

Charter Hall Holdings Pty Ltd

# Compass 2 Warehouse & Distribution Centre

## Groundwater Impact Assessment

FEBRUARY 2022



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## Compass 2 Warehouse & Distribution Centre Groundwater Impact Assessment

Charter Hall Holdings Pty Ltd

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# Glossary

Aquifer	Rock or sediment in a formation, group of formations or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.
Bore	Artificially constructed or improved groundwater cavity used for the purpose of accessing or recharging water from an aquifer. Interchangeable with borehole, piezometer.
Borehole	Includes a well, excavation, or other artificially constructed or improved groundwater cavity which can be used for the purpose of intercepting, collecting or storing water from an aquifer; observing or collecting data and information on water in an aquifer; or recharging an aquifer. Interchangeable with bore, well, piezometer.
Conceptual model	A simplified and idealised representation of the physical hydrogeologic setting and the hydrogeological understanding of the essential flow processes of the system. This includes the identification and description of the geologic and hydrologic framework, media type, hydraulic properties, sources and sinks, and important aquifer flow and surface-groundwater interaction processes.
Groundwater	Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.
Groundwater flow	The movement of water through openings and pore spaces in rocks below the water table i.e. in the saturated zone.
Hydrogeology	The study of the interrelationships of geological materials and processes with water, especially groundwater.
Monitoring bore	A bore used to monitor groundwater levels or quality.
Standing water level	The height to which groundwater rises in a bore after it is drilled and completed, and after a period of pumping when levels return to natural atmospheric or confined pressure levels.
the Study area	A two-kilometer radius surrounding the proposed development.
the Site	Lot 1, Eastern Creek Drive, Eastern Creek, NSW (Lot1 / DP1274322).

# Abbreviations

AIP	NSW Aquifer Interference Policy
DPIE	Department of Planning, Industry and Environment
EC	Electrical conductivity
EIS	Environmental Impact Statement
GDE	Groundwater dependent ecosystems
mAHD	metres Australian height datum
mbgl	metres below ground level
ORP	Oxidation reduction potential / redox potential
SEARs	Secretary's environmental impact requirements
TDS	Total dissolved solids

# Executive summary

This report, Compass 2 Warehouse & Distribution Centre – Groundwater Impact Assessment, details an assessment of impacts to the groundwater regime at a proposed new industrial warehouse and associated infrastructure at Lot 1 DP1274322 Eastern Creek Drive, Eastern Creek, Sydney (the Project). This groundwater impact assessment is part of an Environmental Impact Statement (EIS) and addresses the relevant Planning Secretary’s Environmental Assessment Requirements (SEARs).

The existing groundwater environment was assessed through a desktop review of existing and available geological and hydrogeological information, supplemented by limited intrusive site investigations. A qualitative risk assessment was undertaken through the identification of potential impacts to groundwater (such as levels and quality), groundwater dependent ecosystems (GDEs) and other groundwater users during the construction and operation of the project. Mitigation and management measures were identified to minimise potential impacts to the groundwater regime and users.

The Project design ground level of 66.8 mAHD and requirements for shallow excavations of up to 2.0 m, accounting for site levelling and foundation improvements, were above encountered groundwater levels between 60.01 mAHD and 63.28 mAHD. Water quality observations determined groundwater to be moderately saline to saline, with an electrical conductivity between 18,745  $\mu\text{S}/\text{cm}$  and 24,700  $\mu\text{S}/\text{cm}$ .

## Identified risks and impacts

Table 1.1 provides a summary of construction and operational risks to groundwater and their assessment based on the NSW Aquifer Interference Policy 2012 (DPI, 2012).

Table 1.1 Groundwater risk summary

RISK ID	DESCRIPTION	ASSESSED RISK
C1 – Extraction of groundwater	Construction groundwater extraction resulting in an unacceptable impact to sensitive receptors	Low
C2 – Contamination of groundwater (construction)	Contamination of groundwater from construction activities during the construction phase	Low
O1 – Contamination of groundwater (operation)	Contamination of groundwater from operational activities.	Low
O2 – Alteration of groundwater recharge	Changes to groundwater recharge through altering surface infiltration.	Low
O3 – Alteration of groundwater flow	Changes to groundwater flow paths or groundwater discharge impacting surface water and groundwater quality.	Low

## Management and mitigation measures

The primary risks to groundwater were identified as low risk and did not require specific mitigation and management measures.

Industry standard mitigation and management measures were recommended to reduce the potential consequence of contamination to groundwater.

# 1 Introduction

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## 1.1 Background

Tactical Group Pty Ltd (Tactical) has been appointed by Charter Hall Holdings Pty Ltd (Charter Hall) as development superintendent or project manager of the proposed industrial warehousing development at Lot 1 DP1274322 Eastern Creek Drive, Eastern Creek, NSW 2766 (the Site). The proposed industrial warehouse development has been named Compass 2 Warehouse & Distribution Centre (the Project).

As the proposed development is considered a State Significant Development (SSD) (SDD-30923027), the development application process is subject to the NSW Government Planning Secretary's Environmental Assessment Requirements (SEARs), which requires an Environmental Impact Statement (EIS) to be prepared. As such, Tactical has sought the additional services of WSP Australia Pty Ltd (WSP) for the purpose of conducting supplementary investigations to address the SEARs. This purpose of this report is further described in section 1.3, with an overview of the assessment against relevant SEARs provided in section 1.3.

---

## 1.2 Project description

The Project involves the development of a new industrial warehouse and distribution centre. It includes a forklift charging area, warehouse staging area, main office and dock office, with a total building area of 27,650 square metres (m<sup>2</sup>). The Project is expected to be constructed generally at-grade, requiring earthworks such as filling or shallow (<2 m) excavations for site leveling, foundation improvements and development purposes. The final warehouse ground level is proposed to be 66.8 metres Australian height datum (mAHD). The site location is provided in Figure 1.1. Refer to Appendix A for the architectural drawings of the proposed development (WTSD, 2021).

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## 1.3 Purpose of this technical report

This report has the following objectives:

- provide context and information pertaining to relevant groundwater legislation
- describe the existing hydrogeological environment that may be impacted by the Project
- identify and assess the potential Project impacts to the existing hydrogeological environment
- provide suitable mitigation measures to reduce identified potential impacts.

This groundwater impact assessment addresses the relevant groundwater SEARs for the Project. The relevant requirements for groundwater were provided in section 12 of the SEARs and are detailed in Table 1.1. Where SEARs are not referenced, they are addressed in the EIS paper or other supplementary technical reports.

Table 1.1 SEARs relevant to groundwater

KEY ISSUE NUMBER AND DESCRIPTION	ISSUE AND ASSESSMENT REQUIREMENTS	HOW IT IS ADDRESSED	LOCATION WITHIN THIS REPORT
12. Ground and Water Conditions	Provide an assessment of the potential impacts on surface water and groundwater resources (quality and quantity), including related infrastructure, hydrology, aquatic and groundwater dependent ecosystems, drainage lines downstream assets and watercourses.	The groundwater component was addressed by developing a conceptual hydrogeological model (CHM) for the site after establishing the existing hydrogeological environment. Potential impacts were assessed against the CHM, including impacts to groundwater dependent ecosystems (GDEs).	Chapter 5 Chapter 6 Refer to the surface water impact assessment.
	Identify predicted water discharge points to surface/groundwater and consider discharge quality against the relevant water quality criteria.	There are no water discharge points to groundwater proposed for the Project.	Chapter 6 Refer to the surface water impact assessment.
	Provide an assessment of salinity and acid sulfate soil impacts	Groundwater salinity and acidity for the Project site was assessed through groundwater quality sampling,	Refer to section 4.5 and Chapter 5 Refer to salinity and acid sulfate soils management plan

## 1.4 Report structure

This report has been separated into the following key chapters:

- Chapter 1 – Introduction: Provides a broad introduction to the Project and outlines the purpose of the report.
- Chapter 2 – Methodology: This chapter provides information on the process of assessment. It includes background information for the desktop, site investigations and criteria for assessing risks.
- Chapter 3 – Legislation and policy: This chapter includes background information for assessed legislation, policy and guidelines.
- Chapter 4 – Existing environment: This chapter describes the existing environment within the Study area. The Study area characterisation includes the findings of the desktop assessment and field investigations.
- Chapter 5 – Conceptual hydrogeological model: This chapter describes the conceptual hydrogeological model generated for the Study area, based on the observed existing environment.
- Chapter 6 – Risk and impact assessment: This chapter documents the identified risks to groundwater, their likelihood and impacts, caused by the construction and operation of the Project.
- Chapter 7 – Mitigation and management measures: This chapter lists the recommended mitigation and management measures to address the findings of the risk and impact assessment.
- Chapter 8 – Conclusions.

- Chapter 9 – References.
- 

## 1.5 Referenced technical reports

The following is a list of technical reports that were used in the generation of this report:

- Environmental Due Diligence Assessment – Phase I and II (WSP, 2021a).
- Geotechnical Interpretive Report (WSP, 2021b).

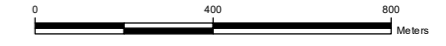
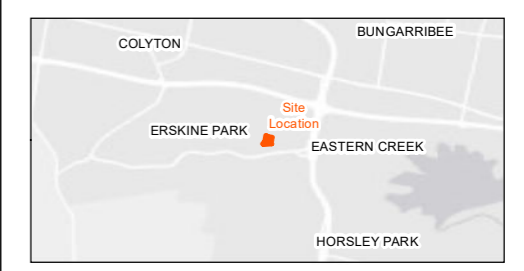


Compass 2 Warehouse and Distribution Centre  
Lot 1, Eastern Creek Drive,  
Eastern Creek, NSW

Figure 1.1  
Project Location and  
Groundwater Study Area

Legend

- Groundwater Study
- Site Location



Coordinate system: GDA 1994 MGA Zone 56  
 Scale ratio correct when printed at A3  
 1:17,000 Date: 2/12/2021

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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## 2 Methodology

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### 2.1 Overview

To achieve the objectives of the SEARs (refer to section 1.3), the following key activities were undertaken:

- field investigations to establish the site-specific conditions
  - a desktop review of publicly available information to characterise the existing environment including climate, topography, geology and hydrogeology
  - identification of local sensitive receptors including local 3<sup>rd</sup> party groundwater users and Groundwater Dependent Ecosystems (GDEs)
  - groundwater impact assessment of potential impacts from the development of the Project to the groundwater environment, including an assessment of the minimal impact considerations of the Aquifer Interference Policy (AIP)
  - identification of mitigation and management measures to address identified potential impacts and risk to the groundwater environment, as appropriate.
- 

### 2.2 Groundwater study area

To adequately characterise the hydrogeological conditions relevant to the Project, a regional scale understanding is required. Groundwater regimes are complex and can be influenced by broad geographical and regional scales. The selected groundwater Study area encompasses a two-kilometre-wide buffer around the Project (the Study area). The Study area was selected to incorporate the Project potential area of influence on groundwater and its impact to sensitive receptors such as registered groundwater bores and groundwater dependent ecosystems (GDEs).

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### 2.3 Site investigations

Hydrogeological site investigations included the installation of four groundwater monitoring bores to allow the measurement of initial groundwater levels and to facilitate the assessment of groundwater quality. The locations of the groundwater monitoring bores were selected to obtain key and representative groundwater data across the Project site. The selection of monitoring bore locations and depths were supported by previous geotechnical (WSP, 2021b) and contamination site investigations (WSP, 2021a). The location of intrusive site works undertaken for geotechnical, contamination and hydrogeological investigations is shown in Figure 2.1.

Borehole drilling and well installation works were conducted on 5 November 2021. Bore development, water level monitoring and water quality sampling were undertaken on 15 November 2021.

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### 2.4 Groundwater monitoring network

The groundwater monitoring bores were installed under the supervision of suitably qualified personal and constructed in accordance with the Minimum Construction Requirements for Water Bores in Australian 4th edition. Following installation, the groundwater monitoring bores were developed by a field hydrogeologist. The screened depth was selected based on hydrogeological observations and targets the shallow regional water table. The locations of the groundwater monitoring bores are provided in Figure 2.1. Refer to Table 2.1 for a summary of construction details and Appendix B for monitoring bore construction logs.

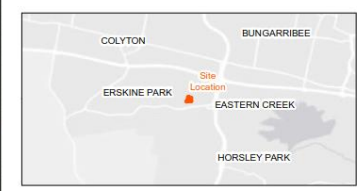


Charter Hall EIS  
Lot 1, Eastern Creek Drive,  
Eastern Creek, NSW

Figure 2.1  
Groundwater Monitoring Network

Legend

- Groundwater Monitoring Wells
- Indicative Topographic Contours
- Site Location



Coordinate system: GDA 1994 MGA Zone 56  
Scale ratio correct when printed at A3  
1:1,500 Date: 29/11/2021

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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Table 2.1 Groundwater monitoring bore construction details.

MONITORING BORE	EASTING <sup>1</sup>	NORTHING <sup>1</sup>	SURFACE ELEVATION (mAHD) <sup>2, 3</sup>	MONITORING BORE TOTAL DEPTH (m)	SCREENED GEOLOGY
MW201	299901.13	6257073.62	68.25	7.20	Shale
MW202	299988.73	6257125.10	65.24	4.50	Siltstone & shale
MW203	299922.18	6256940.80	64.75	8.20	Shale
MW204	300032.78	6257017.52	62.59	5.50	Sandy clay & siltstone

(1) Urchin tracking module (UTM), map grid of Australia (MGA94), Zone 56

(2) mAHD = metres Australian Height Datum

(3) Elevation recorded by surveyor (LP, 2021)

## 2.5 Groundwater level and quality monitoring

Manual groundwater levels were measured using an electronic dip meter.

Groundwater samples were collected following purging of up to three bore volumes with individual disposable bailers for each bore, preventing potential cross-contamination. Where limited groundwater was encountered or recovery was slow, the monitoring bore was purged dry and allowed to recover before a disposable bailer was used to obtain a grab sample.

The physiochemical parameters were recorded using a calibrated water quality meter after purging and groundwater samples were obtained in accordance with Australian/New Zealand Standard 5667:2016, Water Quality – Sampling Guidance on Sampling of Groundwaters (AS/NZS 5667.11, 2016).

Groundwater samples were collected in laboratory supplied bottles and transported under appropriate chain-of-custody protocols in an ice-filled Esky to ALS, a National Association of Testing Authorities (NATA) accredited laboratory for the analytes selected testing, and within holding times.

Table 2.2 Details the groundwater field measurements and laboratory analytical suite.

Table 2.2 Groundwater monitoring analytical suite.

CATEGORY	ANALYTE	ANALYTICAL METHOD
Physiochemical parameters	pH Electrical conductivity (EC) Dissolved oxygen (DO) Temperature Redox potential (ORP) Total dissolved solids (TDS)	Field measurements via a calibrated water quality meter. EC was also determined by laboratory analysis.
Major anions	Chloride Bicarbonate Sulfate	Laboratory analysis
Major cations	Calcium Potassium Sodium Magnesium	Laboratory analysis

## 2.6 Desktop assessment

A desktop review of publicly available data was undertaken to develop an understanding of the hydrogeological environment within the groundwater Study area and identify sensitive receptors including local third-party groundwater users and GDEs. Information reviewed, included:

- legislation and policy relevant to groundwater, including the *NSW Aquifer Interference Policy* and relevant Water Sharing Plans
- survey information from site investigations
- geological data from NSW Seamless Geology, with additional information compiled from geotechnical investigations
- climate data including rainfall and evapotranspiration from Bureau of Meteorology (BOM)
- groundwater dependent ecosystem information from the BOM GDE Atlas and relevant water sharing plans
- registered groundwater bore information including available groundwater levels, quality and yield, from the BOM National Groundwater Information System (NGIS) and WaterNSW.

## 2.7 Risk assessment

The environmental risk analysis was undertaken in accordance with the principles of the Australian standard AS ISO 31000:2018 Risk Management – Guidelines (SA, 2018). This involved categorising each of the risks to groundwater by identifying the consequence of the impact and the likelihood of the impact occurring.

Pre-mitigation and post-mitigation scenarios were assessed and assigned a risk rating. If the initial risk assessment was considered unacceptable, a second assessment was conducted incorporating additional controls or mitigation measures. A new post-mitigation risk was assigned.

The *likelihood* rating for each risk pathway was ranked using the definitions in Table 2.3.

Table 2.3 Definition of likelihood

LIKELIHOOD	DEFINITION	FREQUENCY OF OCCURRENCE	PERCENTILE
Almost certain	Is expected to occur in most circumstances	Once per month	>90%
Likely	Will probably occur in most circumstances	Between once a month and once a year	75–90%
Possible	Might occur at some time	Between once a year and once in five years	50–75%
Unlikely	Could occur at some time but is not expected	Between once in 5 years and once in 20 years	25–50%
Rare	May occur in exceptional circumstances	Once in more than 20 years	10–25%

Specific groundwater related *consequence* definitions were developed in consideration of the existing conditions within the Study Area. The definitions are based on understanding that impacts to groundwater can be defined as either an impact to groundwater availability, that is, impacting either groundwater levels or yields, or impacts to groundwater quality. The resulting level of consequence then considered the spatial and temporal extent of impact. The resulting *consequence* definitions are provided in Table 2.4.

Table 2.4 Groundwater consequence criteria

CONSEQUENCE	DEFINITION
Not significant	Changes to groundwater levels, flow or quality that does not result in: <ul style="list-style-type: none"> <li>• loss of one or more beneficial uses of groundwater, or</li> <li>• impact to groundwater users or GDEs.</li> </ul>
Minor	Changes to groundwater levels, flow or quality that results in either of the following occurring within the Study area: <ul style="list-style-type: none"> <li>• temporary loss of one or more beneficial uses of groundwater, or</li> <li>• temporary impact to groundwater users or GDEs.</li> </ul>
Moderate	Changes to groundwater levels, flow or quality that results in either of the following occurring within the Study area: <ul style="list-style-type: none"> <li>• long-term loss of one or more beneficial uses of groundwater, or</li> <li>• long-term impact to groundwater users or GDEs.</li> </ul>
Major	Changes to groundwater levels, flow or quality that results in either of the following occurring widespread: <ul style="list-style-type: none"> <li>• long-term loss of one or more beneficial uses of groundwater, or</li> <li>• long-term impact to groundwater users or GDEs.</li> </ul>
Extreme	Changes to groundwater levels, flow or quality that results in either of the following occurring widespread: <ul style="list-style-type: none"> <li>• permanent loss of one or more beneficial uses of groundwater, or</li> <li>• permanent impact to groundwater users or GDEs.</li> </ul>

The resulting risk matrix is provided in Table 2.5.

Table 2.5 Risk assessment matrix

LIKELIHOOD	CONSEQUENCE				
	NOT SIGNIFICANT	MINOR	MODERATE	MAJOR	EXTREME
Almost certain	Medium	Medium	High	Very high	Very high
Likely	Low	Medium	High	Very high	Very high
Possible	Low	Low	Medium	High	High
Unlikely	Low	Low	Low	Medium	Medium
Rare	Low	Low	Low	Low	Medium

## 2.8 Impact assessment

The impact assessment characterises the potential changes to the existing condition of the groundwater environment associated with the construction and operation of the Project. Impacts to groundwater resources can be simplified into two categories: impacts to *groundwater quality* and impacts to *groundwater availability* (groundwater levels, or flows).

