Application for Planning Approval

Land Use Planning and Approvals Act 1993

APPLICATION NO.

DA2024/244

LOCATION OF AFFECTED AREA

73 GREENBANKS ROAD & 23 WEILY PARK ROAD, BRIDGEWATER

DESCRIPTION OF DEVELOPMENT PROPOSAL

ELECTRICAL RETICULATION SERVICES & ASSOCIATED SERVICES

A COPY OF THE DEVELOPMENT APPLICATION MAY BE VIEWED AT www.brighton.tas.gov.au AND AT THE COUNCIL OFFICES, 1 TIVOLI ROAD, OLD BEACH, BETWEEN 8:15 A.M. AND 4:45 P.M, MONDAY TO FRIDAY OR VIA THE QR CODE BELOW. ANY PERSON MAY MAKE WRITTEN REPRESENTATIONS IN ACCORDANCE WITH S.57(5) OF THE LAND USE PLANNING AND APPROVALS ACT 1993 CONCERNING THIS APPLICATION UNTIL 4:45 P.M. ON **28/04/2025**. ADDRESSED TO THE CHIEF EXECUTIVE OFFICER AT 1 TIVOLI ROAD, OLD BEACH, 7017 OR BY EMAIL AT development@brighton.tas.gov.au. REPRESENTATIONS SHOULD INCLUDE A DAYTIME TELEPHONE NUMBER TO ALLOW COUNCIL OFFICERS TO DISCUSS, IF NECESSARY, ANY MATTERS RAISED.

JAMES DRYBURGH
Chief Executive Officer

SCAN ME

Brighton
going places

73 GREENBANKS ROAD, BRIDGEWATER

ireneinc & smithstreetstudio
PLANNING & URBAN DESIGN

PLANNING TAS PTY LTD TRADING AS IRENEINC PLANNING & SMITH STREET STUDIO PLANNING & URBAN DESIGN ABN 78 114 905 074

73 GREENBANKS ROAD, BRIDGEWATER

Development application for Utilities

Last Updated – December 2024
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1. INTRODUCTION

Ireneinc Planning & Urban Design has been engaged to prepare an application for the use and development of minor utilities at 73 Greenbanks Road, Bridgewater. This report provides an assessment of the proposal against the provisions of the *Tasmanian Planning Scheme – Brighton*.

The following documentation accompanies this report.

- Title documentation
- DAME supporting brief – use class
- General managers consent request
- Schematic design report, Pitt and Sherry, 19 December 2024, REV 00
- Landowner notification to CT 52510/1

1.1 THE SITE

The land, owned and operated by the client, DAME technologies, is a total of 2.037ha in size and comprises of the following title:

- CT 153305/1

Figure 1: Extent of site area in red (source: the LISTmap, 2024)

The proposal includes connections to the substation at 23 Weily Park Road, and as such, the following title also forms part of the site area:

- CT 52510/1

Figure 2: Extent of site area in red (source: the LISTmap, 2024)

Formal access to the site is via Greenbanks road, along the northern boundary of the lot.

The land is currently vacant, aside from the southern portion of the site that has, until recently, been utilised as a laydown area for heavy vehicles associated with adjoining 21 Weily Park.

Whilst there is an existing service road occurring along the northeastern boundary of the site, conversations with Council have confirmed that this was constructed as part of a planned 9-lot subdivision that is no longer proposed to occur. As such, the extent of Greenbanks Road that occurs within the title's boundary is not public road, and instead forms part of the site's internal driveway.

1.2 EASEMENTS

There are several easements across the site, including electricity transmission lines, leading to a substation adjoining the southwestern boundary.

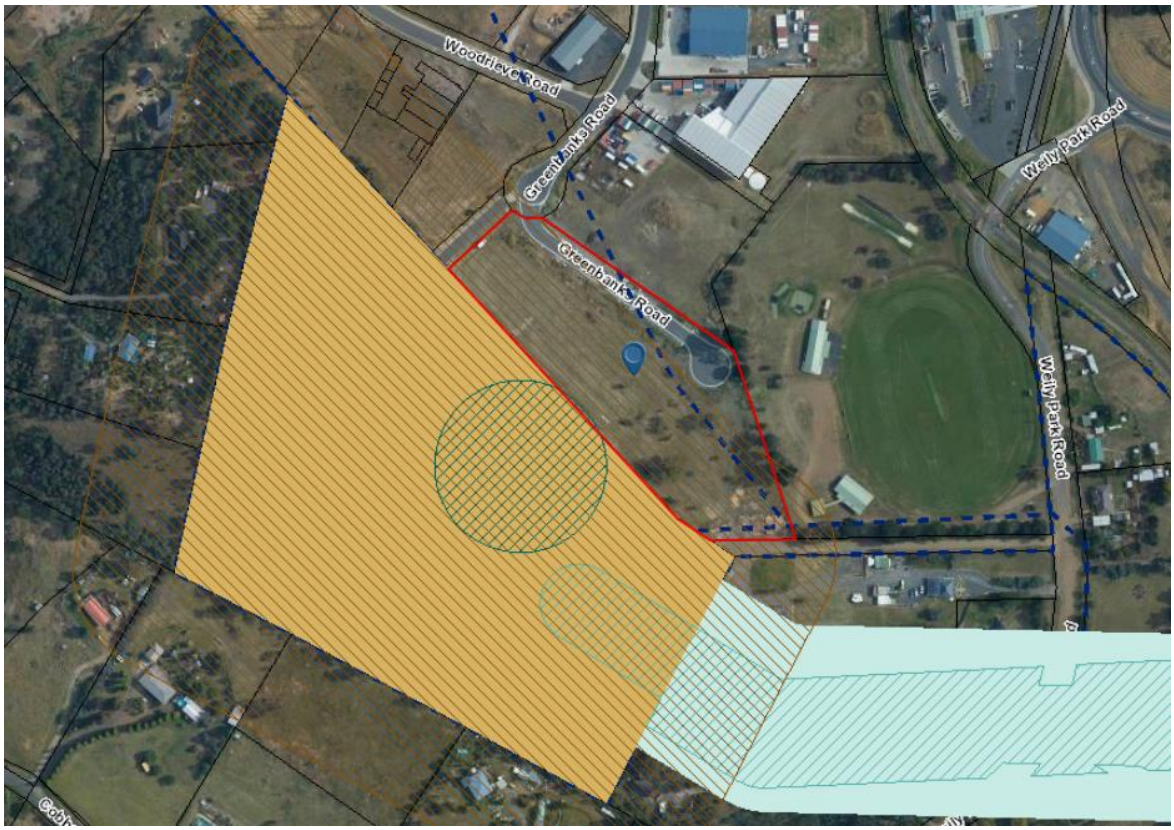

Figure 3: Electricity transmission corridor (source: the listmap, 2024)

There are also two TasWater pipeline easements occurring along the southwestern boundary of the site, as demonstrated on the Schedule of Easements for the property.

1.3 SURROUNDING USE AND DEVELOPMENT

The site is bordered to the west and south by the TasNetworks Bridgewater Substation, to the east by Weily Park, and to the north-east by various industrial developments.

2. THE PROPOSAL

2.1 BACKGROUND INFORMATION AND DEFINITIONS

The following information is to be read in conjunction with the accompanying submission from the proponent. This brief will provide a summary of the supporting document, with explanations of the proposed use and development.

ELECTRICAL GRID

An electrical grid typically comprises of three main components:

- Generation: Facilities where electricity is produced, such as power plants using coal, natural gas, nuclear energy, hydroelectric dams, wind turbines, and solar panels.
- Transmission: High-voltage transmission lines carry electricity over long distances from generation sites to areas where the electricity will be consumed.
- Distribution: Distribution networks operate at lower voltages and deliver electricity directly to homes, businesses, and other end-users.

The electrical grid must maintain a constant balance between electricity supply (generation) and demand (consumption) for the electrical grid to function effectively.

ENERGY RETICULATION

Traditional energy reticulation refers to the systems and processes involved in distributing and managing electrical energy from generation sources to end-users, including physical infrastructure (like transmission lines and transformers), operational management (such as grid control systems), and regulatory frameworks.

Modern energy reticulation integrates enhanced infrastructure with digital technologies for real-time monitoring, advanced grid management, and market mechanisms for energy trading. Consumers play an active role as prosumers (ie consumers are both generating and sharing energy, participating in demand response, and utilising energy storage solutions).

FCAS PROVIDER

Frequency Control Ancillary Services (FCAS) are specialised services that grid operators use to keep the electricity system running smoothly within specific frequency limits. FCAS helps the grid quickly adjust when there are imbalances between how much electricity is being used and how much is being produced. The National Electricity Rules (NER) set the obligations and standards for FCAS providers, and the Australian Energy Market Operator (AEMO) manages the FCAS markets.

Within modern Power systems, FCAS will become an increasingly important part of the electrical grid system. The purpose of FCAS is to adjust consumption and generation rapidly to enhance the grids flexibility and resilience.

The purpose of the proposal is to become a registered FCAS provider.

INTERRUPTABLE FACILITIES

Interruptible facilities are essential participants in FCAS due to their ability to adjust consumption or generation rapidly to enhance the grid's flexibility and resilience.

While not traditional infrastructure, interruptible facilities integrate into grid infrastructure. They can change how much electricity they use or produce, which influences energy flow, much like

substations and transformers do. Interruptible facilities connect to the distribution network in several ways:

- Direct Control by Grid Operators: Some facilities let grid operators directly manage their energy use or production.
- Automated Demand Response: These facilities automatically adjust their energy use when there are changes in grid frequency, without needing any manual control.
- Participation in Energy Markets: Facilities can offer their capacity in energy markets, actively contributing to the energy system.

There are several different interruptible facility systems that could occur onsite, and the exact system will not be finalised until a later date. Example of systems include:

- Supervisory Control and Data Acquisition (SCADA) monitor and control industrial processes, allowing facilities to adjust operations rapidly in response to grid signals.
- Energy Management Systems (EMS) optimise energy usage within a facility, aligning with grid requirements to provide demand response capabilities.
- Automated Demand Response (ADR) technologies facilitate automatic load adjustments without human intervention.

Interruptible facilities are essential participants in FCAS, due to their ability to adjust consumption or generation rapidly to enhance the grid's flexibility and resilience. These interruptible facilities are directly subservient to the primary function of the infrastructure, which is energy reticulation. Interruptible facilities are considered part of energy reticulation for several reasons:

- Interruptible facilities are active grid management to help with transition to renewable energy.
- Interruptible facilities are integral to energy reticulation because they actively participate in grid management, helping balance demand and enhance grid reliability.
- These facilities, which include systems that can adjust consumption or generation, integrate into the distribution network through direct control by grid operators, automated demand response, and participation in energy markets.
- They contribute to demand-side management by engaging in peak shaving, load shifting, and supporting renewable energy integration.
- Their flexibility provides rapid response capabilities, frequency regulation, and contingency support, crucial for managing grid stability, especially with increased renewable energy.
- Regulatory frameworks recognise these facilities as key components of energy reticulation, offering market incentives and ensuring safe integration through standards and aggregation rules.

2.2 THE PROPOSAL

The proposal is for the use and development of electrical reticulation services and associated services. This infrastructure will include a grid of 11 data unit ‘modules’ which will connect to the electricity substation to the southwest of the site. These modules (known as interruptible facilities) will be within prefabricated containers located onsite.

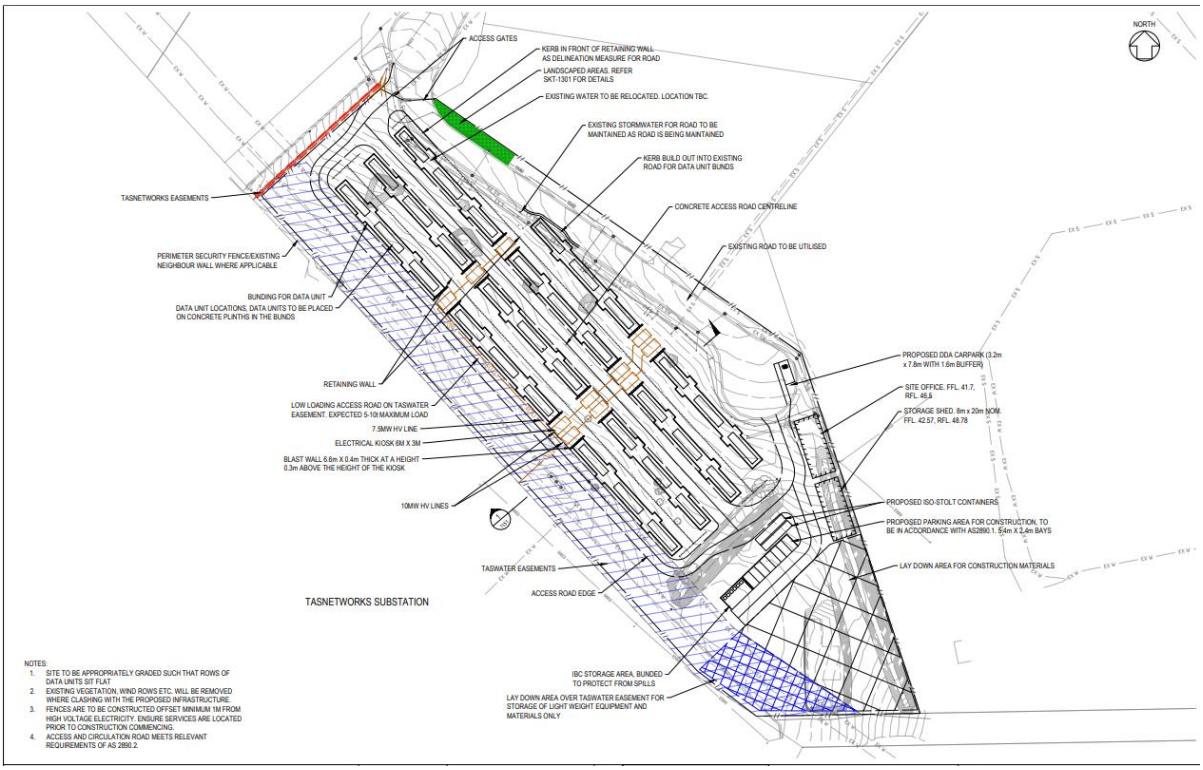

Figure 4: Schematic design and general arrangement (source: pitt and sherry schematic design report, 2024)

USE

The use is proposed to be classified as energy reticulation (utilities) as follows.

Currently there is no active management mechanism within the electricity grid architecture to accommodate for increasing renewable energy. Through the transition to renewable energies, there will be large fluctuations in energy generation that will tip the supply demand balance. This will result in energy being wasted rather than stored.

The purpose of the proposal is to maximise electricity use during off-peak times and minimise it during peak times. In doing so, the development will provide for energy reticulation to contribute to the efficiency and sustainability of existing local infrastructure. This grid stabiliser will absorb supply demand mismatches to assist with the future transition to renewable energies. It is formally known as an Active Grid Response (AGR), that is designed to integrate within the existing network.

The computational power component of the proposal (the data modules), as a subsidiary use to the stabiliser, will be used to provide interruptible compute power. This component of the use is a lower priority, non-guaranteed aspect of the operation. The modules will be cooled by an immersion Cooling Fluid system, with further details provided in the accompanying schematic design report by Pitt & Sherry.

At the core of the proposal by DAME is the service related to Frequency Control Ancillary Services (FCAS), which is guaranteed service to the Australian Energy Market Operator (AEMO). It is important to emphasise that this is DAME's only guaranteed service while providing computational power for a third-party client. If DAME were unable to meet the service standards of AEMO and the Australian Energy Regulator (AER), there would be substantial recourse (fines and removal from the market) due to the strict standards assigned to being an FCAS provider.

DEVELOPMENT

The proposal comprises of the following works and development:

- An 8m x 20m storage shed constructed in tin with a maximum of 6.87m above NGL.
- An 8m x20m prefabricated structure to be utilised as the site office. This will include amenities for workers. The building will be a maximum of 5.97m above NGL.
- 11 data modules that will be housed within prefabricated containers. Details of these data units, as well as the immersion-cooling fluid, are described in detail within the schematic design report provided by Pitt and Sherry. These containers will reach a maximum height of 3.5m from NGL.
- A switch room that is approximately 3.5m tall, 3.0m wide and 6.0m long. This will house the transformers as descried within the schematic design report.
- Car parking for 8 vehicles will be provided, as well as a circulation driveway, and a laydown area. One additional DDA accessible car parking space will be provided in the vicinity of the site office.
- An 1800mm tall chain mesh fence is proposed along the site boundary. Along the frontage, two pairs of dual remote-controlled access gates will be provided, one for entry, and one for egress. The gates will be 2.4m tall. A control panel for the access gate is proposed to be located within the road reserve adjacent the existing private access road. General Managers Consent for these works within the road reserve form part of this application.
- The works occuring on the adjoining property will be limited to electrical connectivity for the site. TasNetworks will provide two staged connection points within the substation (across the land at 23 Weily Park Road), a 10MVA connection on 11kVA bus switchboard, and 10MVA and 7.5MVA connections on 11kVB bus switchboard. 11kV cables will be provided between the substation and the facility, although it has not yet been ascertained as to whether these will be underground or overhead. Details of works to occur will be provided under the schematic design for electrical engineering, which is to be provided under a separate cover.
- Other associated works, including retaining walls, bunds beneath the modules, plinths, hardstand areas, and safety barries. Details of these developments are provided in section 4.10 of the accompanying Schematic Design report.

This utilities infrastructure will connect directly to the TasNetworks Bridgewater Substation via HV lines. As a Frequency Control Ancillary Service provider, it will support grid stabilisation within standard operational limits. In response to frequency drops, it will reduce consumption to restore balance, while frequency increases will prompt a decrease in generation or an increase in consumption at the facility.

The utilities infrastructure will primarily operate autonomously, with the exception of maintenance staff. Other employees may occasionally be stationed in the site office or shed for administrative tasks or component testing.

3. PLANNING SCHEME PROVISIONS

The following provisions of the *Tasmanian Planning Scheme – Brighton* are relevant to the proposal.

3.1 UTILITIES

The site is located within the General Industrial Zone is adjoined by similarly zoned land to the north, utilities to the west and recreation to the east.

3.2 CATEGORISING USE OR DEVELOPMENT

The proposal is for energy reticulation infrastructure which includes interruptible facilities (aka software modules) as a component of this function. While not traditional infrastructure, these facilities integrate into the operational fabric of the grid. Their ability to adjust consumption or generation affects the flow of electricity, like how substations or transformers or batteries manage energy distribution. The software modules provided onsite, as discussed above, form part of this reticulation function/active management of electricity.

The following provisions outline how use is to be categorised, with an assessment of the most appropriate use class provided under section 3.2.1 of this report.

6.2.1 Each proposed use or development must be categorised into one of the Use Classes in Table 6.2.

6.2.2 A use or development that is directly associated with and a subservient part of another use on the same site must be categorised into the same Use Class as that other use.

6.2.3 If a use or development fits a description of more than one Use Class, the Use Class most specifically describing the use applies.

6.2.4 If a use or development does not readily fit any Use Class, it must be categorised into the most similar Use Class.

6.2.5 If more than one use or development is proposed, each use that is not directly associated with and subservient to another use on the same site must be individually categorised into a Use Class.

6.2.6 Notwithstanding sub-clause 6.2.1 of this planning scheme, development which is for subdivision, a sign, land filling, retaining walls or coastal protection works does not need to be categorised into one of the Use Classes.

3.2.1 USE STATUS

Clause 6.2 requires a use or development to be categorised into the most applicable Use Class. The most appropriate categorisation for this proposal is the Utilities Use Class, defined as:

use of land for utilities and infrastructure including:

(a) telecommunications;

(b) electricity generation;

(c) transmitting or distributing gas, oil, or electricity;

(d) transport networks;

(e) collecting, treating, transmitting, storing or distributing water; or

(f) collecting, treating, or disposing of storm or floodwater, sewage, or sullage.

Examples include an electrical sub-station or powerline, gas, water or sewerage main, optic fibre main or distribution hub, pumping station, railway line, retention basin, road, sewage treatment plant, storm or flood water drain, water storage dam and weir.

The definition of utilities includes electricity transmission and generation but does not specifically reference reticulation. Nonetheless, electricity transmission infrastructure is defined as the scheme as:

means infrastructure for or associated with the transmission of electricity. It includes overhead lines, underground electricity and communication cables, substations, communications station, buildings, structures and access tracks for or associated with the transmission of electricity, and the like

The proposal involves active grid management by using data modules that adjust to supply and absorb demand mismatches, thereby contributing to the electrical reticulation system. The data modules adjust consumption and/or generation to affect the flow of electricity, similar to how substations or transformers manage energy distribution. The function is also comparable to a stormwater detention system that temporarily stores water and controls distribution back into the network.

The proposed use is not directly associated with or subservient to another use on the site but is associated with the adjoining electricity network. The software modules are directly associated with, and entirely subservient to, the primary use of the site, which is electrical reticulation infrastructure. Therefore, in accordance with clause 6.2.2 of the planning scheme, the proposal should be categorised within the utilities use class. The use does not align with any other Use Class more closely than Utilities. Per Clause 6.2.3, it must therefore be categorised within the Utilities Use Class.

Further to the above assessment, it is also critical to determine whether the proposal meets the definition of Minor Utilities to determine the appropriate assessment pathway. Under the General Industrial zoning, utilities use does not require a permit if for minor utilities, otherwise permitted.

Minor utilities is defined by the scheme as:

means use of land for utilities for local distribution or reticulation of services and associated infrastructure such as a footpath, cycle path, stormwater channel, water and sewer pipes, retention basin, telecommunication lines, gas pipelines or electricity substations and power lines up to but not exceeding 110kV.

Key characteristics of this definition is that it includes local distribution or reticulation of services whereby the voltage maximum is 110kV.

The proposed use involves active grid management to respond to local demand fluctuations. The software modules maximise electricity use during off-peak times and minimise it during peak times, such as during power outages, or grid balancing. The scale (under the stipulated 110kV threshold) and nature of the infrastructure (transformers, underground cables, and other necessary electrical equipment) align with the characteristics of minor utility services.

This 11kV threshold has been verified by TasNetworks, a key stakeholder in the project responsible for all works outside the site boundary. Therefore, the proposal aligns with the definition of Minor Utilities within the Utilities Use Class.

3.2.2 USE STANDARDS

The following provisions are not applicable to the proposal:

- 19.3.1 Discretionary uses

3.2.3 DEVELOPMENT STANDARDS FOR BUILDINGS AND WORKS

19.4.1 Building height

***Objective**: To provide for a building height that:* *(a) is necessary for the operation of the use; and* *(b) minimises adverse impacts on adjoining properties.*
SCHEME REQUIREMENTS
A1 *Building height must be not more than 20m.*
COMMENTS

Under the scheme, a building is defined as:

(a) a structure and part of a building or structure; and

(b) fences, walls, out-buildings, service installations and other appurtenances of a building; and

(c) a boat or a pontoon which is permanently moored or fixed to land;

Two buildings are proposed onsite, one will be utilised as a storage shed and the other will be offices and amenities for workers.

Staff will only attend the site for maintenance, and both buildings are non-habitable. These buildings are directly subservient to the utilities operation of the site.

The 11 data modules will be sited within prefabricated structures and are therefore classified as buildings for the purpose of this application.

The height of the buildings onsite are as follows:

- The storage shed will reach a maximum of 6.21m from NGL. Please refer to appendix H for cross sections of the prefabricated shed.
- The office will be 5.97m from NGL. Please refer to appendix I for cross sections of the prefabricated sheds.
- The prefabricated structures housing the modules will reach a max height of 3.5m. Please refer to typical section for height of modules from NGL.

The proposal therefore complies with the acceptable solutions.

19.4.2 Setback

***Objective**: That the building setback is appropriate for the site.*

SCHEME REQUIREMENTS

A1

Buildings must have setback from a frontage of:

(a) not less than 10m;

(b) not less than existing buildings on the site; or

(c) not more or less than the maximum and minimum setbacks of the buildings on adjoining properties.

P1

Buildings must have a setback from a frontage that provides adequate space for vehicle access, parking and landscaping, having regard to:

(a) the topography of the site;

(b) the setback of buildings on adjacent properties; and

(c) the safety of road users.

COMMENTS

A1

The proposed buildings are setback over 10m from the road front, thereby complying.

19.4.3 Landscaping

***Objective**: That landscaping enhances the amenity and appearance of the streetscape where buildings are setback from the frontage.*

SCHEME REQUIREMENTS

A1

If a building is set back from a road, landscaping treatment must be provided along the frontage of the site:

(a) to a depth of not less than 6m; or

(b) not less than the frontage of an existing building if it is a lesser distance.

P2

If a building is setback from a road, landscaping treatment must be provided along the frontage of the site, having regard to:

(a) the width of the setback;

(b) the width of the frontage;

(c) the topography of the site;

(d) existing vegetation on the site;

(e) the location, type and growth of the proposed vegetation; and

(f) any relevant local area objectives contained within the relevant Local Provisions Schedule.

COMMENTS

A1

Due to the layout of the frontage, landscaping cannot be provided to a required depth of 6m. As such assessment against the performance criteria will be required.

P1

Approximately 120m2 of landscaping treatment will be provided along the frontage of the site.

a) Landscaping is provided where possible towards the frontage. It is proposed primarily between the existing access driveway onsite and the site boundary.

b) The lot has a frontage that is 20m wide, however, 12m of this is already developed with an existing vehicular crossover and pedestrian pathway.

c) The land is relatively flat, with a topographic gradience of approximately 6m from the southwestern to the northeastern boundary.

d) The site is currently unvegetated, aside from a handful of trees located within the southern portion of the site.

e) TASVEG mapping indicates the land is modified urban land. No threatened species are identified under the LISTmap.

An indicative landscaping plan has been provided. This demonstrates the extent of tree removal across the site, the area proposed to be landscaped, and indicates the types of plants to be proposed. Further details regarding the type and growth of proposed vegetation can be provided upon request from Council.

f) There are no local area objectives under the LPS relevant to the proposal.

3.3 BRI-S10.0 - BRIGHTON INDUSTRIAL HUB SPECIFIC AREA PLAN

This applies to:

BRI-S10.2.1	*The specific area plan applies to the area of land designated as Brighton Industrial Hub Specific Area Plan on the overlay maps.*
BRI-S10.2.2	*In the area of land this plan applies to, the provisions of the specific area plan are in substitution for the provisions of the Attenuation Code, as specified in the relevant provision.*

This use clause only relates to sensitive uses and is therefore not applicable.

3.4 BRI-S4.0 -BRIDGEWATER QUARRY SPECIFIC AREA PLAN

The eastern portion of the site is subject to the Bridgewater Quarry SAP, as demonstrated below.

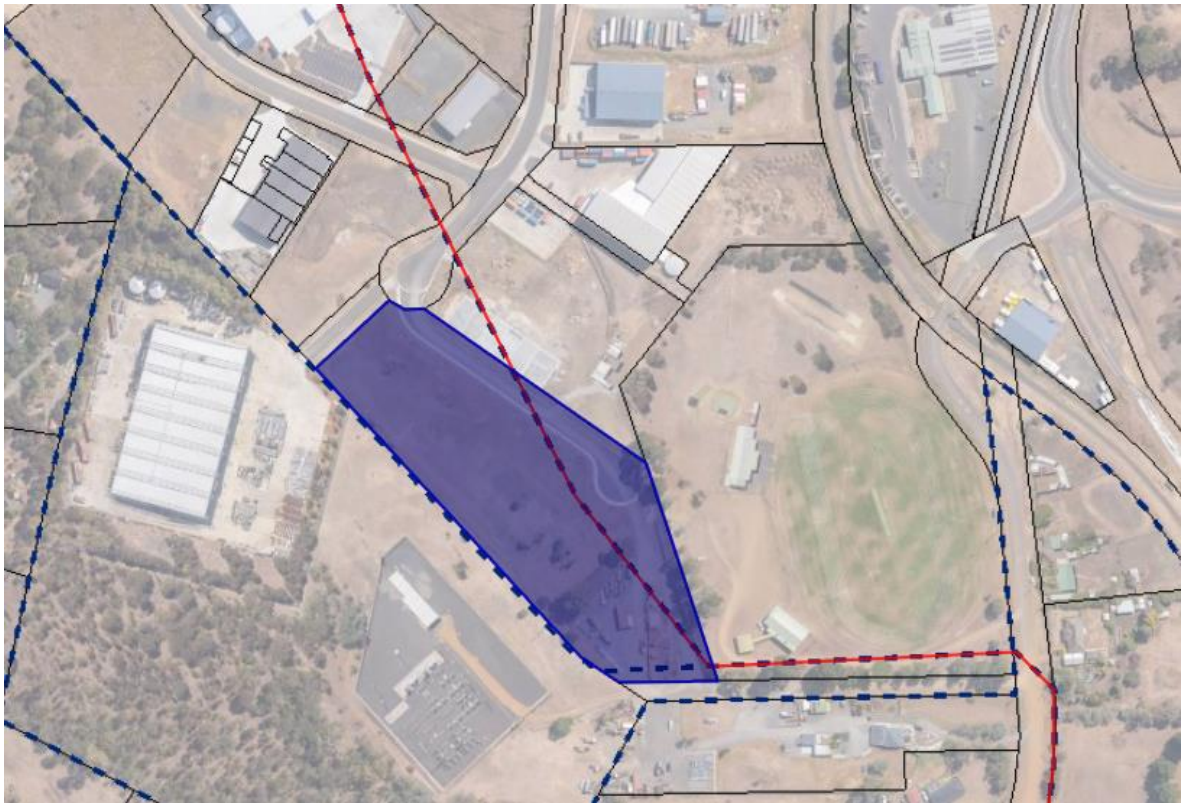

Figure 5: extent of SAP outlined in red (source: the LISTmap, 2024)

This code applies to:

BRI-S4.2.1	*The specific area plan applies to the area of land designated as Bridgewater Quarry Specific Area Plan on the overlay maps.*
BRI-S4.2.2	*In the area of land this plan applies to, the provisions of the specific area plan are in substitution for, and are in addition to the provisions of: (a) Attenuation Code, as specified in the relevant provision.*

3.4.1 USE STANDARDS

Use standards relate to a sensitive use and are therefore not applicable.

3.4.2 DEVELOPMENT STANDARDS

This clause is in addition to clause C9.0 Attenuation Code.

***Objective**: That development is compatible with the operations of the Bridgewater Quarry.*
SCHEME REQUIREMENTS

A1

No Acceptable Solution.

P1

Buildings and works must not result in potential to interfere or conflict with quarry operations having regard to:

(a) the nature of the quarry; including:

(i) operational characteristics;

(ii) scale and intensity;

(iii) degree of hazard or pollution that may be emitted from the activity;

(b) the degree of encroachment of development or use into the Bridgewater Quarry Attenuation Area; and

(c) measures in the design, layout and construction of the development to eliminated, mitigate or manage effects of the quarry; and

(d) any advice from the Bridgewater Quarry operator.

COMMENTS

P1

The quarry this provision relates to is the Boral Quarry. A meeting was held with the quarry operators on 10th December 2024, during which discussions focused on the potential impacts of the proposed development on the quarry operations, and vice versa.

IMPACTS ON THE QUARRY

It was confirmed that the proposal would not interfere with or impact the operational characteristics of the quarry, nor would it have any material impact on its activities (ie scale, intensity).

IMPACTS ON THE PROPOSAL

The quarry is located approximately 1.1 km from the site boundary, and no pollution is anticipated to affect the proposed development.

The only potential impact identified is the effect of ground vibrations from quarry blasting on the proposed development. Following discussions with the quarry operator, it was advised that all buildings and structures on the site be designed to withstand ground vibrations from blasting up to approximately 5mm/s in intensity. As such, any necessary building specifications to accommodate these vibration tolerances will be incorporated into the detailed design phase of the proposal.

The proposed development will also include measures in its design, layout, and construction to eliminate, mitigate, or manage any effects arising from the proximity of the quarry, in line with the advice provided by the quarry operator.

3.5 CODES

3.5.1 ATTENUATION AREA

A portion of the site is subject to the attenuation code, as demonstrated below:

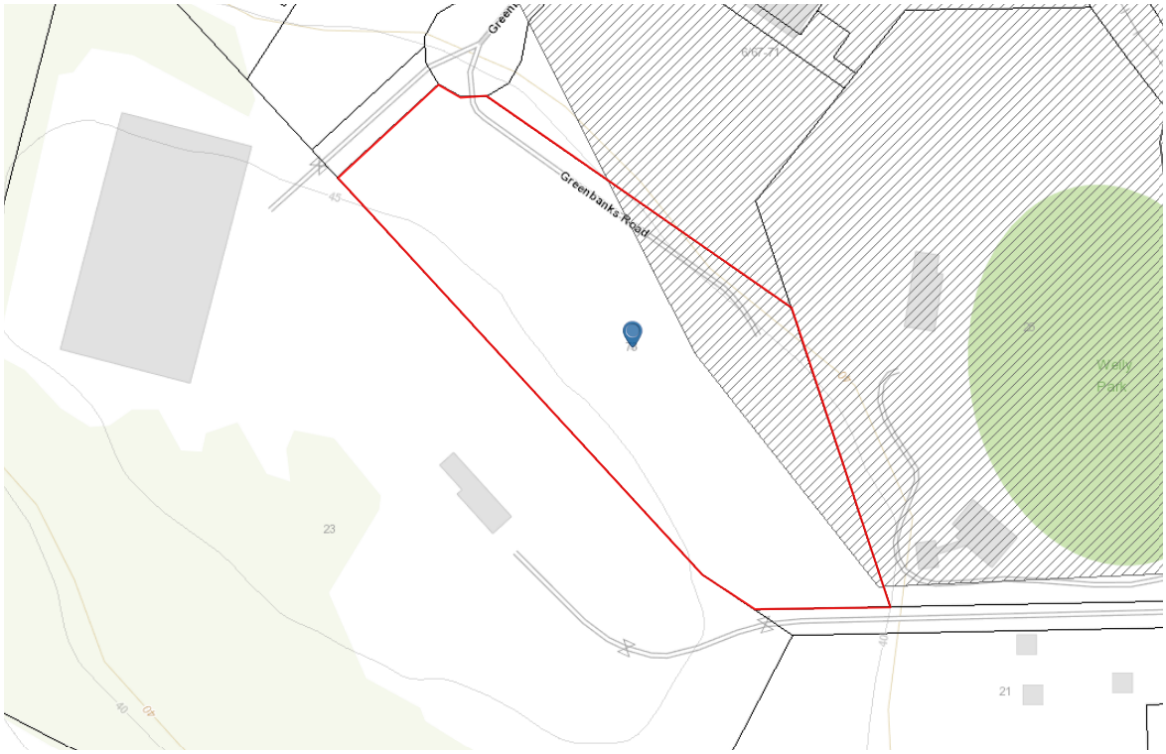

Figure 6: extent of attenuation area (hatched black lines) (source: the listmap, 2024)

This code applies to the list of activities in tables C9.1 and C9.2, sensitive uses and subdivision. As none of these relate to the proposal, the provisions of this code are not applicable.

3.5.2 ELECTRICITY TRANSMISSION CORRIDOR

The majority of the site is subject to the to the electricity transmission infrastructure protection code - substation facility buffer area, as demonstrated in the below figure.

Figure 7: electricity transmission protection area - hatched black lines (source: the listmap, 2024)

Nonetheless, the following exemption is considered relevant to the proposal:

C4.4.1 The following use or development is exempt from this code:

Xx

xx

(d) use or development of electricity transmission infrastructure;

As described in section 3.2.1 of this report, it is considered that the proposal is able to satisfy the definition of electricity transmission infrastructure and is therefore considered to be exempt.

Nonetheless, DAME has engaged Tas Net Connections, a subsidiary of TasNetworks, to design the HV connection and take ownership of transformer maintenance post construction. TasNetworks will provide two staged connection points within the substation, a 10MVA connection on 11kVA bus switchboard, and a 10MVA connection on 11kVB bus switchboard. 11kV cables will be provided between the substation and the facility, although it has not yet been ascertained as to whether these will be underground or overhead.

3.5.3 BUSHFIRE-PRONE AREAS CODE

The entirety of the site is covered by the Bushfire-Prone Area Code as demonstrated in the below figure. This code applies to subdivision, a hazardous or vulnerable use.

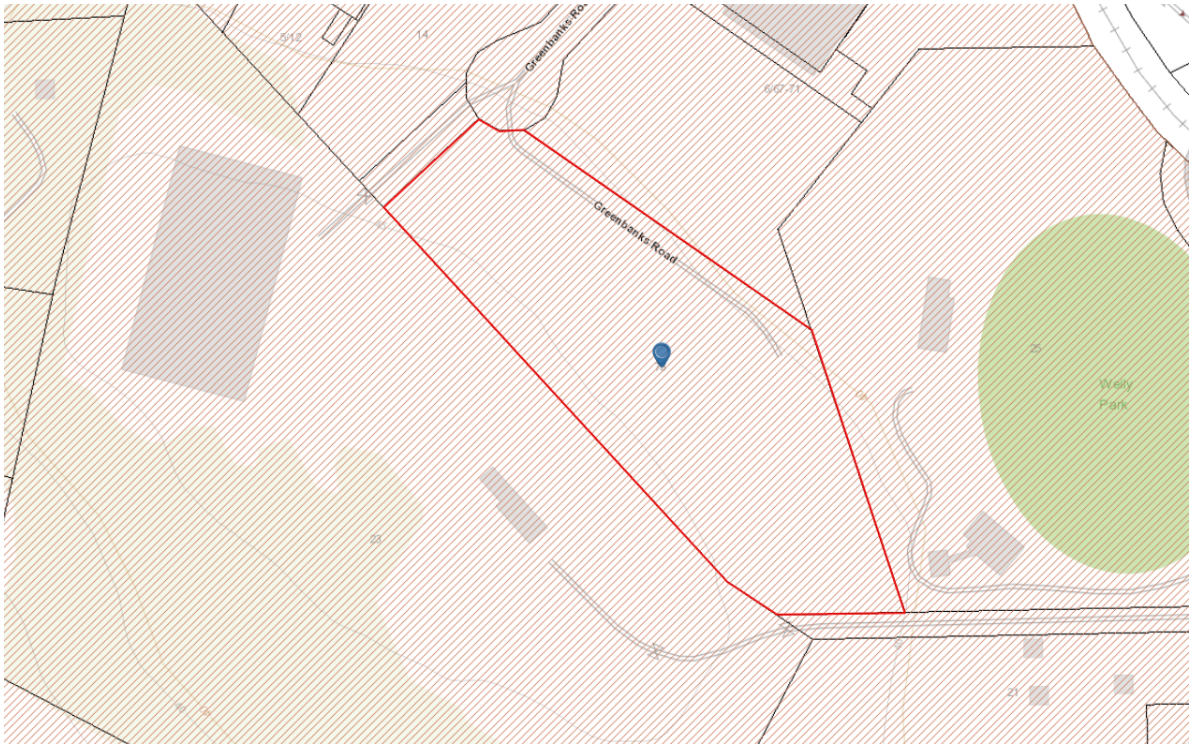

Figure 8: Bushfire-prone area (hatched orange lines) (source: the LISTmap, 2022)

The proposal does include a coolant fluid that surrounds the software modules. Please refer to safety data sheet and technical data sheet attached for details regarding quantity and composition of chemicals. As per section 4.9 of the schematic design report, the chemicals are under manifest quantities, and as no hazardous use is occurring, this code is not applicable.

3.5.4 ROAD AND RAILWAY ASSETS CODE

This code applies to use and development that will increase the amount of vehicular traffic to and from the site. The proposal will not likely result in an increase in vehicular traffic, as the site will only be attended for maintenance purposes. Nonetheless, an assessment against the relevant provisions is provided below.

3.5.5 USE STANDARDS

C3.5.1 Traffic generation at a vehicle crossing, level crossing or new junction
Objective: *To minimise any adverse effects on the safety and efficiency of the road or rail network from vehicular traffic generated from the site at an existing or new vehicle crossing or level crossing or new junction.*
A1.1 *For a category 1 road or a limited access road, vehicular traffic to and from the site will not require:* *(a) a new junction;* *(b) a new vehicle crossing; or* *(c) a new level crossing.* ***A1.2*** *For a road, excluding a category 1 road or a limited access road, written consent for a new junction, vehicle crossing, or level crossing to serve the use and development has been issued by the road authority.*

A1.3

For the rail network, written consent for a new private level crossing to serve the use and development has been issued by the rail authority. A1.4 Vehicular traffic to and from the site, using an existing vehicle crossing or private level crossing, will not increase by more than:

(a) the amounts in Table C3.1; or

(b) allowed by a licence issued under Part IVA of the Roads and Jetties Act 1935 in respect to a limited access road. A1.5 Vehicular traffic must be able to enter and leave a major road in a forward direction.

A1.4

Vehicular traffic to and from the site, using an existing vehicle crossing or private level crossing, will not increase by more than:

(a) the amounts in Table C3.1; or

(b) allowed by a licence issued under Part IVA of the Roads and Jetties Act 1935 in respect to a limited access road.

A1.5

Vehicular traffic must be able to enter and leave a major road in a forward direction.

COMMENTS

A1.1

Not applicable to the proposal.

A1.2

Whilst the existing access is proposed to be upgraded, no new accesses or junctions are proposed.

A1.3

Not applicable to the proposal.

A1.4

The buildings will primarily be utilised for storage and maintenance for utilities onsite. Given the nature of the development, the proposal will not likely generate more than 40 vehicular movements per day.

A1.5

All vehicular traffic will be able to enter and leave in a forward direction.

3.5.6 DEVELOPMENT STANDARDS

The following provisions are not applicable:

- C3.6.1 Habitable buildings for sensitive uses within a road or railway attenuation area

3.5.7 PARKING AND SUSTAINABLE TRANSPORT CODE

The purpose of this code is to ensure that appropriate parking is provided to service the proposed use or development. This code applies to all use and development.

3.5.8 USE STANDARDS

C2.5.1 Car Parking Numbers

Objective: That an appropriate level of car parking spaces are provided to meet the needs of the use
A1 *The number of on-site car parking spaces must be no less than the number specified in Table C2.1, less the number of car parking spaces that cannot be provided due to the site including container refund scheme space, excluding if:* *(a) the site is subject to a parking plan for the area adopted by council, in which case parking provision (spaces or cash-in-lieu) must be in accordance with that plan;* *(b) the site is contained within a parking precinct plan and subject to Clause C2.7;* *(c) the site is subject to Clause C2.5.5; or* *(d) it relates to an intensification of an existing use or development or a change of use where:* *(i) the number of on-site car parking spaces for the existing use or development specified in Table C2.1 is greater than the number of car parking spaces specified in Table C2.1 for the proposed use or development, in which case no additional on-site car parking is required; or* *(ii) the number of on-site car parking spaces for the existing use or development specified in Table C2.1 is less than the number of car parking spaces specified in Table C2.1 for the proposed use or development, in which case on-site car parking must be calculated as follows: N = A + (C- B) N = Number of on-site car parking spaces required A = Number of existing on site car parking spaces B = Number of on-site car parking spaces required for the existing use or development specified in Table C2.1 C= Number of on-site car parking spaces required for the proposed use or development specified in Table C2.1*
COMMENTS **A1** There are no parking requirements for utilities use. Nonetheless, 8 spaces are provided for workers and maintenance crew.

No bicycle or motorcycle parking requirement is generated by the proposal, as such the following provisions are not relevant to the proposal.

- C2.5.2 Bicycle parking numbers
- C2.5.3 Motorcycle parking numbers
- C2.5.4 Loading Bays
- C2.5.5 Number of car parking spaces within the General Residential Zone and Inner Residential Zone

3.5.9 DEVELOPMENT STANDARDS

C2.6.1 Construction of parking areas
Objective: *That parking areas are constructed to an appropriate standard*
A1 *All parking, access ways, manoeuvring and circulation spaces must:* *(a) be constructed with a durable all weather pavement;* *(b) be drained to the public stormwater system, or contain stormwater on the site; and* *(c) excluding all uses in the Rural Zone, Agriculture Zone, Landscape Conservation Zone, Environmental Management Zone, Recreation Zone and Open Space Zone, be surfaced by a spray*

seal, asphalt, concrete, pavers or equivalent material to restrict abrasion from traffic and minimise entry of water to the pavement.

COMMENTS

A1

A parking area will be provided onsite. This will be designed to comply with the above.

C2.6.2 Design and layout of parking areas

Objective: *That parking areas are designed and laid out to provide convenient, safe and efficient parking*

A1.1

Parking, access ways, manoeuvring and circulation spaces must either:

(a) comply with the following:

(i) have a gradient in accordance with Australian Standard AS 2890 - Parking facilities, Parts 1-6;

(ii) provide for vehicles to enter and exit the site in a forward direction where providing for more than 4 parking spaces;

(iii) have an access width not less than the requirements in Table C2.2;

(iv) have car parking space dimensions which satisfy the requirements in Table C2.3;

(v) have a combined access and manoeuvring width adjacent to parking spaces not less than the requirements in Table C2.3 where there are 3 or more car parking spaces;

(vi) have a vertical clearance of not less than 2.1m above the parking surface level; and

(vii) excluding a single dwelling, be delineated by line marking or other clear physical means; or

(b) comply with Australian Standard AS 2890- Parking facilities, Parts 1-6.

COMMENTS

A1.1

All parking areas will be designed to adhere to the relevant Australian standards.

