluding land reserved under the National Parks and Wildlife Act.

The Infrastructure SEPP's definition of an "electricity transmission or distribution network" includes the following components:

(a) Above or below ground electricity transmission or distribution lines (and related bridges, cables, conductors, conduits, poles, towers, trenches, tunnels, ventilation and access structures)

(b) Above or below ground electricity kiosks or electricity substations, feeder pillars or transformer housing, substation yards or substation buildings.

The aim of this Policy is to facilitate the effective delivery of infrastructure across the State through increased regulatory certainty, improved efficiency and flexibility in the location of infrastructure and service facilities, while still providing adequate stakeholder consultation.

Subclause 8(1) of the Infrastructure SEPP provides that the SEPP prevails over all other Environmental Planning Instruments including Local Environmental Plans (LEPs) and SEPPs except in the case where clause 8(2) provides that the following SEPPs override all the requirements of the Infrastructure SEPP to the extent of any inconsistency:

- State Environmental Planning Policy No. 14- Coastal Wetlands (SEPP 14)
- State Environmental Planning Policy No. 26 – Littoral Rainforests (SEPP 26) or
- State Environmental Planning Policy (Major Development) 2005 – Major Development SEPP.

It should be noted that none of the above SEPPs apply to this project.

Since this project can be classified as an "Activity" under Part 5, EE therefore will not be required to submit a Development Application to Blacktown City Council (since Development Applications are assessed under Part 4 of the EP&A Act). However, Blacktown City Council will be given written notice of the intention to carry out the proposed works and EE will consider any response received from the Council.

The construction impacts of the proposed project are only covered the ZS site and area of the surrounding residents as such the works are considered minor. At the conclusion of construction, the site will be restored like a community area, same as before and the proposed work is not of a prescribed kind or an activity that is likely to significantly affect the environment (including critical habitat) or threatened species, populations or ecological communities or their habitats, an EIS is not required.

In view of the above, this project is being assessed as a Class 4 Proposal under the Code.

Since this project is classified as an activity in accordance with Part 5 of the EP&A Act 1979 it must also be assessed under Clause 228(2) of the Environmental Planning and Assessment Regulation 2000.

Under the Energy Services Corporation Act, 1995 EE is also required 'to protect the environment by conducting its operations in compliance with the principles of ecologically sustainable development'.

Clause 228(2) and ESD factors which are required to be considered are listed below.

There would appear to be no other planning instruments or legislation that would restrict the activity in this location.

9.2 Environment Protection and Biodiversity Conservation Act, 1999. (EPBC Act)

The EPBC outlines the Commonwealth Government's role in regards to environmental assessment, biodiversity conservation, the management of protected species, populations and communities and heritage items.

The EPBC Act lists nine matters of national environmental significance (MNES) which must be considered when assessing the impacts of a proposal. An assessment of how this project may impact on these matters is shown in the table below.

MNES	Comment	Likely Impact
World Heritage Property	No world heritage properties would be potentially affected by this proposal	Nil
National Heritage Places	No national heritage places would be potentially affected by this proposal	Nil
Wetlands of International Importance	No wetlands of international importance would be potentially affected by this proposal	Nil
Commonwealth listed Threatened Species and Ecological Communities	No threatened species, populations or ecological communities listed within Commonwealth (or State) legislation would be potentially affected by this proposal	Nil
Commonwealth Listed Migratory Species	No migratory species would be potentially affected by this proposal	Nil
Nuclear Action	This proposal would not result in any nuclear action nor would it require any nuclear action for it to be undertaken	Nil
Commonwealth Marine Areas	No Commonwealth Marine Areas would be potentially affected by this proposal	Nil
Great Barrier Reef Marine Park	The Great Barrier Reef Marine Park would not be affected by this proposal because the Park is not located within EE's Franchise Area	Nil
Water resources in relation to coal seam	Water resources would not be affected by this proposal because it does not involve coal seam gas or coal	Nil

gas development and large coal mining development	mining development	

Table 4: Consideration of MNES.

Results of EPBC Act Protected Matters Report Search are included in Appendix D.

9.3 Electricity Supply Act, 1995. (ES Act)

The ES Act defines EE's licencing requirements and provides a framework for the development and maintenance of electrical infrastructure. In summary, it allows EE to trim and remove trees, carry out works on public roads and acquire land. This Act also requires that works (other than routine repairs or maintenance works) must not be undertaken unless a minimum of 40 days' notice is supplied to the relevant local council. Any submission received must be considered by EE.

