Appendix F
Engineering Infrastructure Report

Prepared by Cuttriss Consultants Ltd

Cuttriss
Surveyors. Engineers. Planners.

Engineering Infrastructure Report for Resource Consent Application – 160 Mazengarb Road, Paraparaumu

Ref: 23333

25 July 2024

Prepared for:

Sussex Trust
160 Mazengarb Road, Paraparaumu

Cuttriss
Surveyors. Engineers. Planners.

Ref: Goodman/23333 18 July 2024

PROPOSED RESIDENTIAL DEVELOPMENT AND SUBDIVISION AT 160 MAZENGARB ROAD, PARAPARAUMU

Cuttriss Consultants Ltd (Cuttriss), on behalf of Sussex Trust, have been engaged to prepare a resource consent application for the proposed residential development and subdivision at 160 Mazengarb Road, Paraparaumu. Cuttriss have been engaged to undertake an assessment of infrastructure to support the residential development and subdivision.

This infrastructure report should be read in conjunction with the resource consent application which includes reference documents such as a Construction & Environmental Management Plan, stormwater reporting, architectural plans and geotechnical reporting.

The subject site is a 7,168m^2, broadly rectangular site known as 160 Mazengarb Road, Paraparaumu. Furthermore, site has one existing dwelling located towards the rear of the property and there are also multiple other outbuildings such as a shed, garage and barn. The subject site has a 60m frontage along Mazengarb Road, with topography that is undulating and falls away from the road. There are a number of mature trees located across the site, primary at the southwestern side of the subject site.

The proposal pertains to the construction of 41 residential allotments, and associated fee simple subdivision. Architectural plans showing the proposed dwellings and communal areas have been prepared by Design Group Stapleton Elliott (DGSE), and are included in the resource consent application. A scheme plan set has been included at **Appendix A**, prepared by Cuttriss, titled 23333 SCH, demonstrating the proposed subdivision, servicing and earthworks.

Access is provided via a private looped road, servicing all dwellings. Units 1 – 5 and 40 – 41 will also have pedestrian access provided directly from Mazengarb Road. Each residential unit will be provided with a carparking space, either situated at the front of the dwelling within the allotment boundaries or a carpark space near the community lawn area.

The access and infrastructure to serve the development will be contained in an access lot shown as Lot 100 on the scheme plans. Lot 100 will be jointly owned by Lots 1-41 and will be managed by a Resident's Society. All infrastructure and roading will be privately owned. It is not proposed to vest any infrastructure with KCDC.

1. PREAMBLE

This report has been prepared to accompany resource consent applications to the Kapiti Coast District Council (KCDC) required for the proposed subdivision and associated earthworks and infrastructure located at 160 Mazengarb Road, Paraparaumu.

As a result of the consenting process there may be amendments to incorporate within the detailed design. As such, the servicing solutions detailed in this report should be treated as

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preliminary and are subject to acceptance by the Council engineering team through the engineering approvals process.

The basis for land development design within the Kapiti Coast District is the KCDC's "Land Development Minimum Requirements April 2022" (LDMR). This adopts NZS4404:2010 (New Zealand Standard for Land Development and Subdivision Engineering) with some local amendments. This report provides:

- an assessment of the compliance of the proposed approach to controlling erosion and sediment from earthworks against the LDMR (Section 5), and
- an assessment of available Council infrastructure, describes how the proposed development will be serviced, and demonstrates how the proposed infrastructure solutions comply with the LDMR (Sections 6 – 8).

The basis for the control of erosion and sediment from earthworks is the GWRC's Best Practice Guidelines *'Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region'* (February 2021) (ESCG). This report provides an assessment of the proposed management of erosion and sediment control against the ESCG. Accompanying this Infrastructure Report is a Preliminary Erosion and Sediment Control Plan that provides detail on how erosion and sediment from earthworks will be controlled (Section 5).

2. DOCUMENTS

The following documents and plans have been referenced or observed in the preparation of this report:

- KCDC Land Development Minimum Requirements April 2022 (LDMR).
- KCDC GIS information available from the KCDC website.
- KCDC Standard Drawings.
- NZS4404:2010 - 'Land Development and Subdivision Infrastructure'.
- Compliance Document for New Zealand Building Code – Clause E1: Surface Water.
- Geotechnical Investigation at 160 Mazengarb Road, Paraparaumu prepared by; Torlesse and submitted with the Application.
- Transportation Assessment prepared by; Stantec Ltd and submitted with the Application.
- Conceptual Stormwater Disposal Design Report prepared by Cuttriss and submitted with the Application.
- Draft Construction and Environmental Management Plan (CEMP) prepared by Cuttriss and submitted with the Application.
- Greater Wellington Regional Council Te Pane Matua Taiao - Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region.
- Scheme Plan drawing set: 23333 SCH prepared by Cuttriss (Overview sheets attached at **Appendix A**).
- Wastewater Report prepared by Hydraulic Analysis Limited (HAL)

3. LOCATION AND SITE DESCRIPTION

The site is located off Mazengarb Road, Paraparaumu. The surrounding locality is predominantly residential, with housing typology comprising large standalone dwellings, predominantly single storey, with land areas typically between 500 – 800m^2. To the south of the subject site is the partially developed Niu Sila Way, where four sections have dwellings constructed on them and the rest remain vacant.

The subject site is located approximately 3.5km from the Paraparaumu town centre, and approximately 3.5km from the Paraparaumu Beach town centres. The nearest recreational space is the Mazengarb Reserve, which is approximately 250m south of the subject site and comprises a number of sports fields, pavilions and a playground.

4. TOPOGRAPHY

The topography of the site is variable, with an undulating dune type landscape. The height varies from approximately RL 4.1m – 7.1m above mean sea level, Wellington Datum 1953.

Heights for the development were recorded prior to the change of height datum from Wellington Datum 1953 to Vertical Datum 2016. Council also supplied the most up to date flood information for the site in Wellington Datum 1953, so we have kept all information pertaining to the site is this datum for now.

Several low-lying areas across the site is shown to have ponding on the latest flood information supplied by KCDC, see attached at **Appendix C**.

The topography is illustrated on the scheme plan via existing contours captured during our topographical survey, see attached at **Appendix A**.

Soil conditions generally comprise of underlying sands. These conditions have been confirmed by way of excavated test pit during the testing process to confirm disposal options for stormwater generated from the development.

5. EARTHWORKS

5.1. EXISTING GROUND CONDITIONS

As detailed in the Torlesse Geotechnical Report (provided with the resource consent application), the soil profile has been identified as fine to medium grained sand (0 – 0.3m deep), with medium to dense fine/coarse grained sand (0.3m – 2.5m) to very dense sand up to a depth of 2.5m to 14m. Torlesse have indicated that there is a moderate risk of liquefaction and that NZS3604:2011 shallow foundations are considered suitable for the building sites.

As revealed by percolation testing completed as part of the stormwater investigations, the soil conditions are favourable for natural infiltration. Refer Stormwater Disposal Report submitted with the Application.

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5.2. EARTHWORKS DESIGN

Earthworks as shown on Sheets 3 and 4 of the Scheme Plan are required to form the new roads, building platforms and carparks. The overview sheet is attached at **Appendix A**.

The earthworks and roading design have been completed using 12d model, a civil engineering and surveying software package. Several iterations of the earthworks design have been completed throughout the design stages of the subdivision. The design seeks to balance the impact on the environment with providing a quality layout with appropriate connectivity and amenity for the future residents.

The earthworks have been designed to transition from the road level at Mazengarb Road at a gentle gradient to the rear of the site. Initially our design tested the ability to fill the site to ensure the gradient of the site would fall from the rear to the front allowing a gravity wastewater system and secondary overflow path to fall to Mazengarb Road. This required a significant amount of fill to be imported and it also required high retaining walls to be construction at the boundary which will fill the site to a level that was approximately 1.5m higher than the adjacent properties.

Cut and fill depths vary across the site, with a maximum cut of approximately 1.5m and a maximum fill of 1.9m. There is a shortfall of material on site and approximately 1,300m³ will be cut to waste (used where possible) and 2,300m³ will be imported to site to bring it to subbase level (this excludes roading and building pad material).

5.3. ANTICIPATED CONSTRUCTION METHODOLOGY

The initial setup works will commence following pre-commencement site meeting. The installation of site access and erosion and sediment control measures will then progress.

A suitable site access point will be established along the Mazengarb Road boundary as required. This site access point is to be located at the existing vehicle access location as detailed in the CEMP for this development provided with the resource consent application.

As noted in Section 5.2 above, it is anticipated that a cut to fill balance will not be achieved for the site and fill material will need to be imported. We have reduced the initial volume of fill proposed to be imported from earlier designs and fill is now limited to what is required to grade gently to the rear of the site and create building sites that are more sympathetic to the surrounding environment. This approach will significantly reduce construction traffic and emissions. Topsoil will be stripped and removed off site.

Any cut to fill will involve excavators and loaders working within the confines of the site. Compaction of fill material is to be completed in accordance with NZS 4431:2022 and is generally achieved with loaders and excavators.

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Roading material will be imported by trucks carting suitable roading aggregate from quarries. This material will be placed, spread and compacted. Preliminary calculations indicate approximately 500m³ compacted material will be imported.

In addition to the importation of roading material for roads, its likely that the site will be stabilised with a layer of basecourse across lots/exposed areas. Preliminary calculations indicate approximately 650m³.

These values are subject to change throughout the consenting & detailed engineering design process.

Sediment control measures will be required to be put in place for the duration of the earthworks, in line with the latest revision of the Greater Wellington Regional Council Te Pane Matua Taiao "*Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region*". These measures are detailed within the Preliminary CEMP submitted with the Application**.**

5.4. ASSESSMENT OF EARTHWORKS COMPLAINCE WITH THE LDMR

The following section demonstrates how the proposed solution complies with the Development Requirements within Part 3 of the LDMR.

(i) General Requirements

The design constraints were identified by Torlesse in their geotechnical report referenced above. It is on this basis that the design is considered to comply with the requirements of NZS 4404:2010 Section 2 as modified by Schedule 2 of the LDMR.

(ii) Geotechnical Appraisal and Design

As noted above, Torlesse completed a geotechnical report prior to the commencement of the design work. It is anticipated that geotechnical monitoring of construction will be completed, and further reporting completed following construction to certify the earthworks.

(iii) Performance Criteria

Geotechnical recommendations from the Torlesse report have informed the design. As such, the proposed earthworks will be stable and geotechnically sound. The landform modification will be limited to the works required to create adequate foundations for roads and services (including stormwater treatment, as well as building areas and access). Implementation of the controls outlined in the Preliminary Erosion & Sediment Control Plan submitted with the Application as part of the CEMP will ensure surface water is managed through construction and that sediment, silt and dust will be managed in accordance with best practice guidelines.

(iv) Erosion and Sediment Control

Erosion and sediment control measures will be installed prior to the commencement of works and monitored throughout the duration of works. These control measures are described in detail in the Draft Construction and Environmental Management Plan provided with the resource consent application and below in relation to the GWRC requirements.

(v) District Plan Provisions

The provisions within the District Plan will be addressed within the Assessment of Environmental Effects to be submitted with the resource consent application.

5.5. GWRC EROSION & SEDIMENT CONTROL GUIDE (ESCG)

GWRC's "*Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region*" (ESCG) provides technical guidance for the selection, design and use of erosion and sediment control practices and measures for land disturbance in the Wellington context. The guide is intended to assist in the implementation of methods and devices to minimise erosion and sedimentation.

The fundamental principles described in Section A2.0 of the ESCG are as follows:

- Minimise Disturbance.
- Stage Construction.
- Protect Slopes.
- Protect Receiving Environments.
- Rapidly Stabilise Exposed Areas.
- Install Perimeter Controls & Diversions.
- Employ Sediment Retention Devices.
- Get Trained and Develop Experience; and
- Adjust the ESC Plan as Needed.

5.6. ASSESSMENT OF EROSION & SEDIMENT CONTROL APPROACH WITH THE ESCG

The draft CEMP referenced by this report and submitted in support of the consent application has been prepared in accordance with Section C1.0 of the ESCG.

The objectives of the draft CEMP are as follows:

1. Establish construction methodologies to avoid the sedimentation of the four natural inland wetlands identified within the site. The Contractor is to ensure that the measures put in place achieve this primary objective.
2. Ensure the works do not accelerate erosion during both the bulk earthworks and civil works construction, and as a result of the finished earthworks.
3. Where objective 2 is not possible, the effective and efficient treatment of sediment discharges and limiting the extent and duration of any erosion or sediment generation.

These objectives will be met by implementing the control methods and practices described in the draft CEMP. The site plan within the draft CEMP shows the locations of the control methods and has been prepared in accordance with Appendix E1.0 of the ESCG. Implementation of control measures in accordance with the draft CEMP will ensure best practice measures are utilised to manage erosion and sedimentation caused by the proposed earthworks and civil works construction and avoid adverse effects on the receiving environment.

6. WASTEWATER

6.1. EXISTING WASTEWATER INFRASTRUCTURE

KCDC GIS records (attached at **Appendix B**) show two sewer rising mains, a 100mm diameter PVC main and a 450mm diameter Asbestos Cement main on Mazengarb Road adjacent to 160 Mazengarb Road.

Two existing sewer manholes (KWWN003084 & KWWN003085) are located within 160 Mazengarb Road approximately 7m south of both 150 Mazengarb Road & 6C College Drive. Sewer manhole KWWN003084 has a recorded invert level of RL 4.70m (NZVD2016) and sewer manhole KWWN003085 has a recorded invert level of RL 5.43 (Wellington Datum 1953) as recorded from the topographical survey. An existing 150mm PVC gravity sewer main connects both manholes and flows north through 150 & 148 Mazengarb Road, out to sewer manhole KWWN003078 located within College Drive. Furthermore, the KCDC GIS details an abandoned 80mm PVC sewer line travelling along the northern boundary of 160 Mazengarb Road from sewer manhole KWWN003084, and out through 3 Holcombe Drive.

