

**Simplicity Living Ltd**

**Te Putahi Ladies Mile, Queenstown  
SH6 and Local Road Upgrades**

**Infrastructure Report**

26 June 2026







## Document control

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# 1. Introduction

## 1.1 Purpose

This Infrastructure Report has been prepared to support the proposed Te Putahi – Ladies Mile residential development located in Queenstown. The purpose of this report is to present the preliminary civil, stormwater, waste water, potable water and utilities design framework required to inform and support the project's fast-track application. The report outlines the key infrastructure components, including road geometry, intersection upgrades, stormwater management, wastewater, water and utilities infrastructure and integration with existing services. This report demonstrates alignment with the requirements of Queenstown Lakes District Council (QLDC) and NZ Transport Agency Waka Kotahi (NZTA).

The preliminary design has been developed using available topographical survey data, LiDAR, and existing services information to establish a robust understanding of existing site conditions and constraints. The design approach focuses on delivering safe, efficient, and coordinated infrastructure solutions that accommodate projected traffic demands, provide for all transport modes, and integrate with existing infrastructure networks.

This report outlines the key standards, guidelines, and design outcomes, and summarises the assumptions, constraints, and any risks or uncertainties affecting detailed design and approvals. It provides a clear basis for stakeholder engagement and progression to detailed design, engineering approvals, tendering, and construction.

## 1.2 Experience and qualifications

### **Gareth Bain**

#### **Senior Civil Engineer / Land Development Manager**

NZDE (Civil), NZBE (Civil), MEngNZ

Gareth is a Senior Civil Engineer and Land Development Manager at Bloxam Burnett & Olliver (BBO) with 14 years of experience in the planning, design, and delivery of civil infrastructure and land development projects throughout New Zealand. His experience includes transport, three waters, earthworks, stormwater management, subdivision design, project management, and client liaison across a wide range of residential, commercial, and industrial developments.

### **Cameron Inder**

#### **Senior Transportation Engineer / Transportation Manager**

NZBE (Civil), CPEng

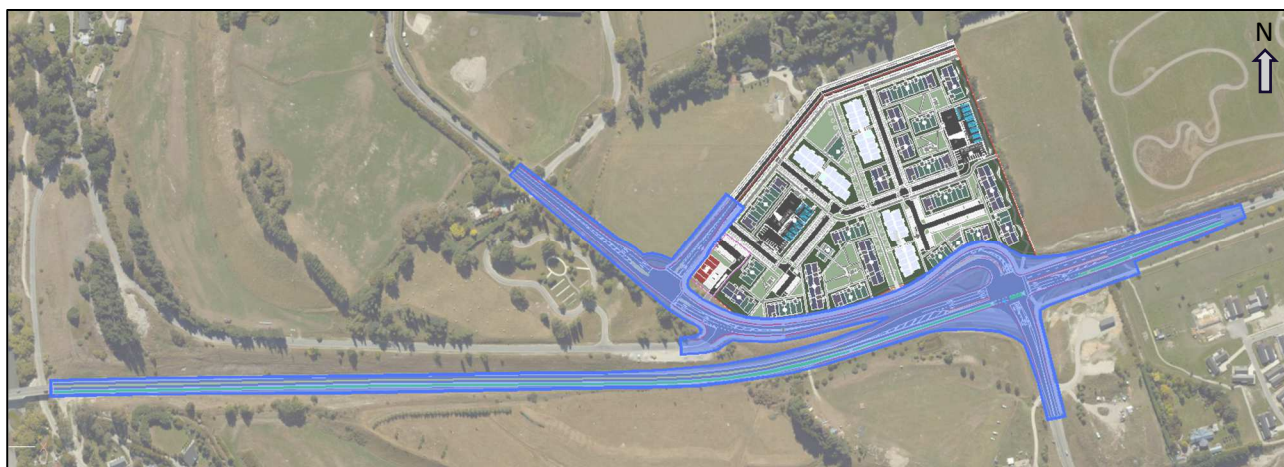
Cameron is a Senior Transportation Engineer and Transportation Manager at Bloxam Burnett & Olliver (BBO) with 27 years of consulting engineering experience. He has extensive expertise in the planning, design, and delivery of transportation and civil infrastructure projects, including roading, intersections, active transport facilities, traffic engineering, transportation assessments, and infrastructure upgrades for residential, commercial, and industrial developments.

We confirm that we have read the Code of Conduct for Expert Witnesses contained in the Environment Court of New Zealand Practice Note and have complied with it in preparing this report. Except where we expressly state that we have relied on the advice or information provided by others, the matters addressed in this report are within our areas of expertise. We have not omitted to consider any material facts known to us that might alter or detract from the opinions expressed in this report.



### 1.3 Site Location and Context

The site is located on the eastern side of the Shotover River and straddles the northern side of the Lower Shotover Road and SH6 roundabout exit, east of the Spence Road and Lower Shotover Road intersection, as illustrated in Figure 1.2.



**Figure No. 1.2 - Site location plan**

SH6 forms the primary eastern gateway to Queenstown and serves as a critical arterial route accommodating commuter, tourist, and freight movements between the Wakatipu Basin and the wider regional network. The corridor also provides direct access to emerging urban growth areas, with the subject development relying on SH6 and its intersecting local roads for connectivity and accessibility. As growth intensifies along Ladies Mile, the efficiency, safety, and resilience of the transport network become increasingly important to support both through-traffic and local movements associated with new development.

Upgrading the SH6 / Shotover Road / Stalker Road roundabout to a signalised intersection will be essential to manage increasing traffic demands and improve network performance. Signalisation will provide greater control over traffic flows, enable safer and more efficient turning movements, and facilitate the integration of dedicated bus lanes to support public transport prioritisation. Together, these improvements will enhance capacity, reduce delays, and improve safety outcomes, while supporting mode shift and ensuring the transport network can accommodate the cumulative effects of ongoing and future development in the Ladies Mile corridor.

### 1.4 Design Co-ordinates, Vertical Datum, Survey and Aerial Imaging

Design levels are in terms of NZVD 2016. Geographic coordinates are in terms of New Zealand Geodetic Datum 2000 (NZGD 2000) projected to Mount Nicholas 2000. 1m LiDAR Digital Elevation Model was captured between the 13<sup>th</sup> and 14<sup>th</sup> March 2021 and has been used for the preliminary design. While this provides a good baseline for the 3D geometric design for the fast track resource consent application, accurate topographic of the whole site is recommended to support detailed design to support engineering approval, tender and construction.

### 1.5 Design Statement

The proposed design for the local road upgrades and improvements to SH6 has been developed in accordance with the Queenstown Lakes District Plan, and New Zealand Transport Agency Waka Kotahi (NZTA) standards and requirements for state highway infrastructure. The design recognises the functional hierarchy and strategic importance of SH6 as a key arterial route, ensuring that safety, capacity, and operational efficiency are maintained and enhanced for both the state highway and the adjoining local road network.



Where interfaces occur between the local road network and SH6, the design adopts the appropriate governing standards, with NZTA requirements prevailing within or affecting the state highway corridor and QLDC requirements applying to local roads, unless otherwise agreed with the relevant authority. Environmental considerations have been integrated into the design to avoid, remedy, or mitigate adverse effects associated with the works, including stormwater management, sediment control, and protection of adjacent land and infrastructure.

This Design Statement should be read in conjunction with the supporting engineering drawings and documentation referenced herein.

## **1.6 Scope of Works**

The scope of work associated with the SH6 and local road interfaces comprises:

- Upgrading the existing Lower Shotover Road, Stalker Road and SH6 roundabout to a signalised intersection.
- New signalised intersection into the Simplicity Living development off Lower Shotover Road.
- Spence Road and Lower Shotover Road intersection upgrade.
- Inclusion of a bus lane on Stalker Road turning left on SH6, west bound up to the Lower Shotover bridge.
- Inclusion of a bus lane on the SH6 west bound lane east of the proposed signalised intersection.
- Embankment widening and/ or contouring.
- Utility service relocations within the corridor.
- New strategic water and wastewater infrastructure.
- Stormwater control and reticulation.
- Pavement design.
- Footpaths and cycleways.
- Landscaping.

## **2. Earthworks and Geotechnical**

### **2.1 General**

Earthworks associated with the development are expected to be minor in nature and will be undertaken with appropriate geotechnical input. Earthworks activities may include, but are not limited to, road widening, road level adjustments, pavement reinstatement, installation of stormwater, wastewater and potable water infrastructure, relocation of existing utility services, embankment widening, and landscaping works.

A site-specific earthworks specification should be prepared during detailed design to define earthworks construction requirements, including compaction criteria, fill embankments, landscaping, and any geotechnical remediation measures required to ensure long-term stability and performance of the project.

### **2.2 Erosion and Sediment Control**

An Erosion and Sediment Control Plan (ESCP) will be prepared to manage earthworks, pavement construction, three waters infrastructure works, and utility service installation associated with the proposed local road upgrades and SH6 improvements. The ESCP will detail the erosion and sediment control measures to be implemented during construction and will form a key component of the overall construction management framework.

The ESCP has two primary objectives: to provide clear guidance on erosion and sediment control practices for all soil disturbing activities, including an understanding of erosion processes and sediment transport





mechanisms; and to minimise adverse environmental effects through the appropriate selection, design, and implementation of control measures.

The erosion and sediment control measures will be designed in accordance with Otago Regional Council (ORC) guidelines and industry best practice for soil disturbing activities. These guidelines establish the minimum standards for erosion and sediment control; however, higher standards may be adopted where required to respond to site-specific conditions and the sensitivity of the receiving environment.

An Erosion and Sediment Control Plan (ESCP) shall be developed by the appointed contractor and incorporated into the construction methodology and programme. The ESCP shall be implemented for the duration of the works to manage runoff, control sediment discharges, and protect downstream environments and surrounding infrastructure within the SH6 corridor and adjoining local road network.

## **2.3 Geotechnical Investigation**

A Geotechnical Interpretive Report (GIR) has been prepared for the development by ENGEO titled Geotechnical Interpretive Report – 12 Lower Shotover Road, Lake Hayes Estate – Rev 4, dated 16/07/2026.

The following key geotechnical considerations from the ENGEO GIR are summarised in Sections 2.3.1 to 2.3.4 to provide a high-level overview of site conditions and constraints. These summaries are provided for context only and should be read in conjunction with the full ENGEO GIR and/or confirmed by further Geotechnical inputs and recommendations:

- Preliminary subgrade CBR design
- Material suitability
- Soakage recommendations
- Stability of cut and fill slopes
- Earthworks Specification and Compaction Control

### **2.3.1 Preliminary subgrade CBR**

The ENGEO GIR indicates that subgrade conditions, based on Scala penetrometer results of 2–4 blows per 100 mm within the upper 1 m and laboratory testing of remoulded loess (CBR 2–5%), comprise generally low-strength native loess and alluvial soils. For preliminary design, an inferred subgrade CBR of 4% may be adopted.

This value is preliminary and is to be confirmed by site-specific testing including in situ and soaked CBR testing and/or falling weight deflectometer assessment. Allowance should be made for potential subgrade improvement measures, such as undercut and replacement and/or geogrid stabilisation, to achieve the required performance. Final pavement design and subgrade treatment will be subject to review and approval by both NZTA and QLDC in accordance with their respective standards and acceptance criteria.

### **2.3.2 Material suitability**

Site-won alluvial and loess soils may be suitable for reuse as engineered fill, subject to appropriate construction controls. Alluvial soils, typically encountered as poorly graded sands within shallow cuts, are generally more workable but require careful moisture management to prevent rapid drying and to achieve adequate compaction.

Loess soils comprise moderately to highly sensitive sandy silts and poorly graded silty sands and are more challenging to reuse due to their sensitivity to moisture content. Placement as engineered fill will require strict control to maintain near-optimum moisture conditions, as over-wetting can significantly reduce workability and compaction performance. Reuse of loess is likely to be most practicable during extended dry weather, with consideration given to stabilisation (e.g. lime or cement) to improve handling and compaction.



### 2.3.3 Stability of cut and fill slopes

Cut batters within engineered fill or stiff / moderately dense Loess and Alluvium may recline at up to 1V:4H (14°). Provided that fill slopes are constructed upon approved subgrade soils, we consider that fill batters no steeper than 1V:3H (18°) may be constructed on-site without creating instability issues. The suitability of batter slopes and embankment configurations will be assessed on a case-by-case basis during detailed design, taking into account site-specific ground conditions, loading, drainage requirements, and geotechnical recommendations.

### 2.3.4 Soakage recommendations

Investigations identified coarse-grained alluvial soils at depths of approximately 2 to 4 m below ground level across most of the site. Site-specific soakage testing within this unit recorded unfactored infiltration rates ranging from approximately 400 to 890 L/hr/m<sup>2</sup>. For preliminary design, an unfactored soakage rate of 500 L/hr/m<sup>2</sup> is recommended for this alluvial layer, subject to appropriate adjustment by the designer.

Soakage devices should be designed to account for variability in the depth to the alluvium (generally between 2.2 m and 3.7 m bgl, around RL 363 m  $\pm$  1 m) and potential changes in finished ground levels due to earthworks. Consideration shall also be given to preventing or managing migration of overlying fine-grained soils into the permeable alluvium.

## 3. Transportation

### 3.1 General

The transport network has been designed in accordance with the Austroads Guide to Road Design and RTS 18 Guidelines for Heavy Vehicle Tracking simulation and relevant local authority engineering standards. These standards have informed the network geometry, design speed, sight distance, intersection layout, and vehicle tracking requirements.

The design seeks to deliver an integrated and legible transport network that responds to the surrounding land use and topography, supports safe and efficient movement for all transport modes, and provides appropriate access to adjacent development areas. Road corridors have also been coordinated to accommodate stormwater, wastewater, and other utility infrastructure.

The adopted design aims to achieve safe operation, efficient network connectivity, and a cost-effective whole-of-life outcome consistent with the intended level of service. Table 3.1 defines the geometric design parameters for the network.

Table No. 3.1

| Geometric Design Parameters |                                                                                                                                 |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Parameter                   | Value and Standard                                                                                                              |
| Proposed Posted Speed limit | 50 km/h                                                                                                                         |
| Design Speed                | 60 km/h                                                                                                                         |
| Sight Distance              | 2.0 sec reaction time and 0.36 coefficient of longitudinal deceleration as per Austroads Guide to Road Design desirable values. |
| Design Vehicles             | 18 m semi-trailer with minimum 0.5 m clearance (wheel track to kerb and body to furniture) as per RTS 18.                       |
|                             | 11 m City Bus with minimum 0.5 m clearance (wheel track to kerb and body to furniture) as per RTS 18.                           |



|                      |                                |
|----------------------|--------------------------------|
| Horizontal Alignment | Austroads Guide to Road Design |
| Vertical Alignment   | Austroads Guide to Road Design |
| Intersection form    | Austroads Guide to Road Design |

Preliminary general arrangement drawings are provided in Appendix A.

### 3.2 Typical Road Corridor Cross-sections

The roading cross-sections have been designed with allowances for pedestrian, cycling, private and public transportation. Typical road cross sections have been presented for SH6, Lower Shotover Road, Stalker Road, the new development collector Road and Spence Road.

Preliminary typical road cross section drawings are provided in Appendix A.

### 3.3 Horizontal Geometry, Design Vehicles and Road Widening

Swept path analysis was undertaken using AutoTURN to confirm that the proposed SH6 intersection upgrades and local road connections can accommodate the required design vehicles safely and efficiently. Vehicle tracking adopted standard NZTA design vehicles, including an 18 m semi-trailer and 11 m City Bus for SH6 movements and local road intersection movements, with a minimum 0.5 m clearance to kerb lines.

Intersection geometry, kerb returns, and turning paths have been designed to ensure safe vehicle manoeuvring, with localised carriageway widening provided where required to maintain lane discipline. The swept path assessments demonstrate that all critical movements, including entry, circulation, and exit paths, operate within acceptable tolerances.

Preliminary swept path drawings are provided in Appendix A.

### 3.4 Vertical Geometry

The vertical alignment has been designed in accordance with QLDC and NZTA standards, with minimum grades provided to maintain effective drainage and avoid ponding. Crossfalls have been designed in accordance with accepted road design standards to promote positive drainage, with kerb return profiles shaped to direct runoff and prevent flat spots. Intersections have been designed with relatively level sections to optimise sight distance and facilitate safe vehicle deceleration and acceleration. Approach grades to intersections are controlled within acceptable limits to maintain safety and operational performance.

The road network has been integrated with the stormwater system, directing surface runoff to treatment devices prior to discharge via soakage. Surface flows are conveyed along the carriageway to defined exceedance flow paths, with sufficient capacity provided to safely manage events up to the 1% AEP without creating undue risk to road users or adjacent infrastructure.

Preliminary design contours and roading longsection drawings are provided in Appendix A.

### 3.5 Sight Distance Requirements for Vehicles at Intersections

Adequate sight distance at the proposed new intersections was achieved when developing the horizontal and vertical alignments to ensure that drivers approaching are able to:

- Recognise the presence of an intersection in time to slow down or stop in a controlled and comfortable manner (ASD); and



- see vehicles approaching in conflicting traffic streams and give way or stop where required by law so to avoid a crash in the event of a potential conflict.

### 3.5.1 Intersections

The proposed roads are designed to a posted speed limit of 50 km/h, with a 60 km/h design speed adopted for geometric layout and sight distance assessments. Sight distance requirements have been determined in accordance with Austroads, using a driver reaction time of 2.0 seconds (per Austroads Guide to Road Design Part 4A Table 3.1), reflecting typical driver alertness in an urban arterial environment.

Intersection layouts and alignments have been assessed against the required sight distance minimum criteria for a 60 km/h design speed, with geometry configured to provide safe visibility, turning movements, and operational performance across the network.

- Minimum Approach Site Distance (**ASD**) = 73m, Minimum crest curve K value of 24
- Safe Intersection Site Distance (**SISD**) = 123m, Minimum crest curve K value of 16
- Minimum Gap Site Distance (**MGSD**)
  - D = 83m @  $t_a = 5$  seconds (Right turn from minor road across a two-lane two-way road)
  - D = 83m @  $t_a = 5$  seconds (Left turn out of minor road at an intersection)

## 3.6 Pavement Markings and Signage

Concept pavement marking and road signage has been designed in accordance with the NZTA Traffic Control Devices (TCD) Manual and relevant Austroads guidance. The design provides clear, consistent, and legible delineation to support the safe and efficient operation of both the SH6 corridor and the adjoining local road network. Markings and signage have been developed to suit the 50 km/h posted speed environment and 60 km/h design speed, ensuring appropriate driver recognition, guidance, and regulatory compliance. Consideration has been given to visibility, retroreflectivity, and placement to maintain effectiveness under all operating conditions, including night-time and adverse weather, while supporting all road users, including pedestrians and cyclists.

Preliminary pavement marking and signage plans are provided in Appendix A.

## 3.7 Roadside Barrier Design

Road safety barriers have not been proposed as part of the current preliminary design and will be further assessed during detailed design once final earthworks, road geometry, side slopes, and adjacent hazards have been confirmed. A road safety audit and barrier assessment should be undertaken in accordance with applicable NZTA requirements to determine whether barriers are warranted and to identify the most appropriate barrier type, length, and placement. Any proposed barriers shall be developed in consultation with NZTA and QLDC and incorporated into the final design, subject to approval through the detailed engineering approval process.

## 3.8 Road Safety Audit

A Road Safety Audit (RSA), or Safe System Audit, should be undertaken at key stages of the project development process, including detailed design and prior to construction, to identify and address potential safety risks for all road users. The audit should be carried out by an independent qualified auditor in accordance with the NZTA Safe System Audit Guidelines and the requirements of Queenstown Lakes District Council's Land Development and Subdivision Code of Practice. The audit process will assess the proposed road network, intersections, pedestrian and cycling facilities, roadside environment, and traffic control devices to ensure the design aligns with Safe System principles and achieves an appropriate level of safety and operational performance. Any recommendations arising from the audit will be reviewed during the



detailed design process and incorporated where required, subject to approval by NZTA and QLDC as part of the engineering acceptance process.

### 3.9 Pavements

Pavements will be designed in accordance with NZTA and the Austroads Guide to Pavement Design. Final pavement designs will be carried out during the detailed design and engineering approval process through liaison and co-ordination with NZTA and QLDC.

## 4. Stormwater

### 4.1 General

The stormwater assessment has been undertaken in accordance with the proposed Te Pūtahi Ladies Mile provisions, Queenstown Lakes District Council (QLDC) Land Development and Subdivision Code of Practice (2025), and the Otago Regional Council Regional Plan: Water for Otago. The Te Pūtahi Ladies Mile provisions establish the primary stormwater performance requirements for the wider catchment. The design has been informed by the current road corridor layout, geotechnical investigations, NIWA HIRDS rainfall data, and coordination with the wider project team. The QLDC Code has been applied as the technical framework for the design and detailing of stormwater infrastructure, while the ORC Regional Plan has guided consideration of environmental effects associated with stormwater discharge to land.

### 4.2 Current Situation

The existing stormwater environment comprises a rural–peri-urban drainage network incorporating roadside swales, catchpits and culvert crossings within a corridor underlain by alluvial soils. The area forms part of the wider Te Pūtahi Ladies Mile catchment, where runoff is primarily managed through infiltration to ground. Existing drainage conditions are influenced by the linear road corridor, adjacent development areas and upstream catchments, requiring clear catchment boundaries and consideration of downstream flow paths, low points and existing drainage connections.

### 4.3 Summary of Stormwater Design

The Simplicity Living Queenstown - Stormwater Management Report by BBO, dated 23/06/2026 outlines the stormwater management strategy for the Te Pūtahi Ladies Mile transport infrastructure upgrades around Lower Shotover Road, Spence Road, SH6 and Stalker Road. The assessment is focused on runoff generated from the proposed road corridor, shared paths and berms (approximately 1.71 ha catchment area). The design philosophy is to collect, treat and soak stormwater back into the ground for the 1% AEP (100-year) climate-change-adjusted storm event, rather than discharge it to a downstream outlet. Stormwater is conveyed through catchpits and pipes, treated via gross pollutant traps (GPTs), and then directed into distributed soakage systems located beneath the shared path and verge areas.

Hydraulic modelling using EPA SWMM demonstrated that the proposed network can manage the adopted 100-year, 24-hour RCP8.5 rainfall event (139 mm rainfall depth) without flooding, surcharge or overflow. Approximately 1,675 m<sup>3</sup> of runoff is generated across the road catchment, with about 1,275 m<sup>3</sup> directed to the principal soakage system. Two soakage options were assessed: a drainage-metal trench and a modular Aquafort system. Both options successfully infiltrated the full design-event runoff volume with no overflow and fully drained after the storm. The report concludes that the proposed treatment-and-soakage approach is technically feasible, environmentally appropriate, consistent with Te Pūtahi, QLDC and NZTA requirements, and capable of managing road corridor runoff without significant adverse stormwater effects, subject to normal detailed design refinements.



Subject to detailed design refinement, the proposed stormwater system is considered technically robust and appropriate for consenting, with no significant adverse stormwater effects anticipated.

## **5. Wastewater**

### **5.1 General**

The wastewater assessment and preliminary design have been undertaken by Mackenzie & Co Ltd. The key design standards adopted for the assessment are the Queenstown Lakes District Council (QLDC) Land Development and Subdivision Code of Practice (2025), the proposed Te Pūhahi Ladies Mile planning provisions, and QLDC's Three Waters engineering requirements. A brief overview of the existing wastewater network and the proposed servicing arrangement is provided below.

### **5.2 Current Situation**

The Te Pūhahi Ladies Mile area is located within the wider Whakatipu Basin wastewater catchment, which is serviced by the Shotover Wastewater Treatment Plant. Existing wastewater infrastructure within the SH6 corridor comprises strategic trunk reticulation and conveyance assets that service the surrounding urban areas, including Lake Hayes Estate and Shotover Country. The corridor forms an important part of the district's wastewater network and has been identified by QLDC as a key growth area requiring future network expansion and capacity upgrades to accommodate planned development within the Ladies Mile corridor.

### **5.3 Proposed Wastewater**

The Simplicity Living development has proposed a strategic wastewater rising main within the SH6 corridor to convey wastewater from the development area to the Shotover Wastewater Treatment Plant. The rising main is intended to form part of the broader wastewater servicing strategy for the Ladies Mile growth area and support the future integration of development with the wider Whakatipu Basin wastewater network. The final alignment, pipe sizing, capacity requirements, staging, and connection arrangements will be confirmed through detailed design, with any required approvals to be progressed as part of the subsequent engineering approval processes with NZTA and QLDC.

## **6. Water**

### **6.1 General**

The water assessment and preliminary design have been undertaken by Mackenzie & Co Ltd. The key design standards adopted for the assessment are the Queenstown Lakes District Council (QLDC) Land Development and Subdivision Code of Practice (2025), the proposed Te Pūhahi Ladies Mile planning provisions, and QLDC's Three Waters engineering requirements. A brief overview of the existing wastewater network and the proposed servicing arrangement is provided below.

### **6.2 Current Situation**

The SH6, Lower Shotover Road and Stalker Road corridor is serviced by the existing QLDC reticulated water supply network, which forms part of the wider Whakatipu Basin water infrastructure servicing Lake Hayes Estate, Shotover Country and surrounding urban development. Existing water supply assets within the corridor provide the primary potable water servicing framework for the area and are expected to play an important role in supporting future growth within the Te Pūhahi Ladies Mile corridor.



## 6.3 Proposed Water

The Simplicity Living development has proposed a series of strategic water mains within the Ladies Mile corridor to service the development and provide connectivity to the wider QLDC water supply network. These water mains are intended to form part of the long-term water servicing framework for the area, improving network resilience, supporting future growth, and creating opportunities to service adjacent development as the corridor develops. The final alignment, pipe sizing, network configuration, hydraulic performance and any associated infrastructure upgrades will be confirmed through detailed design, network modelling, and consultation with QLDC and other relevant stakeholders as part of the subsequent engineering approval processes with NZTA and QLDC.

## 7. Other Services

### 7.1 Power Supply

The upgrade of the SH6 / Shotover Road roundabout to a signalised intersection will require a dedicated and reliable power supply to support traffic signals, street lighting interfaces, and associated ITS infrastructure. This will typically involve connection to the local distribution network, with sufficient capacity confirmed and, where necessary, a new or upgraded point of supply established. Power will be distributed via a Traffic Signal Control Cabinet (TSCC), providing low voltage (230/400 V) supply to all signal equipment.

Low voltage reticulation will service signal poles, lanterns, pedestrian facilities, detectors, and communications infrastructure via an underground duct and cable network, designed in accordance with NZTA and utility provider requirements. Appropriate earthing, surge protection, and system resilience measures will be incorporated to ensure safe and reliable operation.

The proposed upgrade is likely to conflict with existing electrical infrastructure within the roundabout corridor, including underground services and potential overhead assets. These may require relocation, protection, or upgrade to accommodate the new intersection layout. Early coordination with the network utility operator is essential to confirm capacity, identify affected assets, and programme any required relocation works to minimise construction risk and programme impacts.

Detailed power reticulation design will be undertaken at the detailed design stage and submitted as part of the subsequent engineering approval processes with NZTA and QLDC.

### 7.2 Telecommunications

The signalisation of the SH6 / Shotover Road intersection will require a robust communications network to support traffic signal operations, remote monitoring, and integration with wider transport management systems. This will typically include fibre or cellular-based communications linking the Traffic Signal Control Cabinet (TSCC) to the central traffic management system, in accordance with NZTA ITS and communications standards.

Communications infrastructure will include ducting, pits, and cabling to service signal controllers, detection systems, CCTV (if required), and any future smart transport or adaptive signal control capabilities. The network will be designed to provide reliable, secure, and low-latency data transmission, with provision for redundancy where appropriate.

The upgrade is likely to impact existing telecommunications infrastructure within the corridor, including fibre, copper, and service ducts. These assets may require relocation, protection, or upgrade to accommodate the revised intersection layout and underground services. Early engagement with telecommunications providers





(e.g. Chorus, Enable, or other network operators) is recommended to confirm asset locations, capacity, and relocation requirements, and to integrate these works into the overall construction programme.

Detailed communication reticulation design will be undertaken at the detailed design stage and submitted as part of the subsequent engineering approval processes with NZTA and QLDC.

### **7.3 Street Lighting**

Electrical Consulting Services Ltd have prepared a preliminary lighting design for the proposed upgrades to Lower Shotover Road, the internal collector road serving the Simplicity Living development and the SH6 intersection. The design adopts the following lighting categories: PR3 for the collector road, V4 for Lower Shotover Road, and V3 for SH6. The lighting scheme has been developed in accordance with AS/NZS 1158.1.1:2022 and AS/NZS 1158.3.1:2020 for Category V and P roads.

A detailed lighting design, including calculations and layout, will be completed at the detailed design stage and submitted as part of the subsequent engineering approval processes with NZTA and QLDC.

## **8. Safety in Design**

Safety in Design principles should be applied throughout the project to identify and, where reasonably practicable, eliminate or minimise health and safety risks associated with construction, operation and maintenance activities. Key construction and maintenance risks are expected to relate to temporary excavation stability, earthworks, heavy lifts, safe site access and stormwater maintenance. These matters should be further assessed during detailed design and incorporated into the construction methodology to ensure appropriate risk mitigation measures are implemented.

## **9. Key Risk Items Identified**

The proposed design is well developed at a preliminary level; however, as expected, there remain areas where further definition will improve certainty. The current design relies on LiDAR and partial survey data, which is suitable for consenting design but introduces some uncertainty in levels, tie-ins, and drainage paths. Completion of detailed survey and confirmation of existing services will refine the geometry and minimise the potential for design inaccuracies.

ENGEO's recommendations regarding subgrade strength, soil variability and infiltration characteristics provide a sound basis for preliminary design assumptions. While the anticipated alluvial conditions are generally favourable, further targeted investigations during detailed design will help optimise pavement design, confirm trench stability and verify soakage performance, resulting in a more robust and cost-effective outcome.

From a transport perspective, the proposed geometry and intersection upgrades align with NZTA and QLDC guidance. Key parameters such as sight distance, vertical alignment, and swept paths are conceptually sound but require detailed verification, along with completion of a road safety audit, to confirm compliance and operational performance.

The stormwater strategy adopts a distributed soakage approach that is well suited to the site, but its performance is dependent on confirmation of ground conditions and long-term maintenance considerations. Further refinement will focus on infiltration parameters, treatment performance, and ensuring effective exceedance flow paths. The exclusion of external catchments from the design may also present a future risk if upstream development alters runoff patterns, while integration with existing SH6 drainage infrastructure will require careful coordination with NZTA.





Waste water, water and utility services design elements are still to be finalised and will require coordination with relevant providers to confirm capacity, relocations, and integration with the proposed networks. These aspects are typical at this stage and are expected to be resolved through ongoing design development and stakeholder engagement during detailed design and engineering approval.

Overall, the identified risks are consistent with a project at this stage and can be effectively managed through targeted investigations and detailed design. The project is considered readily achievable, with no fundamental constraints identified to progress to the next phase.

## 10. Conclusion

The proposed infrastructure design provides a well-considered and integrated solution that responds appropriately to the strategic importance of the SH6 corridor and the surrounding transport network. The approach aligns with relevant NZTA and QLDC standards and demonstrates a clear understanding of the site constraints, operational requirements, and future growth within the Ladies Mile corridor.

While further refinement is required during detailed design, the key transport, stormwater and utility infrastructure components are conceptually sound and based on established engineering principles. The identified risks are typical for a project at this stage and can be effectively managed through targeted investigations, ongoing design development, and stakeholder engagement.

Overall, the project is considered technically feasible and well-positioned to progress, with no fundamental constraints identified. With continued refinement and collaboration, the proposed works can be successfully delivered to provide a safe, efficient, and resilient infrastructure outcome that supports the long-term development of the area.





**Appendix A – Preliminary Civil Engineering Plans**





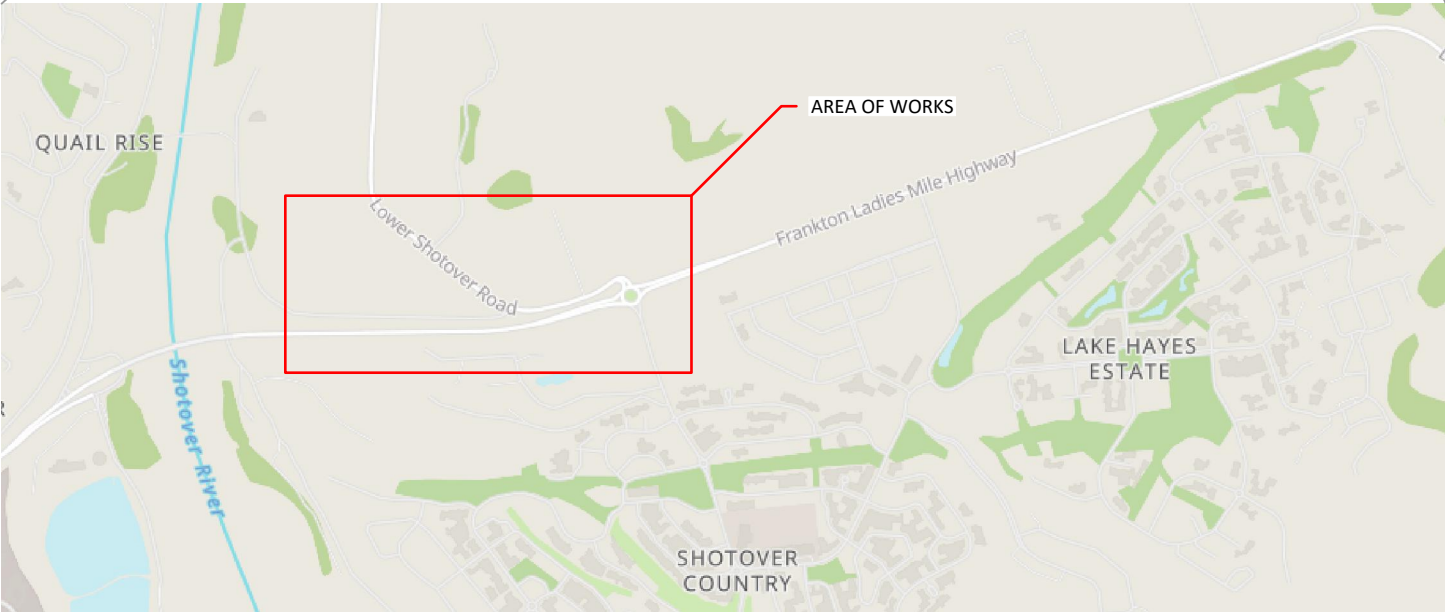
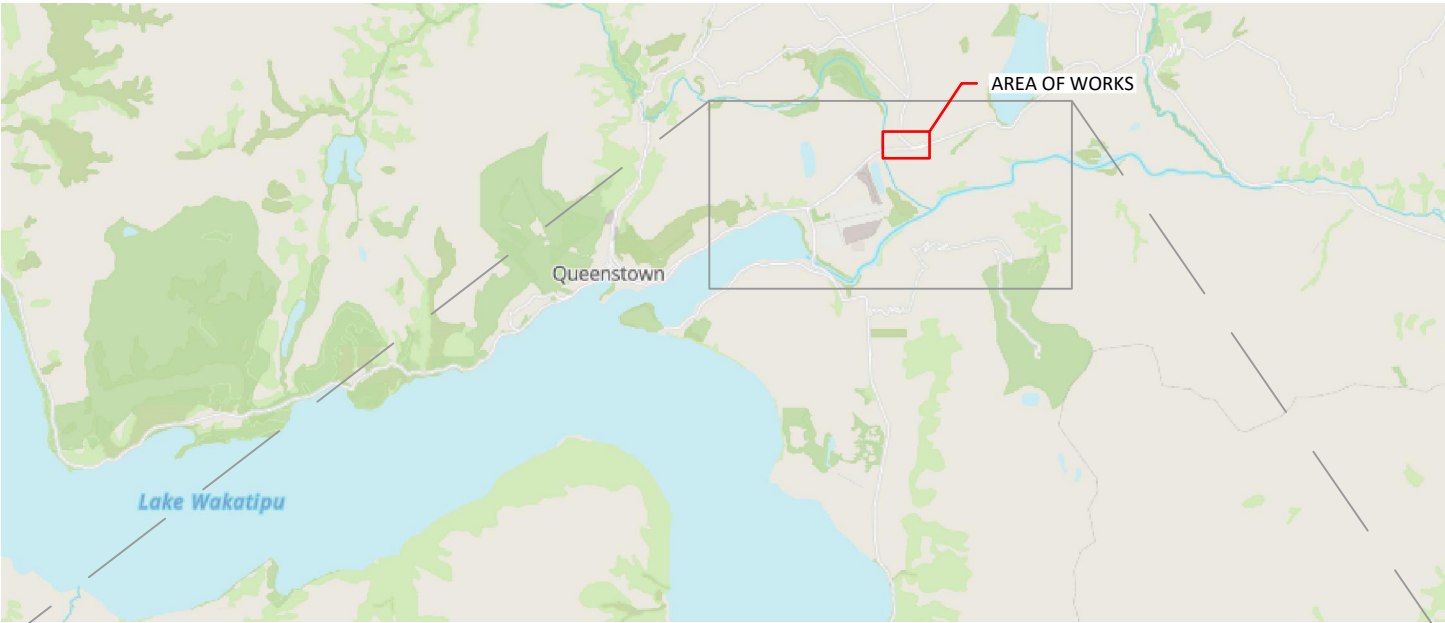
# SIMPLICITY LIVING

## TE PŪTAHI LADIES MILE

**FOR CONSENT**  
149360  
JUNE 2026



| QUEENSTOWN - SIMPLICITY LIVING |                                                                                      |
|--------------------------------|--------------------------------------------------------------------------------------|
| DRAWING NUMBER                 | DRAWING NAME                                                                         |
| 149360-00-1000                 | COVER SHEET                                                                          |
| 149360-00-1001                 | DRAWING INDEX AND LOCALITY PLAN                                                      |
| 149360-00-1120                 | DESIGN CONTOURS OVERVIEW                                                             |
| 149360-00-1121                 | DESIGN CONTOURS PLAN SHEET 1                                                         |
| 149360-00-1122                 | DESIGN CONTOURS PLAN SHEET 2                                                         |
| 149360-00-1123                 | DESIGN CONTOURS PLAN SHEET 3                                                         |
| 149360-00-1124                 | DESIGN CONTOURS PLAN SHEET 4                                                         |
| 149360-00-1210                 | GENERAL ARRANGEMENT OVERVIEW                                                         |
| 149360-00-1211                 | GENERAL ARRANGEMENT & LONGSECTION RS000 SHEET 1                                      |
| 149360-00-1212                 | GENERAL ARRANGEMENT & LONGSECTION RS000 SHEET 2                                      |
| 149360-00-1213                 | GENERAL ARRANGEMENT & LONGSECTION RS000 SHEET 3                                      |
| 149360-00-1214                 | GENERAL ARRANGEMENT & LONGSECTION RS000 SHEET 4                                      |
| 149360-00-1215                 | GENERAL ARRANGEMENT & LONGSECTION RS000 SHEET 5                                      |
| 149360-00-1216                 | GENERAL ARRANGEMENT & LONGSECTION RS100 SHEET 1                                      |
| 149360-00-1217                 | GENERAL ARRANGEMENT & LONGSECTION RS100 SHEET 2                                      |
| 149360-00-1218                 | GENERAL ARRANGEMENT & LONGSECTION RS100 SHEET 3                                      |
| 149360-00-1219                 | GENERAL ARRANGEMENT & LONGSECTION RS200 & RS300                                      |
| 149360-00-1251                 | VEHICLE TRACKING PLAN SHEET 1                                                        |
| 149360-00-1252                 | VEHICLE TRACKING PLAN SHEET 2                                                        |
| 149360-00-1253                 | VEHICLE TRACKING PLAN SHEET 3                                                        |
| 149360-00-1301                 | TYPICAL SECTIONS SHEET 1                                                             |
| 149360-00-1302                 | TYPICAL SECTIONS SHEET 2                                                             |
| 149360-00-1303                 | TYPICAL SECTIONS SHEET 3                                                             |
| 149360-00-1304                 | TYPICAL SECTIONS SHEET 4                                                             |
| 149360-00-1305                 | TYPICAL SECTIONS SHEET 5                                                             |
| 149360-00-1306                 | TYPICAL SECTIONS SHEET 6                                                             |
| 149360-00-2000                 | EXISTING SERVICES OVERVIEW                                                           |
| 149360-00-2001                 | EXISTING SERVICES SHEET 1                                                            |
| 149360-00-2002                 | EXISTING SERVICES SHEET 2                                                            |
| 149360-00-2003                 | EXISTING SERVICES SHEET 3                                                            |
| 149360-00-2004                 | EXISTING SERVICES SHEET 4                                                            |
| 149360-00-2101                 | STORMWATER SHEET 1                                                                   |
| 149360-00-2102                 | STORMWATER SHEET 2                                                                   |
| 149360-00-2103                 | STORMWATER SHEET 3                                                                   |
| 149360-00-2104                 | STORMWATER SHEET 4                                                                   |
| 149360-00-2150                 | STORMWATER TYPICAL STREET CATCHPIT                                                   |
| 149360-00-2151                 | STORMWATER TYPICAL CONCRETE HEADWALL DETAILS                                         |
| 149360-00-2152                 | STORMWATER TYPICAL TRENCH DETAILS FOR CONCRETE AND FLEXIBLE PIPES                    |
| 149360-00-2401                 | WATER SUPPLY PLAN SHEET 1                                                            |
| 149360-00-2402                 | WATER SUPPLY PLAN SHEET 2                                                            |
| 149360-00-2403                 | WATER SUPPLY PLAN SHEET 3                                                            |
| 149360-00-2404                 | WATER SUPPLY PLAN SHEET 4                                                            |
| 149360-00-2701                 | TRAFFIC SIGNAL LAYOUT AND PHASING PLAN LOWER SHOTOVER ROAD & DEVELOPMENT ACCESS ROAD |
| 149360-00-2702                 | TRAFFIC SIGNAL LAYOUT AND PHASING PLAN LOWER SHOTOVER ROAD & SH6 INTERSECTION        |
| 149360-00-2801                 | ROAD MARKINGS SHEET 1                                                                |
| 149360-00-2802                 | ROAD MARKINGS SHEET 2                                                                |
| 149360-00-2803                 | ROAD MARKINGS SHEET 3                                                                |
| 149360-00-2804                 | ROAD MARKINGS SHEET 4                                                                |
| 149360-00-2851                 | TRAFFIC SIGNS SHEET 1                                                                |
| 149360-00-2852                 | TRAFFIC SIGNS SHEET 2                                                                |
| 149360-00-2853                 | TRAFFIC SIGNS SHEET 3                                                                |
| 149360-00-2854                 | TRAFFIC SIGNS SHEET 4                                                                |



| DRAWING ISSUE |          |             |             | DESIGNED |     |    |      |
|---------------|----------|-------------|-------------|----------|-----|----|------|
| REV           | DATE     | FOR         | DESCRIPTION | BY       | CHK | CI | APPR |
| A             | 26/06/26 | FOR CONSENT |             | SC       | GMB | CI |      |

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| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



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|---------|-----------------------|
| PROJECT | SIMPLICITY LIVING     |
|         | TE PŪTAHI LADIES MILE |

|         |                               |
|---------|-------------------------------|
| DRAWING | DRAWING INDEX & LOCALITY PLAN |
|---------|-------------------------------|

|                  |                  |            |             |
|------------------|------------------|------------|-------------|
| STATUS           |                  |            | PRELIMINARY |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) | NTS         |
| VERTICAL DATUM   | NZVD16           | REVISION   | A           |
| DRAWING NUMBER   | 149360-00-1001   |            |             |



Sheet 2

Sheet 3

Sheet 4

KEY: DESIGN CONTOURS

## LEGAL BOUNDARIES

## – MAJOR CONTOURS

- MINOR CONTOURS

## DESIGN STRINGS

1:4000 (A3) 0 40 80 120 160 200m

[illegible]

|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



CLIENT

**% Simplicity**  
Living

PROJECT

PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING

## DRAWING

# DESIGN CONTOURS OVERVIEW

| STATUS |
|--------|
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PRELIMINARY

|            |                  |
|------------|------------------|
| HORIZONTAL | Mt Nicholas 3000 |
|------------|------------------|

|                   |               |
|-------------------|---------------|
| DATUM             | MT NICHOLAS 2 |
| VERTICAL<br>DATUM | NZVD16        |

|                |                |
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| DATUM          | REVISED        |
| DRAWING NUMBER | 149360-00-1120 |

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| SCALE (A3) |
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1:4000

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|  | REVISION |
|  | A        |



100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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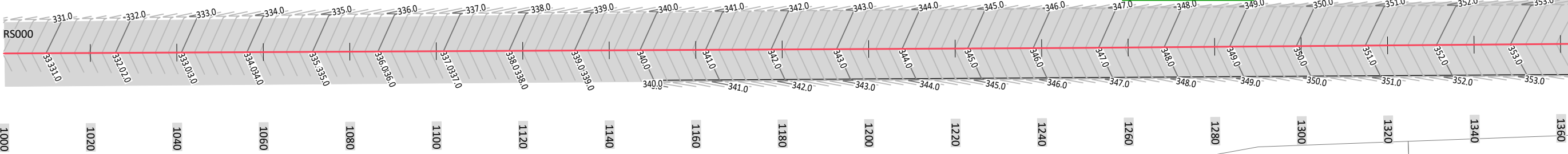
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SHEET 2  
SHEET 1

SPENCE ROAD

STATE HIGHWAY 6



KEY: DESIGN CONTOURS

- LEGAL BOUNDARIES
- MAJOR CONTOURS
- MINOR CONTOURS
- DESIGN STRINGS

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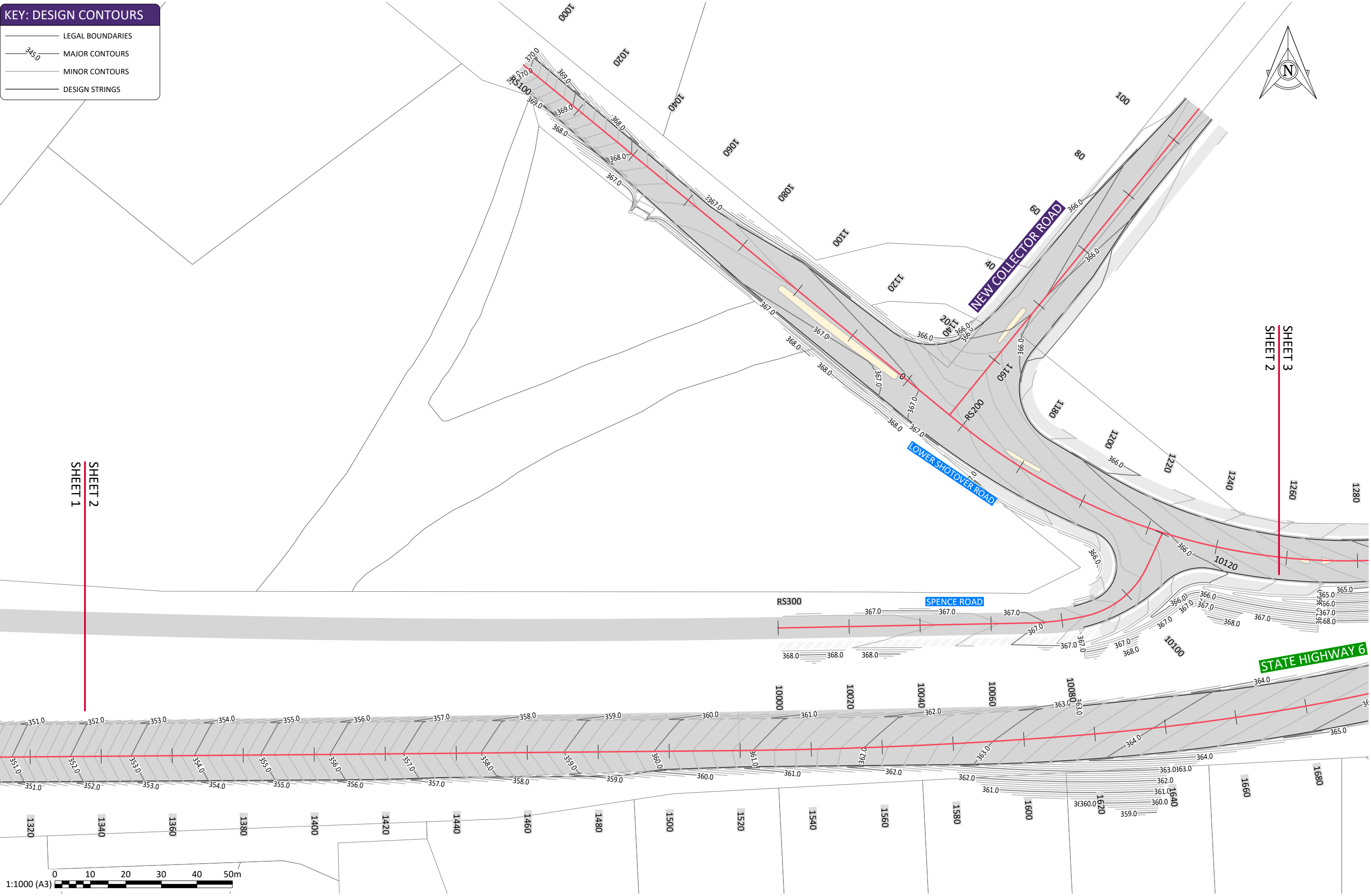
100mm  
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY  
0  
C:\12\data\107.7.120.14\149360-00-1122.dwg 26/06/2026 3:48 pm Iscooper Plotted: 26 Jun 2026 3:48 pm  
Version 5.0 - August 2024

KEY: DESIGN CONTOURS

LEGAL BOUNDARIES

345.0

MAJOR CONTOURS

MINOR CONTOURS

| DRAWING ISSUE |          |             |  | DESIGNED |     |      |  |
|---------------|----------|-------------|--|----------|-----|------|--|
|               |          |             |  | RM       |     |      |  |
|               |          |             |  | SC       |     |      |  |
|               |          |             |  | GMB      |     |      |  |
|               |          |             |  | CI       |     |      |  |
| REV           | DATE     | DESCRIPTION |  | SC       | GMB | CI   |  |
| A             | 26/06/26 | FOR CONSENT |  | BY       | CHK | APPR |  |

|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



CLIENT

% Simplicity Living

DRAWING

PROJECT

SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DESIGN CONTOURS PLAN  
SHEET 2

|                  |                  |  |             |            |  |
|------------------|------------------|--|-------------|------------|--|
| STATUS           |                  |  | PRELIMINARY |            |  |
| HORIZONTAL DATUM | Mt Nicholas 2000 |  |             | SCALE (A3) |  |
| VERTICAL DATUM   | NZVD16           |  |             | 1:1000     |  |
| DRAWING NUMBER   |                  |  |             | REVISION   |  |
| 149360-00-1122   |                  |  |             | A          |  |
| ©copyright       |                  |  |             |            |  |

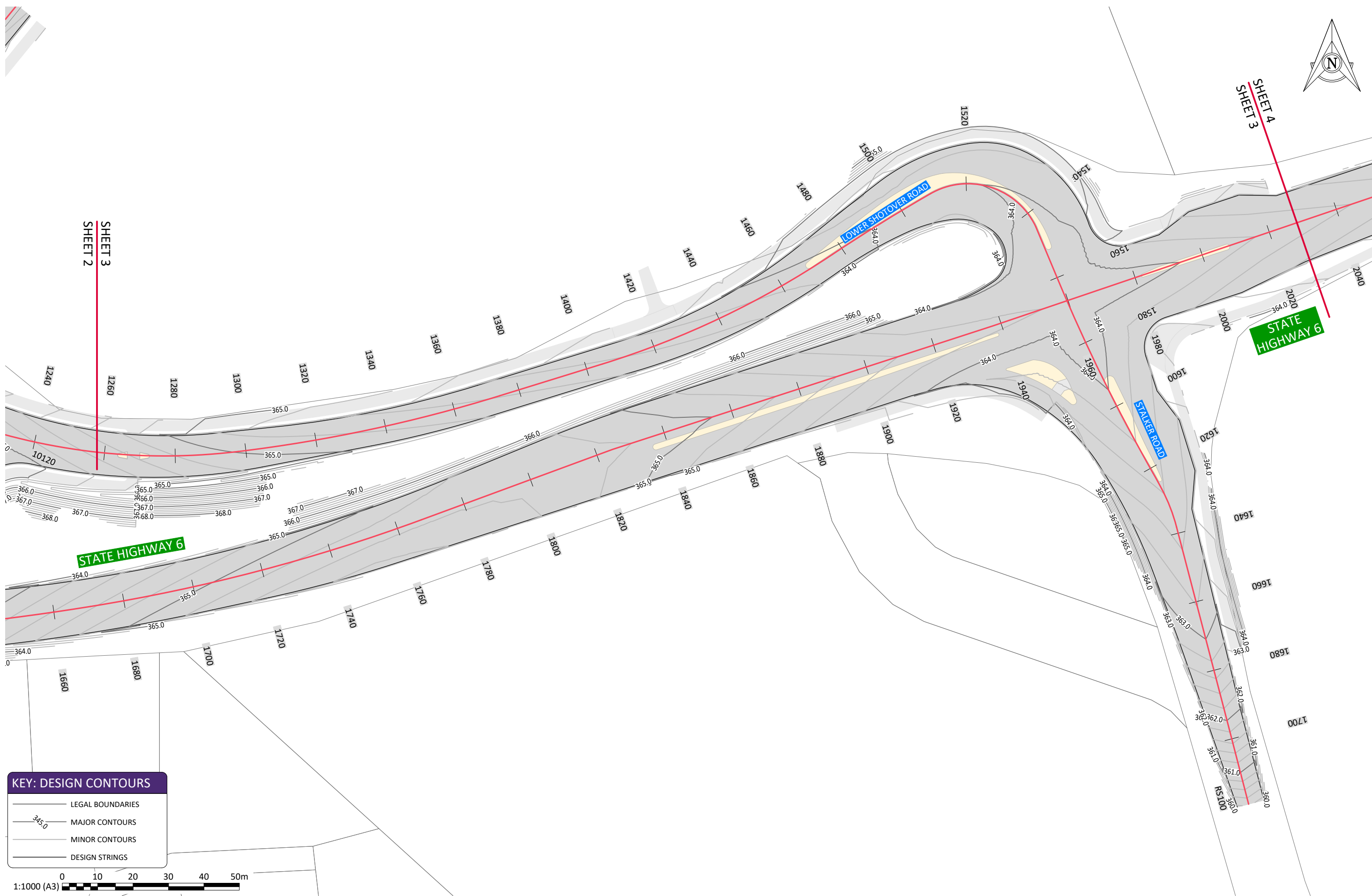


100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

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| KEY: DESIGN CONTOURS |                  |
|----------------------|------------------|
|                      | LEGAL BOUNDARIES |
|                      | MAJOR CONTOURS   |
|                      | MINOR CONTOURS   |
|                      | DESIGN STRINGS   |

1:1000 (A3) 0 10 20 30 40 50m

| DRAWING ISSUE |          |     |             | DESIGNED |     |    |      |
|---------------|----------|-----|-------------|----------|-----|----|------|
| REV           | DATE     | FOR | DESCRIPTION | SC       | GMB | CI | APPR |
| A             | 26/06/26 | FOR | CONSENT     | SC       | GMB | CI | APPR |