As described in section 1.2, the Project consists of the construction of a new at grade warehouse and associated facilities. The Project is expected to include limited earthworks for site leveling, foundation improvements and development purposes. Bulk earthwork excavation depths are not expected to exceed two metres. Deepened footings, if required, are expected to be limited and designed appropriately for site conditions and may include pier or pile foundations.

The method of impact assessment comprised a qualitative assessment of the developed CHM (refer to Chapter 5). The assessment considered the following:

- identified potential risks associated with construction and operation of the Project
- consideration of any potential impacts against legislative criteria to determine if any Project derived impacts represent acceptable or adverse impacts (See *Aquifer Interference Policy* (AIP) criteria in section 3.2.2 and corresponding assessment against the AIP in section 6.5.
- impacts to *groundwater quality* – is there an adverse impact to the beneficial use of the resource, and
- impacts to *groundwater availability* – is there an adverse impact to groundwater levels, groundwater flows and availability to existing groundwater users and sensitive receptors.
- As the protection of GDEs in water sharing plans needs to be balanced with the demands of licensed water users, protection is legislatively restricted to high priority GDEs (DPIE, 2021).

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## 2.9 Limitations

The preparation of this technical report has involved a desktop study and limited field investigations, along with information supplied from the client, freely available reports, data, figures and existing investigations. Publicly available data and reports included the available background water sharing plan documents published by NSW Department of Planning, Industry and Environment, water resource plans and supporting documents published by NSW Department of Planning, Industry and Environment, groundwater levels, quality and registered bore data published by WaterNSW and collated by the Bureau of Meteorology. Existing investigations included an environmental due diligence report and a geotechnical interpretive report by WSP Australia. Preliminary field investigations were used to obtain information on the existing environment within the groundwater study area, predominantly the geology, with groundwater observations also recorded when encountered. The impact assessment is limited to a qualitative assessment based on the provided architectural drawings at the time of preparation of this report.

The level of potential impacts on the groundwater sources is limited to the data available to the assessment and the preliminary nature of the Project design. Assumptions have been reasonably applied in areas of limited data based on expected hydrogeological conditions derived from the interpretation of field data collected and information sourced during the desktop review. No groundwater monitoring was undertaken except for an initial water level and sampling event following installation of the monitoring bores. It should be noted that groundwater conditions, including level and quality, can fluctuate in response to climatic and seasonal variations, as well as in response to other factors. The impact assessment conclusions may differ from those reported in this report if encountered conditions differ from those assumed and existing at the time of the hydrogeological site investigation.

This assessment is adequate to assess typical environmental impacts and provide recommendations for mitigation measures. Recommendations would be subject to refinement as the Project progresses and validation is undertaken during construction.

# 3 Legislation and policy

---

## 3.1 Relevant legislation

### 3.1.1 *Environmental Planning and Assessment Act 1979*

The Environmental Planning and Assessment Act 1979 (EP&A Act 1979, 2021) and Environmental Planning and Assessment Regulation 2000 (EP&A Regulation, 2021) establish a framework for the assessment and approval of developments in NSW. They also provide for the making of environmental planning instruments, including state environmental planning policies (SEPPs) and local environmental plans (LEPs), which determine the permissibility and approval pathway for development Projects and form a part of the environmental assessment process.

Part 5 of the EP&A Act defines the assessment process for Projects that do not require development consent. section 5.5 requires a determining authority to examine and consider, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity.

Having regard to the requirements of section 5.5 of the EP&A Act, the Project is likely to significantly affect the environment. The Project therefore becomes subject to the assessment and approval process in Division 5.2 of the EP&A Act, and, consequently, the Project requires an EIS for the Project under Part 5 of the EP&A Act.

### 3.1.2 *Water Management Act 2000*

Water resources in the groundwater study area are administered under the *Water Management Act 2000* by the NSW Department of Planning, Industry and Environment (DPIE, 2021). The objective of the *Water Management Act 2000* is the sustainable and integrated management of the state's water sources for the benefit of present and future generations. The *Water Management Act 2000* governs the issue of water access licences (WALs) and approvals for those water sources (rivers, lakes, estuaries and groundwater) in NSW where water sharing plans have commenced. Water sharing plans establish rules for sharing water between water users and the environment, and areas rules for water trading.

Typically, if a project extracts ('takes') groundwater directly, such as from groundwater pumping bores, or inadvertently, such as due to excavations intercepting groundwater, the following approvals or licences under the *Water Management Act 2000* would be required:

- water use approval under section 89
- water supply work approval (WSWA) under section 90 (falls under a water management work approval)
- WAL with sufficient entitlement volume in the relevant water source to cover groundwater take.

Where required, the client or its contractor intends to purchase water on the market, where the water has been lawfully taken under a suitable WAL and associated approvals. Details on water demand estimates are provided in the EIS.

---

## 3.2 Key water management policies

### 3.2.1 *Water sharing plans*

Water sharing plans establish rules for sharing water between water users and the environment, and rules for water trading. There are water sharing plans for regulated and unregulated river catchments and groundwater sources in water management areas. Water sharing plans describe the annual groundwater recharge volumes for each identified groundwater source and the volumes of water that are available for sharing. Provisions are made for environmental water allocations, basic landholder rights, and native title rights.

The *Water Sharing Plan for the Greater Metropolitan Regional Groundwater Sources* (DPI, 2011) is relevant to the Project site. The water sharing plan identifies the Sydney Central Basin Groundwater Source as the groundwater source within the Study Area. Discussion of the water sharing plans relevant to the Project is provided in the following sections.

### 3.2.2 NSW Aquifer Interference Policy 2012

The AIP (DPI, 2012) was introduced in September 2012. The AIP clarifies the requirements for obtaining water licences and the assessment processes for aquifer interference activities under the *Water Management Act 2000* and other relevant legislative frameworks. The AIP also defines considerations in assessing whether more than minimal impacts might occur to a key water-dependent asset. Although not all approvals are currently in use, the AIP remains relevant when considering activities that interfere with aquifers.

The AIP assists proponents of aquifer interference activities in preparing the necessary information and studies to be used in the assessment of projects that have a level of aquifer interference. The AIP forms the basis of assessment and subsequent advice provided by the NSW Government at the various stages of an assessment under the *Environmental Planning and Assessment Act 1979*. An aquifer interference activity involves any of the following:

- the penetration of an aquifer
- the interference with water in an aquifer
- the obstruction of the flow of water in an aquifer
- the taking of water from an aquifer while mining or any other activity prescribed by the regulations
- the disposal of water taken from an aquifer through an activity prescribed by the regulations.

The *Water Management Act 2000* includes the concept of ensuring ‘no more than minimal harm’ for both the granting of water access licences and the granting of approvals. The AIP will be satisfied if adequate arrangements are in place to ensure that no more than minimal harm will be imposed on any water source or its dependent ecosystems.

For aquifer impact assessments, the AIP divides groundwater sources into “highly productive” and ‘less productive’ based on water quality and yield. Highly productive groundwater sources have total dissolved solids less than 1,500 mg/L and can sustain yields greater than 5 L/sec. The groundwater sources within the groundwater study area are considered less productive porous rock aquifers and are further detailed in section 5.3.

Threshold for key minimal impact considerations have been developed for both the highly and less productive groundwater sources. For less productive groundwater sources, the minimal impact criteria, in relation to the Project, are summarised as follows:

- impacts to the water table are considered to be minimal where the water table change is less than or equal to 10% of the cumulative variation in the water table and 40 m from any high priority GDE or high priority culturally significant site. If the impact is greater, it must be demonstrated that the variation will not prevent the long-term viability of a GDE.
- impacts to the water table are considered minimal if the cumulative decline in any water supply work is less than 2 m. If the impact is greater, make good provisions apply.
- impacts to water pressure are considered minimal if the cumulative decline in any water supply work is less than 2 m. If the predicted impact is greater, then appropriate studies are required to demonstrate to the Minister’s satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.
- impacts to water quality are considered minimal if the change in groundwater quality remains within the current beneficial use category of the groundwater source beyond 40 m from the activity. If this cannot be achieved, studies are required to demonstrate that the change will not prevent the long-term viability of the GDEs or affected water supply works.

## 4 Existing environment

The combined desktop assessment and site investigation data (detailed in Chapter 2) have been completed to develop a description of the existing hydrogeological regime and conceptual understanding of the Project.

The following sections within this chapter describe the environmental conditions of the groundwater Study area.

### 4.1 Geology, topography and general site conditions

Geology underlying the Study area comprises Bringelly Shale from the Triassic Wianamatta Group, and includes shale, carbonaceous claystone, laminite, lithic sandstone and rare coal rock types (Colquhoun, et al., 2021).

Topography within the Study area is typically characterised by low hills and gently undulating rises and plains. Local relief is typically between 15 m and 30 m with slopes <15% (DPIE, 2016).

Site elevations range from approximately 60 mAHD to 70 mAHD. Higher elevation was located in the north and northwest portion of the site, with a low-lying area extending from the south west into the central portion of the site and along the eastern boundary. During the site investigation works water was observed to pond on the ground surface within the low-lying areas.

A stormwater retention basin and stormwater overflow area are located immediately to the east of the site. An underground stormwater drainage channel runs from Eastern Creek Drive in the southwest, along the southern site boundary. Stormwater will either continue north along the eastern site boundary to the stormwater retention basin or be discharged from the off-site stormwater overflow outlet adjacent to the southeast corner of the site.

### 4.2 Climate

Meteorological data was obtained from the BOM (BoM, 2021) weather station at Horsley Park Equestrian Centre AWS (BOM Station No. 67119) approximately 5 km south of the Project. Available meteorological data and key observations for climate data recorded between 1997-2021 are summarised in Table 4.1.

Table 4.1 Summary of meteorological data obtained from Horsley Park Equestrian Centre AWS (1997-2021)

CLIMATE DATA	VALUES	COMMENT
Mean monthly rainfall (mm) <sup>1</sup>	36.4 – 118.3	Minimum rainfall typically occurs in July, August and September. Maximum rainfall typically occurs in February and March.
Mean annual rainfall (mm) <sup>1</sup>	771.7	Excludes months containing significant data gaps.

(1) mm = millimetres

### 4.3 Hydrogeology

The hydro-stratigraphic unit (HSU) underlying the Study area was identified as the Sydney Central Basin Groundwater Source listed in the *Greater Metropolitan Regional Groundwater Sources Water Sharing Plan*. The Sydney Central Basin Groundwater Source is bounded by the main arm of the Hawkesbury River to the north and by the Nepean River to the west and south, covering an area of 3,757.59 square kilometres (DPI, 2011).

Groundwater predominantly moves laterally through the less permeable shale layers, vertical movement is largely restricted to interbedded minor sandstone stringers and lenses and pervasive fracturing overprint (facilitating primary

intergranular and secondary fracture porosity flow pathways). Low hydraulic conductivity and topographic gradients are expected to result in groundwater having high residence times, resulting in high concentrations of historic salts (DPIE, 2016).

Flow rates is expected to be very low to low, due to the low permeability of the aquifer, with a very low to low hydraulic conductivity of approximately 0.001 – 0.01 m/day ( $1 \times 10^{-8}$  to  $1 \times 10^{-7}$  m/sec) (DPIE, 2016).

## 4.4 Groundwater levels

Groundwater level information was recorded during site investigation field works. During the drilling of bore holes no water inflow was observed. Water levels were taken ten days after well installation on 15 November 2021. Table 4.2 shows the onsite monitoring bore details and recorded water levels. For additional bore details refer to Appendix B - Monitoring bore construction logs.

Table 4.2 Monitoring bore details and observed standing water levels.

MONITORING BORE	SCREEN DEPTH (m)	SCREENED GEOLOGY	GROUNDWATER SOURCE	STANDING WATER LEVEL (MAHD) <sup>1</sup>
MW201	5.0 – 7.2	Shale	Porous rock	63.28
MW202	3.0 – 4.5	Siltstone and shale	Porous rock	62.78
MW203	6.5 – 8.2	Shale	Porous rock	62.42
MW204	3.5 – 5.5	Sandy clay and siltstone	Porous rock & potential perched water from the soil / rock interface	60.01

(1) Standing water level measured during fieldworks on 15 November 2021.

## 4.5 Groundwater quality

Information from the groundwater quality sampling undertaken on 15 November 2021 is presented in Table 4.3.

Regarding groundwater salinity, the Site was mapped as having a moderate to high salinity potential (DIPNR, 2003), as the soil, geology, topography and groundwater conditions predispose the Site to salinity.

Groundwater quality results from both field and laboratory analysis observed electrical conductivity between 18,745 and 24,700  $\mu\text{S}/\text{cm}$  across the Site. This correlates to moderately saline to saline water quality conditions.

Table 4.3 Water quality results from water samples taken on 15 November 2021.

MONITORING BORE	DATE	FIELD RESULTS					
		WATER LEVEL (mAHD)	PH	ELECTRICAL CONDUCTIVITY ( $\mu\text{S}/\text{cm}$ )	OXIDATION/REDUCTION POTENTIAL (mV)	TEMPERATURE ( $^{\circ}\text{C}$ )	DISSOLVED OXYGEN (mg/L)
MW201	15-11-21	63.28	6.38	20193	172.6	18.0	3.15
MW202	15-11-21	62.78	6.43	23924	148.1	18.1	3.22
MW203	15-11-21	60.18	6.61	18795	26.5	18.5	1.79
MW204	15-11-21	60.01	6.71	18745	134.8	18.6	2.23
MONITORING BORE	LABORATORY RESULTS						
	EC ( $\mu\text{S}/\text{cm}$ )	Total Anions (meq)	Total Cations (meq)	Ionic Balance (%)	Hydroxide Alkalinity as $\text{CaCO}_3$ (mg)	Carbonate Alkalinity as $\text{CaCO}_3$ (mg)	Bicarbonate Alkalinity as $\text{CaCO}_3$ (mg)
MW201	20100	225	217	1.80	<1	<1	1040
MW202	24700	274	269	0.94	<1	<1	1040
MW203	19700	227	198	6.82	<1	<1	987
MW204	19300	215	208	1.64	<1	<1	1150
MONITORING BORE	LABORATORY RESULTS <sup>1</sup>						
	Total Alkalinity as $\text{CaCO}_3$ (mg)	Sulfate as $\text{SO}_4$ Turbidimetric (mg)	Chloride (mg)	Calcium (mg)	Magnesium (mg)	Sodium (mg)	Potassium (mg)
MW201	1040	646	6770	235	642	3500	16
MW202	1040	697	8460	338	857	4160	19
MW203	987	645	6860	211	538	3270	26
MW204	1150	657	6320	124	419	3840	12

(1) meq = milli-equivalents

## 4.6 Registered bore search

The NGIS identified five monitoring bores with the Study area, however none of the bores contained water level or water quality data (reference). Table 4.4 summarises registered bores within the Study area, Figure 4.1 shows the location of registered bores within the Study area.

Table 4.4 Registered bores within the Study Area.

BORE ID	PURPOSE	STATUS	BORE DEPTH (M)	WATER LEVEL	SALINITY
GW110313.1.1	Monitoring	Unknown	150	No data	No data
GW114519.1.1	Monitoring	Functional	12	No data	No data
GW114928.1.1	Monitoring	Functional	11.5	No data	No data
GW114927.1.1	Monitoring	Functional	18	No data	No data
GW114926.1.1	Monitoring	Functional	13.5	No data	No data

## 4.7 Sensitive receptors

A sensitive receptor for the purpose of this assessment is any identified receptor that utilises groundwater. Registered bores with a registered use as water supply are therefore considered as a sensitive receptor as they rely on the use of the groundwater resource to supply their water requirements across household, stock and domestic, irrigation and commercial uses. GDEs are also classified as sensitive receptors as they need access to groundwater to meet some or all their water requirements to maintain their communities, processes and ecosystem services.

### 4.7.1 Existing groundwater users

No existing sensitive receptor groundwater users were identified within the Study area.

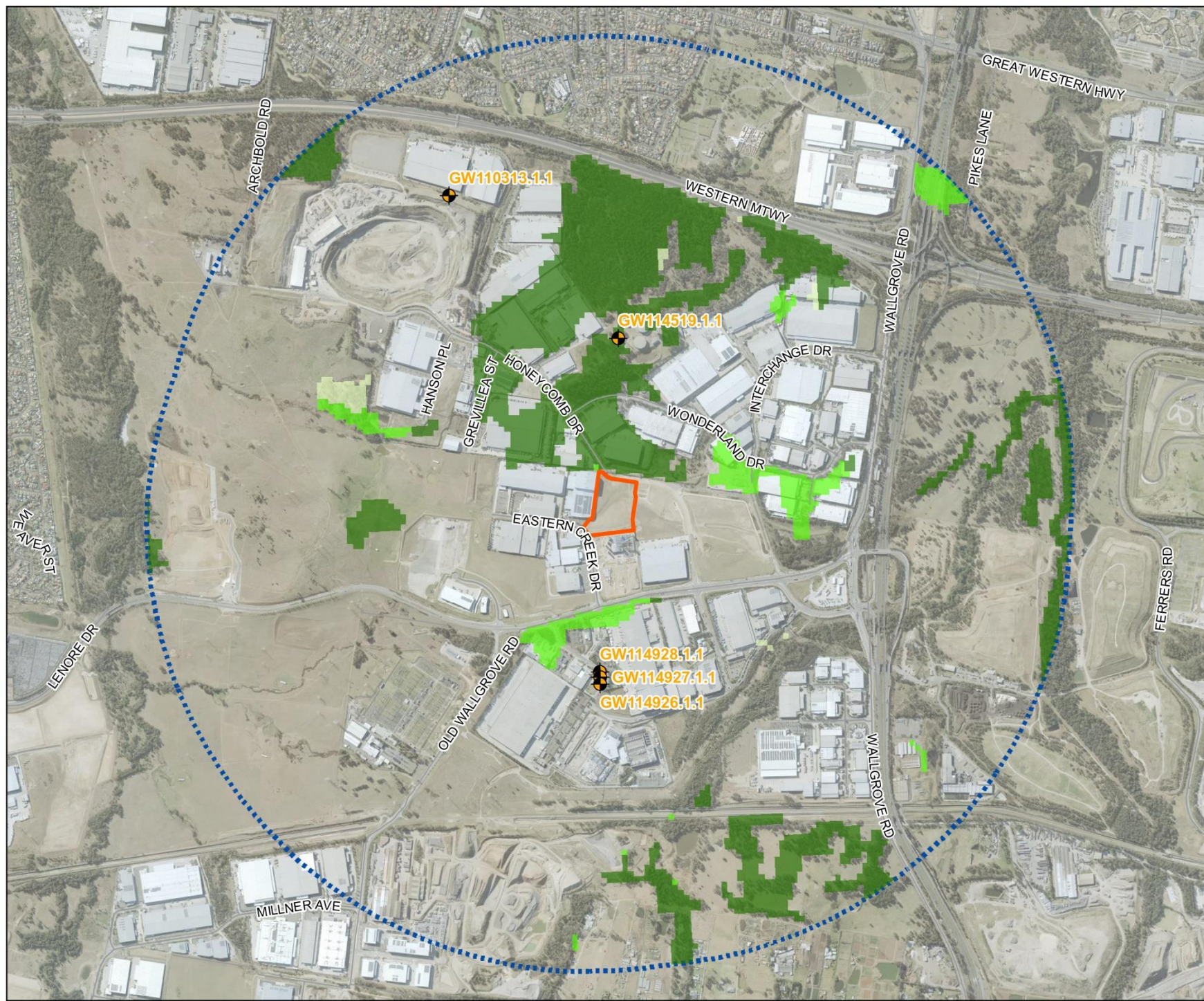
### 4.7.2 Groundwater dependent ecosystems

Three potential GDEs were identified within the Study area from the BOM GDE Atlas and are listed in Table 4.5. No potential GDEs were identified within the project site area and no high priority GDEs were identified within the Study area. High potential GDEs were identified to the north of the Site, however the majority have since been developed as industrial warehousing. Refer to Figure 4.1 for the location of GDEs within the Study area.