Manhole KWWN003085 has an existing easement in gross in favour of KCDC over it. There are no other easements in gross recorded for the remaining sewer located on site.

A draft Modelling report completed by Hydraulic Analysis Limited (HAL) is attached at **Appendix D**. Within this report, HAL have investigated the impact of the proposed development peak flow rate of 1.45l/s against the current peak inflow rate of 146l/s for the Mazengarb 1 Pump Station (PSP00012) during a 5-year ARI Design Storm. When adding the development peak flows (1.45l/s) into the model, HAL have assessed that the peak inflow rate remains around 146l/s, meaning that the inflow into PSP00012 Pump Station has not exceeded capacity. HAL have concluded within their report that:

"*There are no predicted uncontrolled overflows, and the risk of overflows is considered low. Therefore, the downstream network is considered sufficiently sized to accommodate the increased flows from the proposed development*".

6.2. RESIDENTIAL DEMAND ON WASTEWATER RETICULATION

In assessing the likely demand on the existing infrastructure, we have considered design data from NZS4404:2010 and the KCDC LDMR, as well as using information captured on site by way of topographical survey.

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NZS4404:2010 details average dry weather design flows from residential development as being 180-250 litres/head/day. The KCDC LDMR requires the allowance for a design flow of 250 litres/head/day with an average occupancy of 2.5 people per dwelling.

Therefore, the increased residential demand (ADWF) based on the development would be:

No. of Units	40 units/dwellings
Population	100.0 (2.5 persons/dwelling)
ADWF	0.29 litres/second (40,000litres/day)

The increased residential demand (PDWF and PWWF) based on the development would be:

PDWF	0.72 litres/second (2.5 peaking factor)
PWWF	1.45 litres/second (5.0 peaking factor)

6.3. WASTEWATER OPTION EVALUATION

Several wastewater disposal options have been investigated in in the earlier stages of the project. The primary objective was to achieve a gravity system if possible. The final design levels of the development meant that in order to manage the impact of filling next to adjacent properties, the site could not be filled to a level that fully supported a gravity network for all dwellings.

Gravity Network

The topography of the site and subsequent proposed development levels is such that the site cannot be entirely serviced for wastewater reticulation by way of new gravity main connecting to the existing gravity infrastructure (KWWN003085). However, for lots 1 – 23, 40 and 41 (25 dwellings) can be connected to a new gravity main installed within the development site. This proposal is detailed further of the scheme plan set attached to this report, see attached **Appendix A**.

Low Pressure Sewer Network

For the remaining 16 lots, being lots 24-26 and 27-39 it is proposed to install a centralised low-pressure pump and pumping main within the access lot (Lot 100), with individual service connections being provided to the boundary of each nominated lot. The discharge location for the LPS network will be via a new sewer manhole constructed as part of the new gravity network. Detailed sizing, valve locations and flushing points are to be confirmed at the detailed design stage as part of the engineering approvals stage of the project. This proposal is detailed further of the scheme plan set attached to this report, see attached **Appendix A**.

Given the network is a sealed system, the risks of infiltration and sewage egress are significantly reduced. The flexible pipe is not compromised by movement caused by an earthquake, differential settlement, or seasonal variation in soil properties due to groundwater fluctuations.

The low-pressure pumping system will be privately owned, and maintenance will be managed by the Resident's Society set up to manage maintenance of the overall development.

An indicative low pressure pump design has been prepared by Ecoflow, this is attached at **Appendix E**.

6.4. ASSESSMENT OF WASTEWATER SOLUTION COMPLIANCE WITH THE LDMR

The following section demonstrates how the proposed solution complies with the Development Requirements within Part 3 of the LDMR. It is noted the LDMR does not include a specific wastewater strategy.

(i) Objective

The proposed LPS and gravity option is considered the most appropriate method to comply with the LDMR objective: *"Wastewater systems shall minimise environmental impacts, including erosion, pollution of waterways, coastal and marine environments and habitats."* Through the use of the LPS system alongside the gravity system, the subdivision design philosophy aligns with a water sensitive urban design approach, a key outcome of which is minimising the environmental impacts.

(ii) Performance Criteria

The proposed LPS and gravity option is considered the most compliant option when assessed against the performance criteria within the LDMR. The LPS and gravity option provides for the collection of wastewater from each nominated lot, minimises health and safety risks, and through a pressurised system prevents stormwater ingress and sewage egress.

(iii) Design Principles

The proposed design aligns with the requirements NZS 4404:2010 Section 5 as modified by Schedule 5 of the LDMR. Addition 19 within Schedule 5 of the LDMR specifies that common pressure sewer mains can be considered when a normal gravity system is not achievable. The LDMR also states that "*Development of alternative wastewater systems that minimise environmental concerns and/or maintenance expenditure will be encouraged.*"

Although specific pipe sizing, valve locations etc. are yet to be completed, it is anticipated that the proposed design will be in accordance with the requirements of Section 5 of NZS 4404, and Schedule 5 of the LDMR. As confirmed by HAL in their wastewater report, no downstream network improvements will be required.

(iv) Private and Public Drains

It is noted that the public ownership of the on-site infrastructure can result in better network efficiencies, however we have assumed Council would not wish to own this pumping system and we have assumed all infrastructure will remain private.

(v) Pumping Mains and Pump Stations

Pumping stations are only to be considered when other options, including pumping from individual lots to a Council rising main are impracticable.

As demands for housing increase, land available for development is increasingly recognised as a precious resource. The requirement for any centralised pump stations to be located within publicly owned property (outside the road reserve) is not seen as an efficient use of land which could otherwise be developed for housing.

(vi) Construction

Compliance with the construction requirements of the LDMR and NZS 4404 will be addressed during the engineering approvals process and through the construction phase of the project.

(vii) Approved Contractors

Construction of the approved wastewater network will be undertaken by contractors approved by Council.

7. WATER SUPPLY

7.1. EXISTING WATER INFRASTRUCTURE

KCDC GIS records (attached at **Appendix B**) show an existing 250mmØ Asbestos Cement watermain on the western side of Mazengarb Road. A 100mmØ PVC watermain which tees off said 250mmØ Asbestos Cement watermain and runs east down Stella Court, and finally a privately owned 100mmØ watermain which tees off the same 250mmØ Asbestos Cement watermain and travels through a private right of way just north of the Stella Court connection.

7.2. RESIDENTIAL DEMAND ON WATER RETICULATION

The likely demand for any new water infrastructure will be residential demand and fire-fighting demand, in accordance SNZ PAS 4509:2008 – the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice. The residential demand is likely to comprise (non-peak) 25,625 litres/day (41 units/dwellings x 2.5 persons per dwelling x 250 litres per head per day).

At the time of writing this report, KCDC are in the process of upgrading their water reticulation network model. As a result of these upgrades, we have been unable to obtain modelling information to further assess if any network upgrades will be required to meet the minimum service requirements.

It is however noted that given the central location and surrounding built environment, it is not envisaged that there will be water demand issues.

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7.3. PROPOSED WATER RETICULATION INFRASTRUCTURE

It is proposed to reticulate the proposed subdivision for water supply as shown on the Scheme Plan (**Appendix A**), noting that engineering plans will be prepared at the detailed design stage to specify the layout and connection details in accordance with the LDMR.

It is anticipated that a 100mmØ watermain will be installed within the site to meet the residential demand and to provide fire-fighting supply in accordance with the LDMR and SNZ PAS 4509:2008 requirements, with a 63mmØ ridermain teeing off the 100mmØ watermain to service units around the loop road. Lots 1 - 5 positioned along the Mazengarb Road boundary are to be serviced via a 63mmØ ridermain, with reducer to the connection of lot 1. Lot 40 will be serviced from the new 100mmØ water main. The existing 20mmØ connection for the existing house within the site is to be located and provide a service connection for lot 41.

As required by the LDMR, all new lots will be serviced with individual 20mmØ MDPE connections and a manifold box containing a water meter and backflow preventer.

Proposed new valves and connections will be installed in accordance with KCDC standard details (refer KCDC approved drawings).

Water re-use tanks have also been factored into the design. A centralised 20,000L tank will be provided for the development. This tank will provide for washing the refuse areas and watering the gardens.

7.4. ASSESSMENT OF WATER SUPPLY COMPLIANCE WITH THE LDMR

The following section demonstrates how the proposed solution complies with the Development Requirements within Part 3 of the LDMR. Note: we are waiting on modelling to be completed by Council.

(i) Performance Criteria

The proposed supply is assumed to be compatible with the existing water supply system and has been designed provide adequate water supply to meet firefighting and domestic needs for each dwelling. Each lot is to have an individual connection to a private main supply within the development.

(ii) Design Principles

The design layout is in accordance with the requirements of Section 6 of NZS 4404:2010 as modified by Schedule 6 of the LDMR.

(iii) Relevant Information

In the absence of updated water modelling a design for this private development has been prepared and detailed on the attached scheme set at **Appendix A**.

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(iv) Pumping Stations & Reservoirs

Modelling has not yet been completed by Council.

(v) Construction

Compliance with the construction requirements of the LDMR and NZS 4404 will be addressed during the engineering approvals process and through the construction phase of the project.

(vi) Approved Contractors

Construction of the approved water network will be undertaken by contractors approved by Council.

8. WATER DEMAND MANAGEMENT

The development will have a 20,000L communal tank for outdoor water use, including irrigation, washing buildings and supply of water to refuse areas.

The 41 dwellings will not have individual water re-use systems for the following reasons:

- There are no landscape areas that require irrigation within individual lots
- The District Plan requirement to show a reduction in water use of 30% of the Household 2007 summer average water use has been met.
- Council's current system is not implemented in a way that reduces water demand as outdoor tanks are continually 'topped up'. Therefore, this proposal improves this situation significantly.
- Water efficient fittings are a suitable method of reducing water consumption.
- Providing 410,000L of water for re-use is impractical and requires water pumps and a secondary water line to be reticulated in each townhouse which is unnecessary for the reasons above.

In order to support the proposal which includes not providing water re-use options for each dwelling with connections to outdoor taps and toilets we have set out additional information below. This information includes a specific case study of water use in Otaki, where we obtained building files for a number of properties and rainfall data to interrogate the actual water savings and how the current water re-use systems are being implemented.

(i) Overview

KCDC's District Plan includes policies and rules to ensure new developments consider water demand management systems. First introduced in 2009 under Plan Change 75, the District Plan permitted standards require new buildings to be connected to a 10,000L water re-use tank, or a 4,500L water re-use tank if installed in conjunction with a greywater re-use system. The water re-use tanks supply water to the toilets and outdoor taps and outdoor taps are not permitted to connect to the potable water supply. The District Plan permits the provision of a common rainwater storage facility for multi-unit residential developments.

The District Plan allows Council discretion to accept solutions that reduce water demand by 30% when compared to the *Household 2007 summer average water use*, provided non-potable supply is available for outdoor uses, and no outdoor taps are connected to the public water supply system. Matters of discretion include the supply, storage and use of non-potable water and the effects on public health, ecological and hydrological systems.

As per the District Plan, *Household 2007 summer average water use* is 1,560 litres per household per day.

This proposal seeks to construct 41 dwellings each having an outdoor tap. However, the development will be serviced with one communal water reuse tank. The tank will supply water to two centrally located taps for maintenance such as watering of communal gardens and cleaning of the exterior of all units as part of the full maintenance plan. Each unit as part of this development will be fitted with a water meter. Along with water meters externally, internally the dwellings will be fitted with water efficient plumbing fixtures, generally those which are marked as 3 stars or more under the Water Efficiency Labelling Scheme.

The outdoor living areas are predominantly landscaped with paving and artificial grass and therefore will have very little demand for outdoor water use.

Overall, it is considered that any potential or actual adverse effects arising from not providing individual rainwater storage tanks will be less than minor.

The effects of this proposal are discussed below.

(ii) Outdoor Tank Supply

Outdoor tanks in residential areas on the Kāpiti Coast are filled in two ways, either by capturing rainwater runoff from the buildings, or via a restricted flow connection to the Council public water supply system. Rainfall distribution across the Kāpiti Coast varies significantly by location so data was sourced from the GWRC website for rainfall depths at the Ōtaki treatment plant.

As per Figure 1 (over), when the level in the tank drops below a certain volume, the tank is filled using water from the public water supply system.