Version 5.0 - August 2024



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

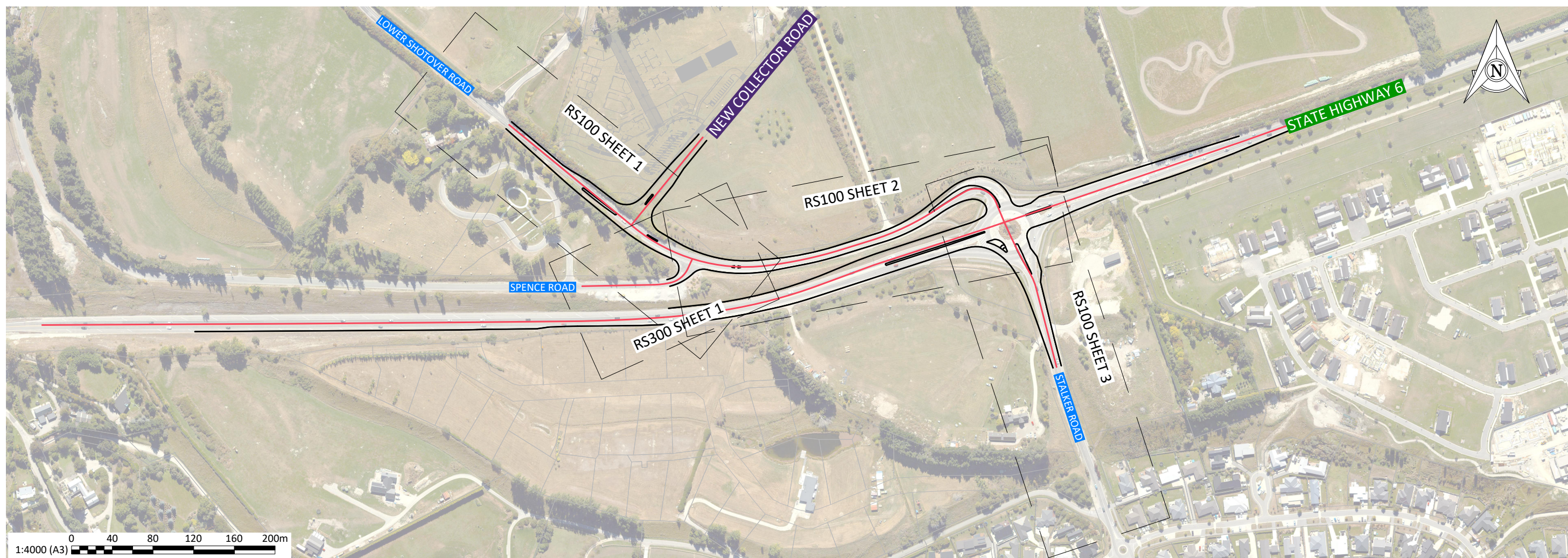
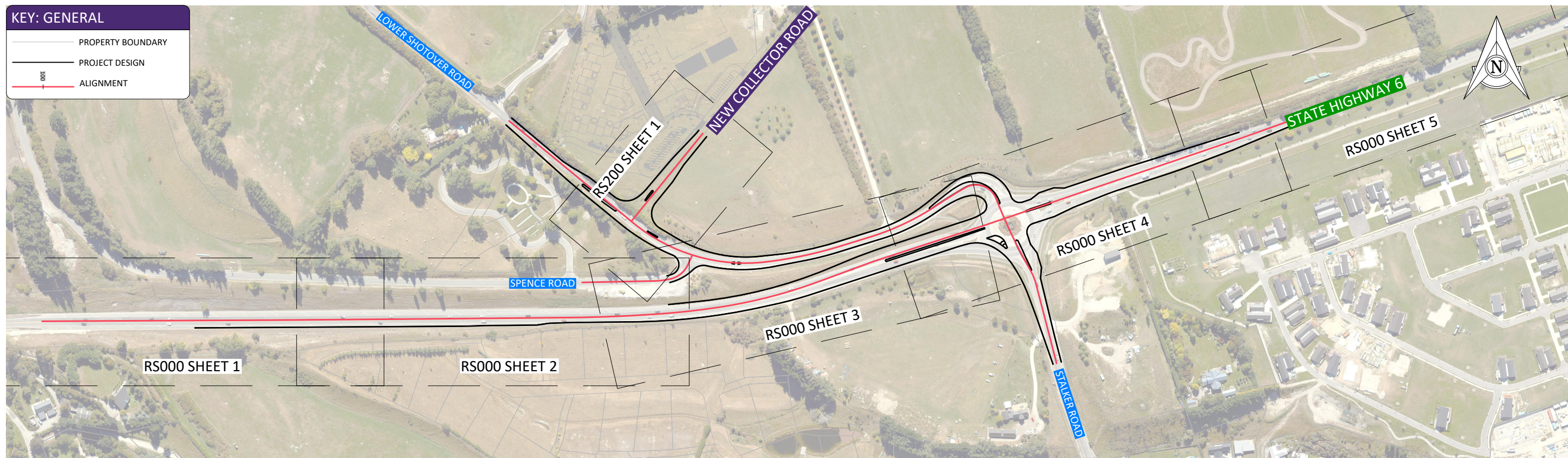
DRAWING  
DESIGN CONTOURS PLAN  
SHEET 3

| STATUS           |                  |            |
|------------------|------------------|------------|
| PRELIMINARY      |                  |            |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM   | NZVD16           | 1:1000     |
| DRAWING NUMBER   | 149360-00-1123   | REVISION   |
|                  |                  | A          |

©copyright







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|---------------|----------|-------------|-------|---------|--------|--|
| DRAWING ISSUE |          |             |       |         |        |  |
|               |          |             |       |         |        |  |
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|               |          |             |       |         |        |  |
|               |          |             |       |         |        |  |
| A             | 26/06/26 | FOR CONSENT |       |         |        |  |
| REV           | DATE     | DESCRIPTION | SC BY | GMB CHK | CT APP |  |

|          |     |
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| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



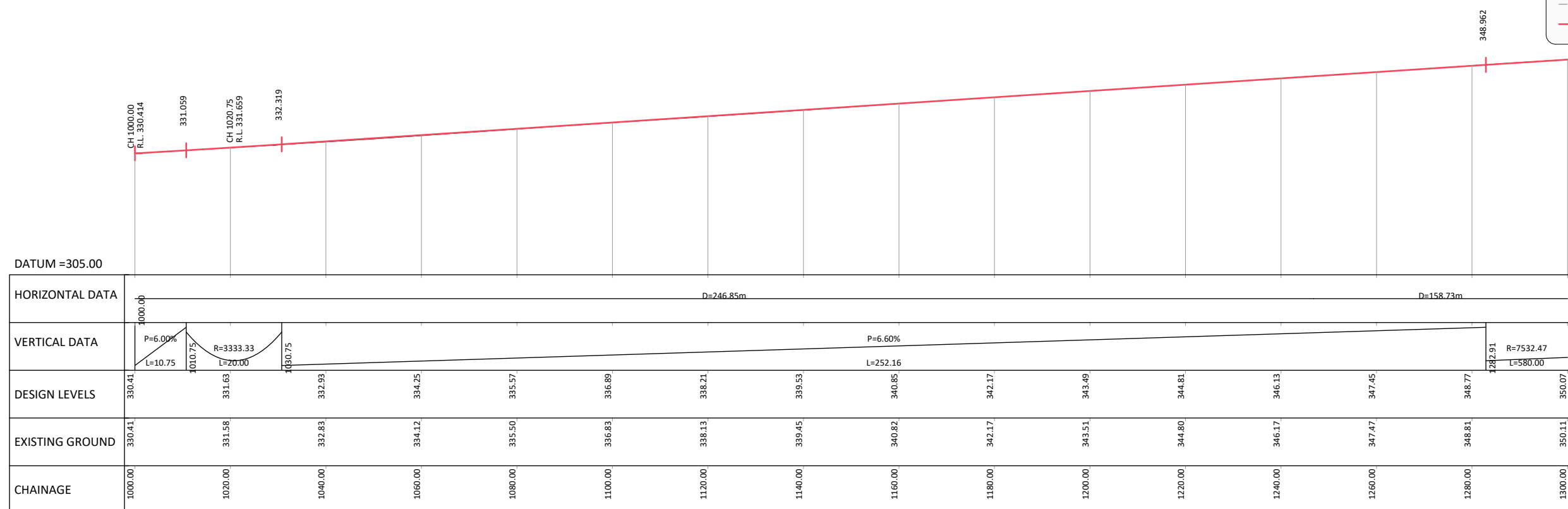
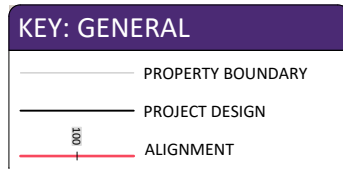
PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

## DRAWING

# GA OVERVIEW PLAN

|                  |  |                  |             |            |  |
|------------------|--|------------------|-------------|------------|--|
| STATUS           |  |                  | PRELIMINARY |            |  |
| HORIZONTAL DATUM |  | Mt Nicholas 2000 |             | SCALE (A3) |  |
| VERTICAL DATUM   |  | NZVD16           |             | 1:4000     |  |
| DRAWING NUMBER   |  |                  |             | REVISION   |  |
| 149360-00-1210   |  |                  |             | A          |  |





LS RS000  
SCALE H 1:1000 V 1:1000

SCALE H 1:1000 V 1:1000

|     |          |             |       |          |         |
|-----|----------|-------------|-------|----------|---------|
|     |          |             |       |          |         |
|     |          |             |       |          |         |
|     |          |             |       |          |         |
|     |          |             |       |          |         |
| A   | 26/06/26 | FOR CONSENT |       |          |         |
| REV | DATE     | DESCRIPTION | SC BY | GMB CHK. | CN APPR |

|          |     |
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| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



CLIENT

**% Simplicity**  
Living

PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING

GENERAL ARRANGEMENT &  
LONGSECTION  
RS000  
SHEET 1

|                  |                  |  |                    |                     |  |
|------------------|------------------|--|--------------------|---------------------|--|
| STATUS           |                  |  | <b>PRELIMINARY</b> |                     |  |
| HORIZONTAL DATUM | Mt Nicholas 2000 |  |                    | SCALE (A3)<br>1:100 |  |
| VERTICAL DATUM   | NZVD16           |  |                    |                     |  |
| DRAWING NUMBER   |                  |  |                    | REVISION            |  |
| 149360-00-1211   |                  |  |                    | A                   |  |



100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

KEY: GENERAL

PROPERTY BOUNDARY

PROJECT DESIGN

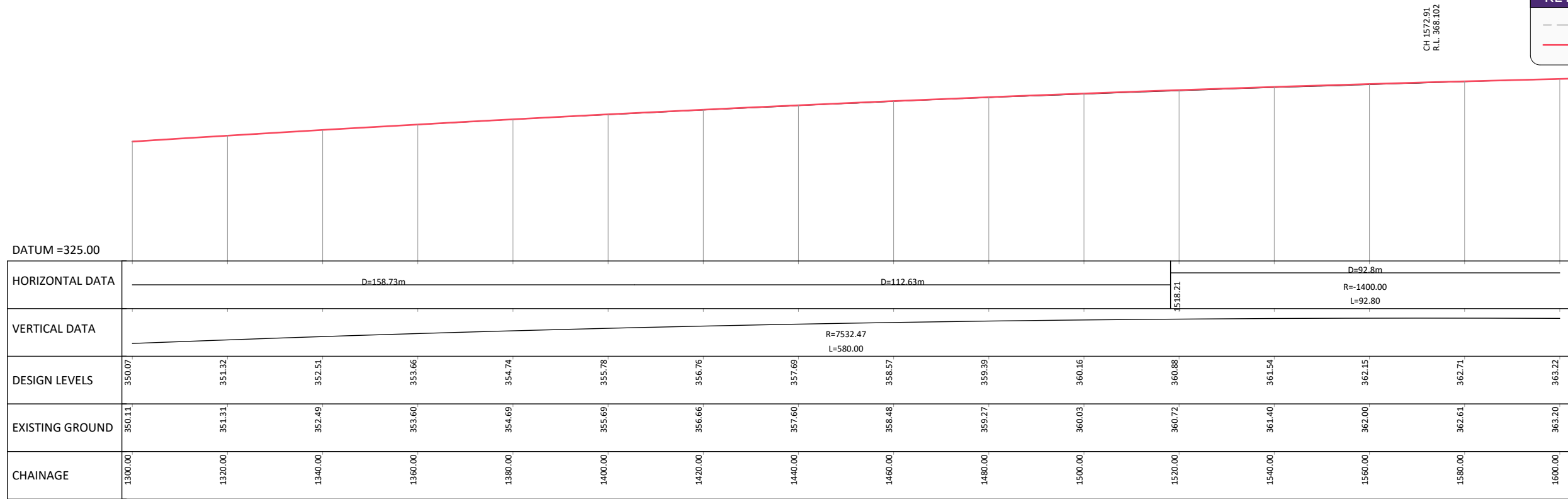
100



KEY: SECTIONS

EXISTING GROUND

DESIGN SURFACE



LS RS000  
SCALE H 1:1000 V 1:1000

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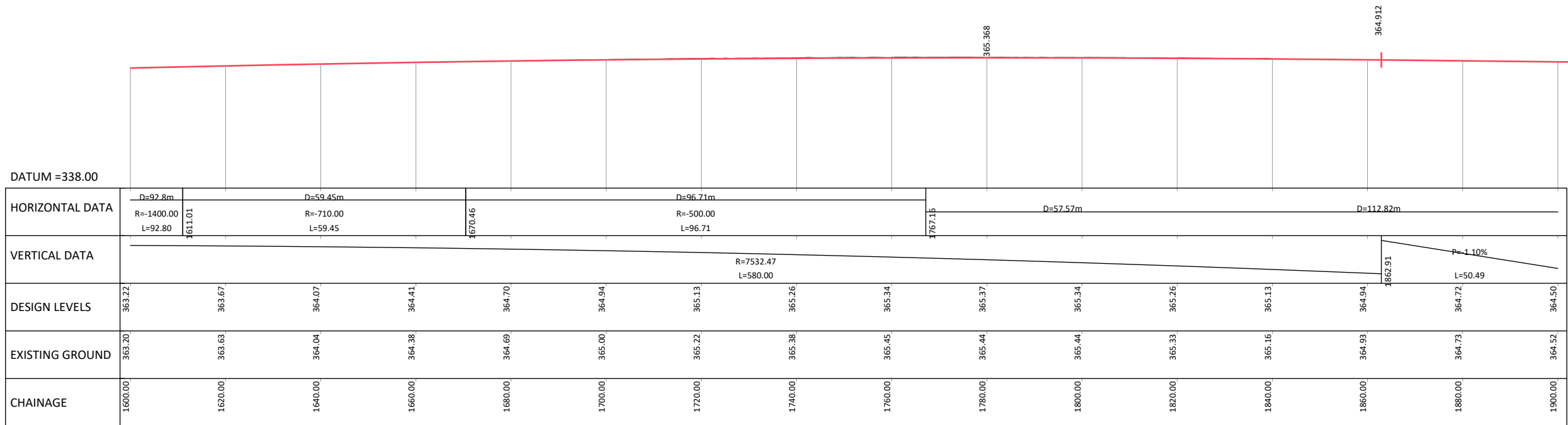
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100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0



LS RS000  
SCALE H 1:1000 V 1:1000

C:\12\5\107.120-14\148360-00-1213.dwg 26/06/2026 3:49 pm Iscooper Plotted: 26 Jun 2026 3:49 pm

|               |          |             |             |     |      |
|---------------|----------|-------------|-------------|-----|------|
| DRAWING ISSUE |          |             | DESIGNED RM |     |      |
| DRAWN SC      |          |             | CHECKED GMB |     |      |
| APPROVED CI   |          |             | BY SC       |     |      |
| DATE          |          |             | CHK GMB     |     |      |
| DESCRIPTION   |          |             | APPR CI     |     |      |
| REV           | DATE     | FOR CONSENT | SC          | GMB | CI   |
| A             | 26/06/26 | FOR CONSENT | BY          | CHK | APPR |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
GENERAL ARRANGEMENT &  
LONGSECTION  
RS000  
SHEET 3

|                              |                  |            |
|------------------------------|------------------|------------|
| STATUS<br><b>PRELIMINARY</b> |                  |            |
| HORIZONTAL DATUM             | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM               | NZVD16           | 1:1000     |
| DRAWING NUMBER               | 149360-00-1213   | REVISION   |
|                              |                  | A          |

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100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

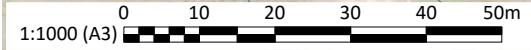
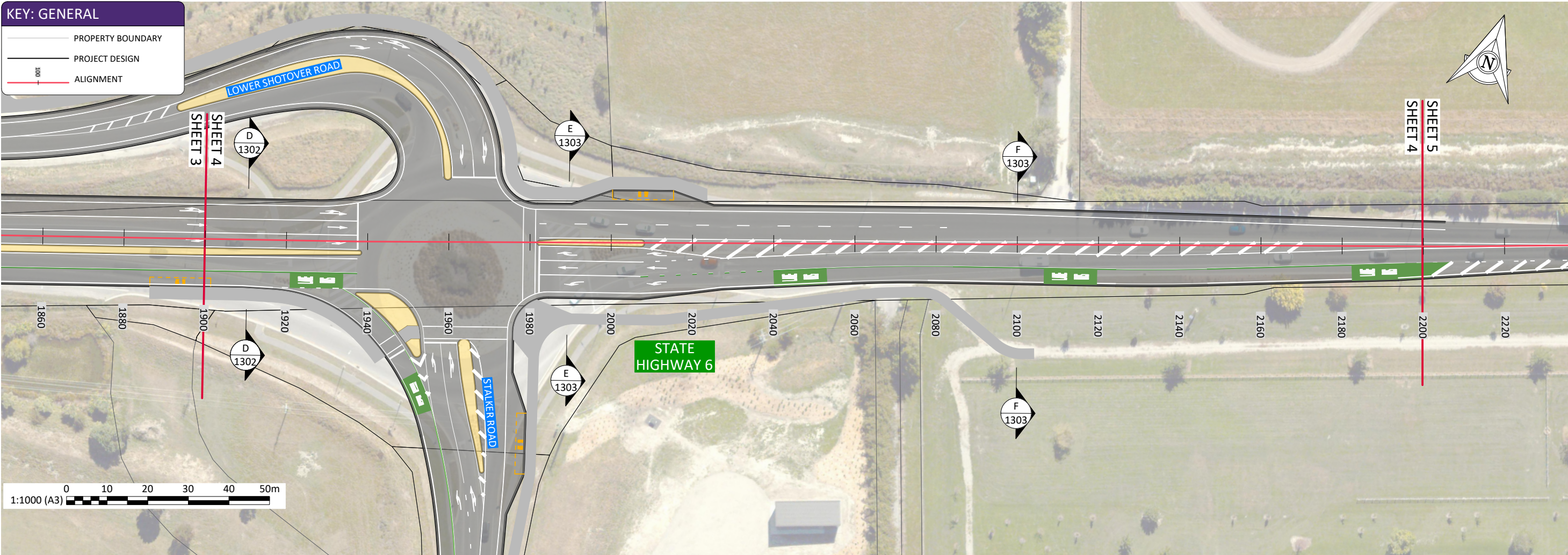
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KEY: GENERAL

PROPERTY BOUNDARY

PROJECT DESIGN

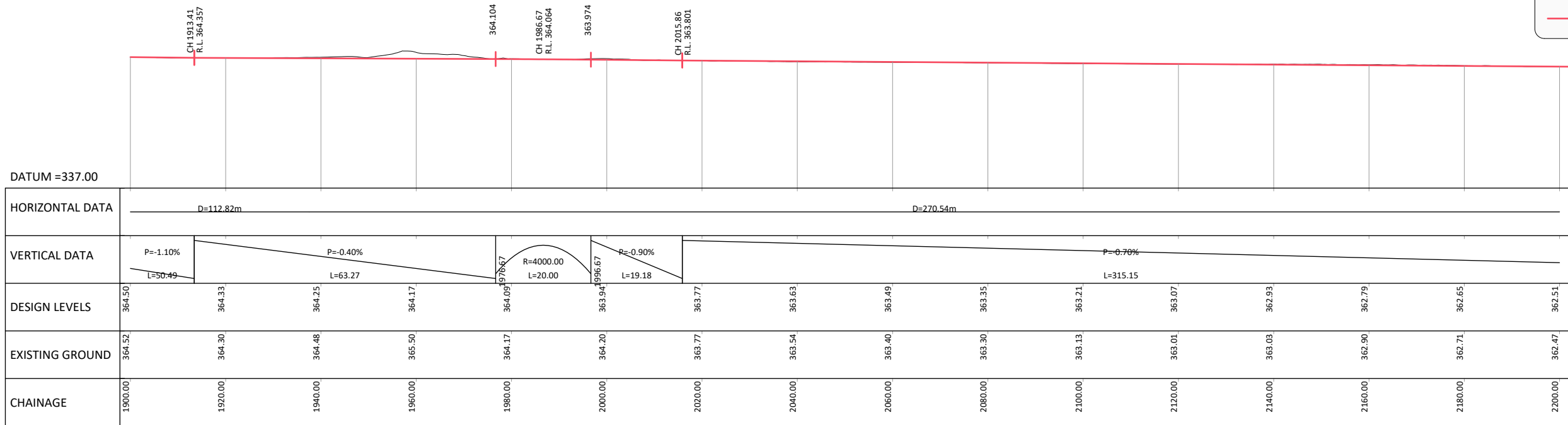
100

ALIGNMENT

KEY: SECTIONS

EXISTING GROUND

DESIGN SURFACE



LS RS000  
SCALE H 1:1000 V 1:1000

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DRAWING ISSUE

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| REV | DATE     | DESCRIPTION |
| A   | 26/06/26 | FOR CONSENT |

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| DESIGNED | RM  |
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DRAWING

GENERAL ARRANGEMENT &  
LONGSECTION  
RS000  
SHEET 4

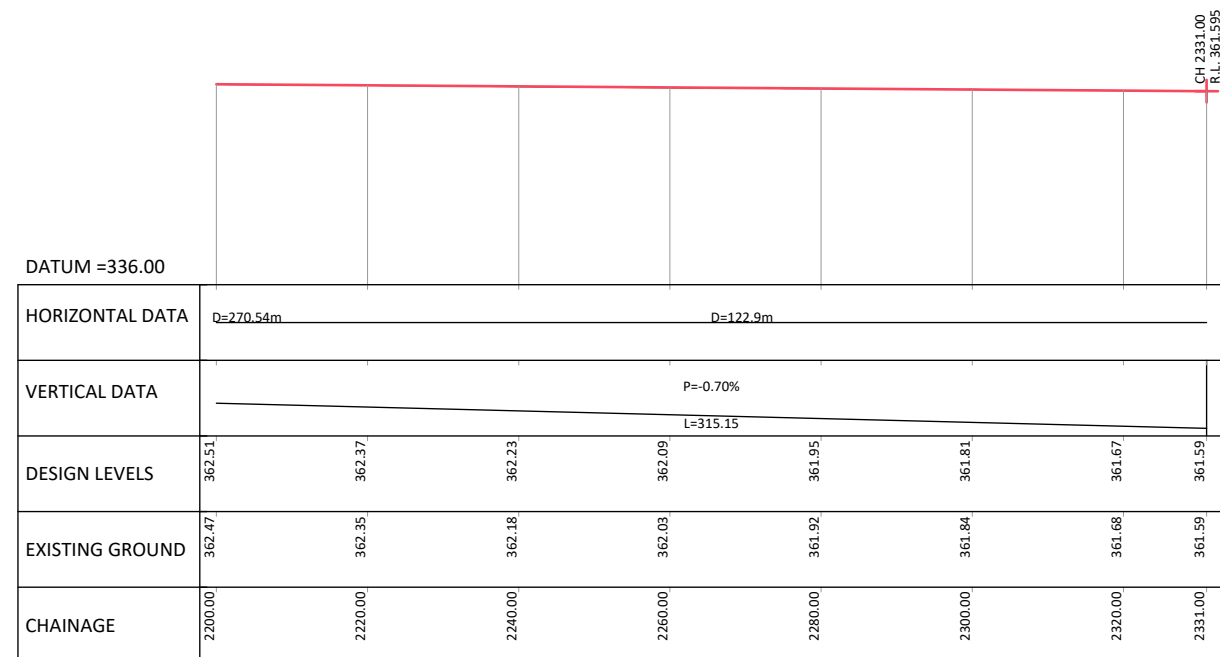
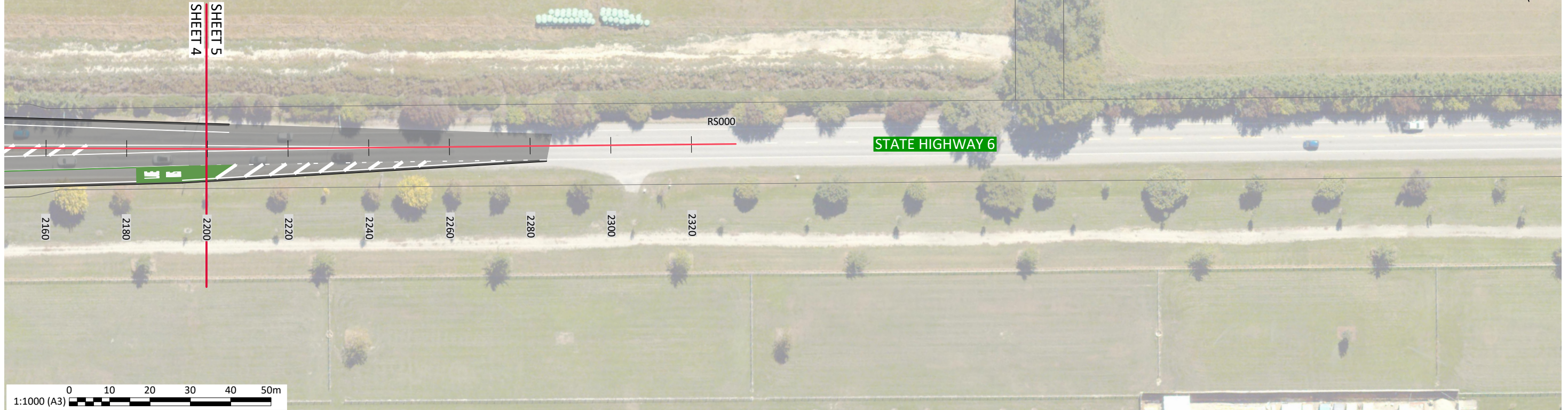
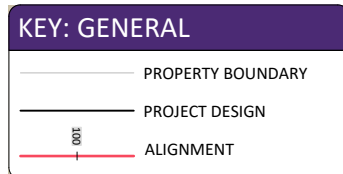
STATUS

PRELIMINARY

|                  |                  |            |
|------------------|------------------|------------|
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM   | NZVD16           | 1:1000     |
| DRAWING NUMBER   | 149360-00-1214   | REVISION   |
|                  |                  | A          |

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DATUM =336.00

|                 |         |         |         |         |         |         |         |         |  |  |
|-----------------|---------|---------|---------|---------|---------|---------|---------|---------|--|--|
| HORIZONTAL DATA |         |         |         |         |         |         |         |         |  |  |
| VERTICAL DATA   |         |         |         |         |         |         |         |         |  |  |
| DESIGN LEVELS   | 362.51  | 362.37  | 362.23  | 362.09  | 361.95  | 361.81  | 361.67  | 361.59  |  |  |
| EXISTING GROUND | 362.47  | 362.35  | 362.18  | 362.03  | 361.92  | 361.84  | 361.68  | 361.59  |  |  |
| CHAINAGE        | 2200.00 | 2220.00 | 2240.00 | 2260.00 | 2280.00 | 2300.00 | 2320.00 | 2331.00 |  |  |

LS RS000  
SCALE H 1:1000 V 1:1000

SCALE H 1:1000 V 1:1000

| DRAWING ISSUE |      |             |             |         |        |
|---------------|------|-------------|-------------|---------|--------|
|               |      |             |             |         |        |
|               |      |             |             |         |        |
|               |      |             |             |         |        |
|               |      |             |             |         |        |
|               | A    | 26/06/26    | FOR CONSENT |         |        |
| REV           | DATE | DESCRIPTION | SC BY       | GMB CHK | CN APP |

|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

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DRAWING

GENERAL ARRANGEMENT &  
LONGSECTION

RS000

SHEET 5

DRAWING

GENERAL ARRANGEMENT &  
LONGSECTION

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GENERAL ARRANGEMENT &  
LONGSECTION

RS000

SHEET 5

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

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| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |

|                  |                  |                    |          |
|------------------|------------------|--------------------|----------|
| STATUS           |                  | <b>PRELIMINARY</b> |          |
| HORIZONTAL DATUM | Mt Nicholas 2000 |                    | SCALE    |
| VERTICAL DATUM   | NZVD16           |                    |          |
| DRAWING NUMBER   |                  |                    | REVISION |
| 149360-00-1215   |                  |                    |          |



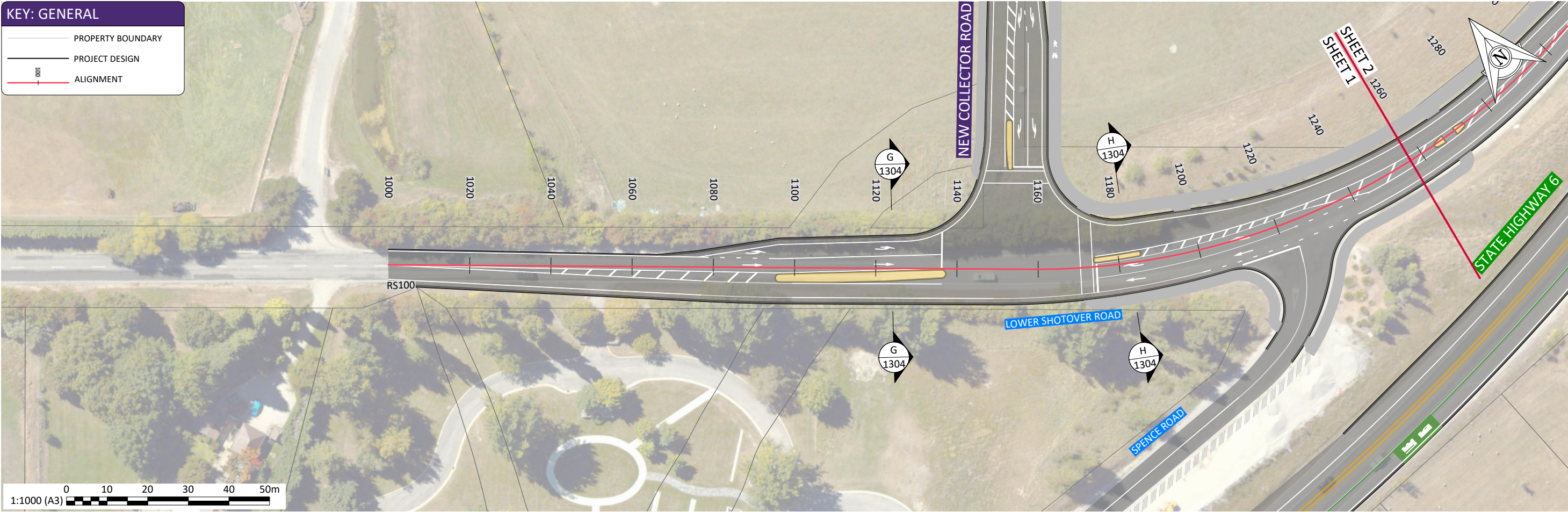
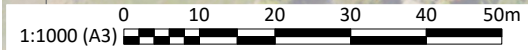
100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

KEY: GENERAL

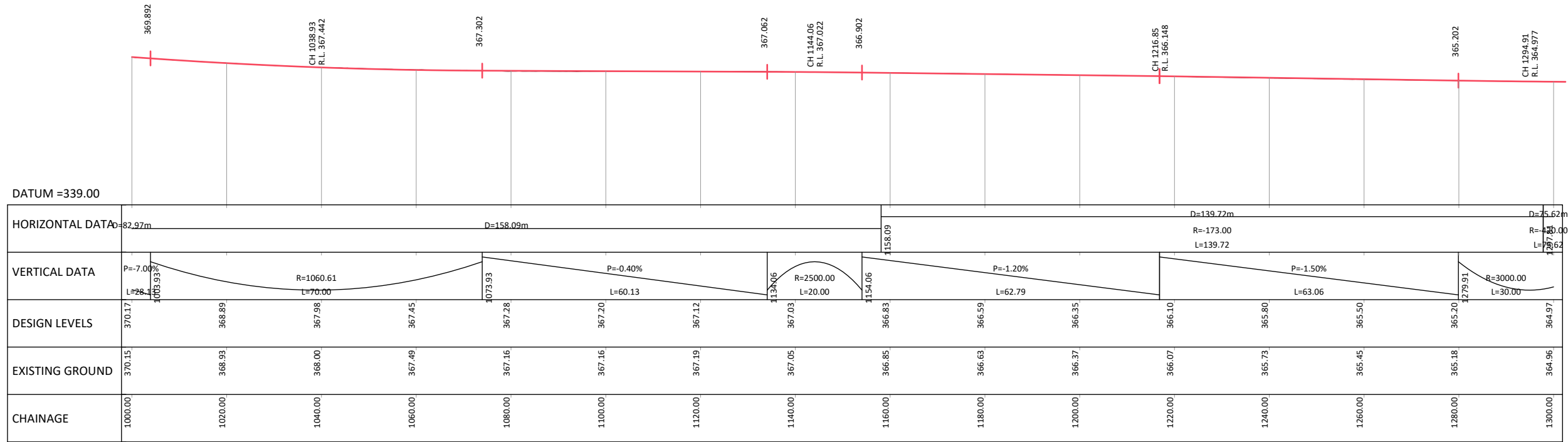
PROPERTY BOUNDARY

PROJECT DESIGNALIGNMENT

KEY: SECTIONS

EXISTING GROUND

DESIGN SURFACE



LS RS100  
SCALE H 1:1000 V 1:1000

C:\12\149360-00-1216.dwg 26/06/2026 3:49 pm bcooper Plotted: 26 Jun 2026 3:49 pm

DRAWING ISSUE

|     |          |             |
|-----|----------|-------------|
| REV | DATE     | DESCRIPTION |
| A   | 26/06/26 | FOR CONSENT |

|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |

CLIENT

% Simplicity Living

PROJECT

SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING

GENERAL ARRANGEMENT &  
LONGSECTION  
RS100  
SHEET 1

STATUS

PRELIMINARY

|                  |                  |            |
|------------------|------------------|------------|
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM   | NZVD16           | 1:1000     |
| DRAWING NUMBER   | 149360-00-1216   | REVISION   |
|                  |                  | A          |

©copyright



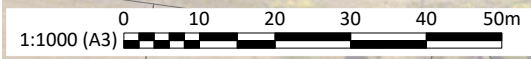
100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

KEY: GENERAL

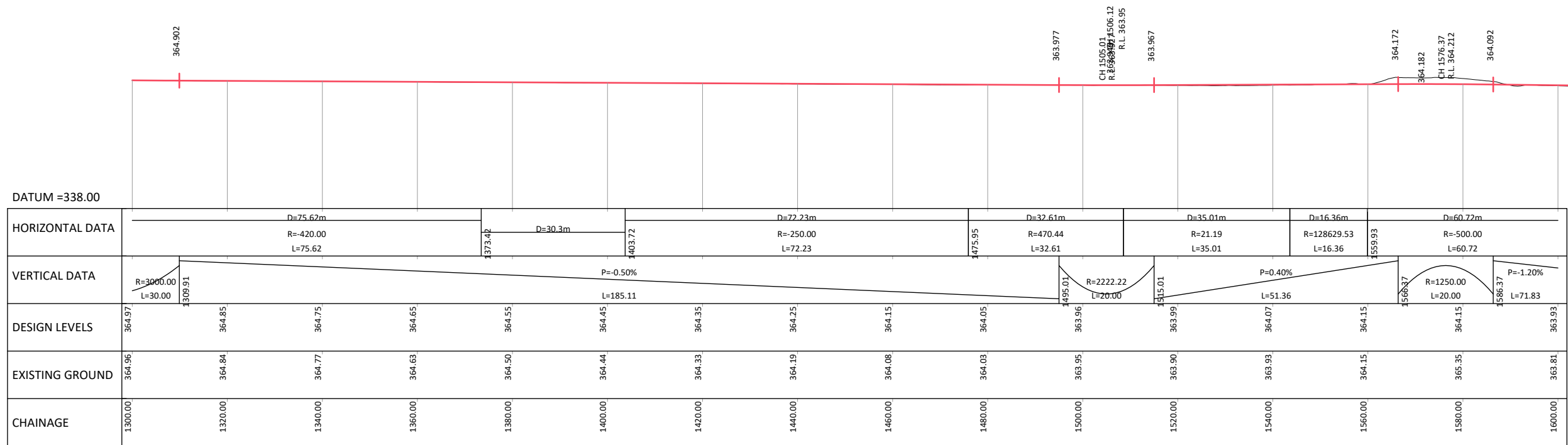
PROPERTY BOUNDARY

PROJECT DESIGN

KEY: SECTIONS

EXISTING GROUND

DESIGN SURFACE



LS RS100  
SCALE H 1:1000 V 1:1000

C:\12\14\148360 - Queensland Simplicity Living\_5670\03 Drawings\001\_48360-00-1217.dwg 26/06/2026 3:49 pm lscoper Plotted: 26 Jun 2026 3:49 pm

DRAWING ISSUE

|     |          |             |
|-----|----------|-------------|
| REV | DATE     | DESCRIPTION |
| A   | 26/06/26 | FOR CONSENT |

DESIGNED

RM

DRAWN

SC

CHECKED

GMB

APPROVED

CI

SC

BY

GMB

CHK

CI

APPR

CLIENT

PROJECT

SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING

GENERAL ARRANGEMENT &  
LONGSECTION  
RS100  
SHEET 2

STATUS

PRELIMINARY

HORIZONTAL DATUM

Mt Nicholas 2000

VERTICAL DATUM

NZVD16

DRAWING NUMBER

149360-00-1217

SCALE (A3)

1:1000

REVISION

A

Version 5.0 - August 2024

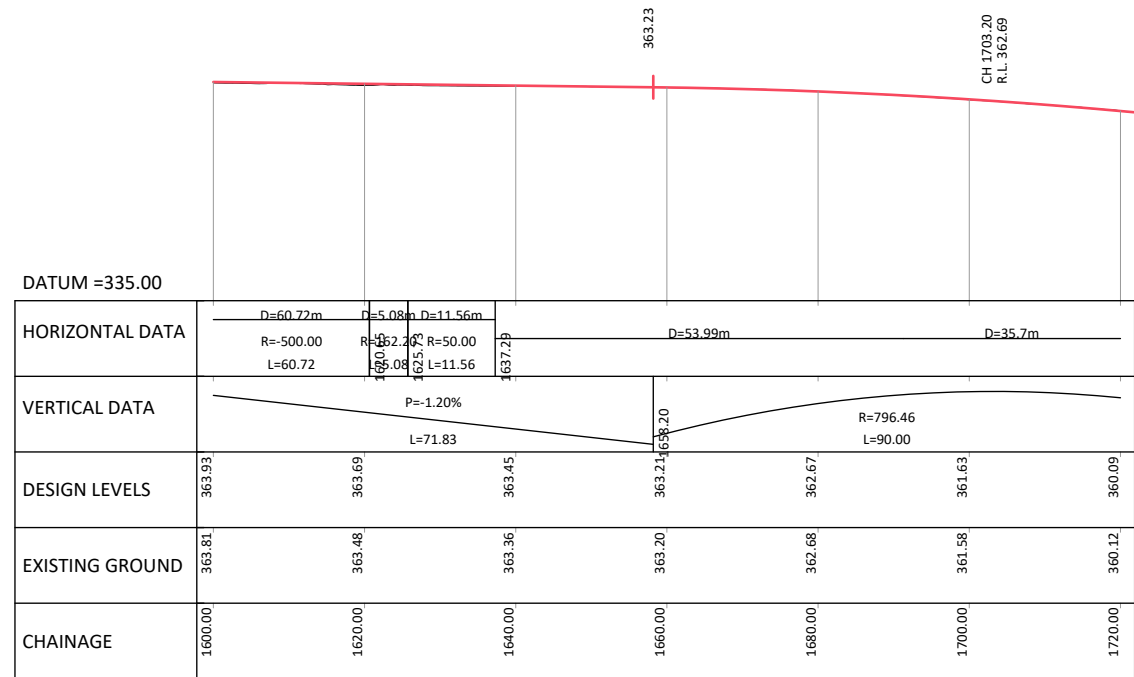
©copyright



100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

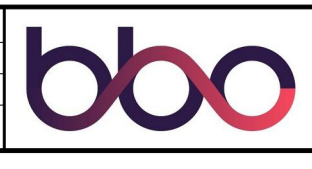
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LS RS100  
SCALE H 1:1000 V 1:1000

C:\12\45\data\107.7.20-14\149360 - Queenstown Simplicity Living\_5670\03 Drawings\00149360-001218.dwg 26/6/2026 3:50 pm lscoper Plotted: 26 Jun 2026 3:50 pm

|               |  |  |  |               |  |  |  |
|---------------|--|--|--|---------------|--|--|--|
| DRAWING ISSUE |  |  |  | DESIGNED RM   |  |  |  |
| DRAWN SC      |  |  |  | CHECKED GMB   |  |  |  |
| APPROVED CI   |  |  |  | BY GMB        |  |  |  |
| REV A         |  |  |  | DATE 26/06/26 |  |  |  |
| FOR CONSENT   |  |  |  | DESCRIPTION   |  |  |  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

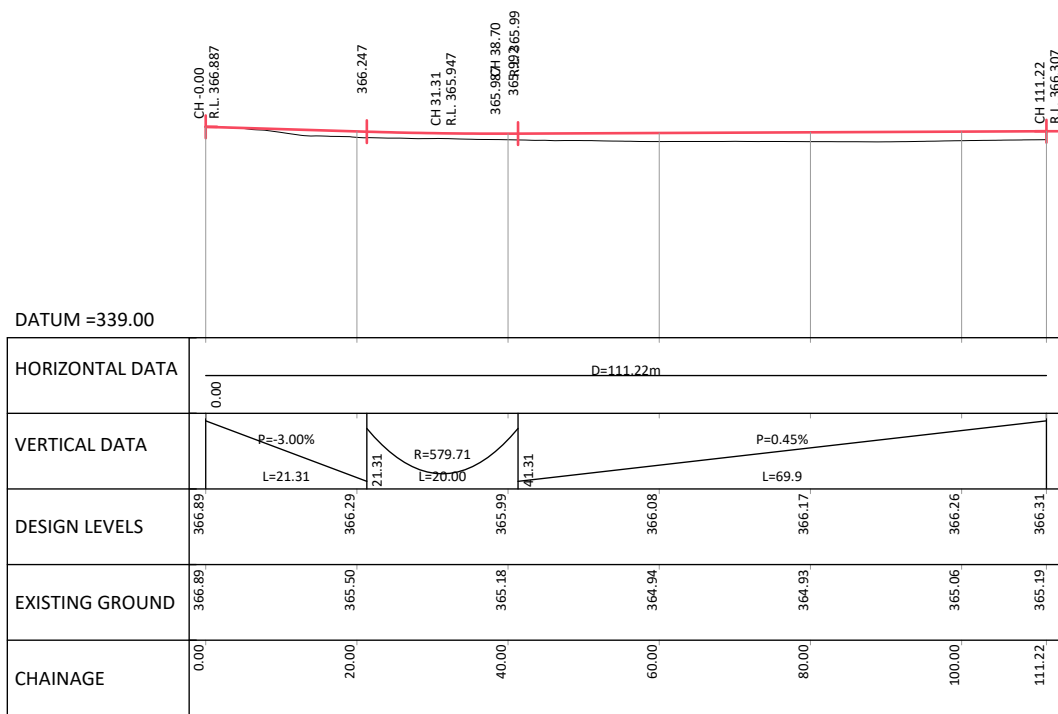
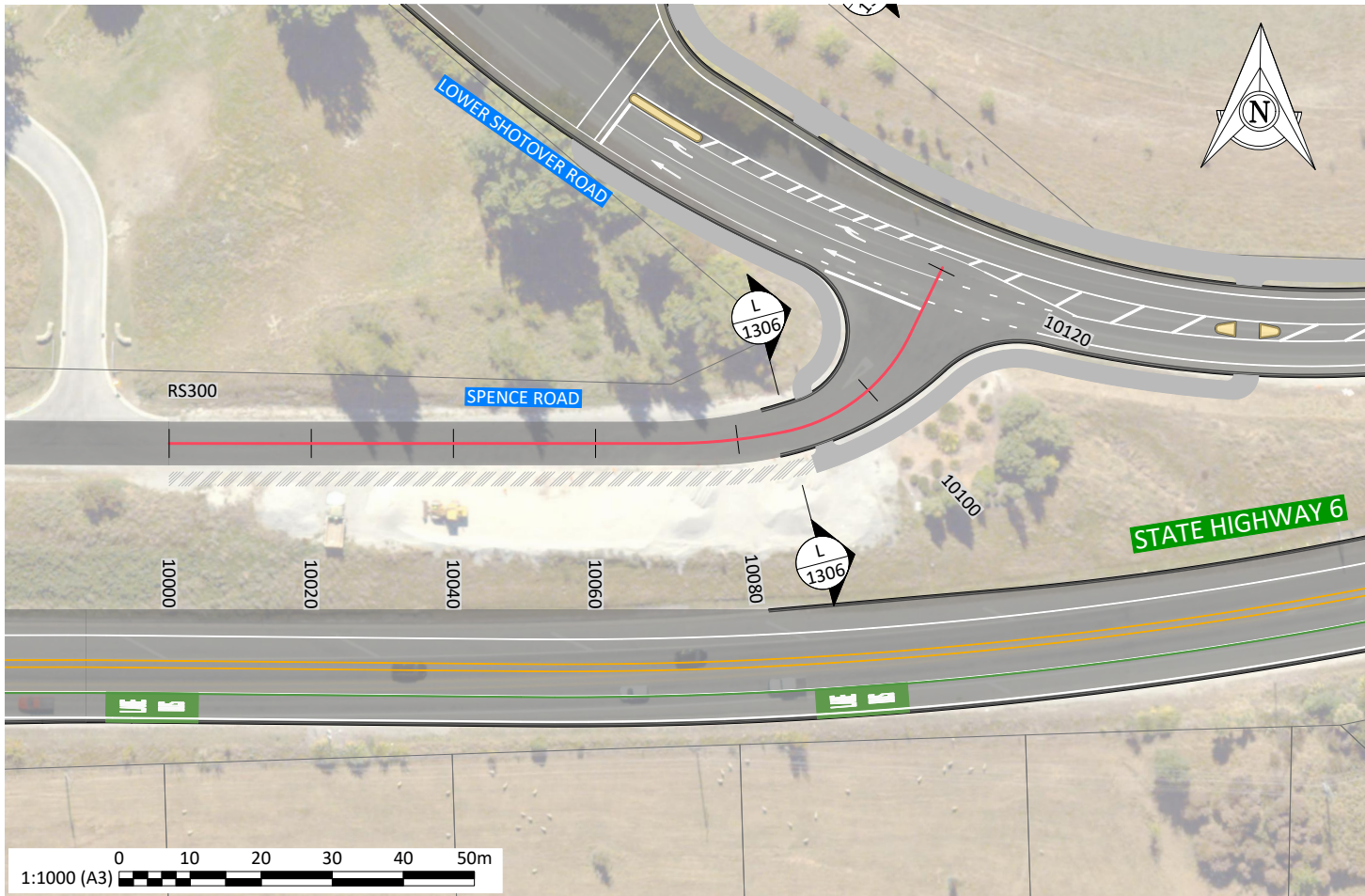
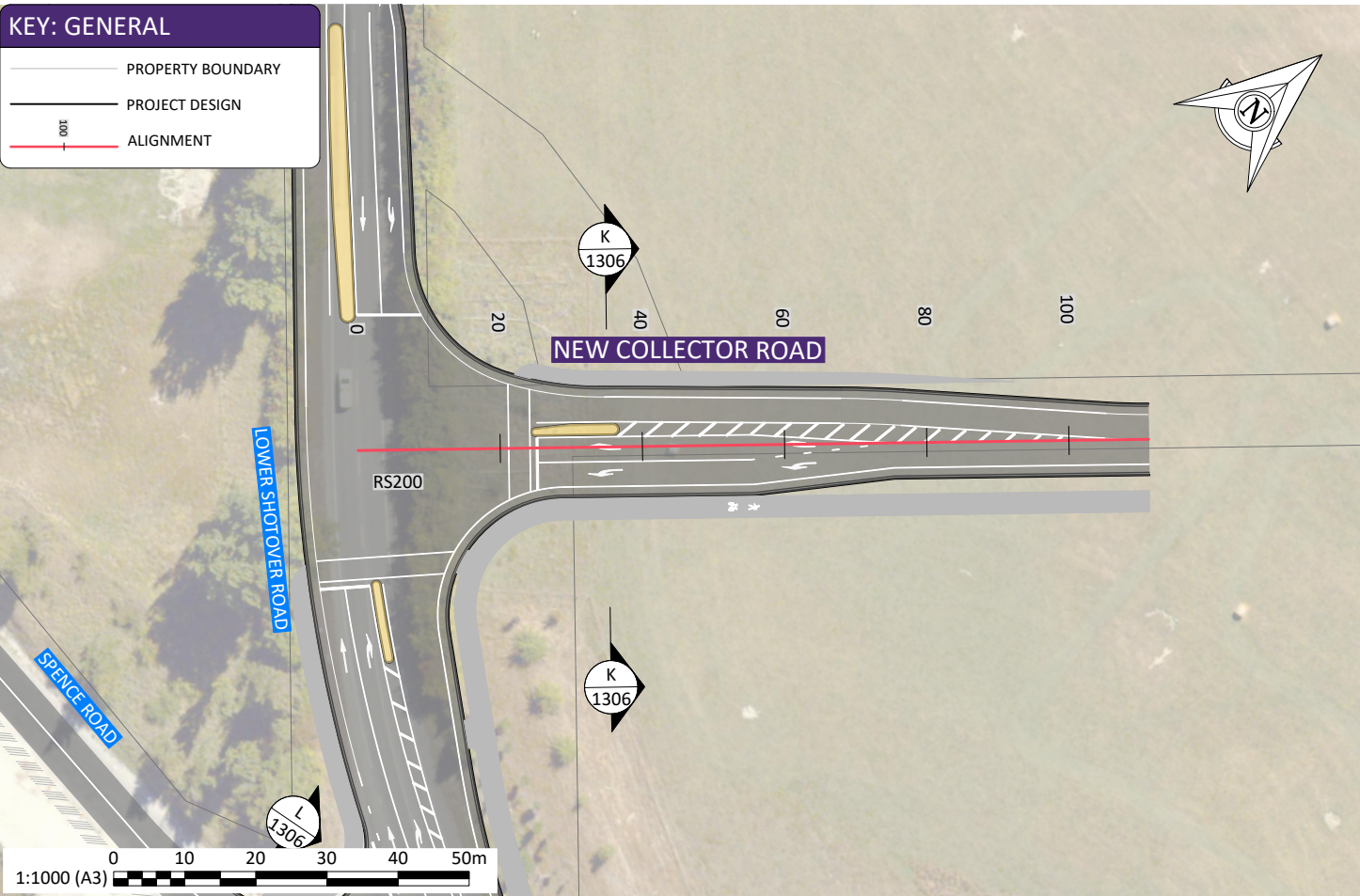
DRAWING  
GENERAL ARRANGEMENT &  
LONGSECTION  
RS100  
SHEET 3

|                              |                  |                      |
|------------------------------|------------------|----------------------|
| STATUS<br><b>PRELIMINARY</b> |                  |                      |
| HORIZONTAL DATUM             | Mt Nicholas 2000 | SCALE (A3)<br>1:1000 |
| VERTICAL DATUM               | NZVD16           | REVISION<br>A        |
| DRAWING NUMBER               | 149360-00-1218   |                      |

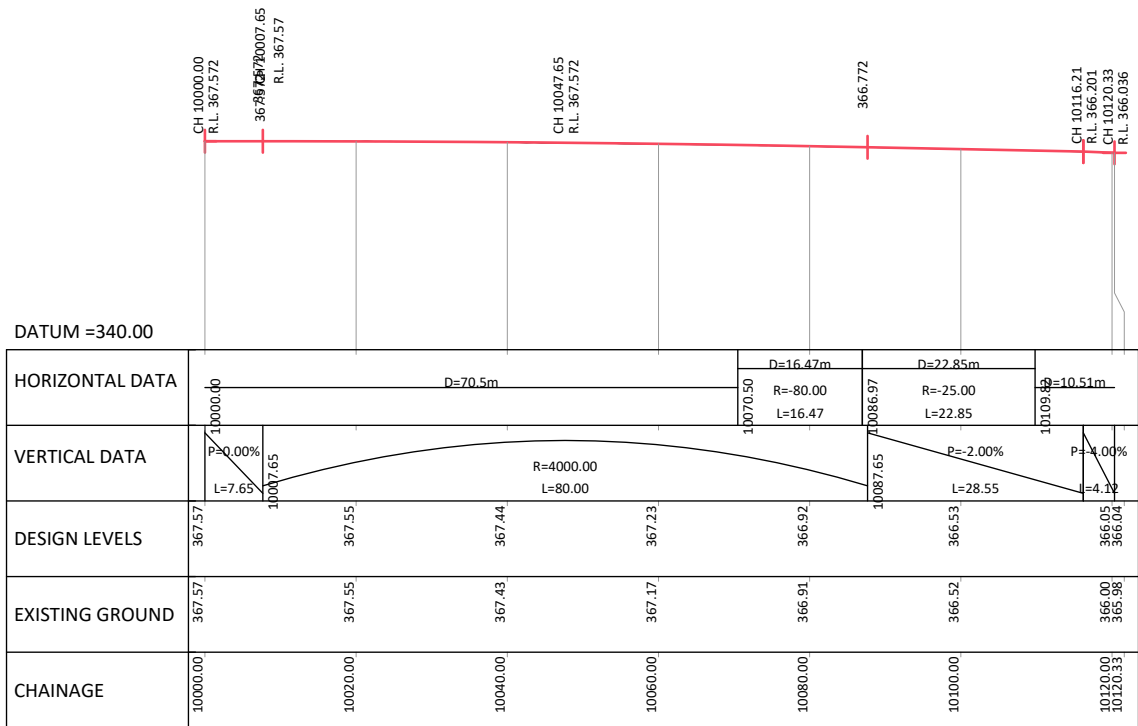
©copyright



100mm  
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY  
0  
C:\12\05\data\107.120-14\149360 - Queensland Simplicity Living\_5670\03 Drawings\00149360-00-1219.dwg 26/06/2026 3:50 pm Isocoper Plotted: 26 Jun 2026 3:50 pm  
Version 5.0 - August 2024



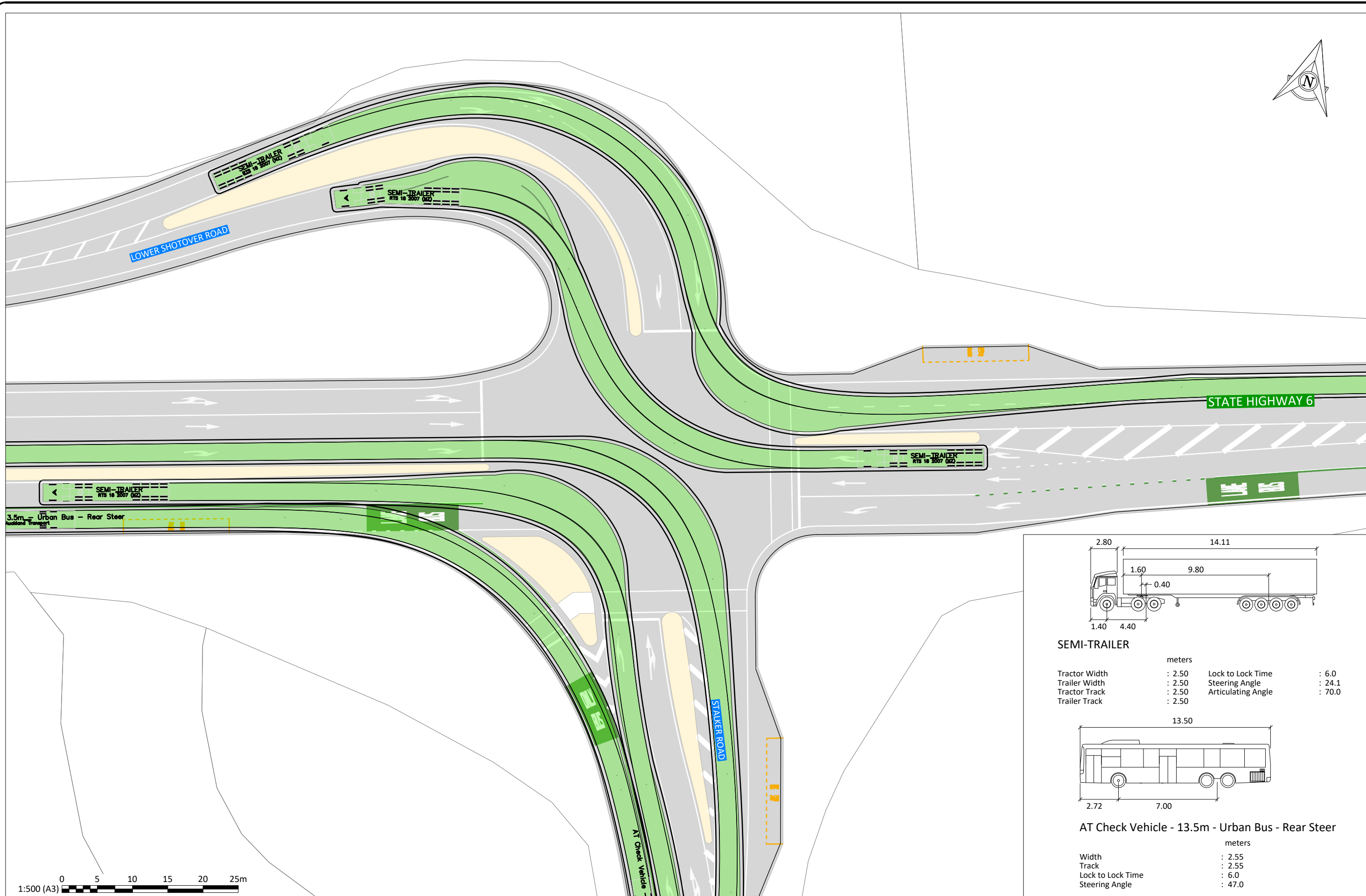
LS RS200  
SCALE H 1:1000 V 1:1000



LS RS300  
SCALE H 1:1000 V 1:1000

|                           |          |             |  |             |     |      |          |                                                                                       |                                                                                       |        |         |         |                                                 |                  |                |   |
|---------------------------|----------|-------------|--|-------------|-----|------|----------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------|---------|---------|-------------------------------------------------|------------------|----------------|---|
| DRAWING ISSUE             |          |             |  | DESIGNED RM |     |      |          |  |  | CLIENT | PROJECT | DRAWING | STATUS                                          |                  |                |   |
|                           |          |             |  |             |     |      |          |                                                                                       |                                                                                       |        |         |         | PRELIMINARY                                     |                  |                |   |
|                           |          |             |  |             |     |      |          |                                                                                       |                                                                                       |        |         |         | HORIZONTAL DATUM                                | Mt Nicholas 2000 | SCALE (A3)     |   |
|                           |          |             |  |             |     |      |          |                                                                                       |                                                                                       |        |         |         | VERTICAL DATUM                                  | NZVD16           | 1:1000         |   |
|                           |          |             |  |             |     |      |          |                                                                                       |                                                                                       |        |         |         | DRAWING NUMBER                                  |                  | REVISION       |   |
| A                         | 26/06/26 | FOR CONSENT |  | SC          | GMB | CI   | APPROVED |  |  | CLIENT | PROJECT | DRAWING | GENERAL ARRANGEMENT & LONGSECTION RS200 & RS300 |                  |                |   |
| REV                       | DATE     | DESCRIPTION |  | BY          | CHK | APPR | CI       |                                                                                       |                                                                                       |        |         |         | DRAWING NUMBER                                  |                  | 149360-00-1219 | A |
| Version 5.0 - August 2024 |          |             |  |             |     |      |          |                                                                                       |                                                                                       |        |         |         |                                                 |                  |                |   |
| ©copyright                |          |             |  |             |     |      |          |                                                                                       |                                                                                       |        |         |         |                                                 |                  |                |   |





|               |      |             |             |  |  |  |    |     |          |     |
|---------------|------|-------------|-------------|--|--|--|----|-----|----------|-----|
| DRAWING TITLE |      |             |             |  |  |  |    |     | DESIGNED | RM  |
|               |      |             |             |  |  |  |    |     | DRAWN    | SC  |
|               |      |             |             |  |  |  |    |     | CHECKED  | GMB |
|               |      |             |             |  |  |  |    |     | APPROVED |     |
|               | A    | 26/06/26    | FOR CONSENT |  |  |  |    | SC  | GMB      | CI  |
| REV           | DATE | DESCRIPTION |             |  |  |  | BY | CHK | APPR     |     |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