A1.2

Parking spaces provided for use by persons with a disability must satisfy the following:

(a) be located as close as practicable to the main entry point to the building;

(b) be incorporated into the overall car park design; and

(c) be designed and constructed in accordance with Australian/New Zealand Standard AS/NZS 2890.6:2009 Parking facilities, Off-street parking for people with disabilities

COMMENTS

A1.2

One DDA parking space is provided as close to the office and amenities area as possible.

C2.6.3 Number of accesses for vehicles
***Objective**: That:* *(a) access to land is provided which is safe and efficient for users of the land and all road network users, including but not limited to drivers, passengers, pedestrians and cyclists by minimising the number of vehicle accesses;* *(b) accesses do not cause an unreasonable loss of amenity of adjoining uses; and* *(c) the number of accesses minimise impacts on the streetscape.*
A1 *The number of accesses provided for each frontage must:* *(a) be no more than 1; or* *(b) no more than the existing number of accesses, whichever is the greater.* *Within the Central Business Zone or in a pedestrian priority street no new access is provided unless an existing access is removed.*
COMMENTS **A1** The existing access to the site will be retained.

The remaining provisions are not considered relevant to the proposal:

- C2.6.4 Lighting of parking areas within the General Business Zone and Central Business Zone
- C2.6.5 Pedestrian access
- C2.6.6 Loading bays
- C2.6.7 Bicycle parking and storage facilities within the General Business Zone and Central Business Zone
- C2.6.8 Siting of parking and turning areas

4. CONCLUSION

The proposal is for the use and development of utilities infrastructure, connecting directly to the TasNetworks Bridgewater Substation via high-voltage lines. As a Frequency Control Ancillary Service (FCAS) provider, the proposal will support grid stabilisation, responding to frequency fluctuations by adjusting consumption or generation to restore balance.

The development will include 11 data modules housed in prefabricated containers, designed to absorb supply-demand mismatches. The associated development includes a storage shed, site office, switch room, car parking, and security fencing. The primary function of the development is grid stabilisation, with the data modules providing computational power as an interruptible facility to achieve this.

The facility will operate autonomously, with minimal staff involved for maintenance and administrative tasks.

The site is located within a General Industrial Zone, where minor utilities are NPR, and utilities are a permitted use. It is subject to various codes, including the Attenuation Area code, Electricity Transmission Protection Area code, Bushfire Prone Area code, Road and Railway Assets code, and Parking and Sustainable Transport code. Additionally, the site falls within the Brighton Industrial Hub and Bridgewater Quarry Specific Area plans.

The site is deemed to comply with the relevant provisions as required.

INTERRUPTIBLE LOADS IN THE GRID

Understanding How Interruptible Facilities Provide Energy Reticulation

DAME

Table of Contents

Abstract

The modern electrical grid relies on a complex interplay between supply and demand to maintain stability and efficiency. Frequency Control Ancillary Services (FCAS) play a critical role in this balance by providing mechanisms to manage frequency deviations. This paper explores why facilities with interruptible capabilities participating in FCAS are considered part of energy reticulation. We delve into the technical, regulatory, and operational aspects that integrate these facilities into the broader energy distribution network.

Introduction

The stability of an electrical grid hinges on the precise balance between electricity supply and demand. Frequency Control Ancillary Services (FCAS) are essential mechanisms that help maintain this equilibrium by responding to frequency deviations caused by sudden changes in load or generation.[1] [2] Facilities that participate in FCAS, especially those offering interruptible loads or generation, play a pivotal role in this dynamic.

Energy reticulation refers to the distribution of energy through a network to end-users. Traditionally associated with the physical infrastructure of power lines and substations, the concept has evolved to encompass various components contributing to the distribution and regulation of electrical energy.[3] This paper examines why the interruptible nature of FCAS-participating facilities is considered an integral part of energy reticulation.

Overview of the Electrical Grid

The electrical grid is a vast and intricate network that delivers electricity from producers to consumers. It is one of the most significant engineering achievements of the modern world, enabling the reliable and efficient supply of electricity, which is essential for virtually every aspect of contemporary life—from lighting and heating to powering industries and communication systems.

An electrical grid typically comprises three main components:

- **Generation:** Facilities where electricity is produced, such as power plants using coal, natural gas, nuclear energy, hydroelectric dams, wind turbines, and solar panels.
- **Transmission:** High-voltage transmission lines carry electricity over long distances from generation sites to areas where the electricity will be consumed.
- **Distribution:** Distribution networks operate at lower voltages and deliver electricity directly to homes, businesses, and other end-users.

The Importance of Grid Stability

The electrical grid must maintain a constant balance between electricity supply (generation) and demand (consumption) for the electrical grid to function effectively. This balance is crucial because it affects the grid's frequency - a measure of how fast the alternating current (AC) cycles per second. The standard grid frequency in Australia is 50 Hz, meaning the current changes direction 50 times per second.

Maintaining this frequency within tight tolerances is essential for several reasons:

- **Equipment Protection:** The electrical devices in the network are designed to operate at a constant frequency. Deviations across the network can cause malfunctions or damage.
- **Grid Reliability:** Frequent fluctuations can lead to power outages or large-scale blackouts.
- **Safety:** Consistent frequency ensures the safe operation of the grid and connected equipment.

The Role of FCAS in Grid Stability

Electric power systems operate at a nominal frequency - 50 Hz in Australia and many other countries and 60 Hz in regions like North America. This frequency is a fundamental characteristic of alternating current (AC) systems and is crucial for the proper functioning of electrical equipment and the synchronization of the grid. Frequency stability is vital because deviations can lead to equipment malfunctions, reduced efficiency, and, in extreme cases, widespread blackouts.[3]

The balance between electricity supply and demand directly influences the system's frequency. When generation exceeds demand, the frequency rises; conversely, when demand exceeds generation, the frequency drops. Maintaining this balance is a continuous challenge due to the dynamic nature of consumption patterns and generation availability, especially with the increasing integration of variable renewable energy sources.[4]

What Are Frequency Control Ancillary Services (FCAS)?

Frequency Control Ancillary Services (FCAS) are specialized services procured by grid operators to maintain the system frequency within strict operational limits, typically ±0.15 Hz around the nominal frequency in the Australian National Electricity Market (NEM).[1] FCAS are essential tools that enable the grid to respond swiftly and effectively to imbalances between supply and demand.

FCAS are categorized based on their response times and the nature of the service provided:

- **Regulation FCAS:** These involve continuous, automatic adjustments to generation or load to manage minor fluctuations in frequency and operate second-by-second, using automatic generation control systems to fine-tune the balance between supply and demand.[1]

- **Contingency FCAS:** These are rapid responses activated during significant frequency deviations caused by generator failures or sudden load drops. Contingency service responses are categorised as very fast (1-second), fast (6-second), slow (60-second), and delayed (5-minute), each designed to address different stages of frequency deviation events. [1]

Mechanisms of FCAS Operation

FCAS operates through a combination of pre-arranged agreements and real-time market mechanisms. FCAS providers, including generators, loads, and storage systems, offer their capacity to the grid operator, who dispatches these services to maintain frequency stability.

When a frequency deviation is detected, the grid's control systems automatically signal FCAS providers to adjust their output or consumption. For example:

- **If the frequency drops** (indicating demand exceeds supply), FCAS providers increase generation or reduce consumption to restore balance.
- **If the frequency rises** (indicating supply exceeds demand), providers decrease generation or increase consumption.

These adjustments counteract the imbalance and return the frequency to the nominal value.[5]

Challenges Addressed by FCAS

FCAS addresses several critical challenges in modern power systems:

- **Variability of Renewable Energy Sources:** The increasing penetration of renewable energy sources like wind and solar introduces more significant variability and uncertainty into the grid. FCAS helps mitigate the resulting frequency fluctuations by providing rapid response capabilities.[6]

- **Unexpected Events:** Equipment failures, sudden disconnection of large loads or generators, and other unforeseen events can cause significant frequency deviations. FCAS provides contingency responses to prevent these events from leading to broader system instability or blackouts.[7]

- **Demand Fluctuations:** Consumer behavior can change rapidly due to weather or time of day. FCAS helps manage these demand fluctuations to maintain a stable grid frequency.[8]

Role of Interruptible Facilities in FCAS

Interruptible facilities are essential participants in FCAS due to their ability to adjust consumption or generation rapidly to enhance the grid's flexibility and resilience.[9]

- **Demand Response Participation:** Interruptible loads can reduce electricity consumption in response to frequency deviations or grid operator signals. This reduction acts as a virtual generation increase from the grid's perspective, helping to restore balance.[10]

- **Fast Response Times:** Many interruptible facilities can respond within seconds, making them suitable for providing fast and slow contingency FCAS. Their rapid response prevents frequency deviations from escalating into system-wide issues.[11]

- **Aggregation of Resources:** Smaller interruptible loads can provide significant FCAS capacity. Aggregators pool resources from multiple facilities, creating a coordinated response that the grid operator can dispatch.[12]

Regulatory Framework Supporting FCAS

The provision and utilisation of FCAS are governed by regulatory frameworks that define the technical requirements, market mechanisms, and compensation structures.[13] The National Electricity Rules (NER) set the obligations and standards for FCAS providers, and the Australian Energy Market Operator (AEMO) manages the FCAS markets.[1]

Regulatory support ensures:

- **Quality and Reliability Standards:** Providers meet the technical specifications to deliver effective FCAS.

- **Market Transparency:** The procurement of FCAS is conducted transparently, with pricing mechanisms that reflect the services' value.

- **Encouragement of Participation:** Policies and incentives are in place to encourage a diverse range of participants, including interruptible facilities, to contribute to FCAS.[14]

Economic Implications of FCAS

FCAS not only contributes to grid stability but also has significant economic implications:

- **Cost Savings:** Effective FCAS reduces the need for expensive standby generation capacity by utilizing existing resources more efficiently.[15]
- **Revenue Streams:** Facilities providing FCAS can earn additional income, incentivizing investment in technologies that support grid stability.
- **Market Efficiency:** FCAS markets promote competition among providers, leading to cost-effective solutions for maintaining frequency stability.[16]

Technological Advances Enhancing FCAS

Advancements in technology have expanded the capabilities and effectiveness of FCAS:

- **Smart Grid Technologies:** Enhanced monitoring and control systems allow for real-time management of resources, improving the responsiveness and precision of FCAS.[17]
- **Energy Storage Systems:** Batteries and other storage technologies can provide rapid FCAS responses, absorbing excess energy or supplying additional power.[18]
- **Advanced Communication Protocols:** Reliable and fast communication between the grid operator and FCAS providers is essential for timely responses. Modern protocols and infrastructure support this requirement.[19]

Future of FCAS in Grid Stability

As the energy landscape continues to evolve, FCAS will play an increasingly vital role:

- **Integration with Renewable Energy:** FCAS will facilitate higher levels of renewable energy integration by compensating for their variability.[20]
- **Decentralization of Energy Resources:** With more distributed generation and storage assets, FCAS will harness a more comprehensive array of resources, enhancing flexibility.[21]
- **Enhanced Demand Response:** Advances in automation and control will enable more consumers to participate in FCAS, expanding the pool of interruptible facilities.[22]

Energy Reticulation Defined

Traditional Energy Reticulation

Energy reticulation involves distributing and managing electrical energy from generation sources to end-users.[1] It encompasses:

- **Physical Infrastructure:** Transmission lines, distribution networks, transformers.
- **Operational Management:** Control systems, grid management practices.
- **Regulatory Frameworks:** Standards and policies governing energy distribution.

Evolution of Energy Reticulation

With advancements in technology and changes in energy policies, energy reticulation has evolved to include:

- **Smart Grids:** Enhanced grids using digital communication technology to detect and react to local changes in usage.[23]
- **Distributed Energy Resources:** Integrating decentralized generation and storage assets into the grid.[24]
- **Demand-Side Management:** Strategies to control and reduce energy consumption on the consumer side.[25]

Components of Modern Energy Reticulation

Modern energy reticulation encompasses:

- **Physical Infrastructure:** Traditional transmission and distribution networks, enhanced with sensors and smart devices.
- **Operational Systems:** Advanced grid management systems, including real-time monitoring and automated control.
- **Regulatory Frameworks:** Policies and regulations that govern energy markets, grid operations, and participation of various resources.[13]
- **Market Mechanisms:** Structures that facilitate the buying and selling of energy and ancillary services, including FCAS.[26]

The Role of Consumers in Energy Reticulation

Consumers are no longer passive recipients of electricity but active participants:

- **Prosumerism:** Consumers generate electricity (e.g., via rooftop solar) and supply excess to the grid.
- **Demand Response Participation:** Adjusting consumption in response to grid needs or price.
- **Energy Storage Utilisation:** Using battery storage systems to manage consumption and support grid operations.

Interruptible Facilities as Components of Energy Reticulation

Interruptible facilities are considered part of energy reticulation for several reasons:

Integration into the Distribution Network

While not traditional infrastructure, these facilities integrate into the operational fabric of the grid. Their ability to adjust consumption or generation affects the flow of electricity, similar to how substations or transformers manage energy distribution.[27]

Interruptible facilities integrate into the distribution network through:

- **Direct Control by Grid Operators:** Some facilities allow grid operators to adjust their consumption or generation directly.[28]
- **Automated Demand Response:** Facilities automatically respond to grid frequency deviations without human intervention.[29]
- **Participation in Energy Markets:** Facilities bid their capacity into ancillary service markets, becoming active participants in energy reticulation.[30]

Contribution to Demand-Side Management

By participating in demand response programs, interruptible facilities help balance the load on the grid. This active grid management is critical to modern energy reticulation, enhancing efficiency and reducing the need for additional infrastructure investment.

Interruptible facilities contribute significantly to demand-side management (DSM)[27]:

- **Peak Shaving:** Reducing consumption during peak demand periods to alleviate stress on the grid.
- **Load Shifting:** Moving energy usage to off-peak times to balance demand.
- **Supporting Renewable Integration:** Adjusting load to match renewable generation profiles, aiding in balancing supply and demand.

Enhancing Grid Flexibility and Reliability

The interruptible nature of these facilities provides grid operators with additional tools to respond to real-time conditions. This flexibility is essential for accommodating the increasing penetration of variable renewable energy sources, which can introduce volatility into the grid by providing:

- **Rapid Response Capabilities:** Interruptible facilities can respond quickly to grid disturbances, improving reliability.

- **Frequency Regulation:** Helping maintain frequency stability through continuous adjustments.
- **Contingency Support:** Providing backup during unexpected events such as generator outages.

Regulatory Recognition

Due to their role in energy distribution and grid support, regulatory bodies often classify interruptible facilities as part of the energy reticulation system. Policies and incentives are structured to encourage their participation in FCAS and other grid services.[13]

Regulatory frameworks recognise interruptible facilities as part of energy reticulation:

- **Market Rules and Incentives:** Policies that enable and encourage participation in FCAS.
- **Standards Compliance:** Requirements for equipment and operations that ensure safe and effective integration.
- **Aggregation Allowances:** Regulations permitting aggregators to combine multiple facilities for market participation.

Technical Aspects to Provide Reticulation

Integration and Control Systems

Interruptible facilities integrate into the energy reticulation system through advanced control systems that enable real-time communication and coordination with grid operators. Systems such as Supervisory Control and Data Acquisition (SCADA) monitor and control industrial processes, allowing facilities to adjust operations rapidly in response to grid signals. Energy Management Systems (EMS) optimize energy usage within a facility, aligning with grid requirements to provide demand response capabilities. Automated Demand Response (ADR) technologies facilitate automatic load adjustments without human intervention, ensuring swift participation in Frequency Control Ancillary Services (FCAS).

Effective participation in FCAS requires standardized communication protocols to ensure interoperability between interruptible facilities and grid operators. Standards define communication protocols for intelligent electronic devices, extending to distributed energy resources and enabling seamless participation in FCAS. Adherence to these standards allows interruptible facilities to effectively communicate and coordinate with the grid, reinforcing their role within energy reticulation.

Enhancing Grid Stability and Power Quality

Interruptible facilities significantly influence power quality and system stability. Adjusting reactive power consumption or generation helps maintain voltage levels within acceptable ranges, contributing to voltage support. Advanced power electronic devices within these facilities mitigate harmonic distortions, improving overall power quality. Their rapid adjustments in load contribute directly to managing frequency, a core aspect of grid stability. These technical capabilities enhance the grid's performance, solidifying the integral role of interruptible facilities in the energy reticulation system.

Management Systems and Cybersecurity Considerations

Distributed Energy Resource Management Systems (DERMS) further integrate interruptible facilities into the grid. DERMS are software platforms that enable the integration and management of distributed energy resources, including interruptible facilities. They provide real-time monitoring and control, allowing grid operators to dispatch resources as needed.[31] Optimising algorithms within DERMS helps dispatch resources based on grid conditions, economic factors, and environmental considerations. The scalability of DERMS allows for managing many distributed resources, enhancing grid flexibility.[32]

However, integrating interruptible facilities introduces cybersecurity risks that require secure communication channels to protect data exchange between facilities and grid operators. Developing risk management frameworks and compliance with cybersecurity standards is crucial for maintaining the integrity and reliability of the energy reticulation system.

Economic and Environmental Benefits

Economic Advantages

Integrating interruptible facilities into energy reticulation offers significant economic benefits. By reducing peak demand and providing ancillary services, these facilities can defer or eliminate the need for costly investments in new-generation capacity or network upgrades.[33] Efficient load management lowers operational costs for utilities and consumers, with reduced reliance on expensive peaking plants. Facilities can generate additional revenue by participating in FCAS markets, providing incentives for investment in responsive technologies. Increased participation in energy markets leads to more competitive pricing and efficient resource allocation, enhancing overall market efficiency.

Environmental and Societal Benefits

The participation of interruptible facilities also contributes to substantial environmental benefits. By providing flexibility, these facilities enable higher penetration of renewable energy sources, which are variable in nature.[34] Efficient energy use and reduced reliance on fossil fuel-based peaking plants lead to lower greenhouse gas emissions. Supporting decentralised energy systems by encouraging local generation and storage reduces transmission losses and environmental impacts of large-scale infrastructure.[35]

Beyond economic and environmental impacts, there are additional societal benefits. Enhanced grid stability reduces the frequency and duration of power outages, improving consumer reliability. The development and deployment of technologies related to interruptible facilities stimulate job creation in engineering, manufacturing, and service sectors, contributing to economic growth.[36]

Policy Support and Challenges

Governments and regulatory bodies recognise the importance of interruptible facilities in achieving policy objectives. Financial incentives and rebates encourage investment in technologies that enable participation in FCAS. Integrating interruptible facilities supports national commitments to reduce emissions under international agreements such as the Paris Agreement.

While the benefits are substantial, challenges remain to maximise the potential of integrating interruptible facilities. Upfront costs for implementing control systems and technologies may be a barrier, requiring financial support or innovative financing solutions.[37] Navigating market rules and compliance requirements can be complex, necessitating expertise and resources not readily available.

Conclusion

Integrating interruptible facilities participating in Frequency Control Ancillary Services (FCAS) into the energy reticulation system is a significant advancement in modern electrical grid management. Equipped with advanced control systems and standardized communication protocols, these facilities actively balance supply and demand by rapidly adjusting consumption or generation in response to grid signals. This capability positions them as essential to maintaining grid stability, enhancing power quality, and improving operational efficiency.

Technically, interruptible facilities contribute to grid stability through real-time responsiveness facilitated by systems like SCADA and EMS. They provide voltage support, mitigate harmonic distortions, and participate in frequency regulation, enhancing grid performance and resilience.

Economically, the incorporation of interruptible facilities offers substantial benefits. They enable the deferral of costly infrastructure investments by reducing peak demand and providing ancillary services, optimising existing assets. Operational cost reductions are achieved through efficient load management, decreasing reliance on expensive peaking plants. Participation in FCAS markets opens additional revenue streams for facility owners, fostering competitive energy markets and promoting efficient resource allocation.

Environmentally, these facilities play a crucial role in facilitating the integration of variable renewable energy sources, supporting the reticulation of decentralised energy systems, and helping minimise energy waste. Societally, enhanced grid stability improves reliability for consumers while stimulation of job creation in related sectors further underscores their positive impact on economic growth and community well-being.

Policy support and regulatory frameworks are instrumental in maximising the benefits offered by interruptible facilities. However, challenges such as initial investment costs and regulatory complexities require ongoing attention. Addressing these challenges through supportive policies, innovative financing solutions, and inclusive programs is essential for fully realising the potential of interruptible facilities.

In summary, the interruptible nature of facilities participating in FCAS is fundamentally intertwined with energy reticulation. Their technical integration, economic advantages, environmental contributions, and societal benefits make them indispensable in achieving a stable, efficient, and sustainable energy system.

As the energy landscape continues to evolve, these facilities will remain at the forefront of efforts to meet the challenges of renewable energy reticulation, shaping a resilient and responsive energy future that meets societal needs.

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Connection Enquiry Response

Bridgewater Data Centre

DAME Industrial Holdings Pty Ltd

Record Number:
Version Number: 2.0
Date: 10 April 2024

Authorisations

Action	Name and title	Date
Prepared by	Nils Blichfeldt, Senior Network Planning Engineer Roger McGuire, Network Planning Engineer	08/04/2024
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Authorised by	Nils Blichfeldt, Senior Network Planning Engineer	10/04/2024

Document control

Date	Version	Description	Author	Approved by
7/03/2024	1.0	Initial release	Network Planning	Network Planning Transmission Lead
10/04/2024	2.0	Revised version	Network Planning	Leader Network Planning

Responsibilities

This document is the responsibility of the Network Planning Team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299.

Please contact Network Planning with any queries or suggestions.

Disclaimer

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Executive summary

DAME Industrial Holdings (DAME) has submitted a connection enquiry for a new data centre to be established close to Bridgewater Substation. The project maximum demand is 27.5 MVA, connected in three separate load blocks.

This revised connection enquiry response addresses a change by the proponent to connect 27.5 MVA total load, a reduction from the previous 35 MVA total. The proposed connection to the network is Bridgewater Substation, supplied via new, dedicated feeders from the 11 kV switchboard.

The proposed loading magnitude, both in the medium and long term will materially alter the technical envelope of the Tasmanian power system and will potentially result in changes in how the system will operate. Substation connection capacity is limited at Bridgewater, with augmentation required at the site to accommodate the new load connections and allow greater utilisation of the transmission corridor.

Proponents are advised that as the system strength and inertia reduce, their connecting equipment must be capable of operating and supporting the network under these conditions. TasNetworks have considered the proponent's capacity requirements and the suitability of the existing network to support these requirements. Technical assessment of the connection option(s) will be undertaken during a connection application phase.

TasNetworks look forward to continuing engagement with DAME on the connection options for the Bridgewater data centre project to ensure that the most appropriate network developments are progressed to support this connection and the continued secure operation of the transmission system.

Contents

1 Background

1.1 Purpose

This document provides preliminary network information relating to the connection enquiry for Bridgewater Data Centre. It includes information on network capability and possible alternate connection options.

This enquiry response presents analysis undertaken by the Network Planning team only – other information and requirements will be provided by the respective subject matter experts as other supporting information for the connection enquiry response and as part of the connection application stage. The purpose of this document is to assist the proponent to understand the various issues influencing the proposed connection arrangements and the rationale behind the preferred option as presented by TasNetworks.

1.2 Connection enquiry

DAME submitted a connection enquiry, received on 29th January 2024. Table 1 provides a summary of the key details from the enquiry considered in this response.

Table 1: Connection enquiry details

Proponent	DAME Industrial Holdings Pty Ltd
Site name	Bridgewater Substation Data Centre
Preferred network connection location	Bridgewater 11 kV switchboard
Connection voltage	11 kV
Maximum demand	Up to 27.5 MVA
Anticipated completion date	June 2024

1.3 Existing network

Bridgwater substation is connected at 110 kV to the Upper Derwent network, which constitutes 220 kV and 110 kV transmission circuits operating in parallel, between Lindisfarne, Waddamana, Liapootah and Chapel Street substations.

Figure 1 provides an overview of the existing transmission network infrastructure in the region

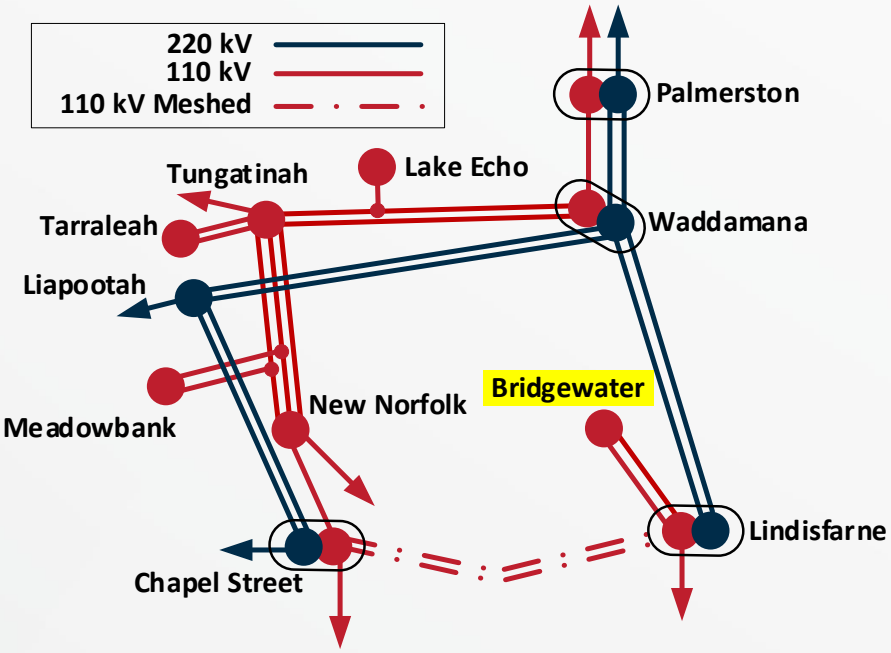

Figure 1: Upper Derwent transmission network

Bridgewater 110/11 kV substation is one of the key substations in southern Tasmania, primarily servicing customers located in Bridgewater, Gagebrook, Old Beach, Granton, Brighton, Bagdad, Kempton, Elderslie, Broadmarsh, Dromedary, New Norfolk and Austins Ferry. The existing substation arrangement consists of two 110 / 11 kV two winding transformers supplying two 11 kV busbars with customer feeder connections. The Bridgewater-Lindisfarne 110 kV transmission lines are rated at approx. 153 MVA Summer continuous rating.

Figure 2 provides an overview of the existing substation layout at Bridgewater.

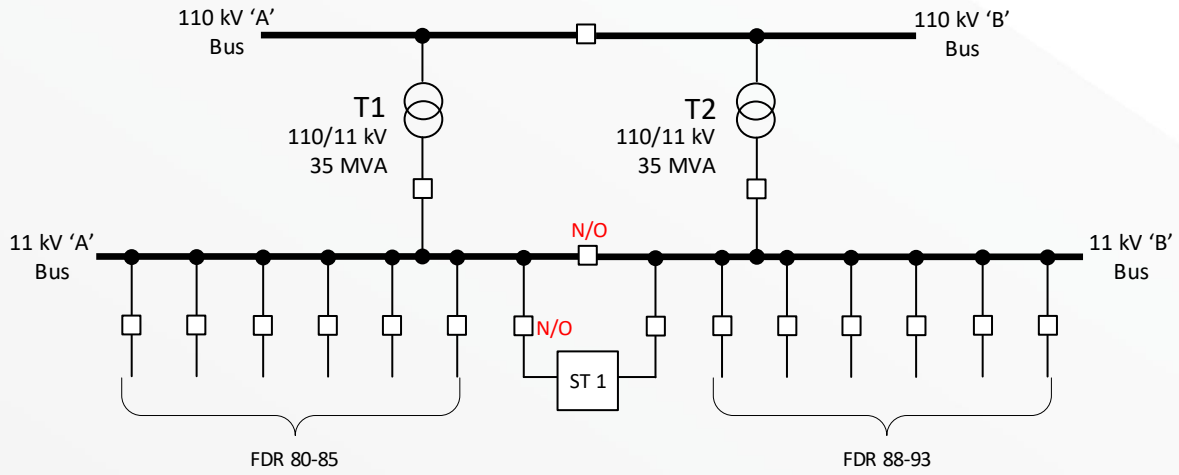

Figure 2: Bridgewater 110 / 11 kV Substation

1.4 Network capacity

Bridgewater substation operates normally open between 'A' and 'B' buses at 11 kV due to fault level restrictions.

During both normal and post contingent operating conditions, the supply capacity is limited to the continuous rating of each transformer (35 MVA). The existing available capacity headroom is specific to each supply transformer T1 and T2.

Table 2 presents the installed firm[1] capacity and spare capacity (headroom) currently available at Bridgewater substation.

Installed Firm capacity (MVA)		Firm Capacity Headroom (MVA)		(n-1) Capacity (MVA)	(n-1) headroom
T1	T2	T1	T2		
35	35	14	21	35	0

Table 2: Bridgewater substation capacity

As the combined total load across both T1 and T2 sums to 35 MVA, all new connecting load to the existing substation would operate non-firm. The load is not evenly distributed across the transformers at peak, resulting in different levels of non-firm capacity under normal operating conditions.

The distribution loading is not equal between buses, resulting in different load duration characteristics and therefore different capacity headroom for each supply transformer.

Figure 3 shows the capacity headroom duration curves for each transformer for calendar year 2023.

[1] Firm Capacity refers to the supplied power available upon the trip of one supply circuit. In the case of the Bridgewater 11 kV, the loss of either supply transformer will result in a firm supply capacity limit of 35 MVA.

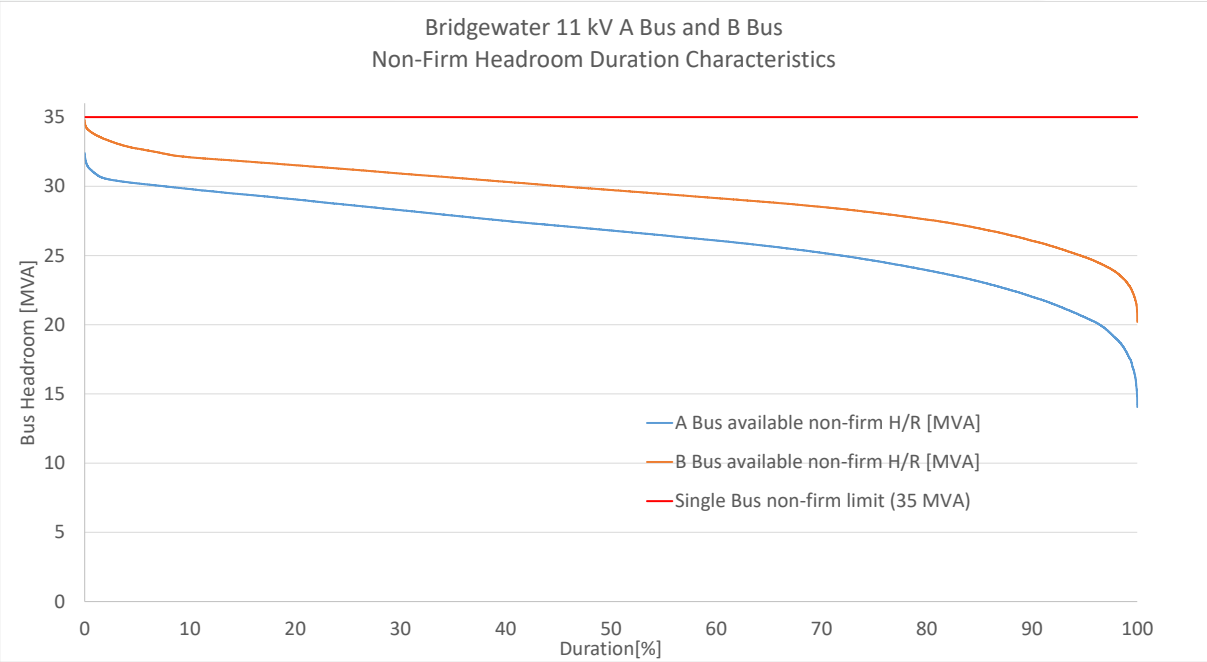

Figure 3: 2023 headroom duration curve for Bridgewater Substation

The duration characteristics yield a variation in headroom between 0-14 MVA for 'A' Bus (T1) and 0-20 MVA for 'B' Bus (T2).

TasNetworks annually derives a weather-adjusted load forecast for each distribution injection point.

The Bridgewater Substation load forecast to 2040 is presented in Figure 4[2] below noting the station loading is forecast to be operating non-firm from Winter 2023 and will generally increase year on year, eroding the available non-firm headroom.

[2] 2023 to 2040 forecast: 50 POE central scenario

For the identified preferred connection option, existing feeder bus allocations and/or load transfers may be necessary to accommodate the identified peak load requirements of the data centre.

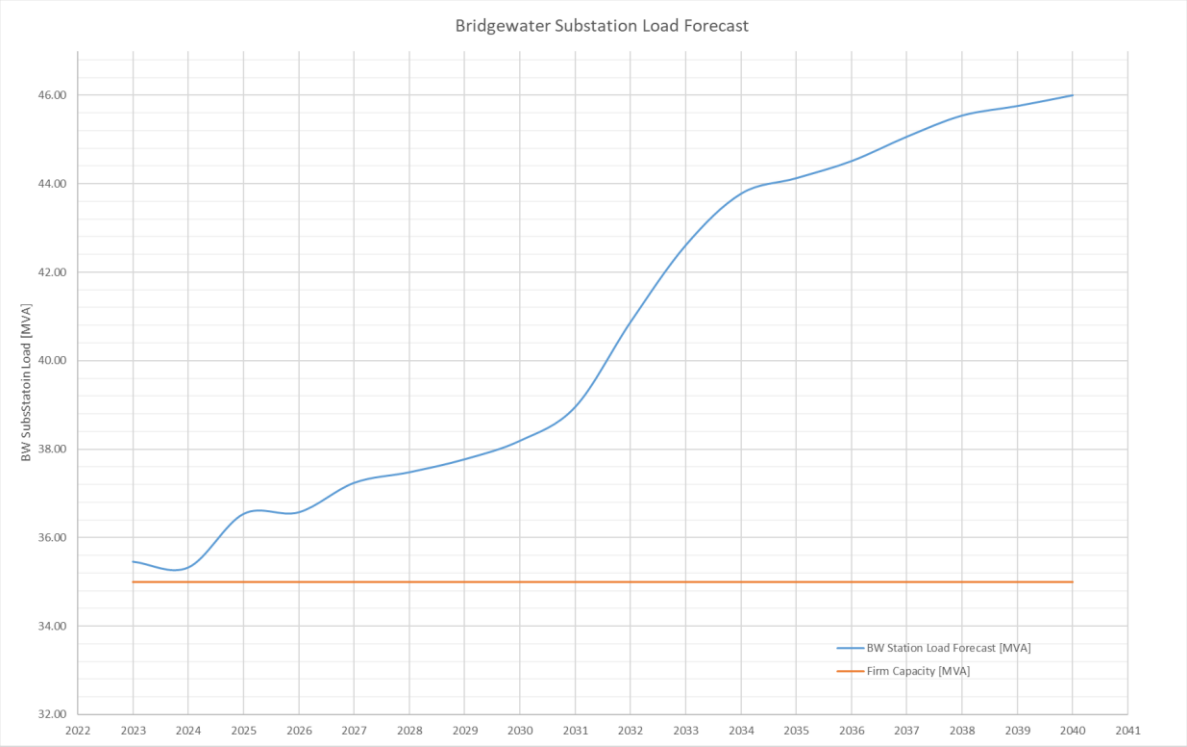

Figure 4: Bridgewater Total Substation Load Forecast to 2040

The proposed Bridgewater 11 kV busbar arrangement and preferred option for the connection of DAME data centre is presented in section 2. It is to be noted that new connections established into the substation must not encroach or otherwise encumber the operation and utilisation of any existing circuits.

1.5 Network constraints

Bridgewater 11 kV switch bays are limited in capacity to 630 A (10.8-12.6 MVA over the allowable operating bus voltage range[3]) per bay. In accordance with the total load requirements indicated in the DAME application, the DAME load blocks will be apportioned to a limit of 10 MVA per bay.

The entirety of the new DAME data centre load will need to be adaptive, such that:

- Under normal operating conditions, the total load does not exceed 35MVA for either transformer; and
- Under (n-1) loss of either transformer, a load tripping scheme is armed and deployed to ensure the total aggregate load connected to the remaining transformer does not exceed 35 MVA.

[3] From AS61000.3.100: Medium Voltage Steady State voltage limits (Average over 10 min rms)

The existing fault level operating range at Bridgewater 11 kV bus is as follows:

Table 3: Bridgewater 11 kV fault level

Fault type	Maximum Fault Level (kA)[4]	Maximum Fault Level (kA)[5]	Minimum Fault Level (kA)
Single Phase-Ground	6.2	3.2	2.6
Three Phase	14.2	7.8	5.9

The potential variability of the load may materially affect the steady state and dynamic performance of the network. Further studies including an initial impact assessment will be necessary to identify and quantify both localised and broader network constraints.

These studies include, but are not be limited to:

- Local and wider network steady state and dynamic voltage stability studies for both firm and non-firm contingency operation.
- An assessment of frequency control due to load variability.
- The ability of the proponent to ensure compliance with power quality requirements.

Figure 4 presents the DAME Bridgewater project location in relation to the existing Bridgewater substation, 11 kV switchyard and adjacent transmission network. Subdivisions 1-5 have been identified as preferred location for connection.

[4] Maximum theoretical Fault Level with 11 kV Bus Coupler operated Closed – operationally restricted due to equipment rating.
[5] Maximum Fault Level with 11 kV Bus Coupler operated Normally Open.

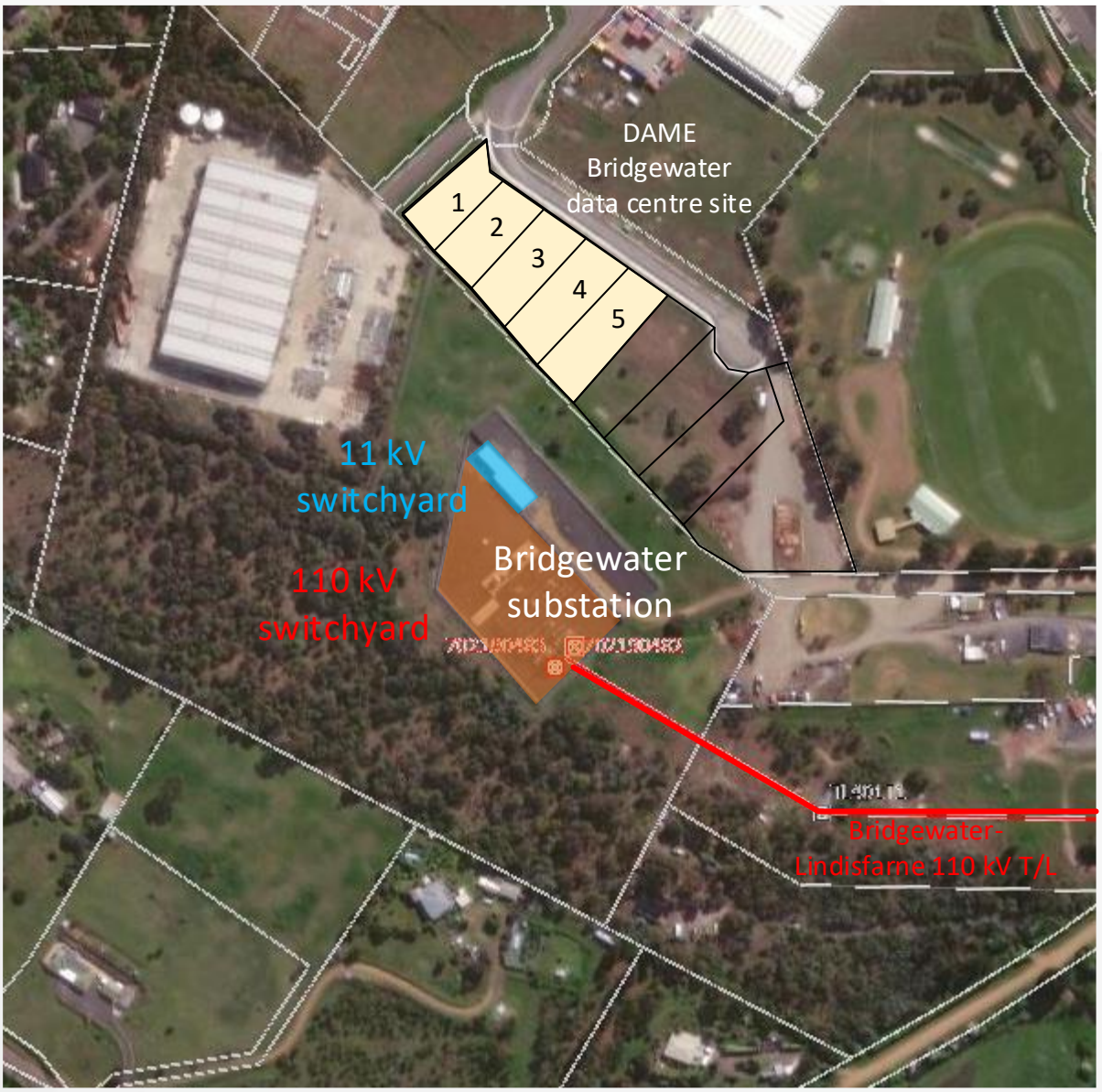

Figure 4: DAME Bridgewater data centre proposed site location

2 Proposed Connection Options

After consultation with the proponent, TasNetworks has revised the enquiry response to identify a single supply connection for a revised total load of 27.5 MVA of the data centre.

This option requires the addition of two (2) new 11 kV circuit breaker panels on 'B' bus, one replacement station service transformer and potential 11kV load reconfiguration. In terms of constructability, a direct bus extension is only possible on 'B' Bus and will likely require an extension of the switch room to install up to two (2) additional panels.

Due to the available headroom differences, the load split for the data centre is as follows:

- 1 x 10 MVA on 'A' Bus (Supplied by transformer T1)
- 1 x 10 MVA + 1 x 7.5MVA on 'B' Bus (Supplied by transformer T2)

To accommodate all load blocks, the following reconfiguration works are required:

- Remove existing station services unit and install one new station services KPX type unit (IDI). The replacement station service transformer is to be selectable between 'A' and 'B' buses.
- Establish parallel connection for the new station service transformer unit and one of the existing 11 kV 'A' bus feeders, freeing up the existing 11 kV station services panel on 'A' bus (designated 'G' Bay).
- Provide parallel connection capability for one 11 kV feeder to 'H' bay side of the station services transformer connection;
- Connection of 10 MVA data centre load block to 'G' bay
- Establish two additional new 11 kV feeder panels on 'B' bus, designated 'Q' and 'R' bays; and
- Connection of 10 MVA and 7.5 MVA data centre load blocks to new 'Q' and 'R' bays.

The proposed single line connection is outlined in Figure 5 below:

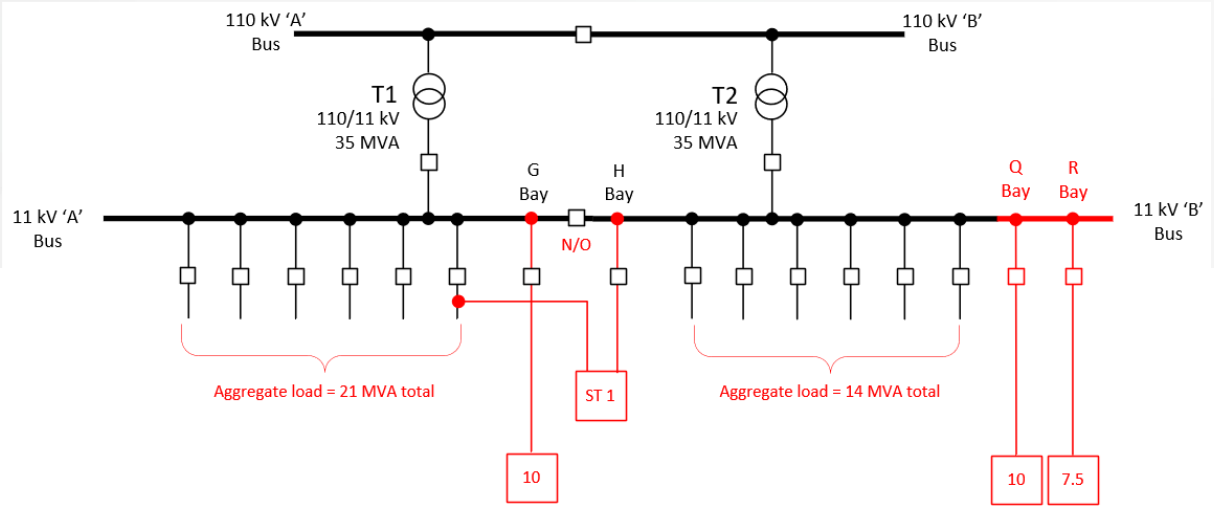

Figure 5: Potential 11 kV connection - DAME Bridgewater data centre

Whilst this option does not require an external building or cabled bus extension works, the 11 kV reconfiguration is highly invasive to the operation of the existing Bridgewater distribution network. Load balancing and / or transfers may be required in the downstream 11 kV network to ensure that the aggregate, (n) system loading conditions do not exceed the capacity limitations of each transformer at the time of connection. Retention of operational load transfer capacity between Bridgewater distribution feeders will be an important consideration for any feeder reconfiguration.

There is a reasonable likelihood that a precise headroom will not be readily achievable through the balancing process and that some load transfer away from Bridgewater may also be necessary. Existing inter-station transfer capacity may not be sufficient to accommodate load balancing and retain operational transfer capacity requirements. This will be studied in detail with options to increase inter-station transfer capacity.