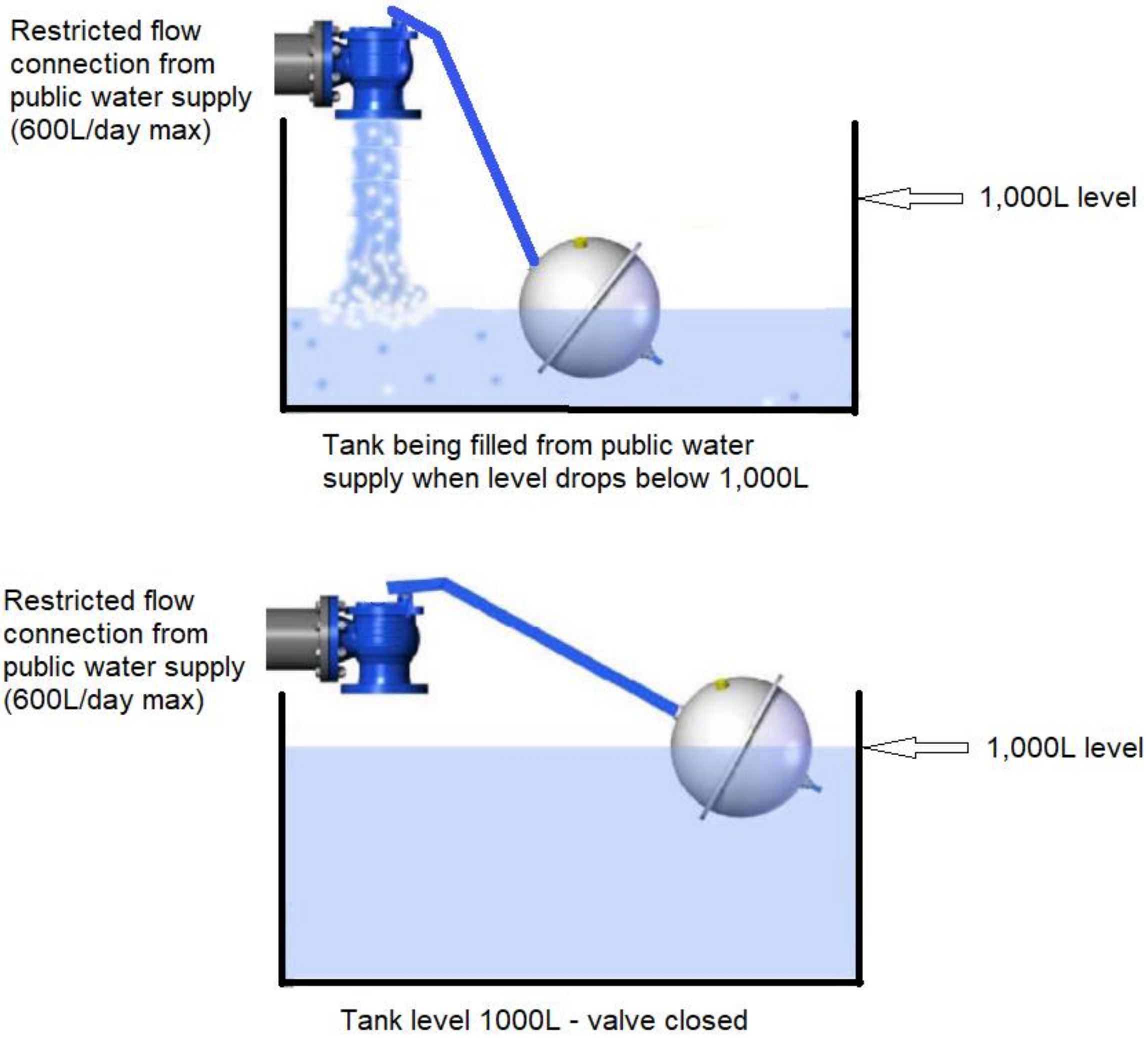

Figure 1 – Rainwater tank valve operation

Discussions with the KCDC Building Consent team and a review of the building consent documentation have confirmed that this level is not controlled through the building consent process. Although the modelling that informed Plan Change 75 (Sinclair Knight Mertz, 2009) specified that 1,000 litres should be the level filled by the restricted flow connection, this is not enforced or monitored. In practice, it is therefore uncertain how much water is being collected from rainwater, and how much is being taken from the public water supply system. We have assumed in the modelling for this report that the restricted flow connection is activated when the level in the tank drops below 1000 litres, noting that this is a conservative real-world scenario.

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Rainfall data from the last 5 years was used to determine how often the average stand alone dwelling in the the proposed development would have drawn on the Council supply. A sample of this data is shown at **Appendix F**, noting that the volume of water being used for flushing toilets and outdoor use was adopted from the analysis for Plan Change 75 (Sinclair Knight Mertz, 2009) as it varies throughout the year. The rainwater tank volume is demonstrated in figure 2 below.

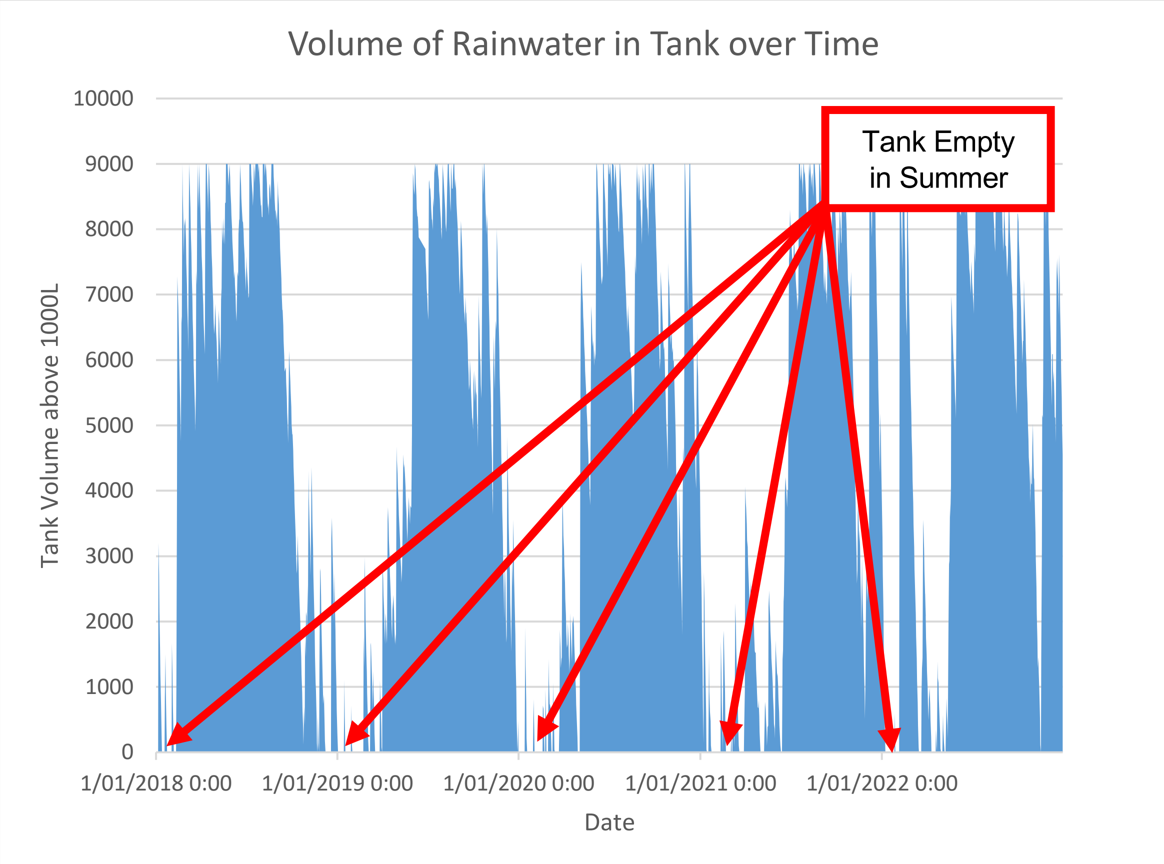

Figure 2 – Rainwater tank volume over time

The calculations demonstrate that even if each site has a 10,000L tank installed to comply with the permitted activity standard, the tanks will draw water from the Council public water supply system 56 days each year on average (when the above volume is 0). Therefore, it is technically impossible to meet the District Plan's rules prohibiting outdoor taps from being connected to the public water supply system, as supply from the public supply for the outdoor taps may be necessary for up to 55 days each year under the accepted scenario.

The water use in the calculations at **Appendix F** is considered conservative when compared to the figures KCDC publish with their water invoices. As per Figure 2, the average outdoor consumption per household is approximately 356L, being the difference between upper use and lower use. The calculations at **Appendix F** have used an average of 217L. If the KCDC figures are used, then the tanks are drained sooner, meaning water could be drawn from the public water system twice as often as calculated above.

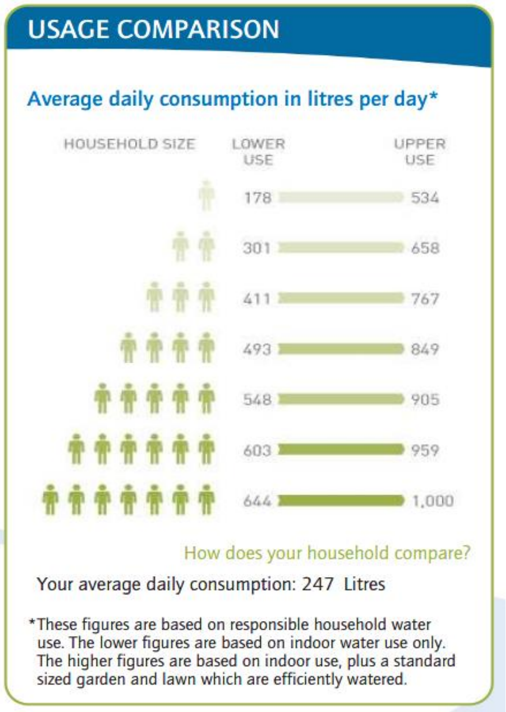

Figure 2 – KCDC published water use figures

Based on the above analysis, it is likely that the District Plan's policies and rules are not currently achieving the intended outcomes. We recommend that a condition of consent should specify that the communal supply from a 20,000L wate reuse tank within the multi-unit areas provides for landscape watering and house washing provisions.

(iii) Outdoor Tap Use

Where a proposal does not include a 10,000L tank for each property, nor a greywater system, the District Plan requires provision be made to ensure that no outdoor taps will be supplied on individual dwellings. To assess the effects of not complying with this requirement, it is important to consider the various uses of outdoor taps, such as irrigation, filling and maintaining swimming pools, and washing buildings.

a. Irrigation

It can be demonstrated that outdoor water use for irrigation in multi-unit developments is considerably less than was allowed for in the baseline scenario which informed the District Plan requirements. The modelling (Sinclair Knight Mertz, 2009) was based on two typical typologies, a 200m² house on a 700m² section, and a 150m² house on a 300m² section. It was assumed in the modelling that the outdoor water use is 85% less in the latter situation, however this was an arbitrary figure and no detailed analysis of a reduction due to housing typology was completed in the assessment. A conservative estimate of the lawn and garden areas in the 700m² scenario is calculated as 210m² per lot. This is based on the District Plan minimum requirement of 30% for impermeable surfaces. In the real world, these areas will be much higher.

The proposed multi-unit houses average 63m² in size, situated on 109m² - 190m² lots. Landscape plans have been provided which shows the landscape and lawn area central to the development. As such, the demand for outdoor water uses for watering the garden and lawn in the proposed multi-unit parts of the development is less than what was anticipated when the District Plan requirements were determined.

The specific typology of housing proposed in this development will therefore use significantly less water for outdoor irrigation when compared to the District Plan baseline.

b. Swimming Pools

The proposed multi-unit development does not include provision for swimming pools, nor space for these in the future. As such, these properties will not use any potable water to maintain a swimming pool.

c. Washing Buildings

The District Plan stipulates that if a 10,000L tank is not provided for each building, provision should be made to ensure that no outdoor taps can be connected to the potable public water system. According to Clause B2 of the building code, exterior building elements must be washed to ensure their durability. To meet the requirements of the building code, it is proposed to connect the outdoor taps for the dwellings to the potable public water supply. An assessment is therefore necessary to determine the effects of non-compliance with the District Plan requirements.

To meet both the building code and District Plan standards, a prior solution accepted by KCDC has been for the resident's society to engage building maintenance contractors to wash the buildings. A survey of six local building washing companies suggested a range of options for supplying water to wash the buildings if no outdoor taps are provided:

- Contractor fills a mobile water tank from the Council depot and drives to site. This option uses water from the potable water supply system, is expensive, and has a relatively high carbon cost.
- Contractor taps into a local hydrant to fill a mobile water tank and drives to site. This option uses water from the potable water supply system, is expensive, and has a relatively high carbon cost. It is acknowledged that filling tanks from hydrants for commercial uses is not an approved solution, however this is real-world practice so has been included as an option.
- Contractor fills up a mobile water tank at their depot and drives to site. This option uses water from the potable water supply system and has a relatively high carbon cost.
- Buy an adaptor for internal fittings (i.e. laundry tap) and connect to internal (public) supply. This option uses water from the potable water supply system.

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All of the above options use water from the public potable water supply system so the District Plan requirement will not reduce demand on the network. The economic and environmental effects of the Council accepted solution are therefore worse than the proposed solution.

Given the above analysis, it is concluded that the effects of this non-compliance are negligible. As a result, the proposed solution should be considered as the preferred choice.

(iv) Demand Management Systems

As required by the District Plan, consideration has been given to rainwater storage tanks, wate re-use systems and other water demand management systems. A communal 20,000-litre water re-use tank will be provided. Consideration was also given to other demand management systems, outlined below.

a. Water Meters

Modelling which informed the District Plan standards (Sinclair Knight Mertz, 2009) did not consider the savings due to water metering and modern fittings. Water metering and volumetric charging are common water demand management techniques (Pollard, 2022). An assessment is therefore necessary to determine how much water these additional measures save when compared to the District Plan baseline.

Water meter readings for all properties from Moy Place and Sue Avenue (for the Otaki case study) were obtained from KCDC to determine how much water these properties use throughout the summer. The Sue Avenue/Moy Place development is typical of a conventional standalone residential subdivision on the Kāpiti Coast, with dwellings averaging approximately 250m² and an average lot size of approximately 800m². This enables a good comparison against the figures used to inform the District Plan standards (Sinclair Knight Mertz, 2009).

Water meter data was supplied by KCDC as an annual average over each of the past three years, so a summer peaking factor was calculated[1] to adjust for summer use. The Council building files were inspected to confirm that each property had a 10,000L water re-use tank installed.