## DRAWING

# VEHICLE TRACKING PLAN

## SHEET 1

|                     |                  |                    |            |
|---------------------|------------------|--------------------|------------|
| STATUS              |                  | <b>PRELIMINARY</b> |            |
| HORIZONTAL<br>DATUM | Mt Nicholas 2000 |                    | SCALE (A3) |
| VERTICAL<br>DATUM   | NZVD16           |                    | 1:1000     |
| DRAWING NUMBER      |                  |                    | REVISION   |
| 149360-00-1251      |                  |                    | A          |

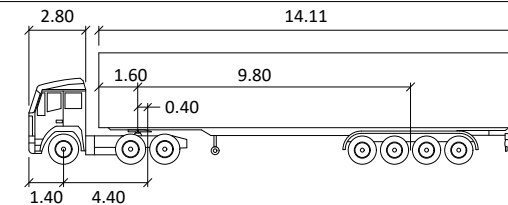
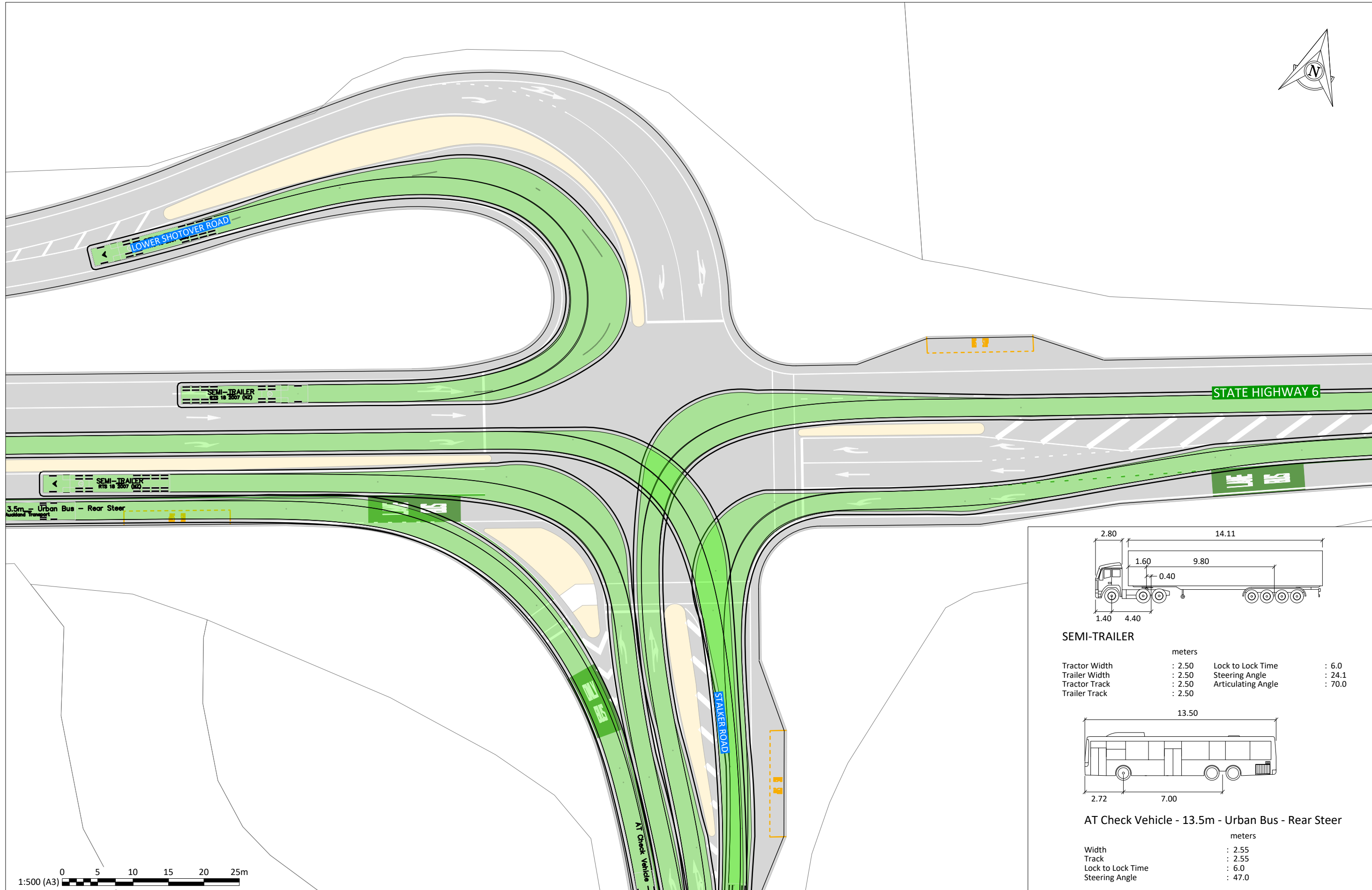


100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

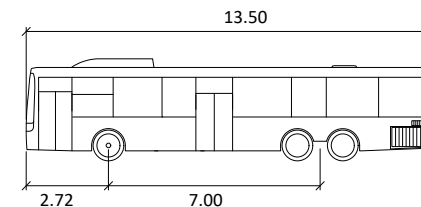
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C:\12\45\data\107.7.20-14\149360 - Queenstown Simplicity Living\_5670\03 Drawings\00149360-00-1252.dwg 26/6/2026 3:50 pm Isocoper Plotted: 26 Jun 2026 3:50 pm



SEMI-TRAILER

|              | Tractor Width | Trailer Width | Tractor Track | Trailer Track | Lock to Lock Time | Steering Angle | Articulating Angle |
|--------------|---------------|---------------|---------------|---------------|-------------------|----------------|--------------------|
| SEMI-TRAILER | 2.50          | 2.50          | 2.50          | 2.50          | 6.0               | 24.1           | 70.0               |



AT Check Vehicle - 13.5m - Urban Bus - Rear Steer

|                                                   | Width | Track | Lock to Lock Time | Steering Angle |
|---------------------------------------------------|-------|-------|-------------------|----------------|
| AT Check Vehicle - 13.5m - Urban Bus - Rear Steer | 2.55  | 2.55  | 6.0               | 47.0           |

| REV | DATE     | DESCRIPTION | SC | GMB | CI | APPR |
|-----|----------|-------------|----|-----|----|------|
| A   | 26/06/26 | FOR CONSENT |    |     |    |      |

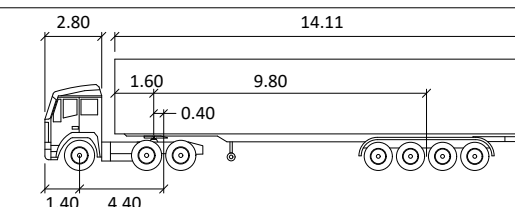
|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

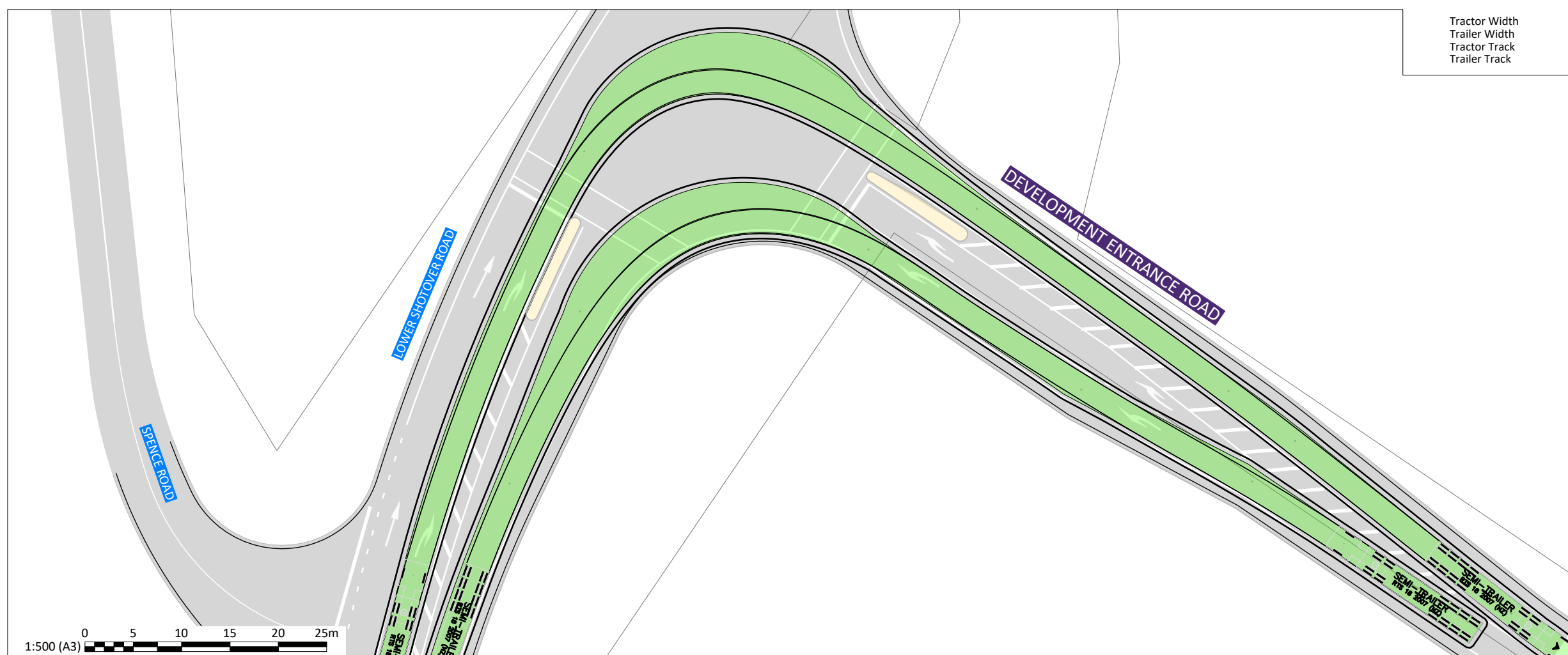
DRAWING  
VEHICLE TRACKING PLAN  
SHEET 2

|                                  |                  |                      |
|----------------------------------|------------------|----------------------|
| STATUS<br><b>PRELIMINARY</b>     |                  |                      |
| HORIZONTAL DATUM                 | Mt Nicholas 2000 | SCALE (A3)<br>1:1000 |
| VERTICAL DATUM                   | NZVD16           | REVISION<br>A        |
| DRAWING NUMBER<br>149360-00-1252 |                  |                      |



## SEMI-TRAILER

|               | meters |                    |        |
|---------------|--------|--------------------|--------|
| Tractor Width | : 2.50 | Lock to Lock Time  | : 6.0  |
| Trailer Width | : 2.50 | Steering Angle     | : 24.1 |
| Tractor Track | : 2.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 2.50 |                    |        |

[illegible]

|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

## DRAWING

## VEHICLE TRACKING PLAN

## SHEET 3

|                  |                  |                    |        |
|------------------|------------------|--------------------|--------|
| STATUS           |                  | <b>PRELIMINARY</b> |        |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3)         | 1:1000 |
| VERTICAL DATUM   | NZVD16           |                    |        |
| DRAWING NUMBER   |                  | REVISION           |        |
| 149360-00-1253   |                  | A                  |        |





|               |          |             |  |    |     |      |          |     |
|---------------|----------|-------------|--|----|-----|------|----------|-----|
| DRAWING ISSUE |          |             |  |    |     |      | DESIGNED | RM  |
|               |          |             |  |    |     |      | DRAWN    | SC  |
|               |          |             |  |    |     |      | CHECKED  | GMB |
|               |          |             |  |    |     |      | APPROVED |     |
|               |          |             |  |    |     |      |          | CI  |
| A             | 26/06/26 | FOR CONSENT |  |    |     |      |          |     |
| REV           | DATE     | DESCRIPTION |  | SC | GMB | CI   |          |     |
|               |          |             |  | BY | CHK | APPR |          |     |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

## DRAWING TYPICAL SECTIONS SHEET 1

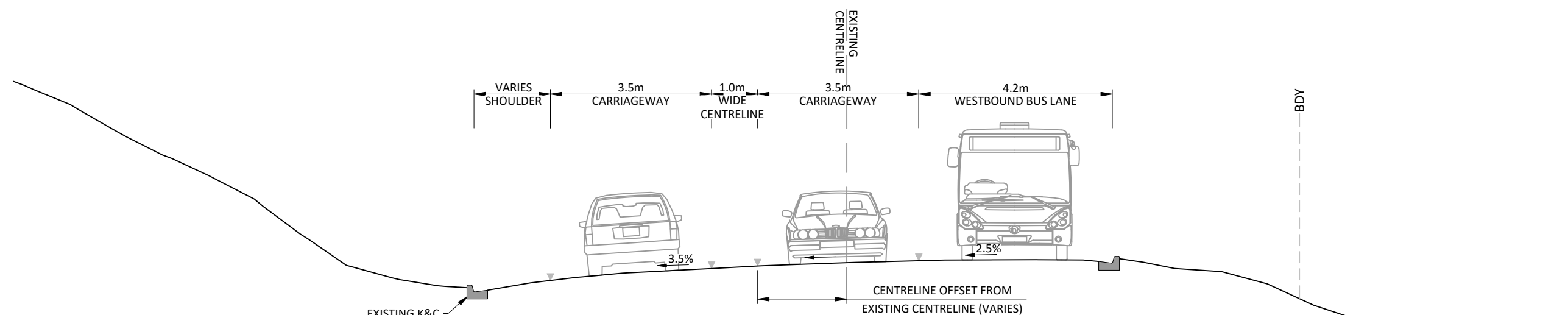
|                     |  |                  |                    |            |  |
|---------------------|--|------------------|--------------------|------------|--|
| STATUS              |  |                  | <b>PRELIMINARY</b> |            |  |
| HORIZONTAL<br>DATUM |  | Mt Nicholas 2000 |                    | SCALE (A3) |  |
| VERTICAL<br>DATUM   |  | NZVD16           |                    | 1:100      |  |
| DRAWING NUMBER      |  |                  |                    | REVISION   |  |
| 149360-00-1301      |  |                  |                    | A          |  |

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

C:\12\45\data\107.7.20-14\149360-Queensdown Simplicity Living\_5670\03 Drawings\001 149360-001 1302.dwg 26/6/2026 3:50 pm lscoper Plotted: 26 Jun 2026 3:50 pm



NEW WATERMAIN (D560)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED

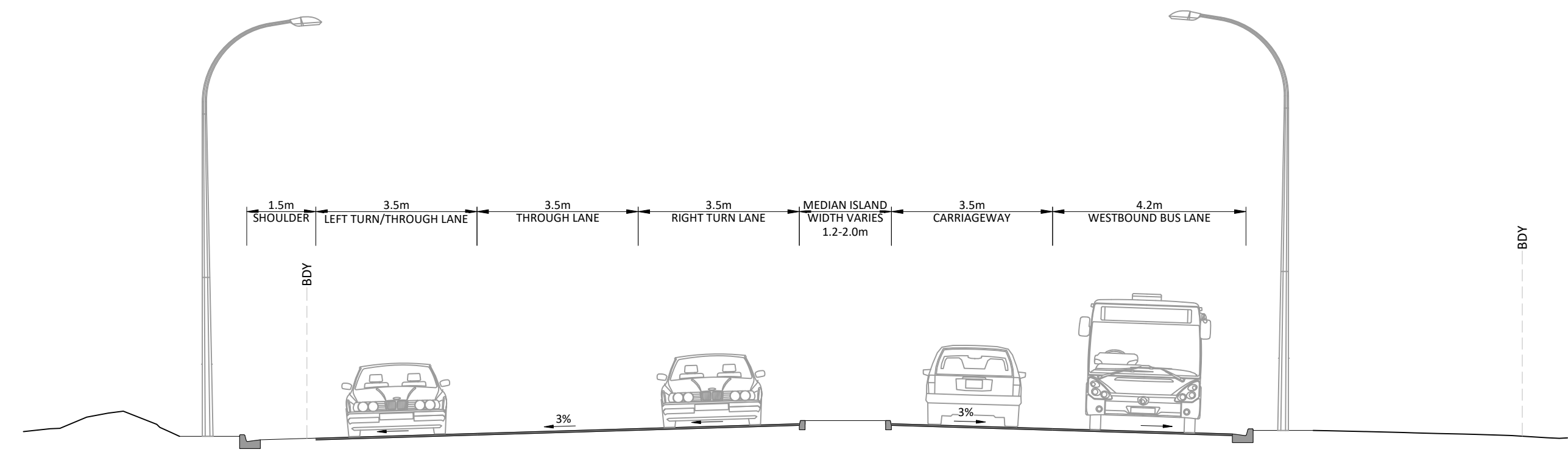
NEW WASTEWATER MAIN (D450)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED

**C**  
1212 CROSS SECTION SH6 CH1570  
SCALE 1:100 @ A3

EXISTING WATERMAIN PIPE (D150)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED

EXISTING WASTEWATER PIPE (D300)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED

1.0



**D**  
1214 CROSS SECTION SH6 CH1910  
SCALE 1:100 @ A3



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| DRAWING ISSUE |          |             |  |  |  |  |  |    |     | DESIGNED | RM       |  |  | CLIENT | SIMPLICITY LIVING | TE PŪTAHI LADIES MILE | PROJECT | TYPICAL SECTIONS | SHEET 2 | DRAWING | STATUS | PRELIMINARY      |                  |            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|               |          |             |  |  |  |  |  |    |     |          |          |                                                                                       |                                                                                       |        |                   |                       |         |                  |         |         |        | HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|               |          |             |  |  |  |  |  |    |     |          |          |                                                                                       |                                                                                       |        |                   |                       |         |                  |         |         |        | VERTICAL DATUM   | NZVD16           | 1:100      |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|               |          |             |  |  |  |  |  |    |     |          |          |                                                                                       |                                                                                       |        |                   |                       |         |                  |         |         |        |                  |                  |            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|               |          |             |  |  |  |  |  |    |     |          |          |                                                                                       |                                                                                       |        |                   |                       |         |                  |         |         |        |                  |                  |            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| A             | 26/06/26 | FOR CONSENT |  |  |  |  |  | SC | GMB | CI       | APPROVED | CI                                                                                    |                                                                                       |        |                   |                       |         |                  |         |         |        |                  |                  |            |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

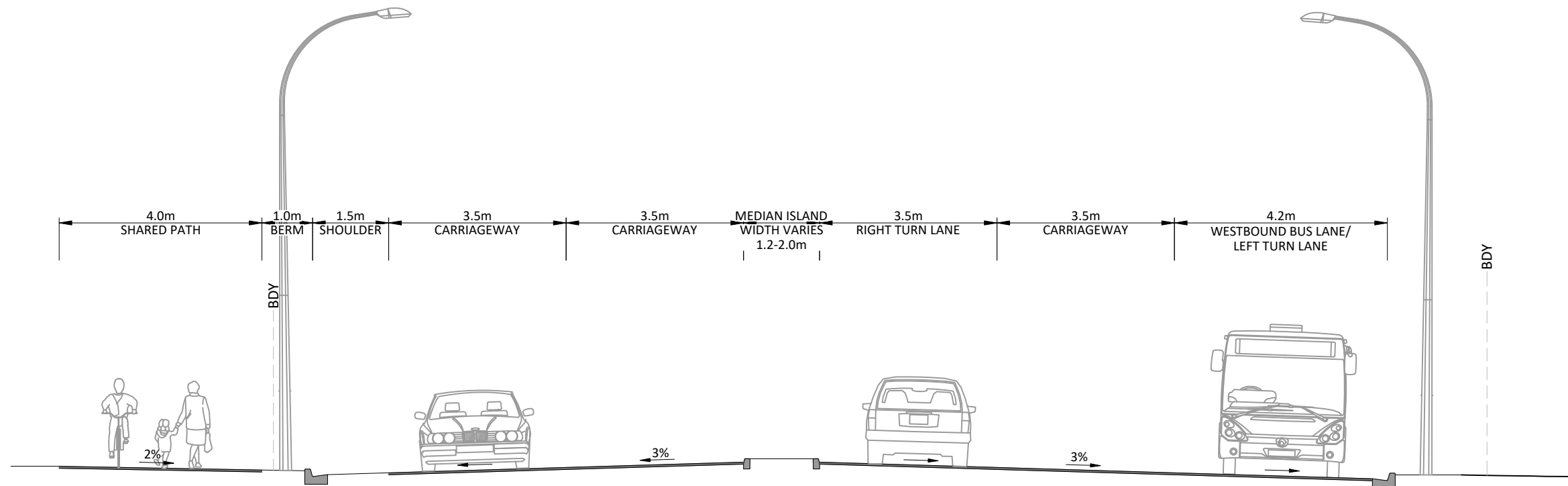


100mm

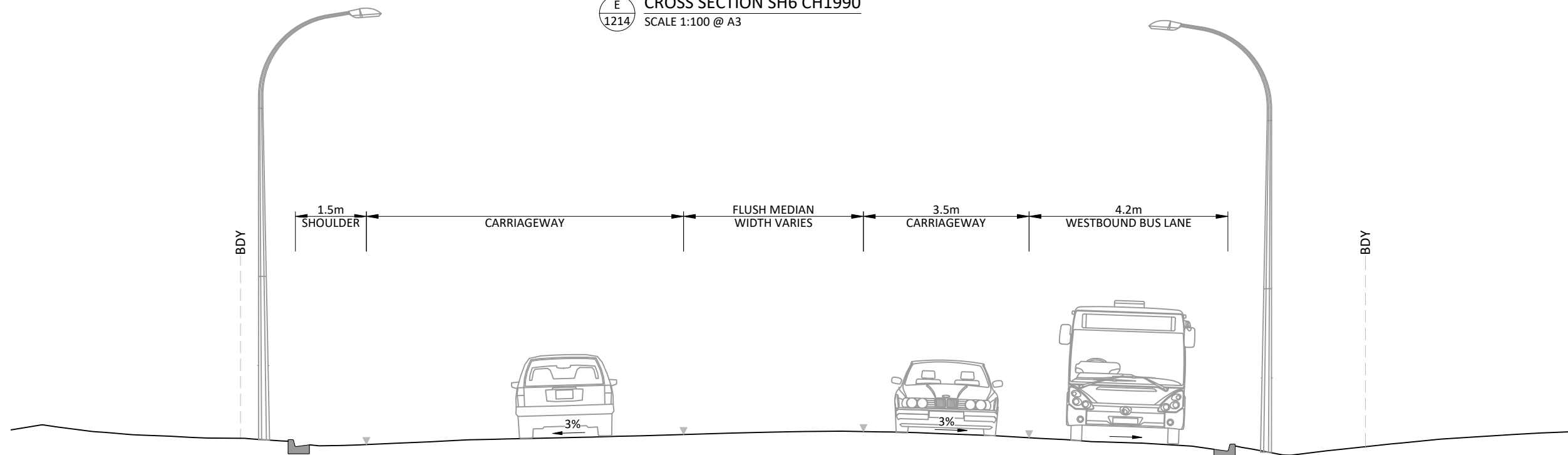
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

C:\12\45\data\107.7.20.14\149360 - Queenstown Simplicity Living\_5670\03 Drawings\001\149360-001-1303.dwg 26/6/2026 3:50 pm Iscooper Plotted: 26 Jun 2026 3:50 pm



E  
1214 CROSS SECTION SH6 CH1990  
SCALE 1:100 @ A3



F  
1214 CROSS SECTION SH6 CH2100  
SCALE 1:100 @ A3

NEW WASTEWATER MAIN (D450)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED

NEW WATER FALLING MAIN (D450)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED

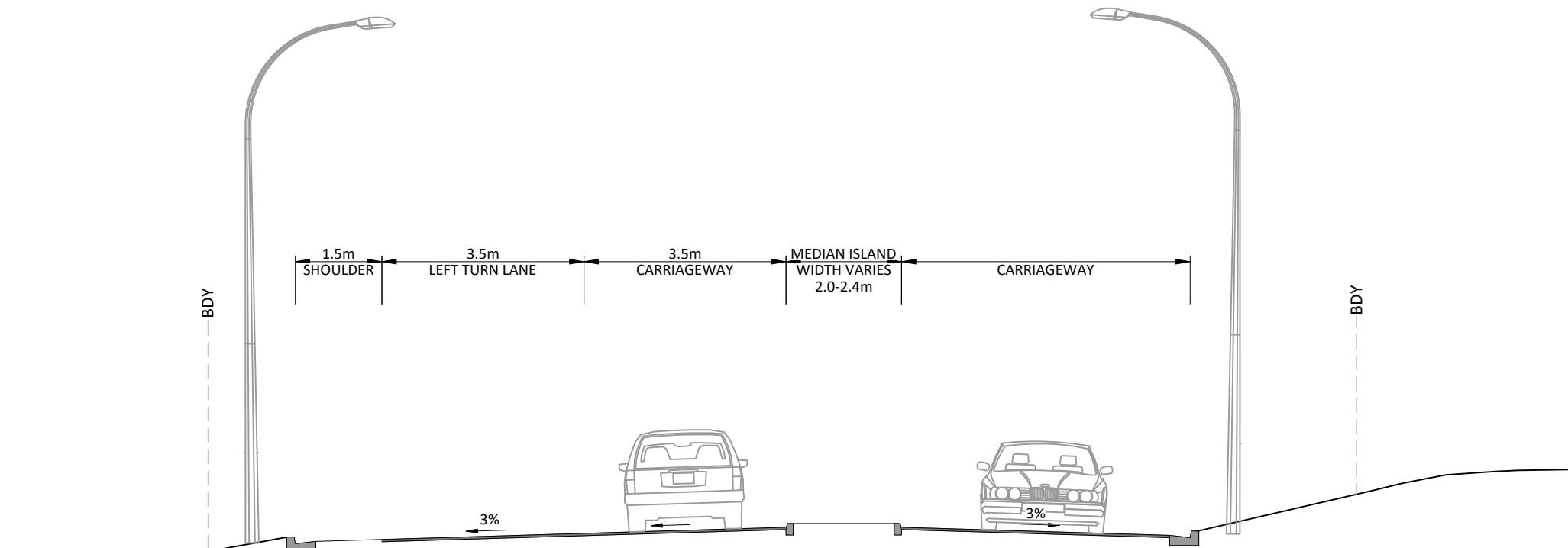
1:100 (A3) 0 1 2 3 4 5m

| DRAWING ISSUE |  | DESIGNED |  | DRAWN |  | CHECKED |  | APPROVED |  |
|---------------|--|----------|--|-------|--|---------|--|----------|--|
|               |  | RM       |  | SC    |  | GMB     |  | CI       |  |
|               |  |          |  |       |  |         |  |          |  |
|               |  |          |  |       |  |         |  |          |  |
|               |  |          |  |       |  |         |  |          |  |
|               |  |          |  |       |  |         |  |          |  |
|               |  |          |  |       |  |         |  |          |  |
|               |  |          |  |       |  |         |  |          |  |
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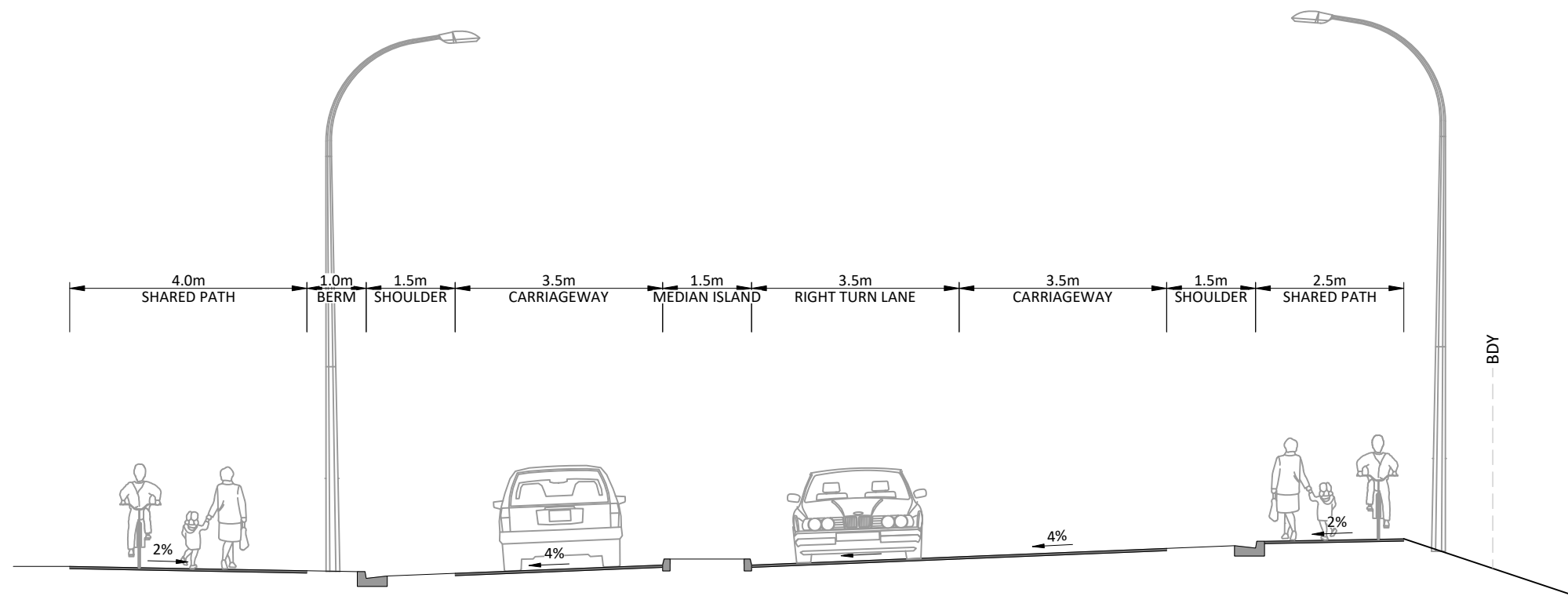
100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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**G**  
1216 CROSS SECTION LOWER SHOTOVER ROAD CH1124  
SCALE 1:100 @ A3



**H**  
1216 CROSS SECTION LOWER SHOTOVER ROAD CH1182  
SCALE 1:100 @ A3



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| DRAWING ISSUE |          |             |  | DESIGNED |     |      |  |
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| REV           | DATE     | DESCRIPTION |  | SC       | GMB | CI   |  |
| A             | 26/06/26 | FOR CONSENT |  | BY       | CHK | APPR |  |

Version 5.0 - August 2024



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
TYPICAL SECTIONS  
SHEET 4

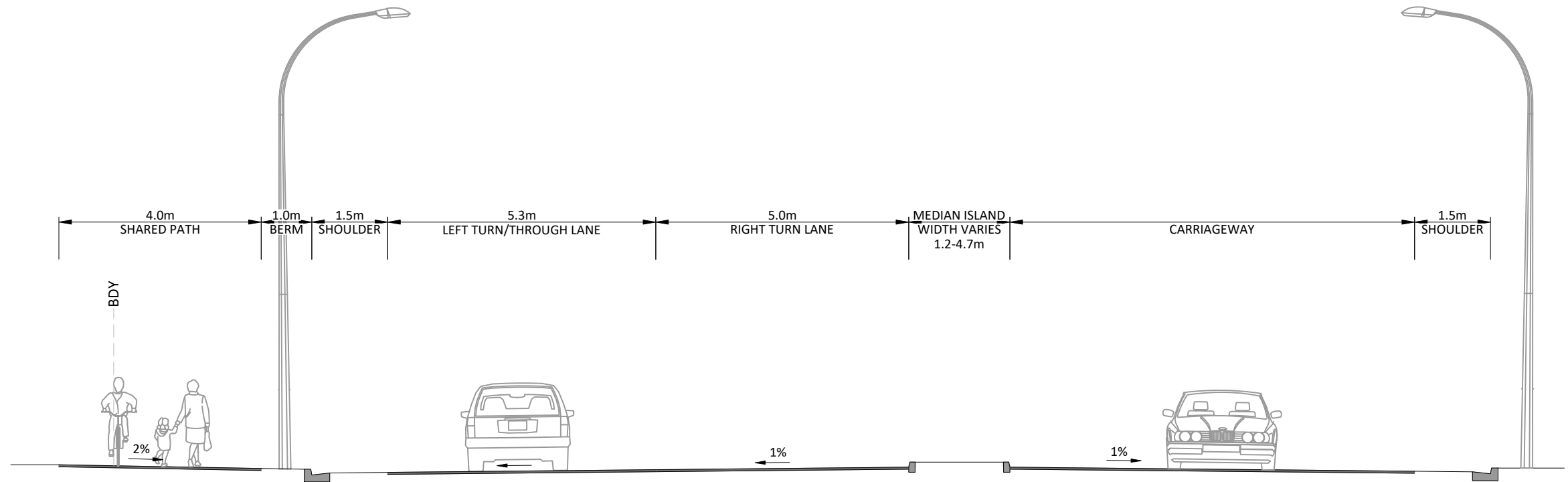
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| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM   | NZVD16           | 1:100      |
| DRAWING NUMBER   | 149360-00-1304   | REVISION   |
|                  |                  | A          |

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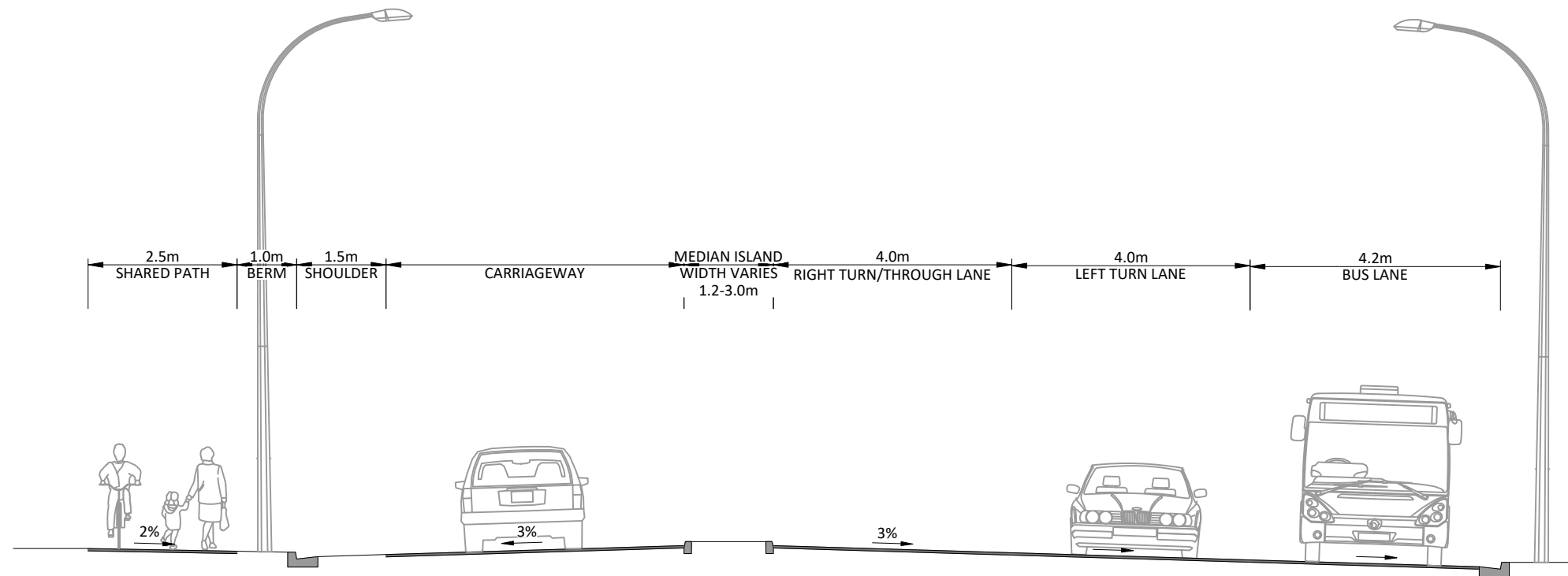
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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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CROSS SECTION LOWER SHOTOVER ROAD CH1545  
SCALE 1:100 @ A3



CROSS SECTION STALKER ROAD CH1597  
SCALE 1:100 @ A3



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| REV           | DATE     | DESCRIPTION |  | BY       | CHK | APPR |  |
| A             | 26/06/26 | FOR CONSENT |  | SC       | GMB | CI   |  |

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PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
TYPICAL SECTIONS  
SHEET 5

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| STATUS<br><b>PRELIMINARY</b> |                  |                     |
| HORIZONTAL DATUM             | Mt Nicholas 2000 | SCALE (A3)<br>1:100 |
| VERTICAL DATUM               | NZVD16           | REVISION<br>A       |
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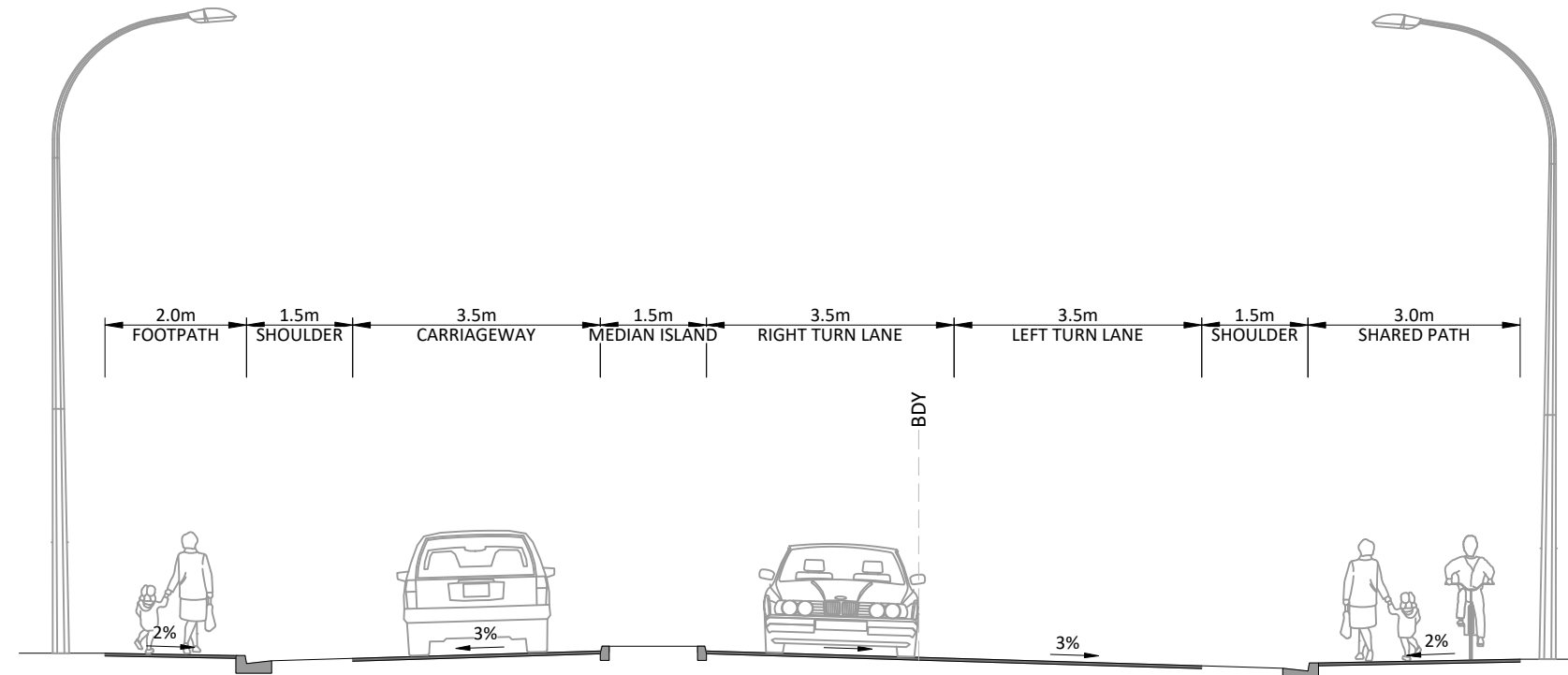
©copyright



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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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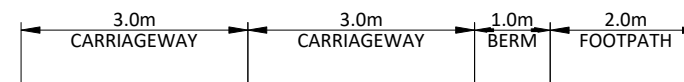
NEW WATER RISING MAIN (D560)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED

K  
1219

CROSS SECTION NEW COLLECTOR ROAD CH0035

SCALE 1:100 @ A3

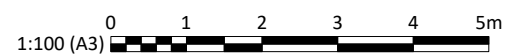
NEW WATER FALLING MAIN (D450)  
HORIZONTAL AND VERTICAL LEVELS  
TO BE CONFIRMED



L  
1219

CROSS SECTION SPENCE ROAD CH10068

SCALE 1:100 @ A3



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| A             | 26/06/26 | FOR CONSENT |  | SC       | GMB | CI   |  |
| REV           | DATE     | DESCRIPTION |  | BY       | CHK | APPR |  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
TYPICAL SECTIONS  
SHEET 6

| STATUS           |                  |            |
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| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
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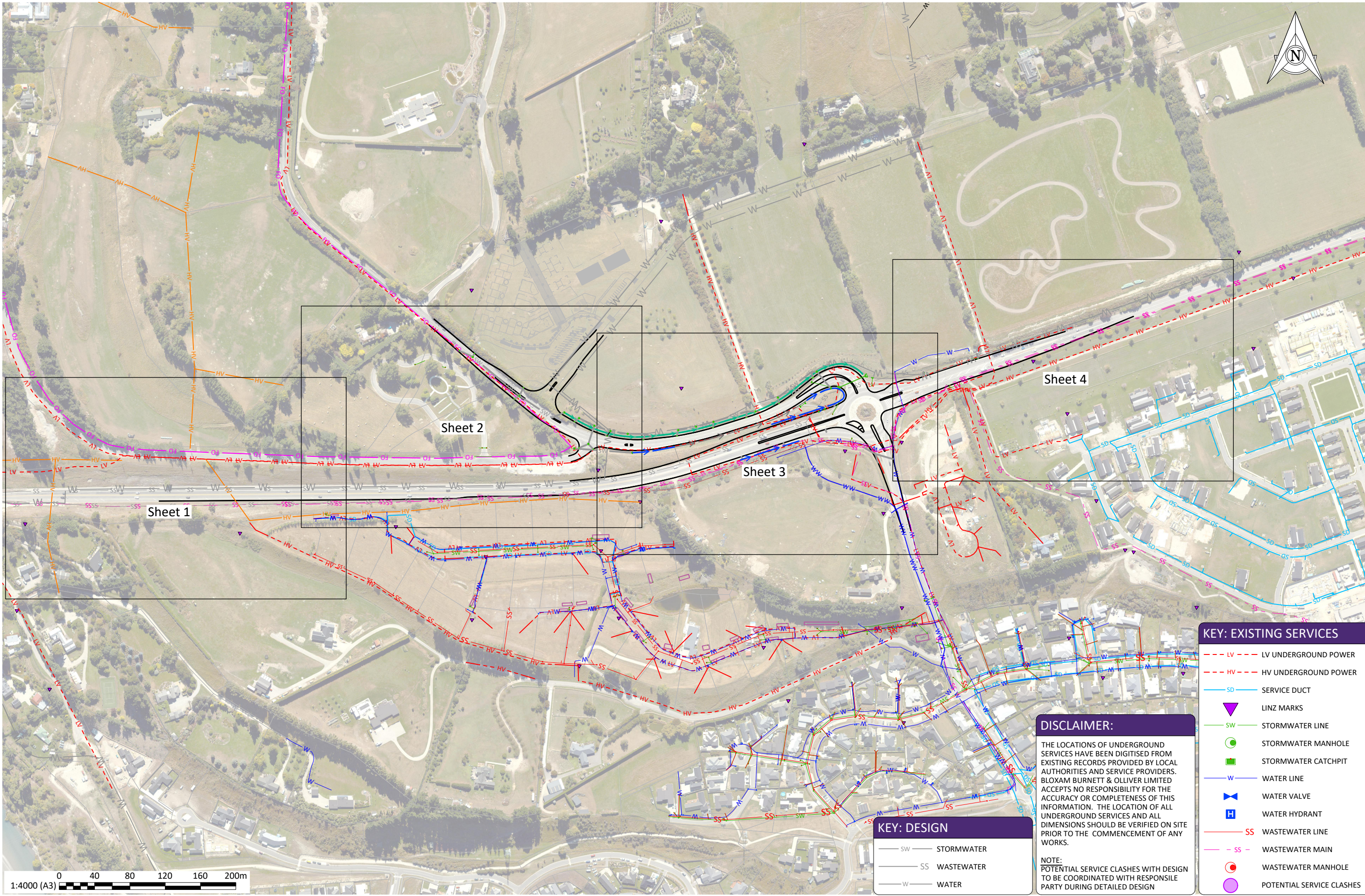


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KEY: EXISTING SERVICES

- LV UNDERGROUND POWER
- HV UNDERGROUND POWER
- SERVICE DUCT
- LINZ MARKS
- STORMWATER LINE
- STORMWATER MANHOLE
- STORMWATER CATCHPIT
- WATER LINE
- WATER VALVE
- WATER HYDRANT
- WASTEWATER LINE
- WASTEWATER MAIN
- WASTEWATER MANHOLE
- POTENTIAL SERVICE CLASHES

KEY: DESIGN

- STORMWATER
- WASTEWATER
- WATER

DISCLAIMER:

THE LOCATIONS OF UNDERGROUND SERVICES HAVE BEEN DIGITISED FROM EXISTING RECORDS PROVIDED BY LOCAL AUTHORITIES AND SERVICE PROVIDERS. BLOXAM BURNETT & OLLIVER LIMITED ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. THE LOCATION OF ALL UNDERGROUND SERVICES AND ALL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

NOTE: POTENTIAL SERVICE CLASHES WITH DESIGN TO BE COORDINATED WITH RESPONSIBLE PARTY DURING DETAILED DESIGN

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PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
EXISTING SERVICES OVERVIEW

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| STATUS<br><b>PRELIMINARY</b> |                  |                      |
| HORIZONTAL DATUM             | Mt Nicholas 2000 | SCALE (A3)<br>1:4000 |
| VERTICAL DATUM               | NZVD16           | REVISION<br>A        |
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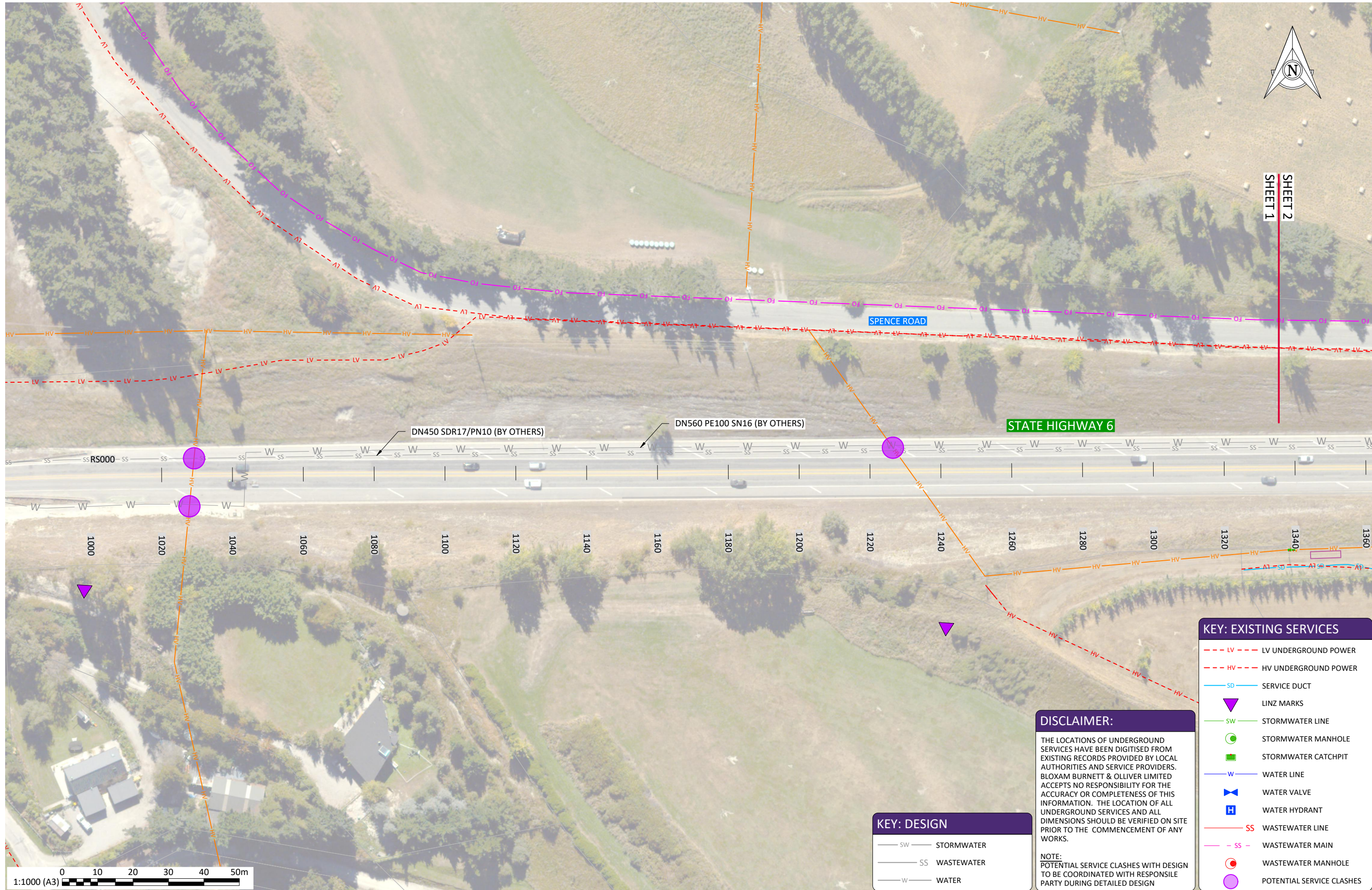


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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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| REV           | DATE     | FOR         | DESCRIPTION | SC       | GMB | CI   | APPR |
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PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
EXISTING SERVICES  
SHEET 1

| STATUS           |                  |                | SCALE (A3)     |          |
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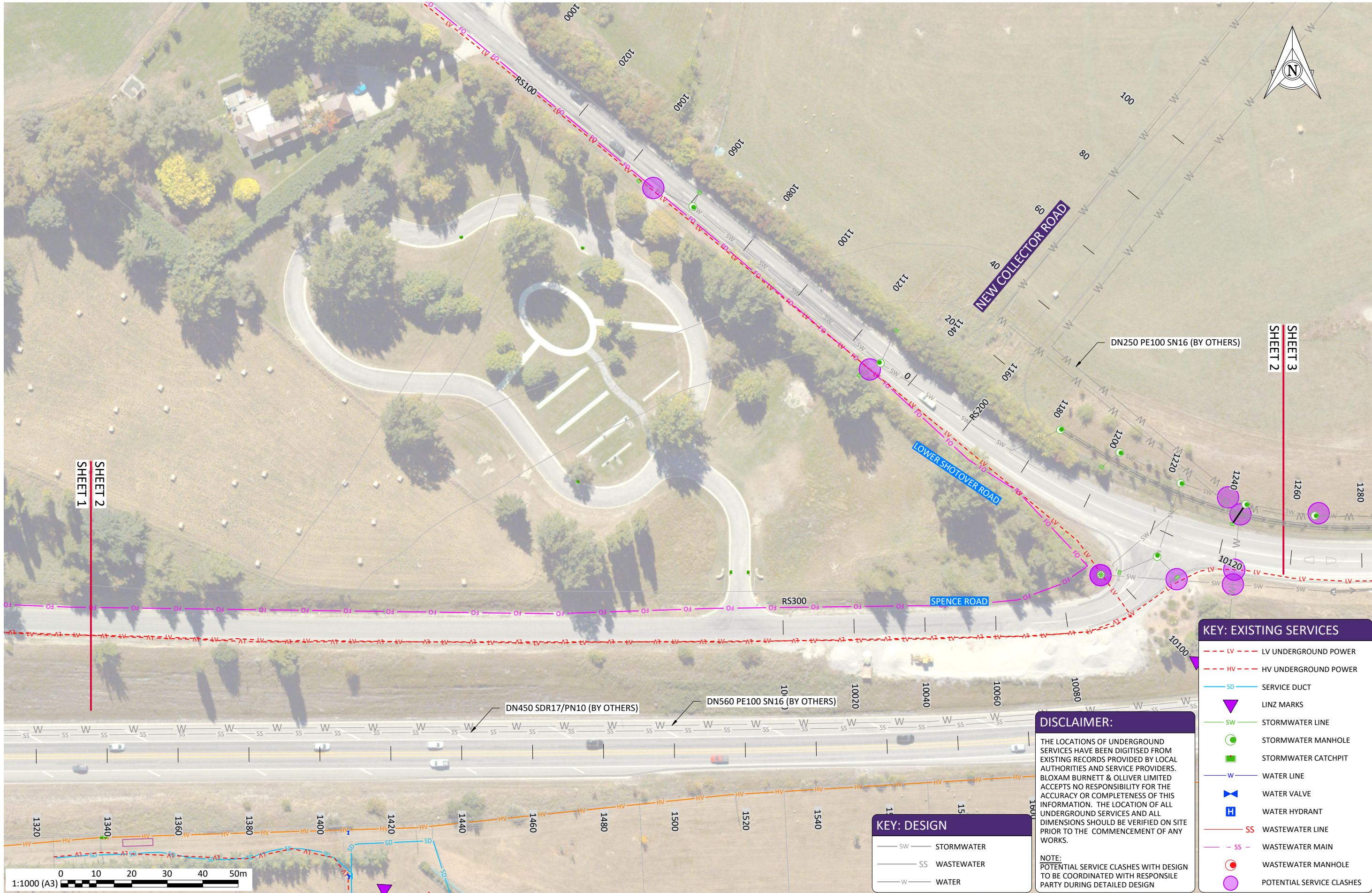


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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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| KEY: EXISTING SERVICES                    |                           |
|-------------------------------------------|---------------------------|
| <span style="color: red;">---</span> LV   | LV UNDERGROUND POWER      |
| <span style="color: red;">---</span> HV   | HV UNDERGROUND POWER      |
| <span style="color: blue;">---</span> SD  | SERVICE DUCT              |
| <span style="color: green;">---</span> SW | STORMWATER LINE           |
| <span style="color: green;">●</span>      | STORMWATER MANHOLE        |
| <span style="color: green;">■</span>      | STORMWATER CATCHPIT       |
| <span style="color: blue;">---</span> W   | WATER LINE                |
| <span style="color: blue;">✕</span>       | WATER VALVE               |
| <span style="color: blue;">H</span>       | WATER HYDRANT             |
| <span style="color: red;">---</span> SS   | WASTEWATER LINE           |
| <span style="color: red;">---</span> SS   | WASTEWATER MAIN           |
| <span style="color: red;">●</span>        | WASTEWATER MANHOLE        |
| <span style="color: red;">○</span>        | POTENTIAL SERVICE CLASHES |

**DISCLAIMER:**

THE LOCATIONS OF UNDERGROUND SERVICES HAVE BEEN DIGITISED FROM EXISTING RECORDS PROVIDED BY LOCAL AUTHORITIES AND SERVICE PROVIDERS. BLOXAM BURNETT & OLLIVER LIMITED ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. THE LOCATION OF ALL UNDERGROUND SERVICES AND ALL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