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

The Protection of the Environment Operations Act 1997 (POEO Act) provides a framework for the licensing of certain activities and is administered by the Office of Environment and Heritage (OEH) (Formerly NSW EPA). Under this Act, the construction and operation of the new Feeders must be conducted in such a manner that they:

- do not pollute the environment
- any waste generated must be classified, handled, transported and disposed appropriately
- and environmental incidents involving actual or potential harm to human health or the environment must be reported to OEH.

9.5 Threatened Species Conservation Act, 1995 (TSC Act)

Section 111(4) of the EP&A Act requires that assessment of an activity must consider its impact on threatened species, populations, ecological communities or their habitats. Schedules 1 and 2 of the TSC Act lists species, populations and ecological communities of native flora and fauna considered to be threatened in NSW. The TSC Act also lists a number of factors to be taken into account in deciding whether this proposal is likely to significant effect the environment. If an activity potentially affects any flora or fauna species, population or ecological community listed by the TSC Act, a test of significance is required. The test of significance, referred to in s. 94 (2) of the TSC Act and section 5A of the EP&A Act, determines whether the proposal is likely to have a significant impact. If a significant impact is determined, a SIS is required and a Class 5 environmental assessment under The Code is required to be conducted.

Proposed works to redevelopment of the Marayong ZS are fully confined within the EE owned land and it is anticipated that there will be no significant vegetation or waterways impacted by the works. The site is not listed as a contaminated or a heritage listed site and no records of any environmental sensitivities have been found. No threatened flora or fauna species, population or ecological community would be affected by the proposal.

10.0 ENVIRONMENTAL IMPACT ASSESSMENT

10.1 Clause 228 (2) Considerations

For the purposes of Part 5 of the Environmental Planning and Assessment Act 1979, and in accordance with the requirements of The Code, the factors to be taken into account when consideration is being given to the likely impact of an activity in the environment include:

(a) Any environmental impact on a community

Marayong ZS has been in operation since the early 1960s. The ZS is located on a sizeable block of land supporting scattered tree plantings within a low density residential area. The proposed redevelopment of the substation to renew aging equipment is not considered to represent a significant change to the existing environment. The new ZS will be constructed directly adjacent to the old substation. Once the new ZS has been completed the old ZS will be demolished and the site will be landscaped. With reduced audibility and increased reliability of the new equipment to be installed at the ZS, the works associated with the redevelopment ZS are considered to present lesser environmental impact than the old substation that it is replacing.

(b) Any transformation of a locality

The substation redevelopment involves constructing a new indoor substation to replace the old outdoor facility. The redevelopment will occur next to the existing substation within the EE owned land. The transformers will be placed in bunds surrounded by fire walls and the old outdoor switchyard will be demolished. The proposed substation facility has been designed to be residential in scale and will represent a significant improvement over the current facility. Some vegetation clearing will be required for the proposed construction and this vegetation will be replaced once the old ZS has been demolished. The proposed works will not significantly transform the locality since the old outdoor substation is being replaced by a modern indoor facility.

(c) Any environmental impact on the ecosystems of the locality

No significant impact on any ecosystem is anticipated with this development. See answers provided above.

(d) Any reduction of the aesthetic, recreational, scientific, or other environmental quality or value of a locality

The proposed works will represent an improvement over the existing Marayong ZS in terms of reliability and aesthetics. The works do not represent any significant reduction of the above criteria.

(e) Any 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

The development will not have any impact on any item having these inherent values. The proposed works will be undertaken on EE owned land and involve the replacement of old equipment which has reached the end of its service life. The site is currently used for the purposes of a public utility undertaking permitted under the current land zoning.

(f) Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)

The existing ZS is and the new ZS will be located on a large portion of land in a residential area, which is regularly mown. There will not be any impact on the habitat of protected fauna as defined above.

(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air

The existing ZS is and the new ZS will be located on a large portion of land owned by EE in a residential area, which is regularly maintained. No species of animal, plant or other form of life will be endangered as a result of the substation redevelopment.

(h) Any long -term effects on the environment

No long term environmental impacts will result because the site is presently used for a ZS and the new substation will be constructed on this site directly adjacent to the old ZS.