3 Asset classification and contestable works

3.1 Contestable works

The regulatory framework provided under the National Electricity Rules (the Rules), allows customers to approach the market in order to design, construct, own and/or operate the Dedicated Connection Assets (DCA) associated with their connection. Alternatively, customers may approach TasNetworks to undertake any or all of these tasks. These works are defined as "Contestable Works" under the rules. Figure 6 presents the asset classification categories.

Further information on contestable works will be by TasNetworks in consultation with proponents as the connection progresses.

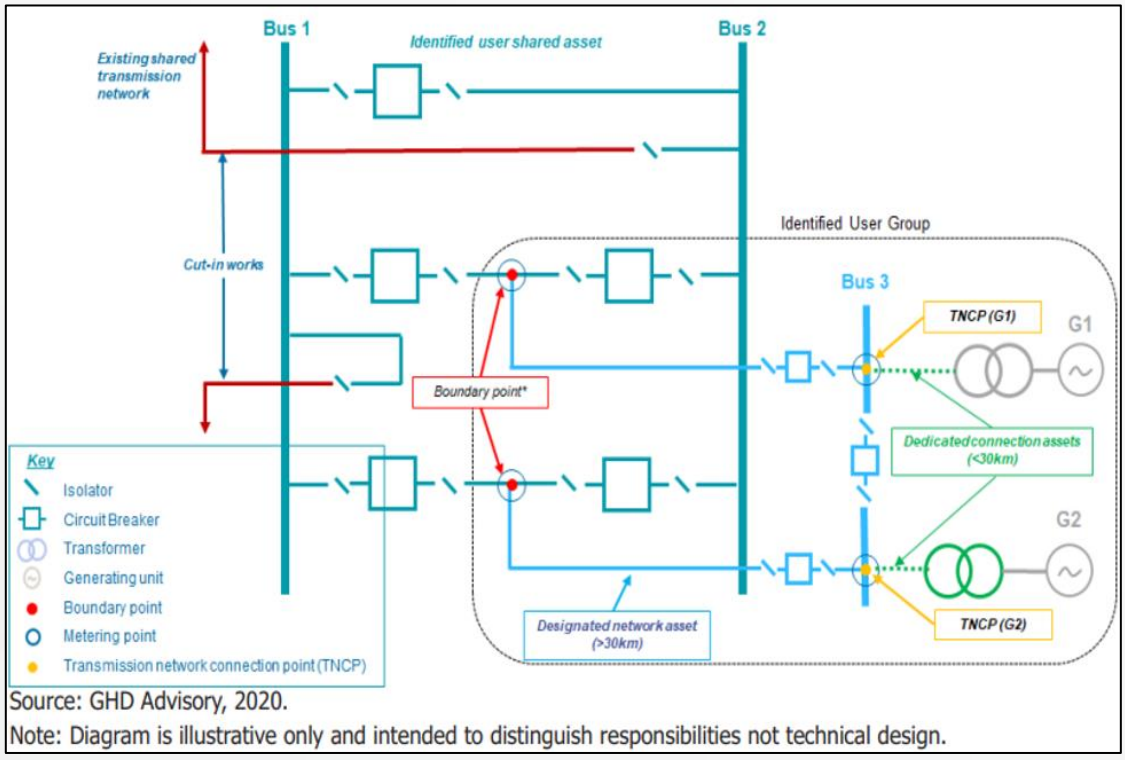

Figure 6: Asset classification categories

3.2 Dedicated connection assets

Assets that connect a proponent's facility to the existing transmission network, and are used exclusively by that proponent, are known as dedicated connection assets (DCA).

3.3 Designated network assets

TasNetworks confirm that the Dedicated Network Assets (DNA) framework does not apply to this connection.

3.4 Identified user shared assets

An Identified User Shared Asset (IUSA) is an asset (or group of assets) that are operated by the TNSP to connect a DCA or DNA to the existing network, but are not for exclusive use by that proponent. The detailed design, construction, and ownership of the IUSA is contestable if the cost of these assets is more than $10 million. The functional specification, cut-in works, operation, maintenance, and control remain with the TNSP.

In this case, it is unlikely that the cost of any IUSA in the identified options above will exceed $10 million. Therefore the design, construction, and ownership of the IUSA is considered non-contestable – and will be undertaken by TasNetworks, as a negotiated transmission service.

3.5 Shared network assets

If Shared Network Assets are required to be augmented to facilitate this connection, the construction of all shared network assets will be TasNetworks' responsibility and will be carried out based on TasNetworks' design and equipment standards. The cost of any Network Augmentation required solely to facilitate a connection is to be borne by the customer.

4 Summary

DAME Industrial Holdings (DAME) has submitted a connection enquiry for a new data centre to be established close to Bridgewater Substation. The project maximum demand is 27.5 MVA, connected in three separate load blocks.

The proposed connection to the network is Bridgewater Substation, supplied via new, dedicated feeders from the 11kV switchboard.

The proponent is advised that connection options that require the new load to be electrically integrated into the existing Bridgewater substation supply scheme will operate as non-firm and will require operating schemes to ensure that capacity limitations are not exceeded under normal and contingency conditions.

We look forward to continuing engagement with DAME on the connection options for the Bridgewater data centre project to ensure that the most appropriate network developments are progressed to support this connection and the continued secure operation of the transmission system.

SAFETY DATA SHEET

Shell Immersion Cooling Fluid S3 X

Version 1.1 Revision Date 30.08.2023 Print Date 31.08.2023

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Shell Immersion Cooling Fluid S3 X

Product code : 001J5126

Manufacturer or supplier's details

Supplier : Viva Energy Australia Pty Ltd
(Formerly: The Shell Company of Australia)
(ABN 46 004 610 459)
720 Bourke Street
Docklands
Victoria 3008
Australia

Telephone : +61 (0)3 8823 4444

Telefax : +61 (0)3 8823 4800

Emergency telephone number : 1800 651 818 (Australia). ; POISONS INFORMATION CENTRE: 13 11 26 (Australia).

Recommended use of the chemical and restrictions on use

Recommended use : Use only as coolant.

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Aspiration hazard : Category 1

Acute toxicity (Inhalation) : Category 4

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : PHYSICAL HAZARDS:
Not classified as a physical hazard under GHS criteria.
HEALTH HAZARDS:
H304 May be fatal if swallowed and enters airways.
H332 Harmful if inhaled.
ENVIRONMENTAL HAZARDS:
Not classified as an environmental hazard under GHS criteria.

Precautionary statements :

Prevention:

P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271 Use only outdoors or in a well-ventilated area.

Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P331 Do NOT induce vomiting.

Storage:
P405 Store locked up.

Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Hazardous components which must be listed on the label:
Contains Distillates (Fischer - Tropsch), heavy, C18-50 - branched, cyclic and linear.

Other hazards which do not result in classification

Used oil may contain harmful impurities.Not classified as flammable but will burn.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Chemical nature : Synthetic base oil and additives.

Hazardous components

Chemical name	CAS-No.	Classification	Concentration (% w/w)
Hydrocarbon wax isomerate	848301-69-9	Asp. Tox.1; H304 Acute Tox.4; H332	90 - 99.9
Butylated hydroxytoluene	128-37-0	Aquatic Chronic1; H410 Aquatic Acute1; H400	0.1 - 0.249

For explanation of abbreviations see section 16.

SECTION 4. FIRST-AID MEASURES

If inhaled : No treatment necessary under normal conditions of use.
If symptoms persist, obtain medical advice.

In case of skin contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available.
If persistent irritation occurs, obtain medical attention.

In case of eye contact	:	Flush eye with copious quantities of water. Remove contact lenses, if present and easy to do. Continue rinsing. If persistent irritation occurs, obtain medical attention.
If swallowed	:	Call emergency number for your location / facility. If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Most important symptoms and effects, both acute and delayed	:	If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Ingestion may result in nausea, vomiting and/or diarrhoea.
Protection of first-aiders	:	When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.
Notes to physician	:	Potential for chemical pneumonitis. Call a doctor or poison control center for guidance.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use water in a jet.
Specific hazards during firefighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Special protective equipment for firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Hazchem Code	:	NONE

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Avoid contact with skin and eyes.
Environmental precautions	:	Local authorities should be advised if significant spillages cannot be contained.
Methods and materials for containment and cleaning up	:	Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
Additional advice	:	For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet. For guidance on disposal of spilled material see Section 13 of this Safety Data Sheet.

SECTION 7. HANDLING AND STORAGE

General Precautions	:	Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Advice on safe handling	:	Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Avoidance of contact	:	Strong oxidising agents.
Product Transfer	:	Proper grounding and bonding procedures should be used during all bulk transfer operations to avoid static accumulation.

Storage

Other data	:	Keep container tightly closed and in a cool, well-ventilated place. Use properly labeled and closable containers. Store at ambient temperature.
Packaging material	:	Suitable material: For containers or container linings, use mild steel or high density polyethylene. Unsuitable material: PVC.
Container Advice	:	Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Oil mist, mineral	Not Assigned	TWA (Mist)	5 mg/m3	AU OEL
Oil mist, mineral	Not Assigned	TWA (Mist)	5 mg/m3	Australia. Workplace Exposure Standards for Airborne Contaminants.
Oil mist, mineral	Not Assigned	TWA (Mist)	5 mg/m3	OSHA Z-1
Oil mist, mineral	Not Assigned	TWA (Inhalable particulate matter)	5 mg/m3	ACGIH

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/

Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/

Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp

L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

Engineering measures : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:
Adequate ventilation to control airborne concentrations.

Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

General Information:
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or subsequent recycle.
Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.

Do not ingest. If swallowed, then seek immediate medical assistance

Personal protective equipment

Protective measures

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory protection : No respiratory protection is ordinarily required under normal conditions of use.

In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material.
If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation.
Check with respiratory protective equipment suppliers.
Where air-filtering respirators are suitable, select an appropriate combination of mask and filter.
Select a filter suitable for the combination of organic gases and vapours and particles [Type A/Type P boiling point >65°C (149°F)].

Hand protection

Remarks : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model.

Eye protection : If material is handled such that it could be splashed into eyes, protective eyewear is recommended.

Skin and body protection : Skin protection is not ordinarily required beyond standard work clothes.
It is good practice to wear chemical resistant gloves.

Thermal hazards : Not applicable

Environmental exposure controls

General advice : Local guidelines on emission limits for volatile substances

must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.
Information on accidental release measures are to be found in section 6.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	white
Odour	:	Slight hydrocarbon
Odour Threshold	:	Data not available
pH	:	Not applicable substance/mixture is non-polar/aprotic
pour point	:	<= -42 °C / <= -44 °F Method: ASTM D97
Melting / freezing point		Data not available
Initial boiling point and boiling range	:	Data not available
Flash point	:	198 °C / 388 °F Method: ASTM D92 (COC)
Evaporation rate	:	Data not available
Flammability (solid, gas)	:	Not applicable
Flammability (liquids)	:	Not classified as flammable but will burn.
Upper explosion limit	:	Typical 10 %(V)
Lower explosion limit	:	Typical 1 %(V)
Vapour pressure	:	< 0.5 Pa (20 °C / 68 °F) estimated value(s)
Relative vapour density	:	> 5
Relative density	:	0.808 (15.0 °C / 59.0 °F)
Density	:	808 kg/m3 (15.0 °C / 59.0 °F) Method: ASTM D4052
Solubility(ies)		

Water solubility	:	negligible
Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	log Pow: > 6 (based on information on similar products)
Auto-ignition temperature	:	> 320 °C / 608 °F
Decomposition temperature	:	Data not available
Viscosity		
Viscosity, dynamic	:	Data not available
Viscosity, kinematic	:	9.9 mm2/s (40.0 °C / 104.0 °F) Method: ASTM D445 52.3 mm2/s (0 °C / 32 °F) Method: ASTM D7042
Explosive properties	:	Classification Code: Not classified.
Oxidizing properties	:	Data not available
Conductivity	:	This material is not expected to be a static accumulator.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph.
Chemical stability	:	Stable.
Possibility of hazardous reactions	:	Reacts with strong oxidising agents.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	No decomposition if stored and applied as directed.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment	:	Information given is based on data on the components and the toxicology of similar products.Unless indicated otherwise, the data presented is representative of the product as a

whole, rather than for individual component(s).

Exposure routes : Skin and eye contact are the primary routes of exposure although exposure may occur following accidental ingestion.

Acute toxicity

Product:

Acute oral toxicity : LD50 rat: > 5,000 mg/kg
Remarks: Based on available data, the classification criteria are not met.

Acute inhalation toxicity : LC 50 Rat: > 1 - < 5 mg/l
Exposure time: 4 h
Remarks: Harmful if inhaled.

Acute dermal toxicity : LD50 Rabbit: > 5,000 mg/kg
Remarks: Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Product:

Remarks: Not irritating to skin., Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation

Product:

Remarks: Slightly irritating to the eye., Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation

Product:

Remarks: Not a skin sensitiser.
Based on available data, the classification criteria are not met.

Chronic toxicity

Germ cell mutagenicity

Product:

: Remarks: Non mutagenic, Based on available data, the classification criteria are not met.

Carcinogenicity

Product:

Remarks: Not a carcinogen., Based on available data, the classification criteria are not met.

Material	GHS/CLP Carcinogenicity Classification
Hydrocarbon wax isomerate	No carcinogenicity classification.
Butylated hydroxytoluene	No carcinogenicity classification.

Material	Other Carcinogenicity Classification
Butylated hydroxytoluene	IARC: Group 3: Not classifiable as to its carcinogenicity to humans

Reproductive toxicity

Product:

:

Remarks: Not a developmental toxicant., Does not impair fertility., Based on available data, the classification criteria are not met.

STOT - single exposure

Product:

Remarks: Based on available data, the classification criteria are not met.

STOT - repeated exposure

Product:

Remarks: Based on available data, the classification criteria are not met.

Aspiration toxicity

Product:

Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Further information

Product:

Remarks: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal., ALL used oil should be handled with caution and skin contact avoided as far as possible.

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment : Information given is based on a knowledge of the components and the ecotoxicology of similar products.

Ecotoxicity

Product:

Toxicity to fish (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to crustacean (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to algae/aquatic plants (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to fish (Chronic toxicity) : Remarks: NOEC/NOEL > 100 mg/l

Toxicity to crustacean (Chronic toxicity) : Remarks: NOEC/NOEL > 100 mg/l

Toxicity to microorganisms (Acute toxicity) : Remarks: Practically non toxic:
LL/EL/IL50 > 100 mg/l
Based on available data, the classification criteria are not met.

Components:
Butylated hydroxytoluene :

Toxicity to fish (Acute toxicity) : LL50 (Oryzias latipes (Orange-red killifish)): 1.1 mg/l
Exposure time: 96 h
Method: Regulation (EC) No. 440/2008, Annex, C.1

Toxicity to crustacean (Acute toxicity) : EC50 (Daphnia magna (Water flea)): 0.48 mg/l
Exposure time: 48 h
Method: Test(s) equivalent or similar to OECD Guideline 202

M-Factor (Short-term (acute) aquatic hazard) : 1

Toxicity to fish (Chronic toxicity) : NOEC: 0.53 mg/l
Exposure time: 30 d
Species: Oryzias latipes (Orange-red killifish)
Method: Test(s) equivalent or similar to OECD Guideline 210

Toxicity to crustacean(Chronic toxicity) : NOEC: 0.069 mg/l
Exposure time: 21 d
Species: Daphnia magna (Water flea)

Method: Test(s) equivalent or similar to OECD Guideline 211

M-Factor (Long-term (chronic) aquatic hazard) : 1

Persistence and degradability

Product:

Biodegradability : Remarks: Inherently biodegradable.

Components:
Butylated hydroxytoluene :

Biodegradability : Exposure time: 62 d
Method: OECD Test Guideline 309
Remarks: Degradation half life
5.65 days

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: Does not bioaccumulate significantly.

Partition coefficient: n-octanol/water : log Pow: > 6Remarks: (based on information on similar products)

Mobility in soil

Product:

Mobility : Remarks: Liquid under most environmental conditions., If it enters soil, it will adsorb to soil particles and will not be mobile.
Remarks: Floats on water.

Other adverse effects

no data available

Product:

Additional ecological information : Does not have ozone depletion potential, photochemical ozone creation potential or global warming potential., Product is a mixture of non-volatile components, which will not be released to air in any significant quantities under normal conditions of use.
Films formed on water may affect oxygen transfer and damage organisms., Causes physical fouling of aquatic organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the

toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses.

Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment.
Waste, spills or used product is dangerous waste.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination.

MARPOL - see International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which provides technical aspects at controlling pollutions from ships.

Contaminated packaging : Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand. Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Local legislation
Remarks : Disposal should be in accordance with applicable regional, national, and local laws and regulations.

SECTION 14. TRANSPORT INFORMATION

National Regulations

ADG
Not regulated as a dangerous good

International Regulations

IATA-DGR
Not regulated as a dangerous good

IMDG-Code
Not regulated as a dangerous good

Maritime transport in bulk according to IMO instruments

MARPOL Annex 1 rules apply for bulk shipments by sea.

Special precautions for user

Remarks	:	Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

SECTION 15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

Standard for the Uniform Scheduling of Medicines and Poisons	:	No poison schedule number allocated

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Product classified as per Work Health Safety Regulations – Implementation of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) 2012 and SDS prepared as per national model code of practice for preparation of safety data sheet for Hazardous chemicals 2020 based on Globally Harmonized Classification version 7.

National Model Code of Practice for the Labelling of Workplace Hazardous Chemicals (2011).

Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG code). Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Other international regulations

The components of this product are reported in the following inventories:

TSCA	:	All components listed.
AIIC	:	All components listed.

SECTION 16. OTHER INFORMATION

Full text of H-Statements

H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of other abbreviations

Acute Tox.	Acute toxicity
Aquatic Acute	Short-term (acute) aquatic hazard
Aquatic Chronic	Long-term (chronic) aquatic hazard
Asp. Tox.	Aspiration hazard

Abbreviations and Acronyms

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for

Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

Date of preparation or review : 30.08.2023

Further information

Training advice	:	Provide adequate information, instruction and training for operators.
Other information	:	A vertical bar (|) in the left margin indicates an amendment from the previous version.
Sources of key data used to compile the Safety Data Sheet	:	The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Shell **Immersion Cooling Fluid *S3 X***

Shell Immersion Cooling Fluid S3 X is a stabilized hydrocarbon fluid based on Shell Gas-to-Liquid Technology (GTL).

DESIGNED TO MEET CHALLENGES

Performance, Features & Benefits

- Shell Immersion Cooling Fluid S3 X is a synthetic, single-phase immersion cooling fluid designed for the needs of high-performance computing, edge computing and blockchain applications.
- The product help to reduce energy costs and emissions used for immersed-cooling of computers. It offers high cooling efficiency, flow behavior and excellent thermodynamic properties that reduces energy consumption.
- Shell Immersion Cooling Fluid S3 X application is environment agnostic. The product is safe and easy to handle, contributes to a safer working environment. It is suitable for use with almost all computer components with good material compatibility it comes into contact with.

Main Applications

- Immersion cooling for data center, high-performance computing, edge computing and blockchain applications.

Typical Physical Characteristics

Properties			Method	Shell Immersion Cooling Fluid S3 X
Colour (Saybolt)			ASTM D156	>+30
	@15°C	kg/m^3	ASTM D4052	808
Flash Point		°C	ASTM D92	198
Pour Point		°C	ASTM D97	-42
Kinematic Viscosity	@40°C	mm^2/s	ASTM D445	9.9
Kinematic Viscosity	@0°C	mm^2/s	ASTM D7042	52.3
Neutralisation Value		mg KOH/g	IEC 62021-1	<0.01

These characteristics are typical of the research product, variations in these characteristics may occur.

Health, Safety & Environment

- **Health and Safety**

  Shell Immersion Cooling Fluid S3 X is unlikely to present any significant health or safety hazard when properly used in the recommended applications and good standards of personal hygiene are maintained.

  Avoid contact with skin. Use impervious gloves with new and used fluid. After skin contact, wash immediately with soap and water.

  Guidance on Health and Safety is available on the appropriate Safety Data Sheet, which can be obtained from your Shell representative.

- **Protect the Environment**

  Take used oil to an authorised collection point. Do not discharge into drains, soil or water.

Technical Helpdesk 1300 134 205

Viva Energy Australia Ltd
(ABN 46 004 610 459)
720 Bourke Street
Docklands Vic 3008

20th February 2025

1 Tivoli Road,
Old Beach
TAS 7017

Dear Dang,

FURTHER INFORMATION – ELECTRICAL RETICULATION SERVICES AND ASSOCIATED SERVICES, 73 GREENBANKS ROAD, BRIDGEWATER & 23 WEILY PARK ROAD, BRIDGEWATER

I am writing in response to the letter received from Council on 4th February 2025 requesting further information in response to the proposed development at 73 Greenbanks Road, Bridgewater (DA 2024 / 00244).The following is in response to those enquiries.

General

1. Provide an Environmental Management Plan (EMP) that includes detailed management of contaminates around stormwater catchments and includes a risk assessment.

Advice: Due to the potential environmental hazards of the cooling fluid used, an Environmental Management Plan (EMP) is necessary. This needs to address the construction and provide comments as to how the plinths, handstand areas and safety barrier referenced in the report and any other environmental protection measures proposed are sized mitigate all environmental concerns. The storage of such materials, the servicing of the machines, drainage and replacement of the fluid (if applicable) should all be included in the report. Other traditional environmental factors such as noise, dust, etc. should also be commented on in this report. The EMP needs to be done by a suitably qualified environmental consultant with experience in such developments.

A comprehensive Stormwater Contaminants Risk Assessment has been provided, which demonstrates that the proposed development will not negatively impact stormwater systems and that any potential risks can be effectively managed. The assessment also addresses construction elements, such as plinths, handstand areas, and safety barriers, as well as the relevant environmental protection measures to manage contaminants around stormwater catchments. Furthermore, it confirms that the proposal will not disrupt adjacent industrial activities.

Please refer to the outcomes of the Stormwater Contaminants Risk Assessment, which provides additional information on the miner cooling fluid, including storage, servicing, drainage and replacement of the fluid. It is noted that the SCRA will continue to be developed during Detailed Design.

Additional information on the plinths, hardstand areas and safety barrier have also been provided in the updated Schematic Design report, however, again are subject to further development during Detailed Design.

Stormwater

2. Provide an amended Stormwater Management Report addressing the following:

ireneinc
49 Tasma St, North Hobart, TAS 7000
Tel (03) 6234 9281
Fax (03) 6231 4727
Mob 0418 346 283
Email planning@ireneinc.com.au

a. The site only has 1 existing legal point of discharge. The existing stormwater infrastructure (and all other infrastructure within the property is private and has never been adopted by Council or other authorities).

The site is proposing 1 LPOD, changing the existing infrastructure to ensure conveyance and treatment of all flows.

b. Inconsistencies were found between the body of the report and the appendices.

Clarification will be required regarding:

i. Required detention volume – listed as 210m3 in the main report and 115m3 in Appendix F and engineering drawings.

ii. Number of stormwater treatment units proposed – two Jellyfish units shown in main Schematic Design report and three units in Appendix F.

iii. MUSIC model details – there is a significant difference in source loading at LPOD 1 between the MUSIC models in the main report and Appendix F.

The report has been revised to include the correct drawings, and the appendices have been updated accordingly.

c. The report states that details of the treatment devices are contained in appendix B however appendix B contains council correspondence.

No details of the treatment systems are provided. d. Provide copies of the MUSIC and DRAINS models.

Please refer to appendix A for details of the treatment devices.

e. The report states it assumes 100% impervious area for the site however the MUSIC model has 2 catchments totalling 1.55ha whilst the total site is just over 2ha.

The bund areas that do not discharge to the system have been excluded from the calculations. However, the roofed areas of the bunds have now been included, which has resulted in an increase in the total area and, consequently, the detention requirements.

3. Please provide further detail on the proposed bunding. The EPA Bunding and Spill Management Guidelines recommend roofing with 'an overhang, extending 12° beyond vertical, to help prevent rain from entering the bunded area'. Reliance on a manually activated pumping system to dewater uncovered bunded areas is not considered suitable and these areas would need to be drained to sewer with a trade waste agreement with TasWater.

Additional information on the proposed bunding is provided in both the Stormwater contaminants Risk Assessment and the Schematic Design Report. This addresses constraints with roofing due to how the data units perform. It is proposed that bunds are roofed as far as practicable, noting that TasWater have advised that a Trade Waste Agreement is not viable.

Parking and access

4. Provide an amended proposal plan clearly showing work proposed in the road reservation.

The location of the gate control panels is indicated on the plans in Appendix A, situated near the site gates. It is important to note that the cul-de-sac may be upgraded in the future. Further details are available in the Schematic Design Report.

5. Provide an amended proposal plan clearly showing the extent, surface type and dimensions of parking and access areas.

An amended site plan, detailing the extent, surface type, and dimensions of the parking areas, has been provided. All relevant documentation has been updated to incorporate these additions. Please refer to Appendix A of the Schematic Design Report.

Regarding the TasNetworks correspondence, Pitt and Sherry have provided the following responses:

1. It is TasNetworks understanding that DAME's connection comprises 27.5 MVA across 11 modules via three (3) connection points:

a. 10 MVA onto A Bus (G Bay) – 4 modules;

b. 10 MVA onto B Bus extension (future Q Bay) – 4 modules; and

c. 7.5 MVA onto B Bus extension (future R Bay) – 3 modules.

Therefore, each connection point cannot have the capability to parallel with another on the DAME side.

As with all regulated connections, DAME's connection will progress through TasNetwork's application and agreement processes, compliant with their processes and in accordance with regulated requirements

2. The connections must be underground to avoid the two overhead feeders (48189 and 48190) which pass across any feasible connection path. Even if it were technically feasible, TasNetworks cannot string a private conductor on network poles or allow overcrossing of distribution feeders.

DAME's connections will be designed to be underground between the TasNetworks substation and the 73 Greenbanks Road site.

3. Design of the DAME perimeter fence, electrical connection and earth grid must ensure the safe operation of both DAME and TasNetworks facilities. Consideration must be given to the isolation of the DAME facility from the Bridgewater Substation earth potential rise and isolation of the TasNetworks Store perimeter fence from the DAME earth grid.

Design of DAME's site will consider isolation between the DAME site and the neighbouring TasNetworks facilities. Further information is to be sought from TasNetworks to develop the earthing design.

If you have any further queries in relation to any of the above, please contact me on 6234 9281.

Yours sincerely,

Michela Fortini

Planner
IRENEINC PLANNING & URBAN DESIGN

ireneinc
PLANNING & URBAN DESIGN

24th march 2025

1 Tivoli Road,
Old Beach
TAS 7017

Dear Dang,

FURTHER INFORMATION – ELECTRICAL RETICULATION SERVICES AND ASSOCIATED SERVICES, 73 GREENBANKS ROAD, BRIDGEWATER & 23 WEILY PARK ROAD, BRIDGEWATER

I am writing in response to the letter received from Council on 3rd March 2025 requesting further information in response to the proposed development at 73 Greenbanks Road, Bridgewater (DA 2024 / 00244).The following is in response to those enquiries.

Environmental management plan

Provide an Environmental Management Plan (EMP) that includes detailed management of contaminates around stormwater catchments and includes a risk assessment.

Comment: the response was insufficient as the EMP was not provided. The purpose of the Environmental Management Plan (EMP) is to identify that all potential avenues for environmental harm/nuisance associated with the project are identified and list the specific protection measures to control these and how they are to be implemented. Presenting this information in the one document not only simplifies the assessment procedure for Council but also provides a specific plan for both Council and the client in the event there are environmental concerns in the future by listing clear actions of how to address them, it also lists any essential roles for the implementation of works and who is responsible for them. This saves significant time and investigations in the event remediation works are required to be undertaken. Specified information such as plinths, hardstands and safety barriers that will form a large part of environmental protection and containment of hazardous materials also need to be listed for approval in the EMP at the time of submission for assessment so Council can be satisfied that what has been proposed can be achieved. Therefore, the requirements for the EMP remain unchanged. An EMP could address some of the items below i.e. Roofs and Bunds.

We appreciate Council's request for an EMP detailing the management of contaminants around stormwater catchments, along with a risk assessment.

Under the General Industrial Zone and Brighton Industrial Hub SAP, provisions regulating traditional environmental factors such as noise and dust are precluded, as the zone is specifically designed to accommodate industrial activities that cannot be located elsewhere. Within this zone, utilities are a permitted use, and minor utilities do not require a permit. The relevant attenuation codes, which assess noise and other potential pollutants, do not apply to the proposal is not classified as an attenuating activity.

Nonetheless, the following EMP is provided that demonstrates the proposed development will not negatively impact stormwater systems and that any potential risks can be effectively managed. The assessment also addresses construction elements, such as plinths, handstand areas, and safety barriers, as well as the relevant environmental protection measures to manage contaminants around stormwater catchments. Furthermore, it confirms that the proposal will not disrupt adjacent industrial activities.

ireneinc
49 Tasma St, North Hobart, TAS 7000
Tel (03) 6234 9281
Fax (03) 6231 4727
Mob 0418 346 283
Email planning@ireneinc.com.au
ABN 78 114 905 074

The document is labelled as a draft and will be revised as the Detailed Design phase progresses.

Stormwater

2. The conservative assumption of 100% impervious site area being drained to the stormwater system means the proposed stormwater system is sufficient for either scenario.

3. At the top of page 11 of the Stormwater System Management Plan (pg 114 in Adobe) there is a slight inconsistency with the number of SPEL vaults nominated for Basin 1. Based on the total volume the correct number is eleven vaults.

4. Hydrocarbons have not been specifically addressed. Given the site use, the most likely source of large-scale hydrocarbons would be a transformer leak which would be contained within the bunds.

The SSMP has been amended to ensure correct figures are reflected.

Regarding the hydrocarbons, a liquid waste contractor will remove the liquid and dispose of the bund accordingly.

Roofs

5. The application states that "Canopy roofs or similar may be attached to the data modules and cooling modules over the bunds to reduce the amount of stormwater required to be pumped out of the bunds."

It is proposed to roof the bunds wherever feasible to minimise the number of suction trucks required to remove stormwater, as the bunds cannot discharge directly into the stormwater system. The roofs will be designed to drain into the updated drainage system, which accounts for the increased runoff. The roofs will be installed on the containers, with additional posts added where necessary for extra structural support.

6. Insufficient detail is provided on the canopy roofs. To be considered in the application the roofs must be included in the proposal plans including elevations.

The canopy roof design has been provided in sketches: S-P.24.1232-CIV-SKT-1152-A 1.

Bunds

7. Bund size requirements must be provided for both the roofed and non-roofed options if both are being considered under this Development Application.

The wording has been revised to clarify that the plan includes the use of roofs, which have been expanded to cover a larger area.

8. Further detail is required regarding the requirements for bund storage. The Bunding and Spill Management Guidelines December 2015 states: "The designed net capacity of a bunded compound in a tank storage facility should be whichever is the largest of the following:

i. At least 110% of the volume of the largest storage vessel; or

ii. At least 110% of the combined volume of any inter-connected vessels within that bunded area; or

iii. At least 25% of the total volume of all vessels stored in that bunded area; or

iv. The capacity of the largest vessel plus the output of any appropriate fire suppression system fitted, over a 20-minute period."

As each bunded area is independent, the storage requirements must be considered independently. This would suggest the storage volume of at least 110% of the volume of the largest storage vessel will be the largest volume, and thus the volume which must be stored.

The baseline maximum spill has been calculated to be approximately 4,100L per data unit (25% of total capacity), aligning with the requirements of AS 1940:2017. This is understood to be the largest of the following:

- At least 110% of the volume of the largest storage vessel; or
- At least 110% of the combined volume of any inter-connected vessels within that bunded area; or
- At least 25% of the total volume of all vessels stored in that bunded area; or
- The capacity of the largest vessel plus the output of any appropriate fire suppression system fitted, over a 20-minute period. Vessels (tanks which will be filled with cooling fluid) will have a maximum capacity of 170L and the pipes themselves will have a capacity of 136L. It is understood that connected pipes and vessels will have a storage capacity significantly below 4,100L.

9. The schedule for emptying the bunds must be specified. Bunds will need to be emptied before and/or after significant rainfalls as well as a regular schedule.

Due to the roofing proposed, water infill into the bunds is expected to be negligible. Bunds will be emptied regularly, as outlined in the EMP. Bunds will be monitored regularly, via maintenance personnel or electronic means, to ensure they are emptied accordingly.

10. It is unclear whether the bunding accommodates output from any fire suppression system.

Fire suppression systems will be likely a retardant foam-based approach due to the cooling fluid being an oil. There is additional storage in the bund for such suppression with little volume actually expected to be used for suppression.

Works in Road reservation

11. The proposal appears to include widening of the existing driveway which is not clearly documented. The applicant states that "It is important to note that the cul-de-sac may be upgraded in the future." This statement is irrelevant and Council has no short term plans to upgrade the cul de sac.

Advice: this could be covered by condition.

A small portion of the access will require widening to cater for one-way clockwise circulation of vehicles. General Managers Consent has been updated accordingly.

The gate control panel has been situated such that modification of the cul-de-sac to meet the LGAT requirements for industrial subdivisions will not require relocation or removal of the gate control panel.

Regarding the TasNetworks request for further information, the location of fence footings have been modified to ensure >3m separation between TasNetworks electrified fence and DAME electrified fence.

If you have any further queries in relation to any of the above, please contact me on 6234 9281.

Yours sincerely,

Michela Fortini

Planner
IRENEINC PLANNING & URBAN DESIGN

pitt&sherry

Transmittal document P.24.1232-009

P.24.1232: 73 Greenbanks Road - Data Centre

Uncontrolled Deliverables

FILENAME	TITLE	DOCUMENT TYPE	REV
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73 Greenbanks Road – Utilities infrastructure

Schematic Design Report – Civil Engineering

Prepared for

DAME

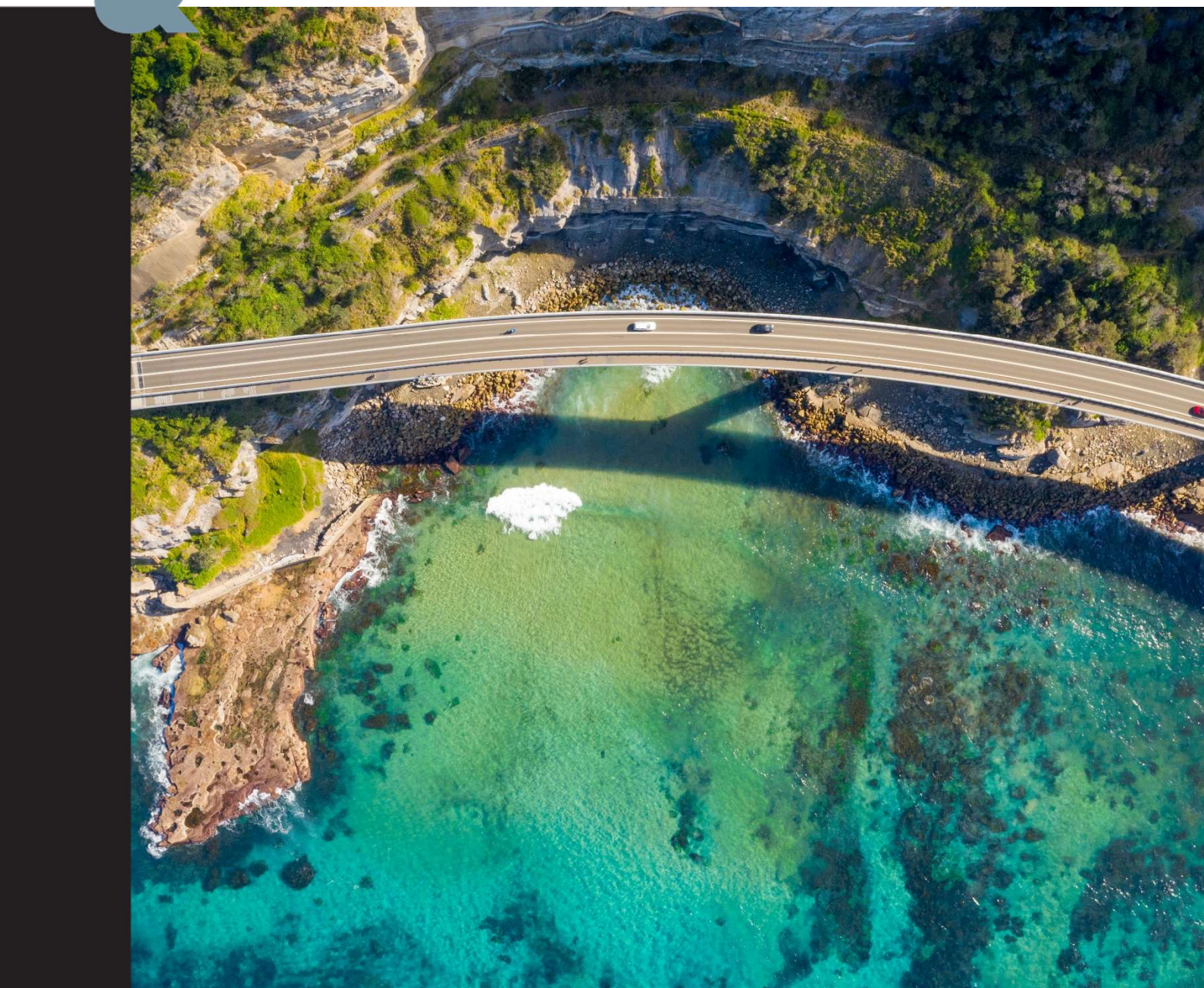
Client representative

Cam Nelson & Dale Andersen

Date

19 March 2025

Rev03



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1. Introduction

1.1 Background

DAME Technologies Pty Ltd (DAME) is proposing to construct a utilities infrastructure facility at 73 Greenbanks Road, Bridgewater. The utilities infrastructure facility will operate via direct HV connection from the TasNetworks Bridgewater Substation. It will operate as a Frequency Control Ancillary Service provider as an interruptible facility, thus aiding in grid stabilisation within standard operational limits by maximising energy use during off-peak times and minimise it during peak periods. The provision of such facilities is expected to be increasingly important as the renewable energy sources are further integrated.

The facility will feature 11 data units, each of which will comprise two 1.25 MW immersion-cooled data modules (shipping container-sized module filled with data miners), and one 2.5MW dielectric-direct cooling module (shipping container-sized module comprising four large fans). Each unit will be powered by a 3,000 kVA transformer. The layout of a data unit is shown below in and . Please note dimensions are in the imperial system.

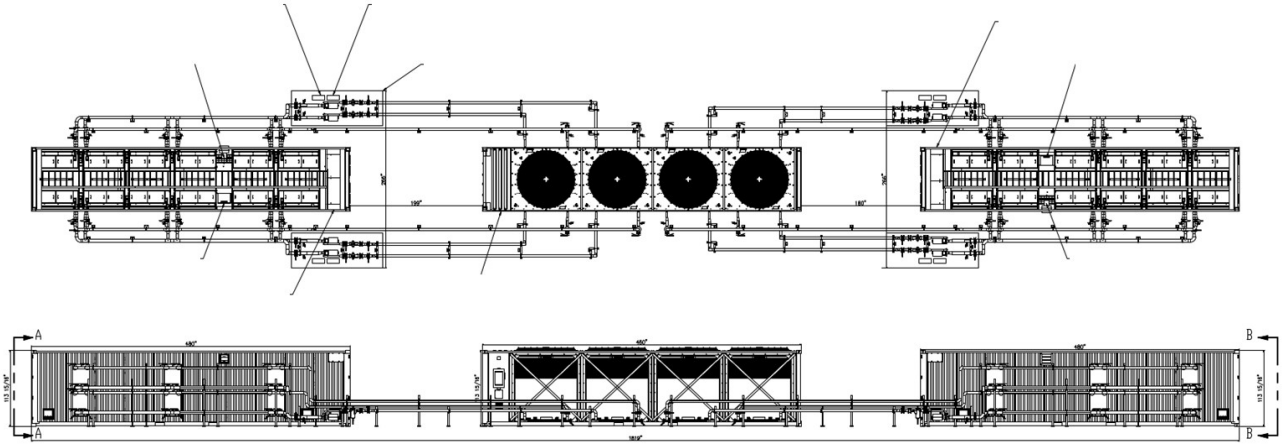

Figure 1: Module set - aerial and side profile

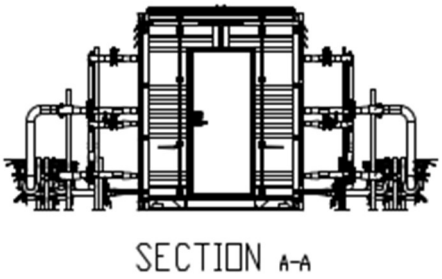

Figure 2: Module - front profile

Data units will comprise servers, data storage drives, and network equipment. The facility will receive 11kV from the TasNetworks Bridgewater Substation and distribute it among the data modules (miners) and variable frequency drives (VFDs) at 420V level. Power is distributed through the Main Switchboard (MSB) and a series of distribution sub-boards connected to the servers and other gears such as Power Distribution Units (PDUs) and Remote Power Panels (RPPs). The facility includes the infrastructure, systems, and processes required for Power System Management (PSM). This includes power supply distribution, backup systems, and management tools to ensure that the facility can operate continuously and effectively without any interruptions.

The key responsibilities of the facility management system are:

- Planning and execution of a robust backup methodology
- Disaster recovery
- Continuity planning
- Day-to-day technical support; and
- Emergency support.

The development will also feature:

- a site office
- a site shed
- circulation roads
- a car park; and
- a laydown area.

As part of the facility development, it is proposed that TasNetworks provide two staged connection points within the Substation, a 10MVA connection on 11kV A bus switchboard, and a 10MVA and 7.5 MVA connection on 11kV B bus switchboard. 11kV cables will be provided between the Substation and the facility, although it has not yet been ascertained as to whether these will be underground or overhead.

1.2 Purpose of this report

This report has been developed to support the planning report and subsequent Development Application to Brighton Council for the proposed utilities infrastructure at 73 Greenbanks Road. The report thus provides an overview of the site's existing conditions, the proposed development, and the criteria, including the standards and guidelines, that have governed schematic design, and will govern the detailed design of the development.

It is noted that this report primarily talks to the civil engineering scope of the development. The report has been updated to address Brighton Council's RFI.

1.3 Site location

The site is located at 73 Greenbanks Road, Bridgewater Tasmania, within the Brighton Industrial Hub. The site, and the site location in the local context, is shown below in Figure 3 and Figure 4, respectively. It is bounded by the TasNetworks Bridgewater Substation along the western and southern boundaries, Weily Park along the eastern boundary, and an industrial development along the north-eastern boundary. The site is accessed via an existing access road from a cul-de-sac at the southern end of Greenbanks Road.

Figure 3: Site

Figure 4: Site locality

2. Existing conditions

2.1 Site

The utilities infrastructure facility site is located at 73 Greenbanks Road, Bridgewater. It is primarily a greenfield site, other than the existing service road and utilities, which are understood to have been constructed as part of a planned 9-lot subdivision no longer proposed by the current owner.

Some images of the site are shown below in Figure 5 to Figure 7.

Figure 5: In the vicinity of the existing water connection from TasNetworks – looking north-west

Figure 6: On the existing service road – facing south

Figure 7: Near the centre of the site - facing east

The land parcel is classified as General Industrial under the *Tasmanian Planning Scheme* (the Planning Scheme). The site is also subject to the following code overlays:

- Electricity Transmission Infrastructure Protection Code – substation facility buffer area (excludes north-eastern portion of the site
- Bushfire-prone Areas Code – Bushfire-prone areas (entire site); and
- Attenuation Code – Attenuation area – Bridgewater Quarry (north-eastern portion of the site).

The code overlays are shown below in Figure 8.