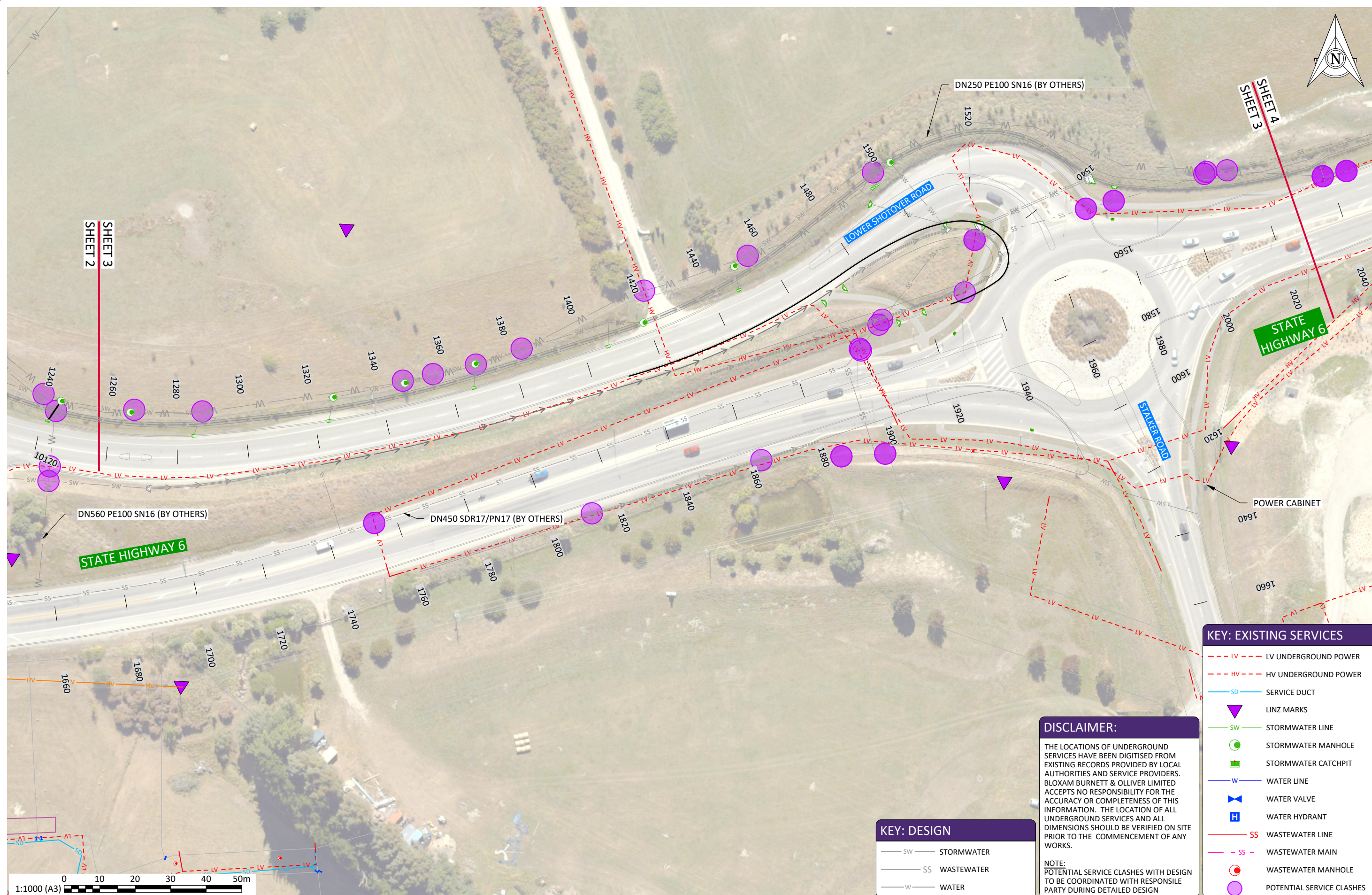
**NOTE:**

POTENTIAL SERVICE CLASHES WITH DESIGN TO BE COORDINATED WITH RESPONSIBLE PARTY DURING DETAILED DESIGN

| KEY: DESIGN                               |            |
|-------------------------------------------|------------|
| <span style="color: green;">---</span> SW | STORMWATER |
| <span style="color: red;">---</span> SS   | WASTEWATER |
| <span style="color: blue;">---</span> W   | WATER      |

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[illegible]

CLIENT **% Simplicity**  
Living

PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING

EXISTING SERVICES  
SHEET 3

|                  |                  |             |        |
|------------------|------------------|-------------|--------|
| STATUS           |                  | PRELIMINARY |        |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3)  | 1:1000 |
| VERTICAL DATUM   | NZVD16           |             |        |
| DRAWING NUMBER   |                  | REVISION    |        |
| 149360-00-2003   |                  | A           |        |



[illegible]

CLIENT

**% Simplicity**  
Living

PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

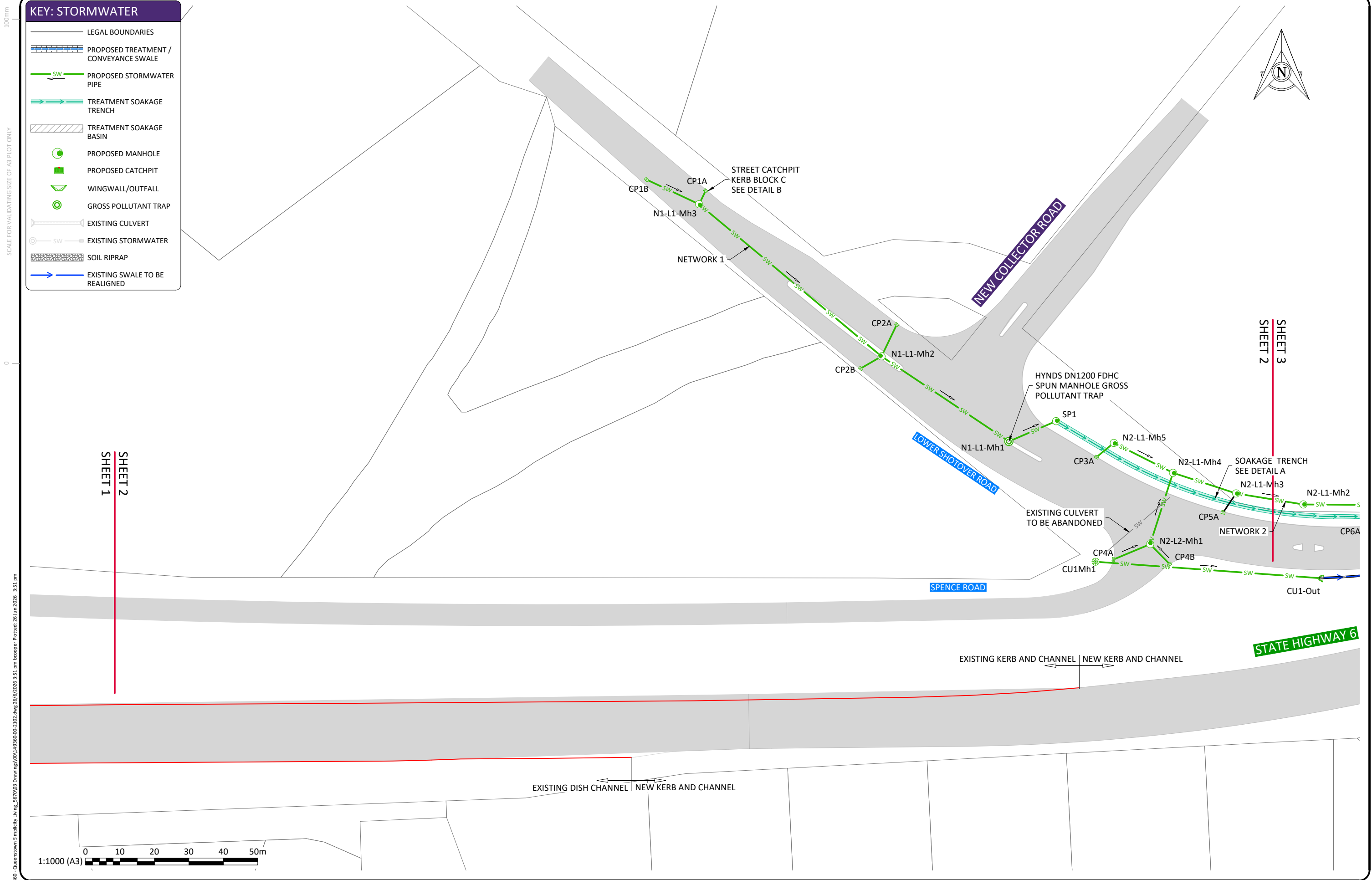
DRAWING  
EXISTING SERVICES  
SHEET 4

|                  |                  |                    |        |
|------------------|------------------|--------------------|--------|
| STATUS           |                  | <b>PRELIMINARY</b> |        |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3)         | 1:1000 |
| VERTICAL DATUM   | NZVD16           |                    |        |
| DRAWING NUMBER   |                  | REVISION           |        |
| 149360-00-2004   |                  | A                  |        |









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|               |          |             |  |  |  |  |  |    |          |                  |                                                                                       |                                                                                       |        |                                            |         |                       |         |                  |            |  |             |
|---------------|----------|-------------|--|--|--|--|--|----|----------|------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------|--------------------------------------------|---------|-----------------------|---------|------------------|------------|--|-------------|
| DRAWING ISSUE |          |             |  |  |  |  |  |    | DESIGNED | RM               |  |  | CLIENT | SIMPLICITY LIVING<br>TE PŪTAHI LADIES MILE | PROJECT | STORMWATER<br>SHEET 2 | DRAWING | STATUS           |            |  | PRELIMINARY |
|               |          |             |  |  |  |  |  |    |          | HORIZONTAL DATUM |                                                                                       |                                                                                       |        |                                            |         |                       |         | Mt Nicholas 2000 | SCALE (A3) |  |             |
|               |          |             |  |  |  |  |  |    |          | VERTICAL DATUM   |                                                                                       |                                                                                       |        |                                            |         |                       |         | NZVD16           | 1:1000     |  |             |
|               |          |             |  |  |  |  |  |    |          | DRAWING NUMBER   |                                                                                       |                                                                                       |        |                                            |         |                       |         | REVISION         |            |  |             |
|               |          |             |  |  |  |  |  |    |          | 149360-00-2102   |                                                                                       |                                                                                       |        |                                            |         |                       |         | A                |            |  |             |
| A             | 26/06/26 | FOR CONSENT |  |  |  |  |  | SC | GMB      | CI               | APPROVED                                                                              | CI                                                                                    |        |                                            |         |                       |         |                  |            |  |             |
| REV           | DATE     | DESCRIPTION |  |  |  |  |  | BY | CHK      | APPR             |                                                                                       |                                                                                       |        |                                            |         |                       |         |                  |            |  |             |

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100mm

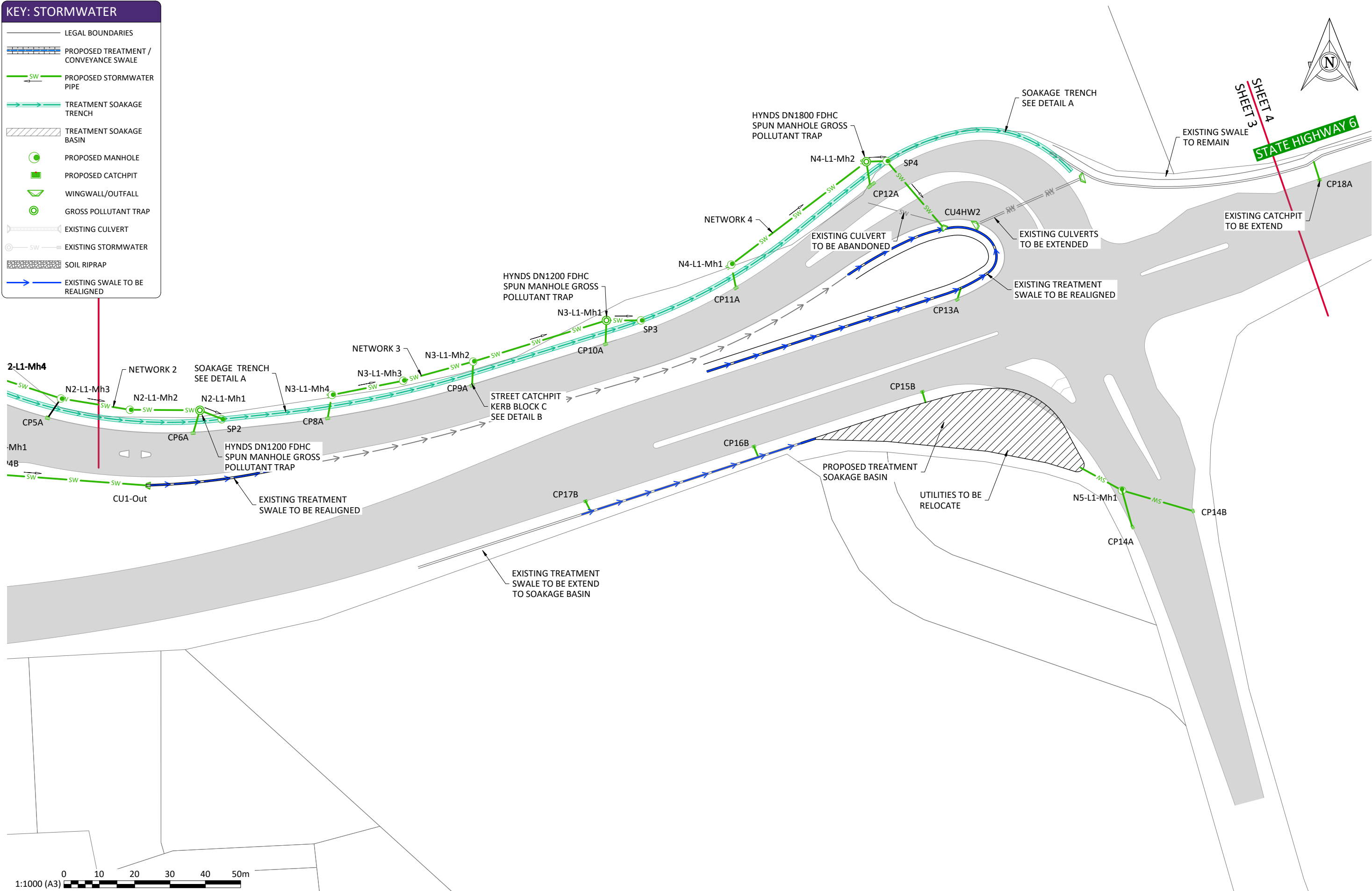
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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# KEY: STORMWATER

- LEGAL BOUNDARIES
- PROPOSED TREATMENT / CONVEYANCE SWALE
- PROPOSED STORMWATER PIPE
- TREATMENT SOAKAGE TRENCH
- TREATMENT SOAKAGE BASIN
- PROPOSED MANHOLE
- PROPOSED CATCHPIT
- WINGWALL/OUTFALL
- GROSS POLLUTANT TRAP
- EXISTING CULVERT
- EXISTING STORMWATER
- SOIL RIPRAP
- EXISTING SWALE TO BE REALIGNED



| REV | DATE     | DESCRIPTION | BY | CHK | APPR |
|-----|----------|-------------|----|-----|------|
| A   | 26/06/26 | FOR CONSENT | SC | GMB | CI   |

|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |

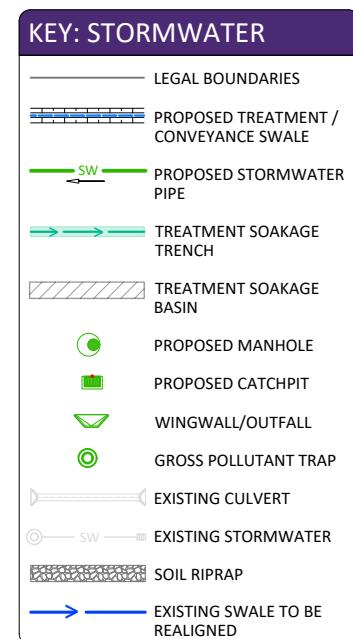


|         |                                            |
|---------|--------------------------------------------|
| PROJECT | SIMPLICITY LIVING<br>TE PŪTAHI LADIES MILE |
|---------|--------------------------------------------|

|         |                       |
|---------|-----------------------|
| DRAWING | STORMWATER<br>SHEET 3 |
|---------|-----------------------|

|                  |                  |
|------------------|------------------|
| STATUS           | PRELIMINARY      |
| HORIZONTAL DATUM | Mt Nicholas 2000 |
| VERTICAL DATUM   | NZVD16           |
| DRAWING NUMBER   | 149360-00-2103   |
| SCALE (A3)       | 1:1000           |
| REVISION         | A                |



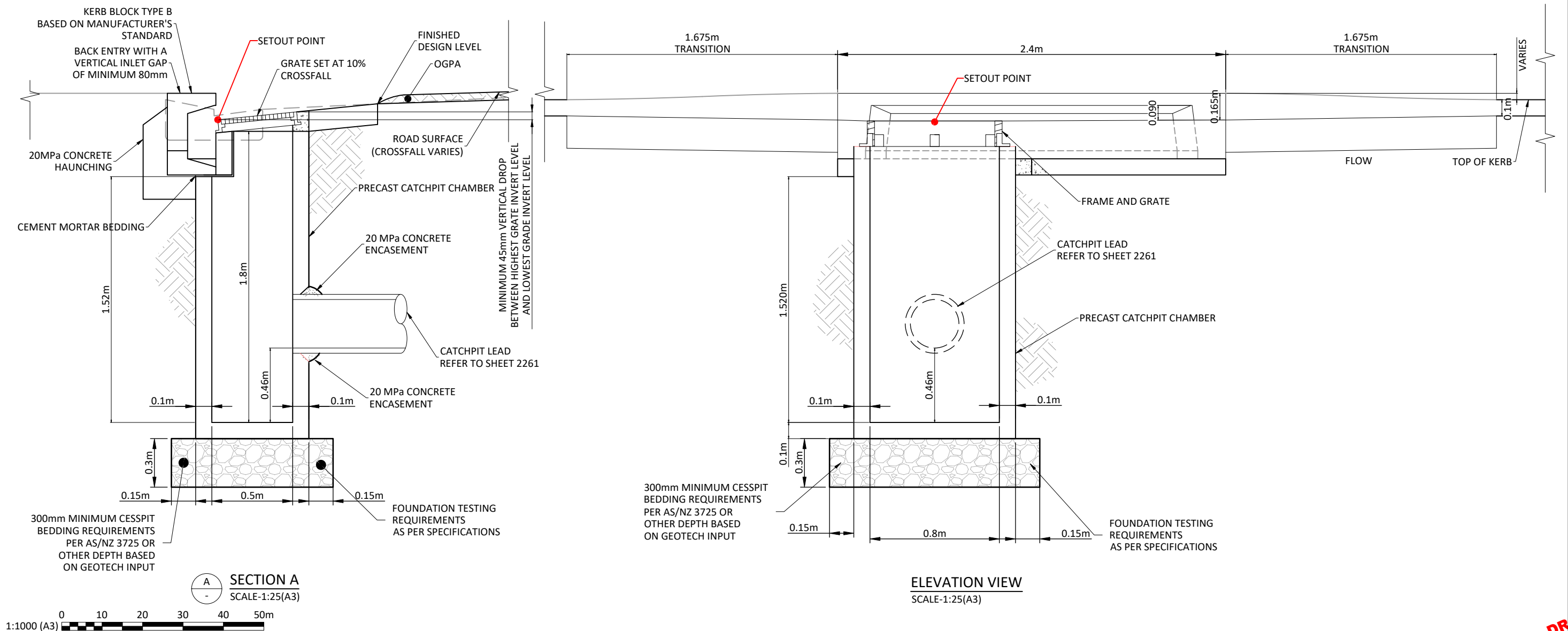
[illegible]

PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING

STORMWATER  
SHEET 4

|                  |                  |                    |        |
|------------------|------------------|--------------------|--------|
| STATUS           |                  | <b>PRELIMINARY</b> |        |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3)         | 1:1000 |
| VERTICAL DATUM   | NZVD16           |                    |        |
| DRAWING NUMBER   |                  | REVISION           |        |
| 149360-00-2104   |                  | A                  |        |



**DRAFT COPY  
NOT APPROVED**

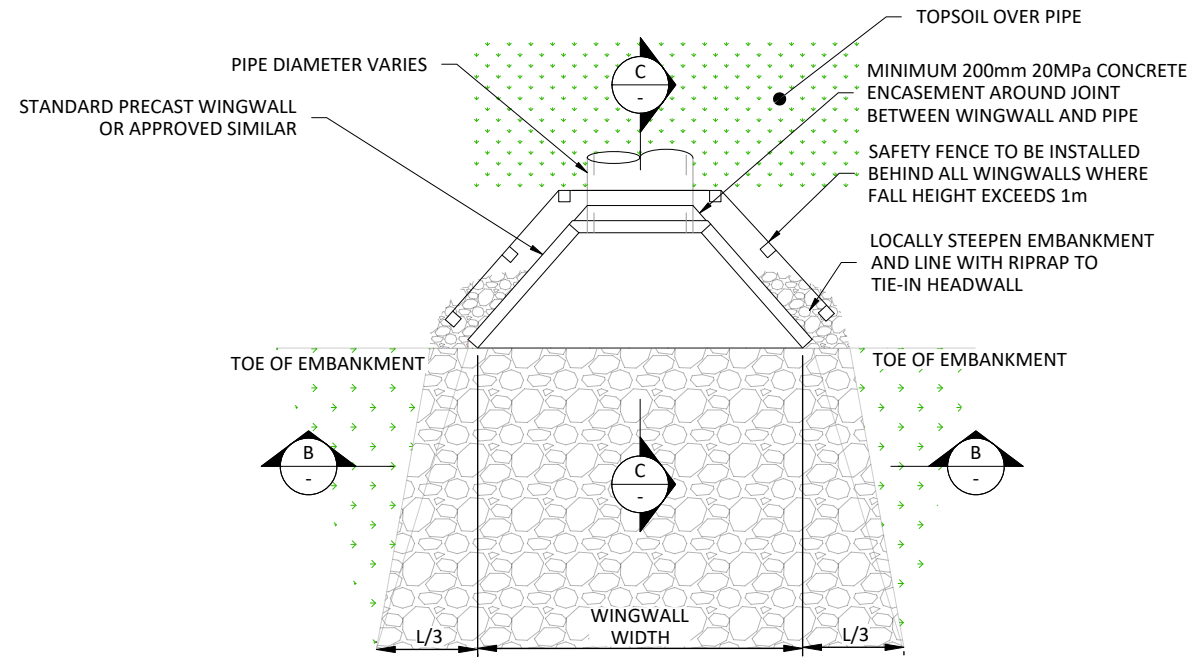
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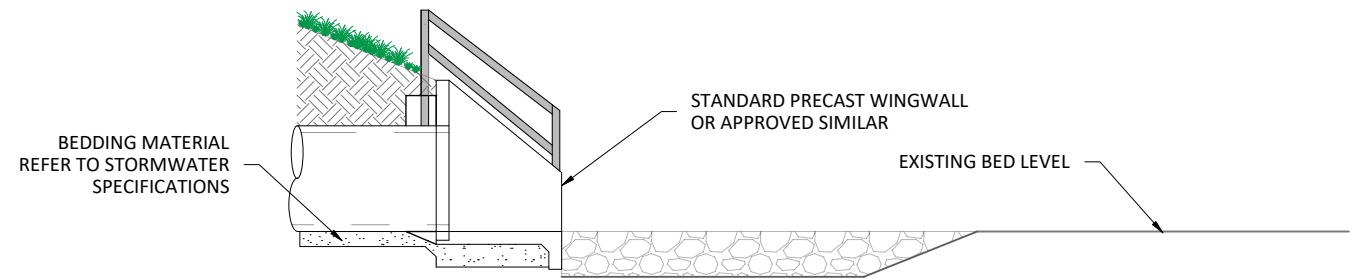
100mm  
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

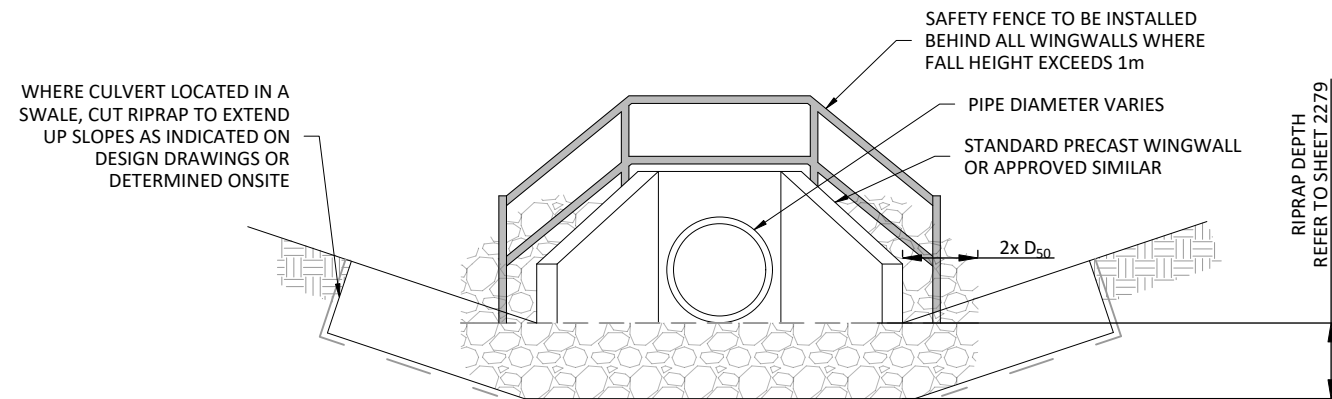
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**A** TYPICAL RIPRAP HEADWALL OUTLET SCOUR PROTECTION  
SCALE 1:50



**C** TYPICAL RIPRAP HEADWALL OUTLET SCOUR PROTECTION  
SCALE 1:50



**B** TYPICAL RIPRAP HEADWALL OUTLET SCOUR PROTECTION  
SCALE 1:50

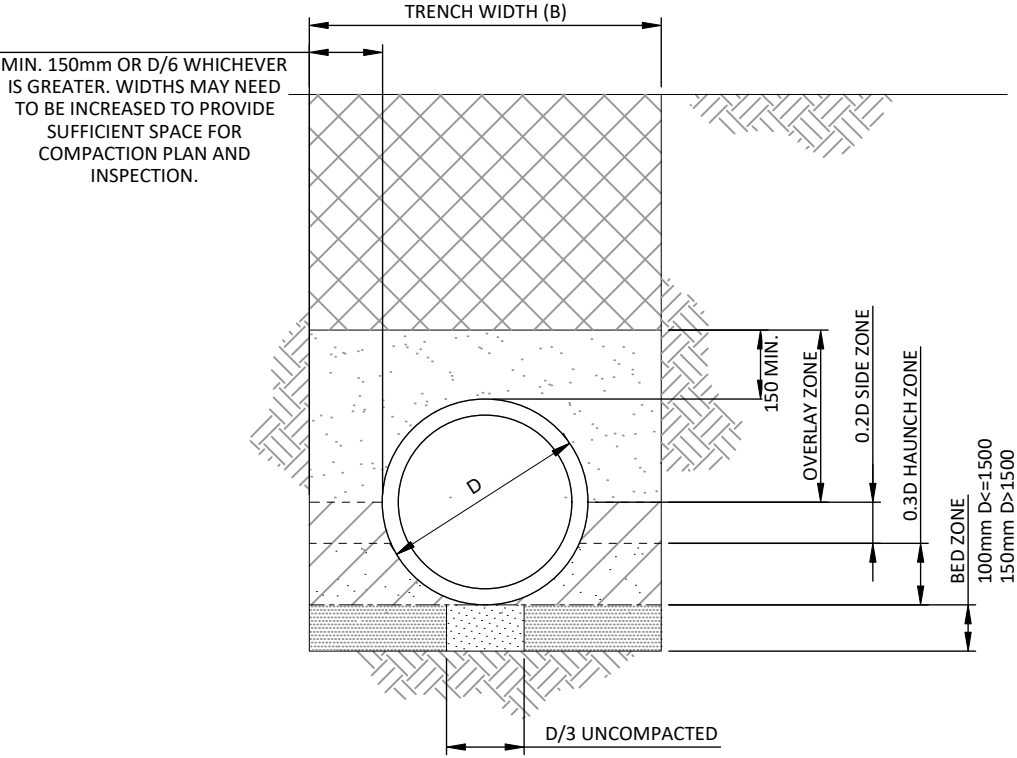
- GENERAL NOTES:**
- PIPE INSTALLATIONS AS PER SPECIFICATIONS AND AS/NZS 3725:2007.
  - FOR RIPRAP TYPE REFER TO THE SPECIFICATIONS.
  - SAFETY FENCE REQUIRED AT ALL CULVERTS AND NETWORK OUTLETS WHERE FALL HEIGHT IS GREATER THAN 1m. SAFETY FENCE SHALL MEET THE REQUIREMENTS FOR NZ BUILDING CODE CLAUSES B1 AND B2. LOAD CAPACITY SHALL COMPLY WITH THE REQUIREMENTS OF NZTA BRIDGE MANUAL 3RD EDITION, AMENDMENT 4, SECTION B6.4.
  - ALL SAFETY FENCES ARE TO BE TYPE A:
    - BE COMPLIANT TO FIGURE 2a of NZBC F4
    - HAVE MAXIMUM GAP OF BETWEEN VERTICAL BARS OF 100mm
    - HAVE A MAXIMUM GAP OF 100mm UNDER THE BOTTOM OF THE FENCE-HAVE A MINIMUM HEIGHT OF 1100mm

1:1000 (A3) 0 10 20 30 40 50m

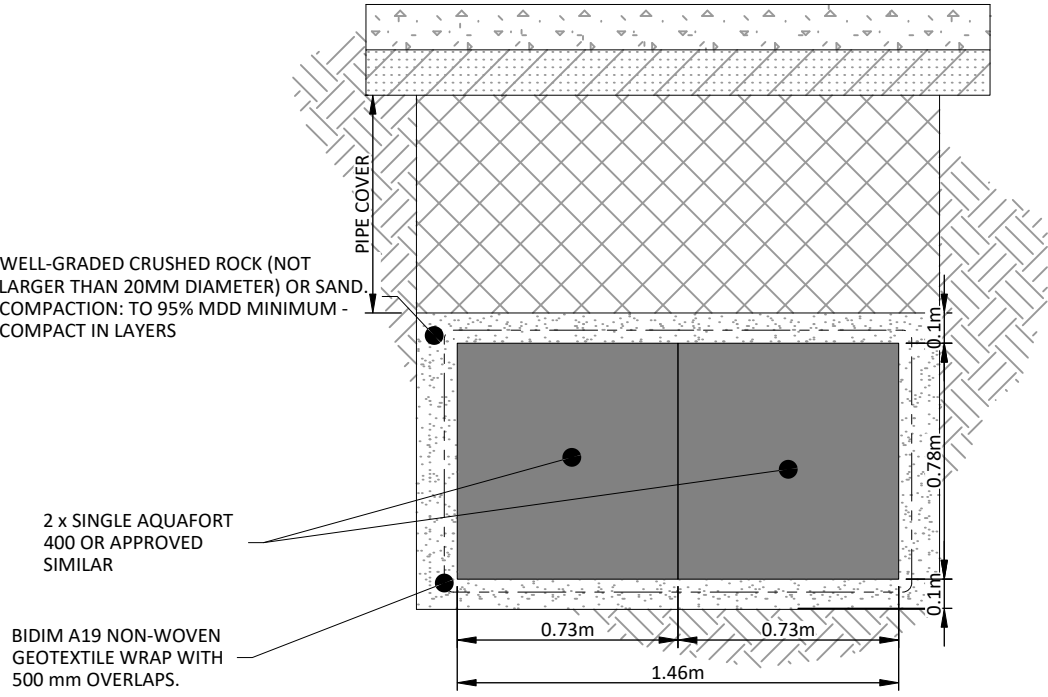
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| DRAWING ISSUE |          |             |  |    |     |      | DESIGNED |
|               |          |             |  |    |     |      | RM       |
|               |          |             |  |    |     |      | DRAWN    |
|               |          |             |  |    |     |      | SC       |
|               |          |             |  |    |     |      | CHECKED  |
|               |          |             |  |    |     |      | GMB      |
|               |          |             |  |    |     |      | APPROVED |
|               |          |             |  |    |     |      | CI       |
| A             | 26/06/26 | FOR CONSENT |  | SC | GMB | CI   |          |
| REV           | DATE     | DESCRIPTION |  | BY | CHK | APPR |          |

100mm  
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY  
0  
C:\1145\data\107\_120\_141\149360 - Queenstown Simplicity Living\_5670\03 Drawings\001\_149360-00-2152.dwg 26/06/2024 3:52 pm bcooper Plotted: 26 Jun 2024 3:52 pm  
Version 5.0 - August 2024

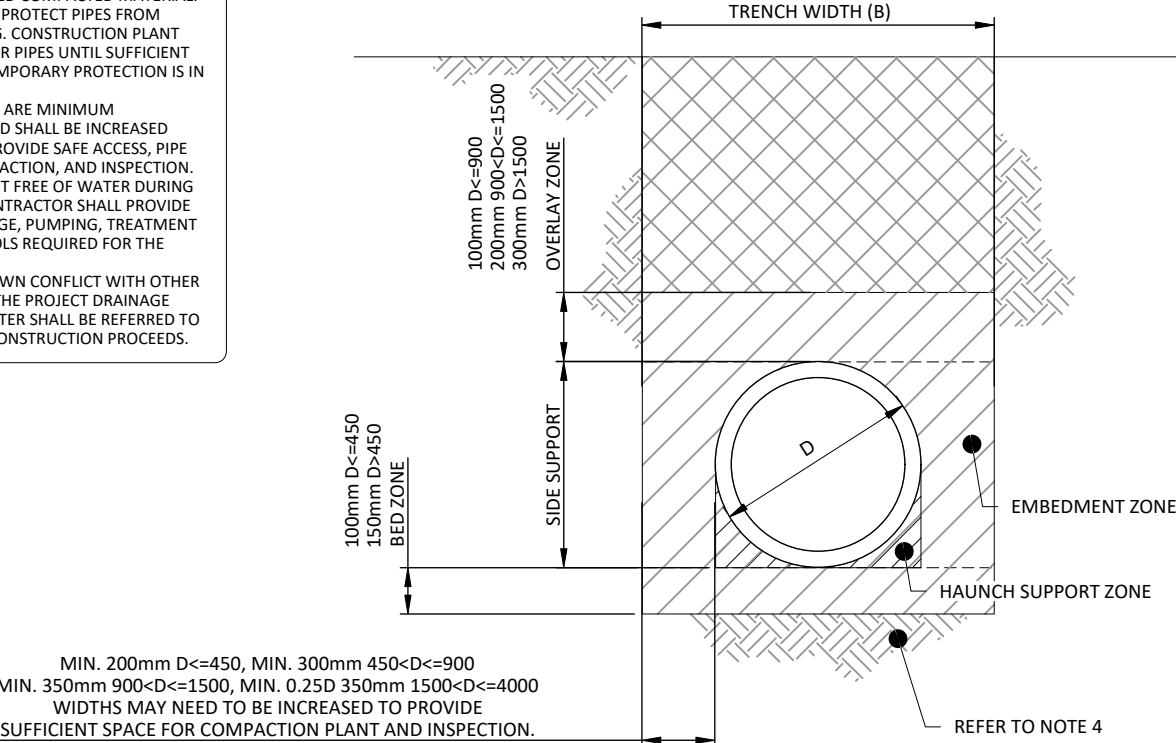
- NOTES:**
1. DETAILS ARE TO BE READ IN CONJUNCTION WITH THE PROJECT DRAINAGE SPECIFICATION, NZTA P46, AS/NZS 3725 FOR CONCRETE PIPES, AND AS/NZS 2566 FOR FLEXIBLE PIPES.
  2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE..
  3. PIPE SIZE, CLASS, MATERIAL, SUPPORT TYPE, COVER, INVERT LEVEL AND ALIGNMENT SHALL BE AS SHOWN ON THE DRAINAGE LONG SECTIONS, SCHEDULES AND RELEVANT PROJECT DRAWINGS..
  4. CONCRETE PIPES SHALL BE INSTALLED IN ACCORDANCE WITH AS/NZS 3725 AND THE PROJECT DRAINAGE SPECIFICATION. UNLESS NOTED OTHERWISE, CONCRETE PIPES UNDER PAVEMENTS SHALL HAVE HS2 BEDDING AND SUPPORT, AND CONCRETE PIPES OUTSIDE PAVEMENTS SHALL HAVE H2 BEDDING AND SUPPORT. AND IN ACCORDANCE WITH THE SPECIFICATION.
  5. FLEXIBLE PIPES SHALL BE INSTALLED IN ACCORDANCE WITH AS/NZS 2566 AND THE PROJECT DRAINAGE SPECIFICATION.
  6. BEDDING, HAUNCH, SIDE SUPPORT, EMBEDMENT, OVERLAY AND BACKFILL MATERIALS SHALL BE AS SPECIFIED IN THE PROJECT DRAINAGE SPECIFICATION AND COMPACTED TO THE SPECIFIED REQUIREMENTS.
  7. EXCAVATED MATERIAL SHALL NOT BE USED WITHIN THE BEDDING, HAUNCH, SIDE SUPPORT, EMBEDMENT OR OVERLAY ZONES UNLESS SPECIFICALLY APPROVED BY THE ENGINEER.
  8. THE TRENCH BASE SHALL BE INSPECTED AND ACCEPTED BY THE ENGINEER PRIOR TO PLACEMENT OF BEDDING MATERIAL. UNSUITABLE, WEAK, ORGANIC, UNCONTROLLED FILL OR CONTAMINATED MATERIAL SHALL BE UNDERCUT AND REPLACED AS DIRECTED BY THE ENGINEER.
  9. WHERE GROUNDWATER IS ENCOUNTERED AND CANNOT BE CONTROLLED BY NORMAL DRAINAGE OR PUMPING, DRAINAGE AGGREGATE MAY BE USED SUBJECT TO THE ENGINEER'S APPROVAL AND SHALL BE WRAPPED IN SUITABLE GEOTEXTILE WHERE REQUIRED.
  10. TRENCH WALLS AND SIDE SUPPORT ZONES SHALL PROVIDE ADEQUATE SUPPORT TO THE PIPE EMBEDMENT. WHERE THIS CANNOT BE ACHIEVED, UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROVED COMPACTED MATERIAL.
  11. TRENCH WALLS AND SIDE SUPPORT ZONES SHALL PROVIDE ADEQUATE SUPPORT TO THE PIPE EMBEDMENT. WHERE THIS CANNOT BE ACHIEVED, UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROVED COMPACTED MATERIAL.
  12. THE CONTRACTOR SHALL PROTECT PIPES FROM CONSTRUCTION LOADING. CONSTRUCTION PLANT SHALL NOT OPERATE OVER PIPES UNTIL SUFFICIENT COVER OR APPROVED TEMPORARY PROTECTION IS IN PLACE.
  13. TRENCH WIDTHS SHOWN ARE MINIMUM REQUIREMENTS ONLY AND SHALL BE INCREASED WHERE NECESSARY TO PROVIDE SAFE ACCESS, PIPE LAYING, JOINTING, COMPACTION, AND INSPECTION.
  14. ALL WORKS SHALL BE KEPT FREE OF WATER DURING CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY DRAINAGE, PUMPING, TREATMENT AND DISCHARGE CONTROLS REQUIRED FOR THE WORKS.
  15. WHERE THE DETAILS SHOWN CONFLICT WITH OTHER PROJECT DRAWINGS OR THE PROJECT DRAINAGE SPECIFICATION, THE MATTER SHALL BE REFERRED TO THE ENGINEER BEFORE CONSTRUCTION PROCEEDS.



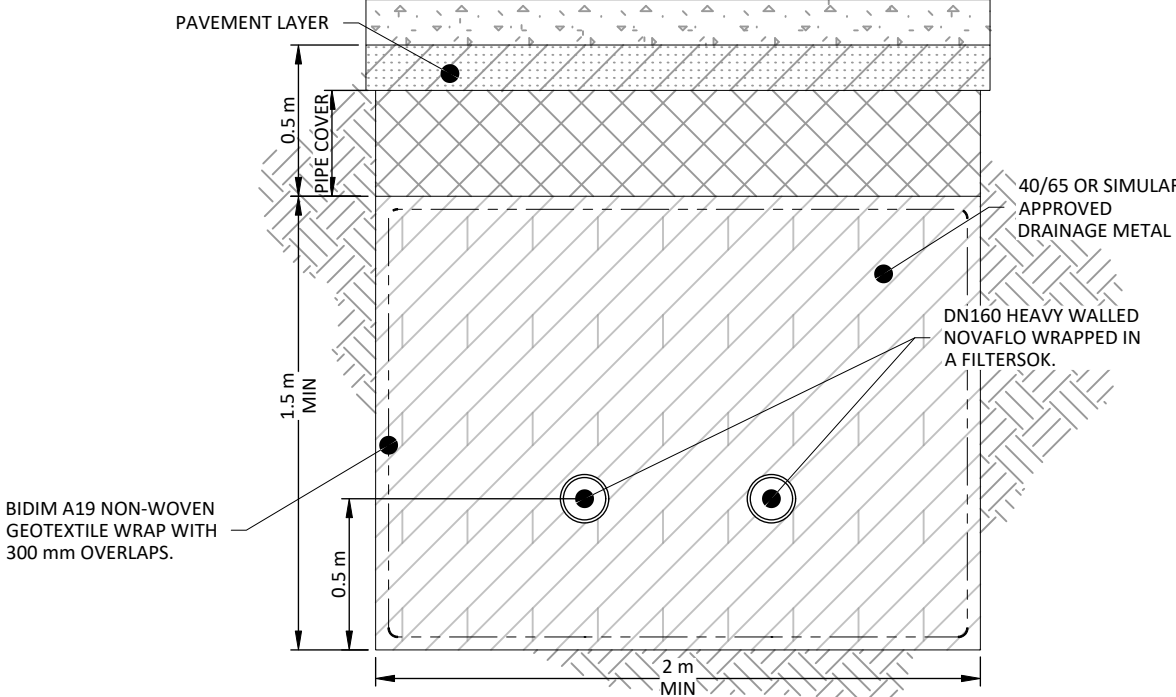
SECTION - CONCRETE PIPE TYPE HS2 SUPPORT - TRENCH  
NOT TO SCALE



SECTION - PROPOSED INFILTRATION TRENCH - MODULAR TANK  
NOT TO SCALE



SECTION - FLEXIBLE PIPE SUPPORT - TRENCH  
NOT TO SCALE



SECTION - PROPOSED INFILTRATION TRENCH - DRAINAGE METAL  
NOT TO SCALE

|               |  |  |  |             |  |  |  |                       |  |  |  |                            |  |  |  |                             |  |  |  |                  |  |  |  |
|---------------|--|--|--|-------------|--|--|--|-----------------------|--|--|--|----------------------------|--|--|--|-----------------------------|--|--|--|------------------|--|--|--|
| DRAWING ISSUE |  |  |  | DESIGNED RM |  |  |  | CLIENT                |  |  |  | PROJECT                    |  |  |  | DRAWING                     |  |  |  | STATUS           |  |  |  |
| A             |  |  |  | DRAWN SC    |  |  |  | Simplicity Living     |  |  |  | SIMPLICITY LIVING          |  |  |  | STORMWATER                  |  |  |  | PRELIMINARY      |  |  |  |
| REV           |  |  |  | CHECKED GMB |  |  |  | TE PŪTAHI LADIES MILE |  |  |  | TYPICAL TRENCH DETAILS FOR |  |  |  | CONCRETE AND FLEXIBLE PIPES |  |  |  | HORIZONTAL DATUM |  |  |  |
| 26/06/26      |  |  |  | APPROVED CI |  |  |  | AND SOAKAGE TRENCH    |  |  |  | FOR CONSENT                |  |  |  | VERTICAL DATUM              |  |  |  | Mt Nicholas 2000 |  |  |  |
| DATE          |  |  |  | BY          |  |  |  | 149360-00-2152        |  |  |  | DESCRIPTION                |  |  |  | DRAWING NUMBER              |  |  |  | NZVD16           |  |  |  |
|               |  |  |  | CHK         |  |  |  | REVISION              |  |  |  |                            |  |  |  |                             |  |  |  | 1:1000           |  |  |  |
|               |  |  |  | APPR        |  |  |  |                       |  |  |  |                            |  |  |  |                             |  |  |  | A                |  |  |  |



100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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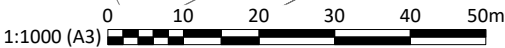


SHEET 2  
SHEET 1

SPENCE ROAD

DN560 PE100 SN16 (BY OTHERS)

STATE HIGHWAY 6



KEY: WATER SUPPLY

LEGAL BOUNDARIES

DN560 WATER BY OTHERS

DN250 WATER BY OTHERS

|               |          |             |  |             |     |      |  |
|---------------|----------|-------------|--|-------------|-----|------|--|
| DRAWING ISSUE |          |             |  | DESIGNED RM |     |      |  |
|               |          |             |  | DRAWN SC    |     |      |  |
|               |          |             |  | CHECKED GMB |     |      |  |
|               |          |             |  | APPROVED CI |     |      |  |
| REV           | DATE     | DESCRIPTION |  | SC          | GMB | CI   |  |
| A             | 26/06/26 | FOR CONSENT |  | BY          | CHK | APPR |  |

Version 5.0 - August 2024



CLIENT

% Simplicity Living

PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
WATER SUPPLY PLAN  
SHEET 1

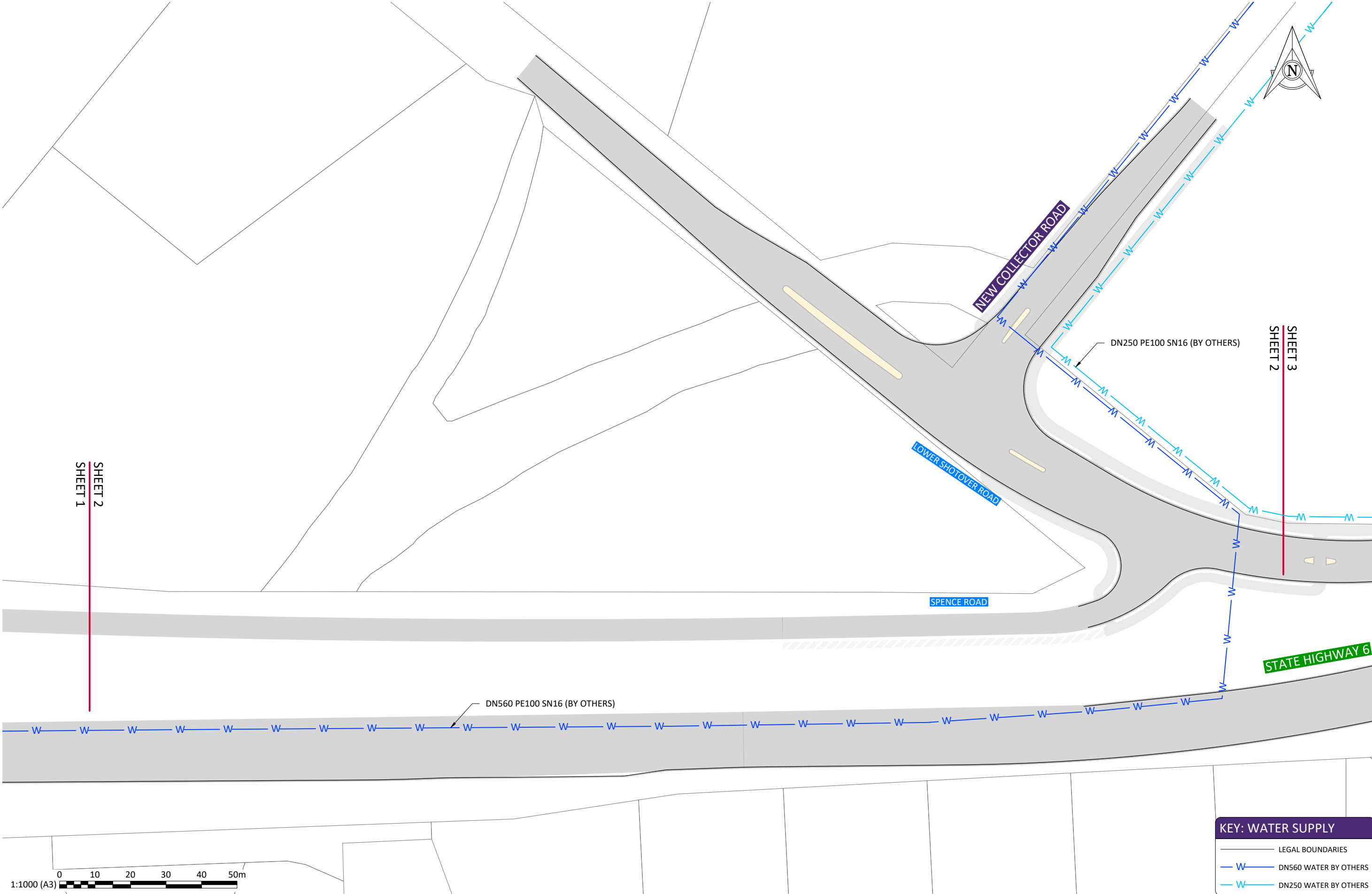
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| STATUS           |                  |            | PRELIMINARY |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |             |
| VERTICAL DATUM   | NZVD16           | 1:1000     |             |
| DRAWING NUMBER   |                  | REVISION   | A           |
| 149360-00-2401   |                  |            |             |

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100mm  
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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KEY: WATER SUPPLY

- LEGAL BOUNDARIES
- DN560 WATER BY OTHERS
- DN250 WATER BY OTHERS

| DRAWING ISSUE |          |             |  | DESIGNED |     |      |  |
|---------------|----------|-------------|--|----------|-----|------|--|
| REV           | DATE     | DESCRIPTION |  | BY       | CHK | APPR |  |
| A             | 26/06/26 | FOR CONSENT |  | SC       | GMB | CI   |  |

Version 5.0 - August 2024



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
WATER SUPPLY PLAN  
SHEET 2

| STATUS           |                  |            |
|------------------|------------------|------------|
| PRELIMINARY      |                  |            |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM   | NZVD16           | 1:1000     |
| DRAWING NUMBER   | 149360-00-2402   | REVISION   |
|                  |                  | A          |

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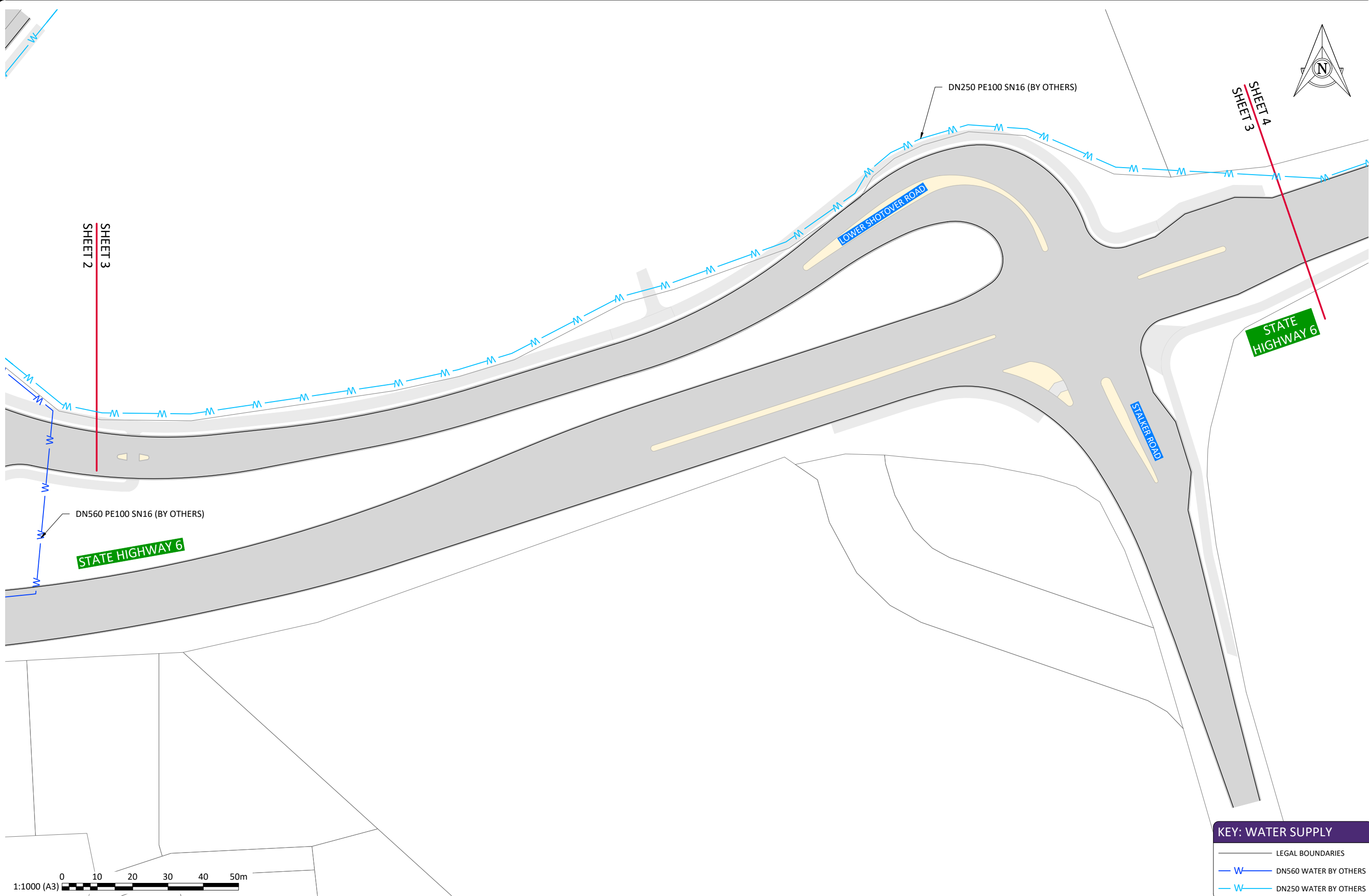


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Version 5.0 - August 2024

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

100mm

0



**KEY: WATER SUPPLY**

- LEGAL BOUNDARIES
- DN560 WATER BY OTHERS
- DN250 WATER BY OTHERS

| DRAWING ISSUE |          |             |  | DESIGNED |     |      |  |
|---------------|----------|-------------|--|----------|-----|------|--|
| REV           | DATE     | DESCRIPTION |  | BY       | CHK | APPR |  |
| A             | 26/06/26 | FOR CONSENT |  | SC       | GMB | CI   |  |

|          |     |
|----------|-----|
| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

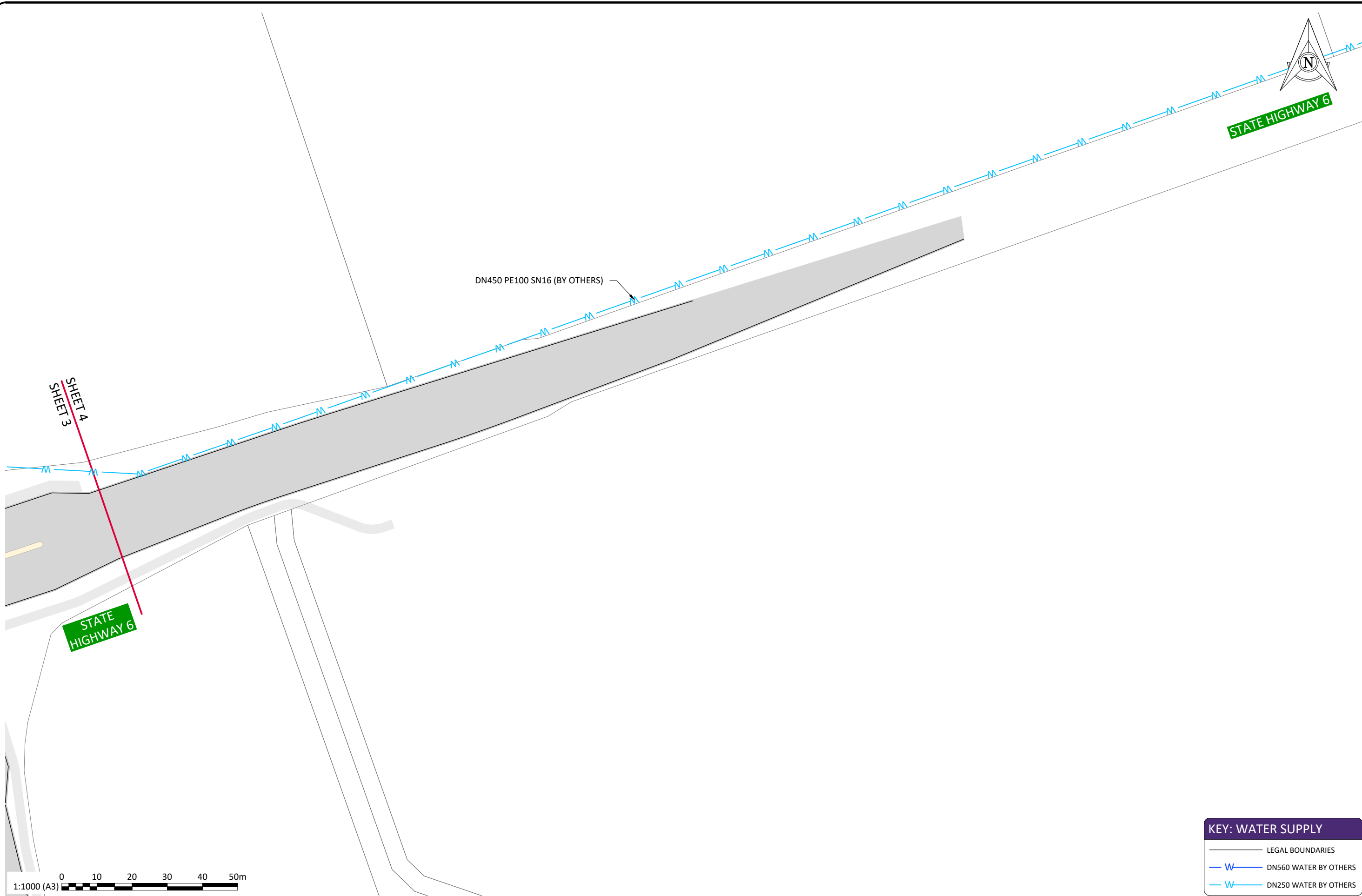
DRAWING  
WATER SUPPLY PLAN  
SHEET 3

|                              |                  |                      |
|------------------------------|------------------|----------------------|
| STATUS<br><b>PRELIMINARY</b> |                  |                      |
| HORIZONTAL DATUM             | Mt Nicholas 2000 | SCALE (A3)<br>1:1000 |
| VERTICAL DATUM               | NZVD16           | REVISION<br>A        |
| DRAWING NUMBER               | 149360-00-2403   |                      |

100mm  
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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| KEY: WATER SUPPLY |                       |  |
|-------------------|-----------------------|--|
| —                 | LEGAL BOUNDARIES      |  |
| — W —             | DN560 WATER BY OTHERS |  |
| — W —             | DN250 WATER BY OTHERS |  |

| DRAWING ISSUE |          |             |  | DESIGNED |     |      |  |
|---------------|----------|-------------|--|----------|-----|------|--|
| REV           | DATE     | DESCRIPTION |  | BY       | CHK | APPR |  |
| A             | 26/06/26 | FOR CONSENT |  | SC       | GMB | CI   |  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
WATER SUPPLY PLAN  
SHEET 4

| STATUS           |                  |            |
|------------------|------------------|------------|
| PRELIMINARY      |                  |            |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM   | NZVD16           | 1:1000     |
| DRAWING NUMBER   | 149360-00-2404   | REVISION   |
|                  |                  | A          |

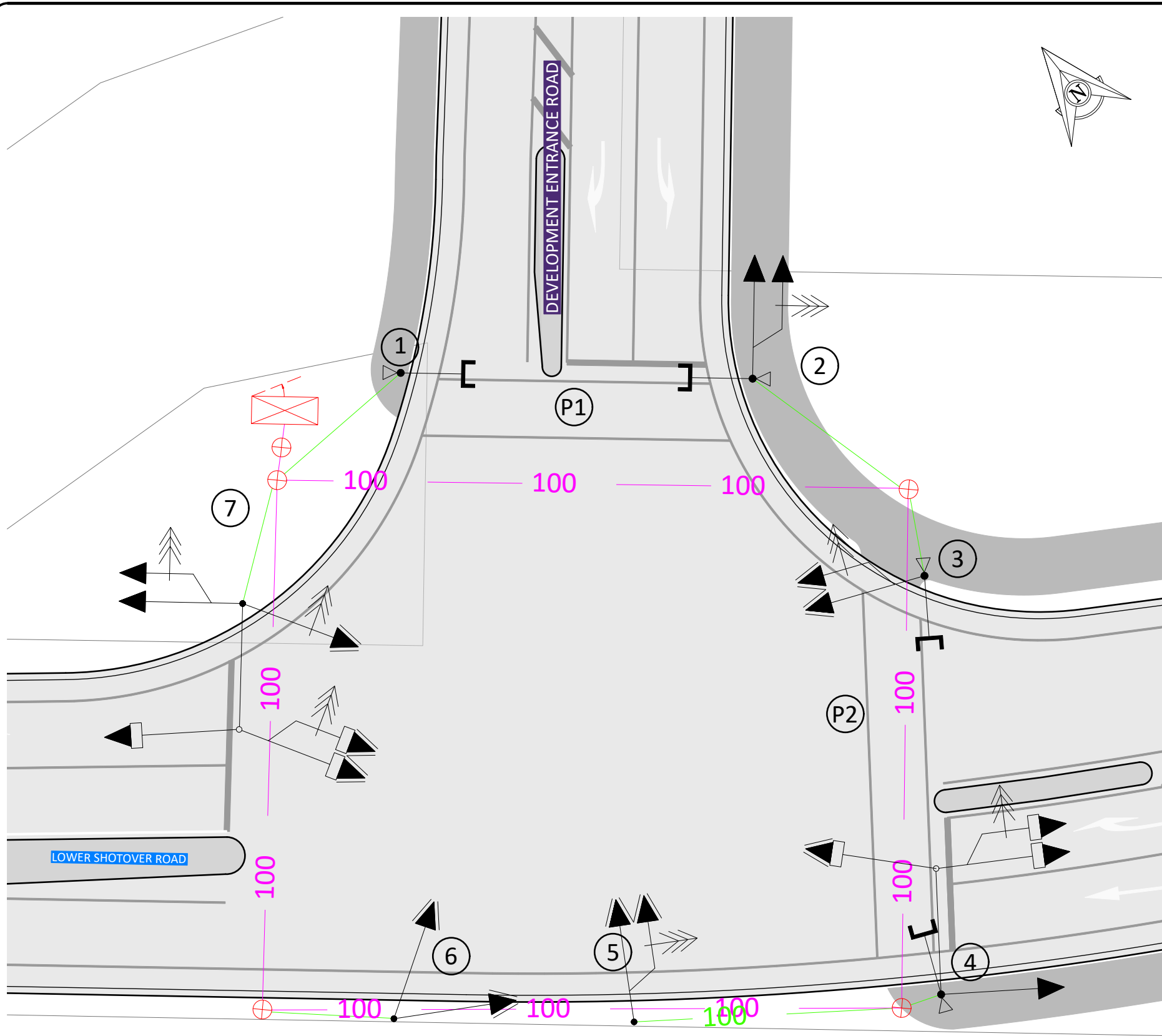


100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

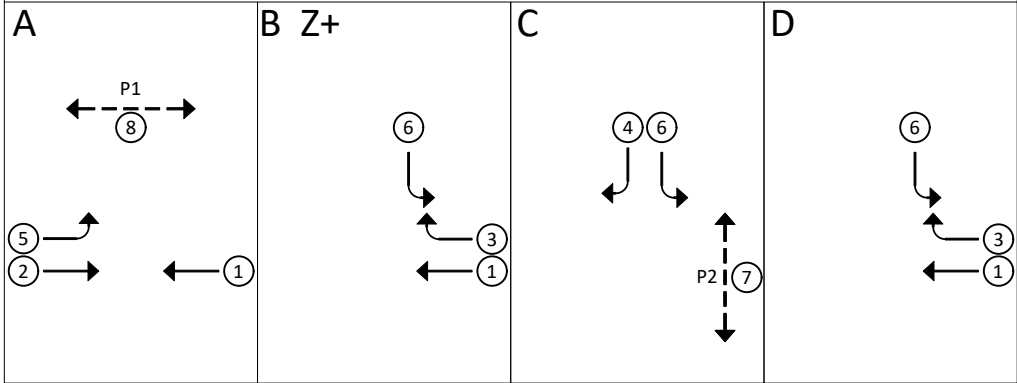
C:\12\5\107.7.20.14\149360 - Queenstown Simplicity Living\_5670\03 Drawings\100\_149360-00-2701.dwg 26/06/2026 3:52 pm Isocoper Plotted: 26 Jun 2026 3:52 pm



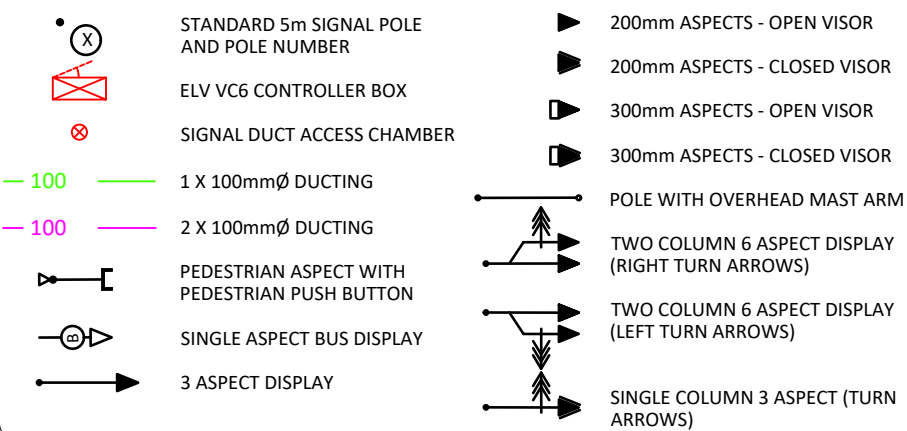
1:250 (A3) 0 2.5 5 7.5 10 12.5m

#### PHASE AND SIGNAL GROUPS

NORMAL PHASE SEQUENCE: A-C-D



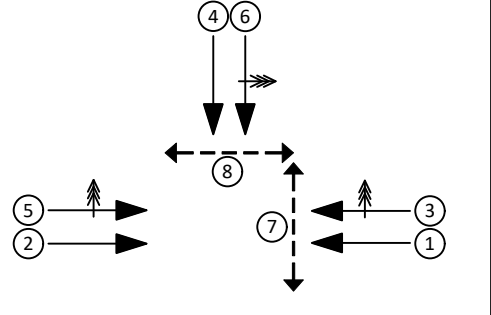
#### KEY



#### NOTES

- SIGNAL INFRASTRUCTURE TO BE INSTALLED IN ACCORDANCE WITH NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS.
- CONTRACTOR SHALL PROVIDE POWER SUPPLY DESIGN, INSTALLATION AND CONNECTION. CONTRACTOR SHALL INCLUDE FIBRE CONNECTION TO CONTROLLER BOX.