(i) Any degradation of the quality of the environment

Following redevelopment the site will still be used as a ZS. The old ZS site will be landscaped when the old ZS site is demolished, therefore no further degradation of the quality of the environment. Also refer to (h) above.

(j) Any risk to the safety of the environment

The substation design will ensure that it will comply with all relevant standards and environmental regulatory requirements.

(k) Any reduction in the range of beneficial uses of the environment

The project will not adversely affect present land use activities. The new substation is being constructed directly next to the old substation and following the demolition of the old ZS, its site will be turfed and landscaped.

(l) Any pollution of the environment

Appropriate pollution controls including erosion and sediment pollution controls and necessary temporary and permanent secondary containment measures will be in place to prevent pollution occurring during the construction of this project and during operation of the facility.

(m) Any environmental problems associated with the disposal of waste

All waste associated with construction works shall be disposed of at an approved facility and in accordance with EE Environmental Management Standard EMS 0007 Waste Management. A copy of this Standard is available on both EE's and EE's Accredited Service Providers (ASP) website.

(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become in short supply

There would be no demand on resources that are in short supply. All of the materials required for the construction of the ZS are commercially available and considered to be generally abundant.

(o) Any cumulative environmental effect with other existing or likely future activities

The rebuild of the Substation involves replacing an old outdoor substation with a modern indoor facility and will not pose any cumulative environmental effect to existing or future activities.

(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions

The proposed ZS site is located well away from the coast, in the western suburbs of Sydney- approximately 38km inland from Sydney CBD. As such, construction of this redeveloped ZS will have no impact on coastal processes.

10.2 Noise Management

Marayong ZS is located in a low density residential area. The closest neighbouring residences to the ZS are across Raymond Street to the north, across Frederick Street to the south and across Charles Street to the west and to the rear of the substation.

10.2.1 Construction noise

The construction of the new ZS and demolition of the existing ZS will generate noise during standard construction hours. Typical noises will include excavation machinery, small machinery typical of building contractors, hand tools, pneumatic/air compressor equipment and generators as well as small and large trucks. All equipment will be fitted with appropriate noise suppression equipment or devices.

Construction noise will be managed in accordance with the *Interim Construction Noise Guideline July 2009 (DECCW 2009)*. In accordance with this guideline, works will generally be restricted standard construction hours:

Mondays to Fridays: 7:00 am to 6:00 pm

Saturdays: 8:00 am to 1:00 pm

Sundays and Public Holidays: No work

If work are required to be undertaken outside the times specified above, those likely to be affected by the out-of-hours works or excessive noise will be notified of the times in which the work is to be carried out and the reasons why it is to be undertaken outside the standard working hours. Should out of hours works be required, the process for undertaking out of hours works as described in EE's Environmental Handbook will be followed. Appropriate internal and external approvals shall be obtained where required prior to any out-of-hours works being carried out.

10.2.2 Operational noise

The ZS will operate continuously, 24 hours a day, 7 days a week. To ascertain the effect of this noise on surrounding properties, EE engaged Day Design Consulting Acoustical Engineers to undertake an Environmental Noise Impact Assessment (Appendix E).

This assessment report recommended either installing a noise barrier along a portion of the ZS boundary or constructing a noise barrier around two sides of the transformers or alternatively replacing all transformers. It is predicted that by replacing the existing transformers with new low noise transformers within three side enclosures, the level of noise emissions from the ZS will be below *Guideline* levels and will not require any further noise reduction mitigating measures.

Mitigating Measures

- All potentially affected residents are to be notified prior to construction works commencing. Details are to include the likely duration of the works and 24 hour contact details for the Project Manager and Construction Contractor.
- Works must be carried out within standard construction hours unless otherwise approved (specified in 10.2.1).

- Out of hours works are subject to the requirements of EE's *Environmental Guideline Handbook,* i.e. advice and approval must be sought from the Network Environmental Assessment Environmental (NEA) Specialist and all potentially affected residents be notified.
- Should power generators be required during any stage of the construction works, the Project Manager must liaise with NEA prior.

10.3 Traffic impacts

There will be a slight increase in traffic movements in the vicinity of Marayong ZS during the construction phase of the project. These will occur when materials are being removed and delivered and as a result of the work crews working on site. These movements will be short term at the site and traffic management plans will be prepared as required. As such the additional construction traffic associated with this development is unlikely to have a significant impact on traffic in the area. Traffic controls will be established and used as required, and care will be taken not to block or restrict access to streets surrounding the site or to residential properties in the vicinity of the ZS site.