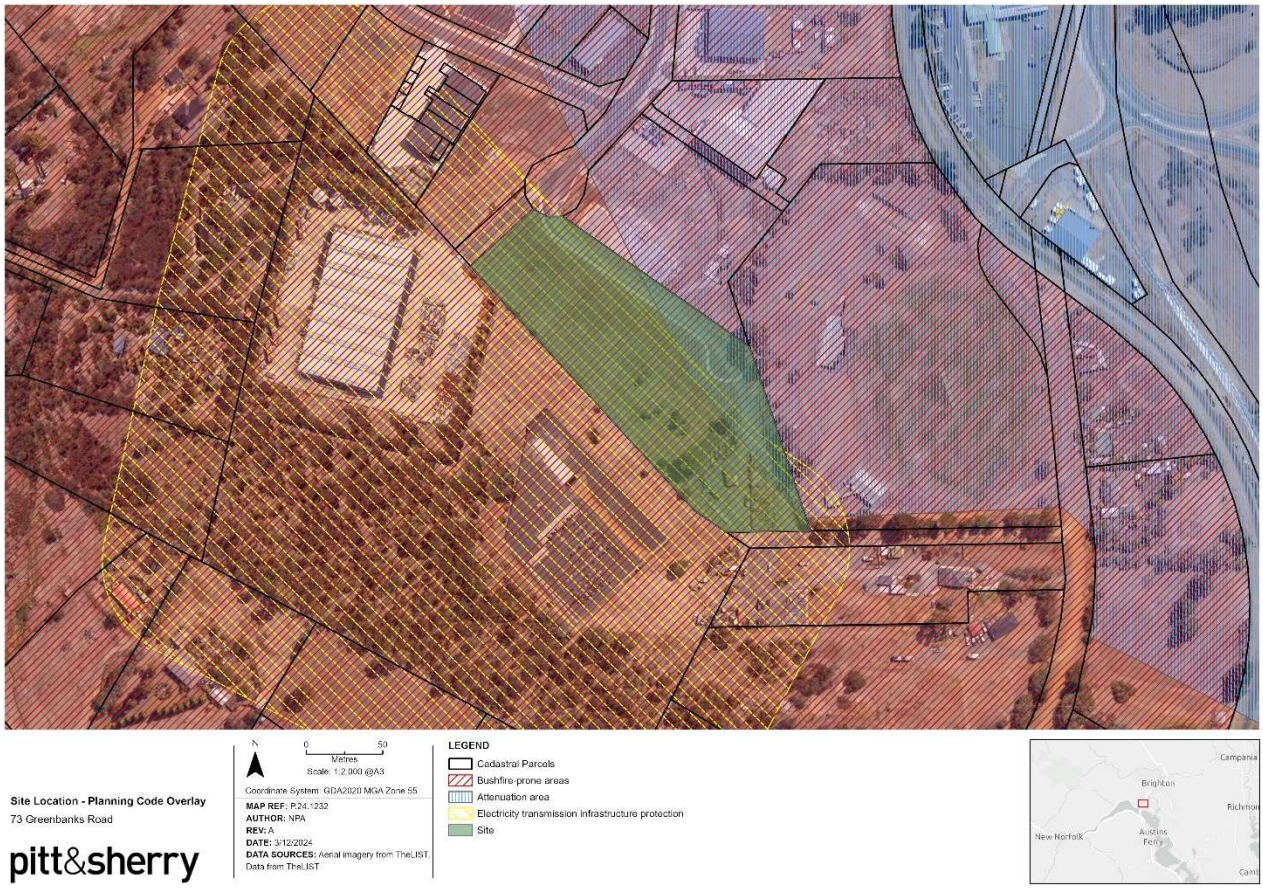

Figure 8: Planning Code Overlay

2.1.1 TasWater easements

Two TasWater easements are located near, and run parallel to, the south-west boundary of the site. The easements are 4.00m wide and 10.06m wide respectively and are located directly adjacent one another. The easements contain a 450 mild steel cement lined (MSCL) reticulation main and a 571 MSCL bulk transfer main. Discussions have already begun with TasWater regarding the easements and their restrictions around them.

2.1.2 Other utilities

The existing site has a number of other utilities located throughout including:

- Sewer
- Water reticulation
- Stormwater; and
- Underground electricity.

These services, as well as the water mains, are shown in the survey below. A pdf file of the survey is included in Appendix C.

Figure 9: Survey

2.1.3 Existing road

It is understood that the existing road and cul-de-sac were designed and constructed in accordance with the Tasmanian Municipal Standard Drawings (LGAT standards) for residential roads and is thus approximately 8-9m wide. The cul-de-sac, however, has a 12.5m radius, which meets the requirements of the LGAT standards for industrial subdivisions. The road has a footpath on the southern side and is unsealed.

2.1.4 Geology

An initial geotechnical investigation undertaken by Statewide Geotechnics titled *Geotechnical Investigation – Proposed Commercial Development 73 Greenbanks Road, Bridgewater* was undertaken at the site in early 2024 (attached in Appendix D). The investigation included a desktop geotechnical assessment, drilling of boreholes at five separate, evenly-spaced locations across the site, geotechnical logging and sampling of the soil profile for analysis and preparation of the report, including recommendations for earthworks and foundation design.

Indicated by the 1:25,000 geology map of the Brighton area, the site and surrounds is underlain by Jurassic Dolerite at shallow depths.

The summary of the borehole data generally showed refusal on MW dolerite at 0.9m to 1.4m depth. Refusal also occurred on cobbles/ boulders at multiple locations. Subsurface layers typically comprised loose clayey silt on the surface, very stiff to hard sandy silty clay from roughly 0.2m to 0.9m, and hard sandy clay below this until refusal.

It is stated that the site can be classified as 'Class M' material based on *AS 2870:2011 – Residential Slabs and Footings* with the underlying dolerite rock layer classified as "Class A' material.

2.1.5 TasNetworks Bridgewater Substation

As discussed, the TasNetworks Bridgewater Substation is located west of the 73 Greenbanks Road site. It comprises two main developments, a substation and a large warehouse. The former is accessed via an easement from Weily Park Road, whereas the latter is accessed from Greenbanks Road. The site is zoned as Utilities under the Planning Scheme.

2.2 Surrounding road network

2.2.1 Greenbanks Road

The site has frontage to Greenbanks Road off the existing cul-de-sac. Greenbanks Road is a Brighton Council (Council) owned two-lane two-way (2L2W) local road[1] that operates from Strong Street (which provides connection to Glenstone Road) and provides access to a new industrial subdivision.

Greenbanks Road, in the vicinity of the site, is approximately 8.5m wide and sealed. A footpath is generally provided on one side of the road. On-street parking is permitted, although it was observed cars are typically accommodated off-street within the developments being visited.

Greenbanks Road is subject to the Tasmanian Urban Speed Limit of 50km/h.

2.2.2 Glenstone Road

Glenstone Road is a Department of State Growth (State Growth) owned 2L2W arterial road[1] configured with a single lane in each direction and is accessed via the Midland Highway. It is the primary access road to the Brighton Industrial Hub. Glenstone Road has an average width of approximately 10.0m.

3. Stakeholder engagement

Stakeholder engagement activities completed on this project to date include:

- Engagement with TasNetworks regarding HV connection
- Engagement with TasWater regarding access to their easement; and
- Engagement with Boral Quarries Planning Team.

It is proposed to continue to liaise with both TasNetworks and TasWater during the design process to ensure the development appropriately considers these key stakeholders. It was advised by Boral Quarries Planning Team that they require documentation outlining that structures on site are appropriately designed to resist the impacts of any blasting that occurs at the quarry.

[1] In accordance with TheLIST's Road Centrelines Transport Class.

4. Schematic design

The schematic design drawings are attached in **Appendix A** of this report.

4.1 Proposed development

As discussed, the site is proposed to be utilised as a utilities infrastructure facility with 11 data unit modules in the form of prefabricated containers located on the site. The utilities infrastructure will operate unmanned, other than maintenance staff, however, other employees may be stationed within the site office or site shed for general office works, or component testing. The maximum number of staff expected to be on site at a single time is eight FTE. During maintenance, should additional staff be on site, their vehicles can be located within the laydown area.

The utilities infrastructure will require civil infrastructure to ensure the units can operate effectively and comply with the relevant requirements. This infrastructure includes but is not limited to: bunding of units, access roads, perimeter fences, stormwater drainage and other services, electrical supply to the modules, retaining walls, internal paths, a site office and shed and a laydown area for material storage.

The design brief has been developed based on the site requirements outlined below:

- 11 sets of data units are to be located within the site, each of which will be powered by a 3,000kVA (3MW) transformer supplying 2,500kVA of power to the data units. As such, a total of 27,500kVA (27.5MW) will be supplied to the data units across the site
- Data units, including the piping (shown in Figure 2) must be spaced a minimum of 6.1m apart laterally for optimal cooling of the data modules; and
- Data units must be installed on a flat surface.

4.1.1 Data units

As discussed, data units are comprised of two data modules and one cooling module. Relevant specifications of the data modules and cooling modules are shown below in Table 1 and Table 2, respectively.

Table 1: Data module relevant specifications

Component	Specification
Maximum Mining Capacity	1.25 MW
Footprint	Hi Cube Dry Ship ISO Container (Exterior Dimensions: 2.44m Width X 2.90m Height X 12.19m Length)
Total Dry Weight (Full Payload, Shipped W/O Miners)	11,340kg
Total Wet Weight (Full Payload, Deployed)	17,422kg
Lifting Provisions	Per ISO 3874 (Top lift spreader preferred)
Equipment Loading Entry Provisions	Hinged Single Sided Container Door w/ Personnel Door Within
Coolant Capacity per Tank	170 litres

Table 2: Cooling module relevant specifications

Component	Specification
Footprint	Hi Cube Dry Ship ISO Container (Exterior Dimensions: 2.44m Width X 2.90m Height X 12.19m Length)
Total Dry Weight (Full Payload, Shipped)	10,886kg
Total Wet Weight (Full Payload, Deployed)	11,406kg
Number of Fan / Gearbox / Motor Assemblies	Four
Lifting Provisions	Per ISO 3874 (Top lift spreader preferred)
Equipment Loading Entry Provisions	Hinged Double Doors, Trailer End
Ambient Air Design Temperature	28°C
Coolant Return (into Coil) Design Temperature	57°C
Coolant Supply (out of Coil) Design Temperature	45°C
Coolant Capacity per Coil	136 Litres
Fan / Motor Assembly	Roof Mounted, Vertical Motor Shaft with Upvent Fan

Miners will be housed within 170 litre tanks that are stacked within racks within the data modules. The tanks are filled with cooling fluid. Pipes slowly circulate pumped fluid between the cooling modules and the data modules such that the fluid temperature remains appropriately low for miner operation.

4.2 Design standards and guidelines

The design of the site will be developed in accordance with the current guidelines and standards listed below:

- Brighton Council
    - *Landscaping policy*
- Cement Concrete and Aggregates Australia
    - *Guide to Industrial Floors and Pavements – design, construction and specification*
- EPA Tasmania
    - *Bunding and Spill Management Guidelines December 2015*
    - *Water Sensitive Urban Design*
- *FM Global Property Loss Prevention Data Sheets 5-4: Transformers*
- *International Fire Engineering Guidelines*
- Local Government Association Tasmania
    - *Tasmanian Standard Drawings: Version 3, December 2020*
- *National Construction Code*
- National Heavy Vehicle Regulator
    - *National Heavy Vehicle Mass and Dimension Limits*
- Standards Australia
    - *AS/NZS 1158.1.1:2022 – Lighting for roads and public spaces Part 1.1: Vehicular traffic (Category V) lighting – Performance and design requirements*
    - *AS/NZS 1158.1.2:2022 – Lighting for roads and public spaces Part 1.2: Vehicular traffic (Category V) lighting – Guide to design, installation, operation and maintenance*
    - *AS/NZS 1158.3.1 Lighting for roads and public spaces Part 3.1 Pedestrian area (Category P) lighting – Performance and design requirements*
    - *AS/NZS 1170.0:2003 – Structural design actions Part 0: General principles*
    - *AS/NZS 1170.1:2002 – Structural design actions Part 1: Permanent, imposed and other actions*
    - *AS/NZS 1170.2:2021 – Structural design actions Part 2: Wind loads*
    - *AS 1428.1: 2021 – Design for access and mobility Part 1: General requirements for access – New building work*
    - *AS 1742.1:2021 – Manual of uniform traffic control devices Part 1: General introduction and index of signs*
    - *AS 1742.2:2022 – Manual of uniform traffic control devices Part 2: Traffic control devices for general use*
    - *AS 1742.10:2024 – Manual of uniform traffic control devices Part 10: Pedestrian control and protection*
    - *AS 1742.11:2016 – Manual of uniform traffic control devices Part 11: Parking controls*
    - *AS 1940:2017 – The storage and handling of flammable and combustible liquids*
    - *AS 2067:2016 – Substations and high voltage installations exceeding 1 kV a.c.*
    - *AS 2159:2009 – Piling - Design and installation*
    - *AS 2419.1:2021 – Fire hydrant installations Part 1: System design, installation and commissioning*
    - *AS/NZS 2890.1:2004 – Parking Facilities Part 1: Off-street car parking*
    - *AS 2890.2:2018 – Parking Facilities Part 2: Off-street commercial vehicle facilities*

- *AS 2890.6:2022 – Off-street parking for people with disabilities*
- *AS/NZS 3000:2018 – Electrical installations*
- *AS 3500.1:2021 – Plumbing and drainage Part 1: Water services*
- *AS 3500.2:2021 – Plumbing and drainage Part 2: Sanitary plumbing and drainage*
- *AS 3600: 2018 – Concrete structures*
- *AS 4100:2021 – Steel structures*
- *AS 4678:2022 – Earth-retaining structures*
- *AS 5216:2021 – Design of post-installed and cast-in fastenings in concrete*

- *Tasmanian Planning Scheme State Planning Provisions*
- Water Supply Code of Australia
  - *WSA 03- 2011-3.1 MRWA Edition V2.0*
  - *TasWater Supplement to Water Supply Code of Australia WSA 03- 2011-3.1 MRWA Edition V2.0*
- Sewerage Code of Australia – Melbourne Retail Water Agencies Integrated Code
  - *WSA 02-2014.3.1 MRWA Edition V2.1; and*
  - *TasWater Supplement to Gravity Sewerage Code of Australia WSA 02 - 2014-.3.1 MRWA Edition V2.1.*

The requirement of other standards will be confirmed as part of design development and included in the detailed design report as necessary.

4.3 Fencing

An 1800mm tall chain mesh fence is proposed on the site boundary. The fence will nominally feature:

- 80NB corner posts at a depth of 900mm, 450mm diameter footing to 1000mm depth
- 40NB intermediate posts at a depth of 600mm, 300mm diameter footing to 700mm depth
- To prevent undermining of the fence and to reduce the maintenance task, the fence shall sit above a 800mm wide x 200mm deep trench filled with rip rap. This should provide a level of deterrent for trenching under and reduce the need to trim vegetation nearby the fence.

Two pairs of dual remote-controlled access gates will be provided at the site frontage, one for entry, and one for egress. The gates are expected to be a maximum of 2.4m tall. A control panel (likely swipe-card controlled) for the access gate is proposed to be located within the road reserve adjacent the existing private access road, subject to agreement by Council. Other supporting infrastructure within the road reserve includes a small kerbed island and a bollard to protect the control panel, and an underground conduit surrounding a LV cable running from the site to the control panel to provide connection. This location is not anticipated to impede any access to adjacent sites. Access to the site will also be provided for TasNetworks and TasWater.

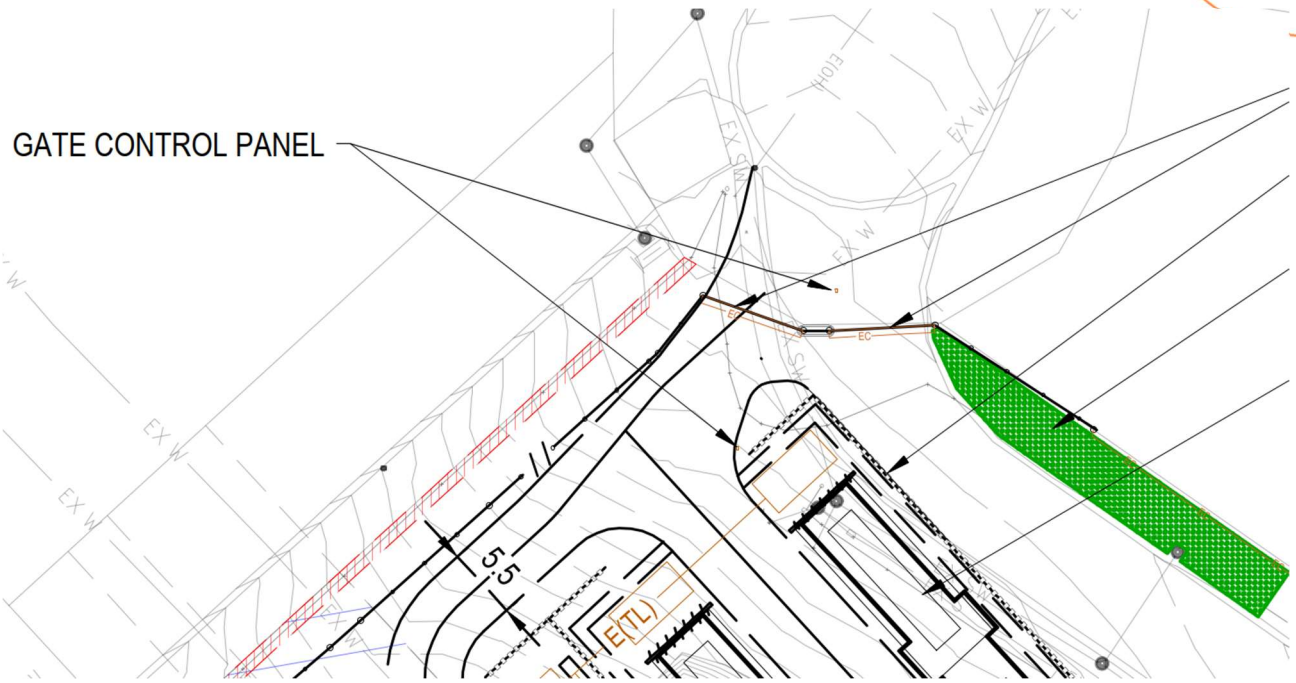

Figure 10: Potential control panel location

Turning paths evidenced in Appendix B show that trucks can travel through the gates whilst missing the control panels. Line marking will be provided to ensure that vehicles stop clear of the gates.

A security system is proposed to be added to the fence for further security. A similar system is installed around the TasNetworks Bridgewater Substation. The system will include attaching star-picket-like extensions to the inside of the fence posts, increasing the total height of the fence to 2.2m.

The following requirements have been considered in locating fence posts, as outlined by the relevant utility authority:

- Fence footings can be, at a minimum, 1m away from positively identified cables. This is inclusive of 11 kV and LV cables
- Fence footings must be a minimum of 1m from the outside of TasWater pipe walls; and
- Will require consent under Section 56W of the Water and Sewer Industry Act if, where not a concrete fence, is taller than 2.1 metres.

The trench will also be designed to not be located within 1m of TasNetworks or TasWater infrastructure. It is noted that the trench will only cross TasWater water mains within the TasWater easement of the 73 Greenbanks Road site.

Cables and pipes near the site boundary will be potholed prior to installation of fencing.

As the site is located in the General Industrial Zone and the fencing will not be greater than 2.8m in height, it is understood that it can be installed prior to Development Application endorsement as part of miscellaneous exemption 4.6.5.

4.4 Security

A monitored pulse fence is proposed to be installed to provide site security. A series of electrified wires will be attached to the fence extensions. The fence will alert a security system if a wire is touched. If energized, the fence will deliver a short shock if a person comes into contact with it.

CCTV will be provided at specific locations on the site. Minimum lighting levels will be provided for CCTV.

4.5 Landscaping

Landscaping is to be provided at the site frontage where space is available, as shown on the plans in Appendix B. It is proposed to plant low shrubs and grasses with shallow roots such that sight distance to and from the site is not impeded, and such that the existing utilities are not impacted. Any planted species will not be listed as noxious weeds.

Shrubs/ groundcovers may include white correa, creeping boobialla and foxtail stipoides.

A number of existing trees on the site will require removal. Trees to be removed are shown on the landscaping plan in Appendix B.

4.6 Buildings

As discussed, both a site shed and a site office are proposed to be located on the site during operation. It is proposed both buildings will also be utilised during construction.

4.6.1 Site shed

An 8m x 20m tin portal frame shed on slab and footings with roller door side access is proposed for the site. The building will have a maximum height of 6.21m. Under the National Construction Code (NCC), the building will be a Class 10a building.

The site shed will have an FFL of 42.57, and a maximum RFL of 48.78m. The minimum natural ground level is 41.91m (average NGL is 42.47m) at the site shed. As such, the building will be a maximum of 6.87m tall above natural ground level.

Architectural drawings of the site shed are shown in Appendix I. It is noted that location and height of doors, windows may change. The maximum height of the building may also be lowered.

4.6.2 Site office

An 8m x 20m prefabricated structure on footings is proposed for the site. The building will have a maximum height of 4.8m. Under the National Construction Code (NCC), the building will be a Class 5 building.

The site office will have an FFL of 41.7 and a maximum RFL of 46.5m. The minimum natural ground level is 40.53m (average NGL is 41.29m) at the site office. As such, the building will be a maximum of 5.97m tall above natural ground level.

High-level architectural drawings of the site office are shown in Appendix J. It is noted that location and height of doors, windows may change. The maximum height of the building may also be lowered, and the building footprint reduced.

4.7 Transformers

It is currently proposed to install transformers located in custom, self-bunded, switchrooms containing a ring main unit (RMU), transformer and LV switchboard. Spacing of transformers has been shown on plans based on the assumption that 3,000kVa oil-insulated transformers are utilised. The switchroom is shown to be 3.5m tall, 3.0m wide and 6.0m long. It is noted that the type and thus the size and spacing of transformers may change slightly based on the manufacturer specifications. Transformers are yet to be ordered.

A liquid volume between 1,000L and 2,000L has been assumed based on the size of the transformer.

As discussed, one transformer will be provided for each of the 11 data units. Transformers will sit on plinths.

4.8 Data units

Please note that for the purposes of this report, rows of data units (from north to south) have been labelled from 1 – 4, from west to east. Although transformers will be within switchrooms and thus can be considered indoor transformers, space proofing has been completed as if they are outdoor transformers to provide improved safety outcomes (and in the instance that the preferred transformer arrangement moves away from utilising a switchroom). It is assumed that transformers will take up no more than 50% of the total length of the switchroom.

4.8.1 Spacing

Spacing – transformer to transformer

Spacing between transformers was governed by the requirements of AS 2067:2016 Table 6.1, shown below in .

TABLE 6.1

CLEARANCES FOR OUTDOOR TRANSFORMERS

Transformer type	Liquid volume	Clearances to other transformers or equipment	Clearances to buildings		
		Horizontal separation G_1 to other transformers or non-combustible surfaces	Horizontal clearance G_2 to combustible surfaces	Horizontal clearance G_3 to 2 hour fire resistant surfaces of buildings	Vertical extent G_4 for 2 hour fire resistant surfaces of buildings
	L	m	m	m	m
Oil-insulated transformers (O)	100 ≤1000	1	6	1	4.5
	>1000 ≤2000	3	7.5	1.5	7.5
	>2000 ≤20 000	5	10	4.5	15
	>20 000 ≤45 000	10	20	7.5	30
	>45 000 ≤60 000	15	30	7.5	30
	>60 000	23	30	7.5	30
Less combustible liquid-insulated transformers (K) without enhanced protection	100 ≤1000	1	6	1	4.5
	>1000 ≤38 000	1.5	7.5	1.5	7.5
	>38 000	4.5	15	4.5	15
Less combustible liquid-insulated transformers (K) with enhanced protection (refer to Note 1)	Clearance G_1 to other transformers or building surfaces				Vertical extent G_4 for 2 hour fire resistant surfaces of buildings
	Horizontal m				Vertical m
	0.9				1.5
Dry-type transformers (A) Fire behaviour class F_0	1.5				3.0

Figure 11: AS 2067:2016 Table 6.1

As noted previously, the spacing between the outer piping of data units must be approximately 6.1m laterally. To provide sufficient space for a crane on the circulation road between data unit rows 2 and 3, this lateral spacing was increased to 7.82m. The minimum spacing between the outer piping of adjacent data units is currently 6.92m.

Minimum spacing between transformers within switchrooms is approximately 10m, exceeding the 3m requirement for transformers with liquid volume between 1,000 and 2,000 litres.

Spacing – transformer to building

Spacing between transformers and buildings was governed by the requirements of AS 2067:2016 and the FM Global Property Loss Prevention Data Sheets 5-4: Transformers, which provides further guidance on the spacing requirements of outdoor transformers.

As the data units will be combustible surfaces (thus requiring 7.5m spacing between the transformer and the data unit), it is proposed to locate fire resisting walls between the two, which instead require a minimum of 1.5m spacing between transformers. 1.5m has been provided between data units and fire resisting walls for data unit door opening.

The fire resisting walls have been allocated 0.2m width, however, are yet to be designed. Walls will be designed in accordance with Figure 6.1 and Figure 6.2(A) of AS 2067:2016.

Data units are spaced at 4.1m from unit to unit when not separated by a transformer within a switchroom and separated by 10m when separated by one transformer within a switchroom.

4.9 Fluids

4.9.1 Miner cooling fluid

Miner cooling fluid is proposed to be Shell Immersion Cooling Fluid S3 X. The safety data sheet for the fluid is attached in Appendix E.

Based on the Safety Data Sheet, the fluid is a Class 2 combustible liquid (flash point 98 degrees C) and a Category 1 aspiration hazard. The fluid is not classified as a hazardous chemical prescribed in Schedule 11 of The Work Health and Safety (WHS) Regulations and as such does not require the preparation of a manifest or notification to the regulator. As the cooling fluid is a combustible liquid the requirements of Australian Standard – AS 1940: The Storage and Handling of Flammable and Combustible Liquids apply. These requirements are met through the design, including bunding.

Approximately 16,400L of the cooling fluid will be circulated through each data unit. As such, a total of 180,400L of cooling fluid will be stored in data units on the site. Additional cooling fluid for top ups is proposed to be stored in ISO STOLT containers on the site.

Further information regarding the storage and handling of the miner cooling fluid can be found in the Environmental Management Plan – Schematic Design, attached in Appendix H.

4.9.2 Transformer fluid

As discussed, transformers are yet to be specified or ordered.

Based on the size of the transformers, they are each expected to have a capacity of between 1,000L and 2,000L. As such, the 11 proposed transformers may hold up to 22,000L of fluid. The fluid will be an oil.

4.10 Lighting

Lighting type and location within the site is yet to be discerned, however, it is expected that lighting will be provided in the vicinity of the site shed and site office, the car park, and pedestrian paths throughout the site. As discussed, it will also be provided as required for CCTV. Light spill into neighbouring properties will be avoided where possible, although it is noted that such lighting would likely improve security for surrounding sites.

Lighting type, location and connection will be provided in detailed design.

4.11 Structures

Structures, other than buildings and their foundations, include site retaining walls, fire resisting walls, bunds and plinths. The aforementioned, plus safety barriers, pedestrian fences and hardstand areas, will be designed in accordance with relevant structural standards during the detailed design phase of this project.

4.11.1 Retaining walls

Retaining walls are expected to be post and panel or gravity walls. Pedestrian fencing is proposed to be located at the top of the retaining walls to protect persons walking along the top of the wall.

Further geotechnical investigations are proposed at the start of detailed design to confirm ground conditions and inform the design requirements of the retaining wall. Retaining walls will be designed to account for maximum loading during construction and operation.

4.11.2 Fire resisting walls

Fire resisting walls are located between transformers and data units to provide a fire-resistant barrier between the two; these walls will be designed in accordance with AS 2067:2016, FM Global Data Sheet 5-4 and the International Fire Engineering Guidelines. If it is determined that these are not required based on the switchroom having sufficient fire resistance, fire resisting walls may be removed from the detailed design.

4.11.3 Bunds

Bunds are located under data units as a provision for leaks and spills. Bund capacity has been designed in accordance with AS 1940:2017, plus a tolerance for rainfall. The minimum height of the bund will be 75mm.

The baseline maximum spill has been calculated to be approximately 4,100L per data unit (25% of total capacity), aligning with the requirements of AS 1940:2017. This is understood to be the largest of the following:

- At least 110% of the volume of the largest storage vessel; or
- At least 110% of the combined volume of any inter-connected vessels within that bunded area; or
- At least 25% of the total volume of all vessels stored in that bunded area; or
- The capacity of the largest vessel plus the output of any appropriate fire suppression system fitted, over a 20-minute period.

Vessels (tanks which will be filled with cooling fluid) will have a maximum capacity of 170L and the pipes themselves will have a capacity of 136L. It is understood that connected pipes and vessels will have a storage capacity significantly below 4,100L.

The bund area is approximately 234m^2. Accounting for the inclusion of plinths, on which the data units will sit, a conservative 220m^2 is assumed as storage area. This would require approximately 1.87mm of storage of the cooling fluid.

In accordance with the EPA's Bunding and Spill Management Guidelines, bunds will be roofed, where possible, with roofing proposed to extend 12 degrees beyond vertical to account for rain angle. Constraints with roofing include the requirement for open air surrounding the cooling modules, and the impedance of roof overhang on circulation roads within the site. It is proposed that the area within the bund protected by the roof (inclusive of the 12-degree extension beyond the vertical), will comprise ~176m^2 of the ~234 m^2 bunded area. This leaves a remaining 58m^2 unprotected, however, approximately 30m^2 of that will be above the cooling module which is expected to push the rain away and onto the roof or ground due to the air blowing out of the fans. It is also noted that rain can enter at angles steeper than 12 degrees, however, the bund has been designed as per the guidelines and there are a number of factors reducing water in the bunds that have also not been accounted for.

The wettest month in the locality is August, which has a 95th percentile rainfall of 168mm. This rainfall accounts for approximately 9.8 cubic metres of rain (does not include potential fan area savings) in the bund spread over the 220m^2 of bund storage area will be 44.3mm of height. A leak of 4,100L would increase the height of liquid in the bund to approximately 46.2mm of height.

To protect against a 99th percentile 24-hour rainfall of 110mm, which is expected to generate approximately 29.0mm of stormwater into the bund, it is proposed that bunds are emptied monthly, or, when liquid in the bund reaches 45mm in height to limit the likelihood of overtopping. During dry months, frequency may be decreased. It is proposed that bund depth is monitored regularly, either via maintenance personnel, or electronically, to ensure adherence to proposed schedule.

In accordance with the EPA's Bunding and Spill Management Guidelines, fluid in bunds will be disposed of by a liquid waste contractor as advice received from TasWater noted that a trade waste agreement was not appropriate. Given that annual rainfall in the Brighton is 487mm, the number of 10-tonne (8kL) trucks required to empty bunds on an average year of rainfall could be expected to be less than 100.

Private waste contractors will dispose of other on-site waste appropriately.

Roofs

Canopy roofs or similar will be attached to the data modules and cooling modules over the bunds to reduce the amount of stormwater required to be pumped out of the bunds. The roofs would also serve to protect pipes from direct sunlight. It is not yet understood the impact of roofs on the efficiency of the cooling modules and therefore the area above the modules will be left roofless and flashed down to the container. Stormwater on roofs will be drained to proposed stormwater catchments.

Roofs will not exceed 5.0m in height above the proposed ground level. Roofs will be designed in accordance with relevant structural standards, accounting for rain, wind, and any necessary loading.

4.11.4 Plinths

Data units and transformers will be located on plinths such that they are not flooded in heavy rains. Plinths are proposed to extend a minimum of 25mm above the height of the bunds from the hardstand to ensure flooding of data and cooling modules does not occur. Plinths will be designed for proposed maximum loadings and such that data units remain flat (i.e. account for grading within the bund). Steps will be provided to access data units and transformers. Plinths will be steel-reinforced concrete and thus impermeable. They will be approximately 3m wide, 0.5m long and 0.1m high.

4.11.5 Safety barriers

Safety barriers will be considered around site where higher risks of collisions are identified, including where piping, data units, retaining walls and fluid stores are in close proximity to circulating traffic. The design of safety barriers is a detailed design action, but will account for the largest design vehicle, proposed vehicle speeds, and consider maximum deflections. Safety barriers are expected to be W-beam road safety barriers.

4.11.6 Pedestrian fences

Pedestrian fences will be designed along the retaining walls where risk of falls is much greater. The design of pedestrian fences is a detailed design action.

4.11.7 Hardstands

Hardstands are proposed in the areas around the bunds, the laydown area and generally anywhere the bunds, roads and buildings aren't. These will be designed to take the required construction or operational loads, governed by crane weights, truck weights, and the weight of data units and fluid stores. These hardstands will be designed to the applicable standards.

4.12 Circulation roads

Circulation roads have been designed in accordance with AS 2890.2 based on the turning paths of the design vehicle which will circulate clockwise throughout the site with separate entry and egress. Turning paths and dimensions are shown in the design drawings attached in Appendix A and Appendix B. The design vehicle is a 19m semi-trailer. Proposed circulation roads include widening of the existing access at the site frontage to enable one-way access and one-way egress of 19m semi-trailers.

It is noted that the westernmost circulation road, adjacent row 1 of data units, will only be utilised by a ~8.8m medium rigid vehicle (MRV) such that considerable masses are not applied to the road over the TasWater easement. 0.5m manoeuvring offsets were provided from the turning paths commensurate with the requirements of the *Austroads Design Vehicles and Turning Path Templates*. These offsets exceed the manoeuvring offset requirements required in accordance with AS 2890.2.

All parking, access ways, manoeuvring and circulation spaces will be constructed with a durable all-weather sealed pavement and be drained to the public stormwater system.

4.13 Ambulant and DDA accessibility

It is not anticipated that maintenance activities will be able to be undertaken by persons with mobility impairments. They are, however, anticipated to be able to attend the site for meetings. As such, a DDA compliant site office and toilet will be provided. Paths between the DDA accessible car parking space and the site office and toilet will thus be designed to meet the requirements of AS 1428.1. The location and dimensions of the DDA accessible car parking space next to the site office is shown on the drawings in Appendix A.

4.14 Footpaths

Where practicable. footpaths will be designed to meet the requirements of the LGAT standards, and thus will provide, at minimum, a 1.m clear width. Where viable, footpaths will be graded and widened (to 1.5m) to meet the requirements of AS 1428.1, particularly in the vicinity of the site office.

As discussed, pedestrian fencing will be provided as necessary to protect pedestrians from hazards such as vertical drops.

Pedestrian crossing points will be located along the circulation road at regular intervals. Crossing locations will consider crossing sight distance and the pedestrian desire lines.

Based on the above, the Development will meet Acceptable Solution A1.2 of C2.6.5 of the Planning Scheme.

4.15 Car parking

Eight standard car parking spaces are provided for the development. It is understood that during operation, generally no more than 6 persons will be on site at a single time. One DDA accessible car parking space will be provided in the vicinity of the site office.

The Planning Scheme – Table C2.1 Parking Space Requirements has been used to determine the number of car parking spaces required for the site. As the site use class is classified as Utilities, there is no car parking requirement.

The car park will be designed in accordance with AS 2890.1 for the parking of light vehicles and will be constructed with a sealed, durable, all-weather pavement. Line marking will be installed to delineate the car parking spaces. The DDA accessible car parking space will be designed in accordance with AS 2890.6. As discussed, dimensions of car parking spaces are shown in Appendix A and are suitable for visitors.

4.16 Pavements

Pavements will be designed based on the geotechnical information discerned during further geotechnical investigations, and the loadings required for each road/ hardstand area.

All proposed roads will be V-shaped, centrally collecting, rigid concrete or flexible asphalt pavements, other from the road along the TasWater easement which may be flexible depending upon the depth of the services beneath it. These roads will be designed to the relevant pavement standards.

Pavements will be designed in the detailed design phase.

4.17 Stormwater

4.17.1 Flooding

The site is not located within a flood-prone area, as per the Planning Scheme. As such, a flooding assessment has not been completed at this stage.

4.17.2 Stormwater

The stormwater design has been based on Brighton Council's Policy 6.1 and the Tasmanian Stormwater Policy Guidance and Standards for Development.

A hydraulic analysis has been undertaken to determine the impact of the new impervious area upon the receiving catchment, and to recommend and size suitable stormwater water management measures to offset the impact.

The hydraulic analysis was undertaken in accordance with the procedures recommended by *Australian Rainfall and Runoff 2019* (ARR). Rainfall Intensity Frequency Durations (IFD) data was obtained from the Bureau of Meteorology (BoM) website. Terrain data utilised was 2013 Greater Hobart 1m DEM LiDAR publicly available from Geoscience Australia.

A DRAINS model was created to assess both the existing and proposed hydrology and hydraulics. An initial loss–continuing loss (IL-CL) hydrological model was used to assess the hydrology.

The existing and proposed flows without detention are shown in Table 3.

Table 3: Existing and Developed Case flow rates

Scenario	2% AEP	1% AEP
Existing Condition	0.289 m^3/s	0.332 m^3/s
Developed Condition	0.426 m^3/s	0.493 m^3/s
Difference	0.137 m^3/s (+47.4%)	0.161 m^3/s (+48.49%)

To offset this increase, a water management measure is proposed. This measure is to provide a storage volume of approximately 172.3m^3. The detention hydraulic outputs are represented in Table 4.

Table 4: Total Site Peak Flow Rates with detention

Location	2% AEP	% Decrease	1% AEP	% Decrease
Catchment outlet	0.210m^3/s	27.3%	0.202m^3/s	25.3%

Based on the Table 4 flow rates the proposed stormwater design will be controlled to maintain the current outlet flow rates from the site.

4.17.3 Stormwater Quality Assessment

Water quality modelling software MUSIC (Model for Urban Stormwater Improvement Conceptualisation) by eWater is to be used to assess the pollutant loads and discharge quality to demonstrate the effectiveness of the treatment measures to remove pollutants. The use of MUSIC as a stormwater modelling software package is recognised as current best practice, as indicated in the Planning Scheme.

The assessment focuses on pollutant reductions of Total Suspended Solids, Total Nitrogen and Total Phosphorus. Water treatment targets are based on Table 3 from the Tasmanian Stormwater Policy Guidance and Standards for Development and are as follows:

- 90% reduction in the average annual load of litter/gross pollutants based on typical urban stormwater concentrations
- 80% reduction in the average annual load of total suspended solids (TSS) based on typical urban stormwater concentrations
- 45% reduction in the average annual load of total phosphorus (TP) based on typical urban stormwater TP concentrations; and
- 45% reduction in the average annual load of total nitrogen (TN) based on typical urban stormwater TN concentrations.

The proposed development includes stormwater quality management measures. These are:

- Three Ocean Protect JellyFish Filter.

These treatment measures have been included in a MUSIC model. A schematic of the music model is shown in Figure 12.

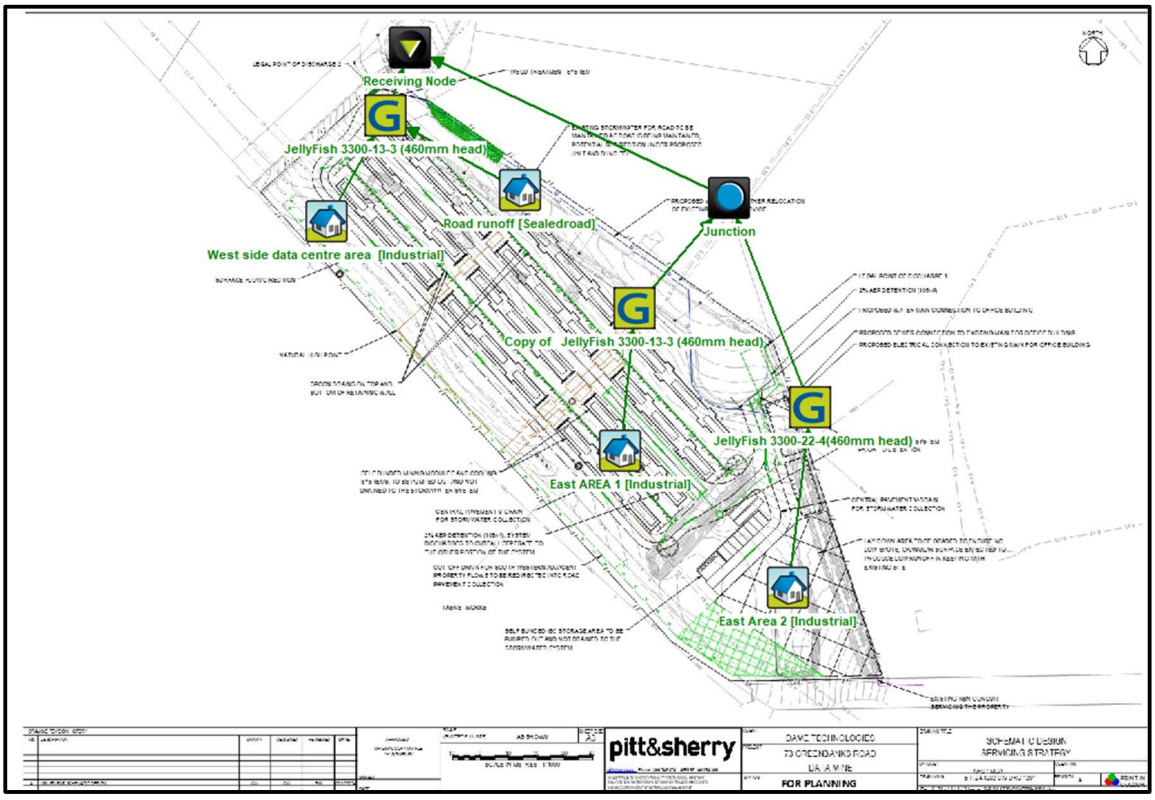

Figure 12: MUSIC model schematic

For the proposed water quality management measures, the following treatment train effectiveness is expected. These results meet the performance solution criteria for Brighton Council Stormwater Management Policy.

Table 5: Treatment train effectiveness LPOD

	Sources	Residual Load	% Reduction
Flow (ML/yr)	8.08	8.08	0
Total Suspended Solids (kg/yr)	1630	114	93
Total Phosphorus (kg/yr)	2.72	1.17	57
Total Nitrogen (kg/yr)	18.3	9.17	50
Gross Pollutants (kg/yr)	308	3.08	99

4.18 Water

It is proposed that a new water main is installed on the north-eastern side of the existing internal road as the existing water main will run under the proposed data units. It is proposed to cap and seal the existing water main. The proposed water main will be a 63mm main up near the office and then a 20mm tapping from there to the office. It is believed that there is adequate pressure as the reservoir is estimated to be BRW1 with a head of approximately 45.5m to site.

Refer to the Hydraulic Sizing Assessment (Appendix G) for further information.

4.19 Sewer

There is a proposed connection into the existing sewer MH near the existing cul-de-sac for the site office. The remaining sections of the upstream main are proposed to be removed as they will not service anything. The proposed sewer is expected to be an approximately 80mm connection for the building and there is expected to be adequate capacity due to the reduction in demand with the proposed development. The existing sewer will need to be confirmed in detailed design. Lines can be capped and sealed and then any infrastructure that is in the way of the proposed development can be removed.

Refer to the Hydraulic Sizing Assessment (Appendix G) for further information.

4.20 Telecommunications

A telecommunications connection is proposed to be provided from the southern boundary of the site via the TasNetworks easement. The cable will likely run along the eastern boundary to the site office.

4.21 LV

To be further determined during detailed design.

4.22 HV

To be further determined during detailed design.

4.23 Traffic

As discussed, the site will operate unmanned and thus generally will generate very low traffic volumes (i.e. maximum of 20 vehicles per day). Vehicles accessing the site, other than vehicles required for specific maintenance activities such as liquid waste removal or large-scale maintenance, will be light vehicles such as utes.

No new crossings are proposed as part of the development. Vehicles are able to enter and exit the site in a forward direction.

As Greenbanks Road is subject to greater than 100 vehicles per day, the Development will meet Acceptable Solutions A1.1, A1.2, A1.3, A1.4 and A1.5 of C3.5.1 of the Planning Scheme.

4.24 Ground vibration

As discussed, a meeting was convened with a member of Boral Quarries Planning Team regarding the implications of the site on the nearby Bridgewater Quarry, and, conversely, the impact of the Bridgewater Quarry on the site. As shown in Figure 8, the relevant Attenuation Area Overlay only covers an eastern portion of the site.

The outcome of the meeting was a request to provide Boral Quarries with the structural specification of infrastructure proposed for the site to ensure it can withstand the expected ground vibration from blasting.

The ground vibration rating for infrastructure within the Attenuation Area will be determined during detailed design and provided to Boral Quarries to confirm compliance. It is anticipated that all buildings will be able to comply with these requirements, noting the roughly 1.1km between the western edge of the quarry and the eastern boundary of the site. Where necessary, dampers or other suppressive systems may be utilised.