The total water used by each property through the summer months was determined by adding the volume from the Council supply as per the water meter readings (which includes the restricted flow connection to the water re-use tanks) and the calculated volume of rainwater from re-use tanks (based on the roof area of each property). Confirmation was sought by the water meter manufacturer that the meters are sensitive enough to measure the restricted flow to the water re-use tanks. The total volume used by each property is shown in Figure 4 below, noting that an example calculation for one of the properties is attached at **Appendix G**.

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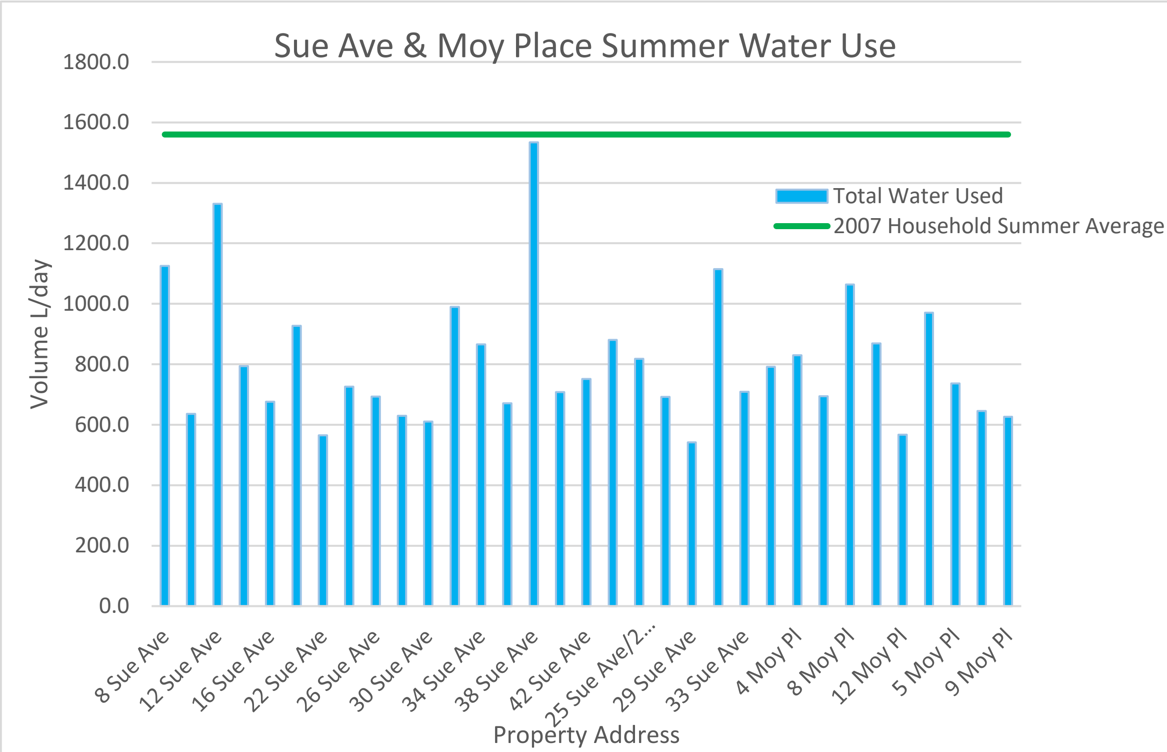
Figure 4 – Sue Ave & Moy Place Summer Water Use



[1]Based on figures at Appendix A of the SKM report "*PURRS Modelling of Raintank and Greywater Effectiveness for the Kapiti Coast*"

The volume of water saved by water metering and modern fittings has been calculated by comparing the average volume of water used for the Moy Place and Sue Avenue properties against the *Household 2007 summer average water use*. An example calculation for one of the properties is attached at **Appendix G**. As demonstrated at **Appendix H**, the savings due to metering and modern fittings were calculated at **48%**, noting that this does not include the additional savings from water re-use tanks.

The distribution of daily water use is skewed with several households with significantly higher water use than the average. A 'typical' household is more likely to be better represented by the median (middle value when the values are ordered) than the average (Pollard, 2022). If the median numbers are used, the savings are calculated at **53%**.

It can therefore be demonstrated that for a conventional standalone residential subdivision, the 30% savings as required by the District Plan are being achieved through water metering and modern fittings alone.

b. Housing Typology

Indoor water use varies depending on housing typology and number of anticipated occupants. As calculated at **Appendix H**, an analysis of water use figures sourced from KCDC demonstrate that for a typical multi-unit development, median indoor water use is 20% less than a conventional standalone residential subdivision. In addition, as discussed in Section 8.iii above, outdoor water use in a multi-unit home will be less than in low density homes due to a relative increase in impermeable surfaces (Sinclair Knight Mertz, 2009). Therefore, housing typology acts as a demand management system through design.

c. Water Sensitive Fittings

Water sensitive fittings are specified in accordance with AS/NZS 6400:2016 and are designed to reduce indoor water demand. The table below summarises the water use for various star ratings as per New Zealand's Water Efficiency Labelling Scheme (WELS):

	0 Stars	1 Star	2 Stars	3 Stars	4 Stars	5 Stars	6 Stars
Tapware	Over 16 l/min	12-16 l/min	9-12 l/min	7.5-9 l/min	6-7.5 l/min	4.5-6 l/min	3-4.5 l/min
Showers	Over 16 l/min	12-16 l/min	9-12 l/min	7.5-9 l/min	N/A	N/A	N/A
Toilets	Ave flush > 6 l	Ave flush > 5.5 l	Ave flush > 4.5 l	Ave flush > 4.0 l	Ave flush > 3.5 l	Ave flush > 3.0 l	Ave flush > 2.5 l

The developer has committed to using water sensitive fittings with at least 4-star ratings within the multi-unit areas (where ratings permit).

KCDC's advice indicates that water-sensitive fittings aren't seen as a long-term solution to decrease water demand. It is noted however, that the use of water sensitive fittings is recommended in an online water conservation video produced by KCDC. The idea that future residents would replace these water-sensitive fittings, which lower both their water consumption and associated Council water bill, seems highly improbable. No evidence could be found to back the assertion that mandatory use of such fittings doesn't constitute a long-term strategy for water demand management.

d. Network Demand Management

Other water demand management systems are available to Council at a network level, although it is noted that is not something specifically proposed in this scenario. Restrictions on outdoor water use at a network level reduces the peak network demand that cannot be otherwise managed through the use of water re-use tanks alone.

e. Conclusion

On the above basis it can be concluded that water metering alone achieves the outcomes desired by the District Plan, and that water-reuse tanks are not necessary to reduce the water used by more than 30% when compared to the *Household 2007 summer average water use*. In addition, the multi-unit housing design and the compulsory use of water sensitive fittings in these areas are effective water demand management systems.

(v) Hydrology

The effects of water storage tanks on the natural hydrological systems have been considered in line with the District Plan standards. Water from the water re-use tanks is required to be connected to toilets. This removes water from the hydrological catchment by conveying it away from site via the Council wastewater network and not allowing the water to soak into the ground.

As per Section 9 of this report, the site has excellent soakage properties, and each standalone dwelling will be connected to the proposed soak pit in the communal area. This will allow water to filter through the underlying sand and recharge the underlying aquifers at source. A reduced tank size to one communal 20,000L tank for the development will provide a balance between water re-use and reducing disruption to the natural hydrological processes.

8.1. WATER DEMAND OPTION EVALUATION

An options evaluation has been included within this report to assist with understanding of the proposed solution. This evaluation confirms the proposed solution as option ii below.

(i) 10,000L Storage per Building

The permitted standard requires each building to be provided with a 10,000L water re-use tank or a 4,000L tank with greywater re-use. In residential developments with more than one dwelling, a common tank with 10,000L for each building is also permitted. Greywater re-use systems were not considered due to the setback requirements to the property boundaries.

The 10,000L tanks are typically buried beneath the garden or lawn and require a pump to convey water from the tank to the outdoor taps and toilets. The dimensions of these tanks vary but are typically 3.0m in diameter and buried 2.5m deep. The excavation required for these tanks is generally 4.0m by 4.0m.

In the context of the proposed development, construction of these tanks within each of the lots is not deemed feasible due to the width of the sections and proximity to the anticipated buildings. The excavation to construct or replace the tanks would undermine the adjoining property unless specific geotechnical provision is made. The building foundations would need to be specifically designed to accommodate a buried tank, which would add significant cost to the project.

The collective installation and maintenance costs for this system would be significant, as each household would be required to maintain and replace the pumps in perpetuity to ensure the water demand management outcomes are permanently achieved.

It is also noted that capturing the rainwater from the buildings interrupts the natural hydrological systems as the water cannot permeate through the ground and recharge the underlying aquifers.

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Providing a communal tank with 10,000L storage for each of the dwellings is not deemed feasible as this would require 410,000L.

On the above basis, providing 10,000L storage per building was not considered appropriate for this development.

(ii) 20,000L Communal Storage

It has been demonstrated in Section 8.iv that water meters and modern fittings reduce the demand on the network by approximately 50% compared to the District Plan baseline. Other water demand measures have been proposed to support the preferred solution, which includes the requirement for a 20,000L communal storage tanks for the full development area.

The mandatory use of water-sensitive fittings will reduce peak demand, a time when the network faces the most strain - a benefit that standalone water tanks cannot offer.

On balance, the reduced individual or communal tanks are seen as the preferred solution for this development. To meet the building code requirements, it is also considered appropriate to connect the outdoor taps for the multi-unit properties to the public water supply.

(iii) No Storage

The water demand targets in the District Plan are being achieved through the use of water meters and modern fittings alone.

In this scenario, all properties would need to have their outdoor taps connected to the public water supply.

9. STORMWATER

9.1. EXISTING STORMWATER INFRASTRUCTURE

KCDC GIS records (see attached at **Appendix B**) show an existing 225mmØ concrete sump lead on the eastern side of Mazengarb Road which flows southeast from Paraparaumu College to stormwater manhole KSWN000613 which then discharges into stormwater manhole KSWN001368, and out via a 675mmØ concrete stormwater main, then a 900mmØ concrete stormwater main travelling through 8 Christow Court and down Bridford Way.

9.2. STORMWATER DISPOSAL AND ATTENUATION

The Conceptual Stormwater Disposal Design Report submitted with the application fully details how the site will be treated for stormwater disposal. The report summarise that the results confirm that typical low impact urban designs (e.g. soakpits, soak trenches, or depression areas) would be suitable for this site.

The primary stormwater disposal system incorporates a piped network capturing the 1% AEP event, which then discharges to a centralised stormwater disposal area designed to store up to a 1% AEP event while allowing soakage out the base.

Secondary overflow has been considered by proposing a connection to the existing 150mm connector pipe in the southern end of the site.

Careful consideration will need to be made to the finished road and right of way levels and sump locations at the detailed design stage to allow runoff into the piped network.

9.3. ASSESSMENT OF STORMWATER COMPLIANCE WITH THE LDMR

The following section demonstrates how the proposed solution complies with the Development Requirements within Part 3 of the LDMR.

(i) Stormwater Management

The proposed design seeks to mimic the natural hydrological processes within the site, by returning runoff to the ground as close to the source as possible. The proposed use of soak pits aligns with the management methodologies listed in the LDMR.

(ii) Performance Criteria

The proposed design aligns with the performance criteria outlined in the LDMR in that it is aligned with the relevant planning standards, considers climate change in the modelling, will achieve hydraulic neutrality, integrates well into the landscape and makes use of natural features and soil conditions, addresses flood events, and mimics the natural hydrological processes.

(iii) Design Principles

The proposed design aligns with the design principles outlined in the LDMR in that it utilises the natural infiltration in the underlying soils to return runoff to ground as close as possible to the source, includes water retention for all proposed lots through District Plan controls and achieves hydraulic neutrality.

(iv) Design Requirements

The proposed design caters to runoff from all storms up to and including the 1%AEP event. Rainfall intensities have been taken from the Isohyet Plans within the LDMR, which include an allowance for climate change. All building sites are above the 1%AEP levels plus freeboard.

(v) Greater Wellington Regional Council Requirements

The Applicant will seek all necessary consents from Greater Wellington Regional Council.

(vi) Stormwater Quality

Stormwater quality has been considered in the planning of the erosion and sediment control measures outlined in the Preliminary CEMP, as well as the concept design described in the stormwater disposal report, both submitted with the application.

Enviropods are to be installed to trap contaminants, which will then be further treated via natural processes in the in-situ soils which are considered an appropriate media for filtration treatment.

Further consideration has also been given to the quality of runoff from the buildings, and it is intended to control building materials to avoid heavy metal contamination in the runoff.

(vii) Low-impact Design References

The proposed design is generally aligned with low-impact design practices, as the design seeks to mimic the natural hydrological processes by disposing of runoff as close to the source as possible.

(viii) Relevant Information

The design considers all relevant information available at the time of lodgement.

(ix) Design Methods

The design has been completed in accordance with the requirements of the LDMR and NZS4404:2010.

(x) Construction

Construction will be completed in accordance with the requirements of the LDMR and NZS4404:2010.

10. FLOOD HAZARD

KCDC correspondence (as attached at **Appendix C**) indicates that the site is subject to ponding with localised areas of ponding occurring. Following a review of the flood information provided it can be concluded that the ponding occurring onsite is due to the site itself and not any external factors, with ponding shown in the low-lying areas of the site between 0.010 – 0.400m.

The proposed development levels will mitigate the risk of ponding based on the current identified hazard, which recommended that any building level (RBL) be 0.3 – 0.5m above top water levels to underside of floor or joist. The undertaking of earthworks onsite will create flood free building platforms.

The subject site will fully contain stormwater runoff and control discharge of stormwater on site.

On the above basis we consider the design and proposed mitigation measures have been appropriately considered, and the subdivision is acceptable from a flood hazard perspective.