Table 4.5 Groundwater dependent ecosystems within the Study Area.

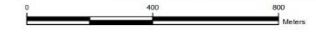
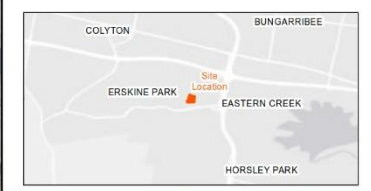
TYPE	NAME	POTENTIAL	GROUNDWATER SOURCE
Terrestrial	Cumberland River Flat Forest	High & moderate	Porous rock
Terrestrial	Cumberland Shale Hills Woodland	High, moderate & low	Porous rock
Terrestrial	Cumberland Shale Plains Woodland	High, moderate & low	Porous rock

Figure 4.1  
 GDEs and Registered Groundwater Bores



**Legend**

- Registered Bores
- Site Location
- Groundwater Study Area
- Terrestrial GDEs**
- High Potential GDE
- Moderate Potential GDE
- Low Potential GDE



Coordinate system: GDA 1994 MGA Zone 56  
 Scale ratio correct when printed at A3  
 1:17,000 Date: 29/11/2021

Data sources: - DNRM, TMR, Translink, Geoscience Australia  
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# 5 Conceptual hydrogeological model

A CHM was developed for this groundwater impact assessment. Conceptual models are a useful tool that capture the existing environmental hydrological and hydrogeological aspects within the Study area and describe the interaction and functions between the two. The following section summarises the conceptual aspects of groundwater underlying the Study area and its interactions with both natural and anthropogenic elements. The CHM for the Study area was developed based on the available data.

The Sydney Central Basin Groundwater Source is the only groundwater source expected within the Study area. The groundwater source is expected to be a shallow unconfined to semi-confined aquifer within porous and fractured siltstone and shale bedrock.

Recharge is expected to be primarily through the infiltration of rainfall. The low permeable natural clays and rock underlying the Project site are expected to slow the infiltration of rainfall, as the very low permeability of the rock and its weathered residuum tend to preferentially shed rainfall as overland stormwater flow.

Localised ephemeral perched groundwater may be encountered on less permeable layers within the soil profile or at the soil-rock interface during times of heavy or extended rainfall. Rainfall infiltration is expected to occur favourably through localised areas of interbedded siltstone and minor sandstone, exploiting permeable and porous layers and localised fractures as vertical flow paths.

Existing stormwater infrastructure directs stormwater from Eastern Creek Drive and the local area to either the stormwater retention basin or to the stormwater overflow area located immediately to the east of the Site. The retention basin is expected to have limited connectivity with the groundwater. During times of stormwater flooding, a small portion of any water discharged into the stormwater overflow area is likely to infiltrate and raise local groundwater levels.

Groundwater flow paths are expected to be short and dictated largely by topography. Groundwater within the Project site is expected to flow towards the eastern site boundary. Groundwater flow propagation is expected to be very low to low, due to the low hydraulic conductivity properties of the aquifer (section 4.3) and low hydraulic gradient, based on the undulating to gentle terrain and short flow paths, typical of the greater hydrogeological landscape.

Depth to groundwater across the Site is expected to be influenced by topography, with groundwater levels typically across the majority of the Project site measured at 2.2 to 2.8 metres below ground level (mbgl). Deeper groundwater, measured at 5.0 mbgl, was encountered at higher elevations around the central western portion of the Site. Groundwater across the Site was recorded between 60.0 mAHD and 63.5 mAHD. Groundwater levels may fluctuate based on seasonal variations and during periods of extended rainfall or drought.

Groundwater quality was measured to be moderately saline to saline.

## 6 Risk and impact assessment

As described in section 2.7, the environmental risk analysis was undertaken in accordance with the principles of the Australian standard AS ISO 31000:2018 Risk Management – Guidelines (SA, 2018). This involved identifying and categorising the risks to groundwater and evaluating the potential impacts and the likelihood of the impacts occurring.

### 6.1 Risks to groundwater

The risk assessment process has evaluated the Project based on the reference design for the Project and the developed CHM based on the field conditions and desktop study of the Study area. Risks were categorised into two phases of the project, the construction and operation phases. A summary of the project activities that pose a risk to groundwater are presented in Table 6.1.

Table 6.1 Summary of risks to groundwater separated by project phase.

PROJECT PHASE	MAIN ACTIVITIES	POTENTIAL IMPACT
Construction Phase	<p>Earthworks and site preparation. Expected to be shallow cuts less than 2 m and fill.</p> <p>Potential construction of deepened footings / foundations, such as piers or piles.</p> <p>Stockpiling and storage of fuels and hazardous chemicals.</p>	<p>Interception / extraction of groundwater when excavating for deep footings / foundations.</p> <p>Contamination of groundwater quality due to chemical spills or leeching.</p>
Operations Phase	<p>Infrastructure maintenance.</p> <p>Storage and handling of hazardous chemicals.</p> <p>Aggressivity of saline groundwater</p>	<p>Contamination of groundwater quality due to chemical spills or leeching.</p> <p>Changes to drainage and groundwater recharge.</p> <p>Changes to groundwater flow paths due to constructed footing / foundations (as installed during the construction phase).</p> <p>Concrete and reinforcing steel corrosion</p>

### 6.2 Impact pathways

Impacts have been classified in a temporal sense with the two temporal phases of the project consisting as:

- the *construction phase*, where impacts are likely to be temporary and localised, e.g. spills and contamination or groundwater extraction from excavations
- *operations phase*, where impacts arise as a result of the completed Project and associated ongoing operational activities, e.g. reduction of permeability due to structures.

Four potential impact pathways were identified within the construction and operational phases of the Project:

- *Groundwater extraction*: Reduction in groundwater levels due to excavations intersecting the groundwater table and resulting in groundwater inflows and consequential drawdown of the water levels. Groundwater ‘take’ has the potential to reduce groundwater availability to existing groundwater users, GDEs or baseflow to creeks or river systems. Dewatering of this nature may also induce ground settlement.

- *Groundwater contamination:* Change to groundwater quality from contamination can occur from the storage, spillage and leaks of hazardous substances, during either construction or operational activities. These substances, including waste-water discharge, can interact with groundwater through surface infiltration.
- *Groundwater recharge deviation:* Changes to surface infiltration, evaporation or evapotranspiration due to alteration of the existing vegetation coverage, surface topography or the addition of impermeable surfaces. This can either increase or reduce groundwater availability.
- *Groundwater flow deviation:* Changes to groundwater flow paths may alter levels and quality. This may be caused by deepened footings permanently intersecting groundwater flow paths, or the mobilisation of existing salts within the landscape, increasing salinity for downgradient receptors.

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## 6.3 Impact assessment

The impact associated with the identified risks in Table 6.1 have been qualitatively assessed below. Each risk was assigned a risk identification (Risk ID) number based on the construction (C) or operational (O) phase.

### 6.3.1 Construction phase

#### *Risk ID C1 – Extraction of groundwater*

The Project requires limited excavation earthworks, predominately associated with site levelling and foundation improvements for a near-grade industrial warehouse. The Project is not expected to require deep excavations or cuttings that have the potential to intersect groundwater or require active dewatering. The proposed warehouse ground level is 66.8 mAHD, this is above encountered groundwater levels between 60.0-63.5 mAHD.

Excavations for deepened footings / foundations such as piers or piling, if required, are expected to be temporary and limited. Design of deepened footings should account for moderately saline to saline conditions. Any potential groundwater extraction resulting from piers or piling, if undertaken, would be considered a minimal impact activity as listed in section 3.3 of the AIP.

As groundwater is not anticipated to be intersected, the Project does not require dewatering for construction, and therefore there is no cause for settlement to occur from groundwater extraction or dewatering.

As such, the construction of the Project is considered to have negligible impact to groundwater levels and sensitive receptors due to groundwater extraction.

#### *Risk ID C2 – Contamination of groundwater*

Contamination may occur during the construction of the Project. The consequence of groundwater contamination can be variable depending on the quantity and type of contaminate involved. Considering the uncertainty of potential spills or leaks, the potential consequence of contamination of the Project was considered moderate (conservative approach).

### 6.3.2 Operation phase

#### *Risk ID O1 – Contamination of groundwater*

Contamination may occur during the operational phase of the Project. The consequence of groundwater contamination can be variable depending on the quantity and type of contaminate involved. Considering the uncertainty of potential spills or leaks, the potential consequence for groundwater was considered moderate (conservative approach).

#### *Risk ID O2 – Alteration of groundwater recharge*

The Project description includes the removal of grass cover and addition of impermeable surfaces across the majority of the Site. The Proposal is not expected to have a significant impact to groundwater recharge due to the limited footprint of the Proposal and the naturally limited infiltration rates of the existing environment. Rainfall is expected to be diverted into council stormwater network and disbursed into the environment through the stormwater retention basin or overflow area immediately to the east of the Site.

The consequence of project activities on groundwater recharge is expected to be low to negligible.

*Risk ID O3 – Alteration of groundwater flow*

If employed, permanent deepened footings / foundations for the Project would be required to be salinity resistant piles founded in weathered rock. If used, piles would not form a continual barrier impeding groundwater flow. The Project was not expected to be of significant mass as to cause mass load related soil compaction, with arising reduction in the permeability of the underlying soil / rock, that would impact on groundwater flow paths.

Considering this, the impact that the Project would impact on groundwater flow paths is negligible.

## 6.4 Risk assessment

Table 6.2 provides a summary of risks to groundwater due to the construction and operational phase of the Project. Table 6.3 displays the risk register for pre-mitigation and post-mitigation measures for identified risks to groundwater.

Table 6.2 Groundwater risk summary

<b>RISK ID</b>	<b>DESCRIPTION</b>
C1 – Extraction of groundwater	Construction groundwater extraction resulting in an unacceptable impact to sensitive receptors
C2 – Contamination of groundwater (construction)	Contamination of groundwater from construction activities during the construction phase
O1 – Contamination of groundwater (operation)	Contamination of groundwater from operational activities.
O2 – Alteration of groundwater recharge	Changes to groundwater recharge through altering surface infiltration.
O3 – Alteration of groundwater flow	Changes to groundwater flow paths or groundwater discharge impacting surface water and groundwater quality.

Table 6.3 Groundwater environmental risk assessment register

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
			CONSEQUENCE	LIKELIHOOD	RATING		CONSEQUENCE	LIKELIHOOD	RATING
<b>Construction Phase</b>									
C1	Groundwater extraction	Construction extraction / dewatering resulting in an unacceptable impact to sensitive receptors.	Minor	Unlikely	Low	Not required	Minor	Unlikely	Low
C2	Groundwater contamination	Degradation of water quality through spills or leaks from machinery/chemicals during construction impacting the groundwater environment.	Moderate	Unlikely	Low	Implementation of standard construction operating procedures (such as a Construction Environmental Management Plan) and staff training in handling of relevant hazardous chemicals	Moderate	Rare	Low
<b>Operational Phase</b>									
O1	Groundwater contamination	Degradation of water quality through spills or leaks from machinery/chemicals during operation impacting the groundwater environment.	Moderate	Unlikely	Low	Implementation of standard operating procedures and staff training in handling of relevant hazardous chemicals	Moderate	Rare	Low
O2	Groundwater recharge alteration	Changes to groundwater recharge through altering site surface coverage.	Not significant	Likely	Low	Not required	Not significant	Likely	Low
O3	Groundwater flow alteration	Changes to groundwater flow during the operation of the Project	Minor	Unlikely	Low	Not required	Minor	Unlikely	Low

## 6.5 NSW Aquifer Interference Policy

Interference approvals under the *Water Management Act 2000* have yet to commence. However, the aquifer interference policy is used to guide proponents and DPIE in assessing aquifer interference activities. As stated in section 3.2.2, the AIP (DPI, 2012) includes minimal impact considerations for assessing the impacts of all aquifer interference activities.

An assessment of the Projects impacts from the potential changes in groundwater levels and quality on GDEs, beneficial use category, water supply works (i.e. registered bores), highly connected surface water source and culturally significant sites is provided in Table 6.4.

Table 6.4 Aquifer Interference Policy *Minimal impact considerations* for a 'less productive porous rock aquifer' – Sydney Central Basin Groundwater Source

FEATURE	MINIMAL IMPACT CONSIDERATIONS	RESPONSE
Water table	Less than or equal to ten per cent cumulative variation in the water table, allowing for typical climatic “post-water sharing plan” variations, 40 m from any:  high priority groundwater dependent ecosystem; or  high priority culturally significant site.  listed in the schedule of the relevant water sharing plan.  A maximum of a two-metre decline cumulatively at any water supply work.	No groundwater take is anticipated for the construction or operation of the proposal.
	If more than ten percent cumulative variation in the water table, allowing for typical climatic “post-water sharing plan” variations, 40 m from any:  high priority groundwater dependent ecosystem; or  high priority culturally significant site.  listed in the schedule of the relevant water sharing plan then appropriate studies will need to demonstrate to the Minister’s satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site.  If more than two metres decline cumulatively at any water supply work then make good provisions would apply.	Refer to above response that indicates this condition is not triggered.
Water pressure	A cumulative pressure head decline of not more than a two-metre decline, at any water supply work.	Pressure heads are not anticipated to be lowered (or raised).
	If the predicted pressure head decline is greater than two metres decline cumulatively at any water supply work, then appropriate studies are required to demonstrate to the Minister’s satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.	Refer to above response that indicates this condition is not triggered.
Water quality	Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.	The proposal is not anticipated to result in a change in groundwater quality which would lower the beneficial use category.

FEATURE	MINIMAL IMPACT CONSIDERATIONS	RESPONSE
	If the above condition is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.	Refer to above response that indicates this condition is not triggered.

The assessment complies with Level 1 acceptance criteria indicating that the proposal is anticipated to have minimal and acceptable impact to the underlying groundwater environment.

# 7 Mitigation and management measures

The primary risks to groundwater identified in Chapter 6 returned a risk rating of low (refer to Table 6.2). Risks identified as low do not require additional mitigation and management measures outside of the standard controls implemented in accordance with relevant NSW legislation and policy requirements. Mitigation and management measures are implemented through the following:

- the development of client or contractors Site environmental management plans for enabling works
- the development of a project specific construction and environment management plan (CEMP) for main construction works
- the operator’s environmental management systems for the operation of the Project.

Groundwater contamination was assessed to have a moderate consequence due to the unknown nature of the risk. During construction and throughout operation of the Project, the risk to groundwater quality from hazardous chemicals (e.g. fuel) that may leach through surface infiltration can be appropriately mitigated and managed through the above measures to reduce the likelihood and consequence of contamination.

Further details of additional specific mitigation measures for contamination are discussed in the contamination technical report.

## 8 Conclusions

This groundwater impact assessment details the risk to groundwater from construction and operation activities of a new industrial warehouse and associated infrastructure at Eastern Creek, Sydney (the Project). This groundwater impact assessment is part of an Environmental Impact Statement (EIS) and addresses the relevant Planning Secretary's Environmental Assessment Requirements (SEARs).

The existing groundwater environment was assessed through a desktop review of existing and available geological and hydrogeological information, supplemented by limited intrusive site investigations. A qualitative risk assessment was undertaken through the identification of potential impacts to groundwater (such as levels and quality), groundwater dependent ecosystems (GDEs) and other groundwater users during the construction and operation of the project.

Identified risks to the groundwater from project activities were assessed and considered low risks. Specific mitigation and management measures were assessed not to be required. Industry standard procedures are recommended to further reduce risk from the construction and operational phases of the Project.

## 9 References

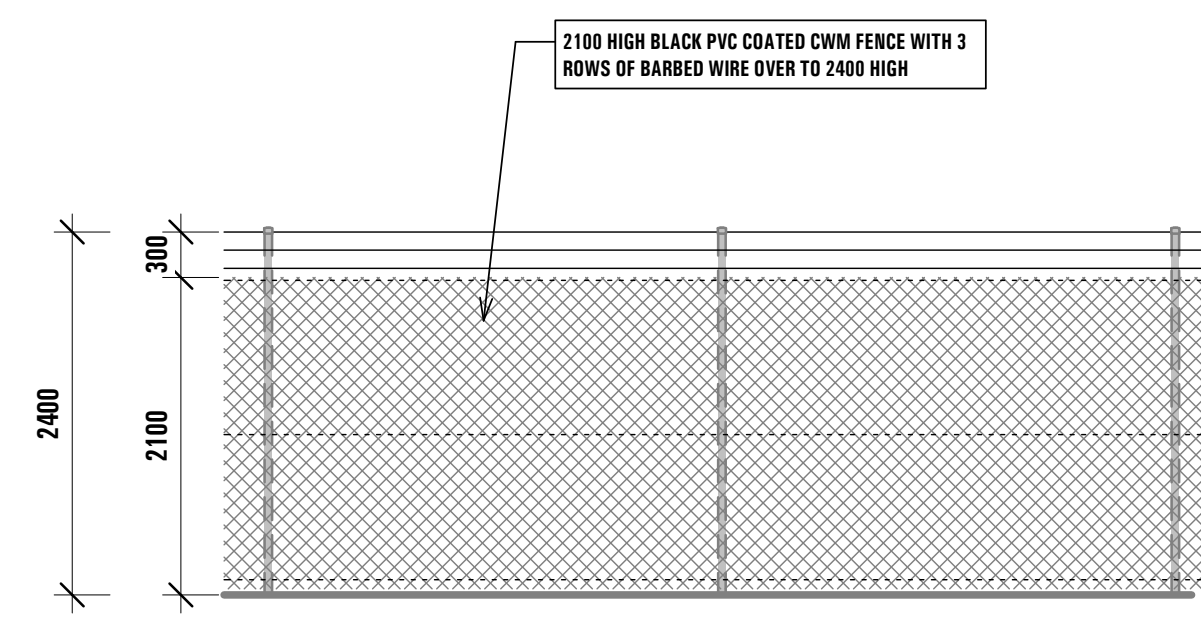
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# Appendix A

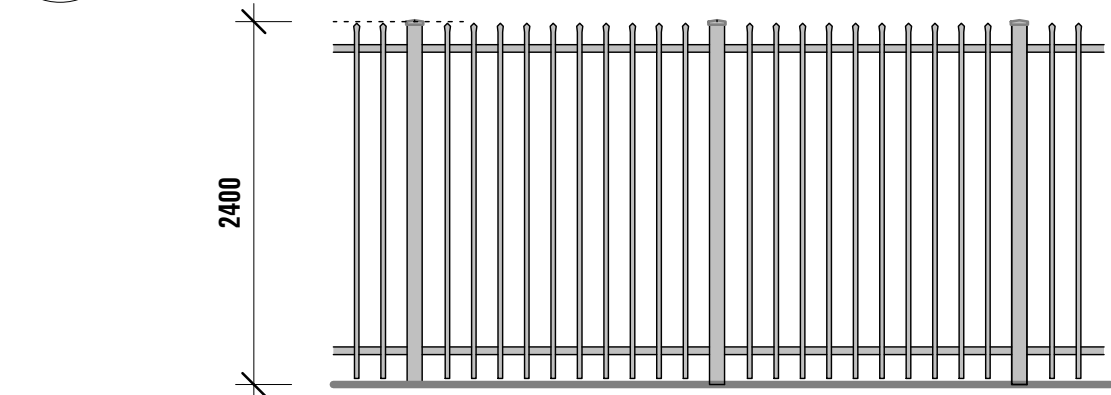
Proposed development details





FENCING - 01 (CWM)