Important information about your report

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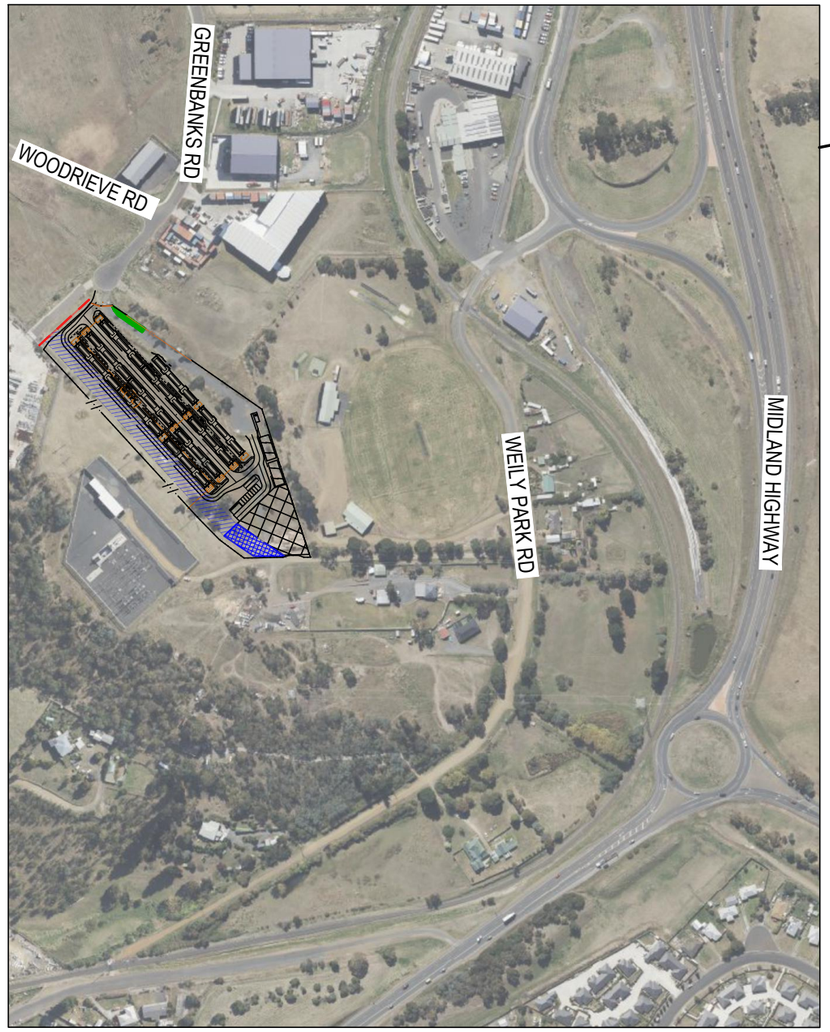
Schematic Design Drawings

Appendix A

DAME TECHNOLOGIES PT
73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE

NORTH



LOCALITY PLAN
NTS

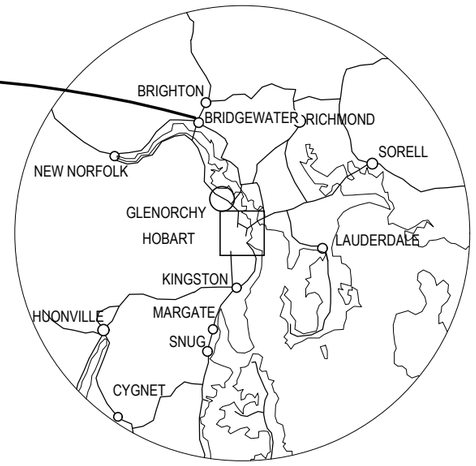


TABLE OF CONTENTS

DRAWING REVISION HISTORY

No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE
B	UPDATED FOR DA RFI	CM	CM	SM	18/02/2025
A	ISSUED FOR SCHEMATIC DESIGN	CM	CM	SM	18/12/2024

APPROVED
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PROJECT 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE
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PRINT IN COLOUR
Feb. 18, 25 - 14:11:47 Name: S-P.24.1232-CIV-DRG-1001.dwg

EXISTING SURVEY CONTROL

- ALIGNMENT PIN
- BENCH MARK
- BOLT
- BOUNDARY PEG
- BOUNDARY ARROW
- DRILL HOLE AND WING
- DUMPY PEG
- G I NAIL
- G I PIPE
- MISCELLANEOUS SURVEY MARK
- NAIL
- PERMANENT MARK
- RM CONCRETE BLOCK
- CONTROL MARK
- SPIKE
- STAR PICKET
- STATE SURVEY MARK
- TRIG STATION-CONCRETE PILLAR
- WATER BOARD PM
- AP-DH-GI-PIPE OR RMCB
- BOLT-DUMPY-NAIL-SPIKE
- DEFAULT SURVEY MARK
- PEG
- PM SSM OR CONTROL MARK
- TRIG STATION
- HORIZONTAL CONTROL POINT
- MINOR CONTROL POINT
- PHOTO CENTRE
- VERTICAL CONTROL POINT

EXISTING TOPOGRAPHY

- BOTTOM OF BANK-EMBANKMENT
- BREAKLINE OR RIDGE
- CLIFF-ESCARPMENT
- CULTIVATION PASTURE
- EDGE OF GARDEN
- FORD
- GRASSLAND
- LAKE
- LANDSLIDE-ERODED BANK
- NATURAL SURFACE
- NATURAL SURFACE POINT
- ORCHARD
- RESERVOIR

EXISTING TOPOGRAPHY (Continued)

- RIVER OR CREEK EDGE
- ROCK AREA
- SPOT HEIGHT
- SWAMP OUTLINE
- SWAMP-MARSH
- TIMBER OR SCRUB (DENSE)
- TIMBER OF SCRUB (MEDIUM)
- TIMBER OF SCRUB (SCATTERED)
- TOP OF BANK
- TOP OF CUTTING
- TREE FOLIAGE (TR)
- TREE FOLIAGE - 1m SPREAD
- TREE FOLIAGE - 2m SPREAD
- TREE FOLIAGE - 3m SPREAD
- TREE FOLIAGE - 4m SPREAD
- TREE FOLIAGE - 5m SPREAD
- TREE FOLIAGE - 6m SPREAD
- TREE FOLIAGE - 7m SPREAD
- TREE FOLIAGE - 8m SPREAD
- TREE FOLIAGE - 9m SPREAD
- TREE FOLIAGE - 10m SPREAD
- TREE FOLIAGE - 12m SPREAD
- TREE FOLIAGE - 15m SPREAD
- TREE TRUNK - 100mm DIA
- TREE TRUNK - 200mm DIA
- TREE TRUNK - 300mm DIA
- TREE TRUNK - 400mm DIA
- TREE TRUNK - 500mm DIA
- TREE TRUNK - 600mm DIA
- TREE TRUNK - 700mm DIA
- TREE TRUNK - 800mm DIA
- TREE TRUNK - 900mm DIA
- TREE TRUNK - 1000mm DIA
- TREE TRUNK - 1200mm DIA

EXISTING TOPOGRAPHY (Continued)

- TREE TRUNK - 1500mm DIA
- TREE TRUNK - UNSPECIFIED DIAMETER
- WATER EDGE-LEVEL (WE)

EXISTING CONTOURS (PHOTOGRAMMETRY)

- CONTOUR - AUX {DECIMETRE}
- CONTOUR - AUX {WHOLE METRE}
- CONTOUR - INDEX
- CONTOUR - INDEX DEPRESSION
- CONTOUR - INTER DEPRESSION
- CONTOUR - STANDARD-INTER

EXISTING BOUNDARIES

- DIGITAL CADASTRE (ACCURACY 1.0m)
- DIGITISING EXTENT (PHOTO)
- DP OVERLAY (ACCURACY 0.1m) (CALCULATED FROM DEPOSITED PLAN)
- EASEMENT
- FIELD COMPLETION BOUNDARY (PHOTO) (NF)
- FIELD SURVEY EXTENT (PHOTO)
- LOCAL GOVERNMENT
- PARISH
- TITLE (ACCURACY 0.02m)
- FENCE
- FENCE LINE
- FENCE MANPROOF
- FENCE OTHER
- FENCE POST-GUIDE POST
- GATE

EXISTING HERITAGE VALUES

- ENDANGERED COMMUNITY
- ENDANGERED ECOLOGICAL COMMUNITY
- HAZARDOUS SITE
- INDIGENOUS HERITAGE AREA
- NON INDIGENOUS HERITAGE SITE
- HEADSTONE
- HISTORICAL POINT OF INTEREST

EXISTING BUILDINGS & STRUCTURES

- AWNING
- AWNING - POINT
- BOTTOM OF WALL
- BUILDING EAVES
- BUILDING WALLS
- CEMETERY
- CONCRETE SLAB AT GROUND LEVEL
- CORNER OF BUILDING AT NS
- DOORWAY
- FLOOR LEVEL
- GENERAL BUILT-UP AREA
- LOADING BAY-DOCK
- MISCELLANEOUS STRUCTURE
- RETAINING WALL
- RUIN
- SILO OR TANKS
- SPORTING ARENA
- STAIRS - OUTSIDE
- SWIMMING POOL
- TOP OF WALL

EXISTING BRIDGE STRUCTURES

- ABUTMENT BOTTOM
- ABUTMENT BOTTOM POINT
- ABUTMENT TOP
- ABUTMENT TOP POINT
- CAP-PILE
- DECK
- EXPANSION JOINT
- EXPANSION PLATE
- HEADSTOCK
- PIER-COLUMN
- PIER-COLUMN POINT
- UNDERNEATH CLEARANCE
- WING WALL

DRAWING REVISION HISTORY

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EXISTING RAIL INFRASTRUCTURE

- RCB — RAILWAY CONTROL BOX
- RAILWAY FORMATION EDGE
- RAILWAY RAMP
- RAILWAY SIGNAL
- RS — RAILWAY SIGNAL TROUGH
- RS — RAILWAY SIGNAL TROUGH - POINT
- RST — RAILWAY STANCHION
- RAILWAY TRACK CENTRE
- RTM — RAILWAY TRACK MONUMENT
- TOP OF RAIL
- RA — TOP OF RAIL - POINT
- TOP OF RAILWAY PLATFORM

EXISTING ROAD INFRASTRUCTURE

- BACK OF KERB
- CENTRE OF ROAD
- DRIVEWAY
- EDGE OF FORMATION
- EDGE OF MEDIAN
- EDGE OF PAVEMENT
- EDGE OF TRACK
- EDGE OF UNSEALED ROAD
- FOOTPATH
- GUTTER FLOW LINE
- LIP LINE
- OFFSET CROWN-CROWN
- PRAM RAMP
- SAFETY BARRIER GUARD FENCE
- SAFETY BARRIER TYPE F
- SAFETY BARRIER WIRE ROPE
- TOP OF KERB
- TOP OF MEDIAN
- VEHICULAR TRACK EDGE
- POINT ON BITUMEN

EXISTING LINE MARKING

- ARROW - LEFT TURN
- ARROW - RIGHT TURN
- ARROW - STRAIGHT AHEAD
- ARROW - STRAIGHT AHEAD AND LEFT
- ARROW - STRAIGHT AHEAD AND RIGHT
- BARRIER AND SEPARATION
- SEPARATION AND BARRIER

EXISTING LINE MARKING (Continued)

- CHEVRON MARKING LEFT
- CHEVRON MARKING RIGHT
- CLEARWAY (3x3)
- CONTINUITY/EDGE INTERMITTENT (1x3)
- DOUBLE BARRIER
- LANE/SEPARATION (3x9)
- LANE (3x6)
- LANE/SEPARATION LINE (9x3)
- SEPARATION (3x1)
- GIVEWAY/HOLDING LINE/JUNCTION CONTINUITY
- PEDESTRIAN CROSSING (SIGNALS)
- PEDESTRIAN CROSSING ZEBRA
- PEDESTRIAN CROSSING APPROACH (ZIG ZAG)
- 40 — SPEED ZONE - 40km/h
- 50 — SPEED ZONE - 50km/h
- 60 — SPEED ZONE - 60km/h
- 70 — SPEED ZONE - 70km/h
- 80 — SPEED ZONE - 80km/h
- 90 — SPEED ZONE - 90km/h
- 100 — SPEED ZONE - 100km/h
- 110 — SPEED ZONE - 110km/h
- TM — TRAFFIC MARKER
- UNBROKEN

EXISTING TRAFFIC CONTROL SYSTEMS

- SIGNAL DETECTOR
- TRAFFIC CONTROL SIGNAL
- TRAFFIC LIGHT WITH OUTREACH
- TSC — TRAFFIC SIGNAL CONTROLLER
- TSD — TRAFFIC SIGNAL DETECTOR
- TRAFFIC SIGNAL JUNCTION BOX
- TT — TRAFFIC SIGNAL CABLE

EXISTING DRAINAGE

- BATTER DRAIN / GI FLUME
- 150H 150H — BOX CULVERT - 150 HIGH
- 225H 225H — BOX CULVERT - 225 HIGH
- 300H 300H — BOX CULVERT - 300 HIGH
- 375H 375H — BOX CULVERT - 375 HIGH
- 450H 450H — BOX CULVERT - 450 HIGH
- 600H 600H — BOX CULVERT - 600 HIGH
- 750H 750H — BOX CULVERT - 750 HIGH
- 900H 900H — BOX CULVERT - 900 HIGH
- 1.05H 1.05H — BOX CULVERT - 1050 HIGH

EXISTING DRAINAGE (Continued)

- 1.2H 1.2H — BOX CULVERT - 1200 HIGH
- 1.5H 1.5H — BOX CULVERT - 1500 HIGH
- 1.8H 1.8H — BOX CULVERT - 1800 HIGH
- 2.1H 2.1H — BOX CULVERT - 2100 HIGH
- 2.4H 2.4H — BOX CULVERT - 2400 HIGH
- 2.7H 2.7H — BOX CULVERT - 2700 HIGH
- 3.0H 3.0H — BOX CULVERT - 3000 HIGH
- 3.3H 3.3H — BOX CULVERT - 3300 HIGH
- 3.6H 3.6H — BOX CULVERT - 3600 HIGH
- ?H ?H — BOX CULVERT - UNSPECIFIED HEIGHT
- DISH DRAIN
- D — DRAIN-TABLE DRAIN
- DRAINAGE BOX
- D — DRAINAGE - DIGITISED (GIS)
- SW — DRAINAGE JUNCTION MANHOLE
- DP — DRAINAGE PIT
- EW — END OF WINGWALL
- FH — FLOOD HEIGHT
- GULLY PIT
- GP — GULLY PIT POINT
- HEADWALL BOTTOM
- HWB — HEADWALL BOTTOM POINT
- HEADWALL TOP
- HWT — HEADWALL TOP POINT
- IL — INLET TO SUMP
- IN 225 Dia — INVERT - 225 DIA
- IN 300 Dia — INVERT - 300 DIA
- IN 375 Dia — INVERT - 375 DIA
- IN 450 Dia — INVERT - 450 DIA
- IN 525 Dia — INVERT - 525 DIA
- IN 600 Dia — INVERT - 600 DIA
- IN 750 Dia — INVERT - 750 DIA
- IN 900 Dia — INVERT - 900 DIA
- IN 1050 Dia — INVERT - 1050 DIA
- IN 1200 Dia — INVERT - 1200 DIA
- IN 1350 Dia — INVERT - 1350 DIA
- IN 1500 Dia — INVERT - 1500 DIA
- IN 1650 Dia — INVERT - 1650 DIA
- IN 1800 Dia — INVERT - 1800 DIA
- IN — INVERT OF PIPE
- SD — INVERT OF SUBSOIL DRAIN OUTLET
- KERB INLET
- OB — OBVERT OF PIPE
- SW — STORMWATER (GIS)

EXISTING DRAINAGE (Continued)

- Ø225 Ø225 — PIPE - 225 DIA
- Ø300 Ø300 — PIPE - 300 DIA
- Ø375 Ø375 — PIPE - 375 DIA
- Ø450 Ø450 — PIPE - 450 DIA
- Ø525 Ø525 — PIPE - 525 DIA
- Ø600 Ø600 — PIPE - 600 DIA
- Ø750 Ø750 — PIPE - 750 DIA
- Ø900 Ø900 — PIPE - 900 DIA
- Ø1050 Ø1050 — PIPE - 1050 DIA
- Ø1200 Ø1200 — PIPE - 1200 DIA
- Ø1350 Ø1350 — PIPE - 1350 DIA
- Ø1500 Ø1500 — PIPE - 1500 DIA
- Ø1650 Ø1650 — PIPE - 1650 DIA
- Ø1050 Ø1050 — PIPE - 1800 DIA
- Ø? Ø? — PIPE - UNSPECIFIED DIAMETER
- SF — SUBSOIL DRAIN FLUSH POINT/MARKER
- SW — TOP OF CONCRETE JUNCTION BOX
- WC — WATER COURSE
- WL — WATER LEVEL POINT

EXISTING COMMUNICATIONS SERVICES

- AJP — ABOVE GROUND JOINING POST
- ITS — ITS CABLE
- T(FO)A — OPTICAL FIBRE - ABOVE GROUND
- T(FO) — OPTICAL FIBRE - DIGITISED (GIS)
- T(FO) — OPTICAL FIBRE - UNDERGROUND)
- OFC — OPTICAL FIBRE CABLE MARKER
- TC(FO) — OPTICAL FIBRE FIBRE CONDUIT
- OJB — OPTICAL FIBRE JUNCTION BOX
- OFP — OPTICAL FIBRE PIT
- TSP — STD MAIN PIT
- T — TELEPHONE - HOUSE CONNECTION
- TELEPHONE - BOX
- TB — TELEPHONE BOX POINT
- TC — TELEPHONE CABLE MARKER
- TDP — TELEPHONE DISTRUBUTION PILLAR
- TC — TELEPHONE CONDUIT
- T — TELEPHONE LINE
- T — TELEPHONE LINE - DIGITISED (GIS)
- TPL — TELEPHONE POLE
- TELEPHONE SINGLE CONCRETE PIT
- TELEPHONE SUMP
- TTM — TELEPHONE TRANSMITTER - MOBILE
- TELEPHONE TRIPLE CONCRETE PIT
- TELEPHONE TWIN CONCRETE PIT

DRAWING REVISION HISTORY

No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE
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A	ISSUED FOR SCHEMATIC DESIGN	CM	CM	SM	18/12/2024

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CLIENT: DAME TECHNOLOGIES
PROJECT: 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE
STATUS: **FOR PLANNING**

DRAWING TITLE: LEGEND - SHEET 2 OF 5
DATUMS: AHD / MGA
CLIENT No.: -
DRAWING No.: S-P.24.1232-CIV-DRG-1022
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EXISTING ELECTRICAL SERVICES

- CABLE JUNCTION BOX
- CABLE MANHOLE
- CABLE MARKER
- CONDUIT
- DISTRIBUTION FUSE POINT
- GARDEN LIGHT
- HIGH TENSION PYLON
- HOUSE CONNECTION
- LIGHT WITH OUTREACH
- LINE - DIGITISED
- LINE - MAJOR TRANSMISSION
- LINE - MINOR TRANSMISSION
- LINE - UNDERGROUND
- MAIN SUMP
- POLE - LIGHT
- POLE - POWER
- POLE - POWER AND LIGHT
- POLE - POWER AND TRANSFORMER
- POWER SERVICE PILLAR - UNDERGROUND
- PYLON LEG
- STAY ANCHOR POLE
- STAY POLE
- SUSPENDED LIGHT
- TRANSFORMER CABINET
- TRANSFORMER CABINET CENTRE
- CONDUIT (GIS)
- LINE - MAJOR TRANSMISSION (GIS)
- LINE - MINOR TRANSMISSION (GIS)
- LINE - UNDERGROUND (GIS)

EXISTING SEWER SERVICES

- HOUSE CONNECTION
- LAMPHOLE
- MAIN
- MAIN - DIGITISED (GIS)
- MANHOLE COVER
- SEWAGE POND
- SEPTIC TANK
- VENT PIPE
- PUMP STATION

EXISTING GAS SERVICES

- ETHANE PIPELINE
- HOUSE CONNECTION
- MAIN - DIGITISED (GIS)
- MAIN - HIGH PRESSURE PIPELINE
- MAIN - LOW PRESSURE
- MAIN - NYLON
- MAIN - POLYETHYLENE
- MANHOLE COVER
- METER
- PIPELINE MARKER
- PIPELINE MARKER - HIGH PRESSURE
- REGULATOR BOX
- TEST POINT
- VALVE BOX
- VENT PIPE

EXISTING WATER SERVICES

- AIR VALVE
- AIR VALVE - RECYCLED
- EARTH TERMINAL
- EARTH TERMINAL - RECYCLED
- FIRE HYDRANT
- HOUSE CONNECTION
- HYDRANT
- HYDRANT - RECYCLED
- MAIN
- MAIN - DIGITISED (GIS)
- MAIN - RECYCLED
- MAIN MARKER
- MAIN MARKER - RECYCLED
- METER
- METER - RECYCLED
- OVERHEAD PIPELINE
- STOP VALVE
- STOP VALVE - RECYCLED
- TAP
- TAP - RECYCLED
- SCOUR VALVE
- SCOUR VALVE - RECYCLED
- UNIDENTIFIED PIPELINE
- WATER COURSE (GIS)

EXISTING MISCELLANEOUS ITEMS

- BORE HOLE
- CAMERA - FLASH UNIT
- CHECK STRING
- GATIC COVER LID
- GOLF COURSE
- HIGH PRESSURE OIL PIPELINE
- HIGH PRESSURE OIL PIPELINE MARK
- HOTSPOT
- JOIN LINE (BOUNDARY)
- BREAK STRINGS
- PARK OR OPEN SPACE
- PETROL PUMP
- POT HOLE - NULL LEVEL
- POT HOLE - WITH RL
- RED LIGHT-SPEED-TRAFFIC CAMERA
- SEISMIC LINE
- SEISMIC TEST SHOT
- SERVICE-JUNCTION BOX
- STOCK GRID
- STOCKPILE
- TEST PIT
- UNDERGROUND TANK
- UNDERGROUND TANK POINT
- UNIDENTIFIED POLE
- UNIDENTIFIED SERVICE
- BIN - LARGE
- BOLLARD
- BUS SHELTER
- BUS STOP
- FIREPLACE
- FLAG POLE

EXISTING MISCELLANEOUS ITEMS (Continued)

- LARGE SIGN
- MAILBOX
- PARKING METER
- PICNIC TABLE
- PUMP
- RUBBISH BIN
- SAFETY FENCE - PEDESTRIAN
- SEAT
- SIGN POST
- SIGN POST - DOUBLE SIDED
- SIGN WITH OUTREACH
- WINDMILL
- WINDMILL - POINT
- MARKER - ENVIRONMENTAL/OTHER

DRAWING REVISION HISTORY

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CLIENT: DAME TECHNOLOGIES
PROJECT: 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE
STATUS: **FOR PLANNING**

DRAWING TITLE: LEGEND - SHEET 3 OF 5
DATUMS: AHD / MGA
CLIENT No.: -
DRAWING No.: S-P.24.1232-CIV-DRG-1023
REVISION: B
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PROPOSED BOUNDARIES

- CADASTRAL
- EASEMENT
- LIMIT OF CONTRACT
- EXTENT OF PROJECT
- FENCE - GENERAL (POST & WIRE)
- FENCE - CHAINWIRE
- FENCE - OTHER
- SAFETY FENCE - PEDESTRIAN
- FENCE - SOUND
- FENCE - REDUNDANT/REMOVED
- GATE

PROPOSED BUILDINGS & STRUCTURES

- ROOFLINE
- WALL
- DOORWAY
- FLOOR LEVEL (FL)
- RETAINING WALL
- STAIRS - OUTSIDE

PROPOSED BRIDGE STRUCTURES

- ABUTMENT BOTTOM
- BRIDGE DECK
- PIER/COLUMN

PROPOSED RAIL INFRASTRUCTURE

- RAILWAY TRACK CENTRE
- TOP OF RAIL
- RAILWAY FORMATION EDGE
- RAILWAY SIGNAL TROUGH (RS)
- RAILWAY CONTROL BOX (RCB)
- RAILWAY SIGNAL
- RAILWAY STANCHION (RST)

PROPOSED ROAD INFRASTRUCTURE

- CONTROL LINE - CENTRELINE
- CONTROL LINE - FILLET
- CONTROL LINE - KERB
- OFFSET CROWN
- EDGE OF LANE SEAL
- EDGE OF MEDIAN
- EDGE OF SHOULDER (SEALED)
- EDGE OF FORMATION (UNSEALED)
- SAFETY BARRIER STEEL BEAM
- SAFETY BARRIER WIRE ROPE
- SAFETY BARRIER TYPE F

PROPOSED ROAD INFRASTRUCTURE (Continued)

- KERB - LIP LINE/EDGE OF SEAL
- KERB - INVERT
- KERB - TOP
- KERB - BACK
- FOOTPATH BACK/FOOTPATH FRONT
- TABLE DRAIN
- EDGE OF VERGE
- EARTHWORKS - HINGE
- EARTHWORKS - BATTER
- EARTHWORKS - BENCH
- DRIVEWAY/ACCESS
- INTERFACE/JOINT
- SUBGRADE
- BATTER SYMBOL
- SLOPE SIGNATURE

PROPOSED LINE MARKING

- ARROW - LEFT TURN
- ARROW - RIGHT TURN
- ARROW - STRAIGHT AHEAD
- ARROW - STRAIGHT AHEAD & LEFT
- ARROW - STRAIGHT AHEAD & RIGHT
- ARROW - MERGE (RURAL)
- ARROW - MERGE (URBAN)
- ARROW - UTURN
- BARRIER (ONE DIRECTION) PD (B1) & (B1a)
- BARRIER (ONE DIRECTION) CD (B1) & (B1a)
- BARRIER (BOTH DIRECTIONS) (B2) & (B2a)
- BARRIER (BOTH DIRECTIONS) (B3) & (B3a)
- BARRIER (BOTH DIRECTIONS) (B4) & (B4a)
- SEPARATION (RURAL) (S) & (Sa)
- SEPARATION (URBAN) (S1)
- SEPARATION (MEDIAN LANE) (S2)
- SEPARATION (SPECIAL PURPOSE) (S3) & (S3a)
- SEPARATION (BICYCLE PATHS) (S4)
- LANE (RURAL) (L)
- LANE (URBAN) (L1)
- LANE (TURNOUT LANE) (L2)
- LANE (SPECIAL PURPOSE) (L3)
- LANE (CONTINUOUS) (LC)
- CONTINUITY (C)
- CONTINUOUS CONTINUITY (CC) & (CCa)
- EDGE (URBAN) (E)

PROPOSED LINE MARKING (Continued)

- EDGE CONTINUITY (URBAN) (EC)
- EDGE RURAL (E2) & (E2a)
- EDGE CONTINUITY (RURAL) (EC2)
- STOP (SL)
- HOLDING (HL)
- JUNCTION CONTINUITY (JC)
- TURN TRAFFIC SIGNALS (T)
- PEDESTRIAN WALKWAY (W)
- NO STOPPING (NS)
- LINEMARKING IDENTIFICATION CODE (B2 / E2)
- RRPM - WHITE - UNIDIRECTIONAL
- RRPM - WHITE - BIDIRECTIONAL
- RRPM - YELLOW - UNIDIRECTIONAL
- RRPM - YELLOW - BIDIRECTIONAL
- RRPM - RED - UNIDIRECTIONAL
- RRPM - GREEN - UNIDIRECTIONAL
- RRPM - NON REFLECTIVE

PROPOSED TRAFFIC CONTROL SYSTEMS

- TRAFFIC SIGNAL CABLE (TT)
- TRAFFIC SIGNAL CONDUIT (TT)
- TRAFFIC SIGNAL DETECTOR LOOP
- 3 ASPECT LANTERN & PHASE (A)
- LOUVRED 3 ASPECT LANTERN
- 3 ASPECT OVERHEAD LANTERN & PHASE (A)
- 3 ASPECT LANTERN WITH GREEN+YELLOW+RED TURN ARROWS & PHASE (A)
- GREEN+YELLOW+RED TURN ARROWS & PHASE (A)
- GREEN + YELLOW TURN ARROWS & PHASE (A)
- GREEN TURN ARROW AND PHASE (A)
- GREEN TURN ARROW WITH FULL RED + YELLOW ASPECTS AND PHASE (RED A YELLOW)
- GREEN+YELLOW TURN ARROWS WITH RED ASPECT & PHASE (RED A)
- PEDESTRIAN PUSH BUTTON
- PEDESTRIAN LANTERN & WALK PHASE (CA)
- TRAFFIC SIGNAL - WIG WAG LANTERNS
- TRAFFIC SIGNAL - LOUVRE
- TRAFFIC SIGNAL CONTROLLER (TSC)
- TRAFFIC SIGNAL JUNCTION BOX

PROPOSED DRAINAGE

- STORMWATER PIPE (SW)
- STORMWATER PIPE - REDUNDANT (xSWx)
- BATTER DRAIN
- DISH DRAIN
- CATCH DRAIN/OPEN DRAIN
- CATCH DRAIN/OPEN DRAIN - LINED
- SUBSOIL DRAIN - GENERAL (SS)
- SUBSOIL DRAIN - CLASS 400 (SS(A))
- SUBSOIL DRAIN - CLASS 1000 (SS(B))
- SUBSOIL DRAIN - STRIP DRAIN (SS(C))
- SURFACE DRAIN - TYPE A1 (UNLINED) (A1)
- SURFACE DRAIN - TYPE A2 (LINED) (A2)
- SURFACE DRAIN - TYPE B1 (UNLINED) (B1)
- SURFACE DRAIN - TYPE B2 (LINED) (B2)
- SURFACE DRAIN - TYPE C1 (UNLINED) (C1)
- SURFACE DRAIN - TYPE C2 (LINED) (C2)
- SURFACE DRAIN (SD)
- SURFACE DRAIN - TYPE 1 (SD1)
- SURFACE DRAIN - TYPE 2 (SD2)
- SURFACE DRAIN - TYPE 3 (SD3)
- SURFACE DRAIN - TYPE 4 (SD4)
- SURFACE DRAIN - TYPE 5 (SD5)
- BOX CULVERT
- PIPE
- ACCESS PIT
- SIDE ENTRY PIT - KERB
- GRATED PIT - KERB
- GRATED PIT - V GUTTER
- GRATED PIT - OPEN DRAIN
- GRATED PIT - TABLE DRAIN
- CATCH PIT - TABLE DRAIN
- SUBSOIL DRAIN FLUSH POINT (SF)
- TOP OF CONCRETE JUNCTION BOX (SW)
- INVERT OF SUBSOIL DRAIN OUTLET (SD)
- KERB SCUPPER
- OBVERT OF PIPE (OB)
- ENDWALL - PLAIN / MC
- ENDWALL - SINGLE & MULTI RC [SQUARE]
- ENDWALL - SINGLE RC [SKEWED]
- ENDWALL - TWIN RC [SKEWED]
- ENDWALL - MULTI RC [SKEWED]
- ENDWALL - DRIVEABLE - TYPE 1
- ENDWALL - DRIVEABLE - TYPE 2

DRAWING REVISION HISTORY

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A	ISSUED FOR SCHEMATIC DESIGN	CM	CM	SM	18/12/2024

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CLIENT: DAME TECHNOLOGIES
PROJECT: 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE
STATUS: **FOR PLANNING**

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PROPOSED DRAINAGE (Continued)

- BATTER DRAIN - SPLASH APRON
- BATTER DRAIN - ENERGY DISSIPATOR
- PIPE OUTLET - ENERGY DISSIPATOR [ON LINE]
- PIPE OUTLET - ENERGY DISSIPATOR [DEFLECTED]

PROPOSED ELECTRICAL SERVICES

- E — LINE - GENERAL
- E(TL) — LINE - MAJOR TRANSMISSION
- E(OH) — LINE - MINOR TRANSMISSION
- E(U) — LINE - UNDERGROUND
- xEx — LINE - REDUNDANT
- EH — HOUSE CONNECTION
- EC — CONDUIT
- EJB — CABLE JUNCTION BOX
- EMH — CABLE MANHOLE
- EFP — DISTRIBUTION FUSE POINT
- HIGH TENSION PYLON
- LIGHT WITH OUTREACH
- POLE - LIGHT
- EP — POLE - POWER
- POLE - POWER AND LIGHT
- POLE - POWER AND TRANSFORMER
- POWER SERVICE PILLAR
- STAY ANCHOR POLE
- STAY POLE
- TRANSFORMER CABINET CENTRE

PROPOSED COMMUNICATIONS

- T — TELEPHONE LINE
- T(OH) — TELEPHONE LINE - ABOVE GROUND
- TC — TELEPHONE CONDUIT
- xTx — TELEPHONE LINE - REDUNDANT
- T(FO)A — OPTICAL FIBRE - ABOVE GROUND
- T(FO) — OPTICAL FIBRE - UNDERGROUND
- TC(FO) — OPTICAL FIBRE FIBRE CONDUIT
- ITS — ITS CABLE
- AJP — ABOVE GROUND JOINING POST
- OJB — OPTICAL FIBRE JUNCTION BOX
- OFP — OPTICAL FIBRE PIT
- TC — TELEPHONE CABLE MARKER
- TDP — TELEPHONE DISTRUBUTION PILLAR
- TPL — TELEPHONE POLE
- TELEPHONE SINGLE CONCRETE PIT
- TTM — TELEPHONE TRANSMITTER - MOBILE
- TELEPHONE TRIPLE CONCRETE PIT
- TELEPHONE TWIN CONCRETE PIT

PROPOSED GAS SERVICES

- G — MAIN - GENERAL
- EG — ETHANE PIPELINE
- GH — HOUSE CONNECTION
- HG — MAIN - HIGH PRESSURE PIPELINE
- LG — MAIN - LOW PRESSURE
- GN — MAIN - NYLON
- GP — MAIN - POLYETHYLENE
- xGx — MAIN - REDUNDANT
- GMH — MANHOLE COVER
- METER
- GP — PIPELINE MARKER
- HP — PIPELINE MARKER - HIGH PRESSURE
- REGULATOR BOX
- TEST POINT
- VALVE BOX
- VENT PIPE

PROPOSED SEWER SERVICES

- S — MAIN
- xSx — MAIN - REDUNDANT
- SH — HOUSE CONNECTION
- SP — SEWAGE POND
- MANHOLE COVER
- SVP — VENT PIPE
- PUMP — PUMP STATION

PROPOSED WATER SERVICES

- W — MAIN
- WM — MAIN - REGIONAL
- WR — MAIN - RECYCLED
- xWx — MAIN - REDUNDANT
- WH — HOUSE CONNECTION
- WO — OVERHEAD PIPELINE
- IRR — IRRIGATION PIPELINE
- AV — AIR VALVE
- WR — AIR VALVE - RECYCLED
- FH — FIRE HYDRANT
- WH — HYDRANT
- WR — HYDRANT - RECYCLED
- WM — METER
- WR — METER - RECYCLED
- SV — STOP VALVE
- WR — STOP VALVE - RECYCLED
- TAP — TAP
- TAPR — TAP - RECYCLED
- ScV — SCOUR VALVE
- SR — SCOUR VALVE - RECYCLED

PROPOSED MISCELLANEOUS ITEMS

- FUEL — FUEL PIPELINE
- UT — UNDERGROUND TANK
- SJ — SAW CUT
- TR1 — SERVICE TRENCH - TYPE 1
- TR2 — SERVICE TRENCH - TYPE 2
- TR3 — SERVICE TRENCH - TYPE 3
- TR4 — SERVICE TRENCH - TYPE 4
- TR5 — SERVICE TRENCH - TYPE 5
- TR6 — SERVICE TRENCH - TYPE 6
- TR7 — SERVICE TRENCH - TYPE 7
- TR8 — SERVICE TRENCH - TYPE 8
- TR9 — SERVICE TRENCH - TYPE 9
- /S1/ — SILT STOP FENCE - TYPE 1
- /S2/ — SILT STOP FENCE - TYPE 2
- |ST| — SEDIMENT TRAP
- FP1 — PRESERVATION FENCE - TYPE 1
- FP2 — PRESERVATION FENCE - TYPE 2
- PUMP — PUMP STATION
- 1.000 — UTILITY - EXPOSED
- BIN - LARGE
- BOLLARD
- BUS — BUS STOP
- FENCE POST-GUIDE POST
- LARGE SIGN
- MAILBOX
- PARKING METER
- BIN — RUBBISH BIN
- SIGN POST
- SIGN POST - DOUBLE SIDED

DRAWING REVISION HISTORY

No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE
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CLIENT: DAME TECHNOLOGIES

PROJECT: 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE

STATUS: **FOR PLANNING**

DRAWING TITLE: LEGEND - SHEET 5 OF 5

DATUMS: AHD / MGA

CLIENT No.: -

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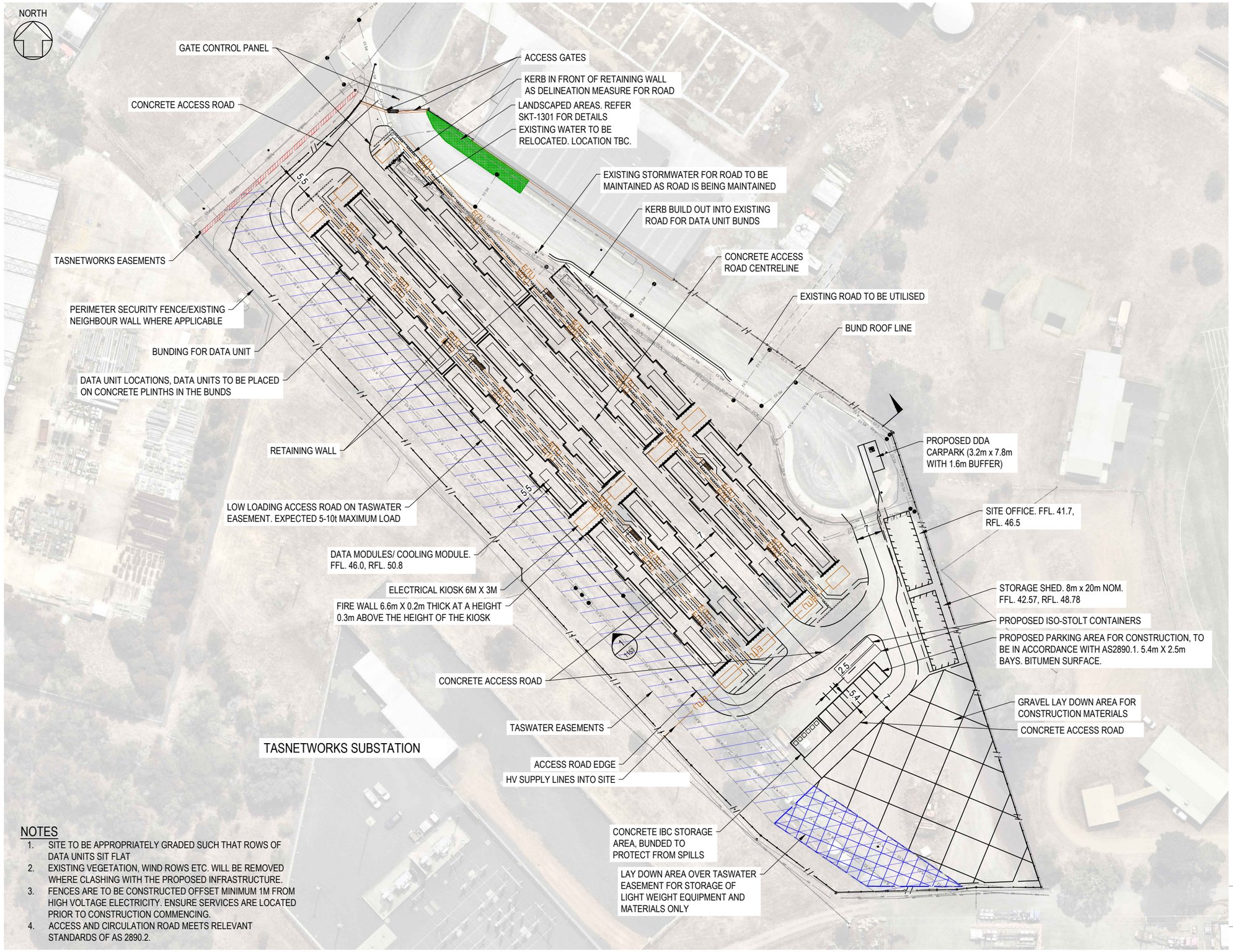

NOTES

1. SITE TO BE APPROPRIATELY GRADED SUCH THAT ROWS OF DATA UNITS SIT FLAT
2. EXISTING VEGETATION, WIND ROWS ETC. WILL BE REMOVED WHERE CLASHING WITH THE PROPOSED INFRASTRUCTURE.
3. FENCES ARE TO BE CONSTRUCTED OFFSET MINIMUM 1M FROM HIGH VOLTAGE ELECTRICITY. ENSURE SERVICES ARE LOCATED PRIOR TO CONSTRUCTION COMMENCING.
4. ACCESS AND CIRCULATION ROAD MEETS RELEVANT STANDARDS OF AS 2890.2.

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SCALE IN METRES - 1:1000

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CLIENT DAME TECHNOLOGIES

PROJECT 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE

STATUS **FOR PLANNING**

DRAWING TITLE GENERAL ARRANGEMENT

DATUMS: AHD / MGA

CLIENT No. -

DRAWING No. S-P.24.1232-CIV-DRG-1101

REVISION 0

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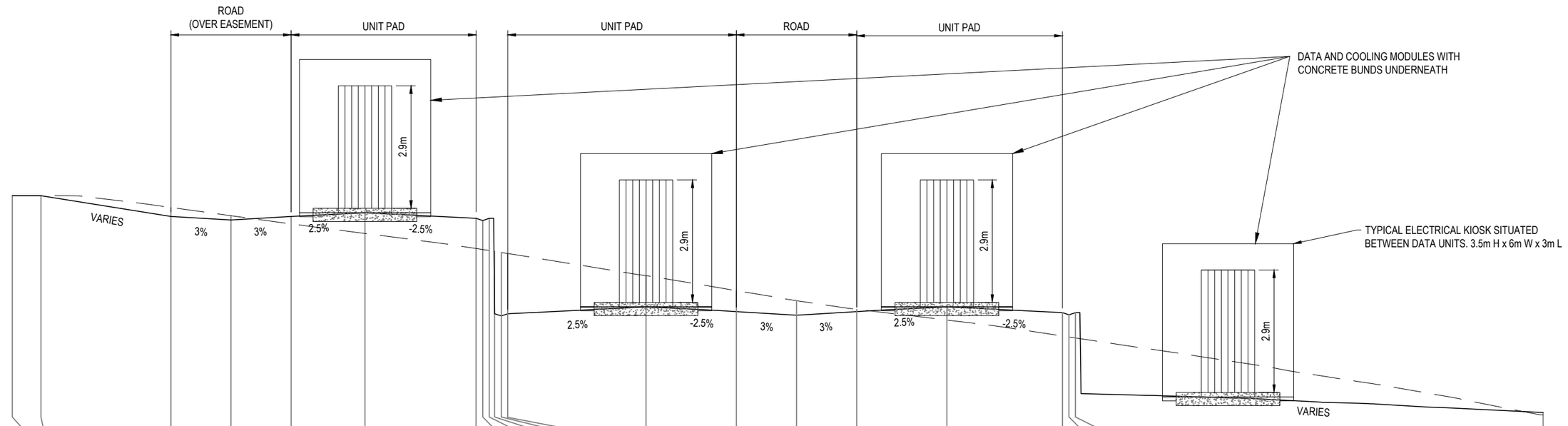

DATUM RL 39.000		ET	ER	CL	ER	CB	EG	VCI	VCE	VCE	VCI	VCE	CB	ER	CL	ER	CB	EG	VCI	VCE	
DESIGN SURFACE	45.454	45.458	44.982	44.900	44.983	45.067	44.940	44.890	44.940	42.758	42.708	42.758	42.917	42.808	42.726	42.808	42.917	42.785	42.735	42.785	40.501
EXISTING SURFACE	45.454	45.458	45.186	44.999	44.813	44.594	44.250	44.227	44.204	44.188	44.160	44.136	43.628	43.288	43.057	42.862	42.615	42.251	42.228	42.205	40.447
CHAINAGE	-10.000	-8.690	-2.750	0.000	2.750	6.128	11.206	11.506	11.806	12.056	12.356	12.656	18.981	23.109	25.859	28.609	32.737	38.015	38.315	38.615	60.000

DRAWING REVISION HISTORY

No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE
B	UPDATED FOR DA RFI	CM	CM	SM	18/02/2025
A	ISSUED FOR SCHEMATIC DESIGN	CM	CM	SM	18/12/2024

APPROVED
ORIGINAL COPY ON FILE
"e" SIGNED BY
SIGNED
DATE

SCALE
(PLOTTED FULL SIZE) AS SHOWN
SHEET SIZE A3

SCALE IN METRES
1:200 HORIZONTAL
1:100 VERTICAL

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CLIENT DAME TECHNOLOGIES
PROJECT 73 GREENBANKS ROAD UTILITIES
INFRASTRUCTURE
STATUS **FOR PLANNING**

DRAWING TITLE
TYPICAL SECTION

DATUMS: AHD / MGA
CLIENT No. -
DRAWING No. S-P.24.1232-CIV-DRG-1151
REVISION B
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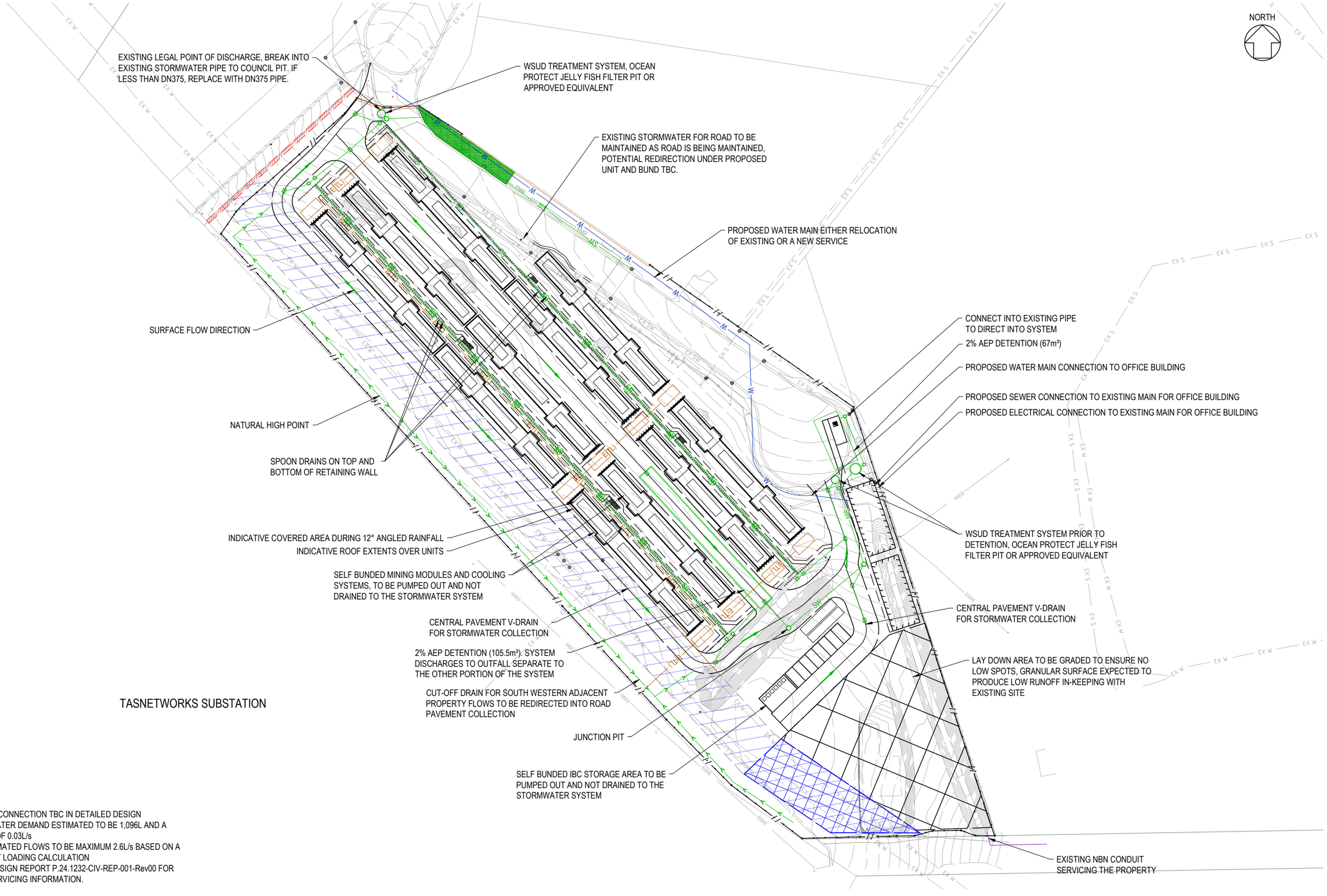

NOTES:

1. FIRE WATER CONNECTION TBC IN DETAILED DESIGN
2. PEAK DAY WATER DEMAND ESTIMATED TO BE 1,096L AND A PEAK FLOW OF 0.03L/s
3. SEWER ESTIMATED FLOWS TO BE MAXIMUM 2.6L/s BASED ON A FIXTURE UNIT LOADING CALCULATION
4. REFER TO DESIGN REPORT P.24.1232-CIV-REP-001-Rev00 FOR FURTHER SERVICING INFORMATION.