#### SIGNAL GROUPS



| DRAWING ISSUE |          |             |  | DESIGNED |    |    |    |
|---------------|----------|-------------|--|----------|----|----|----|
| REV           | DATE     | DESCRIPTION |  | SKB      | CI | CI | CI |
| A             | 26/06/26 | FOR CONSENT |  | SKB      | CI | CI | CI |

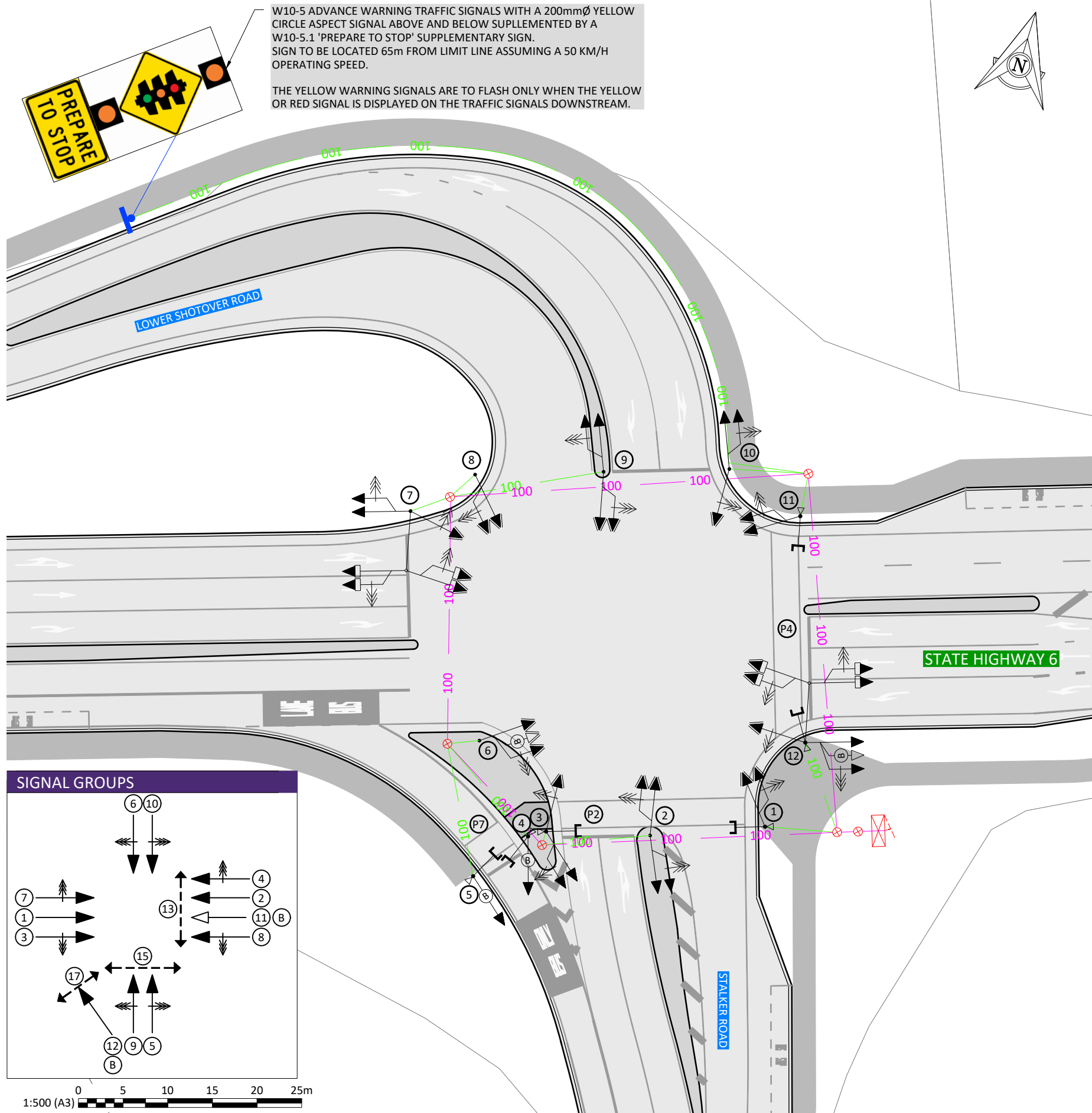
|          |     |
|----------|-----|
| DESIGNED | SKB |
| DRAWN    | SC  |
| CHECKED  | CI  |
| APPROVED | CI  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

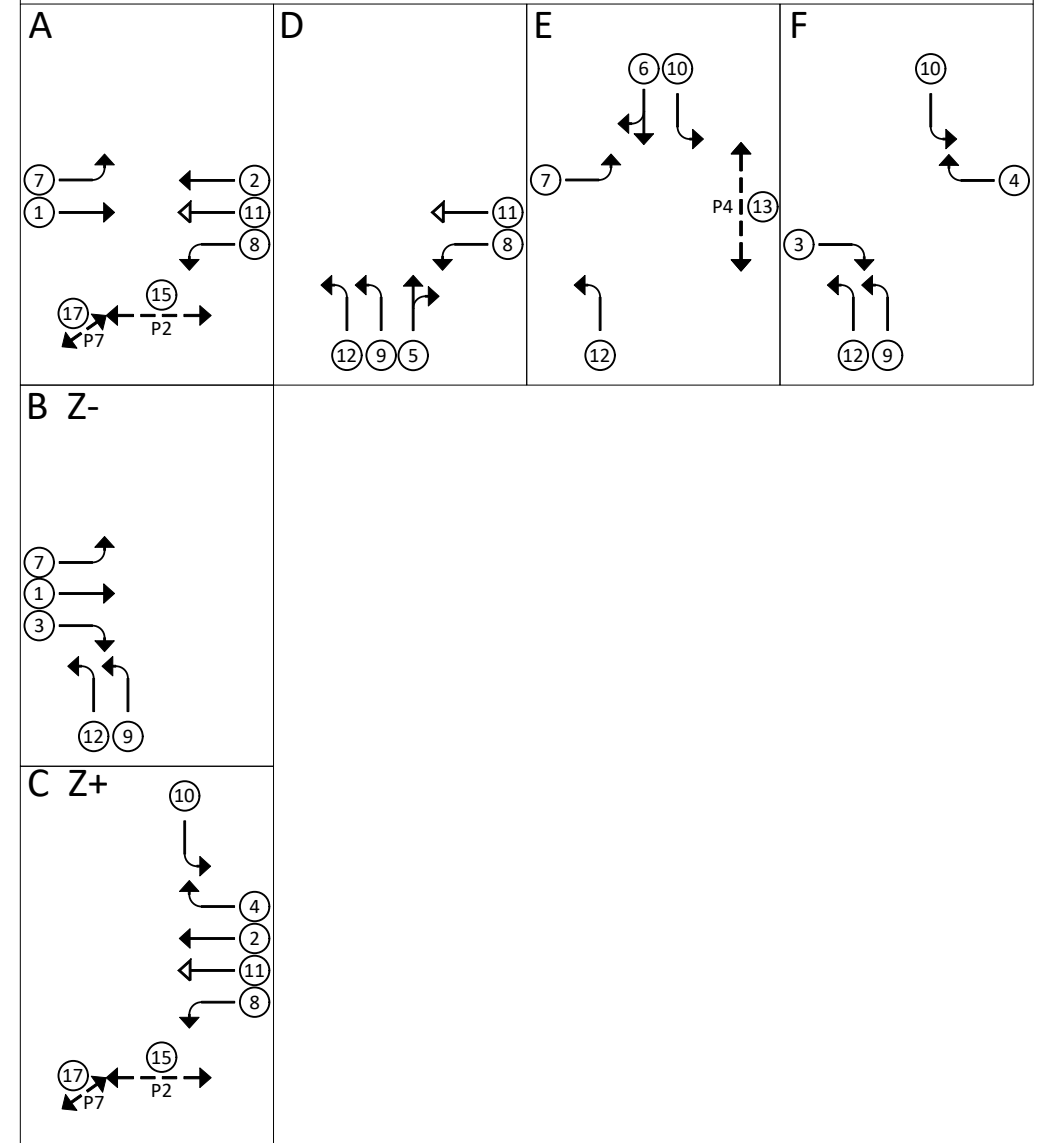
DRAWING  
TRAFFIC SIGNAL LAYOUT AND  
PHASING PLAN  
LOWER SHOTOVER ROAD & NEW  
DEVELOPMENT ACCESS ROAD

| STATUS           |                  |            |
|------------------|------------------|------------|
| PRELIMINARY      |                  |            |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM   | NZVD16           | 1:500      |
| DRAWING NUMBER   | 149360-00-2701   | REVISION   |
|                  |                  | A          |



# **PHASE AND SIGNAL GROUPS**

**NORMAL PHASE SEQUENCE: A-D-E-F**



## **KEY**

|  |                                               |  |                                                 |
|--|-----------------------------------------------|--|-------------------------------------------------|
|  | STANDARD 5m SIGNAL POLE AND POLE NUMBER       |  | 200mm ASPECTS - OPEN VISOR                      |
|  | ELV VC6 CONTROLLER BOX                        |  | 200mm ASPECTS - CLOSED VISOR                    |
|  | SIGNAL DUCT ACCESS CHAMBER                    |  | 300mm ASPECTS - OPEN VISOR                      |
|  | 1 X 100mm Ø DUCTING                           |  | 300mm ASPECTS - CLOSED VISOR                    |
|  | 2 X 100mm Ø DUCTING                           |  | POLE WITH OVERHEAD MAST ARM                     |
|  | PEDESTRIAN ASPECT WITH PEDESTRIAN PUSH BUTTON |  | TWO COLUMN 6 ASPECT DISPLAY (RIGHT TURN ARROWS) |
|  | SINGLE ASPECT WHITE 'B' SYMBOL                |  | TWO COLUMN 6 ASPECT DISPLAY (LEFT TURN ARROWS)  |
|  | 3 ASPECT 'B' WHITE, YELLOW, RED SYMBOLS       |  | SINGLE COLUMN 3 ASPECT (TURN ARROWS)            |

## **NOTES**

- SIGNAL INFRASTRUCTURE TO BE INSTALLED IN ACCORDANCE WITH NZTA P43 SPECIFICATION FOR TRAFFIC SIGNALS.
- CONTRACTOR SHALL PROVIDE POWER SUPPLY DESIGN, INSTALLATION AND CONNECTION. CONTRACTOR SHALL INCLUDE FIBRE CONNECTION TO CONTROLLER BOX.

|             |          |
|-------------|----------|
| DESIGNED    | SKB      |
| DRAWN       | SC       |
| CHECKED     | CI       |
| APPROVED    | CI       |
| REV         | DATE     |
| A           | 26/06/26 |
| FOR CONSENT |          |
| DESCRIPTION |          |
| SKB         | CI       |
| BY          | CHK      |
| CI          | APPR     |



**% Simplicity Living**

**PROJECT**  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

**DRAWING**  
TRAFFIC SIGNAL LAYOUT AND  
PHASING PLAN  
LOWER SHOTOVER ROAD  
& SH6 INTERSECTION

|                                     |                  |            |
|-------------------------------------|------------------|------------|
| <b>STATUS</b><br><b>PRELIMINARY</b> |                  |            |
| HORIZONTAL DATUM                    | Mt Nicholas 2000 | SCALE (A3) |
| VERTICAL DATUM                      | NZVD16           | 1:500      |
| DRAWING NUMBER                      | 149360-00-2702   | REVISION   |
|                                     |                  | A          |



100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

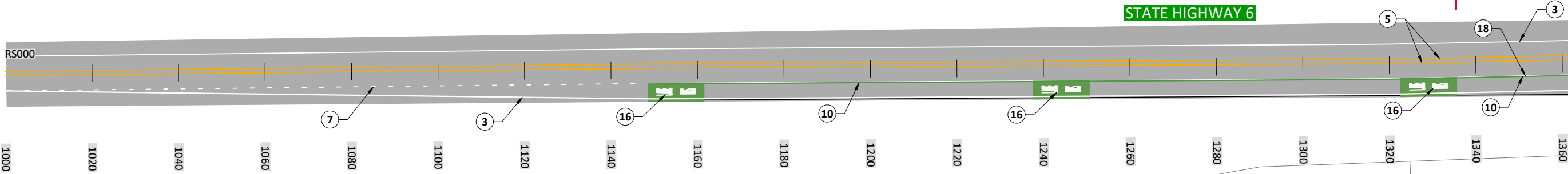
0

C:\12\ds\data\107.7.20-14\149360 - Queenstown Simplicity Living\_5670\03 Drawings\00149360-00-2801.dwg 26/6/2026 3:52 pm bcooper Plotted: 26 Jun 2026 3:52 pm

| ROAD MARKINGS TABLE                                    |                                                             |                |                       |       |        |                                                                                        |
|--------------------------------------------------------|-------------------------------------------------------------|----------------|-----------------------|-------|--------|----------------------------------------------------------------------------------------|
| *ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TCD MANUAL |                                                             |                |                       |       |        |                                                                                        |
| REF#                                                   | MARK TYPE                                                   | STRIPE         | GAP                   | WIDTH | COLOUR | COMMENT                                                                                |
| 1                                                      | CENTRELINE                                                  | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                          |
| 2                                                      | CENTRELINE                                                  | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 3                                                      | EDGE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 4                                                      | LANE LINE                                                   | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                          |
| 5                                                      | NO-OVERTAKING LINES                                         | CONT.          | -                     | 100mm | YELLOW | REFLECTORISED<br>OFFSET 100MM FROM NORMAL<br>CENTRELINE                                |
| 6                                                      | CHEVRON MARK BORDER                                         | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 7                                                      | CONTINUITY LINE                                             | 1m             | 3m                    | 150mm | WHITE  | REFLECTORISED                                                                          |
| 8                                                      | CHEVRON MARK                                                | -              | -                     | 600mm | WHITE  | REFLECTORISED<br>BAR SLOPE: 2:1 TO BORDER MARK<br>SPACING: 6m                          |
| 9                                                      | CYCLE SYMBOL                                                | -              | -                     | -     | WHITE  | REFLECTORISED<br><=60kph: 1080Wx1680H<br>>60kph: 1440Wx2240H<br>SHARED PATH: 360Wx560h |
| 10                                                     | BUS LANE BORDER LINE                                        | CONT.          | -                     | 150   | GREEN  | COLOUR G26 APPLE GREEN OR<br>SIMILAR                                                   |
| 11                                                     | BUS STOP CAGE                                               | 1m             | 1-2m                  | 100mm | YELLOW | REFLECTORISED                                                                          |
| 12                                                     | PAVEMENT MESSAGE - BUS<br>STOP                              | -              | -                     | -     | YELLOW | LETTERING: 1.2m HIGH                                                                   |
| 13                                                     | LIMIT LINE                                                  | CONT.          | -                     | 300mm | WHITE  | REFLECTORISED                                                                          |
| 14                                                     | LANE ARROWS - COMBINED<br>AHEAD & L OR R TURN               | 6.8m           | 1.28m                 | 150mm | WHITE  | SPEED LIMIT >=70kph<br>LONGITUDINAL DIMENSION<br>INCREASED TO 150%                     |
| 15                                                     | LANE ARROWS - STRAIGHT<br>AHEAD / LEFT TURN / RIGHT<br>TURN | 4.8m           | 0.71m /<br>1m /<br>1m | 150mm | WHITE  | SPEED LIMIT >=70kph<br>LONGITUDINAL DIMENSION<br>INCREASED TO 150%                     |
| 16                                                     | PAVEMENT MESSAGE - BUS<br>LANE                              | 2.4m /<br>3.6m | -                     | -     | WHITE  | REFLECTORISED WHITE ON APPLE<br>GREEN COLOURED SURFACING                               |
| 17                                                     | CROSSWALK LINES                                             | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 18                                                     | LANE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 19                                                     | PEDESTRIAN SYMBOL                                           | -              | -                     | -     | WHITE  |                                                                                        |



SHEET 2  
SHEET 1



1:1000 (A3) 0 10 20 30 40 50m

| DRAWING ISSUE |          |             |  | DESIGNED |     |      |  |
|---------------|----------|-------------|--|----------|-----|------|--|
|               |          |             |  | RM       |     |      |  |
|               |          |             |  | SC       |     |      |  |
|               |          |             |  | GMB      |     |      |  |
|               |          |             |  | CI       |     |      |  |
| A             | 26/06/26 | FOR CONSENT |  | SC       | GMB | CI   |  |
| REV           | DATE     | DESCRIPTION |  | BY       | CHK | APPR |  |



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
ROAD MARKINGS PLAN  
SHEET 1

| STATUS           |                  |                      |
|------------------|------------------|----------------------|
| PRELIMINARY      |                  |                      |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3)<br>1:1000 |
| VERTICAL DATUM   | NZVD16           | REVISION<br>A        |
| DRAWING NUMBER   | 149360-00-2801   |                      |

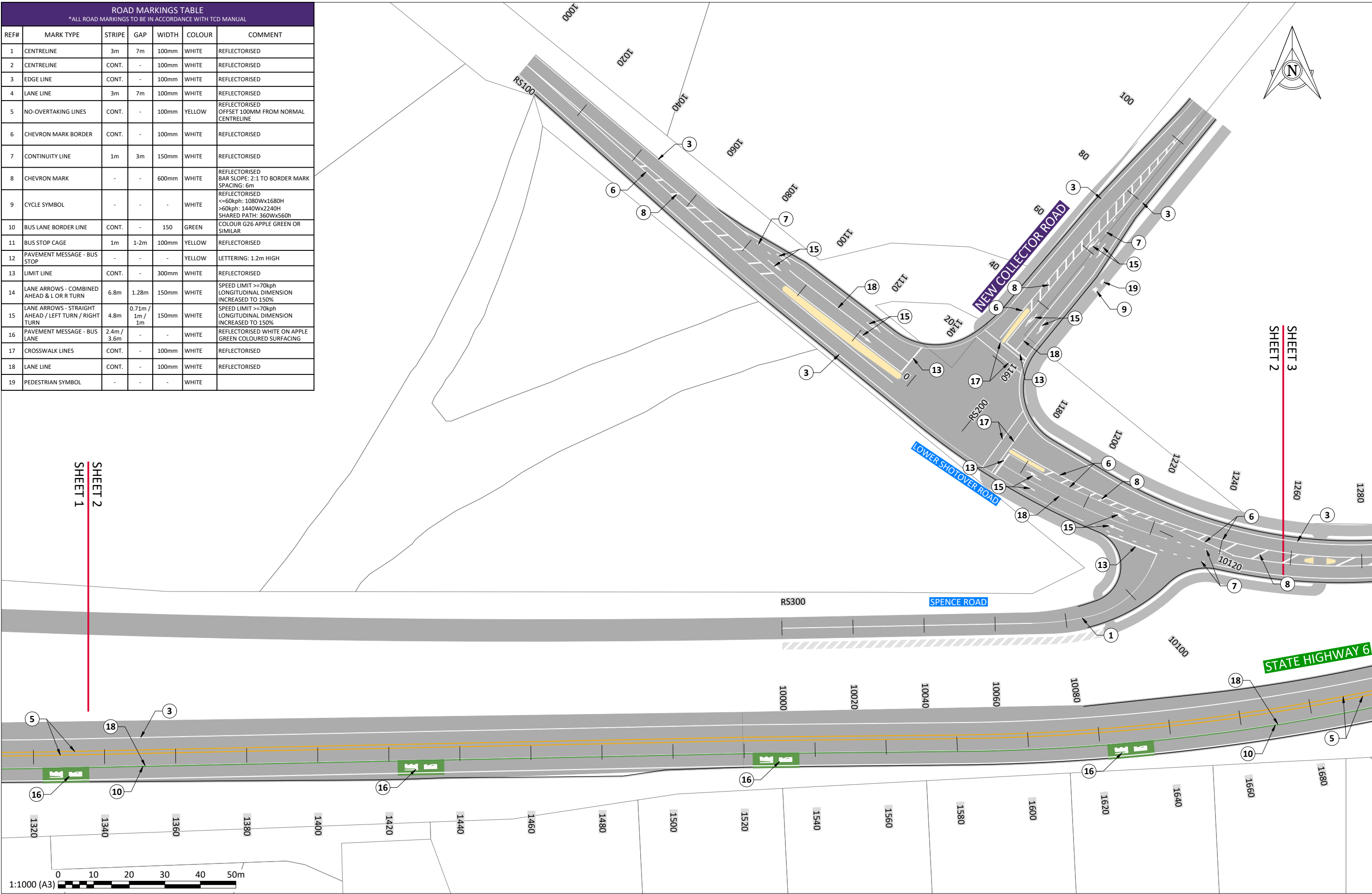
100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

C:\12\data\107.7.20.14\149360 - Queensland Simplicity Living\_5670\03 Drawings\001\149360-00-2802.dwg 26/06/2026 3:52 pm Iscooper Plotted: 26 Jun 2026 3:52 pm

| ROAD MARKINGS TABLE                                    |                                                             |                |                       |       |        |                                                                                        |
|--------------------------------------------------------|-------------------------------------------------------------|----------------|-----------------------|-------|--------|----------------------------------------------------------------------------------------|
| *ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TCD MANUAL |                                                             |                |                       |       |        |                                                                                        |
| REF#                                                   | MARK TYPE                                                   | STRIPE         | GAP                   | WIDTH | COLOUR | COMMENT                                                                                |
| 1                                                      | CENTRELINE                                                  | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                          |
| 2                                                      | CENTRELINE                                                  | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 3                                                      | EDGE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 4                                                      | LANE LINE                                                   | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                          |
| 5                                                      | NO-OVERTAKING LINES                                         | CONT.          | -                     | 100mm | YELLOW | REFLECTORISED<br>OFFSET 100MM FROM NORMAL<br>CENTRELINE                                |
| 6                                                      | CHEVRON MARK BORDER                                         | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 7                                                      | CONTINUITY LINE                                             | 1m             | 3m                    | 150mm | WHITE  | REFLECTORISED                                                                          |
| 8                                                      | CHEVRON MARK                                                | -              | -                     | 600mm | WHITE  | REFLECTORISED<br>BAR SLOPE: 2:1 TO BORDER MARK<br>SPACING: 6m                          |
| 9                                                      | CYCLE SYMBOL                                                | -              | -                     | -     | WHITE  | REFLECTORISED<br><=60kph: 1080Wx1680H<br>>60kph: 1440Wx2240H<br>SHARED PATH: 360Wx560h |
| 10                                                     | BUS LANE BORDER LINE                                        | CONT.          | -                     | 150   | GREEN  | COLOUR G26 APPLE GREEN OR<br>SIMILAR                                                   |
| 11                                                     | BUS STOP CAGE                                               | 1m             | 1-2m                  | 100mm | YELLOW | REFLECTORISED                                                                          |
| 12                                                     | PAVEMENT MESSAGE - BUS<br>STOP                              | -              | -                     | -     | YELLOW | LETTERING: 1.2m HIGH                                                                   |
| 13                                                     | LIMIT LINE                                                  | CONT.          | -                     | 300mm | WHITE  | REFLECTORISED                                                                          |
| 14                                                     | LANE ARROWS - COMBINED<br>AHEAD & L OR R TURN               | 6.8m           | 1.28m                 | 150mm | WHITE  | SPEED LIMIT >=70kph<br>LONGITUDINAL DIMENSION<br>INCREASED TO 150%                     |
| 15                                                     | LANE ARROWS - STRAIGHT<br>AHEAD / LEFT TURN / RIGHT<br>TURN | 4.8m           | 0.71m /<br>1m /<br>1m | 150mm | WHITE  | SPEED LIMIT >=70kph<br>LONGITUDINAL DIMENSION<br>INCREASED TO 150%                     |
| 16                                                     | PAVEMENT MESSAGE - BUS<br>LANE                              | 2.4m /<br>3.6m | -                     | -     | WHITE  | REFLECTORISED WHITE ON APPLE<br>GREEN COLOURED SURFACING                               |
| 17                                                     | CROSSWALK LINES                                             | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 18                                                     | LANE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 19                                                     | PEDESTRIAN SYMBOL                                           | -              | -                     | -     | WHITE  |                                                                                        |



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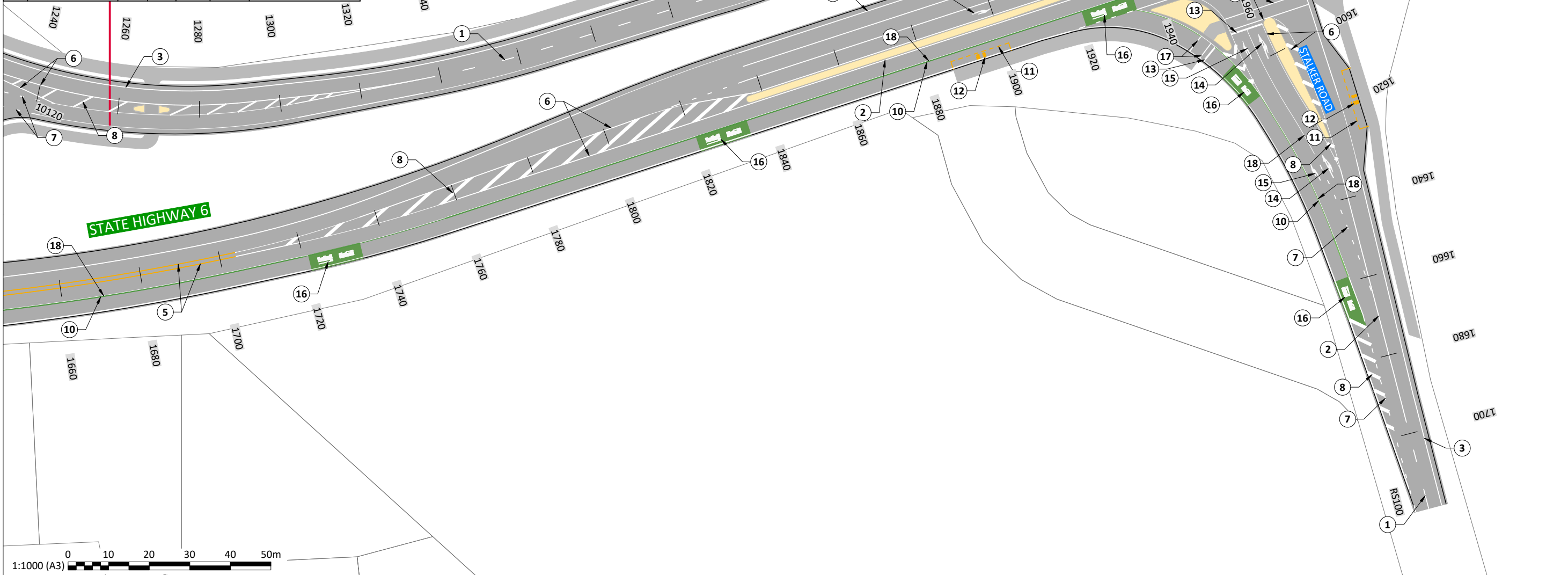
100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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C:\12\45\data\107.7.20-14\49360-Queensdown Simplicity Living\_5670\03 Drawings\001\49360-00-2803.dwg 26/6/2026 3:52 pm Isocoper Plotted: 26 Jun 2026 3:52 pm

| ROAD MARKINGS TABLE                                    |                                                             |                |                       |       |        |                                                                                        |
|--------------------------------------------------------|-------------------------------------------------------------|----------------|-----------------------|-------|--------|----------------------------------------------------------------------------------------|
| *ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TCD MANUAL |                                                             |                |                       |       |        |                                                                                        |
| REF#                                                   | MARK TYPE                                                   | STRIPE         | GAP                   | WIDTH | COLOUR | COMMENT                                                                                |
| 1                                                      | CENTRELINE                                                  | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                          |
| 2                                                      | CENTRELINE                                                  | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 3                                                      | EDGE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 4                                                      | LANE LINE                                                   | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                          |
| 5                                                      | NO-OVERTAKING LINES                                         | CONT.          | -                     | 100mm | YELLOW | REFLECTORISED<br>OFFSET 100MM FROM NORMAL<br>CENTRELINE                                |
| 6                                                      | CHEVRON MARK BORDER                                         | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 7                                                      | CONTINUITY LINE                                             | 1m             | 3m                    | 150mm | WHITE  | REFLECTORISED                                                                          |
| 8                                                      | CHEVRON MARK                                                | -              | -                     | 600mm | WHITE  | REFLECTORISED<br>BAR SLOPE: 2:1 TO BORDER MARK<br>SPACING: 6m                          |
| 9                                                      | CYCLE SYMBOL                                                | -              | -                     | -     | WHITE  | REFLECTORISED<br><=60kph: 1080Wx1680H<br>>60kph: 1440Wx2240H<br>SHARED PATH: 360Wx560h |
| 10                                                     | BUS LANE BORDER LINE                                        | CONT.          | -                     | 150   | GREEN  | COLOUR G26 APPLE GREEN OR<br>SIMILAR                                                   |
| 11                                                     | BUS STOP CAGE                                               | 1m             | 1-2m                  | 100mm | YELLOW | REFLECTORISED                                                                          |
| 12                                                     | PAVEMENT MESSAGE - BUS<br>STOP                              | -              | -                     | -     | YELLOW | LETTERING: 1.2m HIGH                                                                   |
| 13                                                     | LIMIT LINE                                                  | CONT.          | -                     | 300mm | WHITE  | REFLECTORISED                                                                          |
| 14                                                     | LANE ARROWS - COMBINED<br>AHEAD & L OR R TURN               | 6.8m           | 1.28m                 | 150mm | WHITE  | SPEED LIMIT >=70kph<br>LONGITUDINAL DIMENSION<br>INCREASED TO 150%                     |
| 15                                                     | LANE ARROWS - STRAIGHT<br>AHEAD / LEFT TURN / RIGHT<br>TURN | 4.8m           | 0.71m /<br>1m /<br>1m | 150mm | WHITE  | SPEED LIMIT >=70kph<br>LONGITUDINAL DIMENSION<br>INCREASED TO 150%                     |
| 16                                                     | PAVEMENT MESSAGE - BUS<br>LANE                              | 2.4m /<br>3.6m | -                     | -     | WHITE  | REFLECTORISED WHITE ON APPLE<br>GREEN COLOURED SURFACING                               |
| 17                                                     | CROSSWALK LINES                                             | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 18                                                     | LANE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                          |
| 19                                                     | PEDESTRIAN SYMBOL                                           | -              | -                     | -     | WHITE  |                                                                                        |



|               |          |             |    |          |    |             |     |             |  |
|---------------|----------|-------------|----|----------|----|-------------|-----|-------------|--|
| DRAWING ISSUE |          | DESIGNED RM |    | DRAWN SC |    | CHECKED GMB |     | APPROVED CI |  |
| REV           | DATE     | DESCRIPTION | SC | GMB      | CI | BY          | CHK | APPR        |  |
| A             | 26/06/26 | FOR CONSENT |    |          |    |             |     |             |  |

Version 5.0 - August 2024



PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
ROAD MARKINGS PLAN  
SHEET 3

|                              |                  |                      |
|------------------------------|------------------|----------------------|
| STATUS<br><b>PRELIMINARY</b> |                  |                      |
| HORIZONTAL DATUM             | Mt Nicholas 2000 | SCALE (A3)<br>1:1000 |
| VERTICAL DATUM               | NZVD16           | REVISION<br>A        |
| DRAWING NUMBER               | 149360-00-2803   |                      |

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| ROAD MARKINGS TABLE                                    |                                                             |                |                       |       |        |                                                                                       |
|--------------------------------------------------------|-------------------------------------------------------------|----------------|-----------------------|-------|--------|---------------------------------------------------------------------------------------|
| *ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TCD MANUAL |                                                             |                |                       |       |        |                                                                                       |
| REF#                                                   | MARK TYPE                                                   | STRIPE         | GAP                   | WIDTH | COLOUR | COMMENT                                                                               |
| 1                                                      | CENTRELINE                                                  | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                         |
| 2                                                      | CENTRELINE                                                  | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                         |
| 3                                                      | EDGE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                         |
| 4                                                      | LANE LINE                                                   | 3m             | 7m                    | 100mm | WHITE  | REFLECTORISED                                                                         |
| 5                                                      | NO-OVERTAKING LINES                                         | CONT.          | -                     | 100mm | YELLOW | REFLECTORISED<br>OFFSET 100MM FROM NORMAL<br>CENTRELINE                               |
| 6                                                      | CHEVRON MARK BORDER                                         | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                         |
| 7                                                      | CONTINUITY LINE                                             | 1m             | 3m                    | 150mm | WHITE  | REFLECTORISED                                                                         |
| 8                                                      | CHEVRON MARK                                                | -              | -                     | 600mm | WHITE  | REFLECTORISED<br>BAR SLOPE: 2:1 TO BORDER MARK<br>SPACING: 6m                         |
| 9                                                      | CYCLE SYMBOL                                                | -              | -                     | -     | WHITE  | REFLECTORISED<br>≤60kph: 1080Wx1680H<br>>60kph: 1440Wx2240H<br>SHARED PATH: 360Wx560h |
| 10                                                     | BUS LANE BORDER LINE                                        | CONT.          | -                     | 150   | GREEN  | COLOUR G26 APPLE GREEN OR<br>SIMILAR                                                  |
| 11                                                     | BUS STOP CAGE                                               | 1m             | 1-2m                  | 100mm | YELLOW | REFLECTORISED                                                                         |
| 12                                                     | PAVEMENT MESSAGE - BUS<br>STOP                              | -              | -                     | -     | YELLOW | LETTERING: 1.2m HIGH                                                                  |
| 13                                                     | LIMIT LINE                                                  | CONT.          | -                     | 300mm | WHITE  | REFLECTORISED                                                                         |
| 14                                                     | LANE ARROWS - COMBINED<br>AHEAD & L OR R TURN               | 6.8m           | 1.28m                 | 150mm | WHITE  | SPEED LIMIT ≥70kph<br>LONGITUDINAL DIMENSION<br>INCREASED TO 150%                     |
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| 16                                                     | PAVEMENT MESSAGE - BUS<br>LANE                              | 2.4m /<br>3.6m | -                     | -     | WHITE  | REFLECTORISED WHITE ON APPLE<br>GREEN COLOURED SURFACING                              |
| 17                                                     | CROSSWALK LINES                                             | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                         |
| 18                                                     | LANE LINE                                                   | CONT.          | -                     | 100mm | WHITE  | REFLECTORISED                                                                         |
| 19                                                     | PEDESTRIAN SYMBOL                                           | -              | -                     | -     | WHITE  |                                                                                       |

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**% Simplicity**  
Living

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# DRAWING

## ROAD MARKINGS PLAN

### SHEET 4

|                  |                  |                    |        |
|------------------|------------------|--------------------|--------|
| STATUS           |                  | <b>PRELIMINARY</b> |        |
| HORIZONTAL DATUM | Mt Nicholas 2000 | SCALE (A3)         | 1:1000 |
| VERTICAL DATUM   | NZVD16           |                    |        |
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| STANDARD ROAD SIGNS TABLE |                |           |                 |
|---------------------------|----------------|-----------|-----------------|
| ID                        | SIGN SIZE (mm) | SIGN NAME | SIGN            |
| ⑥                         | 750x750        | RLB1      | <div>LANE</div> |
| ⑧                         | 750x300        | RG22      | <div>ENDS</div> |



SHEET 2  
SHEET 1

SPENCE ROAD

STATE HIGHWAY 6

RS000

1000

1020

1040

1060

1080

1100

1120

1140

1160

1180

1200

1220

1240

1260

1280

1300

1320

1340

1360

1:1000 (A3)



| DRAWING ISSUE |          | DESIGNED |     | DRAWN |    | CHECKED |     | APPROVED |    |
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| REV           | DATE     | BY       | CHK | APPR  | RM | SC      | GMB | CI       | CI |
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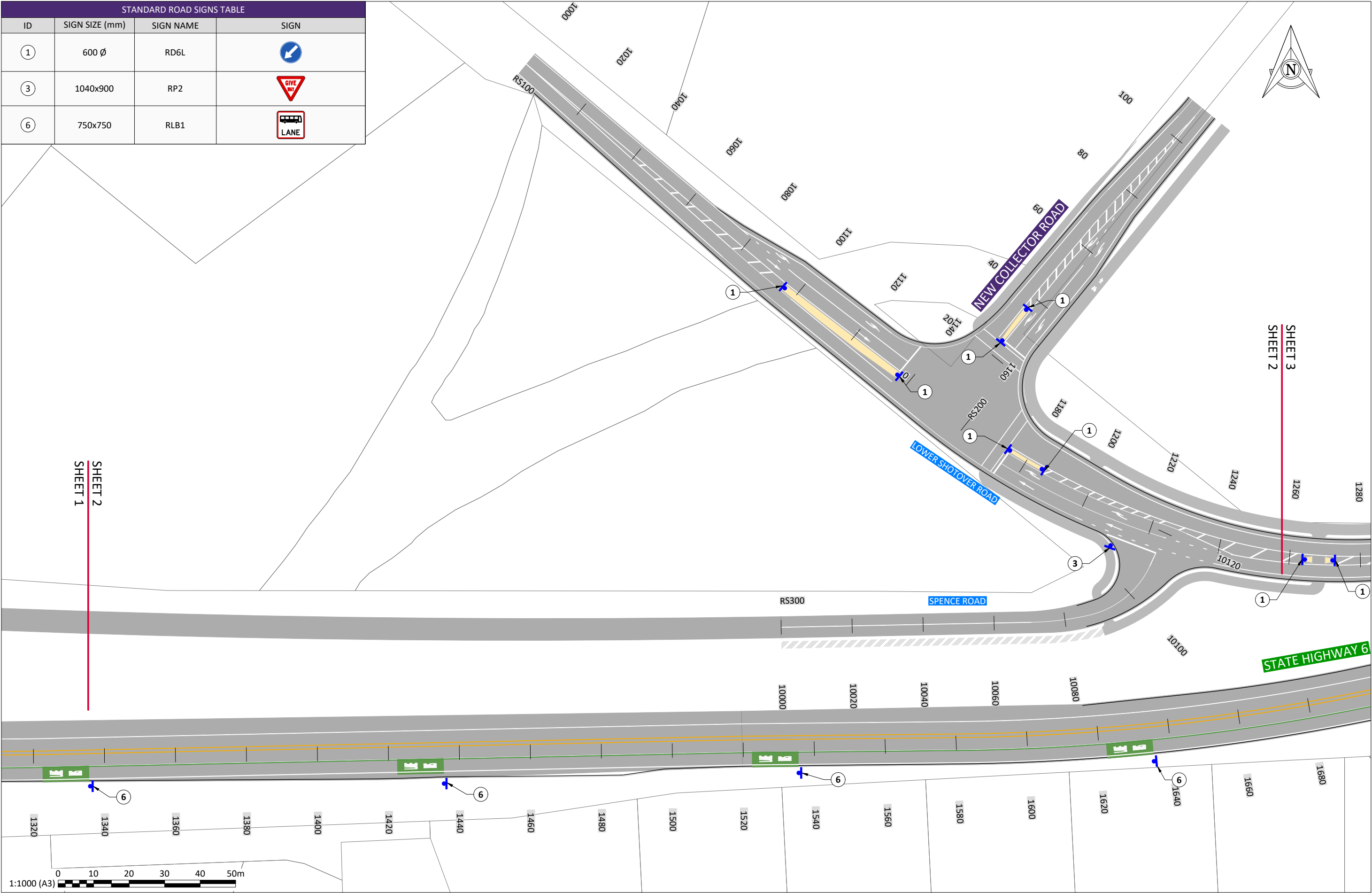
PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
TRAFFIC SIGNS PLAN  
SHEET 1

| STATUS           |                  |            |
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Version 5.0 - August 2024

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| ①                         | 600 ∅          | RD6L      |      |
| ③                         | 1040x900       | RP2       |      |
| ⑥                         | 750x750        | RLB1      |      |



| REV | DATE     | DESCRIPTION |
|-----|----------|-------------|
| A   | 26/06/26 | FOR CONSENT |

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| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |
| BY       | CHK |
| APPR     |     |



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DRAWING  
TRAFFIC SIGNS PLAN  
SHEET 2

|                              |                  |                      |
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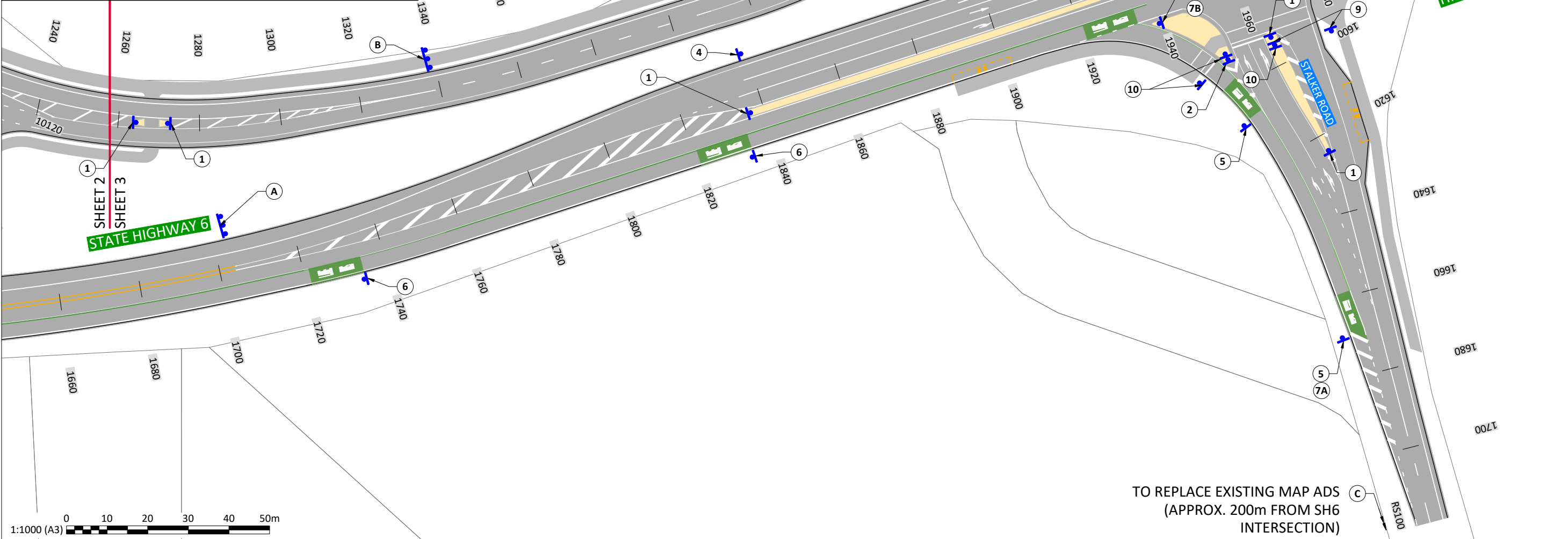
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| ⑤                         | 600x600                    | RLB2      |      |
| ⑥                         | 750x750                    | RLB1      |      |
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| ⑨                         | 750 ∅                      | RS1(50)   |      |
| ⑩                         | 750 ∅                      | RS1(60)   |      |
| ⑪                         | 750x750                    | WW12      |      |
| ⑫                         | 750x313                    | WG3       |      |

| ⑬                         | 600x600 /<br>600x400 | WA5 / WG11 |      |
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| ②                         | 2595x1620            | ADS        |      |
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SHEET 3

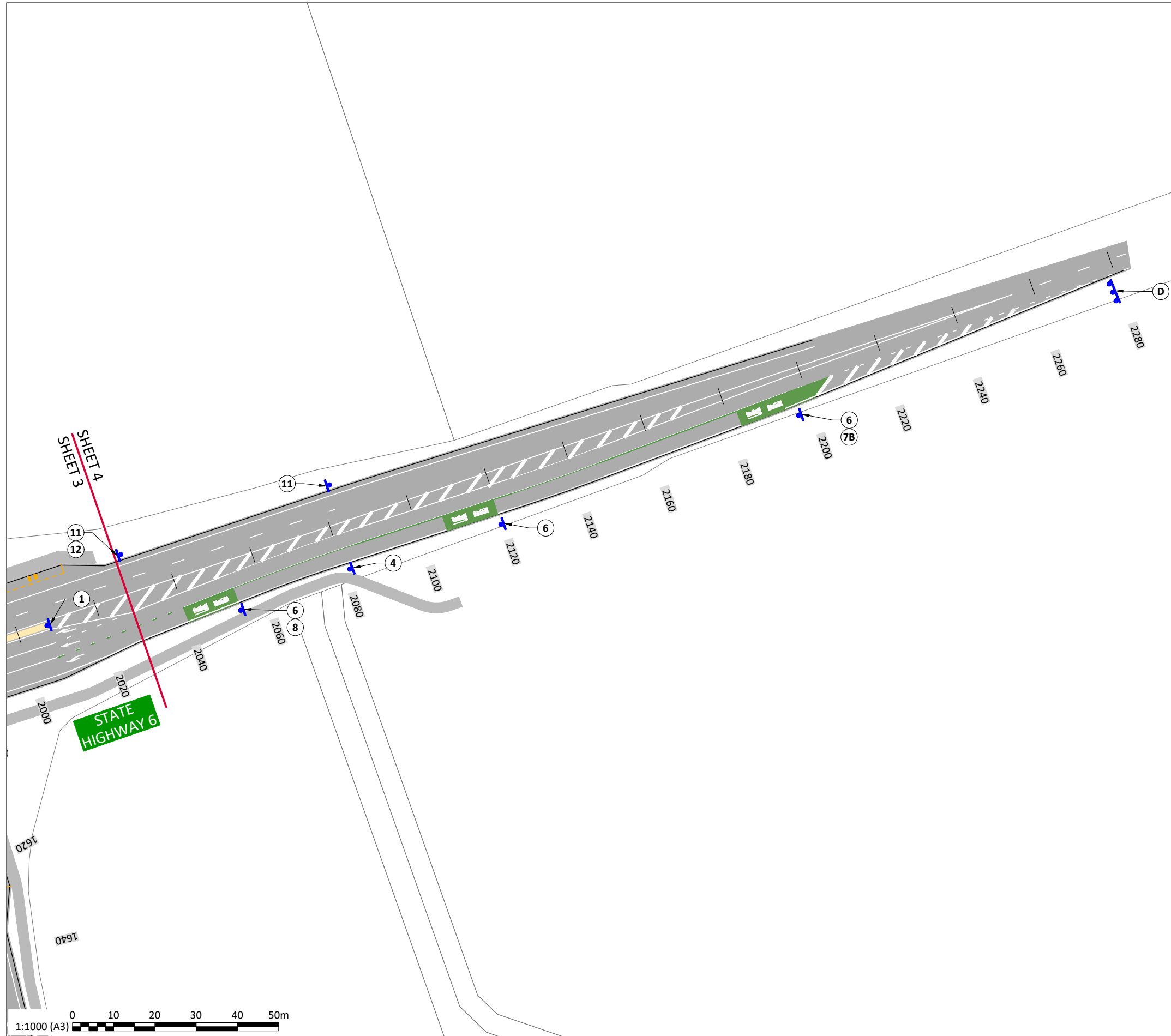
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| ④                         | 750                        | WA4       |      |
| ⑥                         | 750x750                    | RLB1      |      |
| ⑦                         | A = 600x250<br>B = 750x300 | RG21      |      |
| ⑪                         | 750x750                    | WW12      |      |
| ⑫                         | 750x313                    | WG3       |      |
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| VERTICAL DATUM                   | NZVD16           | REVISION<br>A        |
| DRAWING NUMBER<br>149360-00-2854 |                  |                      |



**Appendix B – Stormwater Report**



**Simplicity Living Ltd**

**Te Pūtahi Ladies Mile, Queenstown**

**Public Road Upgrade - Stormwater  
management Report**

June 2026







## Document control

| Project identification   |                                                                                                               |                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------|---------------------|
| Client                   | Simplicity Living Ltd                                                                                         |                     |
| BBO details              | Bloxam Burnett & Olliver Ltd (BBO)<br>Level 5, Building E, Union Square, 192 Anglesea St, Hamilton            |                     |
| BBO representative       | Constantinos Fokianos                                                                                         |                     |
| BBO rep. contact details | 0275101062                                                                                                    | cfokianos@bbo.co.nz |
| Job number/s             | 149360                                                                                                        |                     |
| Job name                 | Te Pūtahi Ladies Mile, Queenstown                                                                             |                     |
| Report name and number   | Public Road Upgrade - Stormwater management Report                                                            |                     |
| File path                | D:\12ds\data\10.7.120.14\149360 - Queenstown Simplicity Living_5670\07 Water Resources\Reports\SW Report.docx |                     |

| Report status |                       |                                                                                     |            |
|---------------|-----------------------|-------------------------------------------------------------------------------------|------------|
| Status        | Name                  | Signature                                                                           | Date       |
| Prepared by   | Constantinos Fokianos |  | 23.06.2026 |
| Checked by    |                       |                                                                                     |            |
| Approved by   |                       |                                                                                     |            |

| Document history |         |                                |               |
|------------------|---------|--------------------------------|---------------|
| Version          | Changes | Approved by<br>(Initials only) | Approved date |
| V1               |         |                                |               |
| V2               |         |                                |               |
| V3               |         |                                |               |
| V4               |         |                                |               |







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# **1. Introduction**

## **1.1 Purpose of Report**

This Stormwater Management Report has been prepared in support of the Fast Track consenting process for the proposed transport infrastructure works associated with Te Pūtahi Ladies Mile, Queenstown.

The report addresses the stormwater management approach for the proposed road corridor works around Lower Shotover Road, Spence Road, State Highway 6 and the Stalker Road interface. These works form part of the wider transport infrastructure package required to support the staged development of the Te Pūtahi Ladies Mile area.

The purpose of this report is to demonstrate that stormwater runoff generated by the proposed road corridor can be appropriately managed within the available transport corridor. In particular, the report considers the collection, treatment, temporary storage and soakage of runoff from the proposed road-related catchments, consistent with the applicable Te Pūtahi Ladies Mile stormwater requirements.

The report has been prepared at a level appropriate for the Fast Track consenting process. It establishes the proposed stormwater management strategy, confirms the feasibility of managing the relevant road runoff by soakage to ground, and identifies the matters that will require confirmation during detailed design.

## **1.2 Project Description**

The project comprises transport infrastructure works within the Te Pūtahi Ladies Mile area, focused on the Lower Shotover Road and Spence Road corridor, the interface with State Highway 6, and the Stalker Road access and active-transport connections.