1 : 50



FENCING - 02 (PALISADE)

1 : 50

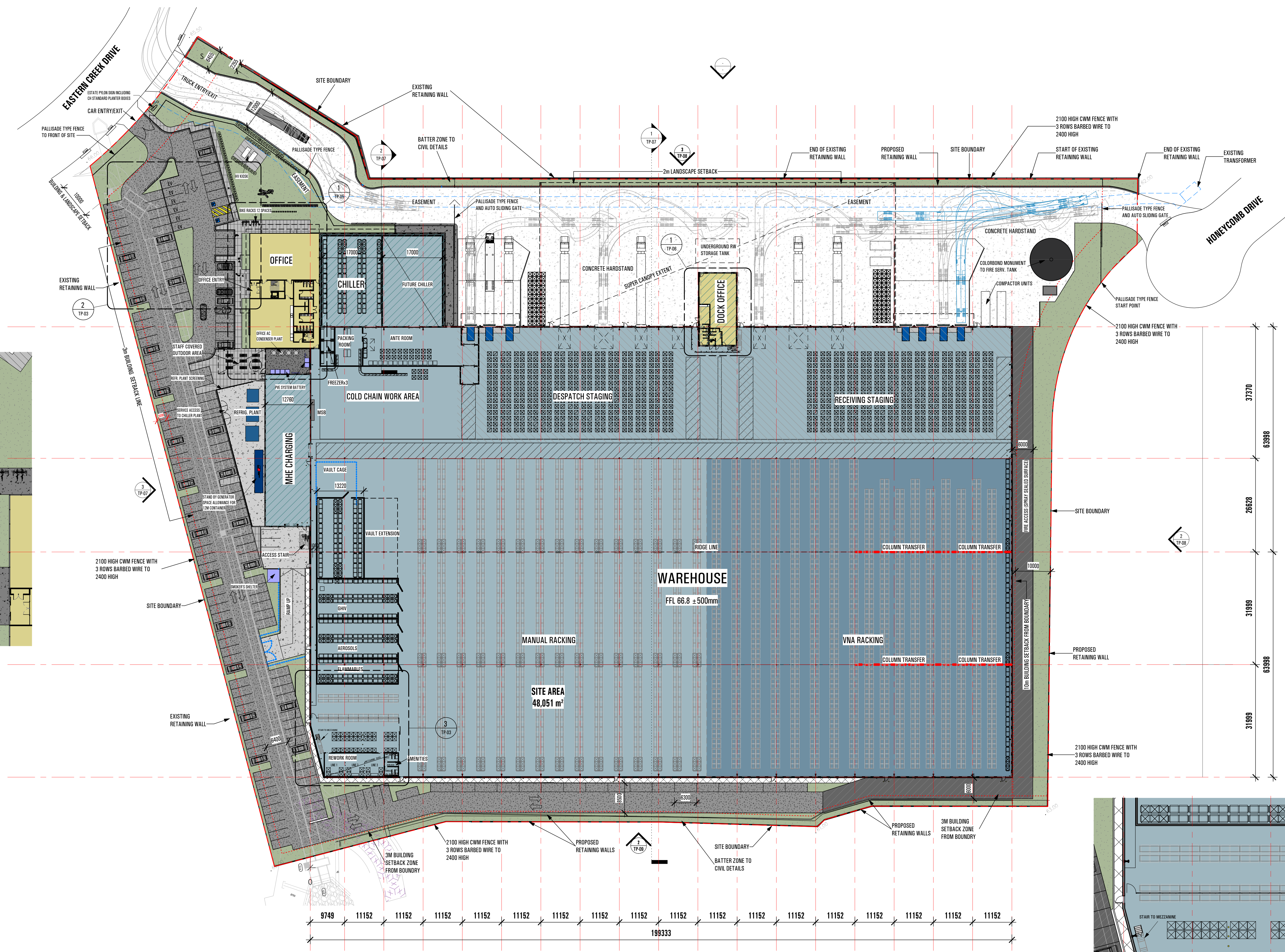


CAR PARK DETAIL

1 : 250

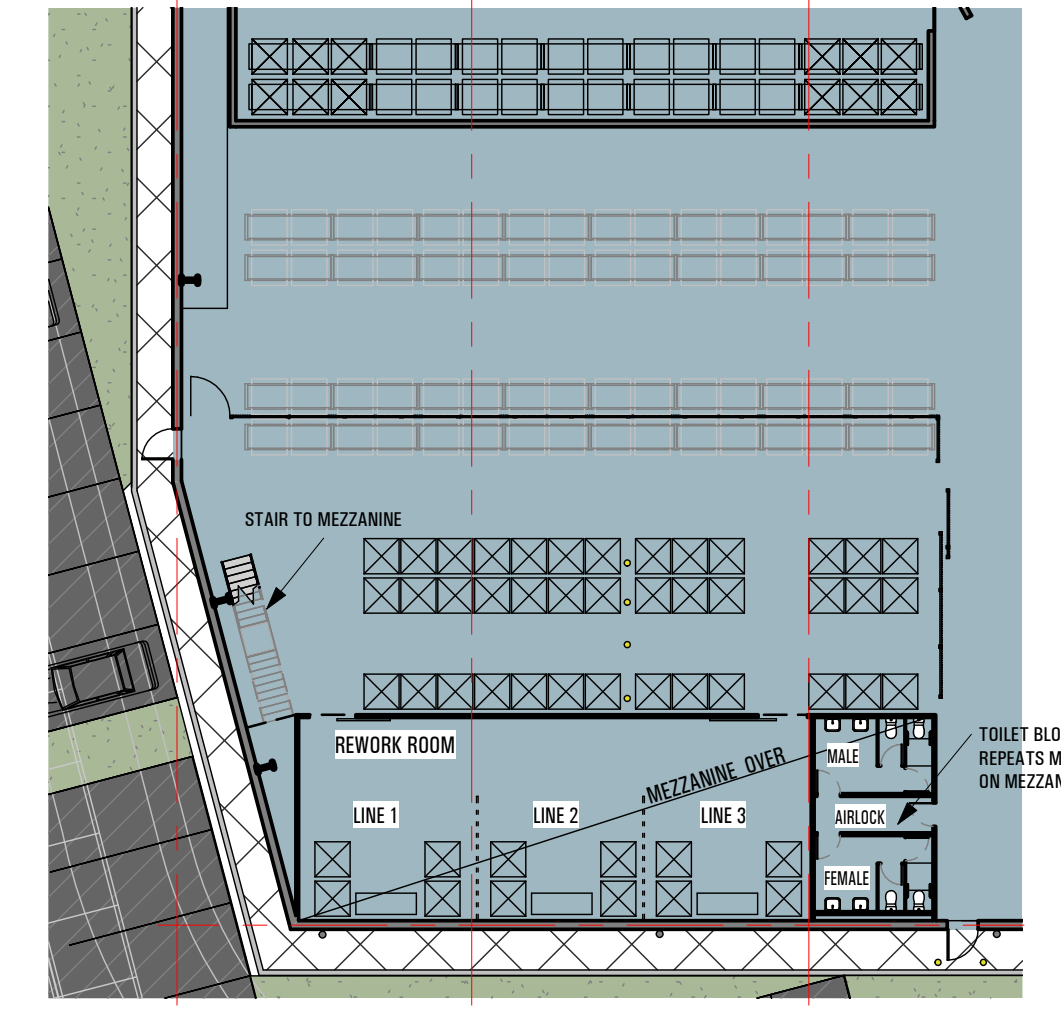
DEVELOPMENT SUMMARY

TOTAL SITE AREA (APPROX)	48,053 M <sup>2</sup>
WAREHOUSE AREA (GFA)	20,280 M <sup>2</sup>
FORKLIFT CHARGING	500 M <sup>2</sup>
FREEZER	920 M <sup>2</sup>
<b>TOTAL WAREHOUSE (GFA)</b>	<b>21,700 M<sup>2</sup></b>
WAREHOUSE STAGING AREAS (HATCHED) - EXCLUDED FROM GFA.	5,120 M <sup>2</sup>
2 STOREY DOCK OFFICE	450 M <sup>2</sup>
2 STOREY MAIN OFFICE	1,300 M <sup>2</sup>
<b>TOTAL OFFICE AREA</b>	<b>1,750 M<sup>2</sup></b>
<b>TOTAL BUILDING AREA</b>	<b>28,570 M<sup>2</sup></b>
<b>TOTAL SITE EFFICIENCY</b>	<b>59.5%</b>
<b>CAR PARKING CALCULATION</b>	
CAR PARKING SPACES	184 NO.
<b>LANDSCAPE CALCULATION</b>	
ACTUAL PROVIDED LANDSCAPED AREA	2,915M <sup>2</sup>
6% OF TOTAL SITE AREA	



SITE PLAN

1 : 500



REWORK AREA DETAIL

1 : 250

# STATE SIGNIFICANT DEVELOPMENT APPLICATION COMPASS 2 WAREHOUSE & DISTRIBUTION CENTRE

ADDRESS: LOT 1 DP1274322,  
EASTERN CREEK DRIVE, EASTERN CREEK NSW 2766

PREPARED FOR: CHARTER HALL  
LEVEL 20, 1 MARTIN PLACE,  
SYDNEY NSW 2000

PREPARED BY: WATCH THIS SPACE DESIGN PTY LTD  
LEVEL 3, SUITE 9, 35 BUCKINGHAM STREET,  
SURRY HILLS NSW 2010

DATE: NOVEMBER 2021

## DRAWING LIST

SHEET NO.	SHEET NAME	ISSUE DATE	CURRENT REVISION
SSD-00	COVER SHEET	01/12/2021	C
SSD-01	SURVEY PLAN	01/12/2021	C
SSD-02	SITE ANALYSIS	01/12/2021	C
SSD-101	SITE PLAN	01/12/2021	D
SSD-102	ROOF PLAN	01/12/2021	C
SSD-103	MAIN OFFICE PLAN	01/12/2021	C
SSD-104	DOCK OFFICE PLAN	01/12/2021	C
SSD-105	ELEVATIONS 1	01/12/2021	C
SSD-106	ELEVATIONS 2	01/12/2021	C
SSD-107	SECTIONS AA, BB	01/12/2021	C
SSD-108	EXTERIOR FINISHES	01/12/2021	C
SSD-109	SIGNAGE STRATEGY PLAN	01/12/2021	C



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Amendments

A	DRAFT ISSUE	19/11/2021
B	DRAFT ISSUE	26/11/2021
C	EIS SUBMISSION	01/12/2021



Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**

Drawn EC Scale	Checked PM Date	Approved PM Date
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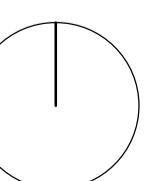
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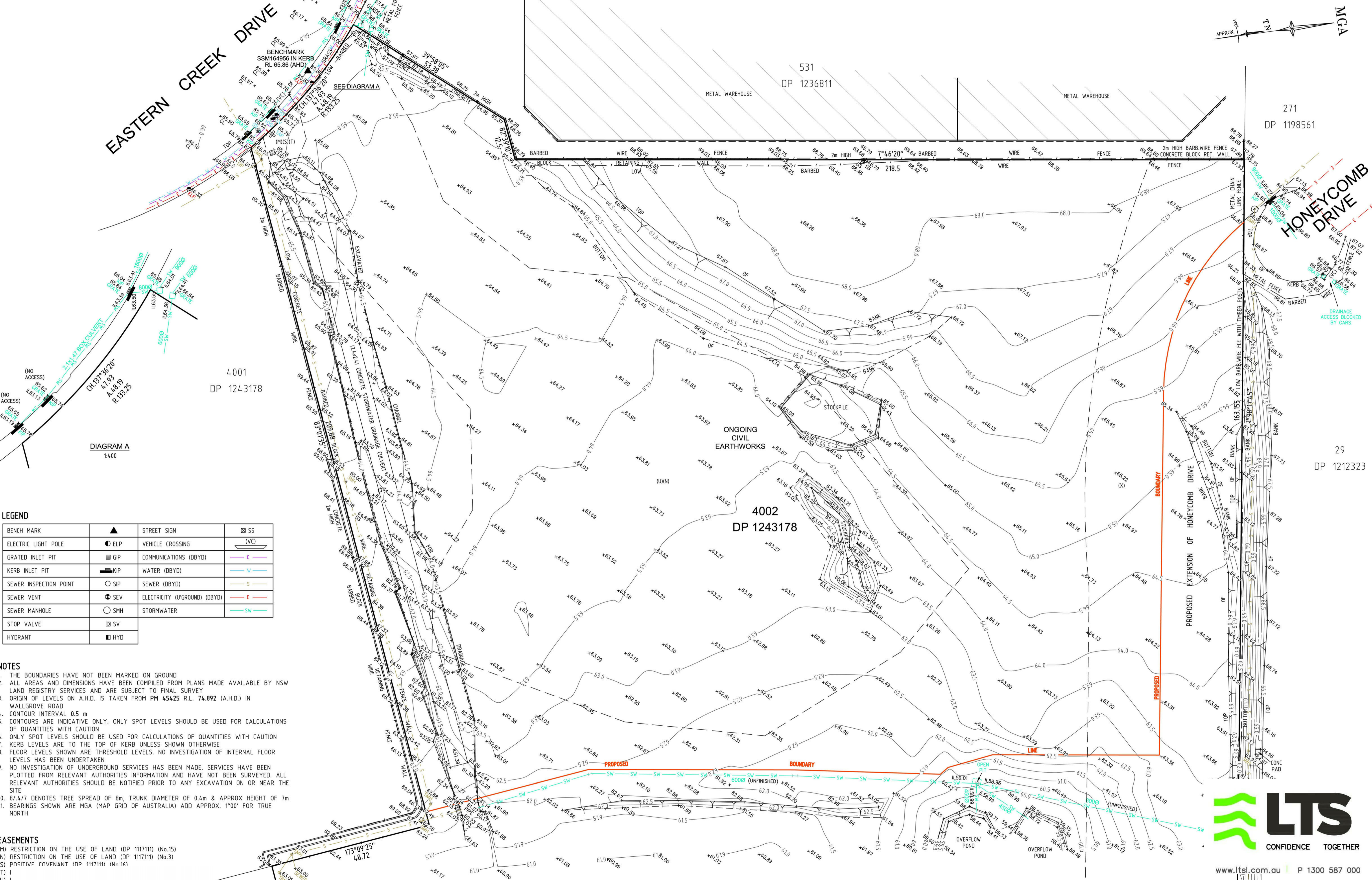
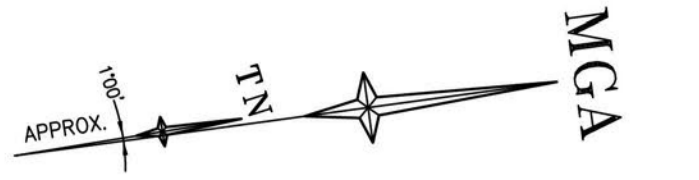
Project Number  
**CH ECD**

Status  
**SSDA**

Drawing Number  
**SSD-00**

Rev  
**C**





**LEGEND**

BENCH MARK	▲	STREET SIGN	SS
ELECTRIC LIGHT POLE	●	VEHICLE CROSSING	(VC)
GRATED INLET PIT	■	COMMUNICATIONS (DBYD)	C
KERB INLET PIT	■	WATER (DBYD)	W
SEWER INSPECTION POINT	○	SEWER (DBYD)	S
SEWER VENT	⊙	ELECTRICITY (U'GROUND) (DBYD)	E
SEWER MANHOLE	○	STORMWATER	SW
STOP VALVE	⊠		
HYDRANT	■		

- NOTES**
1. THE BOUNDARIES HAVE NOT BEEN MARKED ON GROUND
  2. ALL AREAS AND DIMENSIONS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE BY NSW LAND REGISTRY SERVICES AND ARE SUBJECT TO FINAL SURVEY
  3. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM PM 45425 R.L. 74.892 (A.H.D.) IN WALLGROVE ROAD
  4. CONTOUR INTERVAL 0.5 m
  5. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
  6. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
  7. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
  8. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS. NO INVESTIGATION OF INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
  9. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
  10. 8/4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
  11. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH

- EASEMENTS**
- (M) RESTRICTION ON THE USE OF LAND (DP 1117111) (No.15)
  - (N) RESTRICTION ON THE USE OF LAND (DP 1117111) (No.3)
  - (S) POSITIVE COVENANT (DP 1117111) (No.16)
  - (T) F
  - (U) F

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Amendments

A	DRAFT ISSUE	19/11/2021
B	DRAFT ISSUE	26/11/2021
C	EIS SUBMISSION	01/12/2021



Client  
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 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**  
 Drawn EC  
 Scale

Drawing Title  
**SURVEY PLAN**  
 Project Number  
**CH ECD**  
 Status  
 SSDA

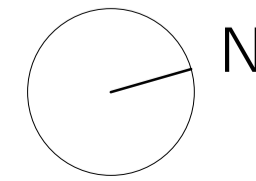
Rev  
**C**  
 Drawing Number  
**SSD-01**



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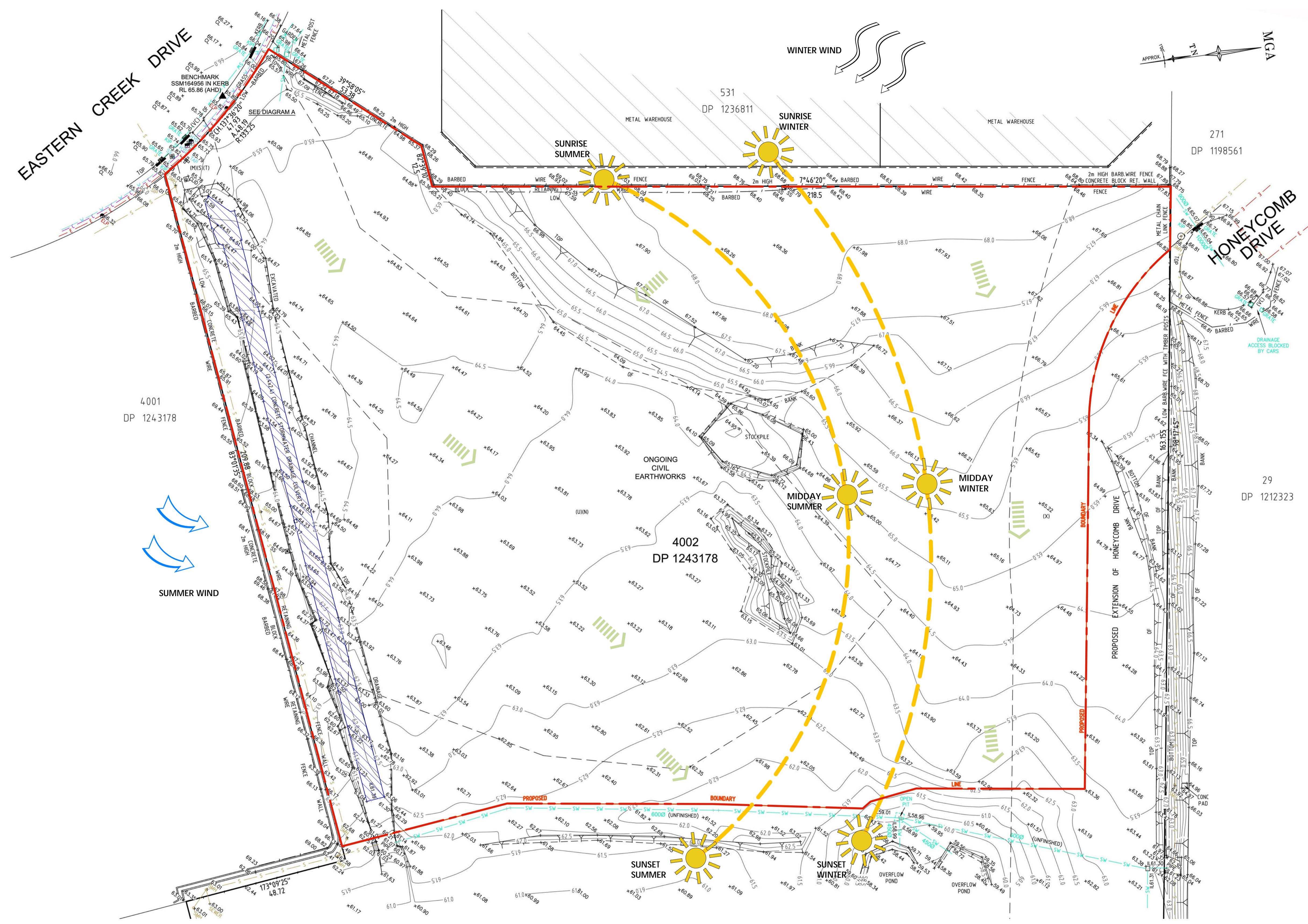