Marayong ZS is located in a residential area and is accessible from Raymond St, Charles St and Frederick St. These streets are a light traffic roads and are predominantly used by residents and very occasionally by EE employees maintaining the Substation. Street parking is permissible along both sides of the road.

Delivery, works vehicles and construction personnel vehicles will where practicable park on the ZS property and overflow park onto adjacent streets in a safe and appropriate manner.

Once completed, the substation will continue to operate as an unmanned facility and as such will generate insignificant or low levels of traffic, principally associated with general or routine maintenance and inspection works.

Mitigating Measures

- A Traffic Management Plan is to be prepared as required.
- Traffic control and safe pedestrian pathways are to be established and maintained along adjacent roads as necessary for the duration of the works.
- Vehicles are not to block access to resident's driveways at any time.
- Designated worksite areas shall be of sufficient size to accommodate skip bins as required and include room for the loading, unloading and manoeuvring of trucks.
- All vehicles associated with the works are to be legally parked at all times.
- All works, including the storage of equipment/materials is restricted to the ZS property.

10.4 Flora and Fauna

The ZS property is predominantly clear of significant vegetation, as it has been in operation since the early 1960s within a residential suburb or area. Whilst not considered floristically significant, it is intended to retain as much of the existing vegetation as possible. The removal of several trees will be required to construct the new ZS. The proposed revegetation of the site following completion of the ZS redevelopment and demolition of the existing ZS will offset the aesthetic impacts assocaited with any tree removal that is necessary. Refer to the attached Landscape Concept Plan in Appendix A.

A designated temporary builder's area is proposed to be established on EE's land adjacent to the worksite. This area will contain site sheds and serve as a stockpile area during the construction works. The placement of builder's sheds, stockpiles and materials are not to impact on vegetation to be retained.

Mitigating Measures

- Site sheds, stockpiled materials, machinery and the like are not to encroach within the drip line of trees to be retained.
- Retain trees wherever possible.
- Establish landscaping to incorporate local plant species and offset the loss of trees removed for the ZS redevelopment.
- Area/s used for site compounds, vehicle parking and stockpiling are to be restored with grass or other landscape treatment at the conclusion of works.
- Protective fencing to be installed around the trees to be retained on site to protect them from damage during construction.
- Fencing is to be installed prior to construction commencing maintained throughout the construction period and removed at the completion of works.

10.5 Heritage and Archaeology

Neither the EE owned ZS property nor the area surrounding are local or State heritage listed (Schedule 5 Environmental Heritage of the Blacktown City Council *Local Environmental Plan* (LEP) *2015*). A search on the Aboriginal Heritage Information Management System (AHIMS) website and EE's EnviroGIS database also has shown no Aboriginal or European heritage site recorded in or near the work site (Appendix F).

The Substation site is located within well-established residential area. Disturbance has already been caused to the land on which the Substation is situated and the road reserves surrounding. The proposed works are restricted to the ZS property and the surrounding road reserves. It is considered unlikely that the works will impact on any Aboriginal or non-Aboriginal heritage sites or areas.

Mitigating Measures

If any Aboriginal or Non Aboriginal heritage items are discovered during the construction, works in the vicinity of the item are to cease immediately and Network Environmental Assessment are to be contacted. They will engage a qualified archaeologist engaged to inspect the items and provide advice if required. The items will be reported to the OEH, the Local Aboriginal Land Council or the NSW Heritage Branch as appropriate. The items will then be assessed for significance, and protection measures will be instituted if required. Appropriate permits or approvals may need to be sought prior to works recommencing in this area.

10.6 Visual Impacts and Overshadowing

A primary design consideration for the ZS redevelopment was to ensure that the ZS fits within the existing residential context of the area. It is considered the proposed indoor ZS facility achieves this.

The various parts of the new ZS have been carefully considered and articulated in order to minimise potential impacts on the amenity of the neighbouring properties and the suburban streetscape. The design presents a traditional architectural form that minimises bulk and scale. Refer Photomontages in Appendix A.

The buildings have been designed to sit in the landscape as low as possible, particularly given the dimensions or relatively large size of the electrical equipment they have been designed to accommodate.