The wider Te Pūtahi Ladies Mile planning framework identifies transport infrastructure as a key component of the planned urban growth area. The relevant works include upgrades to the Lower Shotover Road and Spence Road corridor, works at the Stalker Road and State Highway 6 interface, public-transport facilities, active-travel links, development access roads, and associated corridor improvements.

For stormwater purposes, the project includes new or upgraded road pavement, kerb and channel, catchpits, stormwater reticulation, treatment infrastructure, shared paths, berms and associated drainage works. The stormwater system is required to manage runoff generated by these road corridor elements without creating adverse effects on adjoining land, downstream environments or the wider development area.

The proposed stormwater strategy is based on managing runoff close to source through a distributed treatment and soakage approach within the road corridor. The detailed arrangement of the collection, treatment and soakage infrastructure is described in later sections of this report.

## **1.3 Scope of Assessment**

This report assesses stormwater management for the proposed road corridor works only.

The assessment includes runoff from the proposed road carriageway, shared path and berm/verge areas where those areas are graded to the road drainage system. It considers the proposed collection network, stormwater reticulation, treatment measures, soakage infrastructure, existing drainage interfaces and secondary-flow considerations.





Runoff from adjacent development platforms, private lots, roofs, internal development catchments and wider upstream or off-site catchments is excluded from this assessment. These areas are understood to be managed separately as part of the wider development stormwater system. The proposed road drainage system has therefore not been designed as an overflow or disposal system for the wider development catchment.

The assessment is based on the information available at the time of preparation, including the current road design information, relevant planning provisions, geotechnical information, rainfall data, applicable stormwater guidance and coordination undertaken with the wider project team.

The report is structured to first describe the available information, existing environment and design criteria. It then sets out the catchment assessment, stormwater management philosophy, proposed system, hydraulic and soakage assessment, construction and maintenance requirements, environmental effects and conclusions.

The remaining matters for detailed design relate primarily to final construction-level refinement, including confirmation of catchment extents, final road levels, catchpit spacing, pipe sizing, hydraulic grades, treatment-device selection, soakage-device detailing, utility coordination, pavement interfaces, secondary-flow routes and operation and maintenance requirements. These matters are not expected to alter the overall stormwater management strategy assessed in this report.



## 2. Available Information

### 2.1 Reference Documents

The stormwater assessment has been prepared using the information available at the time of writing. The Te Pūtahi Ladies Mile provisions have been treated as a key design driver, rather than just background information, because they set the stormwater outcome required for the wider area. In particular, the provisions require stormwater to be managed as part of an integrated stormwater management system, with soakage to ground of runoff generated by the 1% AEP event.

The following information has been used to inform this report:

- Te Pūtahi Ladies Mile provisions, proposed 15/04/2026.
- Current roading layout, corridor geometry, proposed levels, shared path layout, intersection layout and earthworks information for the Lower Shotover Road / Spence Road / SH6 / Stalker Road corridor.
- ENGEO, Geotechnical Interpretive Report – 12 Lower Shotover Road, Lake Hayes Estate, Queenstown, Project No. 30002.000.001, dated 16/03/2026.
- NIWA HIRDS rainfall information adopted for the Queenstown project area.
- Queenstown Lakes District Council, Land Development and Subdivision Code of Practice, 2025.
- Otago Regional Council, Regional Plan: Water for Otago, updated August 2025.
- Relevant manufacturer and supplier information for potential stormwater treatment, soakage and drainage components, including Cirtex Aquafort 400 technical information.
- Email correspondence and coordination with the wider project team regarding stormwater design assumptions, the split between road and development stormwater responsibilities, and Fast Track lodgement expectations.

The QLDC Land Development and Subdivision Code of Practice has been used to inform the technical design of the soakage infrastructure, including soakage device layout, drain-down, pre-treatment, secondary flow, factors of safety, construction protection and operation/maintenance requirements. For this project, the Te Pūtahi Ladies Mile provisions set the specific stormwater outcome, while the QLDC Code provides the technical framework for how the system should be designed and detailed.

The ORC Regional Plan: Water for Otago has also been considered in relation to stormwater discharge to land, particularly the need to avoid flooding, erosion, land instability, sedimentation, property damage and adverse water quality effects.

### 2.2 Project Design Information

The road stormwater design has been informed by the current transport corridor layout and associated design information for the proposed Lower Shotover Road / Spence Road / SH6 / Stalker Road works.

The current design information shows a transport corridor that includes road carriageway areas, shared path areas, berms/verges, tie-ins to existing roads and interfaces with the adjacent development. For stormwater purposes, the relevant catchment is therefore not just the sealed carriageway. Shared path and berm/verge areas that are graded toward the proposed road drainage system are also included in the contributing catchment.

The available design information has been used to identify the contributing road catchments, likely drainage low points, road crossfalls, longitudinal grades, existing drainage interfaces, and available corridor space for



stormwater treatment and soakage infrastructure. The proposed stormwater arrangement developed from this information is described separately in Section 7.

## 2.3 Geotechnical Information

The soakage design is based primarily on the ENGEO geotechnical investigations for 12 Lower Shotover Road.

The ENGEO report identifies a ground profile generally comprising topsoil over loess and localised fill, underlain by alluvium. The coarse-grained alluvium has been identified as the preferred soakage horizon. ENGEO recommends an unfactored soakage rate of 500 L/hr/m<sup>2</sup> for the coarse-grained alluvium, subject to the designer applying the appropriate consequence factor.

The report also identifies two important design considerations. First, the depth to suitable coarse-grained alluvium varies across the site, so final trench and soakage well depths will need to be confirmed against the final finished levels and actual ground conditions. Second, the design needs to avoid or account for the migration of fine-grained soils into the coarse-grained alluvium. This has directly informed the proposed use of pre-treatment, clean drainage aggregate, geotextile separation and construction controls.

Groundwater was not encountered in the ENGEO or historical site investigations, and available groundwater information reviewed by ENGEO indicates regional groundwater is significantly below the proposed soakage infrastructure. On this basis, groundwater is not expected to constrain the proposed soakage infrastructure, subject to confirmation during detailed design and construction. This confirmation will include verifying that the base and surrounding infiltration interfaces of the selected soakage device are founded within, or hydraulically connected to, suitable coarse-grained alluvium.

## 2.4 Key Assumptions

The stormwater assessment is based on the road drainage system managing runoff from the proposed roading scope only. This includes the carriageway, shared path and berm/verge areas where those areas drain to the proposed road drainage system.

Runoff from the adjacent development areas, building platforms, private lots, roofs and wider upstream/off-site catchments is excluded. These areas are understood to be managed separately by the development stormwater system by others. On that basis, no uncontrolled spillover from the development system has been included in the road stormwater sizing.

The road soakage system has been assessed to provide temporary storage and soakage capacity for the 1% AEP, 24-hour design event. The assessment uses a separate reticulation model to determine the inflow hydrograph delivered to the soakage system, followed by a dedicated soakage-storage model that assesses effective storage volume, infiltration losses, well-liner storage and overflow performance.

Two feasible soakage-device options have been assessed for the main shared-path soakage system. The first comprises an aggregate-filled drainage-metal trench incorporating twin DN160 perforated distribution pipes and the 900 mm well liner volumes. The second comprises twin side-by-side Aquafort 400 modular tanks, or an approved equivalent proprietary system, together with the 900 mm well liner volumes. Both options use the same upstream reticulation, treatment and well-liner arrangement and demonstrate that the required road runoff can be managed within the available shared-path/verge corridor.

The road corridor, including available shared path/verge areas, is assumed to provide sufficient space for stormwater treatment and soakage infrastructure. This is a key design assumption because it allows the main





stormwater management elements to be kept largely outside the trafficked carriageway where practical, while remaining accessible for inspection and maintenance.

The matters to be confirmed during detailed design are not expected to change the overall stormwater management strategy. They relate mainly to construction-level refinement, including final catchment areas, catchpit spacing, pipe grades, treatment device sizing and levels, utility coordination, selected soakage-device levels and construction details.



### **3. Existing Environment**

#### **3.1 Site Location and Surrounding Environment**

The project is located within the Te Pūtahi Ladies Mile area in Queenstown and relates to the transport corridor around Lower Shotover Road, Spence Road, State Highway 6 and the Stalker Road interface.

The area is part of a wider planned urban growth area, where transport infrastructure, active travel links and public transport improvements are required to support future development. The proposed road works therefore need to function as part of the wider serviced urban corridor, rather than as an isolated road upgrade.

The surrounding environment currently includes existing road corridors, rural and rural-residential land, undeveloped land and areas identified for future urban development. The proposed stormwater approach needs to fit within this changing environment, while avoiding unmanaged runoff onto adjoining land and maintaining a clear split between road drainage and development drainage.

For this report, the relevant stormwater environment is the proposed transport corridor itself, including the carriageway, shared path and berm/verge areas that drain to the road drainage system.

#### **3.2 Existing Topography and Drainage**

The project area sits within the lower part of the Ladies Mile corridor. The existing and proposed transport corridors generally follow the landform around Lower Shotover Road and State Highway 6, with localised grade changes associated with road tie-ins, intersections and proposed regrading.

From a stormwater perspective, the road corridor behaves as a series of long and relatively narrow catchments. Runoff from the carriageway, shared path and berm/verge areas will generally be collected along kerb lines and directed toward local low points unless intercepted earlier.

This is important for the stormwater assessment because the corridor does not behave as a single concentrated catchment. The road drainage design therefore needs to consider localised drainage low points, road crossfall, longitudinal grade, and opportunities to collect and manage runoff progressively along the corridor.

The final drainage catchments will be confirmed from the detailed road surface, including crossfall, kerb lines, shared path grading, berm grading and catchpit locations. Particular attention will be required at sag points, intersections and tie-in areas, where local ponding or surcharge could occur if inlet capacity or exceedance routes are not properly managed.

The shared-path and verge corridor also follows the changing road alignment and longitudinal profile. This is relevant to the proposed stormwater design because the available soakage-storage area will need to respond to local changes in road level, crossfall, service constraints and corridor width. The resulting storage geometry and hydraulic performance are addressed in Sections 7 and 8.

#### **3.3 Geology, Ground Conditions and Groundwater**

Ground conditions have been assessed primarily from the ENGEO Geotechnical Interpretive Report – 12 Lower Shotover Road, Lake Hayes Estate, Queenstown.



The available geotechnical information indicates that the site generally comprises topsoil over loess and localised fill, underlain by alluvium. The loess and finer-grained soils are not the preferred soakage layer. The coarse-grained alluvium is the target material for the proposed soakage system.

ENGEO recommends an unfactored soakage rate of 500 L/hr/m<sup>2</sup> for the coarse-grained alluvium, subject to the appropriate design factors being applied. This rate supports a soakage-based stormwater system, provided the relevant soakage elements are located in suitable material and protected from sediment and fine migration.

A key design issue is the presence of finer-grained material above the alluvium. If fine material migrates into the soakage layer, drainage aggregate or other permeable interfaces associated with the soakage system, the long-term performance of the system could be reduced. This needs to be accounted for in the design through appropriate pre-treatment, clean drainage aggregate, geotextile separation and construction controls to protect the soakage media.

Groundwater was not encountered in the ENGEO investigations, and the available groundwater information indicates that regional groundwater is significantly below the proposed soakage infrastructure. On that basis, groundwater is not expected to constrain the proposed shared-path soakage-storage system, subject to confirmation of final levels and founding conditions during detailed design and construction.

### 3.4 Existing Stormwater Environment

The existing stormwater environment reflects the current rural/peri-urban setting, existing road corridors and the underlying alluvial ground conditions. There is no intention for the proposed road drainage system to rely on a new concentrated downstream discharge point. The design philosophy is instead to manage runoff close to source through pre-treatment and soakage to ground.

Existing roadside drainage features are present along parts of the corridor, including swales, catchpits and culvert crossings. These assets form part of the existing drainage environment and need to be considered in the stormwater design, particularly where the proposed road works affect existing drainage paths, low points or culvert connections.

The wider Te Pūtahi Ladies Mile stormwater framework requires an integrated approach to stormwater management, with runoff from the 1% AEP event soaked to ground where required. For the roading works, this means the existing corridor drainage conditions need to be assessed in the context of the future road layout, including the carriageway, shared path and berm/verge areas that will drain to the road stormwater system.

The adjacent development and upstream/off-site catchments are to be managed separately by others. This is an important interface assumption. The road stormwater system has not been developed as the overflow or disposal system for the wider development catchments.

The existing stormwater environment therefore requires the road drainage design to maintain a clear catchment boundary, avoid uncontrolled diversion of development runoff into the road system, protect downstream or adjacent land from concentrated discharge, and provide safe exceedance behaviour within the road corridor if local blockage, surcharge or events above the design case occur.





## 4. Design Criteria and Standards

### 4.1 Design Basis

The stormwater design has been developed to respond to the Te Pūtahi Ladies Mile stormwater requirements, the QLDC Land Development and Subdivision Code of Practice, and the relevant Otago Regional Council requirements for stormwater discharge to land.

For this project, the key design requirement is that runoff generated from the contributing catchment is captured, treated and soaked to ground for the 1% AEP event. For the road corridor, this applies to the carriageway, shared path and berm/verge areas that drain to the proposed road drainage system.

The proposed road stormwater system is therefore based on the following design basis:

| Item                           | Design Basis                                                                                                                                                                                                                                                     |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stormwater design event        | 1% AEP                                                                                                                                                                                                                                                           |
| Disposal method                | Soakage to ground                                                                                                                                                                                                                                                |
| Drain-down target              | Maximum 24 hours                                                                                                                                                                                                                                                 |
| Main contributing areas        | Carriageway, shared path and berm/verge areas draining to the road drainage system                                                                                                                                                                               |
| Excluded areas                 | Adjacent development platforms, private lots, roofs, internal development catchments and upstream/off-site catchments                                                                                                                                            |
| Target soakage layer           | Coarse-grained alluvium                                                                                                                                                                                                                                          |
| Primary treatment              | Sumped catchpits and GPT manholes before discharge to well liner nodes and the downstream soakage-storage system                                                                                                                                                 |
| Discharge / distribution nodes | 900 mm well liners downstream of GPT manholes, providing treated-flow discharge, inspection, local storage and distribution to the downstream soakage device                                                                                                     |
| Main soakage elements          | Shared-path/verge soakage-storage system, comprising either an aggregate-filled drainage-metal trench or a proprietary modular soakage system, together with treatment/conveyance swales and treatment soakage basin elements where provided by the final layout |
| Secondary flow                 | To be considered for resilience and exceedance behaviour                                                                                                                                                                                                         |
| Soakage assessment method      | Linked SWMM assessment comprising a reticulation model to determine the inflow hydrograph and a separate soakage-storage model to assess storage, infiltration and overflow performance                                                                          |
| Effective storage basis        | Storage based on the actual longitudinal profile and effective void volume of the selected soakage device, including the 900 mm well liner volumes                                                                                                               |

The road drainage system is not intended to receive runoff from the adjacent development catchments. Those catchments are to be managed separately by the development stormwater system.

Secondary flow paths will still be considered during detailed design. This is not intended to reduce the 1% AEP soakage requirement, but to provide resilience for blockage, inlet surcharge, reduced infiltration or events above the design case.



## 4.2 Applicable Standards and Guidelines

The design has been prepared with reference to the following standards, guidelines and planning documents:

| Document / Standard                                                           | Relevance to Design                                                                                                                      |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Te Pūtahi Ladies Mile provisions                                              | Sets the stormwater outcome for the area, including 1% AEP soakage to ground and integrated stormwater management requirements           |
| QLDC Land Development and Subdivision Code of Practice, 2025                  | Provides local design guidance for stormwater infrastructure, soakage devices, treatment, secondary flow, drawdown and maintenance       |
| Otago Regional Council Regional Plan: Water for Otago                         | Relevant to stormwater discharge to land and avoiding adverse effects such as flooding, erosion, sedimentation and water quality effects |
| NZ Building Code Clause E1 – Surface Water                                    | General national surface water performance requirements                                                                                  |
| Auckland Council GD07 – Stormwater Soakage and Groundwater Recharge Guideline | Relevant to soakage testing methodology, infiltration rate factoring, soakage design and drain-down assessment                           |
| AS/NZS 2566                                                                   | Relevant to buried flexible stormwater pipe installation                                                                                 |
| AS/NZS 3725                                                                   | Relevant where rigid concrete pipes or concrete drainage components are used                                                             |
| NZS 4404                                                                      | General land development and subdivision infrastructure reference                                                                        |
| NZS 4431                                                                      | Relevant to earth fill, trench reinstatement and ground preparation around infrastructure                                                |
| NZS 3109                                                                      | Relevant to concrete construction and precast concrete components                                                                        |
| NZTA / Waka Kotahi requirements                                               | Relevant where the works interface with State Highway 6                                                                                  |

The Te Pūtahi Ladies Mile provisions set the performance requirement. The QLDC Code and the other standards then inform how the system is to be designed, detailed, constructed and maintained.

## 4.3 Rainfall and Design Storm Criteria

Design rainfall has been derived from NIWA HIRDS information for the Queenstown project area and applied using the adopted 1% AEP, 24-hour climate-change-adjusted RCP8.5 rainfall temporal pattern.

The reticulation and soakage-storage models have both been assessed using the same adopted 1% AEP, 24-hour event. This provides the runoff hydrograph delivered to the soakage system and allows the downstream storage, infiltration and overflow performance to be assessed using the full temporal distribution of the storm rather than a simplified total-volume check only.



| Parameter               | Adopted Value                              |
|-------------------------|--------------------------------------------|
| Design event            | 1% AEP / 100-year event                    |
| Rainfall duration       | 24 hours                                   |
| Climate-change scenario | RCP8.5                                     |
| Adopted rainfall depth  | 138.7 mm, rounded to 139 mm                |
| Design rainfall input   | 100-year, 24-hour RCP8.5 design hyetograph |
| Required drain-down     | Maximum 24 hours                           |

The 24-hour event is used for the principal storage, soakage and drain-down assessment. Shorter-duration 1% AEP events will still be checked during detailed design for catchpit inlet capacity, kerb flow, sealed-pipe capacity, hydraulic grade and local surcharge behaviour.

This distinction is important. The soakage system is assessed mainly by storage volume, effective infiltration area and drain-down. The upstream catchpit and pipe network is assessed by short-duration peak flow.

## 4.4 Contributing Catchments and Runoff Coefficients

The contributing catchment includes all areas within the roading scope that drain to the proposed road stormwater system. This includes the sealed carriageway, shared path areas and berm/verge areas where these fall toward the catchpits, treatment/conveyance swales or soakage system.

The catchment should not be assessed using road carriageway width alone, as this would miss the shared path and berm/verge areas already included in the design. These areas should be measured and included by surface type.

For concept and lodgement-level calculations, the following runoff coefficients are considered appropriate:

| Surface Type                            | Runoff Coefficient |
|-----------------------------------------|--------------------|
| Sealed road carriageway                 | 0.90               |
| Shared path / paved footpath            | 0.85–0.90          |
| Landscaped berm / grassed verge         | 0.30–0.50          |
| Compacted or highly modified berm areas | 0.50–0.70          |

The final coefficient for each drainage subcatchment should be calculated as a weighted coefficient based on the actual contributing surface areas.

$$C_w = \frac{\sum(A_i \times C_i)}{\sum A_i}$$

where:

- $A_i$  is the area of each surface type; and
- $C_i$  is the runoff coefficient for that surface type.

Where a simplified conservative assessment is required, a higher composite runoff coefficient may be adopted, provided it is clearly stated and checked against the final catchment plan.

The runoff coefficients in this section provide an appropriate preliminary design basis and independent reasonableness check. The dynamic SWMM assessment used for the current stormwater design instead





applies measured subcatchment areas, defined impervious and pervious surface proportions, and the adopted rainfall temporal pattern to generate the inflow hydrograph delivered to the soakage system.

## 4.5 Soakage Design Criteria

The proposed soakage system comprises treatment soakage trenches, well liner discharge/distribution nodes, and a treatment soakage basin, with treatment/conveyance swales provided where corridor space and levels allow. The well liners receive treated runoff downstream of the GPT manholes and provide discharge and distribution points to the principal shared-path soakage-storage system. The system is sized for the contributing road-corridor catchments only.

The design criteria for the soakage system are:

| Item                           | Design Criterion                                                                                                                                                                   |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Design event for soakage       | 1% AEP                                                                                                                                                                             |
| Drain-down time                | Maximum 24 hours                                                                                                                                                                   |
| Target soakage layer           | Coarse-grained alluvium                                                                                                                                                            |
| Pre-treatment                  | Required before discharge to well liners, treatment soakage trench, treatment/conveyance swales or treatment soakage basin                                                         |
| Main soakage elements          | Shared-path/verge soakage-storage system, comprising either a drainage-metal trench or twin modular soakage units, together with treatment soakage basin elements where provided   |
| Discharge / distribution nodes | 900 mm well liners downstream of GPT manholes, providing treated-flow discharge and distribution to the shared-path soakage-storage system                                         |
| Treatment/conveyance elements  | Swales where space and levels allow                                                                                                                                                |
| Storage volume                 | Based on the effective storage volume of the selected device, derived from its actual longitudinal profile, storage geometry, effective void volume and included well liner volume |
| Basin / swale storage          | Included only where intentionally designed to pond and drain down                                                                                                                  |
| Drainage-metal option          | Effective storage to include drainage-metal void volume, the volume of two DN160 perforated distribution pipes and the 900 mm well liner volumes                                   |
| Modular soakage option         | Effective storage based on the proprietary module geometry and stated approximately 95% void ratio, together with the 900 mm well liner volumes                                    |
| Infiltration rate              | Based on ENGEO testing and factored for uncertainty and consequence                                                                                                                |
| Sediment protection            | Required during construction and operation                                                                                                                                         |
| Secondary flow                 | To be considered for resilience and exceedance behaviour                                                                                                                           |

The principal shared-path soakage system is assessed as a storage and infiltration device rather than as a simple gross excavation volume. The downstream storage model represents the actual longitudinal profile of the soakage alignment and applies the effective storage volume available within the selected soakage device.



For the drainage-metal option, the effective volume includes the drainage-metal void volume, the storage volume within the twin DN160 perforated distribution pipes and the 900 mm well liner volumes. For the modular option, the effective volume is based on the proprietary module geometry and stated approximately 95% void ratio, together with the well liner volumes.

This approach avoids overstating available storage by treating the physical trench or modular-device envelope as fully void. It also allows the storage curve to reflect changes in the actual shared-path soakage profile and levels along the corridor.

Where the drainage-metal trench option is adopted, perforated pipes will be used within the trench to assist treated-flow distribution and flushing. They are not relied upon as the primary stormwater conveyance system.

## 4.6 Adopted Infiltration Rate and Factors of Safety

The soakage design is based on the coarse-grained alluvium identified by ENGEO as the preferred infiltration layer. ENGEO recommends an unfactored soakage rate of 500 L/hr/m<sup>2</sup> for this material.

For design purposes, the unfactored soakage rate is reduced using factors of safety for uncertainty and consequence.

| Parameter                | Adopted Value           |
|--------------------------|-------------------------|
| Unfactored soakage rate  | 500 L/hr/m <sup>2</sup> |
| Uncertainty factor, F(u) | 1.5                     |
| Consequence factor, F(c) | 1.5                     |
| Total factor             | 2.25                    |
| Design soakage rate      | 222 L/hr/m <sup>2</sup> |

This gives:

$$\frac{500}{1.5 \times 1.5} = 222 \text{ L/hr/m}^2$$

or:

$$222 \text{ L/hr/m}^2 = 222 \text{ mm/hr} = 0.222 \text{ m/hr}$$

This remains a high infiltration rate. On that basis, the design is expected to be controlled more by catchment collection, treatment, flow distribution, soakage geometry and construction detailing than by the soakage rate itself.

The consequence factor should be reviewed during detailed design once the final soakage-device, well liner, swale and basin layout, secondary flow routes, maintenance access and treatment arrangements are confirmed.

The adopted design soakage rate of 222 L/hr/m<sup>2</sup> has been used as the infiltration parameter for the downstream soakage-storage modelling. The assessment therefore applies the factored rate to the selected soakage-device configuration, rather than relying solely on a simplified manual drain-down calculation based on an assumed trench base area.



## 4.7 Pre-treatment Criteria

Treatment is required before road runoff enters the well liner discharge nodes, the shared-path soakage-storage system, treatment/conveyance swales or the treatment soakage basin. This is required for both water quality and long-term soakage performance.

The treatment system is expected to include sumped catchpits for initial sediment capture, stormwater pipes from catchpits to treatment points, and GPT manholes immediately upstream of the well liner discharge/distribution nodes. The intent is that road runoff is treated before it is discharged into the well liners and then distributed into the downstream shared-path soakage-storage system.

The final GPT sizing and configuration will be confirmed during detailed design, but the report should be clear that road runoff will not discharge directly into the well liners or downstream soakage-storage system without treatment.

Construction runoff is to be kept out of the soakage system. The well liners, shared-path soakage-storage system, treatment/conveyance swales and treatment soakage basin should not be used as temporary sediment controls during construction.

## 4.8 Secondary Flow and Exceedance Criteria

The treatment and soakage system is being sized for the 1% AEP event, but secondary flow paths still need to be considered. The secondary-flow system is a resilience measure and is not relied upon to manage any overflow from the assessed 1% AEP, 24-hour storage event.

This is a resilience requirement. It allows the system to behave safely if there is local blockage, inlet surcharge, temporary reduction in soakage performance, or a storm event above the design case.

The detailed design should confirm that exceedance flows can remain within the road corridor or other agreed flow paths without causing adverse effects on adjoining land or development areas. The road drainage system should not rely on the adjacent development stormwater system as an overflow route unless this is specifically assessed and agreed.

Particular attention will be required at local low points, sag areas and intersection tie-ins.

## 4.9 Water Quality and Environmental Criteria

The proposed system must manage road runoff without creating adverse stormwater effects. The key outcomes are to avoid nuisance flooding on adjoining land, avoid erosion or land instability, avoid sediment discharge to receiving environments, provide treatment for road-derived contaminants before soakage, and maintain long-term soakage performance.

The distributed treatment and soakage approach supports these outcomes by managing runoff close to source, avoiding a concentrated downstream discharge, and providing treatment before discharge to the shared-path soakage system and the underlying ground.





## 4.10 Design Level and Future Refinement

The design criteria above are suitable for the Fast Track lodgement package and demonstrate that the proposed stormwater approach is technically feasible. The matters remaining for detailed design relate to final construction-level refinement, including final GPT selection and levels, well liner levels, confirmation of the preferred soakage-device option, final storage-device levels and profile, secondary-flow routes, utility coordination, pavement interface requirements and maintenance access.

These refinements are not expected to change the overall treatment, storage and soakage strategy assessed in this report.



## 5. Catchment Assessment

### 5.1 Catchment Definition

The stormwater catchment assessment has been completed for the proposed roading works within the Te Pūtahi Ladies Mile transport corridor.

The assessed catchment includes the proposed road carriageway, shared path, berm and verge areas that are graded to drain to the proposed road stormwater system. The catchment excludes adjoining development platforms, private lots, roofs, internal development catchments and wider upstream or off-site catchments. These areas are understood to be managed separately as part of the wider development stormwater system.

The road drainage system has therefore been assessed as a standalone road-corridor system. It has not been sized as an overflow or disposal system for adjoining development catchments.

The current road drainage layout has been represented by sixteen delineated subcatchments in the SWMM model. The total modelled contributing catchment area is approximately 1.71 ha.

### 5.2 Catchment Components

The delineated subcatchments represent the contributing road-related surfaces within the current design layout. These include sealed carriageway, widened pavement areas, road intersections, shared-path areas and berm/verge surfaces that drain toward the proposed road drainage network.

Each subcatchment has been divided into impervious and pervious components to reflect the proposed surface treatment and expected drainage response. Across the full modelled road catchment, the total impervious area is approximately 1.18 ha and the total pervious area is approximately 0.54 ha. This equates to an overall imperviousness of approximately 69%.

The proportion of impervious surface varies between the subcatchments depending on the local road geometry, shared-path extent, verge width and adjoining landscaped areas. Fully sealed road subcatchments have been modelled as 100% impervious, while areas incorporating berms, verges or wider landscaped surfaces include an appropriate pervious component.

This approach represents the different runoff response of sealed road surfaces and vegetated or landscaped corridor areas, rather than applying a single runoff coefficient across the entire transport corridor.

### 5.3 Subcatchment Approach

The road corridor has been divided into practical drainage subcatchments using the current road layout, proposed surface levels, kerb alignment, shared-path grading, local road low points and downstream collection points.

Each modelled subcatchment has been assigned to its relevant downstream collection node in the SWMM reticulation model. This allows runoff to be generated from individual drainage areas and routed through the proposed stormwater network in accordance with the current drainage layout.



The delineated subcatchments represent the local drainage areas associated with the Lower Shotover Road and Spence Road works, shared-path and verge areas, local road tie-ins, intersection areas and the Stalker Road / State Highway 6 interface.

The modelled subcatchments range in size from approximately 0.010 ha to 0.543 ha. The larger subcatchments represent broader road, shared-path and verge catchments, while the smaller subcatchments represent localised road-drainage and tie-in areas.

The adopted catchment areas, imperviousness, overland-flow widths, slopes, surface roughness values, depression-storage allowances and Horton infiltration parameters are recorded in the SWMM model setup and project hydrological calculation record.

## 5.4 Runoff Estimation Method

The hydrological and hydraulic assessment has been undertaken using EPA SWMM. The model applies the adopted design rainfall hyetograph to the delineated road drainage subcatchments and routes the resulting runoff through the proposed stormwater reticulation network.

The design rainfall assessment was based on NIWA HIRDS point rainfall depth data adopted for the project location. Historical and climate-change-adjusted rainfall depths were reviewed for the relevant range of annual recurrence intervals and storm durations required to develop the adopted 24-hour design storm.

The adopted critical rainfall event for this assessment is the 1% AEP, 24-hour RCP8.5 2081–2100 event. The adopted rainfall depth is 139 mm. The corresponding historical 1% AEP, 24-hour rainfall depth is 114 mm.

| Parameter                      | Historical Event | Adopted Design Event     |
|--------------------------------|------------------|--------------------------|
| Annual recurrence interval     | 100-year         | 100-year                 |
| Annual exceedance probability  | 1% AEP           | 1% AEP                   |
| Storm duration                 | 24 hours         | 24 hours                 |
| Climate scenario               | Historical       | RCP8.5, 2081–2100        |
| Rainfall depth                 | 114 mm           | 139 mm                   |
| Increase from historical event | –                | 25 mm, approximately 22% |

A project-specific 24-hour Alternating Block Method rainfall hyetograph was developed from the adopted RCP8.5 depth-duration rainfall relationship.

The method used the relevant 100-year RCP8.5 rainfall depths for the shorter and longer storm durations, including the 10-minute, 20-minute, 30-minute, 1-hour, 2-hour, 6-hour, 12-hour and 24-hour durations. Incremental rainfall depths were generated at ten-minute intervals and arranged using the Alternating Block Method, with the largest increment located at the centre of the 24-hour event.

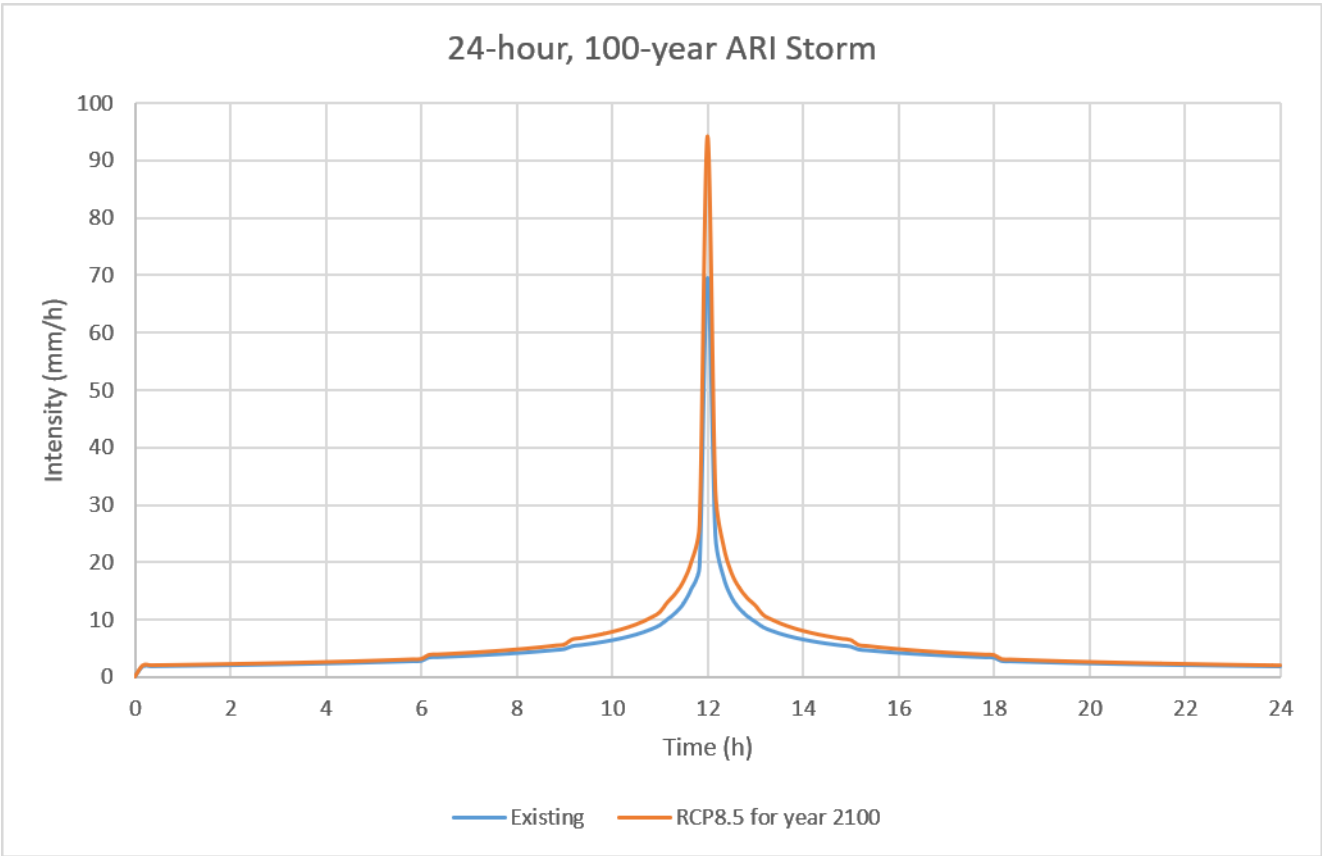
The resulting hyetograph comprises 144 ten-minute rainfall increments. The maximum ten-minute rainfall increment is 15.7 mm, equivalent to an intensity of 94.2 mm/hr, occurring approximately 12 hours after commencement of the storm.

The ten-minute rainfall depths were converted to rainfall intensities and imported directly into SWMM as an intensity-based rainfall time series. The rainfall series represented in SWMM has a cumulative depth of 138.7 mm, which is consistent with the adopted 139 mm design rainfall depth after rounding of individual ten-minute values.





No additional climate-change multiplier has been applied within SWMM. The climate-change allowance is already incorporated in the adopted RCP8.5 2081–2100 rainfall depths and the resulting design hyetograph.



The 24-hour RCP8.5 hyetograph was used to generate the road-runoff hydrograph in the reticulation model. The resulting combined inflow hydrograph to the principal shared-path soakage system was then exported and applied directly to the separate soakage-storage models.

This approach allows the assessment to represent both the total runoff volume generated during the design event and the timing of runoff that controls peak reticulation flows, local surcharge behaviour and the inflow hydrograph delivered to the principal shared-path soakage system.

**5.5      Runoff Coefficients and Modelled Surface Parameters**

The SWMM model does not use a single composite runoff coefficient for the full road corridor. Runoff is calculated dynamically from the defined impervious and pervious portions of each modelled subcatchment.

The following runoff-coefficient ranges remain appropriate as a reasonableness check on the adopted subcatchment imperviousness and expected runoff response:

| Surface Type                            | Adopted Runoff Coefficient |
|-----------------------------------------|----------------------------|
| Sealed carriageway                      | 0.90                       |
| Shared path / paved footpath            | 0.85–0.90                  |
| Landscaped berm / grassed verge         | 0.30–0.50                  |
| Compacted or highly modified berm areas | 0.50–0.70                  |



Each modelled subcatchment includes its measured catchment area, percentage imperviousness, overland-flow width, average surface slope, depression storage and Manning's roughness values for the impervious and pervious surface components.

The adopted model surface parameters are summarised below.

| Parameter                | Impervious Surface | Pervious Surface |
|--------------------------|--------------------|------------------|
| Manning's roughness, $n$ | 0.015              | 0.150            |
| Depression storage       | 2 mm               | 5 mm             |

The pervious portions of the subcatchments have been modelled using the Horton infiltration method. The adopted Horton parameters are:

| Horton Infiltration Parameter | Adopted Value        |
|-------------------------------|----------------------|
| Initial infiltration rate     | 50.8 mm/hr           |
| Minimum infiltration rate     | 12.7 mm/hr           |
| Decay constant                | 4.0 hr <sup>-1</sup> |
| Drying time                   | 7 days               |

These Horton parameters represent rainfall losses from the pervious portions of the road-corridor catchments, including berm and verge areas. They are not the adopted infiltration rate for the downstream soakage system.

The infiltration rate applied to the soakage-storage assessment is based separately on the ENGEO-recommended soakage rate for the coarse-grained alluvium, including the adopted design factors. This is addressed in Section 8.

## 5.6 Modelled Catchment and Reticulation Response

The SWMM reticulation model was run using the adopted 100-year, 24-hour RCP8.5 2081–2100 Alternating Block Method rainfall hyetograph.

The model generated approximately 1,675 m<sup>3</sup> of surface runoff from the full approximately 1.71 ha road catchment during the design event. This runoff was routed through the proposed reticulation network to the relevant downstream road drainage and soakage elements.

The model did not produce node surcharge or node flooding for the assessed design event. This indicates that the modelled reticulation network can convey runoff from the defined road catchments to the downstream stormwater-management elements without loss of containment at the modelled nodes.

The principal shared-path soakage-storage system was assessed using the combined inflow hydrograph generated by the reticulation model. The adopted inflow hydrograph has the following characteristics:

| Parameter                                         | Modelled Result                       |
|---------------------------------------------------|---------------------------------------|
| Total inflow volume to shared-path soakage system | Approximately 1,275 m <sup>3</sup>    |
| Peak inflow rate                                  | Approximately 0.209 m <sup>3</sup> /s |



| Parameter                          | Modelled Result                                           |
|------------------------------------|-----------------------------------------------------------|
| Time of peak inflow                | Approximately 12:10 hours after commencement of the storm |
| Rainfall duration                  | 24 hours                                                  |
| Total rainfall represented in SWMM | 138.7 mm                                                  |

The difference between the total road-catchment runoff and the inflow applied to the principal shared-path soakage model reflects the distributed nature of the road drainage system. The wider corridor includes other local drainage and discharge elements, whereas the approximately 1,275 m<sup>3</sup> hydrograph represents the combined flow directed to the principal shared-path soakage-storage system.

The inflow hydrograph was exported from the reticulation model and applied directly to the separate soakage-storage models. This provides a more representative assessment than a simplified static runoff-volume calculation because it considers the actual timing, peak flow and recession of the runoff generated by the proposed road drainage network.

## 5.7 Catchment Interface with Development Areas

The adjacent development stormwater system remains responsible for managing runoff from development platforms, private lots, building roofs, internal development catchments and wider upstream or off-site catchments.

The road catchment boundary has therefore been defined to include only the areas intended to drain to the proposed road drainage system. This distinction has been maintained in the delineated subcatchments and the SWMM model.

The proposed road stormwater system is not intended to receive uncontrolled runoff, surcharge or overland flow from the wider development system. Any future change to this interface would require reassessment of the road drainage model and the downstream soakage capacity.

## 5.8 Catchment Assessment Summary

The proposed road drainage catchment has been delineated and represented in a dynamic SWMM hydrological and hydraulic model comprising sixteen subcatchments with a combined area of approximately 1.71 ha.

The model includes the proposed road pavement, shared path and relevant berm/verge areas that drain to the road stormwater system. It applies measured catchment areas, defined imperviousness, surface roughness, depression storage and Horton infiltration parameters to simulate the rainfall-runoff response of the proposed road corridor.

The adopted design rainfall event is the 100-year, 24-hour RCP8.5 2081–2100 event, with an adopted rainfall depth of 139 mm. A ten-minute Alternating Block Method hyetograph was developed from the adopted depth-duration rainfall data and imported directly into SWMM as the rainfall time series.

The full modelled road catchment generates approximately 1,675 m<sup>3</sup> of runoff during the design event. The principal shared-path soakage system receives a modelled inflow volume of approximately 1,275 m<sup>3</sup>, with a peak inflow rate of approximately 0.209 m<sup>3</sup>/s.





This inflow hydrograph has been used directly in the separate soakage-storage assessment. The storage, infiltration and overflow performance of the drainage-metal trench and modular soakage options is presented in Section 8.



## 6. Stormwater Management Philosophy

### 6.1 Overall Philosophy

The stormwater strategy for the roading works is based on managing runoff from the contributing transport corridor catchments close to source. This includes runoff from the carriageway, shared path and berm/verge areas that drain to the proposed road drainage system.

The key requirement for the design is to capture, treat and soak runoff from the 1% AEP event to ground, in response to the Te Pūtahi Ladies Mile stormwater provisions. The system has therefore been developed as a distributed treatment and soakage system within the road corridor, rather than a conventional collection system discharging to a downstream outlet.

This approach suits the project because the catchment is long and linear, parts of the shared path/verge corridor provide practical locations for soakage infrastructure, and the available geotechnical information indicates suitable soakage potential within the underlying coarse-grained alluvium. The philosophy is to manage runoff progressively along the corridor using a combination of collection, treatment, distribution and soakage elements, rather than concentrating the full catchment at a single low point.

The road stormwater system is not intended to manage runoff from the wider development, building platforms, private lots or upstream/off-site catchments. Those areas are to be managed separately by the development stormwater system by others.

### 6.2 Distributed Soakage Approach

The proposed soakage approach is based on distributing treated runoff to the available soakage elements along the road corridor. The principal shared-path soakage system provides the main temporary storage and infiltration function, while treatment/conveyance swales and the treatment soakage basin provide additional open treatment, conveyance, storage and soakage opportunities where corridor space and levels allow.

Two feasible configurations have been assessed for the principal shared-path soakage system: an aggregate-filled drainage-metal trench incorporating twin DN160 perforated distribution pipes, and twin side-by-side Aquafort 400 modular tanks, or an approved equivalent proprietary system.

The 900 mm well liners remain part of the system, but their role should be understood as discharge/distribution nodes rather than standalone soak pits. The reticulated stormwater network discharges to the well liners after passing through the GPT manholes. The well liners then provide the hydraulic transition between the treated pipe network and the downstream shared-path soakage-storage system, while also providing access, local storage, flow distribution and flushing points.

The typical stormwater flow path is:

*road surface → kerb and catchpits → stormwater pipes → GPT manhole → well liner discharge/distribution node → shared-path soakage system / swale / basin → ground*

The benefit of this approach is that runoff is spread along the corridor rather than being concentrated at a single low point. That is important for this site, because the road catchment is narrow and linear, and a single terminal device would be less practical, less resilient, and more difficult to maintain. The well liner nodes also allow treated inflows to be introduced to the downstream soakage system at selected locations, helping to distribute flow and use the available storage and infiltration area effectively.



## 6.3 Treatment Philosophy

Road runoff will be treated before it enters the soakage system. This is required for water quality, but it is also needed to protect the long-term performance of the soakage system.

The main risk to the long-term performance of the soakage system is not expected to be a lack of infiltration capacity. The more important risk is sediment and fine material entering the well liner nodes or downstream soakage-storage system and progressively clogging drainage media, proprietary storage components or the underlying alluvium.

The treatment train will therefore include sumped catchpits for coarse sediment capture and GPT manholes at key network locations before discharge to the well liner nodes. The design basis is clear: untreated road runoff is not to discharge directly to the well liners, shared-path soakage system, treatment/conveyance swales or treatment soakage basin.

The well liners, shared-path soakage system, treatment/conveyance swales and treatment soakage basin should also be protected during construction. They should not be used as temporary sediment control devices, and construction runoff should not be allowed to enter the system before the contributing surfaces are stabilised and the treatment devices are operational.

## 6.4 Interface with the Development Stormwater System

The road stormwater system has been developed as a road corridor system only.

The adjacent development platforms, private lots, building roofs, internal development roads and upstream/off-site catchments are outside this assessment. They are to be managed separately by the development stormwater system. This is an important interface assumption and should remain clear on the catchment plans and design drawings.

The road treatment and soakage system contributes to the wider integrated stormwater outcome by managing its own contributing catchment. It should not be treated as the overflow route or disposal system for the wider development catchments unless that is specifically reassessed, agreed and designed for.

## 6.5 Secondary Flow and Resilience Philosophy

Although the treatment and soakage system is being sized for the 1% AEP event, secondary flow paths still need to be considered. The hydraulic assessment confirms that the modelled reticulation network and both assessed shared-path soakage options can manage the adopted 1% AEP, 24-hour design event without node flooding or soakage-device overflow.

The detailed design should confirm how the system behaves if there is inlet blockage, local surcharge, temporary reduction in soakage performance, or a storm greater than the design event. Exceedance flows should remain within the road corridor or other agreed flow paths and should not be directed onto adjoining land or into the development stormwater system unless specifically allowed for.

Local low points, sag areas and intersection tie-ins will need particular attention, as these are the locations where temporary ponding or surcharge is most likely to occur.





## 6.6 Maintenance Philosophy

The system needs to be maintainable, especially because soakage performance depends on keeping sediment and fines out of the well liners, downstream soakage-storage system and underlying soakage interface.

This is one of the reasons for retaining well liner discharge/distribution nodes rather than relying only on a buried soakage-storage device. The well liners provide access for inspection, flushing and local sediment checks downstream of the GPTs and upstream of the shared-path soakage system. The GPT manholes and sumped catchpits provide maintainable locations where sediment, floatables and gross pollutants can be removed before runoff reaches the well liner nodes and downstream soakage-storage system. The open swale and basin elements also improve maintainability where they are used, because sediment build-up, erosion or vegetation issues can be inspected and addressed from the surface.

The maintenance approach is simple:

- capture sediment and gross pollutants early;
- treat runoff before it reaches the well liners and soakage media;
- provide access for inspection and flushing;
- use open swale and basin elements where practical;
- keep the soakage-storage system and underlying alluvium protected from fines.

This keeps the long-term maintenance focus on accessible assets such as catchpits, GPT manholes, well liner nodes, swales and basin areas, rather than relying on direct maintenance of the buried soakage-storage system.

## 6.7 Summary of Stormwater Philosophy

The proposed stormwater philosophy is based on a road-only, distributed treatment and soakage system that captures, treats and soaks runoff from the contributing road corridor catchments for the 1% AEP event.

The system uses stormwater reticulation to collect road runoff, GPT manholes to treat runoff before soakage, and well liner discharge/distribution nodes to introduce treated runoff into the principal shared-path soakage system. The principal soakage system has been assessed using either an aggregate-filled drainage-metal trench or twin side-by-side Aquafort 400 modular tanks, or an approved equivalent proprietary system. Treatment/conveyance swales and a treatment soakage basin are also used where corridor space and levels allow.

This approach is practical for the long linear road catchment, avoids reliance on a single downstream outlet, protects the soakage system through treatment before discharge, distributes flows along the available soakage length, and keeps the road drainage function separate from the wider development stormwater system.



## 7. Proposed Stormwater System

### 7.1 System Overview

The proposed stormwater system comprises a road drainage collection network discharging to a distributed treatment and soakage system within the road corridor. The system includes conventional road drainage reticulation, GPT manholes, well liner discharge/distribution nodes, a principal shared-path soakage-storage system, treatment/conveyance swales and a treatment soakage basin.

The system includes the following main components:

- kerb and channel collection;
- sumped catchpits;
- stormwater reticulation pipes;
- GPT manholes upstream of the well liner discharge nodes;
- 900 mm well liner discharge/distribution nodes;
- a principal shared-path soakage-storage system, comprising either an aggregate-filled drainage-metal trench or twin side-by-side Aquafort 400 modular tanks, or an approved equivalent;
- DN160 perforated drainage pipes within the drainage-metal trench option;
- treatment/conveyance swales where space and levels allow;
- a treatment soakage basin; and
- headwalls/outfalls, riprap protection and existing drainage tie-ins where required.

The proposed arrangement is shown on the stormwater drawings included in Appendix A, including the stormwater layout drawings and typical stormwater detail drawings.

### 7.2 Road Collection System

Road runoff will be collected by kerb and channel and directed to catchpits located along the corridor. Catchpit locations will be set by the final road grading, kerb profiles, subcatchment boundaries and local sag points.

Catchpits are to be sumped where practical to provide first-stage sediment capture. The layout should avoid long uncontrolled kerb flow lengths, particularly near intersections, tie-ins and low points.

Where shared path and berm / verge areas fall toward the road drainage network, treatment/conveyance swales or soakage infrastructure, those areas will be included in the relevant stormwater subcatchment.

### 7.3 Stormwater Reticulation Pipework

Stormwater reticulation pipes will convey runoff from the catchpits to the proposed GPT manholes, well liner discharge nodes, treatment/conveyance swales, the principal shared-path soakage-storage system and the treatment soakage basin, as applicable to each drainage network.

These pipes will be sized for the relevant peak flows during detailed design. The final pipe diameters will be confirmed based on the contributing subcatchment areas, available cover, hydraulic grade, inlet capacity, GPT/manhole levels and connection levels into the downstream well liner or treatment/soakage element.



The stormwater reticulation pipes are to remain separate from the perforated drainage pipes used within the drainage-metal trench option. The reticulation pipes provide conveyance to the treatment and discharge nodes, while the perforated pipes provide distribution within the drainage-metal storage media.

## 7.4 GPT Manholes and Treatment System

Runoff will pass through treatment before entering the well liner discharge nodes, principal shared-path soakage-storage system, treatment/conveyance swales or treatment soakage basin.

The treatment system includes sumped catchpits as the first treatment stage and GPT manholes at key network locations. The GPT manholes are located immediately upstream of the well liner discharge/distribution nodes, so that runoff is treated before it enters the downstream shared-path soakage-storage system.

The selected GPTs are to be maintainable from the road corridor or shared path/verge area and located so that sediment, floatables and gross pollutants can be removed before runoff enters the well liners and soakage media.

The well liners, principal shared-path soakage-storage system, treatment/conveyance swales and treatment soakage basin are not to receive untreated construction runoff and are not to be used as temporary sediment-control devices.

## 7.5 Principal Shared-Path Soakage-Storage System

The principal shared-path soakage-storage system provides the main temporary storage and infiltration function for the road drainage network. It is located within the shared-path/verge corridor where shown on the stormwater drawings.

The system receives treated runoff from the upstream GPT manholes through the 900 mm well liner discharge/distribution nodes. The well liners provide access, local attenuation and controlled distribution of runoff to the downstream soakage-storage device.

Two feasible soakage-device configurations have been assessed for this location:

### 7.5.1 Drainage-metal trench option

This option comprises a nominally 2.0 m wide and 1.5 m deep trench filled with clean 20/50 mm scoria or drainage metal. Two DN160 perforated distribution pipes are located within the lower portion of the trench. The trench is wrapped in Bidim A19 non-woven geotextile, or approved equivalent, with 300 mm overlaps.

The drainage-metal option has been assessed using a void ratio of 0.35. Allowing for the void space within the drainage metal and the storage volume within the two DN160 perforated pipes gives an effective storage area of approximately 1.070 m<sup>3</sup> per metre of trench length. This represents an effective storage ratio of approximately 0.357 across the gross trench profile.

For the hydraulic storage model, this effective storage volume is represented by an equivalent 2.0 m wide storage profile with an effective depth of approximately 0.54 m. The storage curve was derived from the actual longitudinal profile of the soakage-trench alignment, rather than assuming the full physical trench depth is available as water storage.





### 7.5.2 Modular soakage option

This option comprises twin side-by-side Aquafort 400 modular tanks, or an approved equivalent proprietary soakage system, located beneath the shared path/verge corridor. The twin-module arrangement has a nominal width of approximately 1.46 m.

Based on the supplier-stated approximately 95% void ratio, the modular system provides an effective storage depth of approximately 0.74 m across the 1.46 m width. The actual longitudinal profile of the proposed soakage alignment was also used to derive the storage curve for this option.

The 900 mm well liner volumes are included in the hydraulic storage assessment for both options. The separate storage models confirm that both the drainage-metal trench and the modular soakage option can store and infiltrate the modelled 1% AEP, 24-hour RCP8.5 inflow without overflow.

The final detailed design will confirm the selected soakage-device configuration, taking account of the final shared-path design, pavement requirements, utility coordination, supplier requirements, construction methodology, maintenance access and cost. Both options demonstrate that the available shared-path/verge corridor can provide a feasible soakage solution for the proposed road runoff.

GAP, AP, crusher-run materials or other fine-bearing aggregates are not suitable within the drainage-metal trench option because they would reduce the effective storage volume and increase the risk of clogging.

## 7.6 Perforated Distribution Pipes

Where the drainage-metal trench option is selected, DN160 perforated drainage pipes are proposed within the drainage-metal trench to assist treated-flow distribution and flushing.

The typical arrangement is:

| Item          | Proposed Detail                                             |
|---------------|-------------------------------------------------------------|
| Pipe diameter | DN160, where the drainage-metal trench option is selected   |
| Pipe type     | Heavy-walled Novaflo, or approved equivalent                |
| Pipe wrap     | Filter sock                                                 |
| Pipe function | Flow distribution and flushing access                       |
| Trench media  | 20/50 mm scoria / drainage metal                            |
| Geotextile    | Bidim A19 non-woven geotextile wrap, or approved equivalent |

The perforated pipes are to connect to the well liner discharge/distribution nodes where practical. Flush access is to be provided through the well liners and at trench terminations where required.

If the modular soakage option is selected, the connection between the well liners and the Aquafort units will be detailed in accordance with the proprietary supplier's requirements. Separate DN160 perforated distribution pipes would not be required unless retained as part of the final proprietary-system arrangement.



## 7.7 Well Liner Discharge / Distribution Nodes

The discharge/distribution nodes will be formed using 900 mm diameter well liners, or approved equivalent. These well liners remain part of the proposed design and provide the transition between the treated stormwater reticulation network and the selected downstream shared-path soakage-storage system.

The typical well detail is:

| Item               | Proposed Detail                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal diameter  | 900 mm                                                                                                                                                                                                   |
| Typical depth      | 2.5–3.0 m below finished level                                                                                                                                                                           |
| Upper section      | Solid liner where required near surface                                                                                                                                                                  |
| Lower section      | To provide hydraulic connection to the selected downstream soakage-storage system where required                                                                                                         |
| Base               | To maintain hydraulic connection to the selected downstream soakage device; no sealed concrete base unless required for a specific structural reason and an alternative hydraulic connection is provided |
| Base / surround    | Clean drainage aggregate and proprietary connection details, as required for the selected soakage option                                                                                                 |
| Aggregate surround | 300 mm minimum, 450 mm preferred where space allows                                                                                                                                                      |
| Lid                | Flush with shared path / verge finished level                                                                                                                                                            |
| Loading            | To suit shared path and maintenance vehicle loads                                                                                                                                                        |

The well liners provide access, local storage and flow distribution into the downstream soakage-storage system. They are not intended to operate as large standalone soak pits. Their main role is to provide the hydraulic transition between the treated reticulation network and the selected soakage device.

The base and surrounding material of each well liner are to maintain hydraulic connection with the selected downstream soakage system and underlying soakage material. For the drainage-metal option, this will generally be through the trench drainage media and/or DN160 perforated distribution pipes. For the modular option, it will be through the proprietary tank connection arrangement and any associated drainage media required by the supplier.

Given the 900 mm diameter, the well liners should be used as regular access/distribution nodes rather than large, combined junction structures. Multiple large reticulation pipes should not be directed into one well liner where this can be avoided. The GPT manhole immediately upstream should remain the primary treatment and sediment removal point.

## 7.8 Connections Between GPT Manholes, Well Liners and Soakage System

Each well liner will receive treated runoff from an upstream GPT manhole via a sealed inlet pipe. The GPT manhole is the primary treatment and sediment removal point immediately upstream of the well liner.

The downstream connection from each well liner will provide treated-flow distribution into the selected soakage-storage system. For the drainage-metal trench option, this will generally comprise hydraulic connection to the trench drainage media and/or DN160 perforated distribution pipes. For the modular soakage option, the well liners will connect to the proprietary units using the relevant inlet and outlet components required by the selected supplier. The final arrangement will retain practical flushing and inspection access from the well liners.



## 7.9 Location Beneath Shared Path / Verge

The principal shared-path soakage-storage system and associated well liner nodes are proposed beneath the shared path / verge corridor where practical.

The final alignment will be coordinated with:

- shared path pavement build-up;
- utility corridors;
- street lighting and signs;
- landscaping;
- retaining or edge structures;
- treatment device access; and
- maintenance vehicle access.

The proposed location is preferred because it avoids placing the principal soakage-storage device beneath the trafficked carriageway, while still keeping the system accessible and aligned with the road corridor.

The two assessed soakage options provide flexibility within the available corridor. The drainage-metal trench option requires a nominal width of 2.0 m, while the twin modular Aquafort arrangement has a nominal width of approximately 1.46 m. The final selected configuration will be coordinated with the shared-path pavement build-up, utilities, lighting, signage, landscaping, maintenance access and any local width restrictions.

## 7.10 Secondary Flow and Exceedance Arrangement

The detailed road levels will need to confirm safe exceedance behaviour at local sag points, intersections and tie-ins. The hydraulic assessment confirms that neither assessed shared-path soakage option overflows during the adopted 1% AEP, 24-hour RCP8.5 design event; however, safe exceedance routes remain necessary for blockage, reduced long-term infiltration performance or events greater than the adopted design event.

If local blockage or surcharge occurs, exceedance flow should remain within the road corridor or other agreed flow paths. The design should avoid directing uncontrolled flow onto adjoining private land or into the adjacent development stormwater system.