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**LEGEND**

- PROPOSED BOUNDARY
- ▨ SITE LANDFORM
- ▨ EXISTING DRAINAGE



**1 SITE ANALYSIS**  
1 : 600



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Client  
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**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**

Drawn EC  
 Scale As Indicated  
 Checked PM  
 Date  
 Approved PM  
 Date

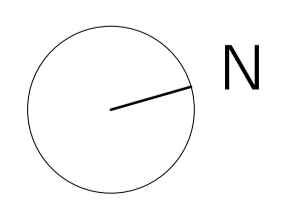
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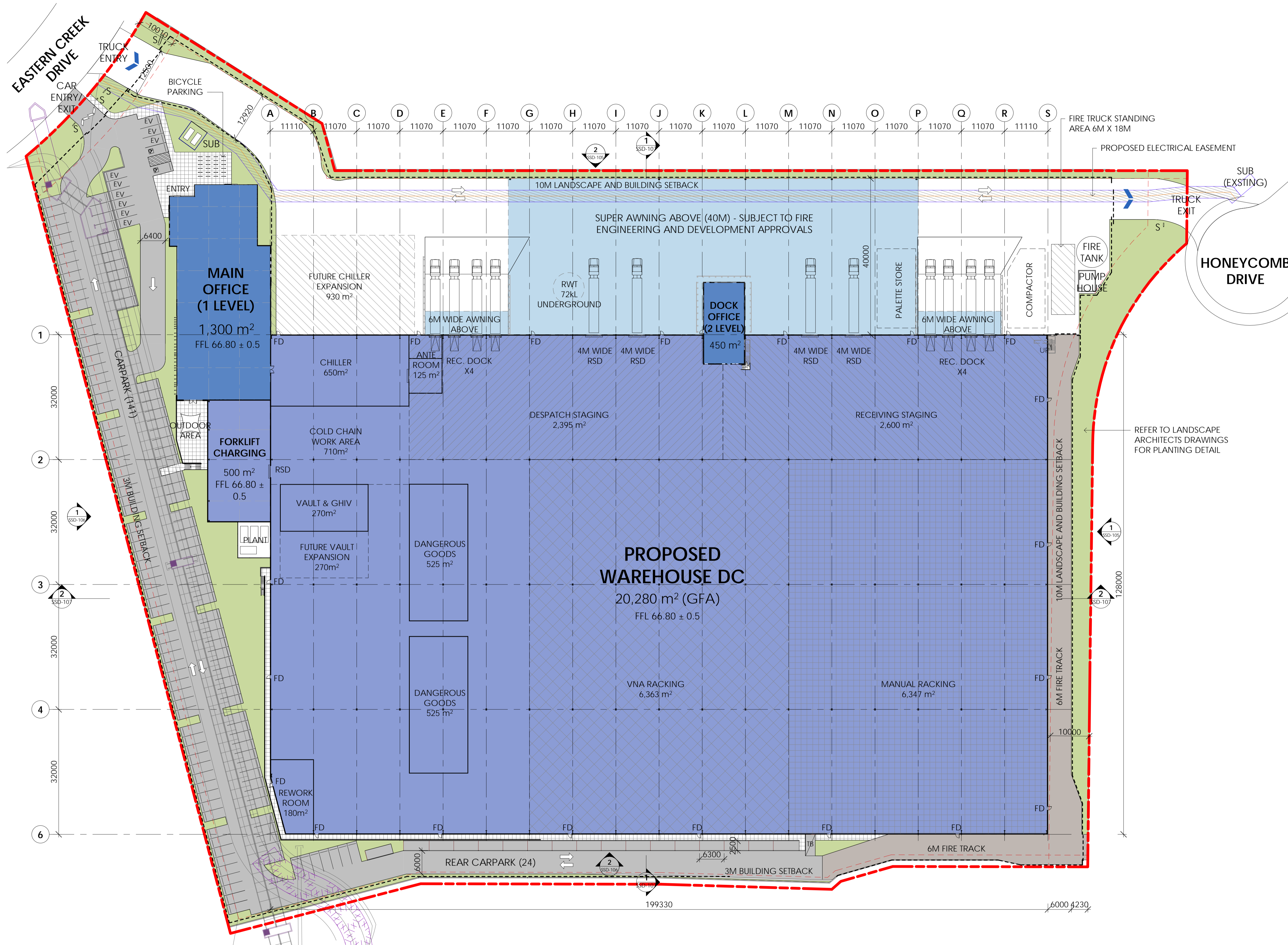
Project Number  
**CH ECD**

Status  
**SSDA**

Drawing Number  
**SSD-02**

Rev  
**C**





**DEVELOPMENT SUMMARY**

TOTAL SITE AREA (APPROX)	48,053 m <sup>2</sup>
WAREHOUSE AREA (GFA)	20,280 m <sup>2</sup>
FORKLIFT CHARGING AREA (GFA)	500 m <sup>2</sup>
<b>TOTAL WAREHOUSE GFA</b>	<b>20,780 m<sup>2</sup></b>
WAREHOUSE STAGING AREAS (HATCHED) - EXCLUDED FROM GFA	5,120 m <sup>2</sup>
MAIN OFFICE AREA (1 LEVEL)	1,300 m <sup>2</sup>
DOCK OFFICE AREA (2 LEVEL)	450 m <sup>2</sup>
<b>TOTAL OFFICE AREA</b>	<b>1,750 m<sup>2</sup></b>
<b>TOTAL BUILDING AREA</b>	<b>27,650 m<sup>2</sup></b>
<b>TOTAL SITE EFFICIENCY</b>	<b>57.5%</b>

**CARPARKING CALCULATION**

CARPARKING REQUIRED (BLACKTOWN COUNCIL DCP)

WAREHOUSE: 1 SPACE PER 200 SQM/GFA  
OFFICE: 1 SPACE PER 40 SQM

TOTAL CARPARKING REQUIRED	145
CARPARKING PROVIDED	165

**LANDSCAPE CALCULATION**

ACTUAL PROVIDED LANDSCAPE AREA	4,295 m <sup>2</sup>
9% OF TOTAL SITE AREA	

**LEGEND**

- SSD SITE BOUNDARY
- - - BUILDING SETBACK
- - - LANDSCAPE SETBACK
- - - - - 2.4M HIGH PALISADE FENCE/ GATE
- PROPOSED WAREHOUSE AREA
- PROPOSED OFFICE AREA
- PROPOSED AWNING
- SITE LANDSCAPE
- EXISTING SITE LANDSCAPE
- LIGHT DUTY PAVEMENT
- HEAVY DUTY PAVEMENT
- ENTRY / OUTDOOR AREA

NOTE: ALL LEVELS ± 500mm

**1 SITE PLAN**  
1 : 500



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Amendments	date
A DRAFT ISSUE	19/11/2021
B DRAFT ISSUE	22/11/2021
C DRAFT ISSUE	26/11/2021
D EIS SUBMISSION	01/12/2021



Client  
**CHARTER HALL**  
Project  
**LOT 1, EASTERN CREEK DR,  
EASTERN CREEK NSW**

Drawn EC  
Scale As Indicated

Checked PM  
Date

Approved PM  
Date

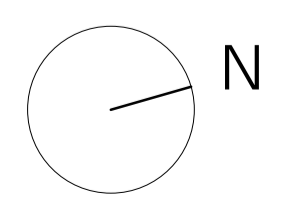
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Project Number  
**CH ECD**

Status  
**SSDA**

Rev  
**D**

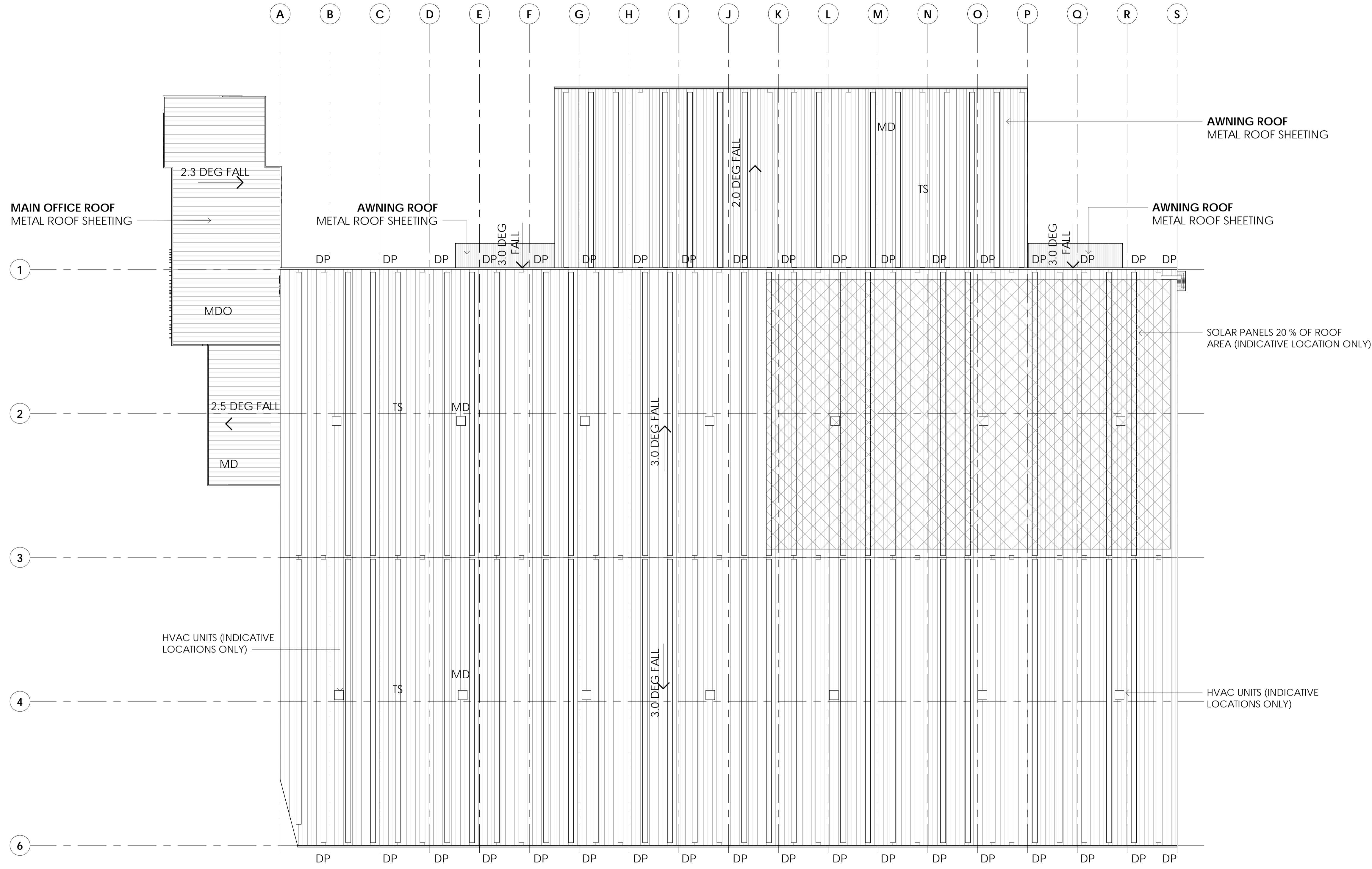
Drawing Number  
**SSD-101**



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**LEGEND**

MD	PROPOSED METAL DECK ROOF - ZINCALUME
MDO	PROPOSED METAL DECK OFFICE - KLIPLOCK
TS	TRANSLUCENT SHEETING
DP	DOWNPIPE



1:500 @A1 0 5 10 20 40m



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Amendments	date
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B DRAFT ISSUE	26/11/2021
C EIS SUBMISSION	01/12/2021

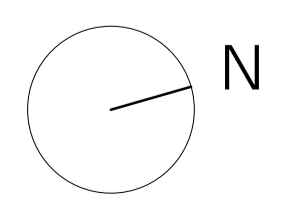


Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**  
 Drawn EC  
 Scale As indicated  
 Checked PM  
 Date  
 Approved PM  
 Date

Drawing Title  
**ROOF PLAN**  
 Project Number  
**CH ECD**  
 Status  
**SSDA**

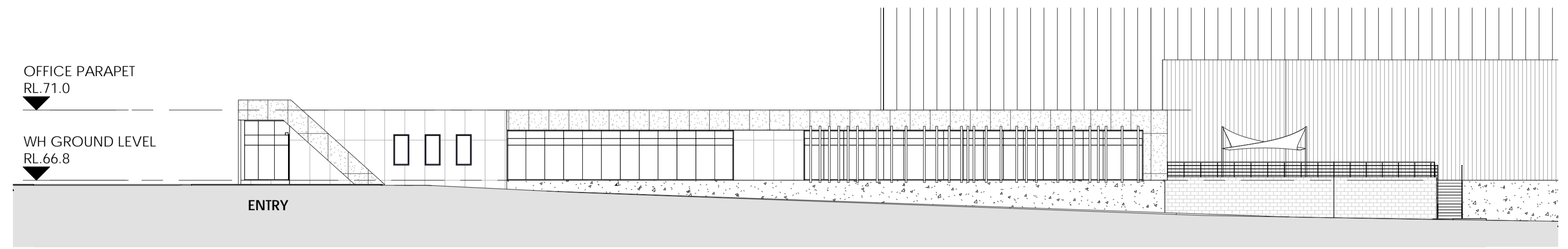
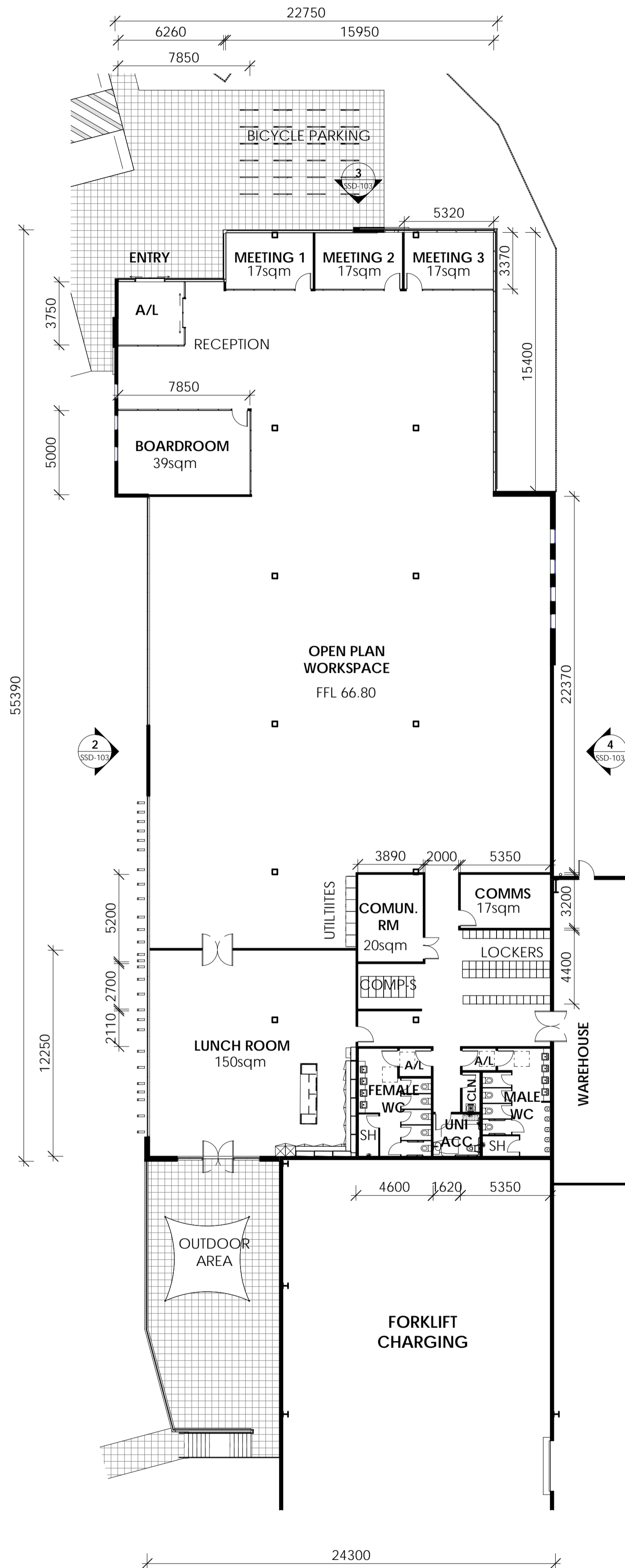
Rev  
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 Drawing Number  
**SSD-102**

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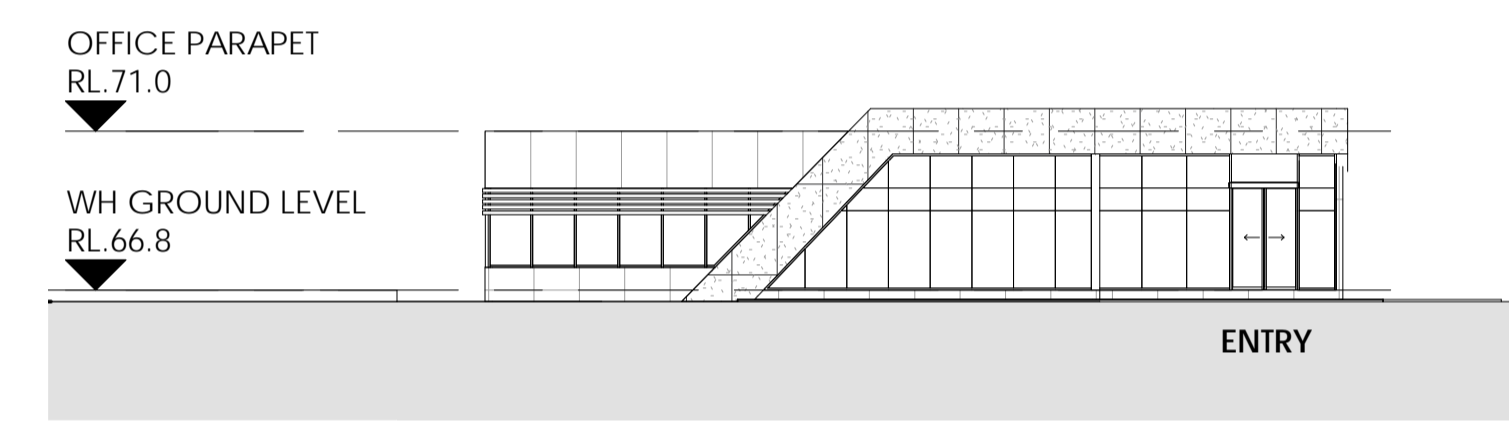