11. POWER & TELECOMMUNICATIONS

Initial consultation with Electra has confirmed that the site can be adequately serviced. It is anticipated that underground service connections will be made available to each of the proposed lots in accordance with the requirements of the LDMR. Similar to the Florian development at Trieste Way the power and telecommunications for the private development will be provided by Wellington Utilities Ltd which supplies power and telecommunications.

12. RECOMMENDATIONS

We recommend any proposed water, stormwater and wastewater design to be carried out in accordance with KCDC LDMR, the requirements of NZS4404:2010 and the New Zealand Building Code. Confirmation of finished roading and/or platform levels within the development will determine the required grades and pipe sizing of the necessary wastewater and stormwater infrastructure.

Proposed Wastewater

We recommend a gravity and low-pressure sewer network is installed to service this development. This system is provided for within KCDC's LDMR. It provides a wastewater network that minimises environmental impacts and removes the need to over fill the site.

Proposed Water

We recommend the installation of a new water network via series via 100mm diameter mains and associated MDPE rider main within the proposed development site to meet the residential demand and to provide fire-fighting supply.

Proposed Stormwater

We recommend the construction of a system that provides hydraulic neutrality and water quality outcomes by directing stormwater from the development to a centralised soakpit via a stormwater pipe network. The stormwater will be discharged into a soakpit system and will naturally infiltrate and soak into the sandy soils.

Proposed Water demand Management Plan

We recommend that a condition of consent should specify that the communal supply from a 20,000L wate reuse tank within the multi-unit areas provides for landscape watering and house washing provisions.

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13. CONCLUSION

This report has been prepared to provide a summary of the infrastructure capacity constraints and identify possible solutions for the proposed subdivision of the site at 160 Mazengarb Road, Paraparaumu.

Confirmation of the final layout, staging and finished roading and platform levels will determine the required grades and pipe sizing of the necessary wastewater and stormwater infrastructure.

Based on our assessment of the existing infrastructure and discussions with KCDC, service providers and other stakeholders, we are satisfied that the proposed subdivision can be adequately serviced and will meet the requirements of the LDMR, and that any infrastructure related effects can be appropriately managed to ensure any potential adverse effects will be appropriately mitigated to an acceptable level.

Furthermore, we consider the measures proposed to control erosion and sediment control meet the requirements of the GWRC's ESCG requirements and that construction effects in relation to erosion and sediment control can be appropriately managed to ensure any potential adverse effects will be properly mitigated to an acceptable level.

Prepared by:

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Approved for release by:

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CUTTRISS CONSULTANTS LTD

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APPENDIX A

DEVELOPMENT SCHEME PLAN

	REVISION DETAILS	NAME	DATE
A	ADDITIONAL DATA ADDED	NKT	07/24

NOTES:

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3. COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 2000, WANGANUI CIRCUIT
4. LEVELS ARE IN TERMS OF MEAN SEA LEVEL WELLINGTON VERTICAL DATUM 1953. ORIGIN OF LEVELS: SP I DP 77773 (DC8A) RL: 5.414, SOURCED FROM LINZ ELLIPSOIDAL HEIGHT CONVERSION, DECEMBER 2021
5. NOT ALL INTERESTS ON THE RECORD OF TITLE MAY BE SHOWN ON THIS PLAN, AND SHOULD BE INVESTIGATED FURTHER
6. SERVICES HAVE BEEN LOCATED ON SITE WHERE POSSIBLE, OTHERWISE SHOWN FROM KCDC RECORDS, AND SHOULD BE VERIFIED ON SITE
7. THE SERVICES SHOWN ON THIS PLAN ARE CONCEPTUAL ONLY, AND THE LOCATION AND DEPTHS MAY CHANGE DURING THE DETAILED DESIGN PROCESS
8. CONTOUR INTERVAL: 0.2m
9. SURVEYED BY: R EVANS & S ROBERTS, 13 MAY 2024
10. INSTRUMENT USED: TRIMBLE GPS RTK R10 VRS & TRIMBLE S7 & DJI M300 RTK
11. BOUNDARY LEVELS FOR DETERMINATION OF CRITICAL RECESSION PLANES MUST BE CONFIRMED PRIOR TO ANY APPLICATION FOR BUILDING CONSENT.
12. BOUNDARY INFORMATION HAS BEEN DETERMINED BY SURVEY CALCULATION METHODS AND HAS NOT BEEN VERIFIED ON SITE
13. ALL ELECTRONIC CAD DATA MUST BE READ IN CONJUNCTION WITH THESE NOTES.

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PROJECT
PROPOSED SUBDIVISION
LOT 12 DP 90944
160 MAZENGARB ROAD,
PARAPARAUMU

SCHEME PLAN - EXISTING LAYOUT

SCALE
A1 - 1:250

REDUCED SCALE
A3 - 1:500

	NAME	DATE
FIELDWORK	RE	05/24
DESIGNED	JTR	07/24
DRAWN	JAO	07/24
CHECKED	JTR	07/24

DRAWING NUMBER
23333 SCH

SHEET 1 OF 19 SHEETS

REVISION A

REVISION DETAILS		NAME	DATE
A	ADDITIONAL DATA ADDED	NKT	07/24

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LEGEND

BOUNDARY - EXISTING
BOUNDARY - NEW
PROPOSED DWELLING
SEAL
FOOTPATH

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160 MAZENGARB ROAD,
PARAPARAUMU

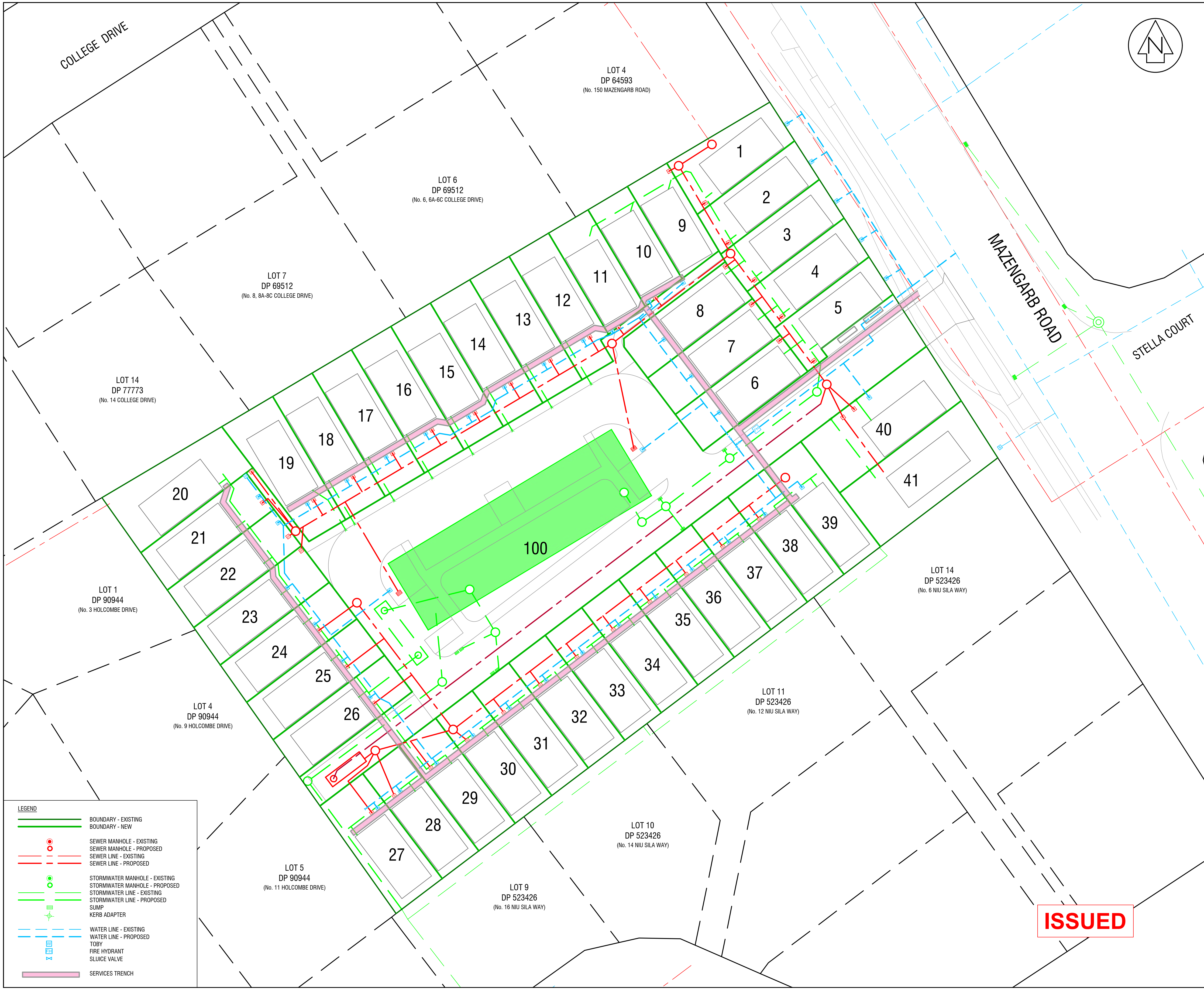
SCHEME PLAN - OVERALL LAYOUT

SCALE
A1 - 1:250

REDUCED SCALE
A3 - 1:500

	NAME	DATE
FIELDWORK	RE	05/24
DESIGNED	JTR	07/24
DRAWN	JAO	07/24
CHECKED	JTR	07/24

DRAWING NUMBER
23333 SCH
SHEET 2 OF 19 SHEETS
REVISION A



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PARAPARAUMU

SCHEME PLAN - ALL SERVICES LAYOUT

SCALE
A1 - 1:250

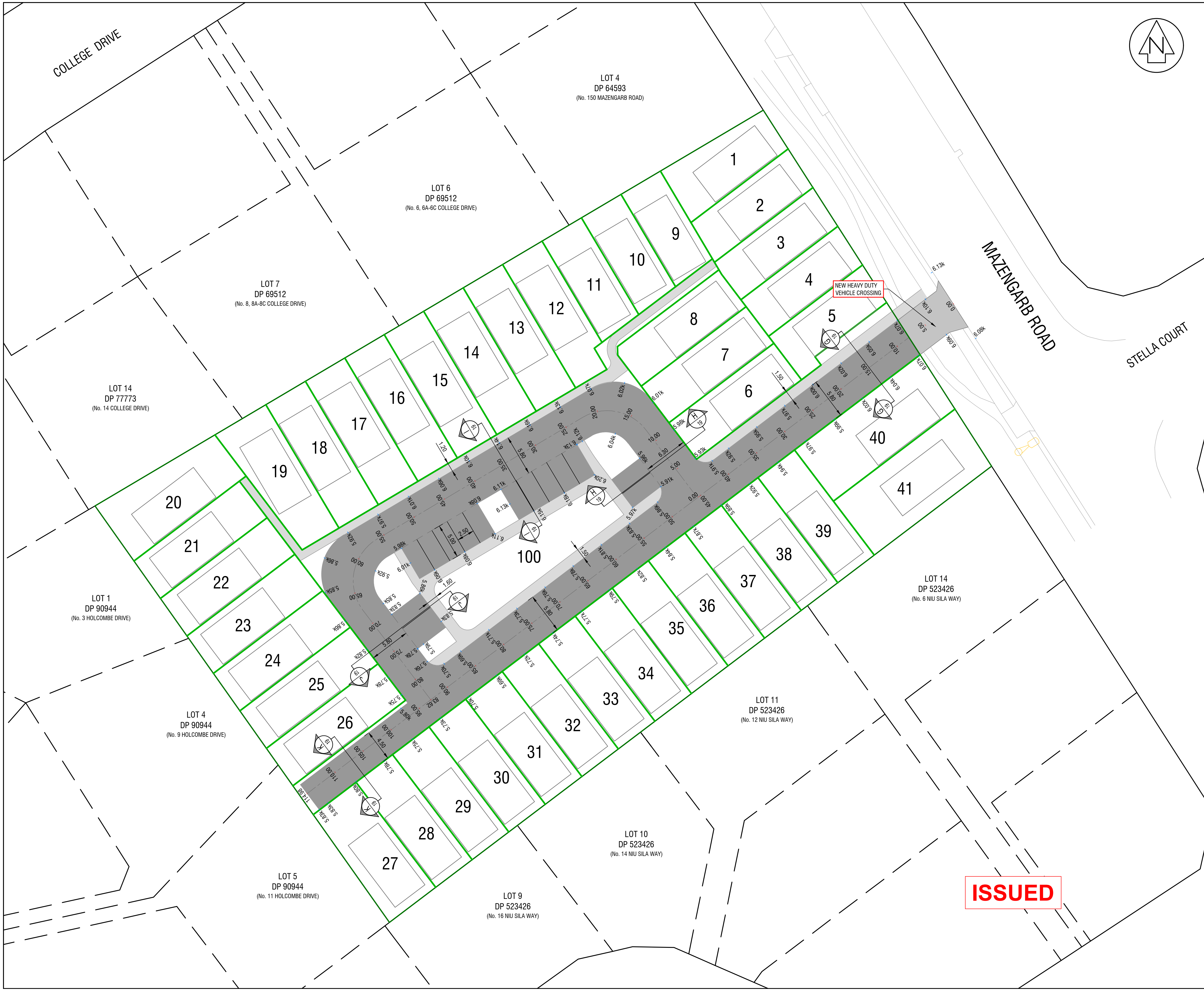
REDUCED SCALE
A3 - 1:500

	NAME	DATE
FIELDWORK	RE	05/24
DESIGNED	JTR	07/24
DRAWN	JAO	07/24
CHECKED	JTR	07/24

DRAWING NUMBER
23333 SCH

SHEET 11 OF 19 SHEETS

REVISION A



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9. SURVEYED BY: R EVANS & S ROBERTS, 13 MAY 2024
10. INSTRUMENT USED: TRIMBLE GPS RTK R10 VRS & TRIMBLE S7 & DJI M300 RTK
11. BOUNDARY LEVELS FOR DETERMINATION OF CRITICAL RECESSION PLANES MUST BE CONFIRMED PRIOR TO ANY APPLICATION FOR BUILDING CONSENT.
12. BOUNDARY INFORMATION HAS BEEN DETERMINED BY SURVEY CALCULATION METHODS AND HAS NOT BEEN VERIFIED ON SITE
13. ALL ELECTRONIC CAD DATA MUST BE READ IN CONJUNCTION WITH THESE NOTES.