This will be checked as part of the final road grading, catchpit layout and hydraulic grade review.

## 7.11 Proposed System Summary

The proposed system is a distributed road soakage system comprising conventional road collection infrastructure, pre-treatment, 900 mm well liner discharge/distribution nodes, and a principal shared-path soakage-storage system.

The upstream reticulation network collects road runoff through kerb, catchpits and sealed stormwater pipes. Runoff is treated through GPT manholes before being discharged to the well liner nodes. The well liners then distribute treated runoff to either:

- an aggregate-filled drainage-metal trench incorporating twin DN160 perforated distribution pipes; or





- twin side-by-side Aquafort 400 modular tanks, or an approved equivalent proprietary soakage system.

Both configurations have been assessed using the inflow hydrograph generated by the reticulation model and separate soakage-storage models. The assessment confirms that the available shared-path/verge corridor can provide sufficient storage and infiltration capacity for the adopted 1% AEP, 24-hour RCP8.5 design event without overflow.

The final detailed design will confirm the selected soakage-device configuration and associated proprietary requirements, levels, pavement interface, utility coordination and maintenance access. The overall treatment, storage and soakage strategy remains unchanged.



## 8. Hydraulic and Soakage Assessment

### 8.1 Assessment Basis

The hydraulic and soakage assessment has been completed using two linked EPA SWMM models.

The first model represents the proposed road stormwater reticulation network. It applies the adopted 1% AEP, 24-hour RCP8.5 2081–2100 rainfall event to the delineated road drainage subcatchments and routes the resulting runoff through the proposed catchpit, pipe and node network.

The second model represents the principal shared-path soakage-storage system. The model uses the combined inflow hydrograph exported from the reticulation model and assesses temporary storage, exfiltration to ground and potential overflow from the soakage device.

This two-model approach separates the stormwater-management functions appropriately. The reticulation model determines the runoff response of the proposed road catchments and the timing of inflow to the soakage system. The soakage-storage model then assesses whether the available shared-path soakage area can receive, store and infiltrate that inflow without overflow.

The reticulation assessment was undertaken using Dynamic Wave routing and the Horton infiltration method for pervious catchment areas. The flow-routing continuity error was -0.347%, and all model time steps converged. No model nodes were surcharged or flooded during the adopted design event.

### 8.2 Design Rainfall and Reticulation Inflow

The adopted rainfall event is the 1% AEP, 24-hour RCP8.5 2081–2100 design event described in Section 5.

The adopted rainfall depth is 139 mm. A project-specific Alternating Block Method hyetograph was developed using the adopted RCP8.5 depth-duration rainfall data and represented in SWMM using 10-minute rainfall intensity increments.

The reticulation model generated approximately 1,675 m<sup>3</sup> of surface runoff from the full modelled road catchment during the design event.

The combined inflow hydrograph directed to the principal shared-path soakage-storage system was exported from the reticulation model and applied directly to the separate soakage-storage models. The adopted inflow hydrograph is summarised below.

| Parameter                                            | Modelled Result                                           |
|------------------------------------------------------|-----------------------------------------------------------|
| Design event                                         | 1% AEP, 24-hour RCP8.5 2081–2100                          |
| Modelled rainfall depth                              | 138.7 mm                                                  |
| Total inflow to principal shared-path soakage system | Approximately 1,275 m <sup>3</sup>                        |
| Peak inflow rate                                     | Approximately 0.209 m <sup>3</sup> /s                     |
| Time of peak inflow                                  | Approximately 12:10 hours after commencement of the storm |

The 1,275 m<sup>3</sup> inflow volume is less than the total road-catchment runoff because the wider road corridor includes a number of local drainage and discharge elements. The exported hydrograph represents the combined flow directed to the principal shared-path soakage-storage system only.



### 8.3 Soakage-Storage Modelling Method

The shared-path soakage system was represented in SWMM as a tabular storage node with exfiltration to ground.

The storage curves were derived from the actual longitudinal profile of the proposed soakage alignment. This is important because the shared-path corridor does not have a uniform level or storage depth along its full length. The model therefore represents progressive filling of the storage device as water levels rise along the profile, rather than assuming that a uniform rectangular trench volume becomes available instantaneously.

The effective storage volumes were used in the storage curves rather than the gross excavation or proprietary device envelope. This avoids overstating the volume available for temporary stormwater storage.

The 900 mm well liner volumes were included in the storage assessment for both soakage-device options.

Two feasible shared-path soakage options were assessed:

- an aggregate-filled drainage-metal trench incorporating twin DN160 perforated distribution pipes; and
- twin side-by-side Aquafort 400 modules, or an approved equivalent proprietary modular soakage system.

### 8.4 Drainage-Metal Trench Option

The drainage-metal option comprises the proposed trench alignment beneath the shared path/verge corridor, with a nominal trench width of 2.0 m.

The physical trench profile was converted to an effective hydraulic storage profile. The effective storage volume includes:

- void space within the drainage-metal trench fill, using the adopted drainage-metal void ratio;
- the internal volume of the two DN160 perforated distribution pipes; and
- the volume available within the 900 mm well liner nodes.

The resulting effective storage volume was converted to an equivalent 2.0 m wide storage profile. This produced an effective hydraulic storage depth of approximately 0.54 m.

The effective depth is not the physical trench depth. It is the equivalent depth of water storage after allowing for the drainage-metal void space and the additional volume provided by the perforated pipes and well liners.

The actual longitudinal profile was then used to develop the SWMM tabular storage curve for the drainage-metal trench option.

The drainage-metal trench model produced the following results:

| Parameter                   | Modelled Result                       |
|-----------------------------|---------------------------------------|
| Total inflow volume         | Approximately 1,275 m <sup>3</sup>    |
| Peak inflow rate            | Approximately 0.209 m <sup>3</sup> /s |
| Maximum stored volume       | Approximately 392 m <sup>3</sup>      |
| Maximum storage utilisation | 76.9%                                 |





| Parameter                               | Modelled Result                    |
|-----------------------------------------|------------------------------------|
| Maximum modelled water depth            | 1.22 m                             |
| Time of maximum stored volume           | Approximately 14:00 hours          |
| Flooding / overflow                     | None                               |
| Final stored volume                     | Nil                                |
| Total inflow discharged by exfiltration | Approximately 1,275 m <sup>3</sup> |
| Continuity error                        | 0.000%                             |

The maximum modelled water depth represents the hydraulic stage within the tabular storage curve relative to the lowest point of the soakage-storage profile. It should not be interpreted as a uniform water depth across the full trench alignment.

The results confirm that the drainage-metal trench option can receive the modelled inflow hydrograph, provide temporary attenuation and infiltrate the full design-event volume without overflow.

## 8.5 Modular Aquafort Option

The modular option comprises twin side-by-side Aquafort 400 modules, or an approved equivalent proprietary soakage device, installed beneath the shared-path/verge corridor.

The twin modular arrangement has a nominal installed width of approximately 1.46 m. Based on the manufacturer-stated approximately 95% void ratio, the physical module depth was converted to an equivalent effective storage depth of approximately 0.74 m.

The Aquafort storage curve was developed from the actual longitudinal profile of the proposed soakage alignment, using the effective modular storage volume and including the 900 mm well liner volumes.

The modular soakage model produced the following results:

| Parameter                               | Modelled Result                       |
|-----------------------------------------|---------------------------------------|
| Total inflow volume                     | Approximately 1,275 m <sup>3</sup>    |
| Peak inflow rate                        | Approximately 0.209 m <sup>3</sup> /s |
| Maximum stored volume                   | Approximately 280 m <sup>3</sup>      |
| Maximum storage utilisation             | 35.0%                                 |
| Maximum modelled water depth            | 0.71 m                                |
| Time of maximum stored volume           | Approximately 12:57 hours             |
| Flooding / overflow                     | None                                  |
| Final stored volume                     | Nil                                   |
| Total inflow discharged by exfiltration | Approximately 1,275 m <sup>3</sup>    |
| Continuity error                        | 0.000%                                |

The modular option provides materially greater available storage margin than the drainage-metal trench option. While the maximum stored volume is lower, it represents only 35% of the available modular-system storage capacity, compared with approximately 77% utilisation for the drainage-metal trench option.

The modelling therefore confirms that the modular option can receive, store and infiltrate the full design-event inflow without overflow.



## 8.6 Adopted Soakage Rate and Exfiltration Parameters

The soakage-storage models adopt the factored design soakage rate derived from the ENGEO geotechnical assessment and described in Section 4.

| Parameter                                        | Adopted Value           |
|--------------------------------------------------|-------------------------|
| ENGEO recommended unfactored soakage rate        | 500 L/hr/m <sup>2</sup> |
| Adopted uncertainty factor                       | 1.5                     |
| Adopted consequence factor                       | 1.5                     |
| Total factor of safety                           | 2.25                    |
| Adopted design soakage rate                      | 222 L/hr/m <sup>2</sup> |
| Equivalent SWMM saturated hydraulic conductivity | 222 mm/hr               |

The factored soakage rate was applied to the storage-node exfiltration calculation in SWMM. The storage models also adopted a suction head of 40 mm and an initial moisture deficit of 0.30 for the SWMM exfiltration calculation.

The same factored soakage rate was applied consistently to both the drainage-metal and modular soakage options. The comparison between options therefore reflects the difference in their effective storage geometry, rather than a difference in the adopted infiltration rate.

## 8.7 Drain-Down and Overflow Performance

Each soakage-storage model was run for a total period of 48 hours. This comprised the 24-hour design rainfall and reticulation inflow period, followed by a further 24-hour period to assess post-storm storage recession and drain-down.

Both modelled options had a final stored volume of nil at the end of the 48-hour simulation period. The full approximately 1,275 m<sup>3</sup> inflow volume was discharged through exfiltration to ground, with no modelled overflow or flooding loss.

The results therefore demonstrate that both assessed soakage-device configurations can manage the modelled 1% AEP, 24-hour RCP8.5 road-runoff inflow within the available shared-path/verge corridor.

## 8.8 Reticulation Conveyance

The reticulation model assessed runoff collection and conveyance through the proposed road catchpit and pipe network for the adopted 1% AEP, 24-hour RCP8.5 rainfall event.

The model did not produce node surcharge or node flooding. The maximum node water depths remain below the assigned node maximum depths, confirming that the assessed network can convey runoff to the downstream stormwater-management elements without loss of containment at the modelled nodes.

The reticulation results provide the basis for the inflow hydrograph applied to the principal shared-path soakage system. Detailed design will continue to confirm final catchpit positions, inlet capacity, kerb-flow



lengths, pipe grades, pipe diameters, GPT levels and connections to the well liner nodes as the road design is refined.

## 8.9 Comparison of Assessed Soakage Options

Both assessed soakage configurations demonstrate that infiltration within the shared-path/verge corridor is feasible for the adopted design event.

| Assessment Item                                | Drainage-Metal Trench              | Twin Aquafort 400 Modules / Approved Equivalent |
|------------------------------------------------|------------------------------------|-------------------------------------------------|
| Nominal device width                           | 2.0 m                              | Approximately 1.46 m                            |
| Effective storage depth                        | Approximately 0.54 m               | Approximately 0.74 m                            |
| Maximum stored volume                          | Approximately 392 m <sup>3</sup>   | Approximately 280 m <sup>3</sup>                |
| Maximum storage utilisation                    | 76.9%                              | 35.0%                                           |
| Flooding / overflow                            | None                               | None                                            |
| Final stored volume                            | Nil                                | Nil                                             |
| Design-event inflow discharged by exfiltration | Approximately 1,275 m <sup>3</sup> | Approximately 1,275 m <sup>3</sup>              |

The drainage-metal trench remains a feasible solution and has the advantage of conventional construction materials and straightforward integration with the DN160 perforated distribution pipes.

The modular option provides a narrower installed footprint and greater hydraulic storage margin. It is therefore likely to be advantageous where shared-path width, utility conflicts, pavement interface requirements or local corridor constraints limit the available trench footprint.

The final selected option will be confirmed during detailed design following coordination of constructability, cost, supplier requirements, pavement loading, utility crossings, maintenance access and final road levels.

## 8.10 Summary

The completed SWMM assessment confirms that the proposed road drainage system can collect and convey runoff from the modelled road catchments during the adopted 1% AEP, 24-hour RCP8.5 2081–2100 design event.

The reticulation model generated an approximately 1,275 m<sup>3</sup> inflow hydrograph to the principal shared-path soakage system, with a peak inflow rate of approximately 0.209 m<sup>3</sup>/s.

Separate soakage-storage models were used to assess both the drainage-metal trench and the twin Aquafort 400 modular option. Both options accommodated the full modelled inflow through temporary storage and exfiltration to ground, without surcharge, flooding or overflow.

The modelling therefore demonstrates that the available shared-path/verge corridor can provide a feasible soakage solution for the proposed road runoff.





## 9. Construction and Geotechnical Considerations

### 9.1 General

The long-term performance of the soakage system depends on the selected soakage-storage device, the well liner discharge/distribution nodes and the surrounding infiltration interfaces being constructed in suitable material and kept clean during construction. For this reason, construction methodology is important to the long-term performance of the system.

The detailed design and construction specification should require the contractor to protect the infiltration surfaces, avoid sediment entering the soakage system, and allow for inspection of the excavation base, well liner bases and soakage-device installation before the system is completed.

### 9.2 Soakage Device Excavation and Base Preparation

The soakage-storage system is to be excavated to the design width, depth and alignment shown on the drawings, with final levels adjusted where required to target suitable coarse-grained alluvium.

Where the drainage-metal trench option is selected, the trench base should be trimmed carefully and lightly scarified before placement of the drainage aggregate. The base should not be over-compacted, tracked over, smeared or left exposed for extended periods where it could become sealed by fine sediment.

Where the modular soakage option is selected, the excavation base and any required bedding layer are to be prepared in accordance with the proprietary supplier's installation requirements. The formation level must remain clean, level and protected from disturbance before installation of the modular units.

If fine-grained soils, uncontrolled fill, soft material or unsuitable material are encountered at the base, the area should be reviewed by the engineer and geotechnical engineer before construction proceeds. Depending on the selected option and local conditions, the response may include local deepening, widening, replacement with clean drainage material, modification of the device alignment or adjustment of the soakage-device level.

### 9.3 Well Liner / Distribution Node Construction

The 900 mm well liner discharge/distribution nodes are to be constructed to maintain hydraulic connection between the treated reticulation network and the selected downstream soakage-storage system.

The well liners are not to incorporate sealed concrete bases unless required for a specific structural reason and an alternative hydraulic connection to the downstream soakage device is provided. The lower well liner arrangement is to allow treated runoff to discharge to the selected trench or modular soakage system while retaining access for inspection, sediment removal and flushing.

Where the drainage-metal trench option is selected, each well liner base should include approximately 300–500 mm of clean drainage aggregate below and around the liner, with hydraulic connection to the trench media and/or the DN160 perforated distribution pipes. Where the modular soakage option is selected, the connection between the well liner and the proprietary units is to be constructed in accordance with the supplier's approved installation details.



The upper section should be solid where required to avoid near-surface fines, pavement material or topsoil entering the well. The lid and frame must suit the final location and any maintenance loading expected along the shared path/verge.

## 9.4 Geotextile and Fine Migration Control

Where the drainage-metal trench option is selected, the aggregate trench is to be fully wrapped with a suitable non-woven geotextile. The geotextile is intended to prevent migration of loess, silt and other fine-grained material into the drainage aggregate while still allowing water to pass through.

The geotextile should wrap the base, sides and top of the trench, with a minimum 300 mm overlap at joints. It should be protected from tearing during aggregate placement and should not be dragged across exposed silty ground.

Where the modular soakage option is selected, the proprietary units are to be wrapped or separated from surrounding soils in accordance with the supplier's approved installation requirements. Any geotextile, drainage aggregate surround or other filter/separation layer must maintain the required storage capacity while preventing migration of surrounding fines into the modular system.

For the well liner nodes, geotextile should be used where required to separate surrounding fine soils from drainage aggregate. It should not be placed as a tight filter layer directly across an open infiltration base where it could blind and reduce vertical soakage.

## 9.5 Drainage Aggregate

Where the drainage-metal trench option is selected, the trench and well liner surrounds are to be filled with clean 20/50 mm scoria or drainage metal, or approved equivalent, free of fines.

GAP, AP, crusher-run material or other fine-bearing aggregates are not suitable within the drainage-metal trench or around the well liner drainage interfaces. The drainage aggregate provides both effective storage volume and flow distribution, so fines content needs to be kept very low.

Where the modular soakage option is selected, drainage aggregate is to be used only where required for bedding, well liner connection details, side support or proprietary installation requirements. The proprietary modular units are to provide the primary storage volume and are not to be substituted with compacted aggregate or other non-approved fill.

All drainage material should be placed carefully to avoid damaging geotextile, proprietary units or prepared infiltration surfaces.

## 9.6 Construction Sediment Control

The well liners and selected shared-path soakage-storage system must not be used as temporary sediment-control devices during construction. Construction runoff should be diverted away from the soakage infrastructure until the contributing road surfaces are stabilised, and the upstream catchpits and treatment devices are operational. If sediment-laden runoff enters the completed soakage-storage system during construction, the affected drainage media, proprietary components or infiltration surfaces may require removal, cleaning, replacement or reinstatement.



This should be made clear in the construction specification and erosion and sediment control plan.

## 9.7 Verification During Construction

The following hold points should be included in the construction methodology:

| Hold Point                     |           | Requirement                                                                                                                                                                 |
|--------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Excavation inspection          | base      | Confirm suitable founding material, no smearing or fine sealing, and appropriate formation level before soakage-device installation                                         |
| Well liner inspection          |           | Confirm well liner base, inlet/outlet connections and hydraulic connection to the selected downstream soakage system                                                        |
| Geotextile inspection          |           | Confirm required separation layers, overlaps and absence of tears before completion of backfill                                                                             |
| Drainage inspection            | aggregate | Where used, confirm clean drainage aggregate free of fines                                                                                                                  |
| Modular inspection             | system    | Where selected, confirm installation in accordance with the proprietary supplier's requirements, including bedding, alignment, wrapping, connections and loading protection |
| Pre-treatment connection check |           | Confirm runoff passes through treatment before entering the well liner and downstream soakage system                                                                        |
| Final inspection               |           | Confirm access covers, flushing points, proprietary components and completed surface levels are installed as designed                                                       |

These checks are important because the long-term performance of the system depends on construction quality, protection of the infiltration interface and prevention of sediment ingress.

## 9.8 Utilities and Pavement Interface

The principal soakage-storage system is proposed beneath the shared path/verge corridor, so the final alignment will need to be coordinated with utilities, lighting, signs, landscaping, retaining elements and shared-path pavement construction.

Minimum cover to the top of the selected soakage-storage device should be confirmed with the pavement design and, where applicable, the proprietary supplier's loading requirements. A nominal minimum cover of 300 mm has been assumed, but this may need to increase locally depending on pavement build-up, service crossings or loading requirements.

Where services cross the trench, the detailed design should confirm whether the trench is locally interrupted, sleeved, bridged, or offset. Any interruptions, crossings or local changes in the storage-device geometry should be allowed for in the final storage and soakage calculations.

## 9.9 Construction Summary

The main construction risks are sediment ingress, smearing or disturbance of the infiltration surface, unsuitable founding material, incorrect installation of the selected soakage-storage device and conflicts with corridor services.





These risks are manageable through normal detailed design and construction controls, provided the excavation bases and well liner nodes are inspected before completion, clean drainage materials are used where required, geotextile and proprietary components are installed correctly, and construction runoff is kept out of the completed soakage system.



## 10. Operation and Maintenance

### 10.1 General

The proposed stormwater system has been arranged so that the main maintenance activities occur at accessible points, rather than within buried soakage media.

The main operation and maintenance objective is to keep sediment, gross pollutants and fine material out of the downstream shared-path soakage-storage system. If the upstream catchpits and treatment devices are maintained properly, the buried soakage device should remain a passive disposal system with limited direct maintenance requirements.

### 10.2 Catchpit Maintenance

Catchpits should be inspected and cleaned regularly, particularly after construction, after large storm events, and during the first year of operation when sediment loads may be higher.

The catchpit sumps should be cleaned before accumulated sediment reduces the available sump depth or begins to pass downstream. The maintenance frequency can be refined once the system is operating, but regular inspection is important because the catchpits are the first sediment control point.

### 10.3 Pre-treatment Device Maintenance

Proprietary treatment devices or treatment manholes should be maintained in accordance with the manufacturer's requirements.

At a minimum, maintenance should include inspection for sediment, floatables, hydrocarbons and blockage. Sediment and gross pollutants should be removed before they reduce treatment efficiency or pass forward into the soakage wells and trench.

### 10.4 Soakage / Distribution Well Maintenance

The 900 mm well liners provide inspection and flushing access between the treated reticulation network and the downstream shared-path soakage-storage system. They should be inspected periodically to confirm that:

- inlet and downstream connection pipes are clear;
- sediment is not accumulating within the well base;
- the downstream drainage-metal distribution pipes remain flushable, where that option is selected;
- proprietary modular-system connections remain clear and serviceable, where that option is selected;
- lids and access covers remain serviceable; and
- no obvious surcharge, prolonged ponding or reduced drain-down performance is occurring.

The well liners should not be allowed to become sediment traps for untreated runoff. The upstream catchpit and GPT treatment system must remain the primary sediment-control barrier protecting the downstream soakage-storage system.



## 10.5 Shared-Path Soakage-Storage System Maintenance

The buried soakage-storage system is not intended to require routine excavation or direct maintenance. Its long-term performance depends on maintaining the upstream catchpits, GPT manholes and well liner nodes so that sediment and fine material do not enter the storage device or underlying infiltration interface.

Where the drainage-metal trench option is selected, the twin DN160 perforated distribution pipes should be flushable from the well liner nodes. If reduced performance or blockage is suspected, the well liners should be inspected for sediment accumulation and the downstream distribution pipes flushed as appropriate.

Where the modular soakage option is selected, the well liner connections and proprietary system access arrangements should be inspected and maintained in accordance with the supplier's operation and maintenance requirements.

Direct intervention in the buried storage device should only be required if there is evidence of significant clogging or loss of performance, such as prolonged ponding, repeated surcharge, reduced post-storm drain-down or evidence that the upstream treatment system has failed.

## 10.6 Inspection Frequency

The final Operation and Maintenance Manual should set inspection frequencies for each asset type. A practical starting point is:

| Asset                                                | Indicative Frequency                                                                                      |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Catchpits                                            | 6-monthly and after major storm events                                                                    |
| Treatment devices                                    | As per manufacturer's requirements, minimum 6-monthly initially                                           |
| 900 mm well liner discharge/distribution nodes       | 6-monthly during the first year, then annually if performance is stable                                   |
| Drainage-metal distribution pipes, where applicable  | Flush as required, or annually if sediment accumulation or reduced performance is observed                |
| Modular soakage-system connections, where applicable | Inspect in accordance with proprietary supplier requirements, and at least annually during the first year |
| Overall system performance                           | After significant rainfall events during the first year                                                   |

The first year of operation is important. Inspection frequency can be adjusted once actual sediment loading and system performance are understood.

## 10.7 Maintenance Records

Maintenance records should be kept for the stormwater system. These should include inspection dates, sediment depths, cleanout dates, issues observed, actions taken and any evidence of surcharge or poor drain-down.

This will help demonstrate that the system is being maintained as intended and will also allow the maintenance frequency to be adjusted over time based on actual performance.





## 10.8 Operation and Maintenance Summary

The proposed stormwater system is maintainable, provided sediment is controlled before it reaches the shared-path soakage-storage system.

The key maintenance focus should be on sumped catchpits, GPT manholes and 900 mm well liner discharge/distribution nodes. The downstream soakage device should remain largely passive, with the well liner nodes providing access for inspection, flushing and performance monitoring where required.

This approach protects the effective storage volume and infiltration interface of either the drainage-metal trench or modular soakage option, reducing the likelihood that intrusive maintenance of the buried storage device will be required.



## 11. Environmental Effects Assessment

### 11.1 General

This section assesses the stormwater-related effects of the proposed road drainage system.

The assessment is based on the system described in previous sections: road runoff is collected, pre-treated and discharged to ground through a distributed soakage system located within the road corridor, including the principal shared-path soakage-storage system. The assessment is also based on the road system managing its own contributing catchment only, with development and upstream/off-site catchments managed separately by others.

The main stormwater effects considered are flooding, downstream discharge, groundwater, water quality, erosion, land stability, construction effects and long-term operation.

### 11.2 Flooding and Downstream Effects

The proposed system has been assessed to manage runoff from the contributing road corridor catchments for the adopted 1% AEP, 24-hour RCP8.5 2081–2100 design event.

The SWMM reticulation model confirmed that the proposed road drainage network can convey runoff from the modelled road catchments without node surcharge or flooding during the assessed event. The resulting inflow hydrograph to the principal shared-path soakage system was then assessed using separate storage and infiltration models.

Both the drainage-metal trench option and the modular soakage option were shown to manage the modelled inflow without overflow. The full design-event inflow volume was discharged by exfiltration to ground, with no residual stored volume at the end of the assessment period.

Because runoff is managed within the road corridor and discharged to ground rather than being directed to a new concentrated downstream outlet, the proposed system is not expected to create adverse downstream flood effects. Detailed design will still confirm inlet capacity, pipe grades, local low-point behaviour and secondary-flow routes.

### 11.3 Effects on Adjoining Land

The road stormwater system is not intended to direct runoff onto adjoining land or into the adjacent development stormwater system.

The reticulation and soakage-storage modelling confirms that the adopted 1% AEP, 24-hour design event can be managed without overflow from the principal shared-path soakage system. On this basis, the proposed system is not expected to create nuisance flooding or uncontrolled discharge onto adjoining land, provided the final detailed design maintains the defined road catchment boundary and safe overland-flow routes.

### 11.4 Groundwater Effects

The proposed system discharges treated stormwater to ground through the shared-path soakage-storage system and associated well liner discharge/distribution nodes.



Based on the available geotechnical information, groundwater is significantly below the proposed soakage trench and well levels. The proposed system is therefore not expected to directly interact with groundwater levels or create groundwater mounding issues of concern.

The final design should still confirm trench and well depths against the geotechnical information and avoid placing soakage devices in unsuitable fine-grained material. Provided this is done, groundwater effects are expected to be low for either the drainage-metal trench or modular soakage option.

## 11.5 Water Quality Effects

Road runoff can contain sediment, hydrocarbons, metals and other contaminants associated with vehicle movements and road surfaces. For this reason, pre-treatment is included before runoff enters the well liner discharge/distribution nodes and the downstream shared-path soakage-storage system.

The treatment train will include sumped catchpits and, where required, proprietary treatment manholes or separators. This will reduce sediment and gross-pollutant loads before runoff enters the downstream soakage-storage system and is discharged to ground.

The proposed approach is expected to provide an appropriate level of treatment for the road corridor runoff, subject to final device sizing and maintenance requirements being confirmed during detailed design.

## 11.6 Sediment and Construction Effects

Construction-phase sediment is one of the main risks to the performance of the soakage system.

The well liners and shared-path soakage-storage system should not receive sediment-laden construction runoff and should not be used as temporary sediment-control devices. If fine sediment enters the drainage-metal media, proprietary modular units, well liner connections or infiltration interfaces during construction, it could reduce the long-term storage and soakage performance of the system.

Construction effects can be managed through normal erosion and sediment-control measures, correct staging, protection of completed soakage infrastructure, and inspection hold points before aggregate placement or modular-system installation and commissioning.

## 11.7 Erosion and Scour

The proposed system does not rely on a concentrated surface discharge to a watercourse or open channel. Runoff is discharged to ground through the distributed shared-path soakage-storage system and associated well liner nodes.

As a result, erosion and scour effects are expected to be low. The hydraulic modelling indicates that neither assessed soakage option overflows during the adopted design event. The key requirement is nevertheless to ensure that any exceedance route associated with blockage, reduced long-term soakage performance or an event larger than the design event is controlled and does not discharge across unprotected batters, loose fill or adjoining land.

This will be checked with the final road levels and overland flow paths during detailed design.





## 11.8 Land Stability

The principal soakage-storage system is proposed within the shared path/verge corridor and will discharge to the underlying alluvium.

No significant land-stability effects are expected, provided the selected soakage device and associated well liner nodes are located away from sensitive slopes, retaining structures or foundations, and the final design considers the zone of influence of the soakage infrastructure.

Where the selected soakage device is located near retaining walls, batters, service trenches, pavement edges or other sensitive infrastructure, the final arrangement should be reviewed with the geotechnical engineer.

## 11.9 Climate Resilience

The stormwater system has been assessed for the 1% AEP, 24-hour RCP8.5 2081–2100 design event, using a climate-change-adjusted rainfall depth of 139 mm. This is approximately 22% greater than the equivalent historical 100-year, 24-hour rainfall depth adopted for the project location.

The reticulation model did not produce node surcharge or flooding during the adopted climate-change design event. The separate soakage-storage models also confirmed that both the drainage-metal trench and modular soakage options can manage the resulting inflow hydrograph without overflow.

The distributed nature of the system provides flexibility for detailed design. Where required, future refinement can include adjustment of soakage-device length, width, depth, number of well liner nodes or distribution arrangements without changing the overall treatment-and-soakage strategy.

Secondary-flow routes will also provide resilience for blockage, temporary reduction in infiltration performance or events greater than the adopted design event.

## 11.10 Overall Stormwater Effects Summary

The proposed stormwater system is expected to appropriately manage stormwater effects from the defined road corridor catchments.

The system captures road runoff, provides pre-treatment through sumped catchpits and GPT manholes, and directs treated runoff to the principal shared-path soakage-storage system through accessible well liner discharge/distribution nodes.

The completed SWMM assessment confirms that the proposed reticulation network can convey runoff from the modelled road catchments without surcharge or flooding during the adopted 1% AEP, 24-hour RCP8.5 2081–2100 event. Separate soakage-storage modelling confirms that both the drainage-metal trench and modular soakage options can manage the modelled inflow without overflow.

The system avoids reliance on a new concentrated downstream stormwater discharge and maintains separation between the assessed road-corridor catchments and the wider development stormwater system.

Subject to final detailed design, construction controls, geotechnical confirmation and ongoing maintenance of the upstream treatment assets, the proposed stormwater effects are expected to be acceptable for the Fast Track consenting process.





## 12. Conclusions

The proposed stormwater system has been developed to manage runoff from the roading scope associated with the Te Pūtahi Ladies Mile transport infrastructure works. The assessment is limited to the proposed road corridor catchments, including the carriageway, shared path and contributing berm/verge areas that drain to the road stormwater system. Runoff from adjoining development platforms, private lots, roofs, internal development catchments and wider upstream or off-site areas has been excluded, on the basis that these are managed separately as part of the wider development stormwater system.

The proposed road catchment has been delineated and assessed using a dynamic EPA SWMM model comprising sixteen subcatchments with a combined area of approximately 1.71 ha. The adopted design event is the 1% AEP, 24-hour RCP8.5 2081–2100 rainfall event, with an adopted rainfall depth of 139 mm. This represents an increase of approximately 22% over the equivalent historical 1% AEP, 24-hour rainfall depth of 114 mm. A project-specific ten-minute Alternating Block Method rainfall hyetograph was developed from the adopted depth-duration rainfall data and applied directly within the SWMM model.

The reticulation model indicates that the proposed road drainage network can convey runoff from the defined road catchments during the adopted design event without modelled node surcharge or flooding. The full modelled road catchment generates approximately 1,675 m<sup>3</sup> of runoff, with approximately 1,275 m<sup>3</sup> directed to the principal shared-path soakage-storage system. The resulting hydrograph has a peak inflow rate of approximately 0.209 m<sup>3</sup>/s and was exported directly from the reticulation model for assessment of the downstream soakage system.

The soakage assessment was completed using separate SWMM storage and exfiltration models. This approach allowed the downstream storage device to be assessed against the actual timing, peak flow and recession of runoff generated by the reticulation network, rather than relying only on a simplified static runoff-volume check. The modelling adopted the factored soakage rate of 222 L/hr/m<sup>2</sup> derived from the ENGEO-recommended infiltration rate for the underlying coarse-grained alluvium.

Two feasible shared-path soakage configurations were assessed. The first comprises a 2.0 m wide drainage-metal trench incorporating twin DN160 perforated distribution pipes and the 900 mm well liner volumes. The trench was represented using its effective hydraulic storage volume, rather than treating the full physical trench depth as available water storage. The second comprises twin side-by-side Aquafort 400 modular tanks, or an approved equivalent proprietary system, represented using the supplier-stated approximately 95% void ratio together with the well liner volumes.

Both soakage options accommodated the full modelled 1% AEP inflow hydrograph without overflow. The drainage-metal trench option reached a maximum storage utilisation of approximately 77%, while the modular option reached approximately 35% utilisation. Both models fully drained by exfiltration during the assessment period, with no residual stored volume at the end of the simulation. The modelling therefore demonstrates that the available shared-path/verge corridor can provide sufficient storage and infiltration capacity for the proposed road runoff under the adopted climate-change-adjusted design event.

The proposed system will collect road runoff through kerb, catchpit and sealed reticulation infrastructure, provide pre-treatment through sumped catchpits and GPT manholes, and discharge treated runoff through accessible 900 mm well liner nodes to the selected soakage system. This arrangement avoids reliance on a new concentrated downstream stormwater discharge and provides accessible locations for inspection, sediment removal, flushing and maintenance.

The remaining work is principally detailed-design refinement rather than confirmation of stormwater feasibility. This includes finalisation of catchpit locations, pipe sizes and grades, hydraulic-grade checks, GPT selection and sizing, final soakage-device selection, proprietary installation details, trench or modular-system





levels, utility coordination, pavement interface requirements, secondary-flow routes, construction methodology and operation and maintenance documentation.

Subject to these normal detailed-design refinements, the proposed stormwater system is considered suitable for the Fast Track consenting phase and is expected to appropriately manage stormwater runoff from the defined road corridor without significant adverse stormwater effects.



Appendix A – Drawings - Maps



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SHEET 2  
SHEET 1

SPENCE ROAD

STATE HIGHWAY 6

KEY: STORMWATER

- LEGAL BOUNDARIES
- PROPOSED TREATMENT / CONVEYANCE SWALE
- PROPOSED STORMWATER PIPE
- TREATMENT SOAKAGE TRENCH
- TREATMENT SOAKAGE BASIN
- PROPOSED MANHOLE
- PROPOSED CATCHPIT
- WINGWALL/OUTFALL
- GROSS POLLUTANT TRAP
- EXISTING CULVERT
- EXISTING STORMWATER
- SOIL RIPRAP

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PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
STORMWATER  
SHEET 1

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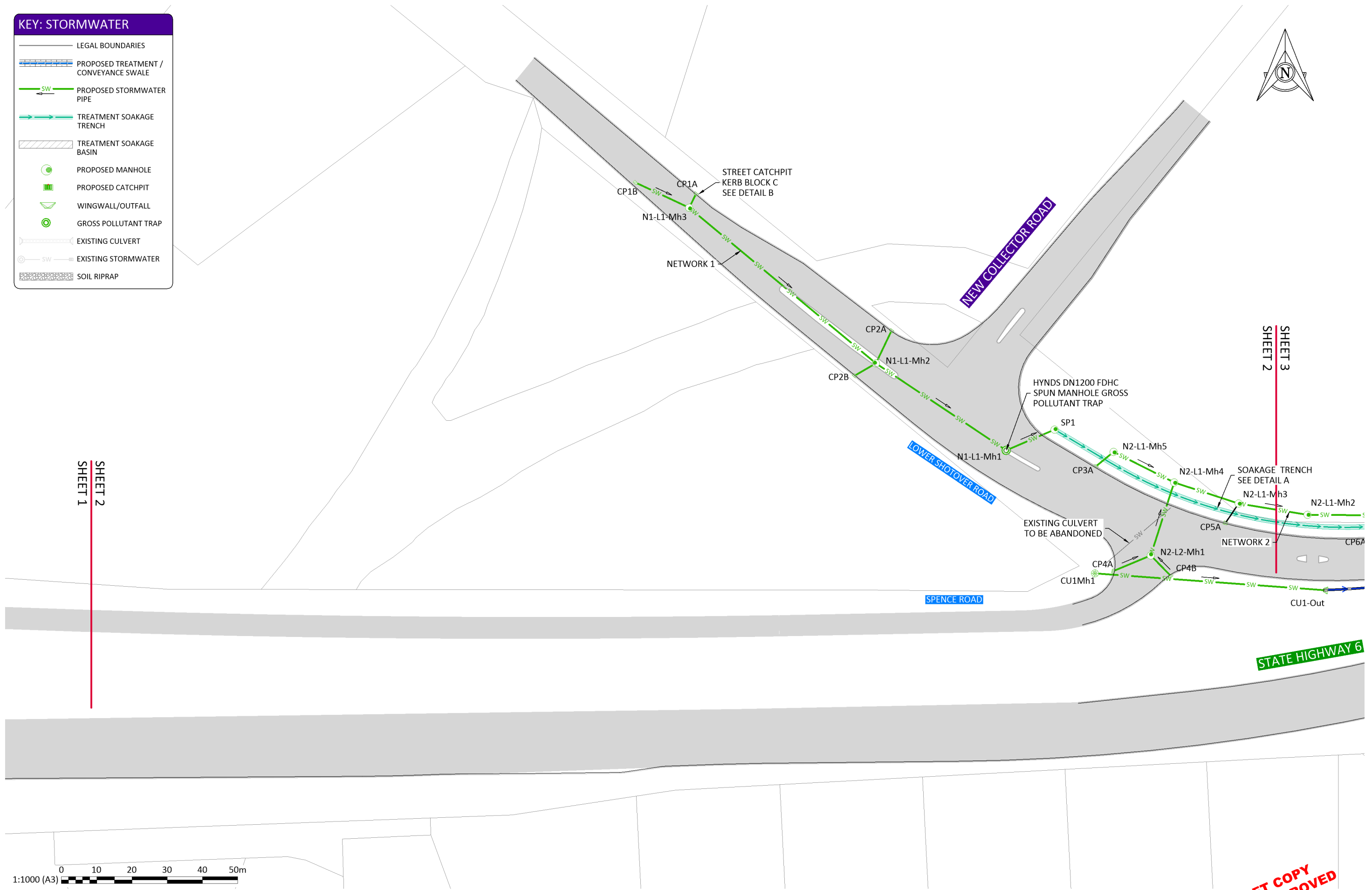
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- LEGAL BOUNDARIES
- PROPOSED TREATMENT / CONVEYANCE SWALE
- PROPOSED STORMWATER PIPE
- TREATMENT SOAKAGE TRENCH
- TREATMENT SOAKAGE BASIN
- PROPOSED MANHOLE
- PROPOSED CATCHPIT
- WINGWALL/OUTFALL
- GROSS POLLUTANT TRAP
- EXISTING CULVERT
- EXISTING STORMWATER
- SOIL RIPRAP



SHEET 2  
SHEET 1

SHEET 3  
SHEET 2



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PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
STORMWATER  
SHEET 2

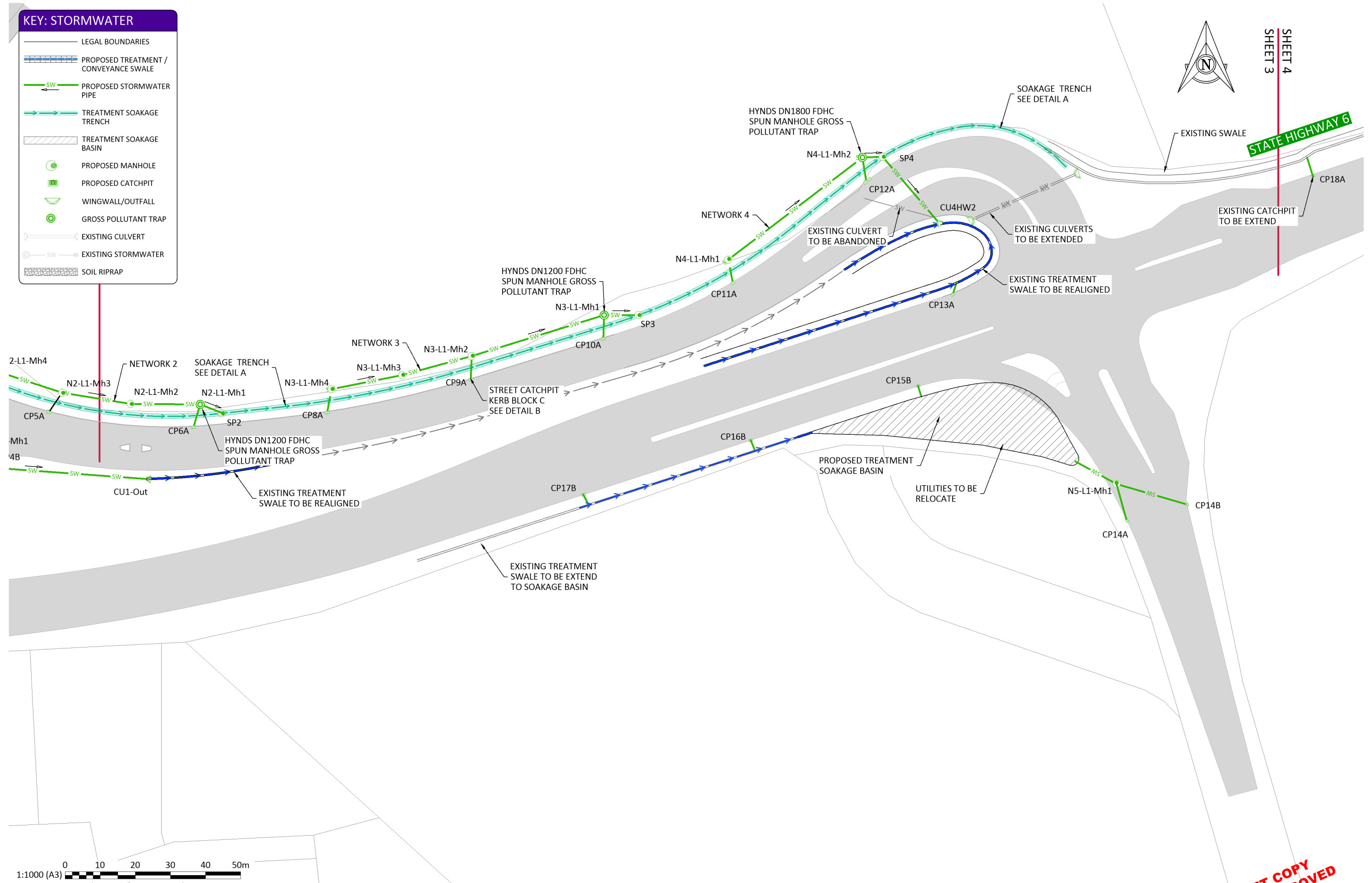
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|  | LEGAL BOUNDARIES                      |
|  | PROPOSED TREATMENT / CONVEYANCE SWALE |
|  | PROPOSED STORMWATER PIPE              |
|  | TREATMENT SOAKAGE TRENCH              |
|  | TREATMENT SOAKAGE BASIN               |
|  | PROPOSED MANHOLE                      |
|  | PROPOSED CATCHPIT                     |
|  | WINGWALL/OUTFALL                      |
|  | GROSS POLLUTANT TRAP                  |
|  | EXISTING CULVERT                      |
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|  | SOIL RIPRAP                           |



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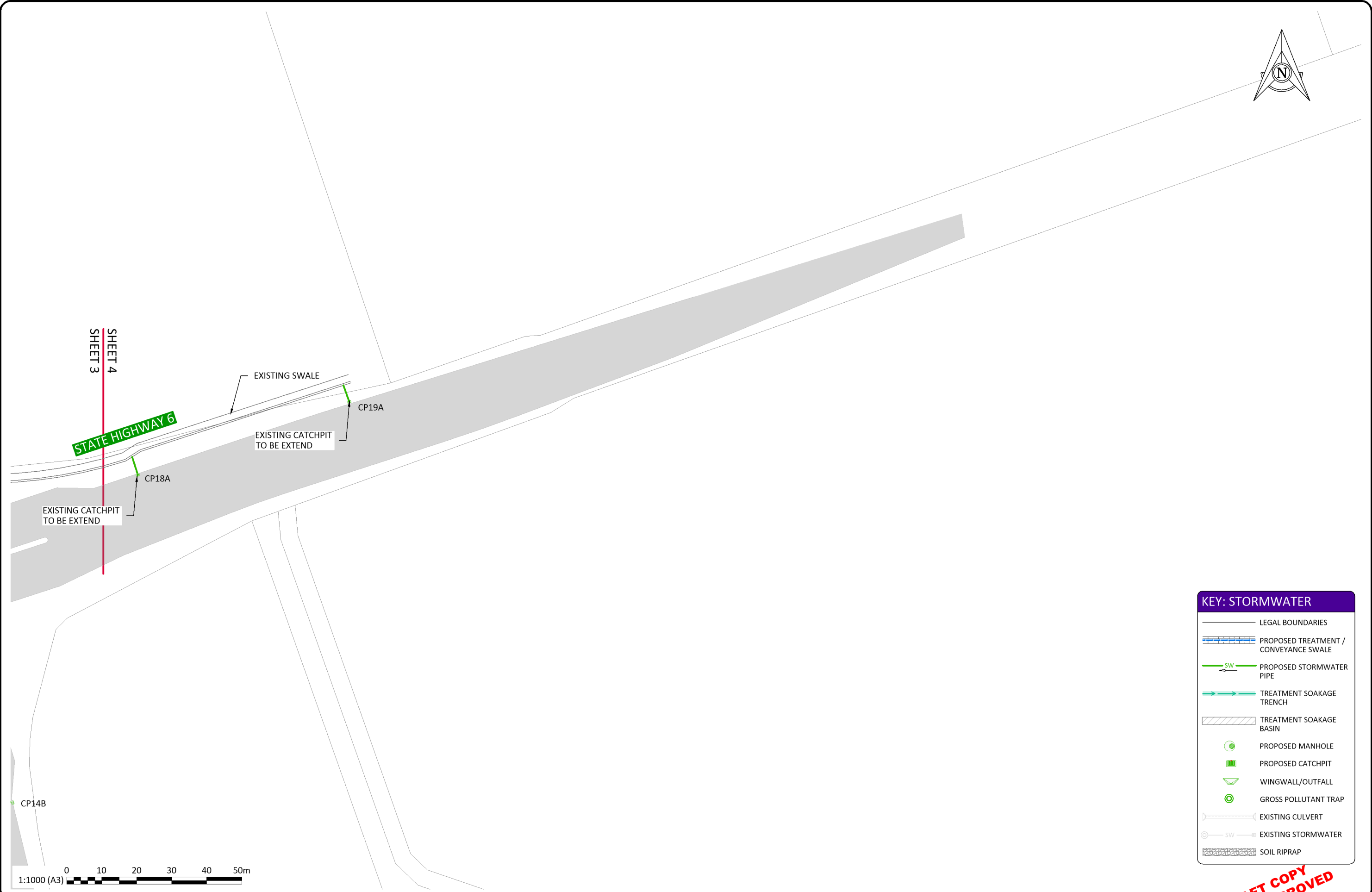
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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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D:\1245\data\107.120.14\149360 - Queenstown Simplicity Living\_5670\03 Drawings\001\49360-00-2104.dwg 23/6/2026 3:58 pm Golanias Plotted: 23 Jun 2026 3:58 pm



KEY: STORMWATER

- LEGAL BOUNDARIES
- PROPOSED TREATMENT / CONVEYANCE SWALE
- PROPOSED STORMWATER PIPE
- TREATMENT SOAKAGE TRENCH
- TREATMENT SOAKAGE BASIN
- PROPOSED MANHOLE
- PROPOSED CATCHPIT
- WINGWALL/OUTFALL
- GROSS POLLUTANT TRAP
- EXISTING CULVERT
- EXISTING STORMWATER
- SOIL RIPRAP

**DRAFT COPY**  
**NOT APPROVED**  
**PRELIMINARY**

| DRAWING ISSUE |      |             |             | DESIGNED |     |      |
|---------------|------|-------------|-------------|----------|-----|------|
| REV           | DATE | FIRST ISSUE | DESCRIPTION | BY       | CHK | APPR |
| A             |      |             |             |          |     |      |

|          |     |
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| DESIGNED | RM  |
| DRAWN    | SC  |
| CHECKED  | GMB |
| APPROVED | CI  |



CLIENT  
**% Simplicity Living**

PROJECT  
SIMPLICITY LIVING  
TE PŪTAHI LADIES MILE

DRAWING  
STORMWATER  
SHEET 4

| STATUS           |                  | SCALE (A3) |
|------------------|------------------|------------|
| HORIZONTAL DATUM | Mt Nicholas 2000 | 1:1000     |
| VERTICAL DATUM   | NZVD16           |            |
| DRAWING NUMBER   |                  | REVISION   |
| 149360-00-2104   |                  | A          |

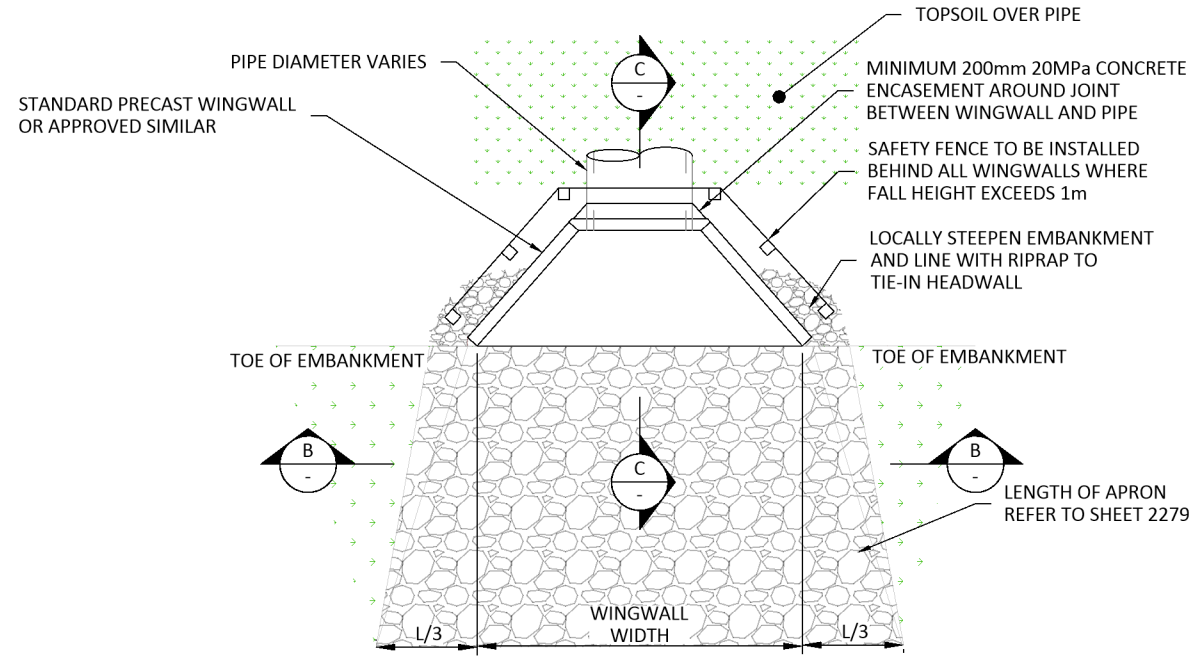


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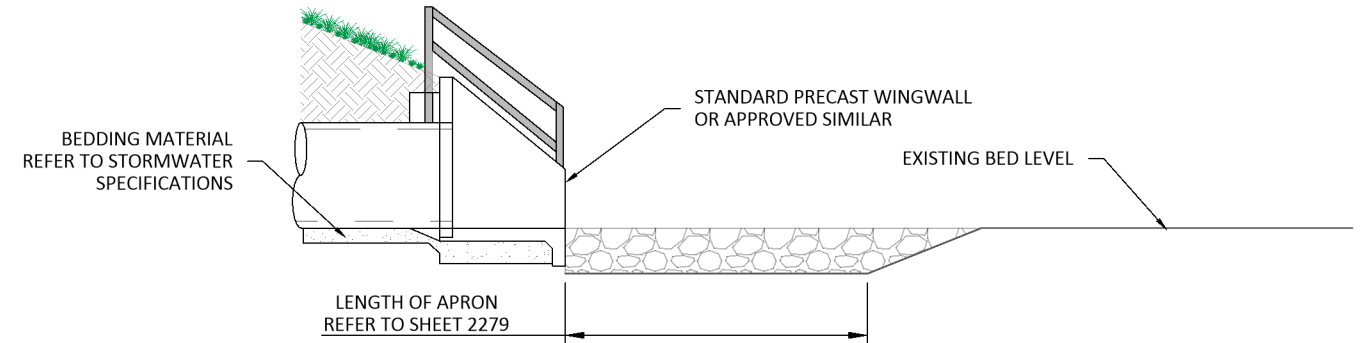
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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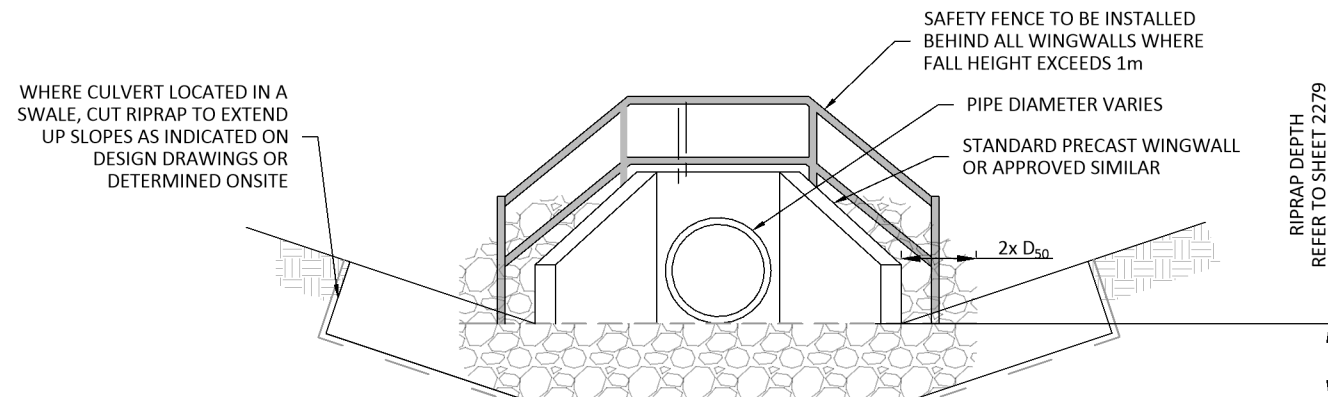
D:\116rskdata\110712014149960 - Queenstown Simplicity Living\_5670\03 Drawings\100149360-00-2151.dwg 23/6/2026 3:59 pm (dellanos) Plotted: 23 Jun 2026 3:59 pm



**A** TYPICAL RIPRAP HEADWALL OUTLET SCOUR PROTECTION  
SCALE 1:50



**C** TYPICAL RIPRAP HEADWALL OUTLET SCOUR PROTECTION  
SCALE 1:50



**B** TYPICAL RIPRAP HEADWALL OUTLET SCOUR PROTECTION  
SCALE 1:50

- GENERAL NOTES:**
- PIPE INSTALLATIONS AS PER SPECIFICATIONS AND AS/NZS 3725:2007.
  - FOR RIPRAP TYPE REFER TO THE SPECIFICATIONS.
  - SAFETY FENCE REQUIRED AT ALL CULVERTS AND NETWORK OUTLETS WHERE FALL HEIGHT IS GREATER THAN 1m. SAFETY FENCE SHALL MEET THE REQUIREMENTS FOR NZ BUILDING CODE CLAUSES B1 AND B2. LOAD CAPACITY SHALL COMPLY WITH THE REQUIREMENTS OF NZTA BRIDGE MANUAL 3RD EDITION, AMENDMENT 4, SECTION B6.4.
  - ALL SAFETY FENCES ARE TO BE TYPE A:
    - BE COMPLIANT TO FIGURE 2a OF NZBC F4
    - HAVE MAXIMUM GAP OF BETWEEN VERTICAL BARS OF 100mm
    - HAVE A MAXIMUM GAP OF 100mm UNDER THE BOTTOM OF THE FENCE-HAVE A MINIMUM HEIGHT OF 1100mm
  - REFER TO SHEET 2279 FOR RETICULATION NETWORK OUTLET DETAILS

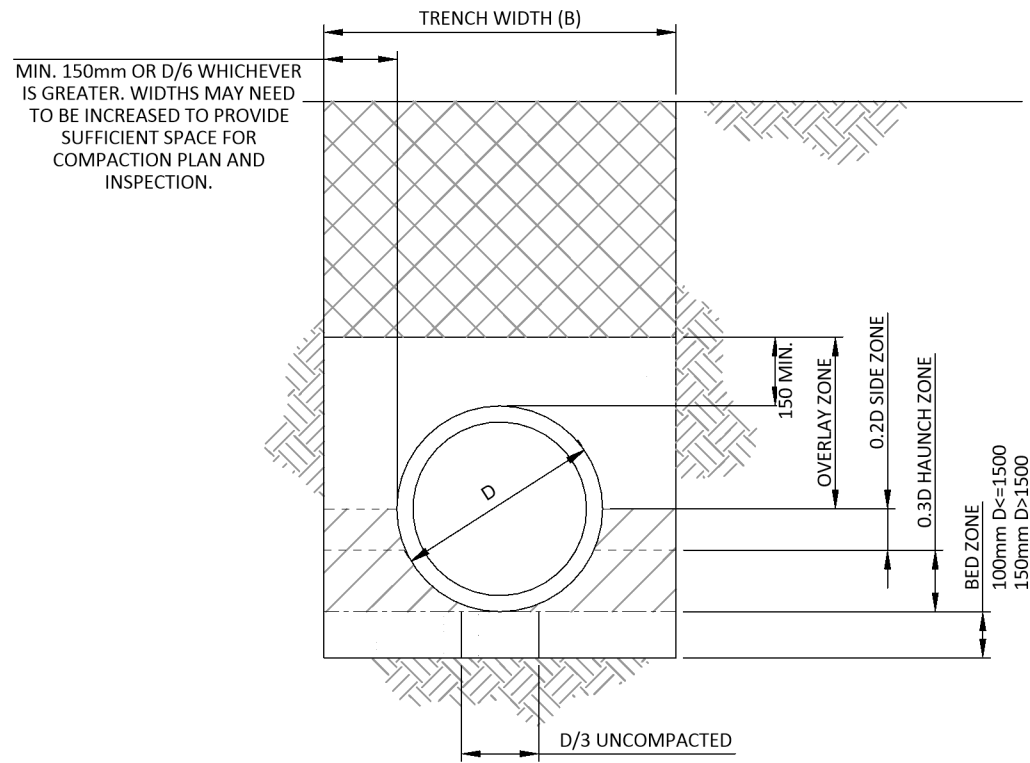
1:1000 (A3) 0 10 20 30 40 50m

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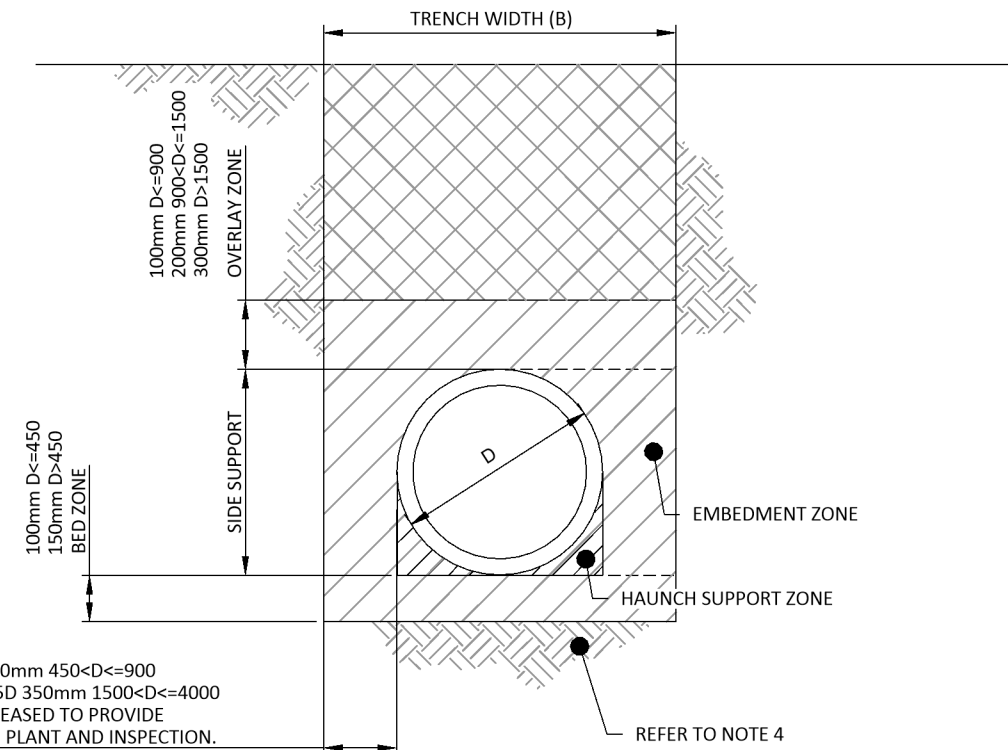
## NOTES:

- DETAILS ARE TO BE READ IN CONJUNCTION WITH THE PROJECT DRAINAGE SPECIFICATION, NZTA P46, AS/NZS 3725 FOR CONCRETE PIPES, AND AS/NZS 2566 FOR FLEXIBLE PIPES.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- PIPE SIZE, CLASS, MATERIAL, SUPPORT TYPE, COVER, INVERT LEVEL AND ALIGNMENT SHALL BE AS SHOWN ON THE DRAINAGE LONG SECTIONS, SCHEDULES AND RELEVANT PROJECT DRAWINGS.
- CONCRETE PIPES SHALL BE INSTALLED IN ACCORDANCE WITH AS/NZS 3725 AND THE PROJECT DRAINAGE SPECIFICATION. UNLESS NOTED OTHERWISE, CONCRETE PIPES UNDER PAVEMENTS SHALL HAVE HS2 BEDDING AND SUPPORT, AND CONCRETE PIPES OUTSIDE PAVEMENTS SHALL HAVE H2 BEDDING AND SUPPORT. AND IN ACCORDANCE WITH THE SPECIFICATION.
- FLEXIBLE PIPES SHALL BE INSTALLED IN ACCORDANCE WITH AS/NZS 2566 AND THE PROJECT DRAINAGE SPECIFICATION.
- BEDDING, HAUNCH, SIDE SUPPORT, EMBEDMENT, OVERLAY AND BACKFILL MATERIALS SHALL BE AS SPECIFIED IN THE PROJECT DRAINAGE SPECIFICATION AND COMPACTED TO THE SPECIFIED REQUIREMENTS.
- EXCAVATED MATERIAL SHALL NOT BE USED WITHIN THE BEDDING, HAUNCH, SIDE SUPPORT, EMBEDMENT OR OVERLAY ZONES UNLESS SPECIFICALLY APPROVED BY THE ENGINEER.
- THE TRENCH BASE SHALL BE INSPECTED AND ACCEPTED BY THE ENGINEER PRIOR TO PLACEMENT OF BEDDING MATERIAL. UNSUITABLE, WEAK, ORGANIC, UNCONTROLLED FILL OR CONTAMINATED MATERIAL SHALL BE UNDERCUT AND REPLACED AS DIRECTED BY THE ENGINEER.
- WHERE GROUNDWATER IS ENCOUNTERED AND CANNOT BE CONTROLLED BY NORMAL DRAINAGE OR PUMPING, DRAINAGE AGGREGATE MAY BE USED SUBJECT TO THE ENGINEER'S APPROVAL AND SHALL BE WRAPPED IN SUITABLE GEOTEXTILE WHERE REQUIRED.
- TRENCH WALLS AND SIDE SUPPORT ZONES SHALL PROVIDE ADEQUATE SUPPORT TO THE PIPE EMBEDMENT. WHERE THIS CANNOT BE ACHIEVED, UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROVED COMPACTED MATERIAL.
- TRENCH WALLS AND SIDE SUPPORT ZONES SHALL PROVIDE ADEQUATE SUPPORT TO THE PIPE EMBEDMENT. WHERE THIS CANNOT BE ACHIEVED, UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROVED COMPACTED MATERIAL.
- THE CONTRACTOR SHALL PROTECT PIPES FROM CONSTRUCTION LOADING. CONSTRUCTION PLANT SHALL NOT OPERATE OVER PIPES UNTIL SUFFICIENT COVER OR APPROVED TEMPORARY PROTECTION IS IN PLACE.
- TRENCH WIDTHS SHOWN ARE MINIMUM REQUIREMENTS ONLY AND SHALL BE INCREASED WHERE NECESSARY TO PROVIDE SAFE ACCESS, PIPE LAYING, JOINTING, COMPACTION, AND INSPECTION.
- ALL WORKS SHALL BE KEPT FREE OF WATER DURING CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY DRAINAGE, PUMPING, TREATMENT AND DISCHARGE CONTROLS REQUIRED FOR THE WORKS.
- WHERE THE DETAILS SHOWN CONFLICT WITH OTHER PROJECT DRAWINGS OR THE PROJECT DRAINAGE SPECIFICATION, THE MATTER SHALL BE REFERRED TO THE ENGINEER BEFORE CONSTRUCTION PROCEEDS.