DRAWING REVISION HISTORY

No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE
B	UPDATED FOR DA RFI	CM	CM	SM	18/02/2025
A	ISSUED FOR SCHEMATIC DESIGN	CM	CM	SM	18/12/2024

APPROVED
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SIGNED
DATE

SCALE (PLOTTED FULL SIZE) AS SHOWN
SHEET SIZE A3
10 0 10 20 30 40
SCALE IN METRES - 1:1000

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CLIENT DAME TECHNOLOGIES
PROJECT 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE
STATUS **FOR PLANNING**

DRAWING TITLE SERVICING STRATEGY
DATUMS: AHD / MGA
CLIENT No. -
DRAWING No. S-P.24.1232-CIV-DRG-1201
REVISION B
PRINT IN COLOUR
Feb. 19, 25 - 09:28:39 Name: S-P.24.1232-CIV-DRG-1201.dwg

Sketches

Appendix B

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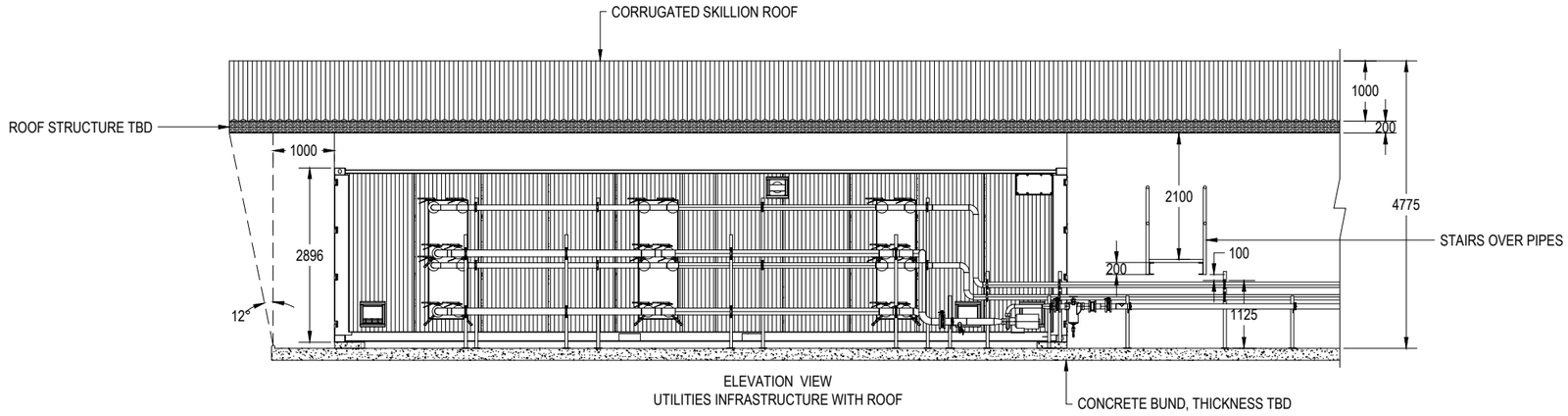
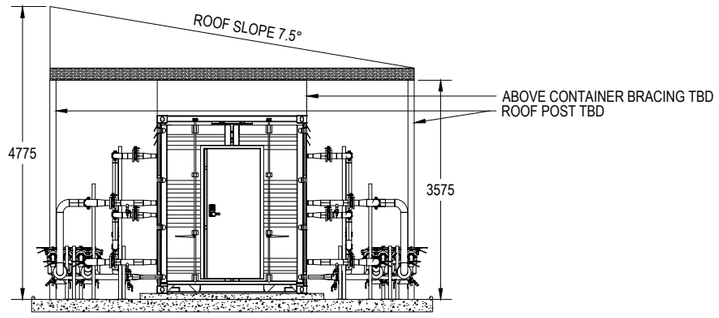


ELEVATION VIEW
UTILITIES INFRASTRUCTURE WITH ROOF



SECTION VIEW
UTILITIES INFRASTRUCTURE WITH ROOF

DRAWING REVISION HISTORY						
No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE	APPROVED
						ORIGINAL COPY ON FILE "e" SIGNED BY
						SIGNED
A	ISSUED FOR INFORAMTION	CM	CM		13/03/2025	
						DATE

SCALE (PLOTTED FULL SIZE) AS SHOWN

SHEET SIZE A3

1000 0 1000 2000 3000 4000

SCALE IN MILLIMETRES - 1:1

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CLIENT DAME TECHNOLOGIES

PROJECT 73 GREENBANKS ROAD
UTILITIES INFRASTRUCTURE

STATUS **FOR INFORMATION**

DRAWING TITLE
UTILITIES INFRASTRUCTURE
ROOF ELEVATION AND SECTION

DATUMS: AHD / MGA

CLIENT No. -

DRAWING No. S-P.24.1232-CIV-SKT-1152

REVISION A

PRINT IN COLOUR

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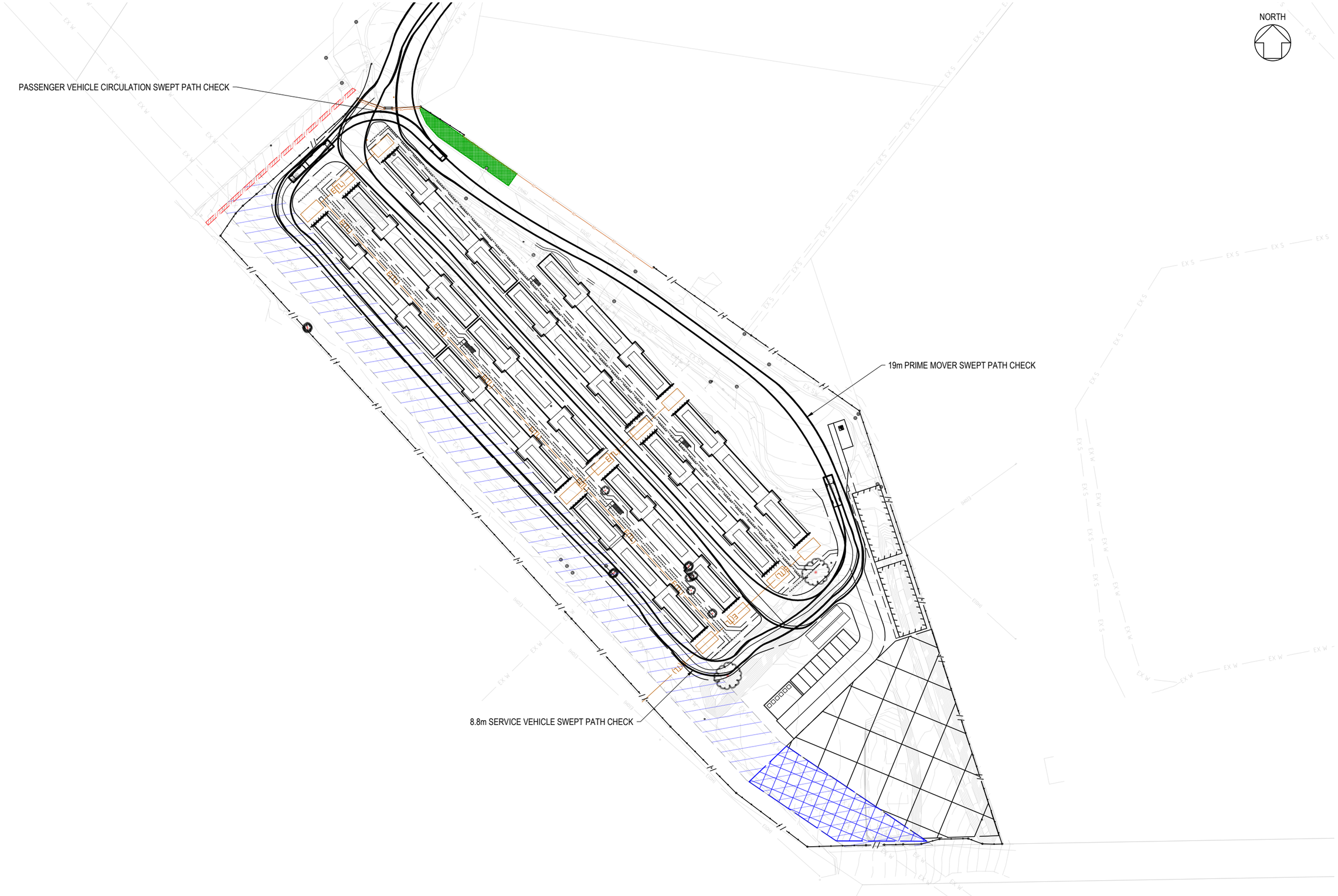

DRAWING REVISION HISTORY						
No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE	APPROVED
						ORIGINAL COPY ON FILE "e" SIGNED BY
B	UPDATED FOR DA RFI		CM	SM	14/02/2025	SIGNED
A	ISSUED FOR INFORAMTION	CM	CM	SM	06/12/2024	DATE

SCALE (PLOTTED FULL SIZE) AS SHOWN | SHEET SIZE A3

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SCALE IN METRES - 1:1000

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CLIENT: DAME TECHNOLOGIES

PROJECT: 73 GREENBANKS ROAD
UTILITIES INFRASTRUCTURE

STATUS: **FOR INFORMATION**

DRAWING TITLE: SCHEMATIC DESIGN
SWEPT PATH CHECKS

DATUMS: AHD / MGA | CLIENT No. -

DRAWING No. S-P.24.1232-CIV-SKT-1201 | REVISION B | PRINT IN COLOUR

Feb. 18, 25 - 14:07:27 Name: S-P.24.1232-CIV-SKT-1201.dwg

NOTES:

1. ALL TREES ON THE SITE TO BE REMOVED DUE TO PROXIMITY TO PROPOSED INFRASTRUCTURE.
2. LANDSCAPED AREAS TO COMPRISE LOW SHRUBS AND GRASSES WITH SHALLOW ROOTS. SHRUBS/ GROUNDCOVER MAY INCLUDE WHITE CORREA, CREEPING BOOBIALLA AND FOXTAIL STIPOIDES. ANY PLANTED SPECIES WILL NOT BE LISTED AS PART OF THE DNRE TASMANIA WEED INDEXES.
3. REPLACEMENT VEGETATION WILL BE REPLANTED IF LOST. VEGETATION WILL BE MAINTAINED TO THE SATISFACTION OF COUNCIL.

DRAWING REVISION HISTORY

No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE
B	UPDATED FOR DA RFI		CM	SM	14/02/2025
A	ISSUED FOR INFORAMTION	CM	NA	SM	18/12/2024

APPROVED

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SIGNED

DATE

SCALE (PLOTTED FULL SIZE) AS SHOWN

SHEET SIZE A3

10 0 10 20 30 40

SCALE IN METRES - 1:1000

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CLIENT DAME TECHNOLOGIES

PROJECT 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE

STATUS **FOR INFORMATION**

DRAWING TITLE SCHEMATIC DESIGN LANDSCAPING PLAN

DATUMS: AHD / MGA

CLIENT No. -

DRAWING No. S-P.24.1232-CIV-SKT-1301

REVISION B

PRINT IN COLOUR

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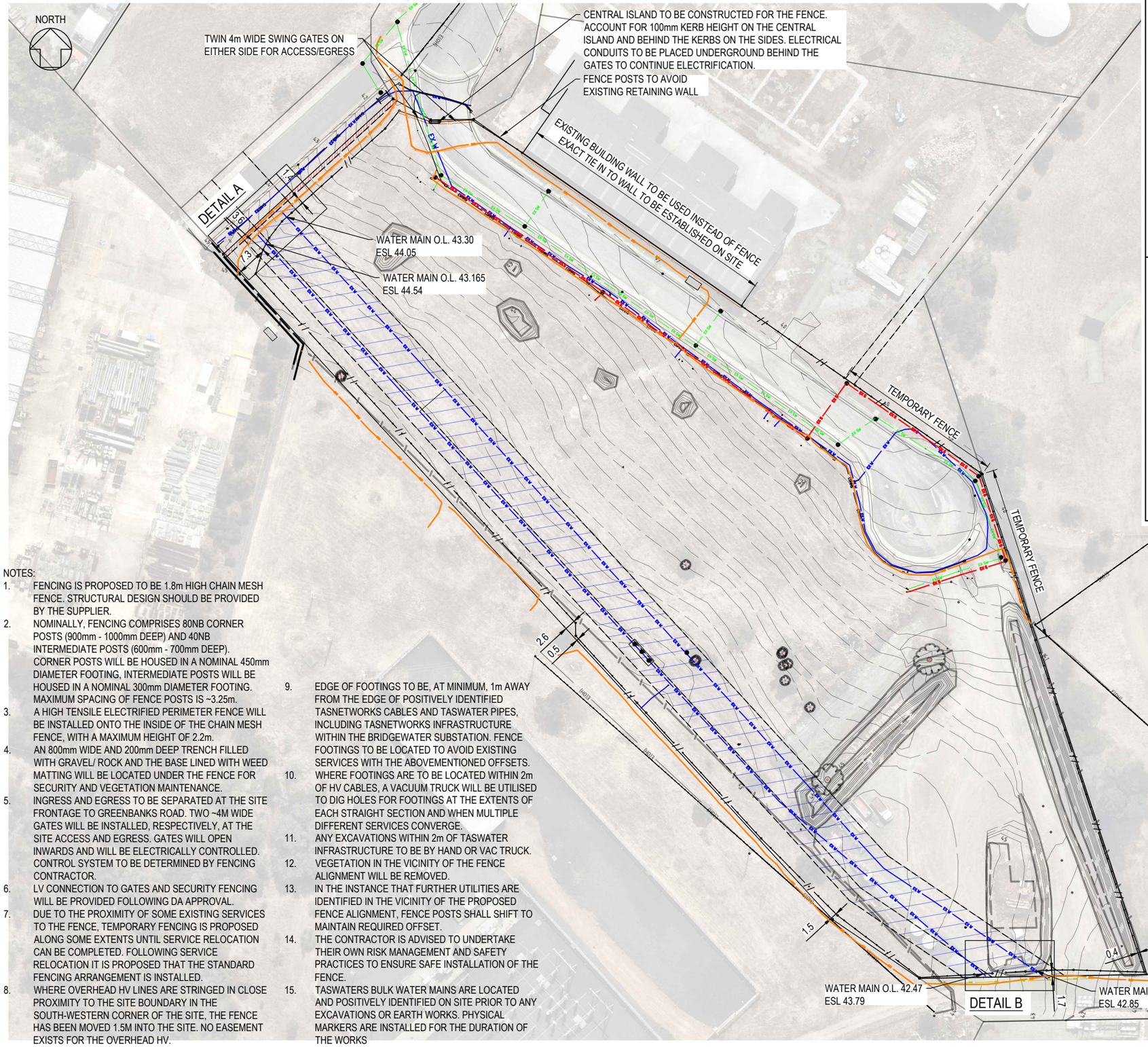
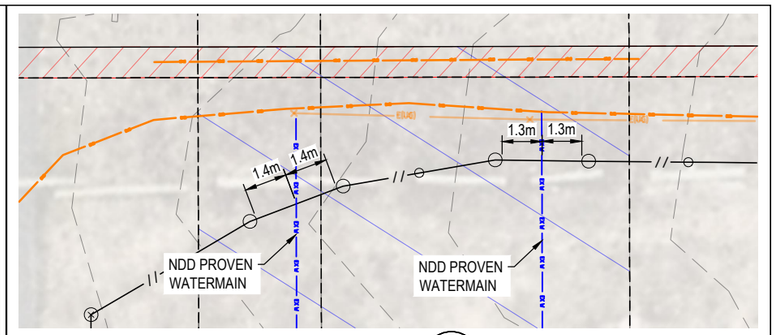
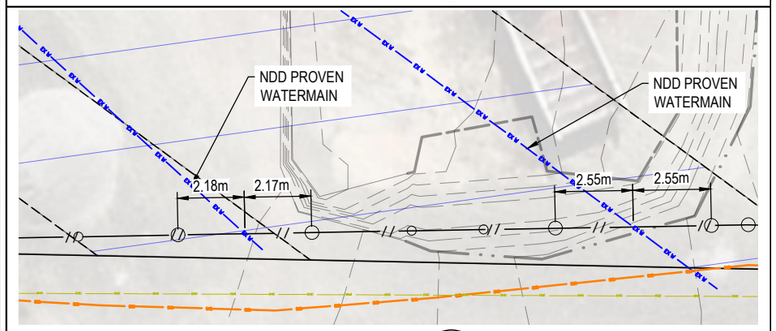




DETAIL A
SCALE 1:200 (m)



DETAIL B
SCALE 1:200 (m)

LEGEND:

- PROPOSED FENCE
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING COMMUNICATIONS
- EXISTING WATER MAINS
- EXISTING UNDERGROUND ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- PROPOSED FENCE FOOTING
- PROPOSED ELECTRICAL FENCE CONDUIT

NOTES:

1. FENCING IS PROPOSED TO BE 1.8m HIGH CHAIN MESH FENCE. STRUCTURAL DESIGN SHOULD BE PROVIDED BY THE SUPPLIER.
2. NOMINALLY, FENCING COMPRISES 80NB CORNER POSTS (900mm - 1000mm DEEP) AND 40NB INTERMEDIATE POSTS (600mm - 700mm DEEP). CORNER POSTS WILL BE HOUSED IN A NOMINAL 450mm DIAMETER FOOTING, INTERMEDIATE POSTS WILL BE HOUSED IN A NOMINAL 300mm DIAMETER FOOTING. MAXIMUM SPACING OF FENCE POSTS IS ~3.25m.
3. A HIGH TENSILE ELECTRIFIED PERIMETER FENCE WILL BE INSTALLED ONTO THE INSIDE OF THE CHAIN MESH FENCE, WITH A MAXIMUM HEIGHT OF 2.2m.
4. AN 800mm WIDE AND 200mm DEEP TRENCH FILLED WITH GRAVEL/ ROCK AND THE BASE LINED WITH WEED MATTING WILL BE LOCATED UNDER THE FENCE FOR SECURITY AND VEGETATION MAINTENANCE.
5. INGRESS AND EGRESS TO BE SEPARATED AT THE SITE FRONTAGE TO GREENBANKS ROAD. TWO ~4M WIDE GATES WILL BE INSTALLED, RESPECTIVELY, AT THE SITE ACCESS AND EGRESS. GATES WILL OPEN INWARDS AND WILL BE ELECTRICALLY CONTROLLED. CONTROL SYSTEM TO BE DETERMINED BY FENCING CONTRACTOR.
6. LV CONNECTION TO GATES AND SECURITY FENCING WILL BE PROVIDED FOLLOWING DA APPROVAL.
7. DUE TO THE PROXIMITY OF SOME EXISTING SERVICES TO THE FENCE, TEMPORARY FENCING IS PROPOSED ALONG SOME EXTENTS UNTIL SERVICE RELOCATION CAN BE COMPLETED. FOLLOWING SERVICE RELOCATION IT IS PROPOSED THAT THE STANDARD FENCING ARRANGEMENT IS INSTALLED.
8. WHERE OVERHEAD HV LINES ARE STRINGED IN CLOSE PROXIMITY TO THE SITE BOUNDARY IN THE SOUTH-WESTERN CORNER OF THE SITE, THE FENCE HAS BEEN MOVED 1.5M INTO THE SITE. NO EASEMENT EXISTS FOR THE OVERHEAD HV.
9. EDGE OF FOOTINGS TO BE, AT MINIMUM, 1m AWAY FROM THE EDGE OF POSITIVELY IDENTIFIED TASNETWORKS CABLES AND TASWATER PIPES, INCLUDING TASNETWORKS INFRASTRUCTURE WITHIN THE BRIDGEWATER SUBSTATION. FENCE FOOTINGS TO BE LOCATED TO AVOID EXISTING SERVICES WITH THE ABOVEMENTIONED OFFSETS.
10. WHERE FOOTINGS ARE TO BE LOCATED WITHIN 2m OF HV CABLES, A VACUUM TRUCK WILL BE UTILISED TO DIG HOLES FOR FOOTINGS AT THE EXTENTS OF EACH STRAIGHT SECTION AND WHEN MULTIPLE DIFFERENT SERVICES CONVERGE.
11. ANY EXCAVATIONS WITHIN 2m OF TASWATER INFRASTRUCTURE TO BE BY HAND OR VAC TRUCK.
12. VEGETATION IN THE VICINITY OF THE FENCE ALIGNMENT WILL BE REMOVED.
13. IN THE INSTANCE THAT FURTHER UTILITIES ARE IDENTIFIED IN THE VICINITY OF THE PROPOSED FENCE ALIGNMENT, FENCE POSTS SHALL SHIFT TO MAINTAIN REQUIRED OFFSET.
14. THE CONTRACTOR IS ADVISED TO UNDERTAKE THEIR OWN RISK MANAGEMENT AND SAFETY PRACTICES TO ENSURE SAFE INSTALLATION OF THE FENCE.
15. TASWATERS BULK WATER MAINS ARE LOCATED AND POSITIVELY IDENTIFIED ON SITE PRIOR TO ANY EXCAVATIONS OR EARTH WORKS. PHYSICAL MARKERS ARE INSTALLED FOR THE DURATION OF THE WORKS

DRAWING REVISION HISTORY

No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE
E	FOR APPROVAL	CM	CM	SM	20/03/2025
D	NOTES UPDATED	CM	CM	CM	14/03/2025
C	UPDATED FOR TASNETWORKS FENCE OFFSET	CM	CM	CM	12/03/2025
B	ISSUED FOR INFORMATION	CM	CM	CM	19/02/2025
A	ISSUED FOR INFORMATION	CM	CM	SM	11/12/2024

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SCALE (PLOTTED FULL SIZE) AS SHOWN
SHEET SIZE A3
10 0 10 20 30 40
SCALE IN METRES - 1:1000

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CLIENT: DAME TECHNOLOGIES
PROJECT: 73 GREENBANKS ROAD UTILITIES INFRASTRUCTURE
STATUS: **FOR APPROVAL**

DRAWING TITLE: SCHEMATIC DESIGN FENCING PLAN
DATUMS: AHD / MGA
CLIENT No.: -
DRAWING No.: S-P.24.1232-CIV-SKT-1501
REVISION: E
PRINT IN COLOUR
Mar. 20, 25 - 09:41:24 Name: S-P.24.1232-CIV-SKT-1501.dwg

Detail, Contour & Feature Survey, 73 Greenbanks Rd, Bridgewater

Appendix C

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BDY A - COMPILED BOUNDARY 47°33'40" 55.35m
BDY B - COMPILED BOUNDARY 119°21' 10.35m
BDY C - COMPILED BOUNDARY 89°21' 10.35m

BDY A
BDY B
BDY C

COMPILED BOUNDARY 124°52'40" 148.91m

DRAINAGE EASEMENT 2.50m WIDE

(37.58m)

ELECTRICITY INFRASTUCTURE EASEMENT 1.00m

PIPELINE EASEMENT 10.0m WIDE

PIPELINE EASEMENT 4.00m WIDE

COMPILED BOUNDARY 317°29'10" 216.71m

PIPELINE EASEMENT 10.06m WIDE

PIPELINE EASEMENT 4.00m WIDE

COMPILED BOUNDARY 161°46'20" 126.49m

COMPILED BOUNDARY 304°07' 25.19m

COMPILED BOUNDARY 268°59'40" 54.65m

N

GENERAL NOTES:

1. THIS PLAN HAS BEEN PREPARED BY SURVEY PLUS FROM A COMBINATION OF EXISTING RECORDS AND FIELD SURVEY FOR THE PURPOSES OF SHOWING THE PHYSICAL FEATURES OF THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.

2. TITLE BOUNDARIES SHOWN WERE NOT VERIFIED OR MARKED AT THE TIME OF THIS SURVEY.

3. SERVICES SHOWN ON THIS PLAN WERE LOCATED WHERE POSSIBLE BY FIELD SURVEY. THEY ARE NOT A COMPLETE PICTURE OF SERVICES ON SITE. ALL SERVICE LOCATIONS ARE TO BE VERIFIED BEFORE COMMENCEMENT OF ANY WORK ON SITE, IN PARTICULAR THOSE SERVICES NOT PREVIOUSLY LOCATED THROUGH FIELD SURVEY.

4. SURVEY PLUS CAN NOT ACCEPT LIABILITY WHATSOEVER FOR LOSS OR DAMAGE CAUSED TO ANY UNDERGROUND SERVICE WHETHER SHOWN BY OUR SURVEY OR NOT.

5. THIS NOTE IS AN INTEGRAL PART OF THIS PLAN/DATA. REPRODUCTION OF THIS PLAN OR ANY PART OF IT WITHOUT THIS NOTE BEING INCLUDED IN FULL WILL RENDER THE INFORMATION SHOWN ON SUCH A REPRODUCTION INVALID AND NOT SUITABLE FOR USE WITHOUT PRIOR AUTHORITY OF SURVEY PLUS.

6. HORIZONTAL DATUM IS MGA (GDA94).

7. VERTICAL DATUM IS AHD.

8. CONTOUR INTERVAL IS 0.2 METRES, INDEX IS 1.0 METRES.

9. SURVEY BY ROBOTIC TOTAL STATION AND GPS.

10. DUE TO THE AGE OF TITLE SURVEY IF ANY CONSTRUCTION WORKS ARE TO BE UNDERTAKEN ON OR NEAR THE TITLE BOUNDARY OR PRESCRIBED SETBACKS A RE-MARK SURVEY WILL BE REQUIRED.

11. TITLE BOUNDARIES SHOWN WERE NOT VERIFIED OR MARKED BY SURVEY PLUS AT THE TIME OF THIS SURVEY.

12. IMPORTED DATA SHOWN ON THIS PLAN WAS OBTAINED FOR PUBLIC AVAILABLE DATA FROM VARIOUS GOVERNMENT AUTHORITIES. THIS INFORMATION IS PROVIDED FOR GUIDANCE ONLY. THE ACCURACY OF ANY IMPORTED DATA IS PER THE ACCURACY QUOTED BY THE SOURCE AND IS IN NO WAY GUARANTEED BY SURVEY PLUS. USERS MUST NOT RELY ON THIS DATA FOR FOR ON-GROUND LOCATION OF BOUNDARIES AND/OR SERVICES.

LIST DATA IMPORT
- TasWater-SewerLateralLine
- TasWater-SewerMain
- TasWater-SewerMaintenanceHole
- TasWater-SewerPressurisedMain
- TasWater-WaterHydrant
- TasWater-WaterLateralLine
- TasWater-WaterMain
- CadastralParcel-OwnerInformation

LOCAL COUNCIL IMPORT
- LocalAuthority-StormwaterMain

13. BOUNDARIES ARE COMPILED ONLY FROM SP153305 AND RELEVANT SURVEY INFORMATION OBTAINED FROM LAND TITLES OFFICE AND ARE APPROXIMATE AND SUBJECT TO SURVEY.

14. ALL WINDOWS WERE NOT ABLE TO BE LOCATED DUE TO OBSTRUCTION OF LINE OF SIGHT FROM TOTAL STATION.
WINDOW LOCATIONS ARE APPROXIMATE ONLY DUE TO BEING UNABLE TO BE PERPENDICULAR TO WINDOWS WHEN LOCATING WITH TOTAL STATION.

15. 3D DATA TURNED OFF IN LAYER CONTROL.
- 3D TIN
- MAJOR CONTOUR 3D
- MINOR CONTOUR 3D

GPS DATA SCALE LOCATION
JOB CONTROL POINT
POINT NO: 1
DESCRIPTION: R/S IN KERB#
GPS SCALE FACTOR = 1.000402297
E: 518915.413
N: 5269198.370
RL: 41.62
EPU = 0.04±

SURVEY PLUS
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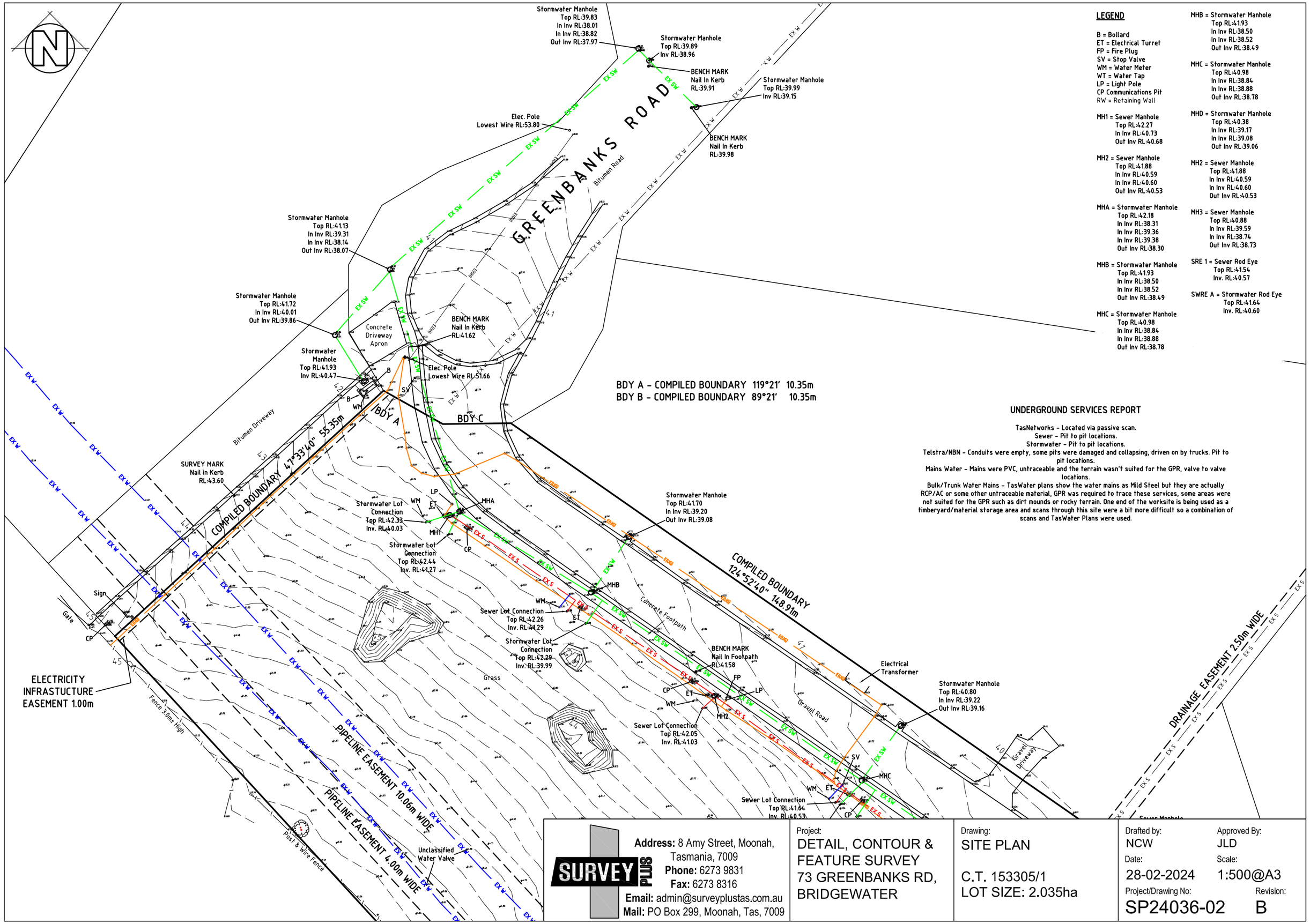
Email: admin@surveyplustas.com.au
Mail: PO Box 299, Moonah, Tas, 7009

Project:
DETAIL, CONTOUR & FEATURE SURVEY
73 GREENBANKS RD, BRIDGEWATER

Drawing:
SITE PLAN

C.T. 153305/1
LOT SIZE: 2.035ha

Drafted by: NCW
Approved By: JLD
Date: 28-02-2024
Scale: 1:1000@A3
Project/Drawing No: SP24036-01
Revision: B



LEGEND

B = Bollard
ET = Electrical Turret
FP = Fire Plug
SV = Stop Valve
WM = Water Meter
WT = Water Tap
LP = Light Pole
CP Communications Pit
RW = Retaining Wall

MH1 = Sewer Manhole
Top RL:42.27
In Inv RL:40.73
Out Inv RL:40.68

MH2 = Sewer Manhole
Top RL:41.88
In Inv RL:40.59
In Inv RL:40.60
Out Inv RL:40.53

MHA = Stormwater Manhole
Top RL:42.18
In Inv RL:38.31
In Inv RL:39.36
In Inv RL:39.38
Out Inv RL:38.30

MHB = Stormwater Manhole
Top RL:41.93
In Inv RL:38.50
In Inv RL:38.52
Out Inv RL:38.49

MHC = Stormwater Manhole
Top RL:40.98
In Inv RL:38.84
In Inv RL:38.88
Out Inv RL:38.78

MHB = Stormwater Manhole
Top RL:41.93
In Inv RL:38.50
In Inv RL:38.52
Out Inv RL:38.49

MHC = Stormwater Manhole
Top RL:40.98
In Inv RL:38.84
In Inv RL:38.88
Out Inv RL:38.78

MHD = Stormwater Manhole
Top RL:40.38
In Inv RL:39.17
In Inv RL:39.08
Out Inv RL:39.06

MH2 = Sewer Manhole
Top RL:41.88
In Inv RL:40.59
In Inv RL:40.60
Out Inv RL:40.53

MH3 = Sewer Manhole
Top RL:40.88
In Inv RL:39.59
In Inv RL:38.74
Out Inv RL:38.73

SRE 1 = Sewer Rod Eye
Top RL:41.54
Inv. RL:40.57

SWRE A = Stormwater Rod Eye
Top RL:41.64
Inv. RL:40.60

UNDERGROUND SERVICES REPORT

TasNetworks - Located via passive scan.
Sewer - Pit to pit locations.
Stormwater - Pit to pit locations.
Telstra/NBN - Conduits were empty, some pits were damaged and collapsing, driven on by trucks. Pit to pit locations.
Mains Water - Mains were PVC, untraceable and the terrain wasn't suited for the GPR, valve to valve locations.
Bulk/Trunk Water Mains - TasWater plans show the water mains as Mild Steel but they are actually RCP/AC or some other untraceable material, GPR was required to trace these services, some areas were not suited for the GPR such as dirt mounds or rocky terrain. One end of the worksite is being used as a timberyard/material storage area and scans through this site were a bit more difficult so a combination of scans and TasWater Plans were used.

SURVEY PLUS
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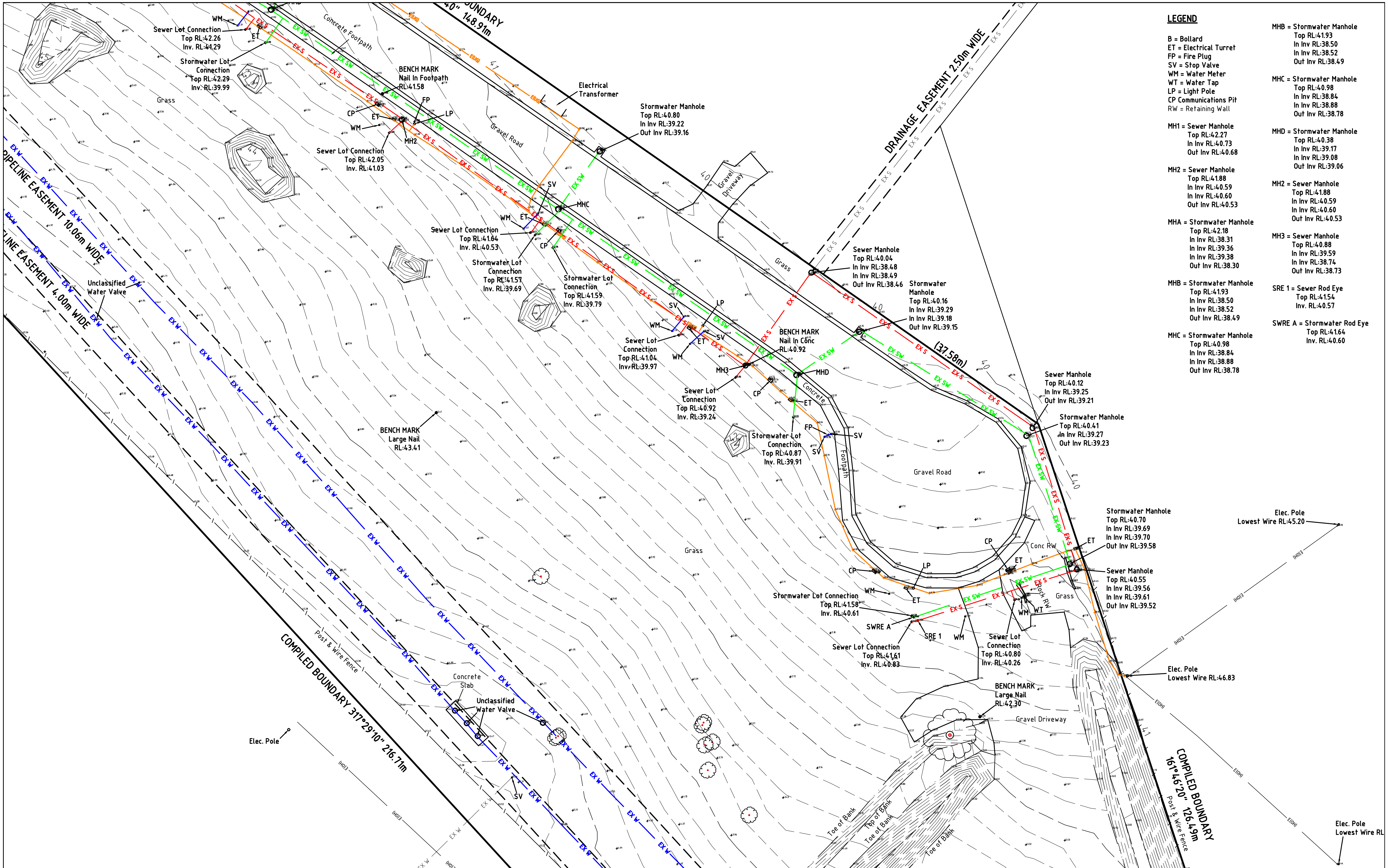
Email: admin@surveyplustas.com.au
Mail: PO Box 299, Moonah, Tas, 7009

Project:
DETAIL, CONTOUR & FEATURE SURVEY
73 GREENBANKS RD, BRIDGEWATER

Drawing:
SITE PLAN

C.T. 153305/1
LOT SIZE: 2.035ha

Drafted by: NCW
Approved By: JLD
Date: 28-02-2024
Scale: 1:500@A3
Project/Drawing No: SP24036-02
Revision: B


LEGEND
B = Bollard
ET = Electrical Turret
FP = Fire Plug
SV = Stop Valve
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CP Communications Pit
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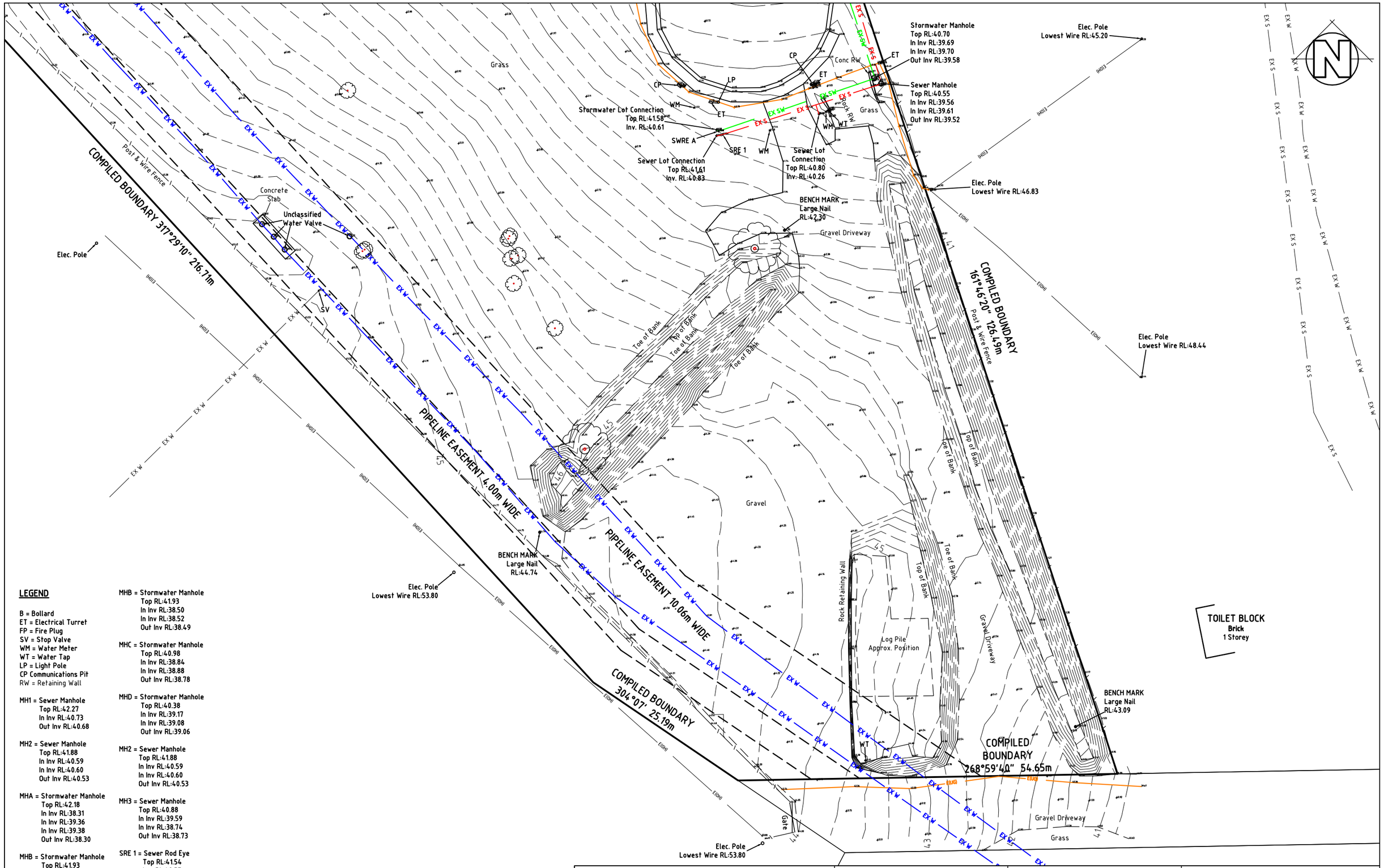
MH2 = Sewer Manhole Top RL:41.88 In Inv RL:40.59 In Inv RL:40.60 Out Inv RL:40.53
MHA = Stormwater Manhole Top RL:42.18 In Inv RL:38.31 In Inv RL:39.36 In Inv RL:39.38 Out Inv RL:38.30
MHB = Stormwater Manhole Top RL:41.93 In Inv RL:38.50 In Inv RL:38.52 Out Inv RL:38.49
MHC = Stormwater Manhole Top RL:40.98 In Inv RL:38.84 In Inv RL:38.88 Out Inv RL:38.78
MHD = Stormwater Manhole Top RL:40.38 In Inv RL:39.17 In Inv RL:39.08 Out Inv RL:39.06
MH3 = Sewer Manhole Top RL:40.88 In Inv RL:39.59 In Inv RL:38.74 Out Inv RL:38.73
SRE 1 = Sewer Rod Eye Top RL:41.54 Inv. RL:40.57
SWRE A = Stormwater Rod Eye Top RL:41.64 Inv. RL:40.60
DRAINAGE EASEMENT 2.50m WIDE
PIPELINE EASEMENT 10.06m WIDE
PIPELINE EASEMENT 4.00m WIDE
COMPILED BOUNDARY 317°29'10" 216.71m
COMPILED BOUNDARY 161°46'20" 126.49m
(37.58m)
BENCH MARK Nail In Footpath RL:41.58
BENCH MARK Nail In Conc RL:40.92
BENCH MARK Large Nail RL:43.41
BENCH MARK Large Nail RL:42.30
Stormwater Manhole Top RL:40.80 In Inv RL:39.22 Out Inv RL:39.16
Sewer Manhole Top RL:40.04 In Inv RL:38.48 In Inv RL:38.49 Out Inv RL:38.46
Stormwater Manhole Top RL:40.16 In Inv RL:39.29 In Inv RL:39.18 Out Inv RL:39.15
Sewer Manhole Top RL:40.12 In Inv RL:39.25 Out Inv RL:39.21
Stormwater Manhole Top RL:40.41 In Inv RL:39.27 Out Inv RL:39.23
Stormwater Manhole Top RL:40.70 In Inv RL:39.69 In Inv RL:39.70 Out Inv RL:39.58
Sewer Manhole Top RL:40.55 In Inv RL:39.56 In Inv RL:39.61 Out Inv RL:39.52
Elec. Pole Lowest Wire RL:45.20
Elec. Pole Lowest Wire RL:46.83
Elec. Pole
Electrical Transformer
Gravel Road
Gravel Driveway
Concrete Footpath
Grass
Unclassified Water Valve
Concrete Slab
Post & Wire Fence