This vacant area of the property is maintained lawn grass and landscaping consisting of shrubs and trees. There are mature tree plantings to be retained on the ZS site. These will be subject to tree protection measures during construction in accordance with the relevant Australian Standards. These existing plantings will be complimented by additional landscape plantings (Appendix A).

Similar to the existing ZS facility, the new ZS will be positioned on the property with considerable separation to the nearest residences to the east and road reserves adjoining elsewhere. No shadowing cast by the new building or transformer bays will extend onto adjoining residential properties. Shadow diagrams are included in Appendix A

The proposed works will result in a positive change to the visual appearance of the site. The existing outdoor ZS will be replaced by a modern indoor facility and once the existing ZS has been demolished, the site will be restored and landscaped.

Mitigating Measures

- The new indoor ZS has been designed to complement the residential area.
- All ground surfaces will be restored to their original condition at the completion of the works.
- Retain existing vegetation around the existing substation site where possible.
- Additional landscape plantings at the completion of construction/demolition works.
- Temporary OH powerlines / poles to be removed.

10.7 Soil and Water Quality

The proposed construction works will require excavation of soil to establish the new control building, excavate the cable basements, construct concrete footings and bunds for the new transformers. The nearest waterway is more than 200m from the work site and with implementation of appropriate erosion and sediment pollution controls, it is not likely to be impacted by this work. Streets surroundings the worksite contain established stormwater drainage. It will be necessary to establish appropriate erosion and sediment controls around the construction and stockpile sites, site compounds and to protect street stormwater drains as necessary to prevent sediment escaping into the stormwater system.

Where spoil is required to be stored on site, sediment fencing must be constructed downstream of these stockpiles as necessary. Soil and water management will be conducted in accordance with EE Standards and *Environmental Guidelines Handbook*. Soil shall not be stored off-site without appropriate consent.

The Construction Contractor will be required to develop a site-specific erosion and sediment control plan (ESCP) as part of their construction environmental management plan (CEMP). This document, in addition to the mitigative measures listed below will minimise the potential for sediments and other material to enter and pollute local drainage systems.

Mitigating Measures

- A site specific CEMP incorporating an ESCP is to be developed by the Construction Contractor.
- Detailed geotechnical investigations will be undertaken as necessary. These will include soil testing for possible contamination.
- Disturbed areas will be resurfaced or revegetated as soon as possible after works have been completed.
- Sediment fences / silt bags are to be used as necessary.
- Sediment tracked on to roads will be swept on a daily basis. Where necessary, a street sweeper will be engaged on a regular or as required basis.
- Spill response kits are to be provided and easily accessible at the work site.
- Excavated materials are to be taken off site each day. Where it is necessary to store spoil or other loose materials on site, sediment fences are to be constructed on the down slope side of the stockpile.
- Concrete mixers and concrete pumping trucks are not to wash out on site. Excess concrete slurry material is to be appropriately disposed of offsite and disposal receipts retained to verify appropriate disposal.
- In the event that acid sulphate soils are exposed during the excavation works, these soils will be managed in accordance with EE's Draft Acid Sulphate Soil Management Plan.
- Spoil Management and dewatering of worksites are all to be managed in accordance with the following EE Standards and the Environmental Guidelines Handbook which are all available on the EE Standards and ASP Website.
  - *EMS 0007 – Waste Management*
  - *EMS 0008 – Environmental Incidence Response and Management*
  - *EMS 0013 – Spoil Management*
  - *EMS 0014 - Dewatering Worksites*

10.8 Air Quality

Dust and other air emissions may be generated as a result of excavation works, vehicular emissions and machinery.

Excavation required for the proposed works is predominantly for the construction of the control room, cable basement, transformer footings and underground cabling. It is anticipated that with appropriate control measures implemented, these works will not generate significant dust.

Exhaust emissions from vehicles and machinery will also be minimal. The scale of the works is such that the impact on air quality will be minimal.

The existing Marayong ZS including the ZS yard is known to contain asbestos in various buildings materials (refer Appendix G). The demolition and removal of this material must be undertaken by a certified contractor in accordance with Safe Work NSW requirements and EE Company Procedure *GSY 1065 Asbestos Management*. A copy of this procedure is available on EE's Business Management system website.