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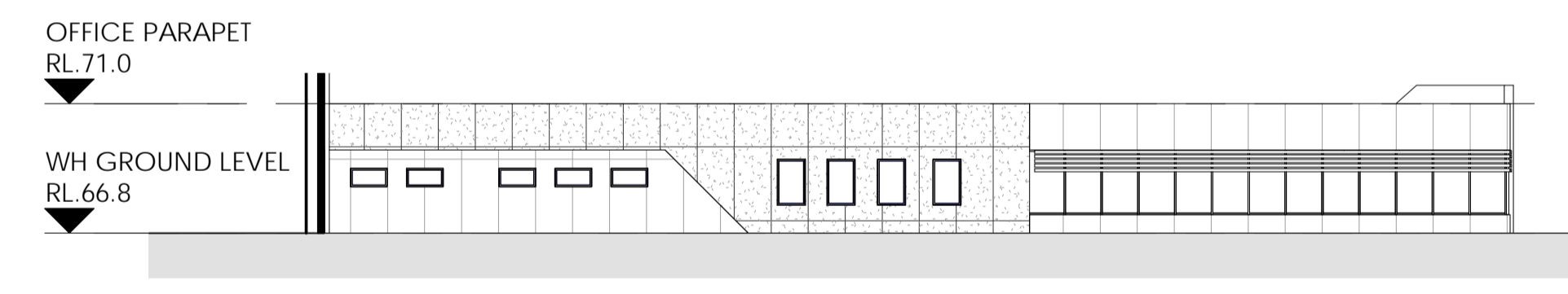
RSD	ROLLER SHUTTER DOOR
FD	FIRE DOOR
DP	DOWNPIPE
RWT	RAINWATER TANK
SUB	SUBSTATION



**2 OFFICE - ELEVATION 1**  
1 : 200



**3 OFFICE - ELEVATION 2**  
1 : 200



**4 OFFICE - ELEVATION 3**  
1 : 200



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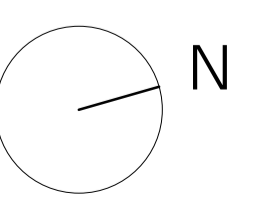
Amendments	date
A DRAFT ISSUE	19/11/2021
B DRAFT ISSUE	26/11/2021
C EIS SUBMISSION	01/12/2021



Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**  
 Drawn EC  
 Scale As indicated  
 Checked PM  
 Date  
 Approved PM  
 Date

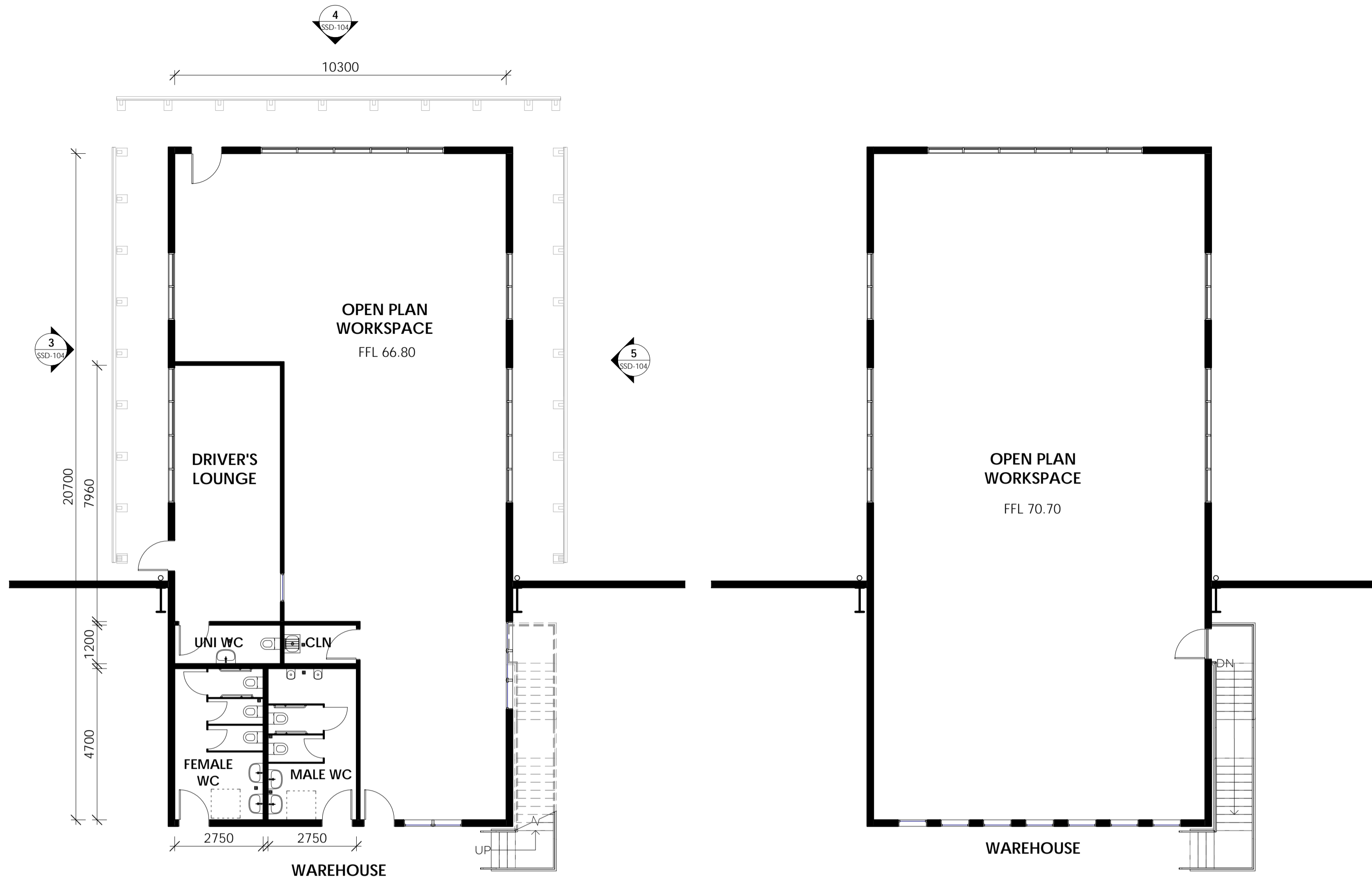
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 Project Number  
**CH ECD**  
 Status  
**SSDA**

Rev  
**C**  
 Drawing Number  
**SSD-103**



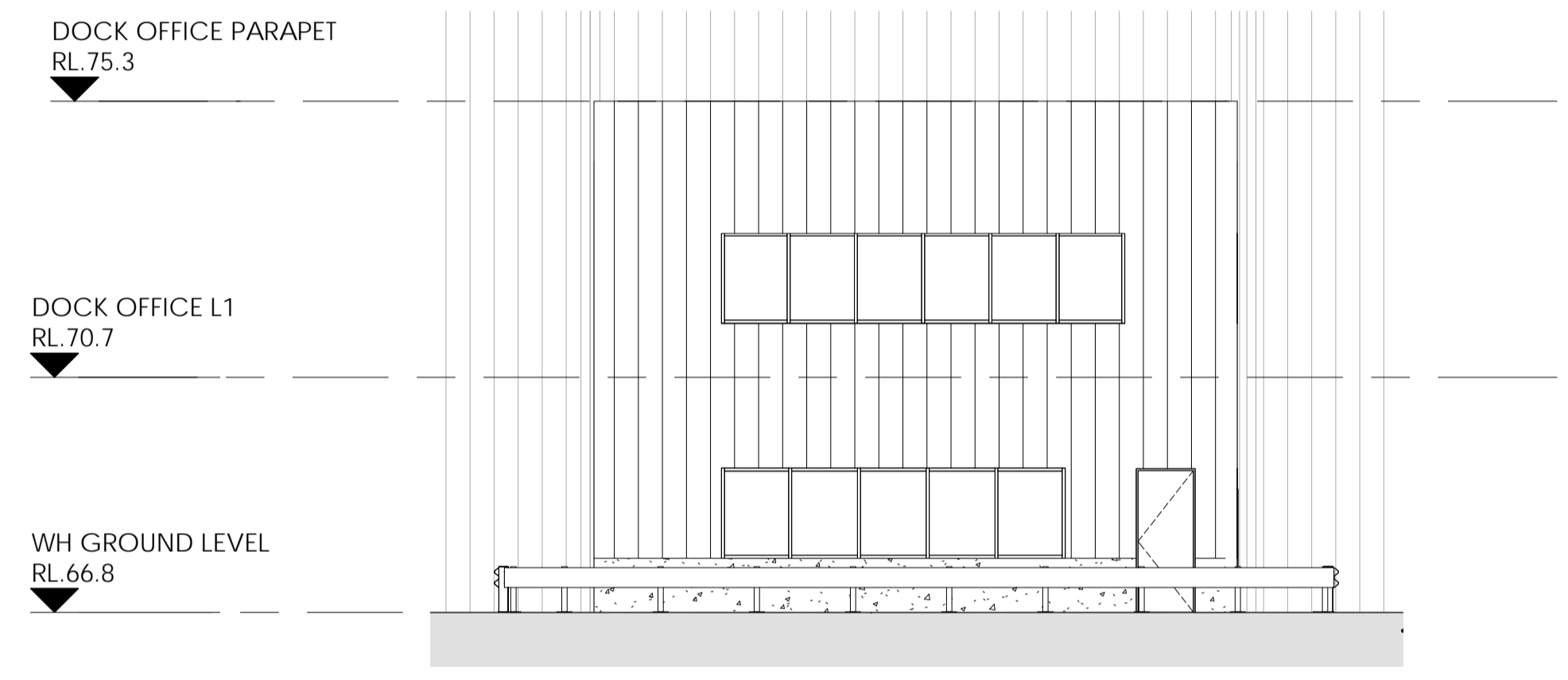
**LEGEND**

RSD	ROLLER SHUTTER DOOR
FD	FIRE DOOR
DP	DOWNPIPE
RWT	RAINWATER TANK
SUB	SUBSTATION

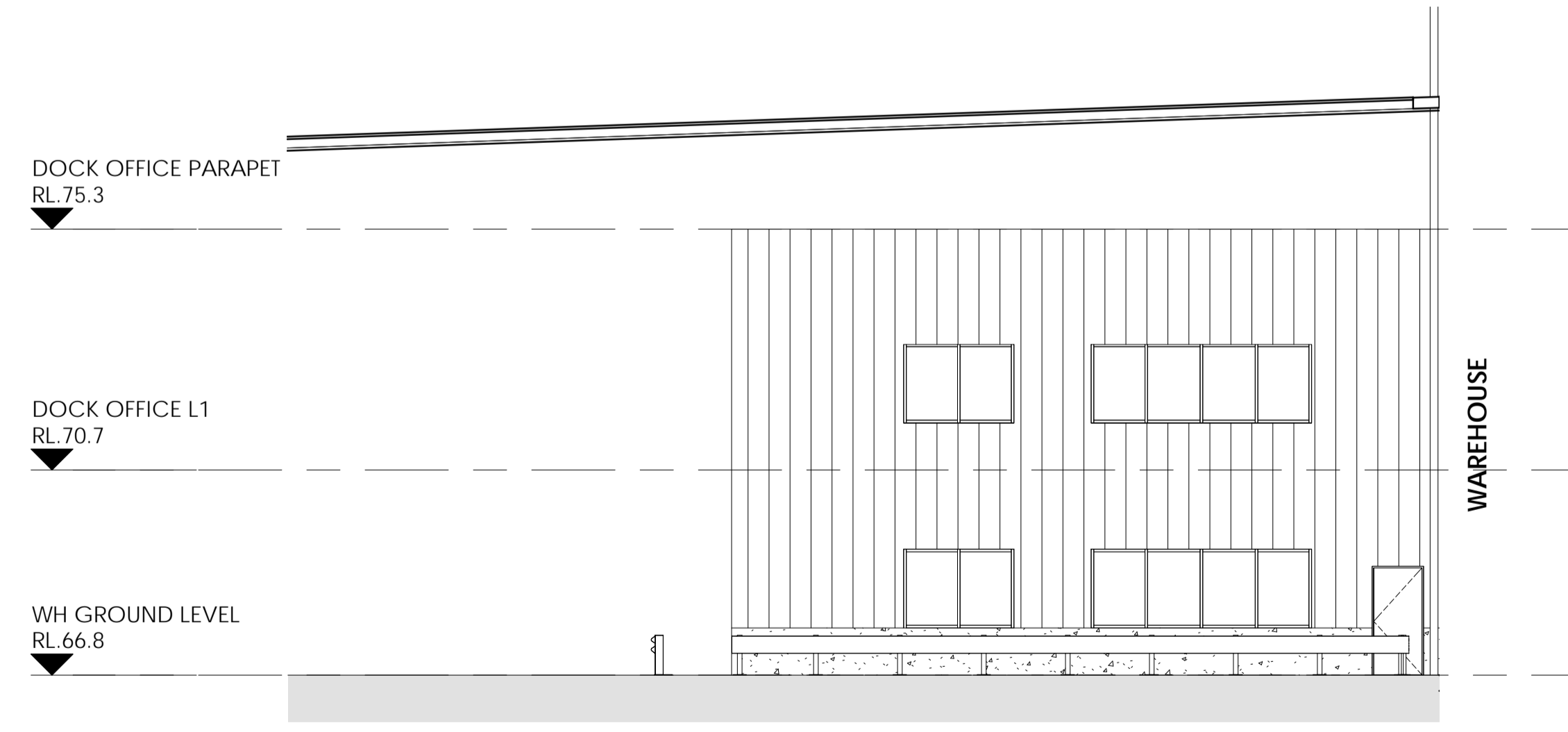


**1 DOCK OFFICE PLAN**  
1 : 100

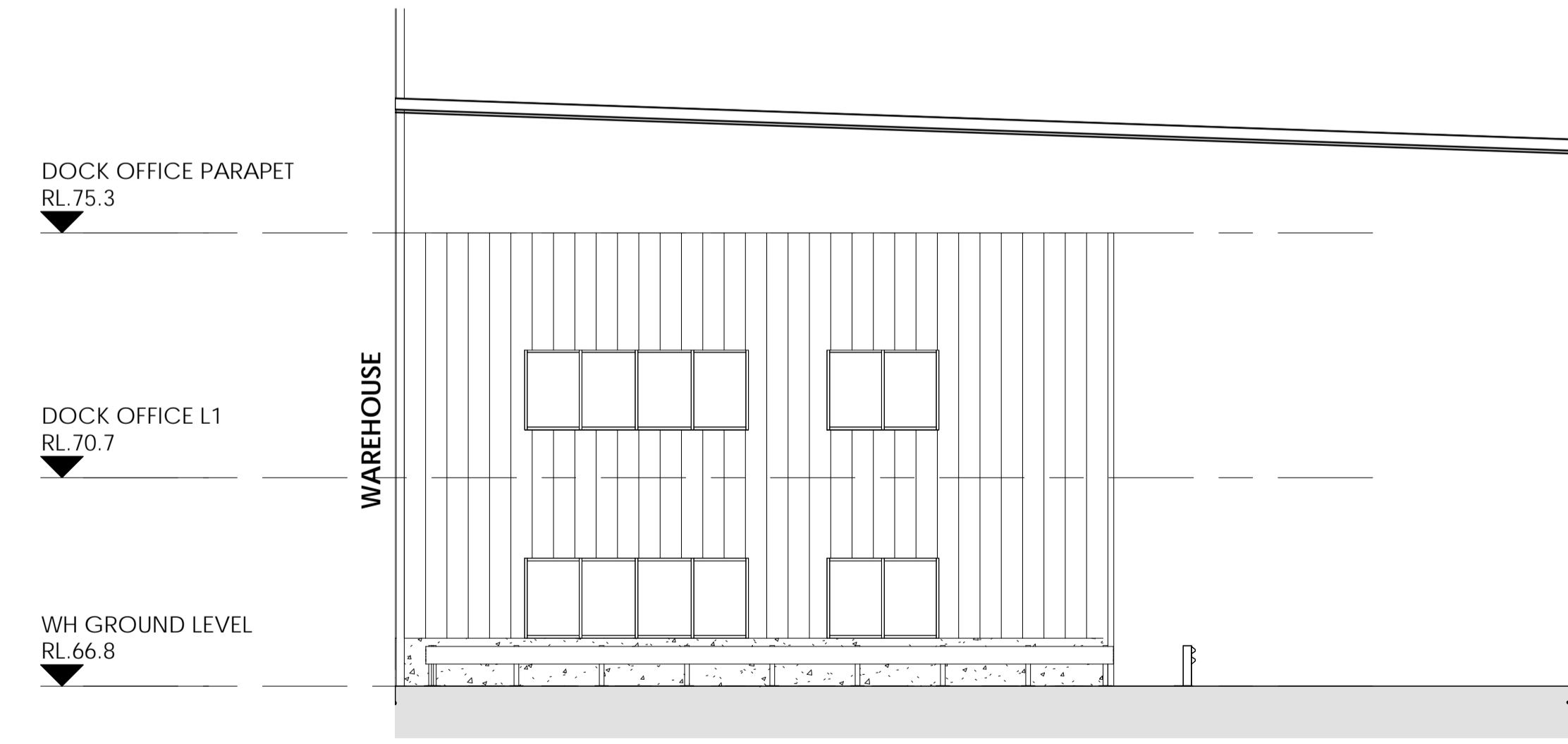
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1 : 100



**4 DOCK OFFICE - ELEVATION 2**  
1 : 100



**3 DOCK OFFICE - ELEVATION 1**  
1 : 100



**5 DOCK OFFICE - ELEVATION 3**  
1 : 100



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Amendments	date
A DRAFT ISSUE	19/11/2021
B DRAFT ISSUE	26/11/2021
C EIS SUBMISSION	01/12/2021

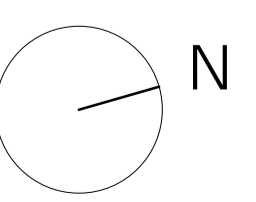


Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**  
 Drawn Author Scale As indicated  
 Checked Checker Date  
 Approved Approver Date

Drawing Title  
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 Project Number  
**CH ECD**  
 Status  
**SSDA**