SURVEY PLUS Address: 8 Amy Street, Moonah, Tasmania, 7009 Phone: 6273 9831 Fax: 6273 8316 Email: admin@surveyplustas.com.au Mail: PO Box 299, Moonah, Tas, 7009	Project: DETAIL, CONTOUR & FEATURE SURVEY 73 GREENBANKS RD, BRIDGEWATER	Drawing: SITE PLAN C.T. 153305/1 LOT SIZE: 2.035ha	Drafted by: NCW Approved By: JLD Date: 28-02-2024 Scale: 1:500@A3 Project/Drawing No: SP24036-03 Revision: B



LEGEND

B = Bollard
ET = Electrical Turret
FP = Fire Plug
SV = Stop Valve
WM = Water Meter
WT = Water Tap
LP = Light Pole
CP Communications Pit
RW = Retaining Wall

MH1 = Sewer Manhole
Top RL:42.27
In Inv RL:40.73
Out Inv RL:40.68

MH2 = Sewer Manhole
Top RL:41.88
In Inv RL:40.59
In Inv RL:40.60
Out Inv RL:40.53

MHA = Stormwater Manhole
Top RL:42.18
In Inv RL:38.31
In Inv RL:39.36
In Inv RL:39.38
Out Inv RL:38.30

MHB = Stormwater Manhole
Top RL:41.93
In Inv RL:38.50
In Inv RL:38.52
Out Inv RL:38.49

MHC = Stormwater Manhole
Top RL:40.98
In Inv RL:38.84
In Inv RL:38.88
Out Inv RL:38.78

MHB = Stormwater Manhole
Top RL:41.93
In Inv RL:38.50
In Inv RL:38.52
Out Inv RL:38.49

MHC = Stormwater Manhole
Top RL:40.98
In Inv RL:38.84
In Inv RL:38.88
Out Inv RL:38.78

MHD = Stormwater Manhole
Top RL:40.38
In Inv RL:39.17
In Inv RL:39.08
Out Inv RL:39.06

MH2 = Sewer Manhole
Top RL:41.88
In Inv RL:40.59
In Inv RL:40.60
Out Inv RL:40.53

MH3 = Sewer Manhole
Top RL:40.88
In Inv RL:39.59
In Inv RL:38.74
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Top RL:41.64
Inv. RL:40.60

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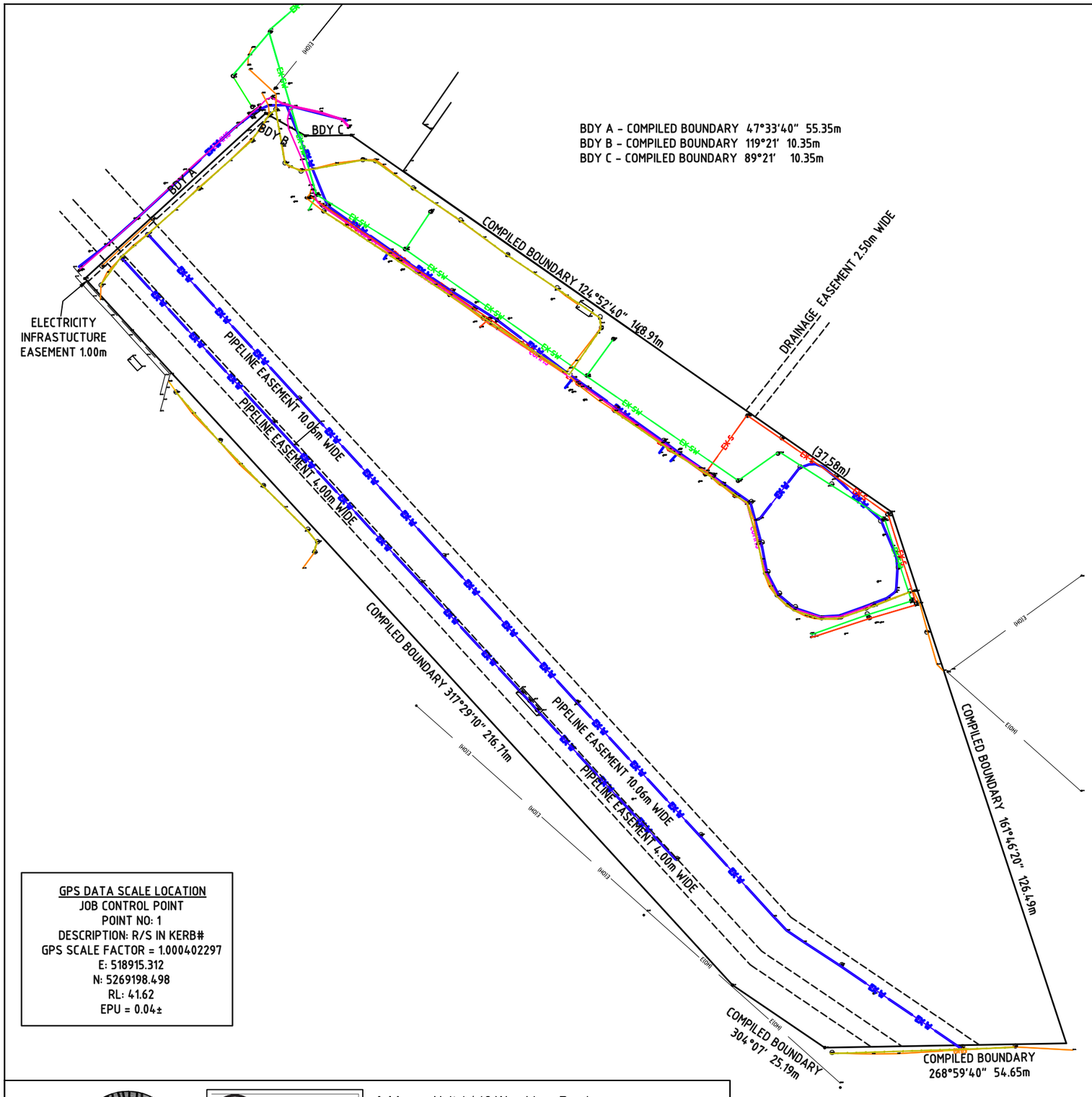
Project:
DETAIL, CONTOUR & FEATURE SURVEY
73 GREENBANKS RD, BRIDGEWATER

Drawing:
SITE PLAN

C.T. 153305/1
LOT SIZE: 2.035ha

Drafted by: NCW
Approved By: JLD
Date: 28-02-2024
Scale: 1:500@A3
Project/Drawing No: SP24036-04
Revision: B



GENERAL NOTES:

1. THIS PLAN HAS BEEN PREPARED BY SURVEY PLUS FROM A COMBINATION OF EXISTING RECORDS AND FIELD SURVEY FOR THE PURPOSES OF SHOWING THE PHYSICAL FEATURES OF THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.

2. TITLE BOUNDARIES SHOWN WERE NOT VERIFIED OR MARKED AT THE TIME OF THIS SURVEY.

3. SERVICES SHOWN ON THIS PLAN WERE LOCATED WHERE POSSIBLE BY FIELD SURVEY. THEY ARE NOT A COMPLETE PICTURE OF SERVICES ON SITE. ALL SERVICE LOCATIONS ARE TO BE VERIFIED BEFORE COMMENCEMENT OF ANY WORK ON SITE, IN PARTICULAR THOSE SERVICES NOT PREVIOUSLY LOCATED THROUGH FIELD SURVEY.

4. SURVEY PLUS CAN NOT ACCEPT LIABILITY WHATSOEVER FOR LOSS OR DAMAGE CAUSED TO ANY UNDERGROUND SERVICE WHETHER SHOWN BY OUR SURVEY OR NOT.

5. THIS NOTE IS AN INTEGRAL PART OF THIS PLAN/DATA. REPRODUCTION OF THIS PLAN OR ANY PART OF IT WITHOUT THIS NOTE BEING INCLUDED IN FULL WILL RENDER THE INFORMATION SHOWN ON SUCH A REPRODUCTION INVALID AND NOT SUITABLE FOR USE WITHOUT PRIOR AUTHORITY OF SURVEY PLUS.

6. HORIZONTAL DATUM IS MGA (GDA94).

7. VERTICAL DATUM IS AHD.

8. SURVEY BY ROBOTIC TOTAL STATION.

9. TITLE BOUNDARIES SHOWN WERE NOT VERIFIED OR MARKED BY SURVEY PLUS AT THE TIME OF THIS SURVEY

10. BOUNDARIES ARE COMPILED ONLY FROM SI0187661 FILED WITH SP153305 AND RELEVANT SURVEY INFORMATION OBTAINED FROM LAND TITLES OFFICE AND ARE APPROXIMATE AND SUBJECT TO SURVEY.

11. ALL WINDOWS WERE NOT ABLE TO BE LOCATED DUE TO OBSTRUCTION OF LINE OF SIGHT FROM TOTAL STATION.
WINDOW LOCATIONS ARE APPROXIMATE ONLY DUE TO BEING UNABLE TO BE PERPENDICULAR TO WINDOWS WHEN LOCATING WITH TOTAL STATION.

GPS DATA SCALE LOCATION
JOB CONTROL POINT
POINT NO: 1
DESCRIPTION: R/S IN KERB#
GPS SCALE FACTOR = 1.000402297
E: 518915.312
N: 5269198.498
RL: 41.62
EPU = 0.04±

UNDERGROUND SERVICES REPORT

TasNetworks - Located via Potholing and Passive Scan.
Slabbingf Over TasNetworks Cable 300mm Wide (Some doubles 600mm)
Comms - Some Locations Pit to Pit (within 50m Spacing area) Then Potholed Within 15m Spacing area
Sewer - Some Locations Pit to Pit (within 50m Spacing area) Then Potholed Within 15m Spacing area
Stormwater - Some Locations Pit to Pit (within 50m Spacing area) Then Potholed Within 15m Spacing area
Water Mains - Located via Potholing.

○ - Denotes Pothole locations to QLA

IMPORTANT NOTE

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Address: Unit 1 / 12 Woodrieve Road, Bridgewater, Tasmania, 7030
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Email: admin@tasual.com.au
Web: www.tasual.com.au
Mail: PO Box 98 Bridgewater, Tas, 7030

DBYD Sequence No: 38282687
Locator: Matt Richardson
Field Date: 21 to 24-01-2025

SURVEY PLUS
Address: 8 Amy Street, Moonah, Tasmania, 7009
Phone: 6273 9831
Fax: 6273 8316
Email: admin@surveyplustas.com.au
Mail: PO Box 299, Moonah, Tas, 7009

Project: UTILITY LOCATION SURVEY 73 GREENBANKS RD, BRIDGEWATER

Drawing: SITE PLAN

C.T. 153305/1

Drafted by: JLD
Approved By: JLD
Date: 4-02-2025
Scale: 1:1000@A3
Project/Drawing No: SP241701-01
Revision: C

LEGEND

B = Bollard
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SV = Stop Valve
WM = Water Meter
WT = Water Tap
LP = Light Pole
CP = Communications Pit

EP1 = New Elec Pole

H A = Stormwater Manhole
Top RL:40.38
In Inv RL:39.17
In Inv RL:39.08
Out Inv RL:39.06

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Out Inv RL:40.68

MH2 = Sewer Manhole
Top RL:41.87
In Inv RL:40.59
In Inv RL:40.65
Out Inv RL:40.56

MH3 = Sewer Manhole
Top RL:40.89
In Inv RL:39.65
In Inv RL:38.74
Out Inv RL:38.67

SRE 1 = Sewer Rod Eye
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Inv. RL:40.57

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Top RL:41.64
Inv. RL:40.60
(Need Changing to new heights)

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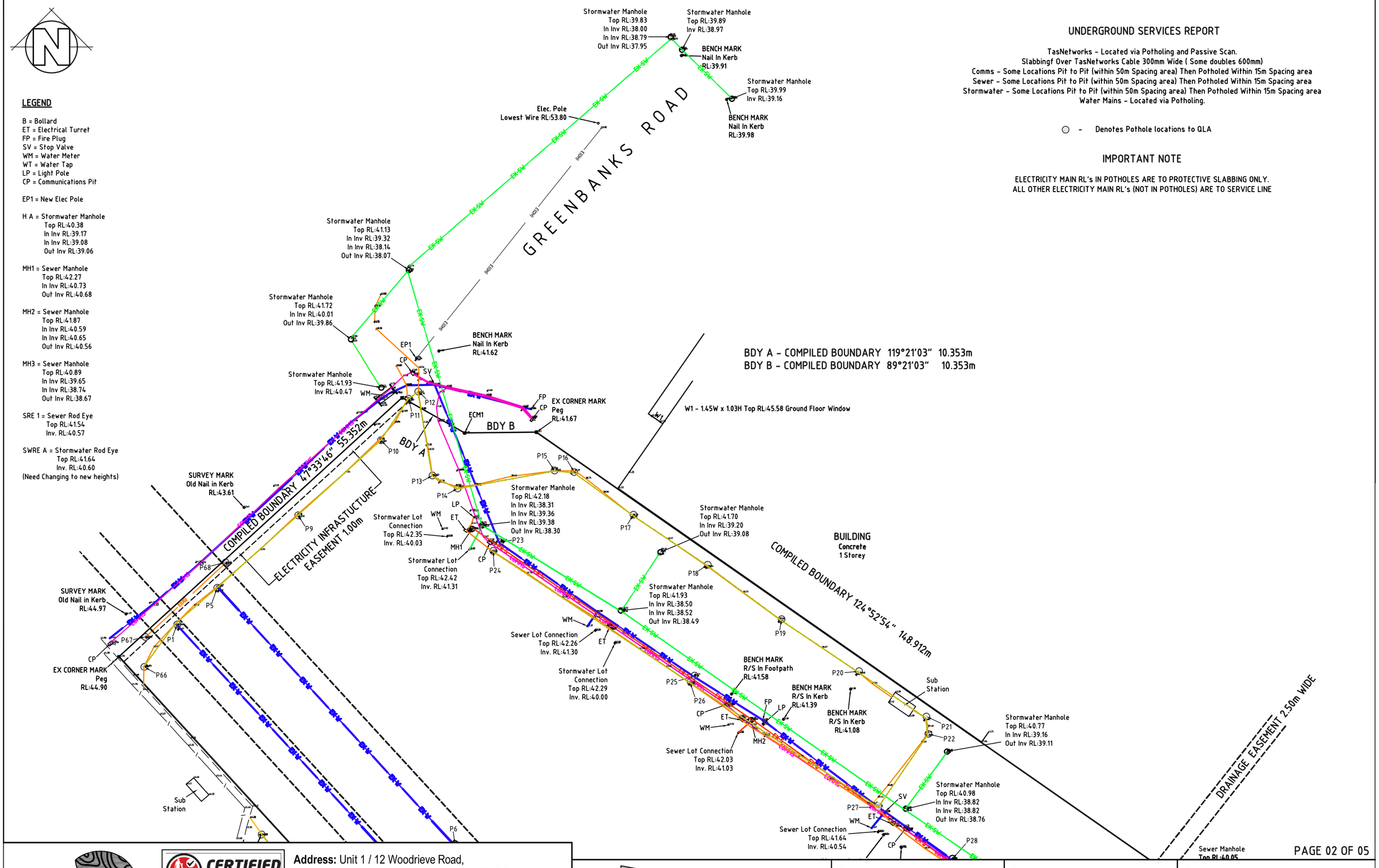

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Locator: Matt Richardson
Field Date: 21 to 24 -01-2025

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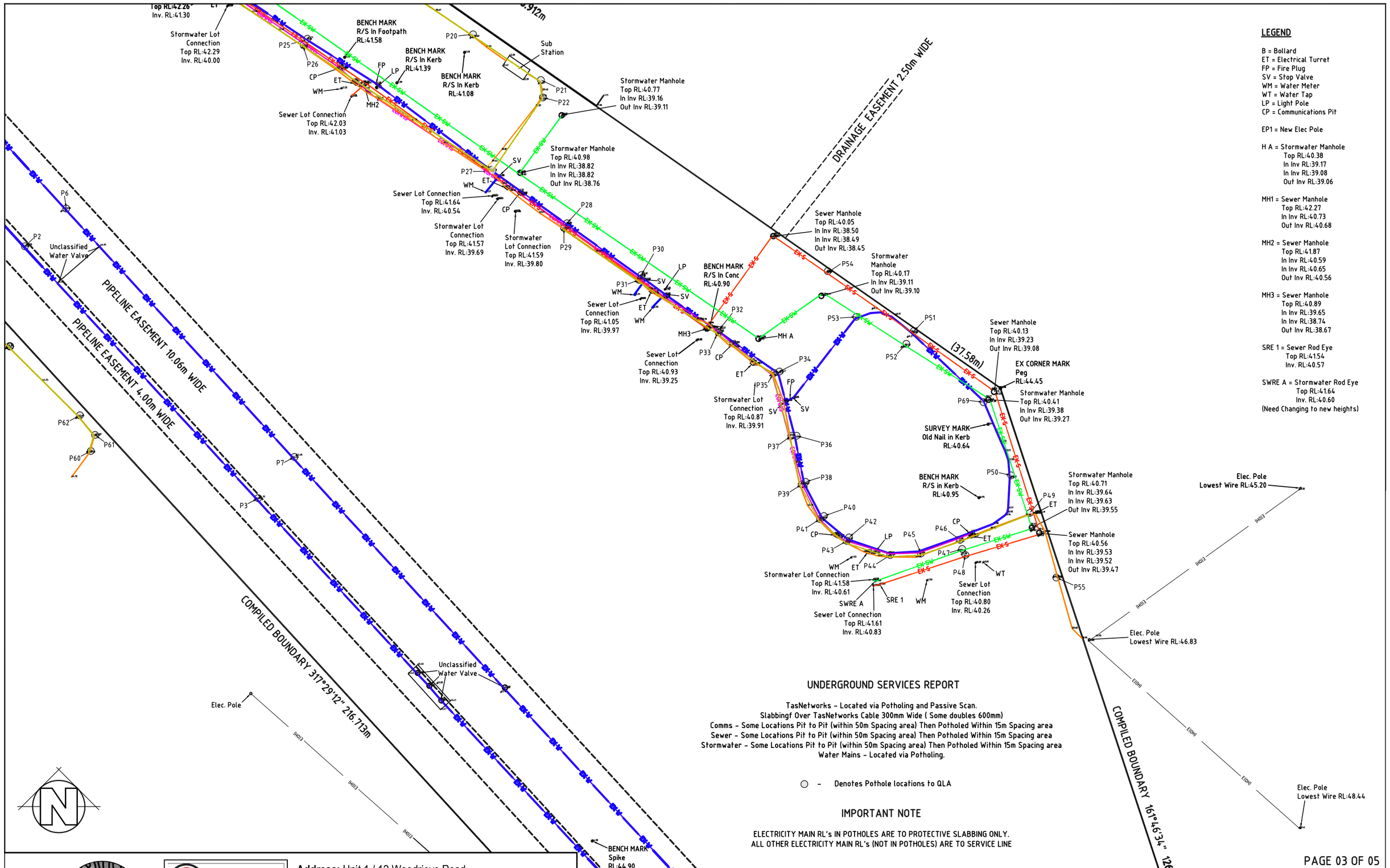
Fax: 6273 8316
Email: admin@surveyplustas.com.au
Mail: PO Box 299, Moonah, Tas, 7009

Project:
UTILITY LOCATION SURVEY
73 GREENBANKS RD, BRIDGEWATER

Drawing:
PART SITE PLAN

C.T. 153305/1

Drafted by: JLD
Approved By: JLD
Date: 4-02-2025
Scale: 1:500@A3
Project/Drawing No: SP241701-02
Revision: C



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In Inv RL:39.17
In Inv RL:39.08
Out Inv RL:39.06

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In Inv RL:40.73
Out Inv RL:40.68

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Top RL:41.87
In Inv RL:40.59
In Inv RL:40.65
Out Inv RL:40.56

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Top RL:40.89
In Inv RL:39.65
In Inv RL:38.74
Out Inv RL:38.67

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Top RL:41.64
Inv. RL:40.60
(Need Changing to new heights)

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○ - Denotes Pothole locations to QLA

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DBYD Sequence No: 38282687
Locator: Matt Richardson
Field Date: 21 to 24 -01-2025

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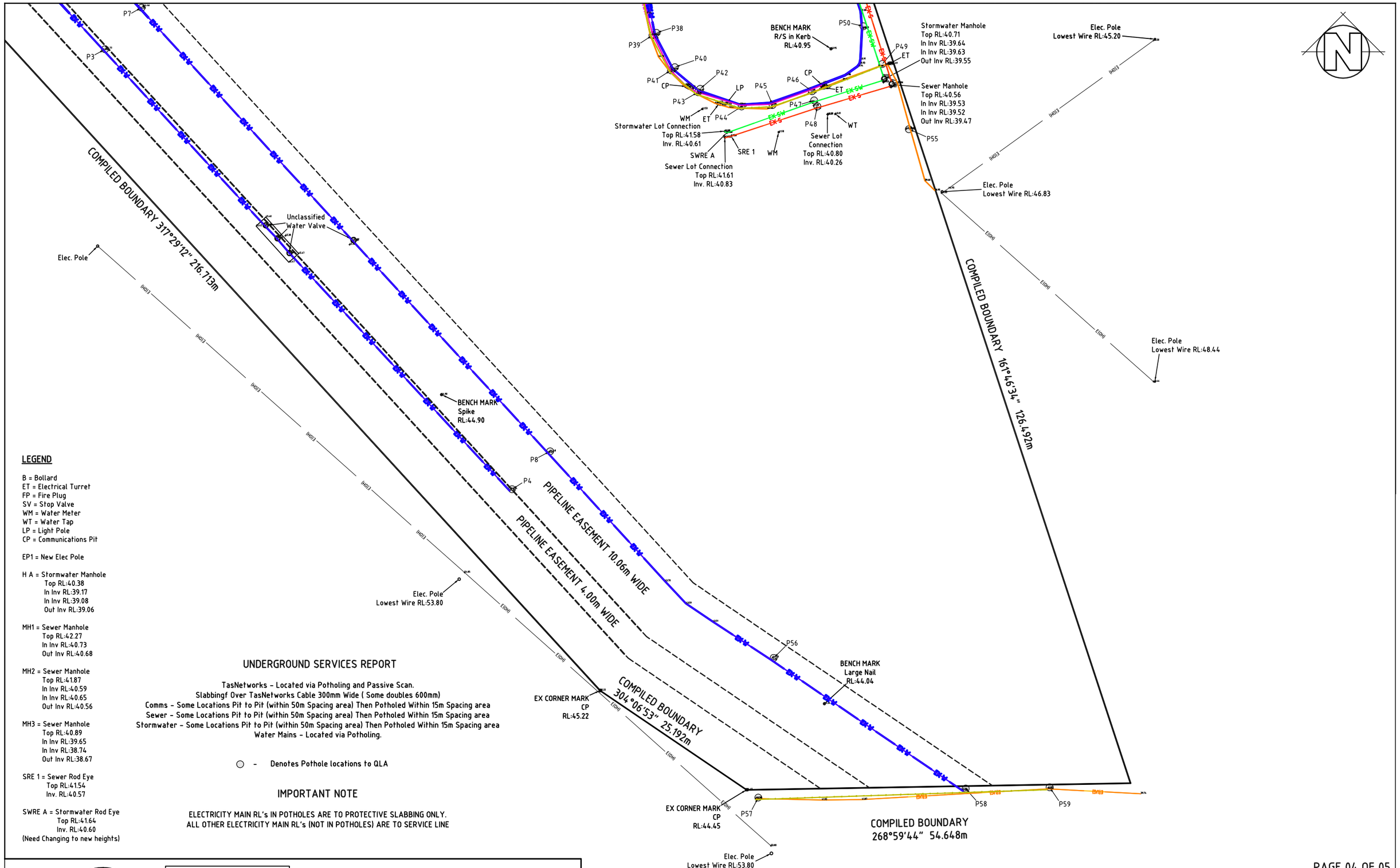
Fax: 6273 8316
Email: admin@surveyplustas.com.au
Mail: PO Box 299, Moonah, Tas, 7009

Project: UTILITY LOCATION SURVEY
73 GREENBANKS RD, BRIDGEWATER

Drawing: PART SITE PLAN
C.T. 153305/1

Drafted by: JLD
Approved By: JLD
Date: 4-02-2025
Scale: 1:500@A3
Project/Drawing No: SP241701-03
Revision: C



LEGEND

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CP = Communications Pit

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Top RL:40.38
In Inv RL:39.17
In Inv RL:39.08
Out Inv RL:39.06

MH1 = Sewer Manhole
Top RL:42.27
In Inv RL:40.73
Out Inv RL:40.68

MH2 = Sewer Manhole
Top RL:41.87
In Inv RL:40.59
In Inv RL:40.65
Out Inv RL:40.56

MH3 = Sewer Manhole
Top RL:40.89
In Inv RL:39.65
In Inv RL:38.74
Out Inv RL:38.67

SRE 1 = Sewer Rod Eye
Top RL:41.54
Inv. RL:40.57

SWRE A = Stormwater Rod Eye
Top RL:41.64
Inv. RL:40.60
(Need Changing to new heights)

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○ - Denotes Pothole locations to QLA

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DBYD Sequence No: 38282687
Locator: Matt Richardson
Field Date: 21 to 24 -01-2025

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Email: admin@surveyplustas.com.au
Mail: PO Box 299, Moonah, Tas, 7009

Project: UTILITY LOCATION SURVEY 73 GREENBANKS RD, BRIDGEWATER

Drawing: PART SITE PLAN C.T. 153305/1

Drafted by: JLD
Approved By: JLD
Date: 4-02-2025
Scale: 1:500@A3
Project/Drawing No: SP241701-04
Revision: C

P1 = Pothole
Water Main RL:42.99
Electricity Line RL:43.77
Natural Surface RL:44.67

P2 = Pothole
Water Main RL:44.25
Natural Surface RL:45.29

P3 = Pothole
Water Main RL:44.39
Natural Surface RL:44.77

P4 = Pothole
Water Main RL:44.15
Natural Surface RL:44.74

P5 = Pothole
Water Main RL:43.28
Electricity Line RL:42.57
Natural Surface RL:44.12

P6 = Pothole
Water Main RL:43.98
Natural Surface RL:44.91

P7 = Pothole
Water Main RL:44.06
Natural Surface RL:44.46

P8 = Pothole
Water Main RL:44.22
Natural Surface RL:44.48

P9 = Pothole
Electricity Line RL:41.97
Natural Surface RL:43.05

P10 = Pothole
Electricity Line RL:41.11
Natural Surface RL:42.09

P11 = Pothole
Electricity Line RL:41.07
Natural Surface RL:41.81

P12 = Pothole
Electricity Line RL:40.84
Natural Surface RL:41.76

P13 = Pothole
Electricity Line RL:40.92
Natural Surface RL:42.02

P14 = Pothole
Electricity Line RL:40.94
Natural Surface RL:41.94

P15 = Pothole
Electricity Line RL:40.53
Natural Surface RL:41.69

P16 = Pothole
Electricity Line RL:40.42
Natural Surface RL:41.62

P17 = Pothole
Electricity Line RL:40.47
Natural Surface RL:41.60

P18 = Pothole
Electricity Line RL:40.28
Natural Surface RL:41.46

P19 = Pothole
Electricity Line RL:40.03
Natural Surface RL:41.13

P20 = Pothole
Electricity Line RL:39.88
Natural Surface RL:40.93

P21 = Pothole
Electricity Line RL:39.65
Natural Surface RL:40.64

P22 = Pothole
Electricity Line RL:39.67
Natural Surface RL:40.73

P23 = Pothole
Water Line RL:41.56
Natural Surface RL:42.07

P24 = Pothole
Electricity Line RL:41.77
Comms. Line RL:41.76
Natural Surface RL:42.25

P25 = Pothole
Water Line RL:41.45
Natural Surface RL:41.70

P26 = Pothole
Electricity Line RL:41.48
Natural Surface RL:42.06

P27 = Pothole
Electricity Line RL:40.71
Water Line RL:40.91
Natural Surface RL:41.23

P28 = Pothole
Water Line RL:40.67
Natural Surface RL:41.01

P29 = Pothole
Electricity Line RL:40.64
Natural Surface RL:41.20

P30 = Pothole
Water Line RL:40.49
Natural Surface RL:40.81

P31 = Pothole
Electricity Line RL:40.42
Natural Surface RL:40.92

P32 = Pothole
Water Line RL:40.33
Natural Surface RL:40.52

P33 = Pothole
Electricity Line RL:40.15
Natural Surface RL:40.72

P34 = Pothole
Water Line RL:40.13
Natural Surface RL:40.42

P35 = Pothole
Electricity Line RL:40.16
Natural Surface RL:40.72

P36 = Pothole
Water Line RL:40.33
Natural Surface RL:40.93

P37 = Pothole
Electricity Line RL:40.34
Natural Surface RL:40.93

P38 = Pothole
Water Line RL:40.67
Natural Surface RL:40.92

P39 = Pothole
Electricity Line RL:40.65
Comms. Line RL:40.90
Natural Surface RL:40.92

P40 = Pothole
Water Line RL:40.85
Natural Surface RL:41.21

P41 = Pothole
Electricity Line RL:40.88
Comms. Line RL:41.06
Natural Surface RL:41.21

P42 = Pothole
Water Line RL:40.97
Natural Surface RL:41.27

P43 = Pothole
Electricity Line RL:40.97
Comms. Line RL:41.21
Natural Surface RL:41.27

P44 = Pothole
Electricity Line RL:40.88
Water Line RL:40.85
Comms. Line RL:41.01
Natural Surface RL:41.23

P55 = Pothole
Electricity Line RL:40.06
Natural Surface RL:40.92

P56 = Pothole
Water Line RL:43.28
Natural Surface RL:44.23

P57 = Pothole
Electricity Line RL:43.59
Natural Surface RL:44.32

P58 = Pothole
Electricity Line RL:42.09
Water Line RL:41.69
Natural Surface RL:42.86

P59 = Pothole
Electricity Line RL:40.85
Natural Surface RL:41.87

P60 = Pothole
Electricity Line RL:44.89
Natural Surface RL:45.76

P61 = Pothole
Electricity Line RL:44.80
Natural Surface RL:45.69

P62 = Pothole
Electricity Line RL:45.63
Natural Surface RL:45.59

P63 = Pothole
Electricity Line RL:44.71
Natural Surface RL:45.69

P64 = Pothole
Electricity Line RL:44.72
Natural Surface RL:45.64

P65 = Pothole
Electricity Line RL:44.59
Natural Surface RL:45.52

P66 = Pothole
Electricity Line RL:43.96
Natural Surface RL:44.84

P67 = Pothole
Electricity Line RL:43.64
Natural Surface RL:44.82

P68 = Pothole
Electricity Line RL:42.49
Natural Surface RL:43.93

P69 = Pothole
Water Main RL:39.62
Natural Surface RL:40.48

UNDERGROUND SERVICES REPORT

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Slabbingf Over TasNetworks Cable 300mm Wide (Some doubles 600mm)
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Project: UTILITY LOCATION SURVEY 73 GREENBANKS RD, BRIDGEWATER

Drawing: POTHOLING HEIGHT INFO

Drafted by: JLD
Approved By: JLD
Date: 4-02-2025
Scale: 1:500@A3
Project/Drawing No: SP241701-05
Revision: C

Geotechnical Investigation – Proposed Commercial Development, 73 Greenbanks Road, Bridgewater

Appendix D

Statewide Geotechnics
ABN 93 844 683 471

55 Leonard Avenue
Moonah TAS 7009

Telephone: 0499 498 337
Email: statewidegeo@gmail.com

14th March 2024 Our Ref SI115

Attention: Noel Bradbury
Facility Delivery
Dame Technologies Ltd
via email: Noel@dame.net.au
No hard copy to follow

Re: Geotechnical Investigation – Proposed Commercial Development
73 Greenbanks Road, Bridgewater

1. Background

This document details the findings of a geotechnical investigation undertaken by Statewide Geotechnics for a proposed commercial development on a greenfield site within a newly-developed subdivision at 73 Greenbanks Road in Bridgewater, Tasmania, at your earlier request.

It is understood from information provided by the client that the proposed development comprises the formation of a large cut/fill hardstand area approximately 35m wide along the centreline of the site, upon which will be placed 50 No 40-foot containers and a transportable site office at the western end of the site. Excavations up to 2m depth are anticipated.

The purpose of the geotechnical site investigation was to develop an understanding of the subsurface geological profile to aid the assessment of the excavatability of prevailing materials and the design of foundations for the proposed development. The geotechnical investigation comprised the drilling of ten boreholes along the approximate centreline of the site by an experienced Engineering Geologist from Statewide Geotechnics, Hobart.

The results of the investigation are summarised in this report, including a description of site activities, factual information on subsurface conditions encountered during the investigation and associated analysis of sampled materials. The report also presents comments and recommendations relevant to excavations and foundation design.

To aid in the investigation, the client provided a site location plan, a set of detailed survey plans from the project's surveyor, Survey Plus P/L, and a site layout plan showing the intended positions of five investigation boreholes and the extent of proposed cut/fill earthworks.

Copies of the abovementioned site layout and survey plans are presented in Appendix A, whilst. aerial images of the site are presented in Appendix B

2. Scope of Work

The scope of work for the geotechnical site investigation comprised a field investigation and analysis of soil samples, followed by review and recommendations based on the results. The investigation was broken down into the following components:

- Desktop geotechnical assessment, including a review of geological maps, historic aerial images, published and unpublished Mineral Resources Tasmania report and other published information;
- Drilling of boreholes at five separate, evenly-spaced locations along the centreline of the proposed hardstand area;
- Geotechnical logging and sampling of the soil profile for subsequent analysis; and
- Preparation of a factual geotechnical report including the results of the geotechnical investigation and recommendations for earthworks and foundation design.

3. Site Conditions and Geology

The site comprises a featureless, elongate 2.035ha parcel of greenfield land within a newly-developed industrial subdivision at Greenbanks Road, situated between the Transend Bridgewater substation and Weily Park in Bridgewater. The site is accessed off the southern side of the termination of Greenbanks Road.

The site slopes uniformly at a slight angle towards the northeast, falling from an elevation of approximately 45.5mASL at the southwest boundary to approximately 41mASL at Greenbanks Road.

At the time the investigation was undertaken, the site was vegetated wholly by mostly low grass with a small number of immature eucalypts located towards the southern extent of the property.

The 1:25,000 scale geology map of the Brighton area, published by Mineral Resources Tasmania and accessed via the 'LISTmap' website, shows the site and surrounds to be underlain by Jurassic dolerite rock at shallow depth.

A search conducted of the Mineral Resources Tasmania online database found no documentation relating specifically to the site or immediate surrounds.

The general arrangement of the site, including measured site slope angles, is shown on attached Figure 1.

4. Aerial Photo Interpretation

Aerial photographs of the Brighton area taken between 1985 and the present time were examined in detail as part of the desktop assessment. No aerial photographs of the site prior to this time period could be located.

The photographs show the site to have been vacant pasture vegetated wholly by low grass since at least 1985, with Greenbanks Road having been constructed in the early 2000s. Later photographs taken in 2012 detail the extension of Greenbanks Road along the northeastern side of the property.

5. Field Investigation Methodology

The fieldwork component of the geotechnical investigation was undertaken by an experienced engineering Geologist from Statewide Geotechnics. The investigation methodology was generally consistent with Australian Standard AS1726-1993 – '*Geotechnical Site Investigations*' and Statewide Geotechnics' standard work procedures.

Invasive testing of the site was undertaken on the 1st March 2024 and comprised the drilling of a total of ten boreholes, two each at five evenly-spaced locations, along the centreline of the proposed hardstand area to provide good coverage. Two holes were drilled at each location to verify the depth of refusal in instances where the first borehole encountered refusal at shallow depth, to increase the level of confidence in the field data.

The strength of subsurface materials encountered within the investigation boreholes were assessed down-hole, where possible, using a 19mm hand shear vane.

The soil profile in each of the boreholes was fully logged, with samples taken at selected depths for subsequent inspection and analysis.

The locations of the boreholes are shown on Figure 1 attached, whilst copies of the borehole logs and an information sheet explaining the various descriptive terms used are presented in Appendix C.

6. Findings

The investigation revealed consistent subsurface conditions at the site, in general agreement with the 1:25,000 scale geology map of the area and the findings of investigations previously undertaken on nearby properties.

A summary of the borehole data is presented in Table 1 below.

Table 1 – Summary of Borehole Data

BH	Location	Subsurface Layers	Depth (m)	Notes
BH1A	Centre line, NW end	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 0.90	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	0.90 – 1.00 (Refusal)	HW dolerite Refusal on MW dolerite
BH1B	Centre line, NW end	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 0.80	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	0.80 – 0.90 (Refusal)	HW dolerite Refusal on MW dolerite
BH2A	Centre line, approx. mid-way b/w NW end and centre	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 1.10	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	1.10 – 1.20 (Refusal)	HW dolerite Refusal on MW dolerite
BH2B	Centre line, approx. mid-way b/w NW end and centre	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 0.70 (Refusal)	Residual dolerite clay, some cobbles Refusal on cobble/boulder
BH3A	Centre line, centre	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 0.60 (Refusal)	Residual dolerite clay, some cobbles Refusal on cobble/boulder
BH3B	Centre line, centre	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 0.90	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	0.90 – 1.00 (Refusal)	HW dolerite Refusal on MW dolerite
BH4A	Centre line, approx. mid-way b/w SE end and centre	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 1.20	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	1.20 – 1.30 (Refusal)	HW dolerite Refusal on MW dolerite

BH4B	Centre line, approx. mid-way b/w SE end and centre	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 0.80	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	0.80 – 0.90 (Refusal)	HW dolerite Refusal on MW dolerite
BH5A	Centre line, SE end	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 0.90	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	0.90 – 1.00 (Refusal)	HW dolerite Refusal on MW dolerite
BH5B	Centre line, SE end	Clayey SILT (ML), moist, loose	0.00 – 0.20	Topsoil
		Sandy Silty CLAY (CH), some cobbles, moist, very stiff to hard	0.20 – 1.30	Residual dolerite clay, some cobbles
		Sandy CLAY (CL), low plasticity, dry to moist, hard	1.30 – 1.40 (Refusal)	HW dolerite Refusal on MW dolerite

The investigation boreholes encountered consistent geological conditions across the site, with eight of the ten holes (Boreholes 1A, 1B, 2A, 3B, 4A, 4B, 5A, and 5B) having encountered a surficial silty topsoil layer to 0.20m depth underlain by a variable thickness of residual dolerite clay over weathered insitu dolerite rock. The residual dolerite clay layer was found to be of generally very stiff consistency, containing abundant coarse dolerite clasts, and coloured dark red-brown. The lowermost approximately 100mm of these boreholes encountered hard sandy clay material interpreted to be highly weathered dolerite, with refusal being met thereafter at depths ranging between 0.60m and 1.40m below existing ground level.

Two of the ten boreholes, BH2B and BH3A, encountered a similar surface profile but met with shallower refusal at respective depths of 0.70m and 0.60m on large floating dolerite clasts rather than insitu weathered dolerite rock, with the lowermost 100mm layer of residual weathered dolerite clay being absent from the soil profile.

All of the ten investigation boreholes were noted to be in a dry state on completion.

No foreign materials or obvious signs of environmental contamination were observed during the course of the field investigation.

6. Discussion and Recommendations

The findings of both the desktop study and field investigation indicate that the site is not affected by any geohazards and is capable of supporting the proposed development without risk of adverse impact on either the proposed development, the site itself or surrounding land, provided the following recommendations are incorporated in the design and construction of the project. Accordingly, site conditions dictate that the design and construction do not require any special considerations beyond ensuring that the recommendations provided herein and the applicable Australian Standards are adhered to.

The investigation found the site to be underlain by a thin topsoil layer over a variable thickness of residual dolerite clay of generally stiff to very stiff consistency. This clay layer was in turn found to be underlain by moderately weathered or better quality insitu dolerite rock between 0.60m and 1.40m depth.
No fill material was encountered in the course of the investigation, nor are there any obvious signs of fill having been placed on the site or on neighbouring land.

Based on AS2870-2011 – '*Residential Slabs and Footings*' and the strength and plasticity characteristics of the subsurface materials encountered in the investigation, insofar as can be considered applicable, the site in its current state is broadly classified as 'Class M'. The underlying dolerite rock layer would be classified as a 'Class A' material.

Excavations in natural materials are expected to encounter topsoil and residual clay to a depth of 1.4m or more which may be excavated using conventional excavation equipment such as tracked excavators or dozers. Whilst the structure and strength of the underlying rock is largely unknown, based on an inspection of nearby earthworks, it is likely that excavations in this material may be similarly accomplished with conventional excavation equipment, possibly requiring ripping.

Excavations undertaken at the site are not likely to encounter groundwater, however seasonal variations and weather conditions at the time of construction are likely to impact potential water inflows. Any water inflows should be carefully monitored and assessed by a geotechnical engineer or engineering geologist if required.

For excavations in natural topsoil and clays, a temporary maximum batter slope of 2H:1V may be adopted. Near-vertical batter slopes may be adopted in insitu dolerite material, where encountered. Personnel should not be allowed to enter any excavations deeper than 1.5m without a prior assessment of stability being undertaken by a qualified geotechnical practitioner.

Excavations undertaken in the residual clay and underlying dolerite may yield material suitable for use as engineered fill. If use of this material is to be contemplated, oversized particles greater than 150mm in size would need to be selectively removed, and sampling and testing by an accredited testing agency undertaken to determine, as a minimum, California Bearing Ratio (CBR) and Standard Compaction (SMDD) in accordance with AS1289-2003 - '*Methods of Testing Soils for Engineering Purposes*' to check suitability of use for backfill under foundations and pavements. Where possible, approved imported material should be used in construction of engineered fill.

Any retaining walls over 1m in height should be specialist engineer designed to resist the lateral load imposed by the retained materials and be provided with adequate subsoil drainage.

By way of a disclaimer, it should be noted that variations in subsurface conditions may occur in areas of the site not specifically covered by the field investigation. The base of all footing excavations should therefore be inspected to ensure that the founding medium meets the requirements referenced herein with respect to type and strength of founding material. Statewide Geotechnics is able to provide this service if required.

A Form 55 'certificate of Qualified Person' for the development is provided in Appendix D herein.

Should you further clarification, or if we can be of further assistance, please contact the undersigned.

For and on behalf of Statewide Geotechnics

Drew Bedelph
Engineering Geologist
Statewide Geotechnics

References:

- AS1289 – 2003 – '*Methods of Testing Soils for Engineering Purposes*'
- AS1726 – 2017 – 'Geotechnical Site Investigations'
- AS2870 - 2011 - '*Residential Slabs and Footings*'.