Mitigating Measures

- All loads will be covered when carrying loose materials to and from the site.
- Disturbed surfaces / loose stockpiles will be covered or dampened with water as necessary.
- The removal of asbestos is to be carried out by a licenced contractor in accordance with Safe Work NSW requirements. Appropriate notification is to be provided to surrounding properties prior to asbestos removal activities being undertaken.
- Any dust generated during construction of the ZS will be managed in accordance with EE *Environmental Guidelines Handbook*.

10.9 Utilities and Services

The proposed ZS works are predominatly located within the EE owned Marayong ZS site and will have minimal impact on other services and utilities.

A detailed Dial Before You Dig (DBYD) search will be conducted for all services in the vicinity of the substation property as part of the final project design and construction activites. Design and construction will accommodate the services identified in the area.

Mitigating Measures

- The Contractor will conduct DBYD searches prior to works commencing on site.
- Project Manager will notify impacted residents and businesses regarding any potential interruptions to electricity supply prior to these occurring in accordance with NECF requirements.

10.10 Waste

Activities associated with the construction phase of the project have the potential to generate waste materials, including surplus construction materials, demolition waste and asbestos waste.

If not managed properly, these wastes have the potential to impact upon the local environment, including the visual amenity and aesthetic quality of the site, water quality of local stormwater systems and waterways as well as the health and safety of local residents, businesses and road users.

All waste generated as a result of this Project will be managed in accordance with EE's Environmental Management Standard EMS0007 – Waste Management.

Any putrescible waste which may be generated during maintenance works will be removed at the completion of the day's work. Once completed, the substation will generate minimal waste and will be maintained as part of EE's Substation Maintenance regime. Substation sites are inspected and maintained on an eight weekly basis.

Mitigating Measures

- All waste materials will be managed in accordance with EE's Environmental Management Standard EMS 0007 Waste Management.
- Where excavated spoil is suspected to be contaminated, works will immediately cease and the Project Manager and the relevant Environmental Specialist notified. Suspected contaminated spoil will be tested to provide a waste classification for disposal.
- The removal of asbestos will be carried out by licenced Contractors in accordance with Safe Work NSW requirements and EE Company procedure *GSY1065* Asbestos Management.
- All excavated spoil is to be classified prior to disposal and / or re-use. Waste disposal dockets will be obtained from the licensed waste disposal facility and copies retained for audit purposes.
- All waste materials will be stored in an appropriate designated area on site prior to disposal.

10.11 Safety and Hazards

EE has strict security and fencing standards for its electricity substations. The ZS buildings have been designed to meet all relevant Australian Safety Standards, Building Code of Australia requirements and will include safety devices and facilities.

The ZS Control Building will be alarmed and will be monitored by EE's System Operations Control Room. The building has been designed to be secure against unauthorised entry, vandalism and theft, and to provide a safe operating environment for staff.

The design has considered the appropriate application of fire exit doors and access to control and switch rooms ensuring compliance to the relevant standards.

Safety precautions will need to be implemented throughout the construction period for the protection of workers as well as the surrounding community. Standard safety procedures will be followed to ensure the safety of workers and the general public during the construction works.

The transformers will be installed within a concrete bund and surrounded on three sides from each other by fire rated walls. The control building will be designed as such so that the threat from fire external to the substation is minimised. Fire protection and Transformer fire walls are discussed further in Section 8.4 and Section 8.6.

All staff and contractors working on the site will need to be inducted prior to commencing work on the site. The electrical equipment will be designed and constructed in such a manner as to meet all statutory and safety requirements set by the relevant state authorities and instrumentalities.

Mitigating Measures

- All necessary safety measures, including information/contact details signage, site fencing barriers, lighting, fencing etc. will be used.
- These will be checked on a daily basis to ensure they are in adequate working condition.
- All works will be undertaken in accordance with Safe Work NSW requirements, EE standards and procedures and any other applicable requirements.

10.12 Electric and Magnetic Fields

Electric and Magnetic Fields (EMF) are produced whenever electricity or electrical equipment is in use. The EMFs associated with electrical infrastructure are often regarded as a concern by the public. There has been considerable public and scientific discussion on the health effects of EMFs particularly in relation to power lines.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is responsible for the guidelines and standards for EMF. In terms of exposure within the home, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) advise that:

Magnetic fields within homes can vary at different locations and also over time. The actual strength of the field at a given location depends upon the number and kinds of sources and their distance from the location of measurement. Typical values measured in areas away from electrical appliances are of the order of 0.1 – 2 milligaus (mG).