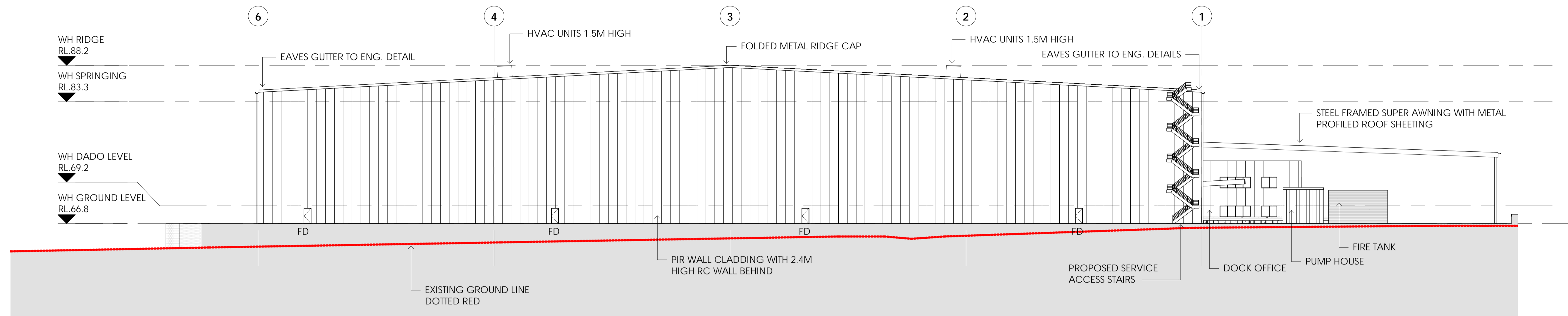
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Rev  
**C**

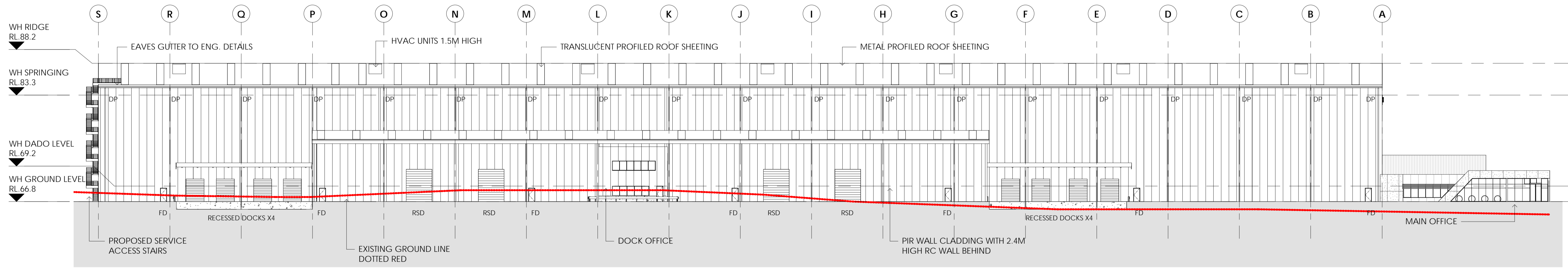


**LEGEND**

RSD	ROLLER SHUTTER DOOR
FD	FIRE DOOR
DP	DOWNPIPE



**1 ELEVATION - NORTH**  
1 : 300



**2 ELEVATION - WEST**  
1 : 300

1:300 @A1 0 3 6 12 24m



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Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**  
 Drawn EC  
 Scale As indicated  
 Checked PM  
 Date  
 Approved PM  
 Date

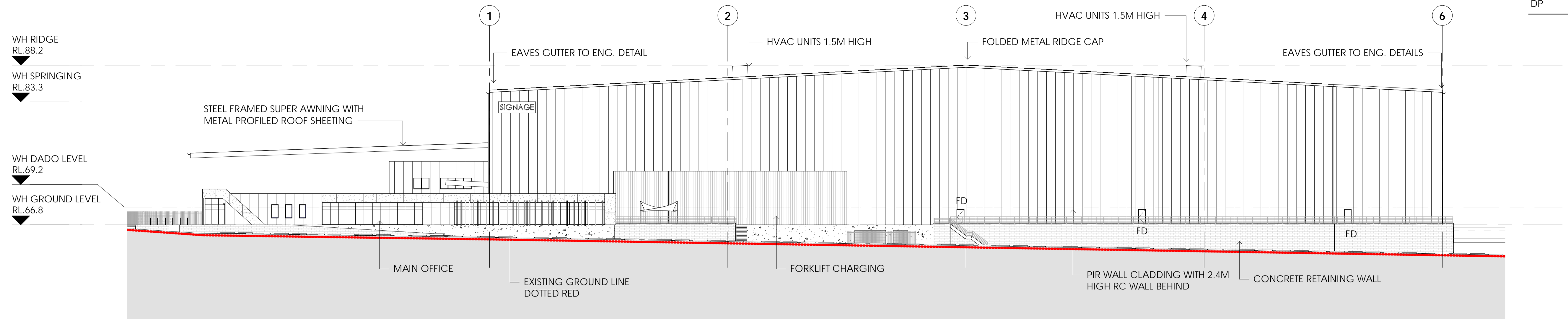
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 Project Number  
**CH ECD**  
 Status  
**SSDA**

Drawing Number  
**SSD-105**

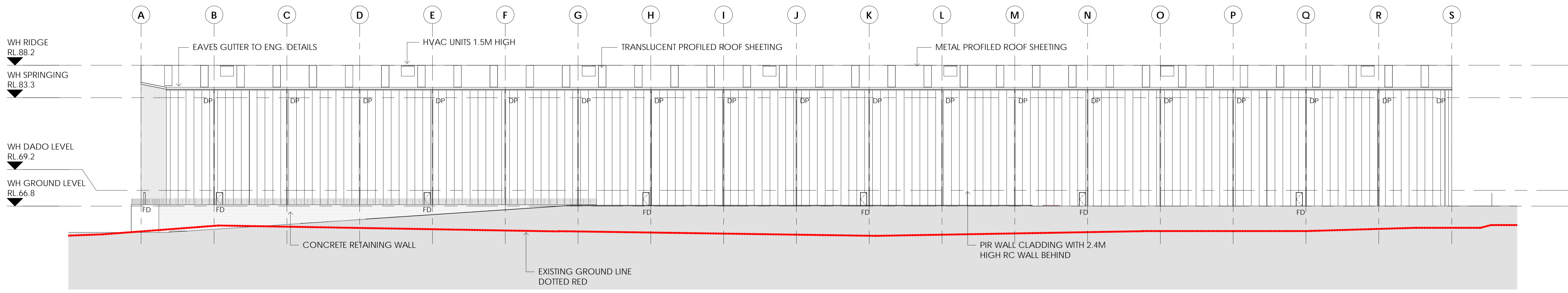
Rev  
**C**

**LEGEND**

RSD	ROLLER SHUTTER DOOR
FD	FIRE DOOR
DP	DOWNPIPE



**1 ELEVATION - SOUTH**  
1 : 300



**2 ELEVATION - EAST**  
1 : 300



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Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**  
 Drawn EC  
 Scale As indicated  
 Checked PM  
 Date  
 Approved PM  
 Date

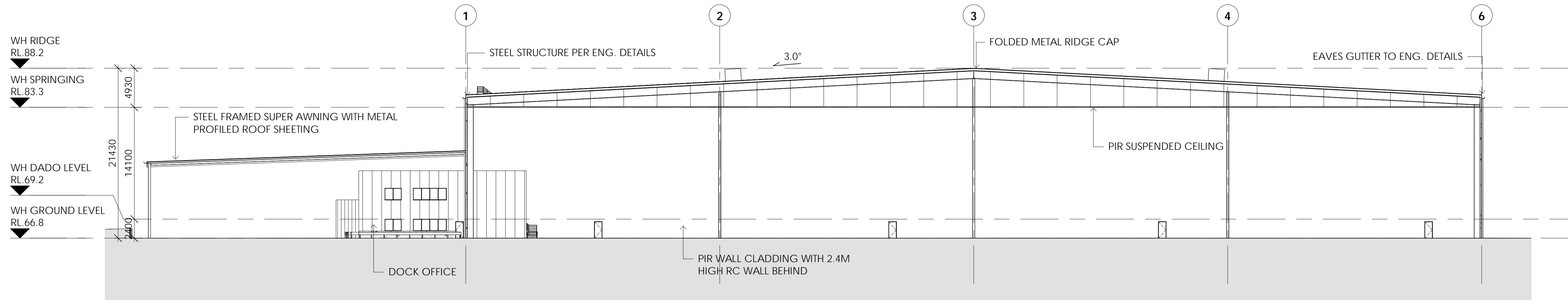
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 Project Number  
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 Status  
**SSDA**

Drawing Number  
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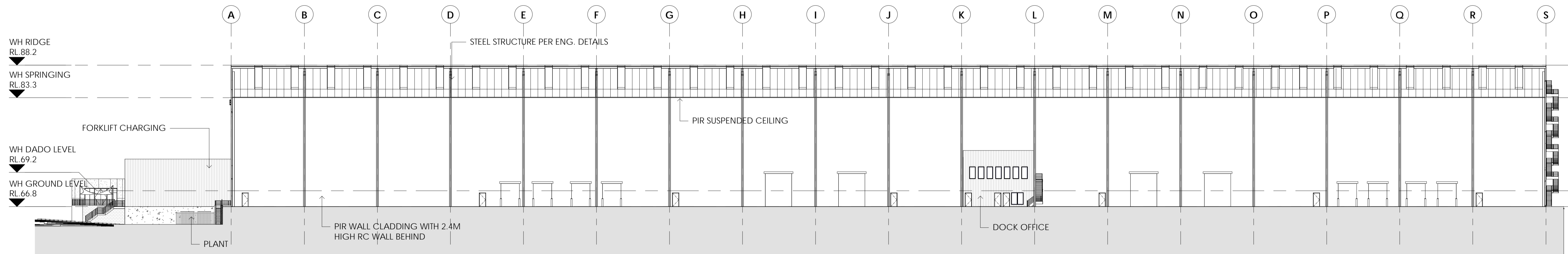
Rev  
**C**

**LEGEND**

RSD	ROLLER SHUTTER DOOR
FD	FIRE DOOR
DP	DOWNSPIPE



**1 SECTION AA**  
1 : 300



**2 SECTION BB**  
1 : 300

1:300 @A1 0 3 6 12 24m



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Managing Consultant

Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**

Drawn EC  
 Scale As indicated  
 Checked PM  
 Date  
 Approved PM  
 Date

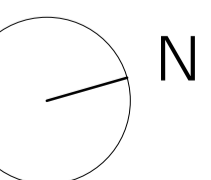
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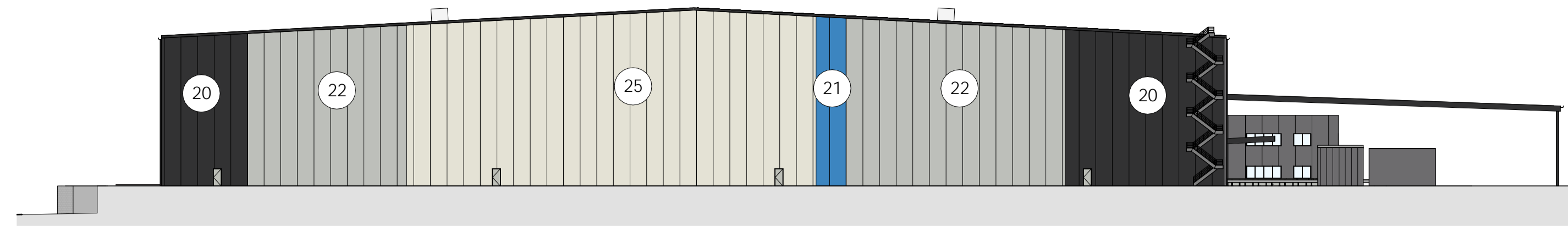
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**CH ECD**

Status  
**SSDA**

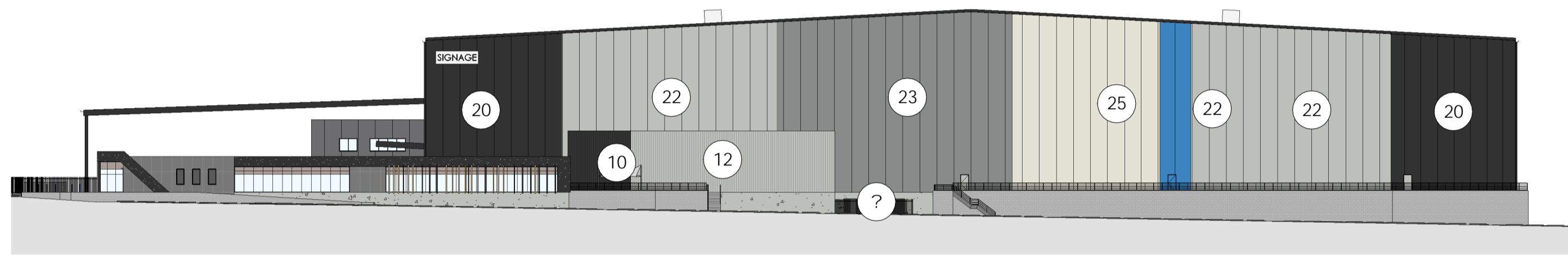
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Rev  
**C**

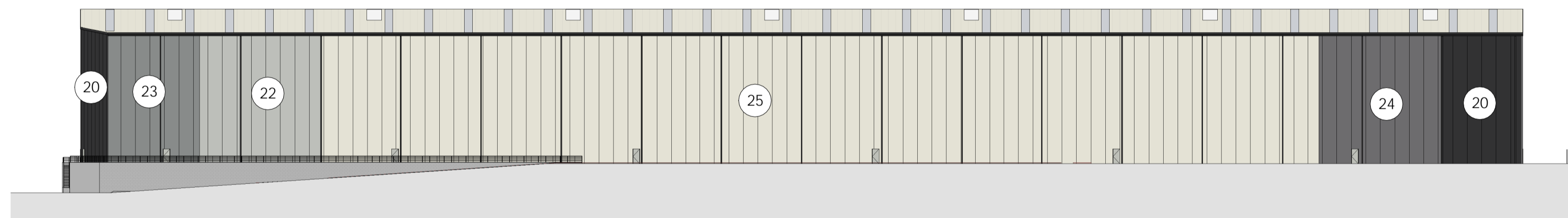




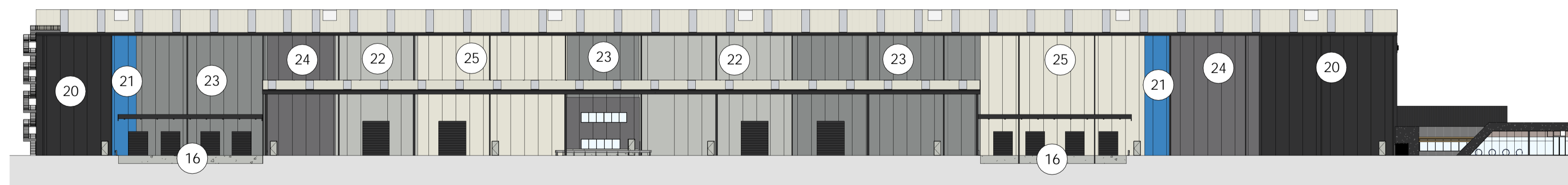
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1 : 500



**2** EXTERNAL FINISHES - SOUTH  
1 : 500

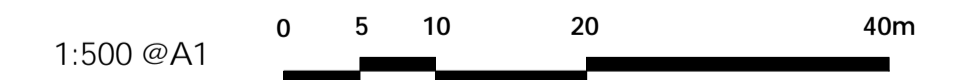


**3** EXTERNAL FINISHES - EAST  
1 : 500



**4** EXTERNAL FINISHES - WEST  
1 : 500

20	PIR WALL CLADDING - VERTICAL 'MONUMENT'
21	PIR WALL CLADDING - VERTICAL 'CHARTER HALL BLUE'
22	PIR WALL CLADDING - VERTICAL 'SHALE GREY'
23	PIR WALL CLADDING - VERTICAL 'WINDSPRAY'
24	PIR WALL CLADDING - VERTICAL 'BASALT'
25	PIR WALL CLADDING - VERTICAL 'SURFMIST'
10	METAL WALL CLADDING - VERTICAL 'MONUMENT'
12	METAL WALL CLADDING - VERTICAL 'SHALE GREY'
16	PRECAST CONCRETE WALL PANELS - PAINT FINISH 'SHALE GREY'



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Client  
**CHARTER HALL**  
 Project  
**LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW**

Drawn Author Scale As indicated	Checked Checker Date	Approved Approver Date
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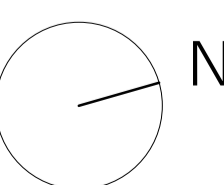
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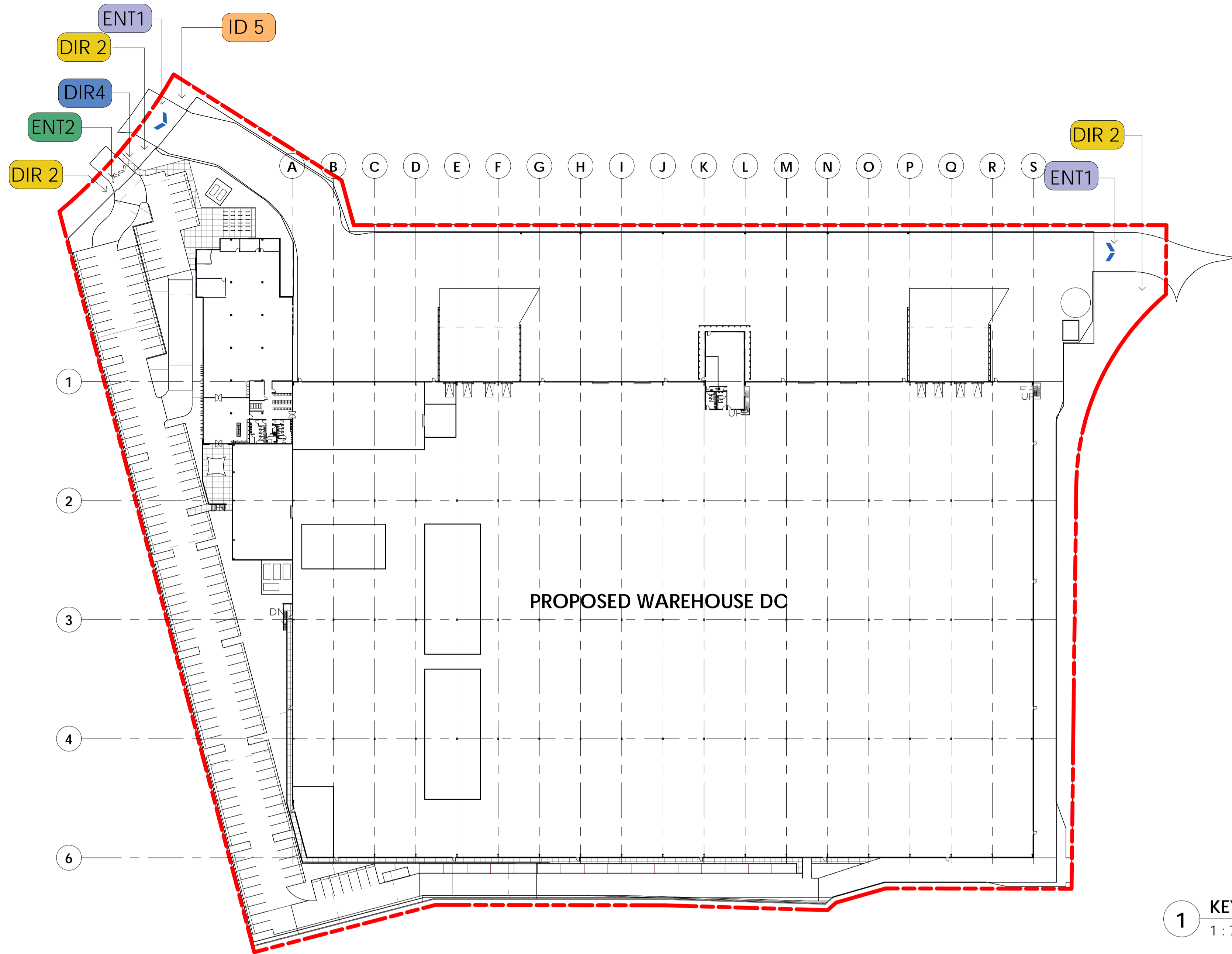
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**CH ECD**