LEGEND

- BOUNDARY - EXISTING
- BOUNDARY - PROPOSED
- 11.42k / 30.00 — LEVEL - TOP OF KERB / CHAINAGE
- SEAL
- FOOTPATH
- SUMP
- STREET LAMP

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CLIENT
SUSSEX TRUST

PROJECT
PROPOSED SUBDIVISION
LOT 12 DP 90944
160 MAZENGARB ROAD,
PARAPARAUMU

SCHEME PLAN -
ROAD LAYOUT

SCALE
A1 - 1:250

REDUCED SCALE
A3 - 1:500

	NAME	DATE
FIELDWORK	RE	05/24
DESIGNED	JTR	07/24
DRAWN	JAO	07/24
CHECKED	JTR	07/24

DRAWING NUMBER
23333 SCH
SHEET 17 OF 19 SHEETS
REVISION A

APPENDIX B

KCDC GIS RECORDS

Kapiti Coast District Council

Kāpiti Coast DISTRICT COUNCIL

Key to map symbols

- Valve
- Manifold
- Hydrant
- Fitting
- Service
- Rider Main
- Reticulation Main
- Fitting
- Service
- Rider Main
- Reticulation Main
- Manhole
- Valve
- Other
- WW Service
- Main
- Rising main
- Other
- Pump Station
- Non-KCDC WW Service
- Other
- Manhole
- Sump
- Inlet/Outlet
- Other
- Service
- Gravity main
- Other
- Open channel
- Other
- Sump
- Well-up
- Non-KCDC SW Service
- Non-KCDC SW Pipe
- Other
- Parcel Boundaries

N

0 30 60 Metres

Scale 1:1,250 at A4

Date Printed: July 18, 2024

Map credits:

APPENDIX C

KCDC UPDATED FLOOD DATA

Nicola Todd

From: Tapiwa Mbona <Tapiwa.Mbona@kapiticoast.govt.nz>
Sent: Thursday, 2 May 2024 2:04 pm
To: Nicola Todd
Subject: FW: [#CCL23333] latest flood modelling @ 160 Mazengarb Road, Parapraumu

Please find forwarded, Nicola

FYI

Tapiwa Mbona
Coastal & Stormwater Asset Engineer
Te Kaipuukaha Taonga, o ngaa wai Aawha, me Taatahi

Kāpiti Coast District Council
Tel 04 296 4778
Mobile 027 555 4778

www.kapiticoast.govt.nz

From: Tony Trueman <tony.trueman@awa.kiwi>
Sent: Thursday, May 2, 2024 12:20 PM
To: Tapiwa Mbona <Tapiwa.Mbona@kapiticoast.govt.nz>
Subject: RE: latest flood modelling @ 160 Mazengarb Road, Parapraumu

Hi Tapiwa

I have had a look at this location.

The Mazengarb TUFLOW 100yr ARI 2130 peak depth results, clipped to the parcel boundary.

Ponding occurs within the low-lying areas of the site.

Generally, depths across the site are in the order of 10 to 400 mm – (wellington 1953 vertical datum).

Any runoff associated with an increase in impervious area would need to be mitigated on-site, any storage on the floodplain, off-set by development, would need to be mitigated on-site.

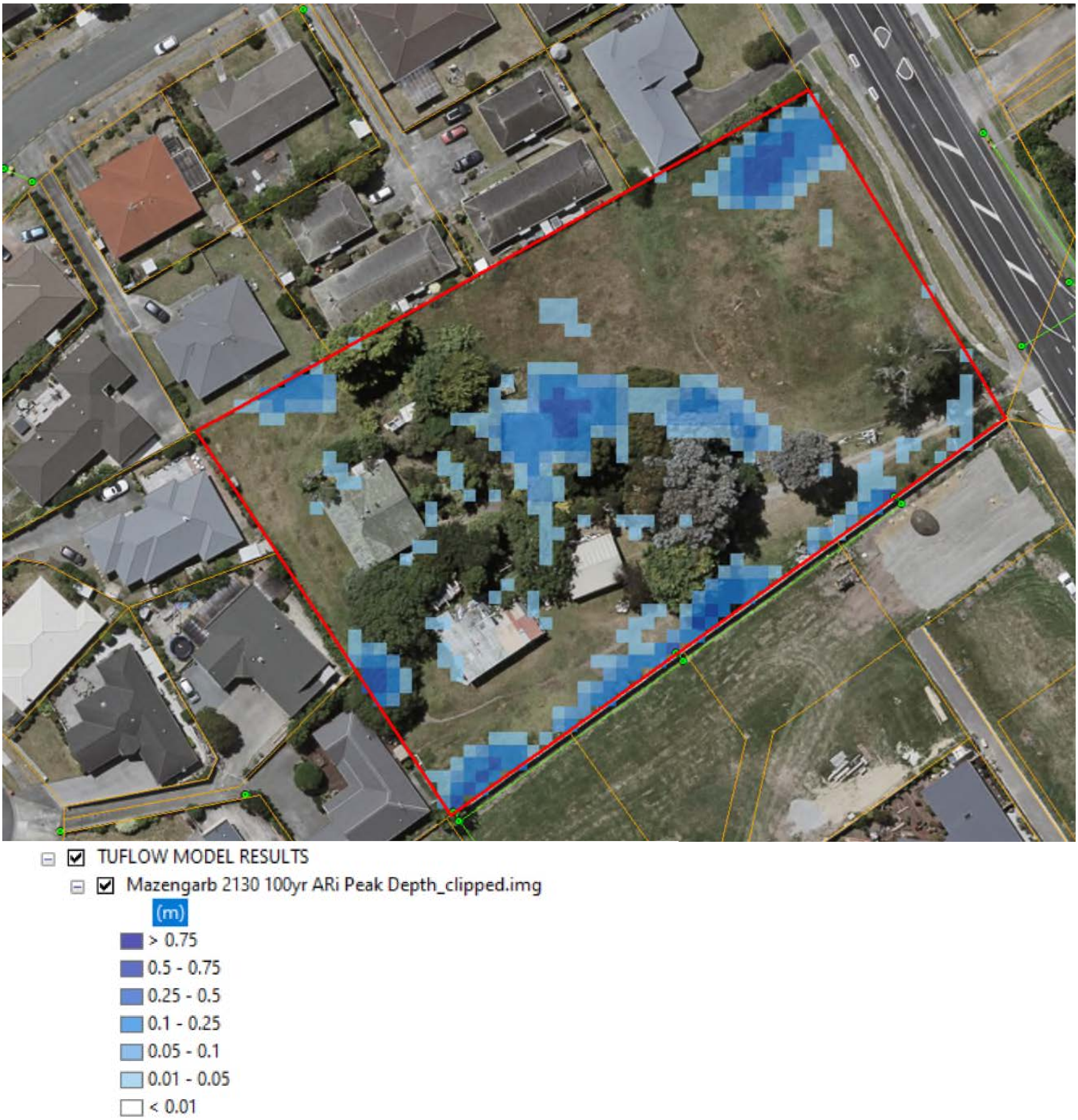
I have clipped the peak depth results (IND – wellington 1953 vertical datum, NZTM) and top water level (TWL – wellington 1953 vertical datum, NZTM) for the sites in raster (.img) format to show the location and depth of flooding to further inform the developed design – see link provided in email below.

https://www.dropbox.com/t/s6jToCXGJkOiA5Xk

Note that these are the base results. While we have run sensitivity analysis including development intensification this has been applied as a general area intensity increase rather than on a development block basis. We would recommend a recommended building level (RBL) of 300mm – 500mm above top water levels to underside of floor or joist for these locations.

Regards

Tony



From: Tapiwa Mbona <Tapiwa.Mbona@kapiticoast.govt.nz>
Sent: Wednesday, May 1, 2024 3:00 PM
To: Tony Trueman <tony.trueman@awa.kiwi>
Subject: latest flood modelling @ 160 Mazengarb Road, Parapraumu

Hi Tony,

May you please help with the request as per the forwarded email?

Regards

Tapiwa Mbona
Coastal & Stormwater Asset Engineer
Te Kaipuukaha Taonga, o ngaa wai Aawha, me Taatahi

Kāpiti Coast District Council
Tel 04 296 4778
Mobile 027 555 4778

www.kapiticoast.govt.nz

From: Nicola Todd <nicola@cuttriss.co.nz>
Sent: Wednesday, May 1, 2024 1:49 PM
To: Tapiwa Mbona <Tapiwa.Mbona@kapiticoast.govt.nz>
Subject: 160 Mazengarb Road

Kia ora Taps

Can you please supply the latest flood modelling for 160 Mazengarb Road, Paraparaumu? I expect it would be quite different and hopefully non-existent as the property to the south was filed several years ago (with consent).

Thank you.

Ngā mihi nui | Thank you

Nicola Todd (she/her)| Director | BSurv (Hons) | MS+SNZ |
Cuttriss Consultants Limited
| e. nicola@cuttriss.co.nz | m. +64 21 221 1978
| http://www.cuttriss.co.nz

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Wellington Region Business Awards – Professional Service and Supreme Award Winners 2019

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APPENDIX D

HAL WASTEWATER MODELLING

KAPITI COAST DISTRICT COUNCIL

160 Mazengarb Road

Development Impact Assessment

JULY 2024

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This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

Document Title	160 Mazengarb Road Development Impact Assessment
HAL Job Reference	J0667

Revision Schedule

Rev	Date	Description	Prepared by	Checked by	Reviewed by	Approved by
1	05/07/2024	Draft for Client Review	KM	BDR	BDR	BDR
2	12/07/2024	Final incorporating Client comments	KM	BDR	BDR	BDR

Contents

List of Figures

List of Tables

1 Introduction

1.1 Objective

The objective of this study is the utilise the existing Hydraulic model of the Paraparaumu and Waikanae wastewater network to assess the impact of the proposed 160 Mazengarb Road development. The existing modelled populations have been updated by HAL to provide an estimated existing (2018) population scenario.

1.2 Background

The proposed development site is located within the township of Paraparaumu. The proposal seeks to develop a lot into 40 townhouses.

2 Scope

The following tasks were undertaken as part of this assessment:

- Calculation of design flows for the 160 Mazengarb Road development.
- Assessment of the 160 Mazengarb Road development impact on the existing network for the current development scenario.

Each of these tasks is discussed in more detail in the following sections.

3 160 Mazengarb Road Design Flows

3.1 Overview

The 160 Mazengarb Road proposal seeks to develop 40 townhouses. The development seeks to connect into a new manhole on Pipe ID KWWN003085. The location of the proposed development and the discharge point Figure 1 below.

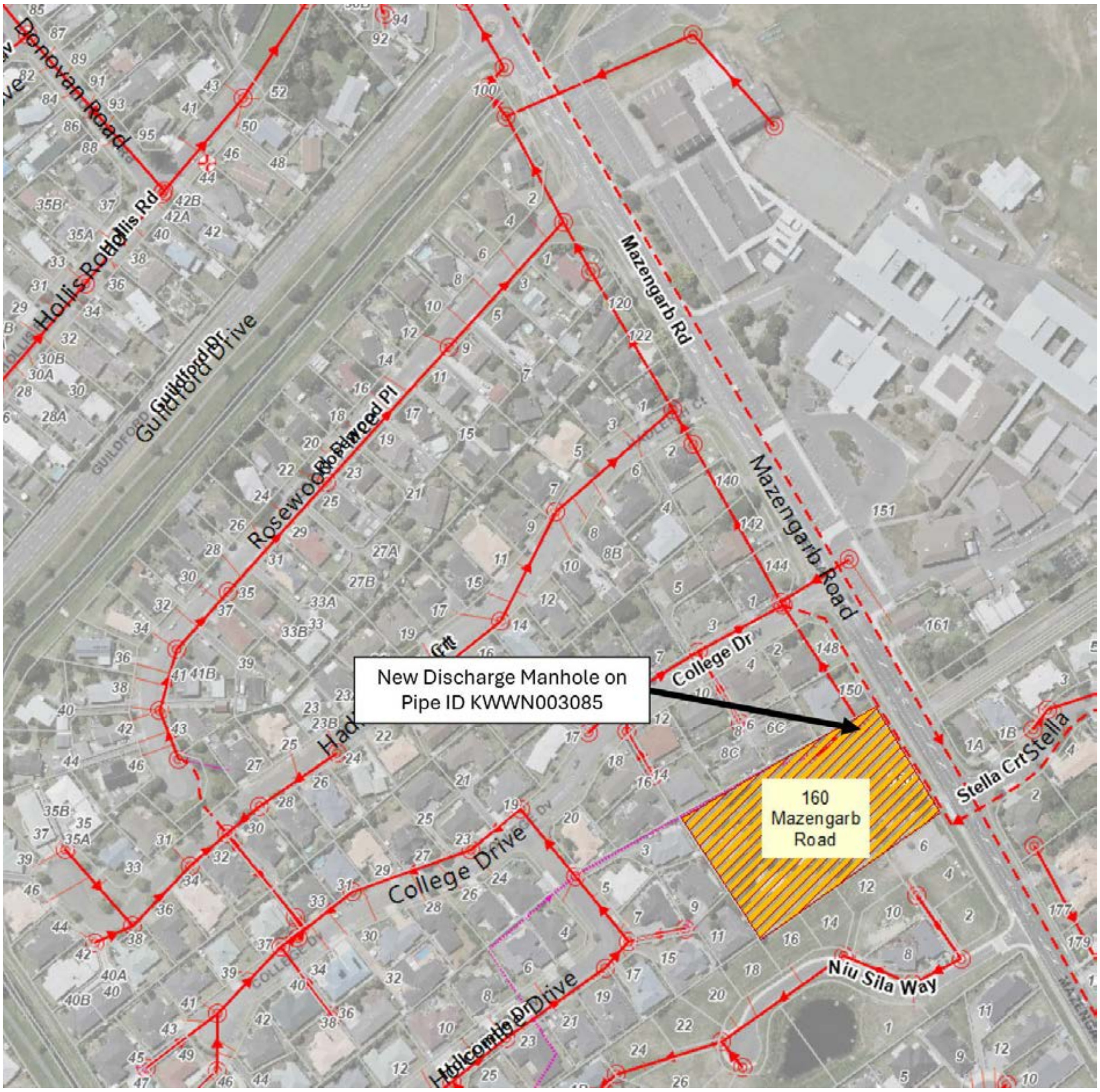


Figure 1: Proposed 160 Mazengarb Road Development location

From the connection point, the network flows west via gravity before discharging to Pump Station ID: PSP00012 (Mazengarb#1 PS), which then pumps to the Paraparaumu WWTP via a series of additional pump stations.