Typical magnetic field measurements and ranges associated with various appliances are shown in table below.

Appliance	Typical measurement (mG)	Range of measurements (mG)
Electric Stove	6	2 - 30
Refrigerator	2	2 - 5
Electric Kettle	3	2 - 10
Toaster	3	2 - 10
Television	1	0.2 - 2
Personal Computer (PC)	5	2 - 20
Electric blanket	20	5 - 30
Hair dryer	25	10 - 70
Pedestal fan	1	0.2 - 2

Table 5: Typical values of magnetic field measured to Common household appliances at normal user distance (Source: Australian Radiation Protection and Nuclear Safety Agency, ARPANSA, 2017).

EMF levels were calculated based on the proposed ZS design and the electricity feeders supplying it. These levels are well below the allowable limits that have been set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines and the Institute of Electrical and Electronics Engineers (IEEE) standards for continuous exposure of the general public. Refer to Appendix H for further general information regarding EMF.

10.13 Socio-Economic Impacts

The ZS redevelopment project will potentially provide employment for local suppliers and contractors in the short term.

Short term impacts on the community during the construction phase of the proposal include increased traffic intensity, altered traffic conditions, maintaining access to properties and noise.

Once completed, the Project will provide reliable electricity supply to the residents of Marayong and surrounding suburbs. Failure to undertake this work would result in increased risk of outages in near future and may result in partial loss of supply to businesses and surrounding residents.

10.14 Sustainable Development

The ZS redevelopment has been designed using a range of sustainable architectural solutions. These include the selection of materials and finishes promoting extended life cycles, reduced maintenance and reduced consumption of resources; appropriate use of natural ventilation systems to reduce the need for air conditioning; and improved insulation through the selection of materials with improved thermal mass and roof insulation.

10.15 Site Contamination and Remediation

A search on the EPA website has shown no contaminated site is recorded in or near the work area.

The known site contaminants include asbestos containing materials, lead containing paint and lead containing dust. Hazardous materials were identified in the existing Control Building, adjacent western exterior, Telstra communication pits, UG conduits in the Transformer yard, and in various electrical equipment to be demolished. Refer to EE's *Hazardous Materials Site Register*, *Hazardous Materials Survey Report* by NA & Associates Nov 2009 and *Asbestos Material Survey Report* by A.D. Envirotech Australia Pty Ltd Aug 2013 (Appendix G).

A Remediation Action Plan will be prepared to guide appropriate management actions to ensure the site is suitable for ongoing use. A licensed asbestos contractor shall carry out the remediation works in accordance with Safe Work NSW requirements and EE Company Procedures.

There is potential for the existing ZS site to be contaminated due to leaks or spills from oil containing equipment on the site. It should be noted that evidence of oil leaks have not been identified. Should contamination be identified or suspected, the site and spoil from the subject areas is to be managed in accordance of EE's *Environmental Guidelines Handbook*.

11.0 SUMMARY OF MITIGATING MEASURES

Table 6 below provides a summary of the mitigating measures to be undertaken to minimise any potential impacts associated with the proposed works.

Impact	Mitigation Measure
General	Blacktown City Council shall be notified in writing at least 40 days prior to works commencing on site.
	Written notification is to be provided to all impacted residents at least 21 days prior to the works commencing.
	All written notifications are to include proposed duration of the works, hours of work and contact details of the relevant site manager / project manager.
Noise	Works must be carried out in accordance with the standard work hours unless otherwise approved. The standard working hours are: • 7am to 6pm Monday to Friday • 8am to 1pm Saturdays • No work on Sundays or public holidays
	Works and activities may be undertaken outside of these hours where specifically required by other approval authorities such the Council for road works where the works will not generate offensive noise (e.g. internal works only with minimal noise). Refer to and abide by EE's Environmental Guidelines Handbook for out of hour's noise mitigation measures.
Traffic and pedestrian access	Traffic management plans will be produced as required.
	Safe pedestrian pathways are to be established around the worksite as required and maintained throughout construction.
	Work vehicles are to be legally parked at all times.
	Vehicles are not to block access to driveways of any residents at