Attachments:

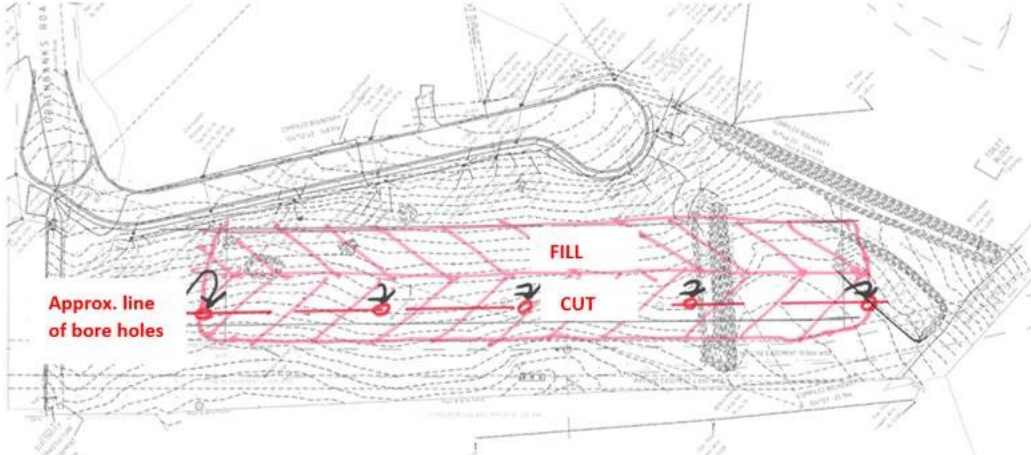
- Figure 1 – Site Layout and Test Location Plan (1 page)

Appendices:

- Appendix A – Site Layout and Survey Plans (5 pages) Appendix
- B – Aerial Site Images (3 pages)
- Appendix C - Borehole Logs and Descriptive Terms (11 pages)
- Appendix D – Form 55 Certificate of Qualified Person (2 pages)

APPENDIX A

Site Layout and Survey Plans


FILL
CUT
Approx. line
of bore holes

BDY A - COMPILED BOUNDARY 47°33'40" 55.35m
BDY B - COMPILED BOUNDARY 119°21' 10.35m
BDY C - COMPILED BOUNDARY 89°21' 10.35m

LEGEND

B = Bollard
ET = Electrical Turret
SV = Stop Valve

MH1 = Sewer Manhole
Top RL:42.27
In Inv RL:40.73
Out Inv RL:40.68

MH2 = Sewer Manhole
Top RL:41.88
In Inv1 RL:40.59
In Inv2 RL:40.60
Out Inv RL:40.53

MHA = Stormwater Manhole
Top RL:42.18
In InvE RL:38.31
In InvF RL:39.36
In InvG RL:39.38
Out Inv RL:38.30

MHB = Stormwater Manhole
Top RL:41.93
In InvH RL:38.50
In InvI RL:38.52
Out Inv RL:38.49

MHC = Stormwater Manhole
Top RL:40.98
In InvJ RL:38.84
In InvK RL:38.88
Out Inv RL:38.78

Stormwater Manhole
Top RL:39.83
In InvA RL:38.99
In InvB RL:38.95
Out Inv RL:38.94

Stormwater Manhole
Top RL:39.89
Inv RL:38.96

BENCH MARK
Nail In Kerb
RL:39.91

Stormwater Manhole
Top RL:39.99
Inv RL:39.15

BENCH MARK
Nail In Kerb
RL:39.98

Elec. Pole
Lowest Wire
RL:53.80

GREENBANKS ROAD
/Bitumen Road

Stormwater Manhole
Top RL:41.13
In InvC RL:39.31
In InvD RL:38.14
Out Inv RL:38.13

Stormwater Manhole
Top RL:41.72
In Inv RL:40.01
Out Inv RL:39.86

Concrete Driveway Apron

BENCH MARK
Nail In Kerb
RL:41.62

Stormwater Manhole
Top RL:41.93
Inv RL:40.47

Elec. Pole
Lowest Wire
RL:51.66

Water Meter

BDY A
BDY B
BDY C

Bitumen Driveway

Stormwater Lot Connection
Top RL:42.33
Inv. RL:40.03

Light Pole
WM
ET
MHA
MH1

Stormwater Lot Connection
Top RL:42.44
Inv. RL:41.27

Comms. Pit

Stormwater Manhole
Top RL:41.70
In Inv RL:39.20
Out Inv RL:39.08

Water Meter
MHB
Concrete Footpath

Sewer Lot Connection
Top RL:42.26
Inv. RL:41.29

Stormwater Lot Connection
Top RL:42.29
Inv. RL:39.99

Grass

BENCH MARK
Nail In Footpath
RL:41.58

Electrical Transformer

Stormwater Manhole
Top RL:40.80
In Inv RL:39.22
Out Inv RL:39.16

Comms. Pit
ET
FP
Light Pole
Water Meter
MH2
Gravel Road

Sewer Lot Connection
Top RL:42.05
Inv. RL:41.03

Water Meter
SV
ET
MHC

Sewer Lot Connection
Top RL:41.64
Inv. RL:40.53

COMPILED BOUNDARY
124°52'40" 148.91m

DRAINAGE EASEMENT 2.50m WIDE

Gravel Driveway

Sign
Gate
Comms. Pit

ELECTRICITY INFRASTUCTURE EASEMENT 1.00m

Fence 3.0m± High

PIPELINE EASEMENT 10.06m WIDE

PIPELINE EASEMENT 4.00m WIDE

Post & Wire Fence

Unclassified
Water Valve

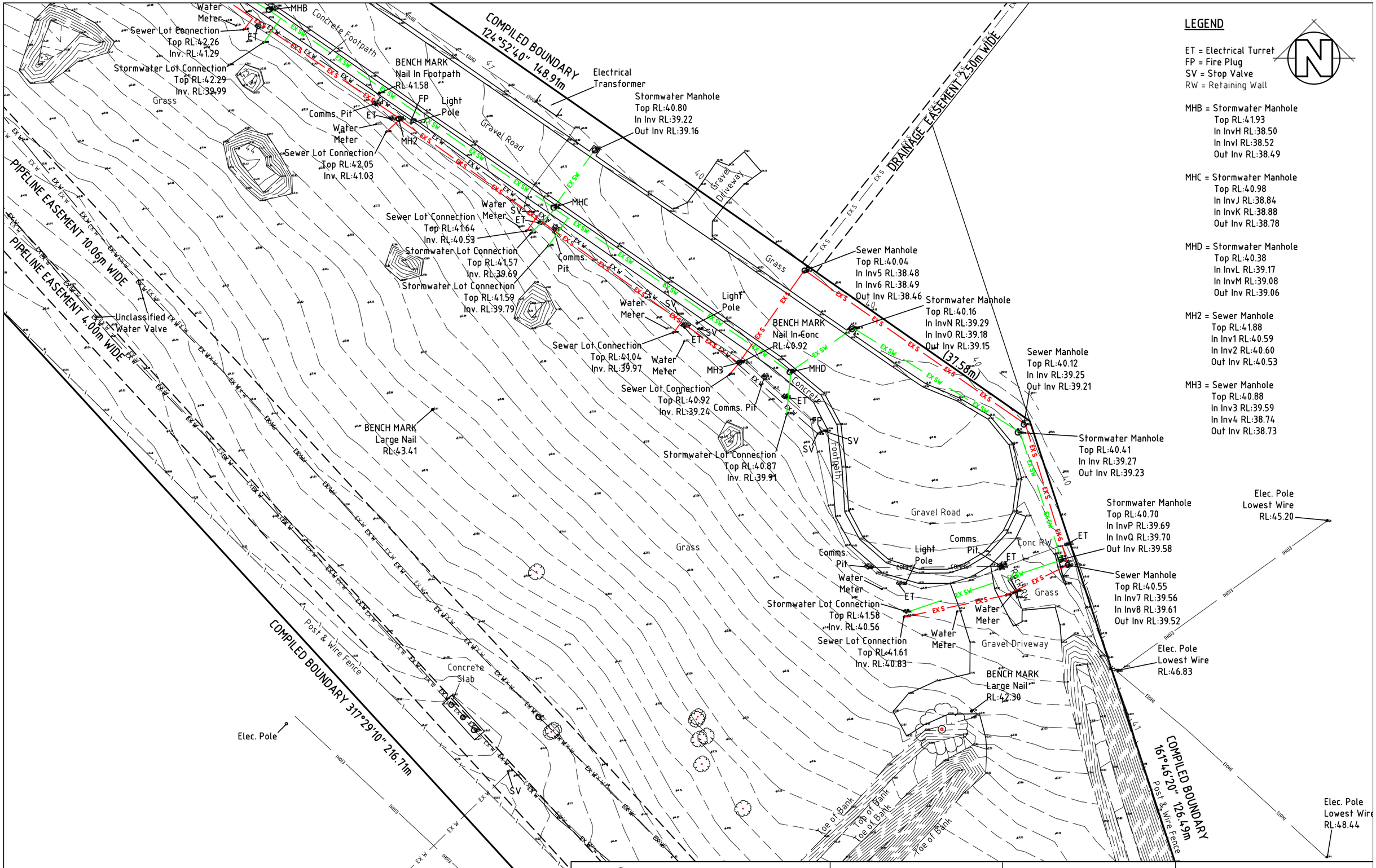
SURVEY PLUS
Address: 8 Amy Street, Moonah, Tasmania, 7009
Phone: 6273 9831
Fax: 6273 8316
Email: admin@surveyplustas.com.au
Mail: PO Box 299, Moonah, Tas, 7009

Project:
DETAIL, CONTOUR & FEATURE SURVEY
73 GREENBANKS RD, BRIDGEWATER

Drawing:
SITE PLAN

C.T. 153305/1
LOT SIZE: 2.035ha

Drafted by: NCW
Approved By: JLD
Date: 16-02-2024
Scale: 1:500@A3
Project/Drawing No: SP24036-02
Revision: A



LEGEND

ET = Electrical Turret
FP = Fire Plug
SV = Stop Valve
RW = Retaining Wall

MHB = Stormwater Manhole
Top RL:41.93
In InvH RL:38.50
In InvI RL:38.52
Out Inv RL:38.49

MHC = Stormwater Manhole
Top RL:40.98
In InvJ RL:38.84
In InvK RL:38.88
Out Inv RL:38.78

MHD = Stormwater Manhole
Top RL:40.38
In InvL RL:39.17
In InvM RL:39.08
Out Inv RL:39.06

MH2 = Sewer Manhole
Top RL:41.88
In Inv1 RL:40.59
In Inv2 RL:40.60
Out Inv RL:40.53

MH3 = Sewer Manhole
Top RL:40.88
In Inv3 RL:39.59
In Inv4 RL:38.74
Out Inv RL:38.73

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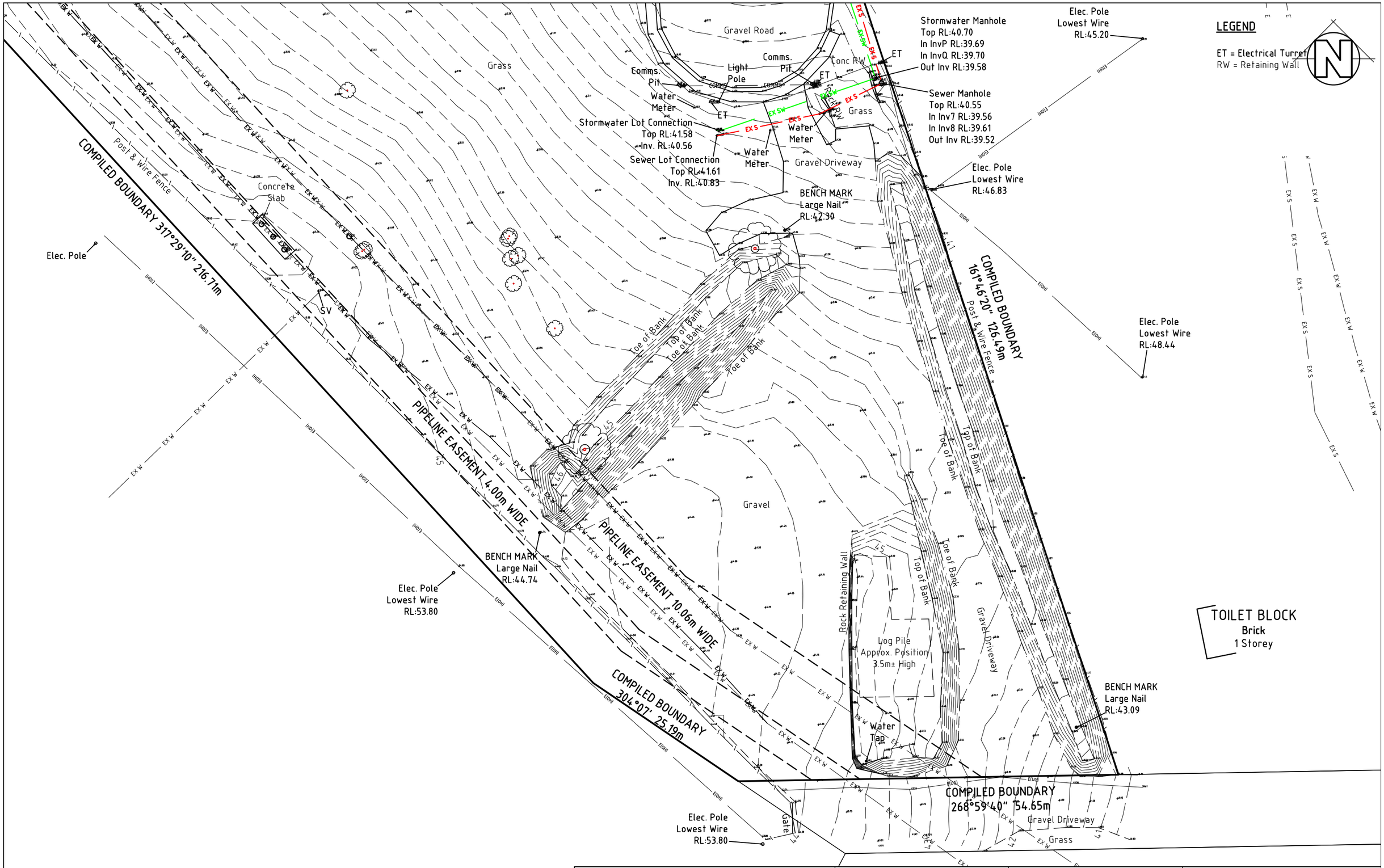
Revision: A



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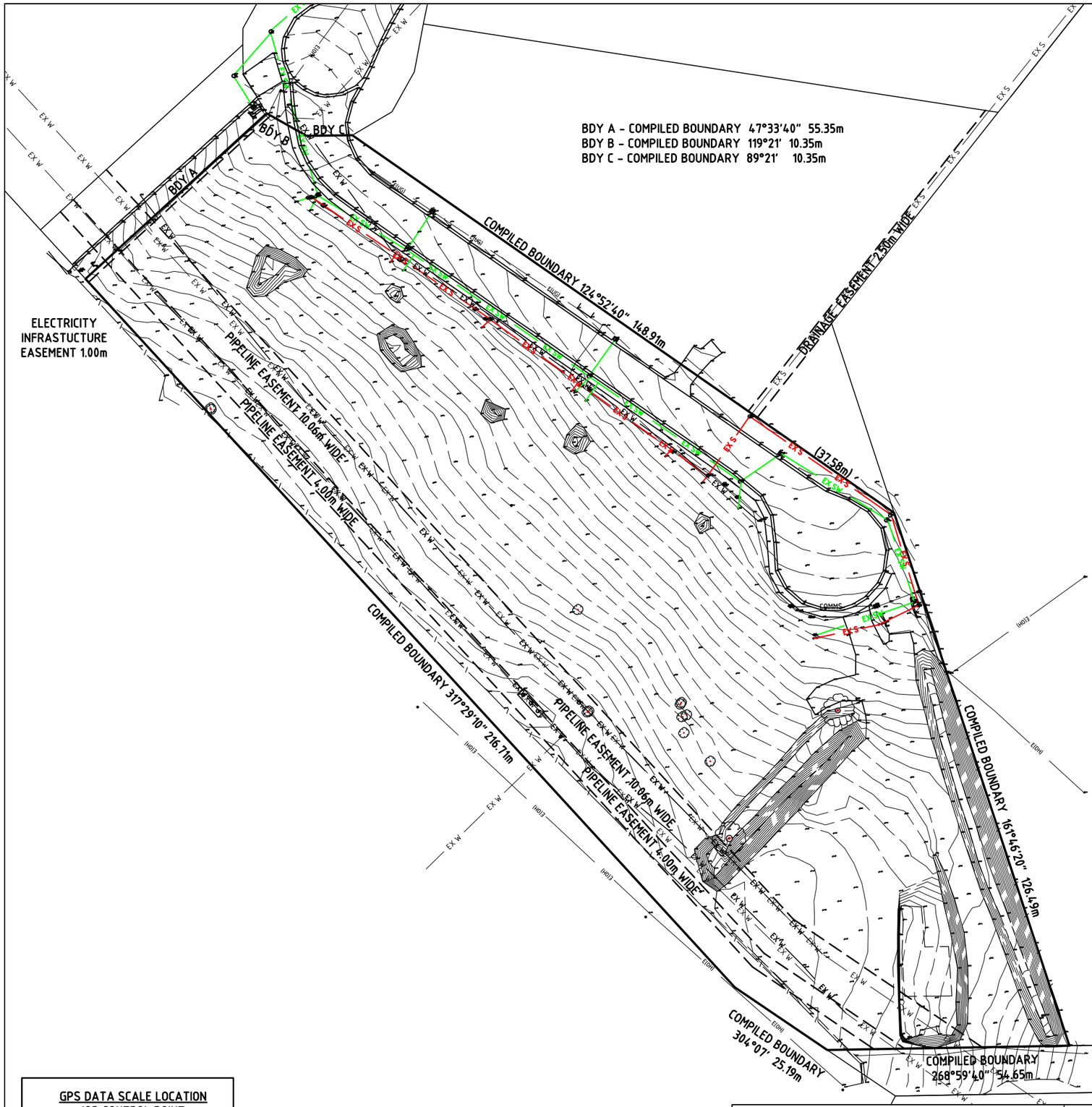
73 GREENBANKS RD, BRIDGEWATER

Drawing:
SITE PLAN

C.T. 153305/1
LOT SIZE: 2.035ha

Drafted by: NCW
Approved By: JLD
Date: 16-02-2024
Scale: 1:500@A3
Project/Drawing No: SP24036-04
Revision: A



GENERAL NOTES:

1. THIS PLAN HAS BEEN PREPARED BY SURVEY PLUS FROM A COMBINATION OF EXISTING RECORDS AND FIELD SURVEY FOR THE PURPOSES OF SHOWING THE PHYSICAL FEATURES OF THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.

2. TITLE BOUNDARIES SHOWN WERE NOT VERIFIED OR MARKED AT THE TIME OF THIS SURVEY.

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4. SURVEY PLUS CAN NOT ACCEPT LIABILITY WHATSOEVER FOR LOSS OR DAMAGE CAUSED TO ANY UNDERGROUND SERVICE WHETHER SHOWN BY OUR SURVEY OR NOT.

5. THIS NOTE IS AN INTEGRAL PART OF THIS PLAN/DATA. REPRODUCTION OF THIS PLAN OR ANY PART OF IT WITHOUT THIS NOTE BEING INCLUDED IN FULL WILL RENDER THE INFORMATION SHOWN ON SUCH A REPRODUCTION INVALID AND NOT SUITABLE FOR USE WITHOUT PRIOR AUTHORITY OF SURVEY PLUS.

6. HORIZONTAL DATUM IS MGA (GDA94).

7. VERTICAL DATUM IS AHD.

8. CONTOUR INTERVAL IS 0.2 METRES, INDEX IS 1.0 METRES.

9. SURVEY BY ROBOTIC TOTAL STATION AND GPS.

10. DUE TO THE AGE OF TITLE SURVEY IF ANY CONSTRUCTION WORKS ARE TO BE UNDERTAKEN ON OR NEAR THE TITLE BOUNDARY OR PRESCRIBED SETBACKS A RE-MARK SURVEY WILL BE REQUIRED.

11. TITLE BOUNDARIES SHOWN WERE NOT VERIFIED OR MARKED BY SURVEY PLUS AT THE TIME OF THIS SURVEY.

12. IMPORTED DATA SHOWN ON THIS PLAN WAS OBTAINED FOR PUBLIC AVAILABLE DATA FROM VARIOUS GOVERNMENT AUTHORITIES. THIS INFORMATION IS PROVIDED FOR GUIDANCE ONLY. THE ACCURACY OF ANY IMPORTED DATA IS PER THE ACCURACY QUOTED BY THE SOURCE AND IS IN NO WAY GUARANTEED BY SURVEY PLUS. USERS MUST NOT RELY ON THIS DATA FOR FOR ON-GROUND LOCATION OF BOUNDARIES AND/OR SERVICES.

LIST DATA IMPORT
- TasWater-SewerLateralLine
- TasWater-SewerMain
- TasWater-SewerMaintenanceHole
- TasWater-SewerPressurisedMain
- TasWater-WaterHydrant
- TasWater-WaterLateralLine
- TasWater-WaterMain
- CadastralParcel-OwnerInformation

LOCAL COUNCIL IMPORT
- LocalAuthority-StormwaterMain

13. BOUNDARIES ARE COMPILED ONLY FROM SP153305 AND RELEVANT SURVEY INFORMATION OBTAINED FROM LAND TITLES OFFICE AND ARE APPROXIMATE AND SUBJECT TO SURVEY.

14. ALL WINDOWS WERE NOT ABLE TO BE LOCATED DUE TO OBSTRUCTION OF LINE OF SIGHT FROM TOTAL STATION.
WINDOW LOCATIONS ARE APPROXIMATE ONLY DUE TO BEING UNABLE TO BE PERPENDICULAR TO WINDOWS WHEN LOCATING WITH TOTAL STATION.

15. 3D DATA TURNED OFF IN LAYER CONTROL.
- 3D TIN
- MAJOR CONTOUR 3D
- MINOR CONTOUR 3D

GPS DATA SCALE LOCATION
JOB CONTROL POINT
POINT NO: 1
DESCRIPTION: R/S IN KERB#
GPS SCALE FACTOR = 1.000402297
E: 518915.413
N: 5269198.370
RL: 41.62
EPU = 0.04±

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Project/Drawing No: SP24036-01
Revision: A

APPENDIX B

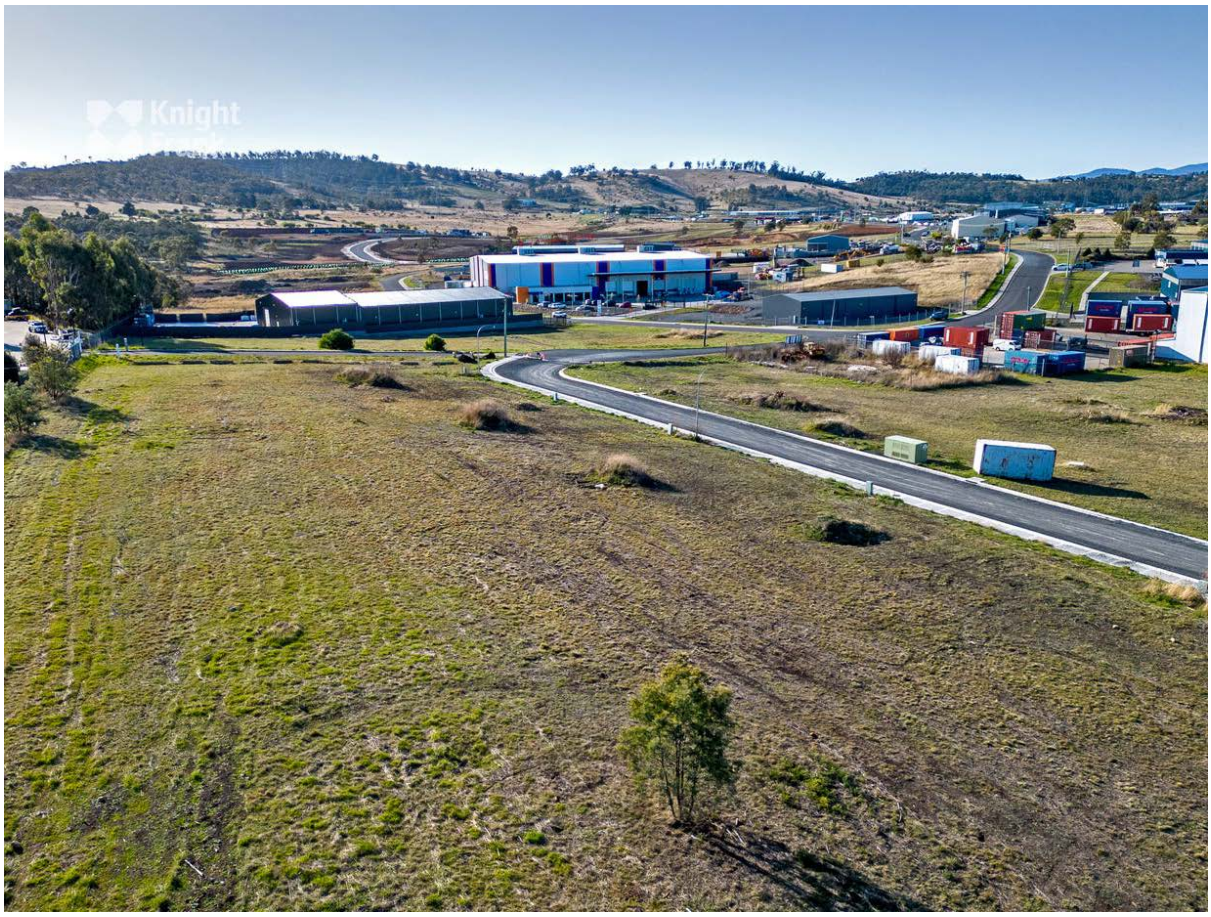
Aerial Site Images

View looking south across site

View looking north across site

View looking east across site

View looking west across site



View looking north across site towards Greenbanks Road

APPENDIX C

Borehole Logs and Descriptive Terms

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH1A
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D	1.00		CL	becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
								Auger refusal - borehole terminated at 1.00m depth				Dry on completion
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support
C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH1B
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D			CL	becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
					1.00			Auger refusal - borehole terminated at 0.90m depth				Dry on completion
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support
C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH2A
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface

Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D	1.00							
				D			CL	becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
								Auger refusal - borehole terminated at 1.20m depth				Dry on completion
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support

C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH2B
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface

Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D						H		cobble/boulder?
								Auger refusal - borehole terminated at 0.70m depth				Dry on completion
					1.00							
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support

C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH3A
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
										H		cobble/boulder?
								Auger refusal - borehole terminated at 0.60m depth				Dry on completion
					1.00							
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support
C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH3B
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D	1.00		CL	becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
								Auger refusal - borehole terminated at 1.00m depth				Dry on completion
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support
C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH4A
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D	1.00			becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
					1.50			Auger refusal - borehole terminated at 1.30m depth				Dry on completion
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support

C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH4B
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D			CL	becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
					1.00			Auger refusal - borehole terminated at 0.90m depth				Dry on completion
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support

C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH5A
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D	1.00		CL	becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
								Auger refusal - borehole terminated at 1.00m depth				Dry on completion
					1.50							
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support

C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

STATEWIDE geotechnics

Engineering Log - Borehole

Borehole no:	BH5B
Sheet	1 of 1

Client:	Dame Technologies Ltd	Hole commenced:	1/03/2024
Project Name:	Site Investigation - 73 Greenbanks Rd, Bridgewater	Hole completed:	1/03/2024
Project No:	SI115	Hole logged by:	DGB
Hole Location:	Refer Site Plan	Log checked by:	DGB

Drill Model and Mounting: Proline Slope: deg. R.L. Surface
Hole Diameter: 100 mm Bearing: deg. Datum Operator: DGB

Drilling Information						Rock Substance						Observations
Method	Penetration 1 2 3	Support	Water	Sample Tests	Depth meters	Graphic Log	Classification symbol	Material / Soil type: plasticity or particle characteristics, colour, secondary and minor component	Moisture condition	Consistency, density index	Pocket Penetrometer 100 200 300 400 500	Structure and additional observations
AS							ML	Clayey SILT, low plasticity, minor organics, some	D	L		Topsoil
				D				gravel to cobble size dolerite clasts, dark brown				
							CH	Sandy Silty CLAY, medium plasticity, some gravel	M	VSt/H		Residual dolerite clay/XW dolerite
								to cobble size dolerite clasts, mostly subangular,				
				D	0.50			to angular, dark red-brown to orange-brown				Vane refusal (coarse clasts)
				D	1.00			becoming sandy, low plasticity, yellow-brown	D/M	H		HW/MW dolerite
					1.50			Auger refusal - borehole terminated at 1.40m depth				Dry on completion
					2.00							
					2.50							
					3.00							
					3.50							
					4.00							

Method

Support

C - Casing
M - Mud

Penetration
No Resistance
Ranginf to Refusal

Graphic Log
Inflow
Outflow
Water Level

Samples and Tests

U60	Undisturbed Sample
U50	50mm Diameter
D	Disturbed Sample
N	Standard Penetration
N*	SPT + Sample
Nc	Cone Penetrometer

Classification Symbols and Soil Description - Based on Unified Soil Classification Systsem

Moisture Condition

D	Dry
M	Moist
W	Wet

Plastic Limit

<	PL
=	PL
>	PL

Consistency/ relative rock density

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
Fb - Friable
VL - Very Loose
L - Loose
MD - Moderately Dense
VD - Very Dense

DESCRIPTIVE TERMS - BOREHOLE/EXCAVATION LOG

Method

S auger screwing	W washbore	B blade bucket
D auger drilling	N natural exposure	C cable tool
R roller/tricone	E existing excavation	H hammer drill

Water

*	not observed
▼	observed water level
▶	observed water inflow
◀	observed water outflow
R	refer report for details

Notes, samples, tests, etc

U45	undisturbed sample, 45mm diameter
D	disturbed sample
N*	Standard Penetration Test N indicates SPT value * indicates sample retrieved

Structure, additional observations

PP	pocket penetrometer test, figure indicates soil strength (kPa)
V	vane shear test, figure indicates soil strength (kPa)
DCP	dynamic cone penetrometer test, figure indicates blows/depth increment.

Soil profile

known boundary	probable boundary	possible boundary
	- - - - - - - - - -	_ _?_ _?_ _?_ _?_ _

Moisture condition (based on appearance and feel)

dry (D)	Looks and feels dry, cohesive soils usually hard powdery or friable, granular soils run freely through the fingers.
moist (M)	Soils feel cool, darker in colour. Cohesive soils usually weakened by moisture, granular soils tend to cohere, no free water on hands.
wet (W)	Soils feel cool, darker in colour. Cohesive soils usually weakened, granular soils tend to cohere, free water collects on hands when remoulding.

Consistency (based on undrained shear strength (Cu), estimated, or measured by vane shear test)

very soft	soft	firm	stiff	very stiff	hard
VS	S	F	St	VSt	H
C_u(kPa) 12.5	25	50	100	200	

Density Index (generally estimated or based on penetrometer results)

very loose	loose	medium dense	dense	very dense
VL	L	MD	D	VD
Density Index I_d(%) 15	35	65	85	

APPENDIX D

Form 55 Certificate of Qualified Person

CERTIFICATE OF QUALIFIED PERSON – ASSESSABLE ITEM

Section 321

Form **55**

To: Dame Technologies Ltd *Owner /Agent*

73 Greenbanks Road *Address*

BRIDGEWATER TAS 7030 *Suburb/postcode*

Qualified person details:

Qualified person: Drew Bedelph T/A Statewide Geotechnics

Address: 55 Leonard Avenue

MOONAH TAS 7009

Phone No: 0499498337

Fax No: -

Licence No: n/a

Email address: statewidegeo@gmail.com

Qualifications and Insurance details: BSc (Hons) with major in Geology, Professional Indemnity Insurance (AIG Australia Ltd, policy number 1023401768, $1,000,000 cover)

(description from Column 3 of the Director's Determination - Certificates by Qualified Persons for AssesBScsable Items

Speciality area of expertise: Engineering Geology

(description from Column 4 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)

Details of work:

Address: 73 Greenbanks Road

BRIDGEWATER TAS 7030

Lot No: 1

Certificate of title No: 153305

The assessable item related to this certificate: Foundation classification in accordance with AS2870-2011

(description of the assessable item being certified)
Assessable item includes –
- *a material;*
- *a design*
- *a form of construction*
- *a document*
- *testing of a component, building system or plumbing system*
- *an inspection, or assessment, performed*

Certificate details:

Certificate type: Foundation classification

(description from Column 1 of Schedule 1 of the Director's Determination - Certificates by Qualified Persons for Assessable Items n)

This certificate is in relation to the above assessable item, at any stage, as part of - *(tick one)*

building work, plumbing work or plumbing installation or demolition work: ✔

or

a building, temporary structure or plumbing installation: ☐

In issuing this certificate the following matters are relevant –

Documents:	Site investigation report dated 14th March 2024 by Drew Bedelph, Statewide Geotechnics
Relevant calculations:	Not applicable
References:	As per the site investigation report dated 14th March 2024 Appendix B of AS2870-2011

Substance of Certificate: (what it is that is being certified)

An investigation was conducted for the purposes of assessing general geological conditions at the site and consequently assigning a Site Classification in accordance with AS2870-2011: 'Residential Slabs and Footings'.

Scope and/or Limitations

The classification is applicable only for ground conditions encountered at the time of the investigation.

I certify the matters described in this certificate.

	Signed:	*Certificate No:*	*Date:*
Qualified person:			14/03/2024

Miner cooling fluid – Safety Data Sheet

Appendix E

SAFETY DATA SHEET

Shell Immersion Cooling Fluid S3 X

Version 1.1 Revision Date 30.08.2023 Print Date 31.08.2023

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Shell Immersion Cooling Fluid S3 X

Product code : 001J5126

Manufacturer or supplier's details

Supplier : Viva Energy Australia Pty Ltd
(Formerly: The Shell Company of Australia)
(ABN 46 004 610 459)
720 Bourke Street
Docklands
Victoria 3008
Australia

Telephone : +61 (0)3 8823 4444

Telefax : +61 (0)3 8823 4800

Emergency telephone number : 1800 651 818 (Australia). ; POISONS INFORMATION CENTRE: 13 11 26 (Australia).

Recommended use of the chemical and restrictions on use

Recommended use : Use only as coolant.

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Aspiration hazard : Category 1

Acute toxicity (Inhalation) : Category 4

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : PHYSICAL HAZARDS:
Not classified as a physical hazard under GHS criteria.
HEALTH HAZARDS:
H304 May be fatal if swallowed and enters airways.
H332 Harmful if inhaled.
ENVIRONMENTAL HAZARDS:
Not classified as an environmental hazard under GHS criteria.

Precautionary statements :

Prevention:

P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271 Use only outdoors or in a well-ventilated area.

Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P331 Do NOT induce vomiting.

Storage:
P405 Store locked up.

Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Hazardous components which must be listed on the label:
Contains Distillates (Fischer - Tropsch), heavy, C18-50 - branched, cyclic and linear.

Other hazards which do not result in classification

Used oil may contain harmful impurities.Not classified as flammable but will burn.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Chemical nature : Synthetic base oil and additives.

Hazardous components

Chemical name	CAS-No.	Classification	Concentration (% w/w)
Hydrocarbon wax isomerate	848301-69-9	Asp. Tox.1; H304 Acute Tox.4; H332	90 - 99.9
Butylated hydroxytoluene	128-37-0	Aquatic Chronic1; H410 Aquatic Acute1; H400	0.1 - 0.249

For explanation of abbreviations see section 16.

SECTION 4. FIRST-AID MEASURES

If inhaled : No treatment necessary under normal conditions of use.
If symptoms persist, obtain medical advice.

In case of skin contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available.
If persistent irritation occurs, obtain medical attention.

In case of eye contact	:	Flush eye with copious quantities of water. Remove contact lenses, if present and easy to do. Continue rinsing. If persistent irritation occurs, obtain medical attention.
If swallowed	:	Call emergency number for your location / facility. If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Most important symptoms and effects, both acute and delayed	:	If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Ingestion may result in nausea, vomiting and/or diarrhoea.
Protection of first-aiders	:	When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.
Notes to physician	:	Potential for chemical pneumonitis. Call a doctor or poison control center for guidance.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use water in a jet.
Specific hazards during firefighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Special protective equipment for firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Hazchem Code	:	NONE

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Avoid contact with skin and eyes.
Environmental precautions	:	Local authorities should be advised if significant spillages cannot be contained.
Methods and materials for containment and cleaning up	:	Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
Additional advice	:	For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet. For guidance on disposal of spilled material see Section 13 of this Safety Data Sheet.

SECTION 7. HANDLING AND STORAGE

General Precautions	:	Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Advice on safe handling	:	Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Avoidance of contact	:	Strong oxidising agents.
Product Transfer	:	Proper grounding and bonding procedures should be used during all bulk transfer operations to avoid static accumulation.

Storage

Other data	:	Keep container tightly closed and in a cool, well-ventilated place. Use properly labeled and closable containers. Store at ambient temperature.
Packaging material	:	Suitable material: For containers or container linings, use mild steel or high density polyethylene. Unsuitable material: PVC.
Container Advice	:	Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Oil mist, mineral	Not Assigned	TWA (Mist)	5 mg/m3	AU OEL
Oil mist, mineral	Not Assigned	TWA (Mist)	5 mg/m3	Australia. Workplace Exposure Standards for Airborne Contaminants.
Oil mist, mineral	Not Assigned	TWA (Mist)	5 mg/m3	OSHA Z-1
Oil mist, mineral	Not Assigned	TWA (Inhalable particulate matter)	5 mg/m3	ACGIH

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/

Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/

Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp

L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

Engineering measures : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:
Adequate ventilation to control airborne concentrations.

Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

General Information:
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or subsequent recycle.
Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.

Do not ingest. If swallowed, then seek immediate medical assistance

Personal protective equipment

Protective measures

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory protection : No respiratory protection is ordinarily required under normal conditions of use.

In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material.
If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation.
Check with respiratory protective equipment suppliers.
Where air-filtering respirators are suitable, select an appropriate combination of mask and filter.
Select a filter suitable for the combination of organic gases and vapours and particles [Type A/Type P boiling point >65°C (149°F)].

Hand protection

Remarks : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model.

Eye protection : If material is handled such that it could be splashed into eyes, protective eyewear is recommended.

Skin and body protection : Skin protection is not ordinarily required beyond standard work clothes.
It is good practice to wear chemical resistant gloves.

Thermal hazards : Not applicable

Environmental exposure controls

General advice : Local guidelines on emission limits for volatile substances

must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.
Information on accidental release measures are to be found in section 6.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	white
Odour	:	Slight hydrocarbon
Odour Threshold	:	Data not available
pH	:	Not applicable substance/mixture is non-polar/aprotic
pour point	:	<= -42 °C / <= -44 °F Method: ASTM D97
Melting / freezing point		Data not available
Initial boiling point and boiling range	:	Data not available
Flash point	:	198 °C / 388 °F Method: ASTM D92 (COC)
Evaporation rate	:	Data not available
Flammability (solid, gas)	:	Not applicable
Flammability (liquids)	:	Not classified as flammable but will burn.
Upper explosion limit	:	Typical 10 %(V)
Lower explosion limit	:	Typical 1 %(V)
Vapour pressure	:	< 0.5 Pa (20 °C / 68 °F) estimated value(s)
Relative vapour density	:	> 5
Relative density	:	0.808 (15.0 °C / 59.0 °F)
Density	:	808 kg/m3 (15.0 °C / 59.0 °F) Method: ASTM D4052
Solubility(ies)		

Water solubility	:	negligible
Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	log Pow: > 6 (based on information on similar products)
Auto-ignition temperature	:	> 320 °C / 608 °F
Decomposition temperature	:	Data not available
Viscosity		
Viscosity, dynamic	:	Data not available
Viscosity, kinematic	:	9.9 mm2/s (40.0 °C / 104.0 °F) Method: ASTM D445 52.3 mm2/s (0 °C / 32 °F) Method: ASTM D7042
Explosive properties	:	Classification Code: Not classified.
Oxidizing properties	:	Data not available
Conductivity	:	This material is not expected to be a static accumulator.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph.
Chemical stability	:	Stable.
Possibility of hazardous reactions	:	Reacts with strong oxidising agents.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	No decomposition if stored and applied as directed.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment	:	Information given is based on data on the components and the toxicology of similar products.Unless indicated otherwise, the data presented is representative of the product as a

whole, rather than for individual component(s).

Exposure routes : Skin and eye contact are the primary routes of exposure although exposure may occur following accidental ingestion.

Acute toxicity

Product:

Acute oral toxicity : LD50 rat: > 5,000 mg/kg
Remarks: Based on available data, the classification criteria are not met.

Acute inhalation toxicity : LC 50 Rat: > 1 - < 5 mg/l
Exposure time: 4 h
Remarks: Harmful if inhaled.

Acute dermal toxicity : LD50 Rabbit: > 5,000 mg/kg
Remarks: Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Product:

Remarks: Not irritating to skin., Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation

Product:

Remarks: Slightly irritating to the eye., Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation

Product:

Remarks: Not a skin sensitiser.
Based on available data, the classification criteria are not met.

Chronic toxicity

Germ cell mutagenicity

Product:

: Remarks: Non mutagenic, Based on available data, the classification criteria are not met.

Carcinogenicity

Product:

Remarks: Not a carcinogen., Based on available data, the classification criteria are not met.

Material	GHS/CLP Carcinogenicity Classification
Hydrocarbon wax isomerate	No carcinogenicity classification.
Butylated hydroxytoluene	No carcinogenicity classification.

Material	Other Carcinogenicity Classification
Butylated hydroxytoluene	IARC: Group 3: Not classifiable as to its carcinogenicity to humans

Reproductive toxicity

Product:

:

Remarks: Not a developmental toxicant., Does not impair fertility., Based on available data, the classification criteria are not met.

STOT - single exposure

Product:

Remarks: Based on available data, the classification criteria are not met.

STOT - repeated exposure

Product:

Remarks: Based on available data, the classification criteria are not met.

Aspiration toxicity

Product:

Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Further information

Product:

Remarks: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal., ALL used oil should be handled with caution and skin contact avoided as far as possible.

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment : Information given is based on a knowledge of the components and the ecotoxicology of similar products.

Ecotoxicity

Product:

Toxicity to fish (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to crustacean (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to algae/aquatic plants (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to fish (Chronic toxicity) : Remarks: NOEC/NOEL > 100 mg/l

Toxicity to crustacean (Chronic toxicity) : Remarks: NOEC/NOEL > 100 mg/l

Toxicity to microorganisms (Acute toxicity) : Remarks: Practically non toxic:
LL/EL/IL50 > 100 mg/l
Based on available data, the classification criteria are not met.

Components:
Butylated hydroxytoluene :

Toxicity to fish (Acute toxicity) : LL50 (Oryzias latipes (Orange-red killifish)): 1.1 mg/l
Exposure time: 96 h
Method: Regulation (EC) No. 440/2008, Annex, C.1

Toxicity to crustacean (Acute toxicity) : EC50 (Daphnia magna (Water flea)): 0.48 mg/l
Exposure time: 48 h
Method: Test(s) equivalent or similar to OECD Guideline 202

M-Factor (Short-term (acute) aquatic hazard) : 1

Toxicity to fish (Chronic toxicity) : NOEC: 0.53 mg/l
Exposure time: 30 d
Species: Oryzias latipes (Orange-red killifish)
Method: Test(s) equivalent or similar to OECD Guideline 210

Toxicity to crustacean(Chronic toxicity) : NOEC: 0.069 mg/l
Exposure time: 21 d
Species: Daphnia magna (Water flea)

Method: Test(s) equivalent or similar to OECD Guideline 211

M-Factor (Long-term (chronic) aquatic hazard) : 1

Persistence and degradability

Product:

Biodegradability : Remarks: Inherently biodegradable.

Components:
Butylated hydroxytoluene :

Biodegradability : Exposure time: 62 d
Method: OECD Test Guideline 309
Remarks: Degradation half life
5.65 days

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: Does not bioaccumulate significantly.

Partition coefficient: n-octanol/water : log Pow: > 6Remarks: (based on information on similar products)

Mobility in soil

Product:

Mobility : Remarks: Liquid under most environmental conditions., If it enters soil, it will adsorb to soil particles and will not be mobile.
Remarks: Floats on water.

Other adverse effects

no data available

Product:

Additional ecological information : Does not have ozone depletion potential, photochemical ozone creation potential or global warming potential., Product is a mixture of non-volatile components, which will not be released to air in any significant quantities under normal conditions of use.
Films formed on water may affect oxygen transfer and damage organisms., Causes physical fouling of aquatic organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the

toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses.

Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment.
Waste, spills or used product is dangerous waste.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination.

MARPOL - see International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which provides technical aspects at controlling pollutions from ships.

Contaminated packaging : Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand. Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Local legislation
Remarks : Disposal should be in accordance with applicable regional, national, and local laws and regulations.

SECTION 14. TRANSPORT INFORMATION

National Regulations

ADG
Not regulated as a dangerous good

International Regulations

IATA-DGR
Not regulated as a dangerous good

IMDG-Code
Not regulated as a dangerous good

Maritime transport in bulk according to IMO instruments

MARPOL Annex 1 rules apply for bulk shipments by sea.

Special precautions for user

Remarks	:	Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

SECTION 15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

Standard for the Uniform Scheduling of Medicines and Poisons	:	No poison schedule number allocated

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Product classified as per Work Health Safety Regulations – Implementation of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) 2012 and SDS prepared as per national model code of practice for preparation of safety data sheet for Hazardous chemicals 2020 based on Globally Harmonized Classification version 7.

National Model Code of Practice for the Labelling of Workplace Hazardous Chemicals (2011).

Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG code). Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Other international regulations

The components of this product are reported in the following inventories:

TSCA	:	All components listed.
AIIC	:	All components listed.

SECTION 16. OTHER INFORMATION

Full text of H-Statements

H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of other abbreviations

Acute Tox.	Acute toxicity
Aquatic Acute	Short-term (acute) aquatic hazard
Aquatic Chronic	Long-term (chronic) aquatic hazard
Asp. Tox.	Aspiration hazard

Abbreviations and Acronyms

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for

Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

Date of preparation or review : 30.08.2023

Further information

Training advice	:	Provide adequate information, instruction and training for operators.
Other information	:	A vertical bar (|) in the left margin indicates an amendment from the previous version.
Sources of key data used to compile the Safety Data Sheet	:	The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Stormwater Management Plan

Appendix F