3.2 Development Design Flows

The PWWF for this development assessment has been calculated using the proposed 40 townhouses. Following the KCDC ‘Land Development Minimum Requirements : 2022’ code the design flow formulas as shown below in Table 1 can be used to calculate a proposed residential Peak Wet Weather Flow (PWWF) of 1.45 l/s for the development.

Table 1: Gravity Option 160 Mazengarb Road Design Flows

No of units	Type of units	Occupancy	Population	ADWF (l/p/day)	ADWF (l/s)	DWF Peaking Factor	PDWF (l/s)	WWF Peaking Factor	PWWF (l/s)
40	Townhouse	2.5	100	250	0.29	2.5	0.72	5	1.45

4 160 Mazengarb Road Development Impact

4.1 Pre-Development Scenario

The Paraparaumu and Waikanae wastewater model was run under the pre-development scenario, without the proposed development adopting a standard design storm with a 5-year ARI being used as the level of service for this assessment.

Figure 2 shows the network as a long section during pre-development scenario up until PSP00012. As shown in the long sections, the existing network shows some evidence of minor pipe surcharge just upstream of PSP00012 as a result of backup from the PS, however there are no uncontrolled overflows.

.

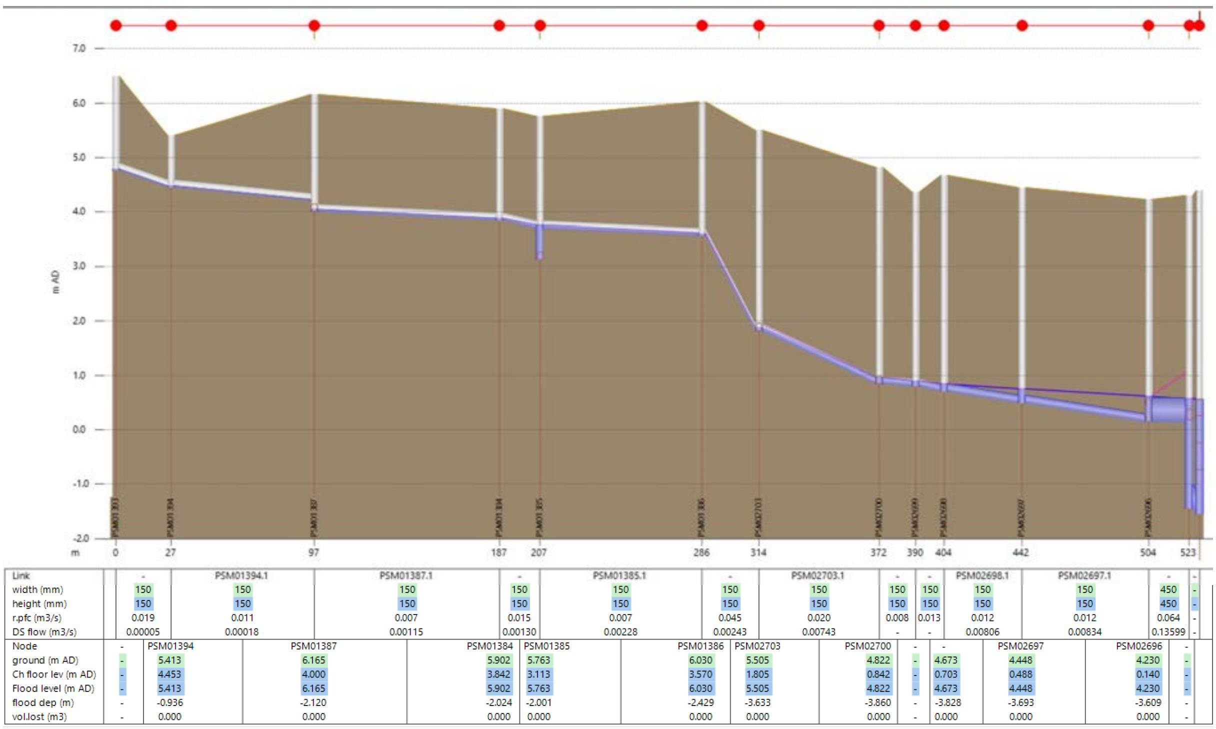


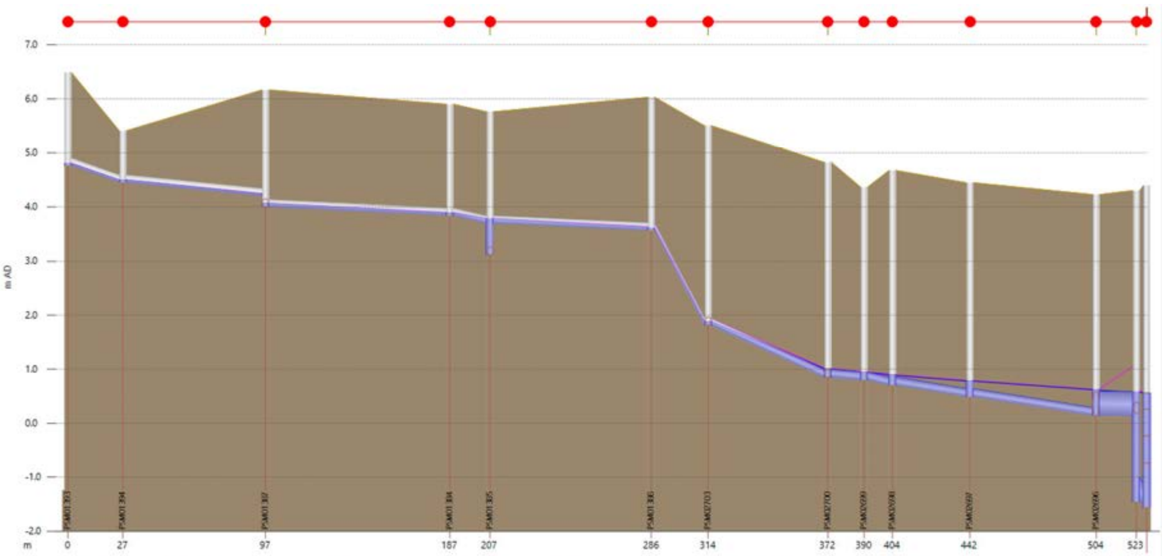
Figure 2: Pre-development flows to PSP00012 - 5-year ARI design storm, long section

4.2 Post-Development Scenario

The Paraparaumu and Waikanae wastewater model was run for the 5-year ARI design storm to assess how the local network performs in storms of this magnitude, with the additional peak wet weather flows of 1.45 l/s from the proposed 160 Mazengarb Road development discharging into a new manhole along Pipe ID KWWN003085.

Figure 3 shows the network as a long section on the post-development scenario. As shown in the figure, the post development scenario shows similar surcharging just upstream of PSP00012 seen in the pre-development scenario with a limited effect from the new development and there are no signs of uncontrolled overflows, and the risk of overflows is considered low.

.



Link	-	PSM01394.1	PSM01387.1	-	PSM01385.1	-	PSM02703.1	-	-	PSM02698.1	PSM02697.1	-	-
width (mm)	150	150	150	150	150	150	150	150	150	150	150	450	-
height (mm)	150	150	150	150	150	150	150	150	150	150	150	450	-
r.pfc (m3/s)	0.019	0.011	0.007	0.015	0.007	0.045	0.020	0.008	0.013	0.012	0.012	0.064	-
DS flow (m3/s)	0.00150	0.00163	0.00260	0.00275	0.00373	0.00389	0.00889	-	-	0.00934	0.00942	0.13721	-

Node	-	PSM01394	PSM01387	PSM01384	PSM01385	PSM01386	PSM02703	PSM02700	-	-	PSM02697	PSM02696	-
ground (m AD)	-	5.413	6.165	5.902	5.763	6.030	5.505	4.822	-	4.673	4.448	4.230	-
Ch floor lev (m AD)	-	4.453	4.000	3.842	3.113	3.570	1.805	0.842	-	0.703	0.488	0.140	-
Flood level (m AD)	-	5.413	6.165	5.902	5.763	6.030	5.505	4.822	-	4.673	4.448	4.230	-
flood dep (m)	-	-0.915	-2.099	-2.012	-1.982	-2.424	-3.626	-3.811	-	-3.775	-3.666	-3.609	-
vol.lost (m3)	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-	0.000	0.000	0.000	-

Figure 3: Post-development flows to PSP00012 - 5-year ARI design storm, long section

5 Mazengarb 1 Pump Station (PSP00012) Assessment

From the proposed development sites, the 150mm wastewater network flows via gravity to Mazengarb 1 Pump Station (PSP00012), which has a modelled capacity of 150 l/s during normal pump rate (based on KCDC records).

As shown in Figure 4 below, the pre-development scenario simulates a peak inflow rate of approximately 146 l/s in the 5-year design storm. With the proposed 160 Mazengarb Road development peak flows (1.45 l/s) added into the model, in the post-development scenario the peak inflow rate remains around 146 l/s meaning that the inflow into PSP00012 Pump Station has not exceeded capacity.

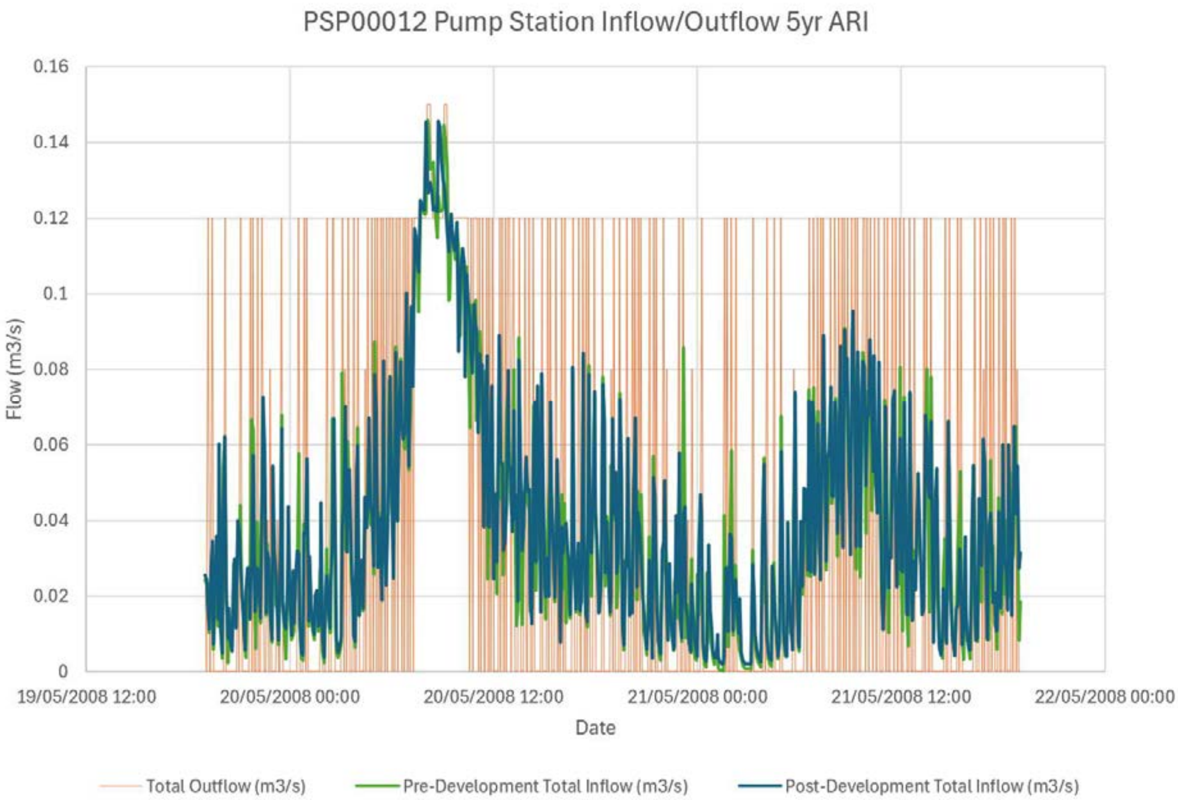


Figure 4: Existing Pre- and Post-Development PSP00012 Pump Station Flows – 5-year ARI Design Storm

6 Model Assumptions and Limitations

The following assumptions should be read in conjunction with the following reports.