Status  
**SSDA**

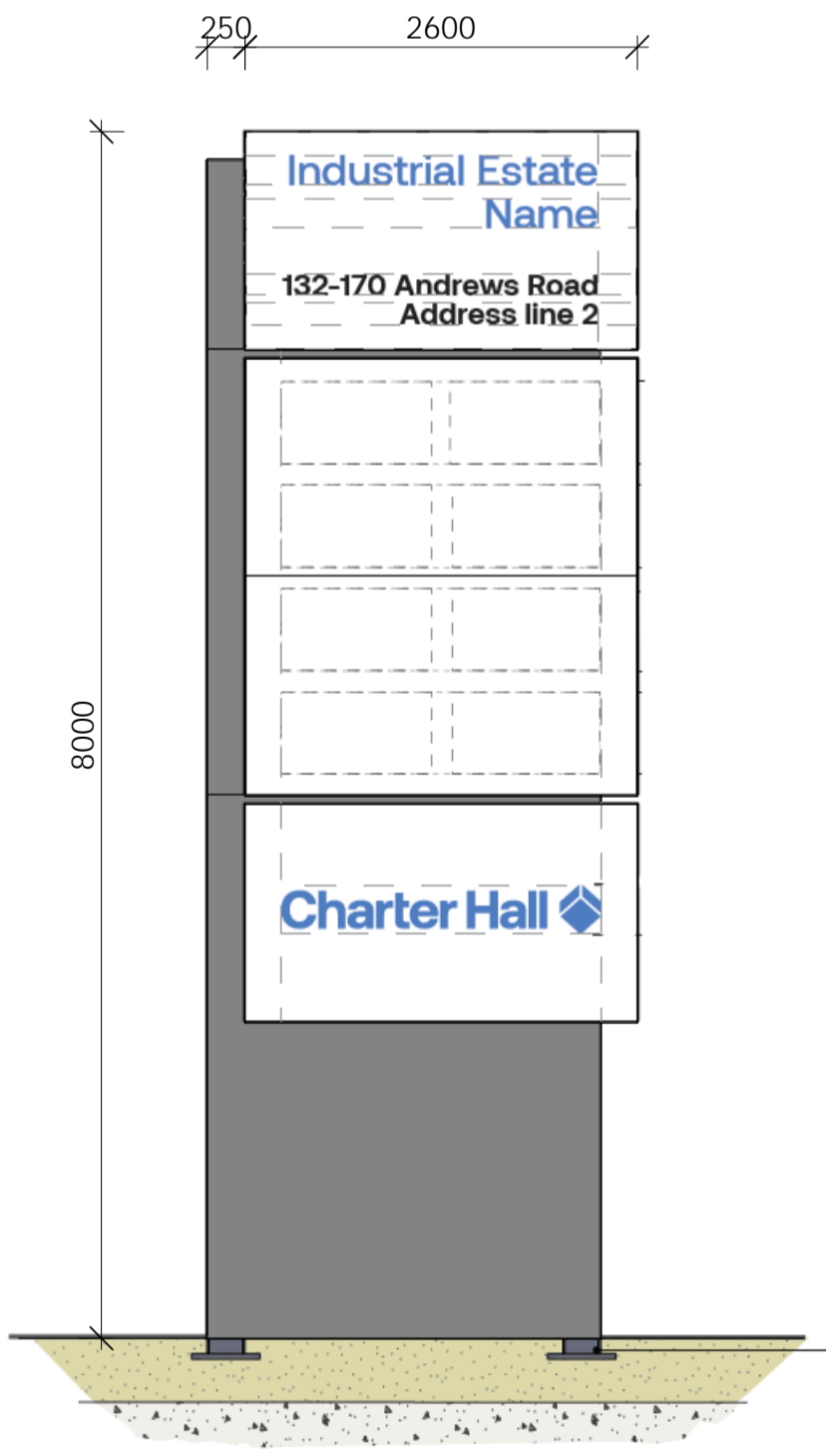
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**SSD-108**

Rev  
**C**

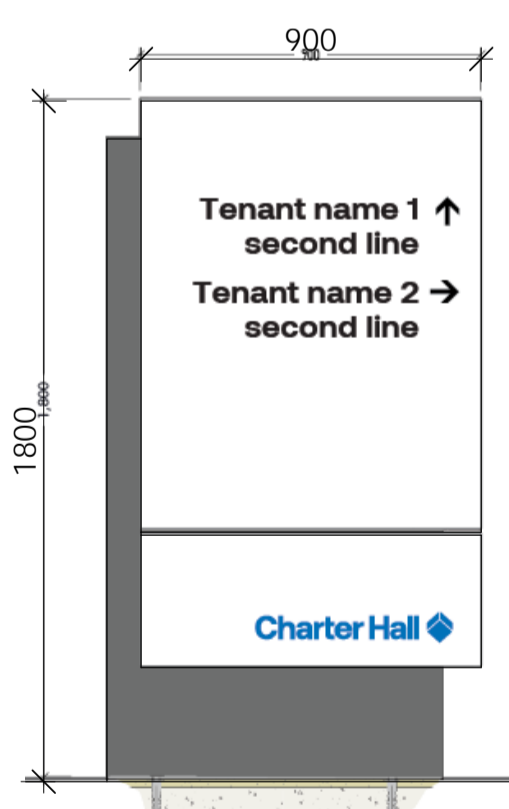




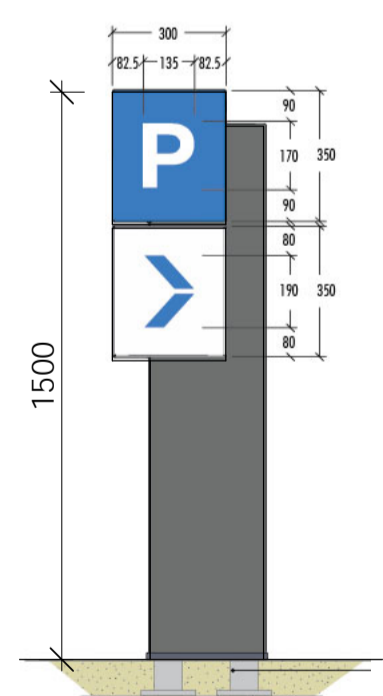
1 KEY PLAN  
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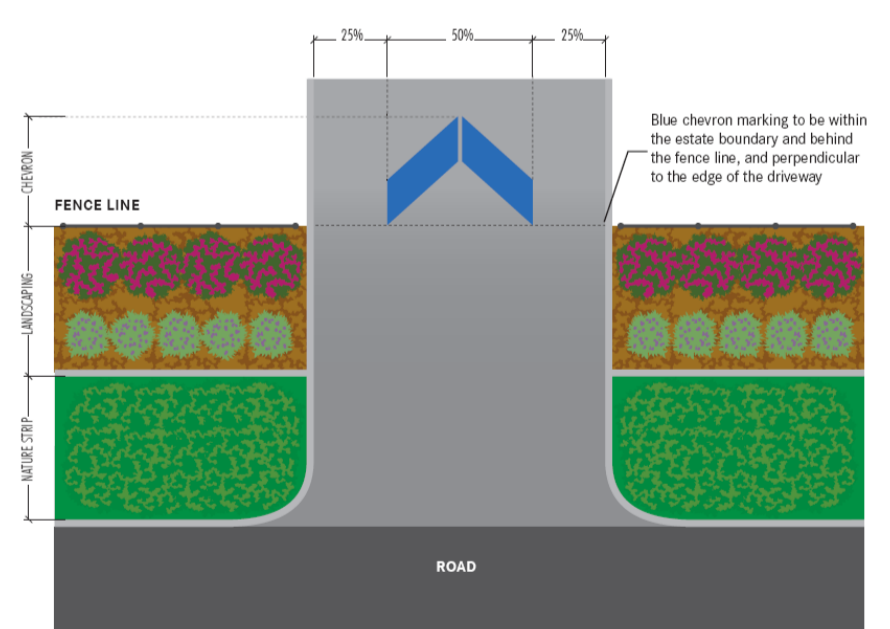
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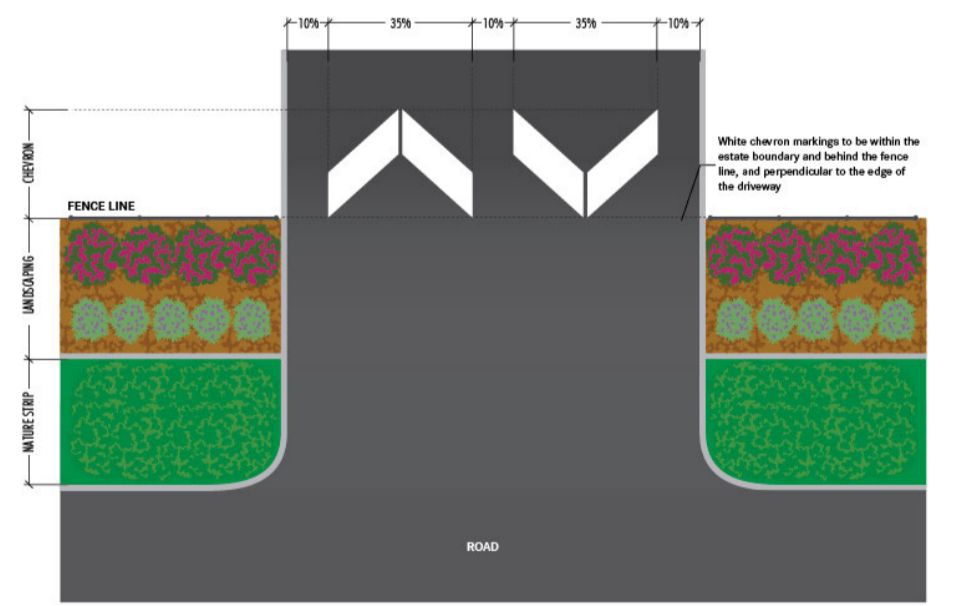
DIR2



DIR4



ENT1



ENT2



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Client  
**CHARTER HALL**  
 Project  
 LOT 1, EASTERN CREEK DR,  
 EASTERN CREEK NSW

Drawn EC  
 Scale As Indicated  
 Checked PM  
 Date  
 Approved PM  
 Date

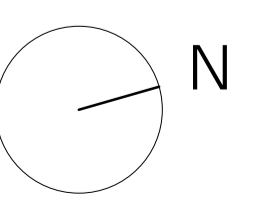
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Project Number  
**CH ECD**

Status  
**SSDA**

Drawing Number  
**SSD-109**

Rev  
**C**



# Appendix B

Monitoring bore construction logs





# BOREHOLE ENGINEERING LOG

BOREHOLE NO.

## MW201

SHEET 1 OF 1

Client: **Charter Hall Holdings Pty Ltd**  
 Project: **Compass 2 Warehouse & Distribution Centre**  
 Borehole Location: **Lot 1 Eastern Creek Drive, Eastern Creek**  
 Project Number: **PS127384**

Date Commenced: **5-10-21**  
 Date Completed: **5-10-21**  
 Recorded By: **DI**  
 Log Checked By: **AM**

Drill Model/Mounting: **Massenza MI2**  
 Borehole Diameter: **100 mm**

Driller:  
 Driller Lic No:

Surface RL: **68.25 m mAHD**  
 Co-ords: **E 299901.13 N 6257073.62 MGA94 56**

Borehole Information							Field Material Description		
2	3	4	5	6	7	8	9		
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD	DEPTH(m)	Field Test	SAMPLE	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION
Auger - Two Pronged Blade-bit	NII		TOC 69.27 m AGL	0.20					FILL: Sandy CLAY; low plasticity; dark brown; fine to medium grain sand.
				67	-1				FILL: Sandy CLAY; low to medium plasticity; dark brown, orange and brown; fine to medium grain sand; trace sub-rounded to sub-angular ironstone, road base and sandstone gravels.
				1.50					
				66	-2				RESIDUAL SOIL: Silty CLAY; medium plasticity; orange, brown and grey; fine to medium grain sand; trace sub-rounded ironstone gravels.
				65	-3				WEATHERED ROCK: SILTSTONE; highly weathered; inferred very low strength, brown and grey.
				64	-4				
				63	-5				WEATHERED ROCK: SHALE; moderately to highly weathered; inferred very low to low strength; grey and dark grey.
				62	-6				
				61	-7				
				7.20					END OF BOREHOLE AT 7.20 m
				60	-8				
				59	-9				

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This borehole log should be read in conjunction with WSP's accompanying standard notes.



# BOREHOLE ENGINEERING LOG

BOREHOLE NO.

## MW202

SHEET 1 OF 1

Client:	<b>Charter Hall Holdings Pty Ltd</b>	Date Commenced:	<b>5-10-21</b>
Project:	<b>Compass 2 Warehouse &amp; Distribution Centre</b>	Date Completed:	<b>5-10-21</b>
Borehole Location:	<b>Lot 1 Eastern Creek Drive, Eastern Creek</b>	Recorded By:	<b>DI</b>
Project Number:	<b>PS127384</b>	Log Checked By:	<b>AM</b>

Drill Model/Mounting:	<b>Massenza MI2</b>	Driller:		Surface RL:	<b>65.24 m mAHD</b>
Borehole Diameter:	<b>100 mm</b>	Driller Lic No:		Co-ords:	<b>E 299988.73 N 6257125.1 MGA94 56</b>

Borehole Information							Field Material Description		
2	3	4	5	6	7	8	9		
METHOD	SUPPORT	WATER	WELL CONSTRUCTION TOC 66.27 m AGL	RL(m) mAHD	DEPTH(m)	Field Test	SAMPLE	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION
Auger - Two Pronged Blade-bit	NII			66.27	0.60				FILL: Sandy CLAY; low to medium plasticity; dark grey, grey and brown; fine to medium grain sand; with silt and sub-rounded to sub-angular siltsone, road base and sandstone gravels.
				64	1.40				RESIDUAL SOIL: Sandy CLAY; medium plasticity; yellow and grey; fine grain sand; with silt; trace sub-rounded ironstone gravels.
				63	2.00				RESIDUAL SOIL: Silty CLAY; medium plasticity; yellow-brown and grey; trace fine grain sand.
				62					WEATHERED ROCK: SILTSTONE; highly weathered; inferred very low strength; orange-brown, grey, yellow and red.
				61	4.00				WEATHERED ROCK: SHALE; moderately to highly weathered; inferred very low to low strength; dark grey.
				60	4.50				END OF BOREHOLE AT 4.50 m
				59					
				58					
				57					
				56					

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This borehole log should be read in conjunction with WSP's accompanying standard notes.



# BOREHOLE ENGINEERING LOG

BOREHOLE NO.

## MW203

SHEET 1 OF 1

Client:	<b>Charter Hall Holdings Pty Ltd</b>	Date Commenced:	<b>5-10-21</b>
Project:	<b>Compass 2 Warehouse &amp; Distribution Centre</b>	Date Completed:	<b>5-10-21</b>
Borehole Location:	<b>Lot 1 Eastern Creek Drive, Eastern Creek</b>	Recorded By:	<b>DI</b>
Project Number:	<b>PS127384</b>	Log Checked By:	<b>AM</b>

Drill Model/Mounting:	<b>Massenza MI2</b>	Driller:		Surface RL:	<b>64.75 m mAHD</b>
Borehole Diameter:	<b>100 mm</b>	Driller Lic No:		Co-ords:	<b>E 299922.18 N 6256940.8 MGA94 56</b>

Borehole Information							Field Material Description		
2	3	4	5	6	7	8	9		
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD	DEPTH(m)	Field Test	SAMPLE	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION
Auger - Two Pronged Blade-bit	Nil		TOC 65.79 m AGL	64.00	-1				FILL: Sandy CLAY; medium plasticity; dark brown and orange-brown; fine to medium grain sand; trace sub-angular gravels.
				64.80	-1				RESIDUAL SOIL: Sandy CLAY; medium plasticity; dark red, brown and orange; fine grain sand; with silt.
				63.00	-2				WEATHERED ROCK: SILTSTONE; highly weathered; inferred very low strength; grey and dark grey.
				62.00	-3				WEATHERED ROCK: SHALE; highly weathered; inferred very low strength; grey and dark grey.
				61.00	-4				WEATHERED ROCK: SHALE; highly weathered; inferred very low strength; grey and dark grey.
				60.00	-5				
				59.00	-6				
				58.00	-7				
				57.00	-8				
				56.20	-9				END OF BOREHOLE AT 8.20 m

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This borehole log should be read in conjunction with WSP's accompanying standard notes.



# BOREHOLE ENGINEERING LOG

BOREHOLE NO.

## MW204

SHEET 1 OF 1

Client:	<b>Charter Hall Holdings Pty Ltd</b>	Date Commenced:	<b>5-10-21</b>
Project:	<b>Compass 2 Warehouse &amp; Distribution Centre</b>	Date Completed:	<b>5-10-21</b>
Borehole Location:	<b>Lot 1 Eastern Creek Drive, Eastern Creek</b>	Recorded By:	<b>DI</b>
Project Number:	<b>PS127384</b>	Log Checked By:	<b>AM</b>

Drill Model/Mounting:	<b>Massenza MI2</b>	Driller:		Surface RL:	<b>62.59 m mAHD</b>
Borehole Diameter:	<b>100 mm</b>	Driller Lic No:		Co-ords:	<b>E 300032.78 N 6257017.52 MGA94 56</b>

Borehole Information							Field Material Description		
2	3	4	5	6	7	8	9		
METHOD	SUPPORT	WATER	WELL CONSTRUCTION TOC 63.55 m AGL	RL(m) mAHD	DEPTH(m)	Field Test	SAMPLE	GRAPHIC LOG	SOIL/ROCK MATERIAL FIELD DESCRIPTION
Auger - Two Pronged Blade-bit	NII								FILL: Sandy CLAY; low plasticity; brown; fine grain sand; with silt and sub-angular road base and siltstone gravels. FILL: Sandy CLAY; medium plasticity; pale brown, orange and grey; fine to medium grain sand; trace sub-rounded ironstone gravels. RESIDUAL SOIL: Silty CLAY; medium plasticity; dark brown; with fine grain sand. RESIDUAL SOIL: Sandy CLAY; medium plasticity; orange-brown and grey; fine to medium grain sand; trace sub-rounded ironstone gravels. WEATHERED ROCK: SILTSTONE; highly to extremely weathered; inferred very low strength; grey and brown. END OF BOREHOLE AT 7.20 m
				62	-1				
				61	-2				
				60	-3				
				59	-4				
				58	-5				
				57	-6				
				56	-7				
				55	-8				
				54	-9				

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This borehole log should be read in conjunction with WSP's accompanying standard notes.