Impact	Mitigation Measure
	any time.
Flora and Fauna	Site sheds, stockpiled materials, machinery and the like are not to encroach within the drip line of surrounding trees.
	Retain trees wherever possible.
	Fence trees to be retained.
	Site is to be landscaped at completion of works.
Heritage and Archaeology	In the event that a suspected heritage or Aboriginal archaeological item is encountered, works will cease in that area and an archaeologist engaged to inspect the items and provide advice. Appropriate permits or approvals may be required to be sought prior to works re-commencing in this area.
Dilapidation Assessment and Site remediation	All ground surfaces will be restored as soon as possible after completion of the works.
	A dilapidation assessment and/or photographic record is to be carried out of public roadways, footpaths, driveways etc. that may be impacted by proposed works.
Soil and Water Qulity	Standard Erosion and Sediment controls are to be established to prevent materials running to stormwater.
	Sediment fencing should be constructed downstream of stockpiles if required.
Air Quality	All loads will be covered when carrying loose materials to and from the site.
	Disturbed surfaces / loose stockpiles will be dampened with water as necessary.
	The removal of asbestos is to be carried out by a licenced Contractor in accordance with Safe Work NSW requirements. Appropriate notification is to be provided to surrounding properties prior to asbestos removal activities being undertaken. Refer to and abide by EE's Environmental Guidelines Handbook.
Utilities and Services	The Contractor will conduct Dial Before You Dig searches prior to works commencing on site.
	Works will be planned, wherever possible, such that they do not impact upon the electricity supply to residents.
Waste	All waste materials will be managed in accordance with EE's EMS 0007 Waste Management.
	Where excavated spoil is suspected to be contaminated, works will immediately cease and the Project Manager and the relevant Environment Specialist notified.
	All excavated spoil is to be classified prior to disposal and / or re-use. Waste disposal dockets will be obtained from the licensed waste disposal facility and provided to the Network Environmental Specialist if requested.
	All waste materials will be stored in an appropriate designated area on site until they are disposed of.
Safety and Hazards	All necessary safety measures, including signage, barriers, lighting, fencing etc. will be used. These will be checked on a daily basis to ensure they are in adequate working condition and removed at the

Impact	Mitigation Measure
	completion of works.

Table 6: Summary of Mitigating Measures.

12.0 ENVIRONMENTAL MANAGEMENT

To ensure that appropriate steps are taken to manage environmental aspects of infrastructure projects, EE has developed a number of Environmental Management Standards.

The EE Environmental Management Standard *EMS0001 Environmental Impact Assessment and Environmental Management Plans* have the stated purpose of ensuring 'that all work on EE's Network is undertaken in such a manner as to manage any actual or potential environmental impacts. Activities are to be carried out using a due diligence approach, in accordance with industry and other appropriate standards to ensure positive environmental outcomes and compliance with relevant legislation'. A copy of *EMS 0001* is available on EE's Standard and EE's ASP website.

The assessment has not identified any issues that are not able to be managed by employment industry 'best practice' environmental management techniques.

The successful contractor for the building construction will be required to produce a site specific CEMP prior to commencing any work at the site.

These plans are subject to audits by the Network environment assessment Section to ensure that the works are carried out in an environmentally satisfactory manner.

13.0 CONCLUSIONS AND RECOMMENDATIONS

The investigations undertaken as part of this REF have shown that the redevelopment of Marayong ZS will be fully confined to the existing site, will have minimal environmental impacts and should proceed subject to the mitigation measures outlined in this REF report.

In accordance with Part 5 of the EP&A Act, EE is responsible for this environmental assessment of the redevelopment of the facility.

It is concluded that:

- An Environmental Impact Statement (EIS) is not required for the Project.
- EE makes a formal determination in relation to the Project.

It is recommended that all work be carried out in accordance with this REF and the associated Environmental Management Plan that will be produced before work commences.

14.0 REFERENCES

Environmental Planning and Assessment Act (NSW) 1979.

Environmental Planning and Assessment Regulation 2000.

NSW State Environmental Planning Policy (Infrastructure) 2007.

EPBC Act Protected Matters Report Oct 2017

Blacktown Development Control Plan 2015.

Blacktown Local Environmental Plan 2015.

The Code of Practice for Authorised Network Operators September 2015

Network Investment Options Report – Marayong Zone Substation Renewal, EE, Aug 2017.

Project Definition T-1757 – Marayong Zone Substation Renewal, EE, Sep 2017.

LIST OF APPENDICES