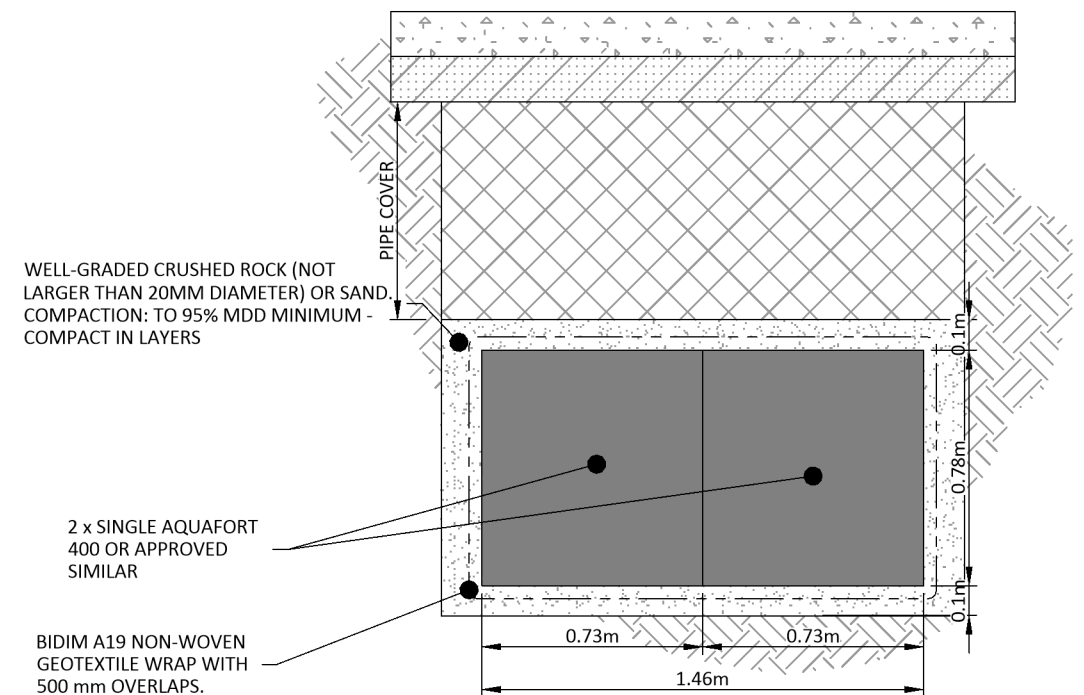
SECTION - CONCRETE PIPE TYPE HS2 SUPPORT - TRENCH

NOT TO SCALE



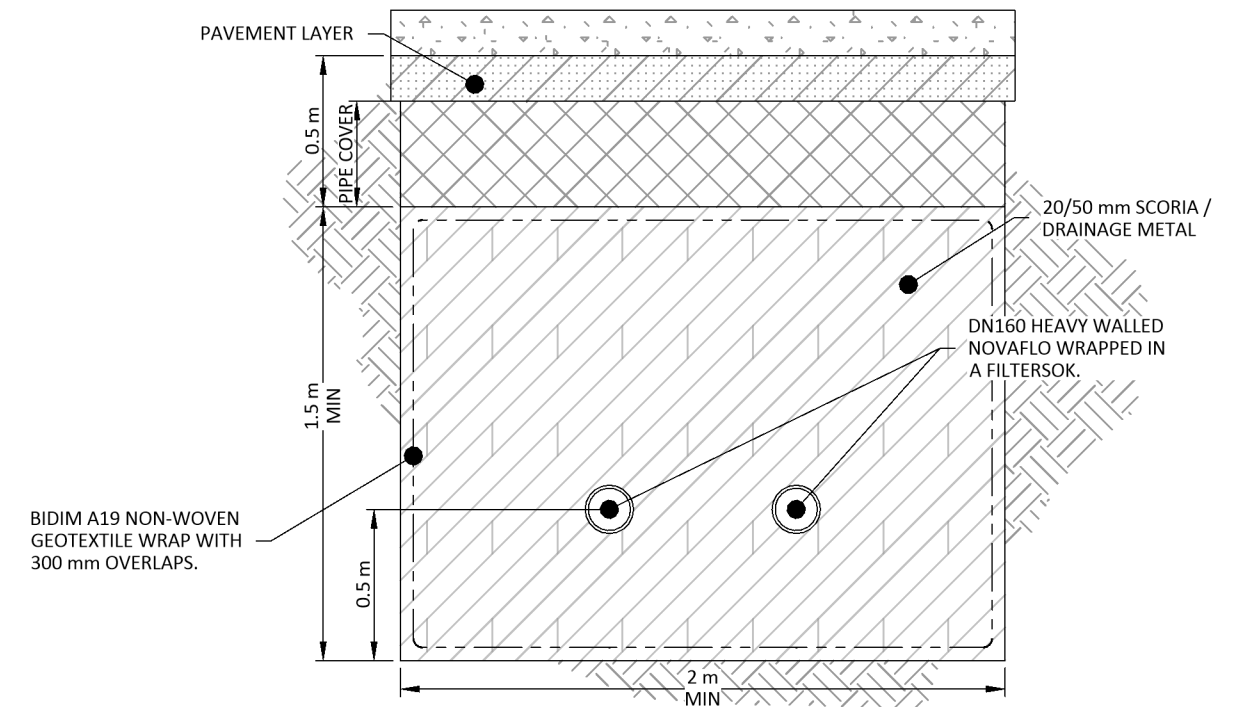
SECTION - FLEXIBLE PIPE SUPPORT - TRENCH

NOT TO SCALE



SECTION - PROPOSED INFILTRATION TRENCH - MODULAR TANK

NOT TO SCALE



SECTION - PROPOSED INFILTRATION TRENCH - DRAINAGE METAL

NOT TO SCALE

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**NOT APPROVED**  
**PRELIMINARY**

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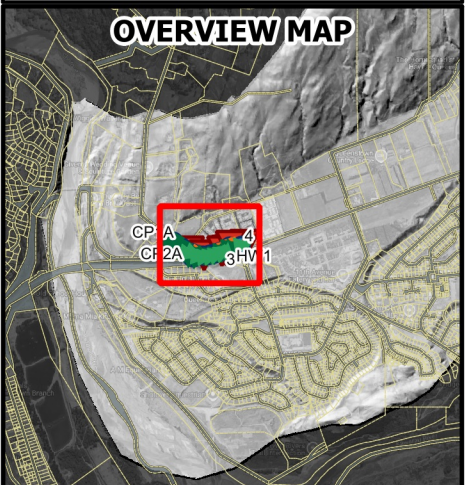
## LEGEND

-  nz-primary-parcels — nz\_primary\_p
-  nz-primary-road-parcels — nz\_prim
-  swmm\_junctions
-  swmm\_outfalls
-  swmm\_subcatchments
- swmm\_conduits
-  Circular pipes
-  Trapezoidal channels
-  swmm\_weirs
-  nz-primary-parcels — nz\_primary\_p
-  nz-primary-road-parcels — nz\_prim

## MODEL PARAMETERS

Model Used: EPA SWMM  
Model Version: v5.2 (Build 5.2.4)  
Flow Units: m<sup>3</sup>/s (CMS)  
  
Design Event: 1% AEP / 100-year  
Storm Duration: 24 hours  
Climate Scenario: RCP8.5, 2081–2100  
Rainfall Depth: 139 mm  
Rainfall Input: 10-min ABM hyetograph  
  
Infiltration: Horton Method  
Flow Routing: Dynamic Wave  
  
Surface Levels: 1 m LiDAR & Survey  
Vertical Datum: NZVD2016

## OVERVIEW MAP

[illegible]

# SIMPLICITY LIVING TE PUTAHI LADIES MILE EPA SWMM MODEL LAYOUT

|                                |  |                                     |  |
|--------------------------------|--|-------------------------------------|--|
| STATUS                         |  | FOR INFORMATION                     |  |
| DATE<br>23/06/2026             |  | SCALE (ORIGINAL SIZE A3)<br>1:2,000 |  |
| MAP NUMBER<br>149360-SWMM-0001 |  | REVISION<br>A                       |  |



## Appendix B – Hydrological and Hydraulic Calculations









|           |                |          |            |
|-----------|----------------|----------|------------|
| Client :  | Simplicity     | By       | DE         |
|           |                | Checked  | CF         |
|           |                | Approved | -          |
| Project : | Project's Name | Revision | A          |
|           |                | Date     | 23.06.2026 |

### Queenstown Simplicity Catchment Characteristics - Proposed Conditions

| ID    | A              | Percent Impervious | A        | A <sub>imp</sub> | A <sub>perv</sub> | L <sub>fp</sub> | Width (A/L <sub>fp</sub> ) | Slope | n <sub>imperv</sub> | n <sub>perv</sub> | D-Store Imperv. | D-Store Perv. | Infiltration (Horton) |                |              |
|-------|----------------|--------------------|----------|------------------|-------------------|-----------------|----------------------------|-------|---------------------|-------------------|-----------------|---------------|-----------------------|----------------|--------------|
|       |                |                    |          |                  |                   |                 |                            |       |                     |                   |                 |               | f <sub>i</sub>        | f <sub>o</sub> | Decay Const. |
|       | m <sup>2</sup> | %                  | ha       | m <sup>2</sup>   | m <sup>2</sup>    | m               | m                          | %     |                     |                   | mm              | mm            |                       |                |              |
| CP1A  | 213            | 100.0              | 0.0213   | 213              | 0                 | 85              | 2.50                       | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP1B  | 216            | 100.0              | 0.0216   | 216              | 0                 | 86              | 2.50                       | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP2A  | 417            | 100.0              | 0.0417   | 417              | 0                 | 83              | 5.00                       | 2     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP2B  | 868            | 84.0               | 0.0868   | 729              | 139               | 158             | 5.50                       | 2     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP3A  | 557            | 80.8               | 0.0557   | 450              | 107               | 51              | 11.00                      | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP4A  | 97             | 63.9               | 0.0097   | 62               | 35                | 14              | 7.00                       | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP4B  | 220            | 100.0              | 0.022    | 220              | 0                 | 47              | 4.70                       | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP5A  | 1317           | 91.9               | 0.1317   | 1210             | 107               | 108             | 12.20                      | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP6A  | 979            | 86.8               | 0.0979   | 850              | 129               | 75              | 13.00                      | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP8A  | 807            | 74.1               | 0.0807   | 598              | 209               | 70              | 11.50                      | 0.5   | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP9A  | 814            | 74.9               | 0.0814   | 610              | 204               | 85              | 9.60                       | 0.5   | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP10A | 851            | 65.2               | 0.0851   | 555              | 296               | 89              | 9.60                       | 0.5   | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP11A | 1136           | 52.7               | 0.1136   | 599              | 537               | 118             | 9.60                       | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CP12A | 2777           | 70.1               | 0.2777   | 1948             | 829               | 289             | 9.60                       | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| 53    | 406            | 84.0               | 0.0406   | 341.04           | 64.96             | 41              | 9.90                       | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |
| CU2   | 5432           | 50.0               | 0.543245 | 2716.23          | 2716.22           | 453             | 12.00                      | 1     | 0.015               | 0.15              | 2               | 5             | 50.8                  | 12.7           | 4            |

#### GLOSSARY:

A: Catchment area

A<sub>imp</sub>: Impervious area of a catchment

A<sub>perv</sub>: Pervious area of a catchment

L<sub>fp</sub>: Length of overland flow

Slope: Average surface slope

n<sub>imperv</sub>: Manning Number for impervious area

n<sub>perv</sub>: Manning Number for pervious area

D-Store Imperv.: Depth of depression storage on impervious area

D-Store Perv.: Depth of depression storage on pervious area

f<sub>i</sub>: Maximum rate on the Horton infiltration curve

f<sub>o</sub>: Minimum rate on the Horton infiltration curve

Decay Const.: Decay constant for the Horton infiltration curve



# 100-Year/24-Hour Storm with Climate Change (RCP8.5)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... CMS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Infiltration Method ..... HORTON

Flow Routing Method ..... DYNWAVE

Surcharge Method ..... EXTRAN

Starting Date ..... 06/18/2026 00:00:00

Ending Date ..... 06/19/2026 00:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:10:00

Wet Time Step ..... 00:01:00

Dry Time Step ..... 00:01:00

Routing Time Step ..... 1.00 sec

Variable Time Step ..... YES

Maximum Trials ..... 20

Number of Threads ..... 5

Head Tolerance ..... 0.005000 m

|                            | Volume    | Depth   |
|----------------------------|-----------|---------|
| Runoff Quantity Continuity | hectare-m | mm      |
| *****                      | -----     | -----   |
| Total Precipitation .....  | 0.238     | 138.673 |
| Evaporation Loss .....     | 0.000     | 0.000   |
| Infiltration Loss .....    | 0.066     | 38.802  |
| Surface Runoff .....       | 0.168     | 97.819  |
| Final Storage .....        | 0.004     | 2.073   |
| Continuity Error (%) ..... | -0.015    |         |

|                            | Volume    | Volume   |
|----------------------------|-----------|----------|
| Flow Routing Continuity    | hectare-m | 10^6 ltr |
| *****                      | -----     | -----    |
| Dry Weather Inflow .....   | 0.000     | 0.000    |
| Wet Weather Inflow .....   | 0.168     | 1.675    |
| Groundwater Inflow .....   | 0.000     | 0.000    |
| RDII Inflow .....          | 0.000     | 0.000    |
| External Inflow .....      | 0.000     | 0.000    |
| External Outflow .....     | 0.168     | 1.677    |
| Flooding Loss .....        | 0.000     | 0.000    |
| Evaporation Loss .....     | 0.000     | 0.000    |
| Exfiltration Loss .....    | 0.000     | 0.000    |
| Initial Stored Volume .... | 0.000     | 0.000    |
| Final Stored Volume .....  | 0.000     | 0.005    |
| Continuity Error (%) ..... | -0.347    |          |

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Highest Continuity Errors

\*\*\*\*\*

Node N1L1M1 (-2.12%)

Node N1L1M2 (1.34%)

\*\*\*\*\*

Time-Step Critical Elements

\*\*\*\*\*

None

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Highest Flow Instability Indexes

\*\*\*\*\*

Link 31 (11)

\*\*\*\*\*

Most Frequent Nonconverging Nodes

\*\*\*\*\*

Convergence obtained at all time steps.

\*\*\*\*\*

Routing Time Step Summary

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Minimum Time Step : 0.95 sec

Average Time Step : 1.00 sec

Maximum Time Step : 1.00 sec

% of Time in Steady State : 0.00

Average Iterations per Step : 2.00

% of Steps Not Converging : 0.00

Time Step Frequencies :



1.000 - 0.549 sec : 100.00 %  
0.549 - 0.302 sec : 0.00 %  
0.302 - 0.166 sec : 0.00 %  
0.166 - 0.091 sec : 0.00 %  
0.091 - 0.050 sec : 0.00 %

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

| Runoff       | Total  | Total | Total | Total | Imperv | Perv   | Total  | Total    | Peak   |
|--------------|--------|-------|-------|-------|--------|--------|--------|----------|--------|
| Coeff        | Precip | Runon | Evap  | Infil | Runoff | Runoff | Runoff | Runoff   | Runoff |
| Subcatchment | mm     | mm    | mm    | mm    | mm     | mm     | mm     | 10^6 ltr | CMS    |
| 01A          | 138.67 | 0.00  | 0.00  | 0.00  | 135.89 | 0.00   | 135.89 | 0.03     | 0.01   |
| 0.980        |        |       |       |       |        |        |        |          |        |
| 01B          | 138.67 | 0.00  | 0.00  | 0.00  | 135.88 | 0.00   | 135.88 | 0.03     | 0.01   |
| 0.980        |        |       |       |       |        |        |        |          |        |
| 02A          | 138.67 | 0.00  | 0.00  | 0.00  | 136.05 | 0.00   | 136.05 | 0.06     | 0.01   |
| 0.981        |        |       |       |       |        |        |        |          |        |
| 02B          | 138.67 | 0.00  | 0.00  | 19.21 | 114.11 | 2.98   | 117.08 | 0.10     | 0.02   |
| 0.844        |        |       |       |       |        |        |        |          |        |
| 03A          | 138.67 | 0.00  | 0.00  | 22.97 | 110.04 | 3.66   | 113.70 | 0.06     | 0.01   |
| 0.820        |        |       |       |       |        |        |        |          |        |
| 04A          | 138.67 | 0.00  | 0.00  | 42.97 | 87.37  | 6.97   | 94.34  | 0.01     | 0.00   |
| 0.680        |        |       |       |       |        |        |        |          |        |
| 04B          | 138.67 | 0.00  | 0.00  | 0.00  | 136.14 | 0.00   | 136.14 | 0.03     | 0.01   |
| 0.982        |        |       |       |       |        |        |        |          |        |
| 05A          | 138.67 | 0.00  | 0.00  | 9.69  | 124.81 | 1.55   | 126.36 | 0.17     | 0.03   |
| 0.911        |        |       |       |       |        |        |        |          |        |
| 06A          | 138.67 | 0.00  | 0.00  | 15.79 | 118.06 | 2.51   | 120.57 | 0.12     | 0.02   |
| 0.869        |        |       |       |       |        |        |        |          |        |
| 08A          | 138.67 | 0.00  | 0.00  | 31.21 | 100.75 | 4.71   | 105.46 | 0.09     | 0.02   |
| 0.760        |        |       |       |       |        |        |        |          |        |
| 09A          | 138.67 | 0.00  | 0.00  | 30.30 | 101.76 | 4.51   | 106.27 | 0.09     | 0.02   |
| 0.766        |        |       |       |       |        |        |        |          |        |
| 10A          | 138.67 | 0.00  | 0.00  | 42.23 | 88.61  | 6.03   | 94.65  | 0.08     | 0.02   |
| 0.683        |        |       |       |       |        |        |        |          |        |
| 11A          | 138.67 | 0.00  | 0.00  | 57.65 | 71.69  | 7.95   | 79.64  | 0.09     | 0.02   |
| 0.574        |        |       |       |       |        |        |        |          |        |
| 12A          | 138.67 | 0.00  | 0.00  | 36.79 | 94.86  | 4.67   | 99.53  | 0.28     | 0.05   |
| 0.718        |        |       |       |       |        |        |        |          |        |
| 53           | 138.67 | 0.00  | 0.00  | 11.93 | 122.60 | 1.94   | 124.54 | 0.05     | 0.01   |
| 0.898        |        |       |       |       |        |        |        |          |        |
| CU2          | 138.67 | 0.00  | 0.00  | 63.28 | 67.61  | 6.06   | 73.67  | 0.40     | 0.06   |
| 0.531        |        |       |       |       |        |        |        |          |        |

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Node Depth Summary  
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| Node   | Type     | Average<br>Depth<br>Meters | Maximum<br>Depth<br>Meters | Maximum<br>HGL<br>Meters | Time of Max<br>Occurrence<br>days hr:min | Reported<br>Max Depth<br>Meters |
|--------|----------|----------------------------|----------------------------|--------------------------|------------------------------------------|---------------------------------|
| CP10A  | JUNCTION | 0.02                       | 0.10                       | 363.34                   | 0 12:10                                  | 0.10                            |
| CP11A  | JUNCTION | 0.02                       | 0.12                       | 363.08                   | 0 12:10                                  | 0.12                            |
| CP12A  | JUNCTION | 0.04                       | 0.20                       | 363.06                   | 0 12:10                                  | 0.20                            |
| CP1A   | JUNCTION | 0.01                       | 0.05                       | 366.18                   | 0 12:10                                  | 0.05                            |
| CP1B   | JUNCTION | 0.01                       | 0.04                       | 366.42                   | 0 12:10                                  | 0.04                            |
| CP2A   | JUNCTION | 0.02                       | 0.11                       | 365.73                   | 0 12:11                                  | 0.10                            |
| CP2B   | JUNCTION | 0.02                       | 0.13                       | 365.73                   | 0 12:12                                  | 0.13                            |
| CP3A   | JUNCTION | 0.02                       | 0.10                       | 365.14                   | 0 12:10                                  | 0.10                            |
| CP4A   | JUNCTION | 0.00                       | 0.02                       | 365.39                   | 0 12:10                                  | 0.02                            |
| CP4B   | JUNCTION | 0.01                       | 0.04                       | 365.06                   | 0 12:10                                  | 0.04                            |
| CP5A   | JUNCTION | 0.02                       | 0.11                       | 364.61                   | 0 12:10                                  | 0.11                            |
| CP6A   | JUNCTION | 0.03                       | 0.12                       | 364.03                   | 0 12:10                                  | 0.12                            |
| CP8A   | JUNCTION | 0.02                       | 0.11                       | 363.75                   | 0 12:10                                  | 0.11                            |
| CP9A   | JUNCTION | 0.02                       | 0.08                       | 363.62                   | 0 12:10                                  | 0.08                            |
| HW1    | JUNCTION | 0.06                       | 0.30                       | 363.72                   | 0 12:10                                  | 0.30                            |
| HW2    | JUNCTION | 0.02                       | 0.12                       | 363.28                   | 0 12:10                                  | 0.12                            |
| N1L1M1 | JUNCTION | 0.08                       | 0.25                       | 365.01                   | 0 12:20                                  | 0.25                            |
| N1L1M2 | JUNCTION | 0.06                       | 0.23                       | 365.73                   | 0 12:12                                  | 0.22                            |
| N1L1M3 | JUNCTION | 0.02                       | 0.07                       | 366.08                   | 0 12:10                                  | 0.07                            |
| N2L14  | JUNCTION | 0.02                       | 0.09                       | 364.56                   | 0 12:10                                  | 0.09                            |
| N2L1M1 | JUNCTION | 0.02                       | 0.10                       | 363.85                   | 0 12:10                                  | 0.10                            |
| N2L1M2 | JUNCTION | 0.03                       | 0.14                       | 364.12                   | 0 12:10                                  | 0.14                            |
| N2L1M3 | JUNCTION | 0.03                       | 0.14                       | 364.34                   | 0 12:10                                  | 0.14                            |
| N2L1M5 | JUNCTION | 0.01                       | 0.06                       | 365.00                   | 0 12:10                                  | 0.06                            |
| N2L2M1 | JUNCTION | 0.02                       | 0.07                       | 364.71                   | 0 12:10                                  | 0.07                            |
| N3L1M1 | JUNCTION | 0.03                       | 0.17                       | 363.11                   | 0 12:10                                  | 0.17                            |
| N3L1M2 | JUNCTION | 0.03                       | 0.11                       | 363.37                   | 0 12:10                                  | 0.11                            |
| N3L1M3 | JUNCTION | 0.02                       | 0.10                       | 363.53                   | 0 12:10                                  | 0.10                            |
| N3L1M4 | JUNCTION | 0.02                       | 0.10                       | 363.65                   | 0 12:10                                  | 0.10                            |
| N4L1M1 | JUNCTION | 0.02                       | 0.10                       | 362.98                   | 0 12:10                                  | 0.10                            |
| N4L1M2 | JUNCTION | 0.02                       | 0.13                       | 362.79                   | 0 12:10                                  | 0.13                            |
| 2      | OUTFALL  | 0.00                       | 0.00                       | 364.16                   | 0 00:00                                  | 0.00                            |
| 3      | OUTFALL  | 0.00                       | 0.00                       | 364.26                   | 0 00:00                                  | 0.00                            |
| 4      | OUTFALL  | 0.02                       | 0.12                       | 363.24                   | 0 12:10                                  | 0.12                            |





|     |         |      |      |        |   |       |      |
|-----|---------|------|------|--------|---|-------|------|
| SP1 | OUTFALL | 0.00 | 0.00 | 363.85 | 0 | 00:00 | 0.00 |
| SP2 | OUTFALL | 0.02 | 0.08 | 362.51 | 0 | 12:10 | 0.08 |
| SP3 | OUTFALL | 0.00 | 0.00 | 361.67 | 0 | 00:00 | 0.00 |
| SP4 | OUTFALL | 0.02 | 0.09 | 362.26 | 0 | 12:10 | 0.09 |

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Node Inflow Summary  
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| Node   | Type     | Maximum<br>Lateral<br>Inflow<br>CMS | Maximum<br>Total<br>Inflow<br>CMS | Time of Max<br>Occurrence<br>days hr:min | Lateral<br>Inflow<br>Volume<br>10^6 ltr | Total<br>Inflow<br>Volume<br>10^6 ltr | Flow<br>Balance<br>Error<br>Percent |
|--------|----------|-------------------------------------|-----------------------------------|------------------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|
| CP10A  | JUNCTION | 0.016                               | 0.016                             | 0 12:10                                  | 0.0805                                  | 0.0805                                | 0.021                               |
| CP11A  | JUNCTION | 0.019                               | 0.019                             | 0 12:10                                  | 0.0905                                  | 0.0905                                | 0.020                               |
| CP12A  | JUNCTION | 0.047                               | 0.047                             | 0 12:10                                  | 0.279                                   | 0.279                                 | 0.011                               |
| CP1A   | JUNCTION | 0.005                               | 0.005                             | 0 12:10                                  | 0.0289                                  | 0.0289                                | 0.033                               |
| CP1B   | JUNCTION | 0.005                               | 0.005                             | 0 12:10                                  | 0.0293                                  | 0.0293                                | 0.030                               |
| CP2A   | JUNCTION | 0.011                               | 0.011                             | 0 12:10                                  | 0.0567                                  | 0.0567                                | 0.018                               |
| CP2B   | JUNCTION | 0.031                               | 0.031                             | 0 12:10                                  | 0.152                                   | 0.152                                 | 0.012                               |
| CP3A   | JUNCTION | 0.014                               | 0.014                             | 0 12:10                                  | 0.0633                                  | 0.0633                                | 0.025                               |
| CP4A   | JUNCTION | 0.002                               | 0.002                             | 0 12:10                                  | 0.00915                                 | 0.00915                               | 0.037                               |
| CP4B   | JUNCTION | 0.006                               | 0.006                             | 0 12:10                                  | 0.0299                                  | 0.0299                                | 0.023                               |
| CP5A   | JUNCTION | 0.032                               | 0.032                             | 0 12:10                                  | 0.166                                   | 0.166                                 | 0.010                               |
| CP6A   | JUNCTION | 0.024                               | 0.024                             | 0 12:10                                  | 0.118                                   | 0.118                                 | 0.018                               |
| CP8A   | JUNCTION | 0.018                               | 0.018                             | 0 12:10                                  | 0.0851                                  | 0.0851                                | 0.021                               |
| CP9A   | JUNCTION | 0.017                               | 0.017                             | 0 12:10                                  | 0.0865                                  | 0.0865                                | 0.015                               |
| HW1    | JUNCTION | 0.063                               | 0.063                             | 0 12:10                                  | 0.4                                     | 0.4                                   | 0.147                               |
| HW2    | JUNCTION | 0.000                               | 0.063                             | 0 12:10                                  | 0                                       | 0.399                                 | -0.096                              |
| N1L1M1 | JUNCTION | 0.000                               | 0.039                             | 0 12:15                                  | 0                                       | 0.264                                 | -2.081                              |
| N1L1M2 | JUNCTION | 0.000                               | 0.051                             | 0 12:10                                  | 0                                       | 0.267                                 | 1.354                               |
| N1L1M3 | JUNCTION | 0.000                               | 0.011                             | 0 12:10                                  | 0                                       | 0.0583                                | 0.062                               |
| N2L14  | JUNCTION | 0.000                               | 0.022                             | 0 12:10                                  | 0                                       | 0.102                                 | 0.020                               |
| N2L1M1 | JUNCTION | 0.000                               | 0.077                             | 0 12:10                                  | 0                                       | 0.387                                 | 0.004                               |
| N2L1M2 | JUNCTION | 0.000                               | 0.053                             | 0 12:10                                  | 0                                       | 0.269                                 | 0.017                               |
| N2L1M3 | JUNCTION | 0.000                               | 0.053                             | 0 12:10                                  | 0                                       | 0.269                                 | 0.017                               |
| N2L1M5 | JUNCTION | 0.000                               | 0.014                             | 0 12:10                                  | 0                                       | 0.0633                                | 0.041                               |
| N2L2M1 | JUNCTION | 0.000                               | 0.008                             | 0 12:10                                  | 0                                       | 0.0391                                | 0.046                               |
| N3L1M1 | JUNCTION | 0.000                               | 0.051                             | 0 12:10                                  | 0                                       | 0.252                                 | 0.011                               |
| N3L1M2 | JUNCTION | 0.000                               | 0.035                             | 0 12:10                                  | 0                                       | 0.172                                 | 0.039                               |
| N3L1M3 | JUNCTION | 0.000                               | 0.018                             | 0 12:10                                  | 0                                       | 0.085                                 | 0.033                               |
| N3L1M4 | JUNCTION | 0.000                               | 0.018                             | 0 12:10                                  | 0                                       | 0.0851                                | 0.032                               |
| N4L1M1 | JUNCTION | 0.000                               | 0.019                             | 0 12:10                                  | 0                                       | 0.0904                                | 0.094                               |
| N4L1M2 | JUNCTION | 0.000                               | 0.066                             | 0 12:10                                  | 0                                       | 0.369                                 | -0.003                              |
| 2      | OUTFALL  | 0.000                               | 0.000                             | 0 00:00                                  | 0                                       | 0                                     | 0.000 ltr                           |
| 3      | OUTFALL  | 0.000                               | 0.000                             | 0 00:00                                  | 0                                       | 0                                     | 0.000 ltr                           |
| 4      | OUTFALL  | 0.000                               | 0.063                             | 0 12:10                                  | 0                                       | 0.4                                   | 0.000                               |
| SP1    | OUTFALL  | 0.000                               | 0.031                             | 0 12:20                                  | 0                                       | 0.269                                 | 0.000                               |
| SP2    | OUTFALL  | 0.000                               | 0.077                             | 0 12:10                                  | 0                                       | 0.387                                 | 0.000                               |
| SP3    | OUTFALL  | 0.000                               | 0.050                             | 0 12:10                                  | 0                                       | 0.252                                 | 0.000                               |
| SP4    | OUTFALL  | 0.000                               | 0.066                             | 0 12:10                                  | 0                                       | 0.369                                 | 0.000                               |

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Node Surcharge Summary  
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No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
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No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
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| Outfall Node | Flow<br>Freq<br>Pcnt | Avg<br>Flow<br>CMS | Max<br>Flow<br>CMS | Total<br>Volume<br>10^6 ltr |
|--------------|----------------------|--------------------|--------------------|-----------------------------|
| 2            | 0.00                 | 0.000              | 0.000              | 0.000                       |
| 3            | 0.00                 | 0.000              | 0.000              | 0.000                       |
| 4            | 94.58                | 0.005              | 0.063              | 0.400                       |
| SP1          | 91.97                | 0.003              | 0.031              | 0.269                       |
| SP2          | 94.72                | 0.005              | 0.077              | 0.387                       |
| SP3          | 94.55                | 0.003              | 0.050              | 0.252                       |
| SP4          | 94.65                | 0.005              | 0.066              | 0.369                       |
| System       | 67.21                | 0.021              | 0.273              | 1.677                       |

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Link Flow Summary  
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| Maximum<br> Flow | Time of Max<br>Occurrence | Maximum<br> Veloc | Max/<br>Full | Max/<br>Full |
|------------------|---------------------------|-------------------|--------------|--------------|
|------------------|---------------------------|-------------------|--------------|--------------|



| Link | Type    | CMS   | days | hr:min | m/sec | Flow | Depth |
|------|---------|-------|------|--------|-------|------|-------|
| 1    | CONDUIT | 0.005 | 0    | 12:10  | 0.89  | 0.04 | 0.14  |
| 2    | CONDUIT | 0.005 | 0    | 12:10  | 0.74  | 0.05 | 0.16  |
| 3    | CONDUIT | 0.011 | 0    | 12:10  | 0.37  | 0.07 | 0.36  |
| 4    | CONDUIT | 0.010 | 0    | 12:09  | 0.42  | 0.10 | 0.57  |
| 5    | CONDUIT | 0.030 | 0    | 12:10  | 0.85  | 0.27 | 0.59  |
| 6    | CONDUIT | 0.039 | 0    | 12:15  | 0.63  | 0.57 | 0.54  |
| 8    | CONDUIT | 0.002 | 0    | 12:10  | 1.05  | 0.01 | 0.07  |
| 9    | CONDUIT | 0.006 | 0    | 12:10  | 1.17  | 0.03 | 0.12  |
| 10   | CONDUIT | 0.008 | 0    | 12:10  | 0.63  | 0.07 | 0.17  |
| 11   | CONDUIT | 0.031 | 0    | 12:20  | 0.49  | 0.58 | 0.41  |
| 12   | CONDUIT | 0.014 | 0    | 12:10  | 0.74  | 0.20 | 0.31  |
| 13   | CONDUIT | 0.014 | 0    | 12:10  | 1.07  | 0.05 | 0.17  |
| 14   | CONDUIT | 0.022 | 0    | 12:10  | 1.05  | 0.12 | 0.24  |
| 15   | CONDUIT | 0.032 | 0    | 12:10  | 1.55  | 0.21 | 0.33  |
| 16   | CONDUIT | 0.053 | 0    | 12:10  | 1.32  | 0.19 | 0.30  |
| 17   | CONDUIT | 0.053 | 0    | 12:10  | 1.32  | 0.19 | 0.30  |
| 18   | CONDUIT | 0.024 | 0    | 12:10  | 0.92  | 0.35 | 0.40  |
| 19   | CONDUIT | 0.077 | 0    | 12:10  | 3.60  | 0.06 | 0.19  |
| 20   | CONDUIT | 0.018 | 0    | 12:10  | 0.79  | 0.26 | 0.35  |
| 21   | CONDUIT | 0.018 | 0    | 12:10  | 0.78  | 0.14 | 0.26  |
| 22   | CONDUIT | 0.017 | 0    | 12:10  | 0.78  | 0.14 | 0.26  |
| 23   | CONDUIT | 0.017 | 0    | 12:10  | 1.26  | 0.13 | 0.25  |
| 24   | CONDUIT | 0.035 | 0    | 12:10  | 0.90  | 0.14 | 0.29  |
| 25   | CONDUIT | 0.016 | 0    | 12:10  | 0.82  | 0.24 | 0.33  |
| 26   | CONDUIT | 0.050 | 0    | 12:10  | 1.03  | 0.21 | 0.35  |
| 27   | CONDUIT | 0.019 | 0    | 12:10  | 0.81  | 0.28 | 0.37  |
| 28   | CONDUIT | 0.019 | 0    | 12:10  | 0.84  | 0.14 | 0.26  |
| 29   | CONDUIT | 0.047 | 0    | 12:10  | 1.04  | 0.69 | 0.61  |
| 30   | CONDUIT | 0.066 | 0    | 12:10  | 2.42  | 0.14 | 0.29  |
| 35   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 36   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 37   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 38   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 39   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 40   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 41   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 31   | CONDUIT | 0.063 | 0    | 12:10  | 1.19  | 0.75 | 0.70  |
| 49   | CONDUIT | 0.063 | 0    | 12:10  | 0.37  | 0.00 | 0.08  |
| 51   | CONDUIT | 0.000 | 0    | 00:00  | 0.00  | 0.00 | 0.00  |
| 33   | WEIR    | 0.000 | 0    | 00:00  |       |      | 0.00  |
| 34   | WEIR    | 0.000 | 0    | 00:00  |       |      | 0.00  |
| 42   | WEIR    | 0.000 | 0    | 00:00  |       |      | 0.00  |
| 43   | WEIR    | 0.000 | 0    | 00:00  |       |      | 0.00  |
| 45   | WEIR    | 0.000 | 0    | 00:00  |       |      | 0.00  |
| 46   | WEIR    | 0.000 | 0    | 00:00  |       |      | 0.00  |
| 48   | WEIR    | 0.000 | 0    | 00:00  |       |      | 0.00  |

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Flow Classification Summary  
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| Conduit | Adjusted<br>/Actual<br>Length | -----<br>Up<br>Dry |      | Fraction of<br>Down Sub<br>Dry Crit |      | Time in Flow Class<br>Sup Up<br>Crit Crit |      | Down<br>Crit Crit |      | Norm<br>Ltd | Inlet<br>Ctrl |
|---------|-------------------------------|--------------------|------|-------------------------------------|------|-------------------------------------------|------|-------------------|------|-------------|---------------|
|         |                               | Dry                | Dry  | Dry                                 | Crit | Crit                                      | Crit | Crit              | Crit |             |               |
| 1       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 2       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 3       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.91 | 0.00                                      | 0.00 | 0.03              | 0.91 | 0.00        | 0.00          |
| 4       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.94 | 0.01                                      | 0.00 | 0.00              | 0.93 | 0.00        | 0.00          |
| 5       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.93 | 0.02                                      | 0.00 | 0.00              | 0.92 | 0.00        | 0.00          |
| 6       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.51 | 0.00                                      | 0.00 | 0.44              | 0.11 | 0.00        | 0.00          |
| 8       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 9       | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 10      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 11      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 12      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 13      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.01                                      | 0.00 | 0.94              | 0.01 | 0.00        | 0.00          |
| 14      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 15      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 16      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 17      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 18      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 19      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.95                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 20      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 21      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 22      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 23      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 24      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.01 | 0.01                                      | 0.00 | 0.93              | 0.01 | 0.00        | 0.00          |
| 25      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 26      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 27      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 28      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 29      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.95              | 0.00 | 0.00        | 0.00          |
| 30      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.00 | 0.95                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 35      | 1.00                          | 1.00               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 36      | 1.00                          | 1.00               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 37      | 1.00                          | 1.00               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 38      | 1.00                          | 1.00               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 39      | 1.00                          | 1.00               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 40      | 1.00                          | 1.00               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 41      | 1.00                          | 1.00               | 0.00 | 0.00                                | 0.00 | 0.00                                      | 0.00 | 0.00              | 0.00 | 0.00        | 0.00          |
| 31      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.73 | 0.22                                      | 0.00 | 0.00              | 0.00 | 0.85        | 0.00          |
| 49      | 1.00                          | 0.05               | 0.00 | 0.00                                | 0.95 | 0.00                                      | 0.00 | 0.00              | 0.48 | 0.00        | 0.00          |



51 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

| -----   |           |                        |          |                              |                                    |
|---------|-----------|------------------------|----------|------------------------------|------------------------------------|
| Conduit | -----     |                        | -----    |                              | Hours<br>Above Full<br>Normal Flow |
|         | Both Ends | Hours Full<br>Upstream | Dnstream | Hours<br>Capacity<br>Limited |                                    |
| 31      | 0.01      | 0.01                   | 0.01     | 0.01                         | 0.01                               |

Analysis begun on: Tue Jun 23 14:18:26 2026  
Analysis ended on: Tue Jun 23 14:18:28 2026  
Total elapsed time: 00:00:02



# 100-year/24hour Design Storm with Climate Change (RCP8.5) Soakage trench Model

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... CMS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Flow Routing Method ..... DYNWAVE

Surcharge Method ..... EXTRAN

Starting Date ..... 06/18/2026 00:00:00

Ending Date ..... 06/20/2026 00:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:01:00

Routing Time Step ..... 0.10 sec

Variable Time Step ..... YES

Maximum Trials ..... 20

Number of Threads ..... 1

Head Tolerance ..... 0.005000 m

|                            | Volume<br>hectare-m | Volume<br>10^6 ltr |
|----------------------------|---------------------|--------------------|
| Flow Routing Continuity    | -----               | -----              |
| Dry Weather Inflow .....   | 0.000               | 0.000              |
| Wet Weather Inflow .....   | 0.000               | 0.000              |
| Groundwater Inflow .....   | 0.000               | 0.000              |
| RDII Inflow .....          | 0.000               | 0.000              |
| External Inflow .....      | 0.128               | 1.275              |
| External Outflow .....     | 0.000               | 0.000              |
| Flooding Loss .....        | 0.000               | 0.000              |
| Evaporation Loss .....     | 0.000               | 0.000              |
| Exfiltration Loss .....    | 0.128               | 1.275              |
| Initial Stored Volume ...  | 0.000               | 0.000              |
| Final Stored Volume .....  | 0.000               | 0.000              |
| Continuity Error (%) ..... | 0.000               |                    |

\*\*\*\*\*

Time-Step Critical Elements

\*\*\*\*\*

None

\*\*\*\*\*

Highest Flow Instability Indexes

\*\*\*\*\*

All links are stable.

\*\*\*\*\*

Most Frequent Nonconverging Nodes

\*\*\*\*\*

Convergence obtained at all time steps.

\*\*\*\*\*

Routing Time Step Summary

\*\*\*\*\*

Minimum Time Step : 0.10 sec

Average Time Step : 0.10 sec

Maximum Time Step : 0.10 sec

% of Time in Steady State : 0.00

Average Iterations per Step : 2.00

% of Steps Not Converging : 0.00

Time Step Frequencies :

0.100 - 0.040 sec : 100.00 %

0.040 - 0.016 sec : 0.00 %

0.016 - 0.006 sec : 0.00 %

0.006 - 0.003 sec : 0.00 %

0.003 - 0.001 sec : 0.00 %

\*\*\*\*\*

Node Depth Summary

\*\*\*\*\*

| Node | Type    | Average<br>Depth<br>Meters | Maximum<br>Depth<br>Meters | Maximum<br>HGL<br>Meters | Time of Max<br>Occurrence<br>days hr:min | Reported<br>Max Depth<br>Meters |
|------|---------|----------------------------|----------------------------|--------------------------|------------------------------------------|---------------------------------|
| 4    | OUTFALL | 0.00                       | 0.00                       | 0.00                     | 0 00:00                                  | 0.00                            |
| SP3  | STORAGE | 0.24                       | 1.22                       | 362.89                   | 0 14:00                                  | 1.22                            |

\*\*\*\*\*





Node Inflow Summary  
\*\*\*\*\*

| Node | Type    | Maximum<br>Lateral<br>Inflow<br>CMS | Maximum<br>Total<br>Inflow<br>CMS | Time of Max<br>Occurrence<br>days hr:min | Lateral<br>Inflow<br>Volume<br>10^6 ltr | Total<br>Inflow<br>Volume<br>10^6 ltr | Flow<br>Balance<br>Error<br>Percent |
|------|---------|-------------------------------------|-----------------------------------|------------------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|
| 4    | OUTFALL | 0.000                               | 0.000                             | 0 00:00                                  | 0                                       | 0                                     | 0.000                               |
| SP3  | STORAGE | 0.209                               | 0.209                             | 0 12:10                                  | 1.28                                    | 1.28                                  | 0.000                               |

\*\*\*\*\*  
Node Surge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Storage Volume Summary  
\*\*\*\*\*

| Storage Unit | Average<br>Volume<br>1000 m³ | Avg<br>Pcnt<br>Full | Evap<br>Pcnt<br>Loss | Exfil<br>Pcnt<br>Loss | Maximum<br>Volume<br>1000 m³ | Max<br>Pcnt<br>Full | Time of Max<br>Occurrence<br>days hr:min | Maximum<br>Outflow<br>CMS |
|--------------|------------------------------|---------------------|----------------------|-----------------------|------------------------------|---------------------|------------------------------------------|---------------------------|
| SP3          | 0.056                        | 10.9                | 0.0                  | 100.0                 | 0.392                        | 76.9                | 0 14:00                                  | 0.030                     |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Outfall Node | Flow<br>Freq<br>Pcnt | Avg<br>Flow<br>CMS | Max<br>Flow<br>CMS | Total<br>Volume<br>10^6 ltr |
|--------------|----------------------|--------------------|--------------------|-----------------------------|
| 4            | 0.00                 | 0.000              | 0.000              | 0.000                       |
| System       | 0.00                 | 0.000              | 0.000              | 0.000                       |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link | Type | Maximum<br> Flow <br>CMS | Time of Max<br>Occurrence<br>days hr:min | Maximum<br> Veloc <br>m/sec | Max/<br>Full<br>Flow | Max/<br>Full<br>Depth |
|------|------|--------------------------|------------------------------------------|-----------------------------|----------------------|-----------------------|
| 51   | WEIR | 0.000                    | 0 00:00                                  |                             |                      | 0.00                  |

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

| Conduit | Adjusted<br>/Actual<br>Length | Up<br>Dry | Down<br>Dry | Sub<br>Dry | Sup<br>Crit | Up<br>Crit | Down<br>Crit | Norm<br>Crit | Inlet<br>Ltd | Ctrl |
|---------|-------------------------------|-----------|-------------|------------|-------------|------------|--------------|--------------|--------------|------|
|         |                               |           |             |            |             |            |              |              |              |      |

\*\*\*\*\*  
Conduit Surge Summary  
\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Tue Jun 23 14:23:20 2026  
Analysis ended on: Tue Jun 23 14:23:22 2026  
Total elapsed time: 00:00:02



# 100-year/24hour Design Storm with Climate Change (RCP8.5) Aquafort Soakage Model

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... CMS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Flow Routing Method ..... DYNWAVE

Surcharge Method ..... EXTRAN

Starting Date ..... 06/18/2026 00:00:00

Ending Date ..... 06/20/2026 00:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:01:00

Routing Time Step ..... 0.10 sec

Variable Time Step ..... YES

Maximum Trials ..... 20

Number of Threads ..... 1

Head Tolerance ..... 0.005000 m

|                            | Volume<br>hectare-m | Volume<br>10^6 ltr |
|----------------------------|---------------------|--------------------|
| Flow Routing Continuity    | -----               | -----              |
| Dry Weather Inflow .....   | 0.000               | 0.000              |
| Wet Weather Inflow .....   | 0.000               | 0.000              |
| Groundwater Inflow .....   | 0.000               | 0.000              |
| RDII Inflow .....          | 0.000               | 0.000              |
| External Inflow .....      | 0.128               | 1.275              |
| External Outflow .....     | 0.000               | 0.000              |
| Flooding Loss .....        | 0.000               | 0.000              |
| Evaporation Loss .....     | 0.000               | 0.000              |
| Exfiltration Loss .....    | 0.128               | 1.275              |
| Initial Stored Volume ...  | 0.000               | 0.000              |
| Final Stored Volume .....  | 0.000               | 0.000              |
| Continuity Error (%) ..... | 0.000               |                    |

\*\*\*\*\*

Time-Step Critical Elements

\*\*\*\*\*

None

\*\*\*\*\*

Highest Flow Instability Indexes

\*\*\*\*\*

All links are stable.

\*\*\*\*\*

Most Frequent Nonconverging Nodes

\*\*\*\*\*

Convergence obtained at all time steps.

\*\*\*\*\*

Routing Time Step Summary

\*\*\*\*\*

Minimum Time Step : 0.10 sec

Average Time Step : 0.10 sec

Maximum Time Step : 0.10 sec

% of Time in Steady State : 0.00

Average Iterations per Step : 2.00

% of Steps Not Converging : 0.00

Time Step Frequencies :

0.100 - 0.040 sec : 100.00 %

0.040 - 0.016 sec : 0.00 %

0.016 - 0.006 sec : 0.00 %

0.006 - 0.003 sec : 0.00 %

0.003 - 0.001 sec : 0.00 %

\*\*\*\*\*

Node Depth Summary

\*\*\*\*\*

| Node | Type    | Average<br>Depth<br>Meters | Maximum<br>Depth<br>Meters | Maximum<br>HGL<br>Meters | Time of Max<br>Occurrence<br>days hr:min | Reported<br>Max Depth<br>Meters |
|------|---------|----------------------------|----------------------------|--------------------------|------------------------------------------|---------------------------------|
| 4    | OUTFALL | 0.00                       | 0.00                       | 0.00                     | 0 00:00                                  | 0.00                            |
| SP3  | STORAGE | 0.12                       | 0.71                       | 362.37                   | 0 12:57                                  | 0.71                            |

\*\*\*\*\*



Node Inflow Summary  
\*\*\*\*\*

| Node | Type    | Maximum<br>Lateral<br>Inflow<br>CMS | Maximum<br>Total<br>Inflow<br>CMS | Time of Max<br>Occurrence<br>days hr:min | Lateral<br>Inflow<br>Volume<br>10^6 ltr | Total<br>Inflow<br>Volume<br>10^6 ltr | Flow<br>Balance<br>Error<br>Percent |
|------|---------|-------------------------------------|-----------------------------------|------------------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|
| 4    | OUTFALL | 0.000                               | 0.000                             | 0 00:00                                  | 0                                       | 0                                     | 0.000 ltr                           |
| SP3  | STORAGE | 0.209                               | 0.209                             | 0 12:10                                  | 1.28                                    | 1.28                                  | -0.000                              |

\*\*\*\*\*  
Node Surge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Storage Volume Summary  
\*\*\*\*\*

| Storage Unit | Average<br>Volume<br>1000 m³ | Avg<br>Pcnt<br>Full | Evap<br>Pcnt<br>Loss | Exfil<br>Pcnt<br>Loss | Maximum<br>Volume<br>1000 m³ | Max<br>Pcnt<br>Full | Time of Max<br>Occurrence<br>days hr:min | Maximum<br>Outflow<br>CMS |
|--------------|------------------------------|---------------------|----------------------|-----------------------|------------------------------|---------------------|------------------------------------------|---------------------------|
| SP3          | 0.022                        | 2.8                 | 0.0                  | 100.0                 | 0.280                        | 35.0                | 0 12:57                                  | 0.048                     |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Outfall Node | Flow<br>Freq<br>Pcnt | Avg<br>Flow<br>CMS | Max<br>Flow<br>CMS | Total<br>Volume<br>10^6 ltr |
|--------------|----------------------|--------------------|--------------------|-----------------------------|
| 4            | 0.00                 | 0.000              | 0.000              | 0.000                       |
| System       | 0.00                 | 0.000              | 0.000              | 0.000                       |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link | Type | Maximum<br> Flow <br>CMS | Time of Max<br>Occurrence<br>days hr:min | Maximum<br> Veloc <br>m/sec | Max/<br>Full<br>Flow | Max/<br>Full<br>Depth |
|------|------|--------------------------|------------------------------------------|-----------------------------|----------------------|-----------------------|
| 51   | WEIR | 0.000                    | 0 00:00                                  |                             |                      | 0.00                  |

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

| Conduit | Adjusted<br>/Actual<br>Length | -----<br>Up<br>Dry | Down<br>Dry | Fraction of Time<br>Sub<br>Dry | Sup<br>Crit | Up<br>Crit | Down<br>Crit | Norm<br>Ltd | Inlet<br>Ctrl |
|---------|-------------------------------|--------------------|-------------|--------------------------------|-------------|------------|--------------|-------------|---------------|
|---------|-------------------------------|--------------------|-------------|--------------------------------|-------------|------------|--------------|-------------|---------------|

\*\*\*\*\*  
Conduit Surge Summary  
\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Tue Jun 23 14:24:21 2026  
Analysis ended on: Tue Jun 23 14:24:22 2026  
Total elapsed time: 00:00:01