- Aurecon's report 'Paraparaumu Wastewater System – Model Build and Calibration Report, June 2009)
- Watershed's Model Update Report (2016)
- Watershed's Model Recalibration and System Performance Report (2017)

The following limitations apply to the modelling undertaken as part of these studies:

- The model has been verified (and recalibrated) against flows developed from KCDC pump station SCADA data, and as such has an inherent limitation to the degree of accuracy able to be achieved.
- The distribution of the modelled population is an approximation based on the population increase between the 2006 and 2018 census. No allowance has been made for additional growth since 2018 which is considered to be minor.
- Future growth other than this development has not been considered as part of this assessment
- No allowance has been made for future increased inflow/infiltration in existing areas due to deterioration of existing sewers.
- Pump station model parameters are based on information provided by KCDC operations, and its accuracy has not been validated as part of this study.
- No assessment of the development's infrastructure has been completed as part of this report.

7 Conclusion

The objective of this study was to utilise the existing hydraulic model of the Paraparaumu and Waikanae wastewater network to assess the impact of the proposed 40 townhouses on 160 Mazengarb Road.

The model was run under the existing population scenario, with the additional flows from the proposed development at 160 Mazengarb Road with a calculated design flow of 1.45 l/s added in. The development impact was assessed against a 5-year ARI design storm to understand the performance of the downstream network, with the development assumed to connect into new manhole along pipe ID: KWWN003085.

The model was run with the additional 160 Mazengarb Road development flows connected to the 150mm local network. The model simulates some evidence of minor surcharging within the local network, just upstream of PSP00012 as a result of back-up from the pump station, however there are no predicted uncontrolled overflows and the risk of overflows is considered low. Therefore, the downstream network is considered sufficiently sized to accommodate the increased flows from the proposed development.

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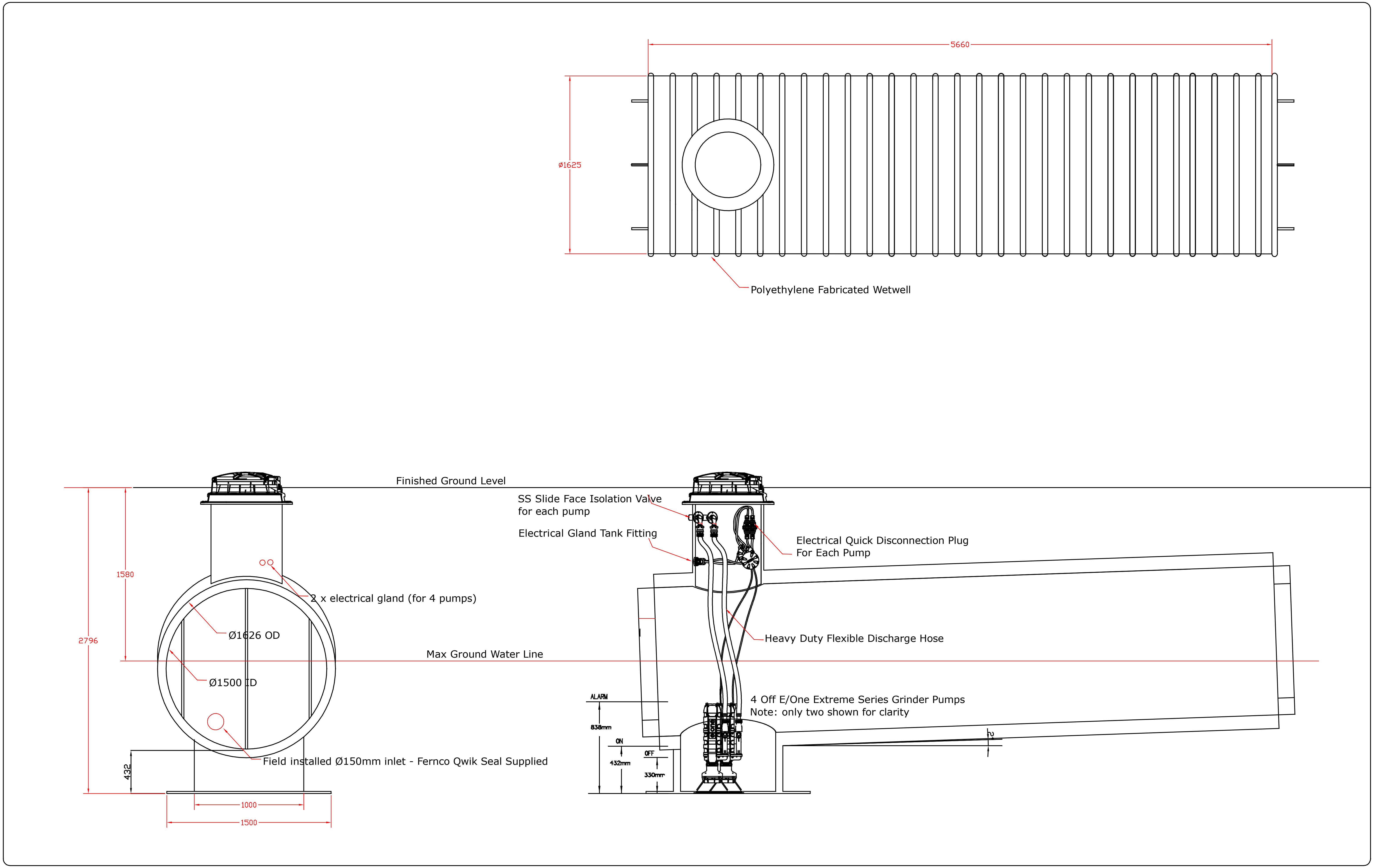
APPENDIX E

ECOFLOW PUMP



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Email: info@ecoflow.co.nz

DRAWN	JM	16/01/2024
CHECKED		
CLIENT APPROVED		
CLIENT		

TITLE

10m3 Quadraplex Chamber
OD1626 x 5.66m long

Job

REVISION	SCALE		Dwg No.
1	NTS	AT	1

SEWER SYSTEMS

APPENDIX F

RAIN TANK CALCULATIONS SAMPLE

Date	Rainfall (24 Hours)	Area (m^2)	Runoff (24 hours)	First Flush	Runoff (24 hours)	Water re-use (toilets + outdoor)	Tank volume increase	Tank volume	Council water used	Water returned to ground	Rainwater re-used
1/01/2018	0	107	0	0	0	565	0	0	565	0	0
2/01/2018	0	107	0	0	0	565	0	0	565	0	0
3/01/2018	0	107	0	0	0	565	0	0	565	0	0
4/01/2018	0	107	0	0	0	565	0	0	565	0	0
5/01/2018	6	107	578	-20	558	565	0	0	7	0	558
6/01/2018	33.5	107	3226	-20	3206	565	3206	3206	0	0	565
7/01/2018	1	107	96	-20	76	565	0	2717	0	0	565
8/01/2018	0	107	0	0	0	565	0	2153	0	0	565
9/01/2018	0	107	0	0	0	565	0	1588	0	0	565
10/01/2018	2	107	193	-20	173	565	0	1195	0	0	565
11/01/2018	1.5	107	144	-20	124	565	0	755	0	0	565
12/01/2018	0.5	107	48	-20	28	565	0	218	347	0	218
13/01/2018	0	107	0	0	0	565	0	0	565	0	0
14/01/2018	0	107	0	0	0	565	0	0	565	0	0
15/01/2018	0	107	0	0	0	565	0	0	565	0	0
16/01/2018	0	107	0	0	0	565	0	0	565	0	0
17/01/2018	1	107	96	-20	76	565	0	0	489	0	76
18/01/2018	5.12	107	493	-20	473	565	0	0	92	0	473
19/01/2018	8.88	107	855	-20	835	565	835	835	0	0	565
20/01/2018	13	107	1252	-20	1232	565	1232	1502	0	0	565
21/01/2018	0	107	0	0	0	565	0	937	0	0	565
22/01/2018	0	107	0	0	0	565	0	372	192	0	372
23/01/2018	2	107	193	-20	173	565	0	0	392	0	173
24/01/2018	0	107	0	0	0	565	0	0	565	0	0
25/01/2018	0	107	0	0	0	565	0	0	565	0	0
26/01/2018	0	107	0	0	0	565	0	0	565	0	0
27/01/2018	0	107	0	0	0	565	0	0	565	0	0
28/01/2018	0	107	0	0	0	565	0	0	565	0	0
29/01/2018	0	107	0	0	0	565	0	0	565	0	0
30/01/2018	0	107	0	0	0	565	0	0	565	0	0
31/01/2018	0	107	0	0	0	471	0	0	471	0	0
1/02/2018	0	107	0	0	0	471	0	0	471	0	0
2/02/2018	17.5	107	1685	-20	1665	471	1665	1665	0	0	471
3/02/2018	0	107	0	0	0	471	0	1194	0	0	471
4/02/2018	0	107	0	0	0	471	0	724	0	0	471
5/02/2018	0	107	0	0	0	471	0	253	218	0	253
6/02/2018	0	107	0	0	0	471	0	0	471	0	0
7/02/2018	0	107	0	0	0	471	0	0	471	0	0
8/02/2018	0	107	0	0	0	471	0	0	471	0	0
9/02/2018	0	107	0	0	0	471	0	0	471	0	0
10/02/2018	0	107	0	0	0	471	0	0	471	0	0
11/02/2018	10	107	963	-20	943	471	943	943	0	0	471
12/02/2018	37.5	107	3611	-20	3591	471	3591	4063	0	0	471
13/02/2018	38.5	107	3708	-20	3688	471	3688	7280	0	0	471
15/02/2018	0	107	0	0	0	471	0	6809	0	0	471
16/02/2018	0	107	0	0	0	471	0	6338	0	0	471
17/02/2018	1.5	107	144	-20	124	471	0	5992	0	0	471
18/02/2018	0	107	0	0	0	471	0	5521	0	0	471
19/02/2018	0	107	0	0	0	471	0	5050	0	0	471
20/02/2018	2	107	193	-20	173	471	0	4752	0	0	471
21/02/2018	25	107	2408	-20	2388	471	2388	6668	0	0	471
22/02/2018	4.005	107	386	-20	366	471	0	6563	0	0	471
23/02/2018	43.995	107	4237	-20	4217	471	4217	9000	0	1309	471
24/02/2018	0	107	0	0	0	471	0	8529	0	0	471
25/02/2018	0	107	0	0	0	471	0	8058	0	0	471
26/02/2018	0	107	0	0	0	471	0	7587	0	0	471
27/02/2018	11	107	1059	-20	1039	471	1039	8156	0	0	471
28/02/2018	4	107	385	-20	365	471	0	8050	0	0	471
1/03/2018	5	107	482	-20	462	341	462	8171	0	0	341
2/03/2018	0	107	0	0	0	341	0	7830	0	0	341
3/03/2018	0	107	0	0	0	341	0	7489	0	0	341
4/03/2018	0	107	0	0	0	341	0	7148	0	0	341
5/03/2018	0	107	0	0	0	341	0	6807	0	0	341
6/03/2018	0	107	0	0	0	341	0	6466	0	0	341
7/03/2018	0	107	0	0	0	341	0	6126	0	0	341
8/03/2018	27	107	2600	-20	2580	341	2580	8365	0	0	341
9/03/2018	10.5	107	1011	-20	991	341	991	9000	0	15	341
10/03/2018	0	107	0	0	0	341	0	8659	0	0	341
11/03/2018	0	107	0	0	0	341	0	8318	0	0	341
12/03/2018	0	107	0	0	0	341	0	7977	0	0	341
13/03/2018	0	107	0	0	0	341	0	7637	0	0	341
14/03/2018	0	107	0	0	0	341	0	7296	0	0	341
15/03/2018	0	107	0	0	0	341	0	6955	0	0	341
16/03/2018	0	107	0	0	0	341	0	6614	0	0	341
17/03/2018	0	107	0	0	0	341	0	6273	0	0	341
18/03/2018	0	107	0	0	0	341	0	5932	0	0	341
19/03/2018	0	107	0	0	0	341	0	5591	0	0	341
20/03/2018	0	107	0	0	0	341	0	5250	0	0	341

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APPENDIX G

SUE AVE/MOY PLACE RAIN TANK CALCULATION

Example Calculation - 8 Sue Ave	Total (Summer)	Average Annual (Summer)	Average daily (Summer)
Tank size	9000		
Total rainfall	199689	66563	
Total rainfall lost to overflow	75366	25122	
Total water needed for toilets & outdoor	156146	52049	
Total Council water used (trickle feed)	36872	12291	137
Total rainfall volume re-used	119274	**39758**	442

Date	Rainfall (24 Hours)	Area (m²)	Runoff (24 hours)	First Flush	Runoff (24 hours)	Water re-use (toilets + outdoor)	Tank volume increase	Tank volume	Council water used	Water returned to ground	Rainwater re-used
1/12/2019	0	242	0	0	0	542	0	0	542	0	0
2/12/2019	0.2	242	44	-20	24	542	0	0	519	0	24
3/12/2019	0.8	242	174	-20	154	542	0	0	388	0	154
4/12/2019	14	242	3049	-20	3029	542	3029	3029	0	0	542
5/12/2019	0.4	242	87	-20	67	542	0	2554	0	0	542
6/12/2019	0.6	242	131	-20	111	542	0	2123	0	0	542
7/12/2019	0	242	0	0	0	542	0	1580	0	0	542
8/12/2019	5.8	242	1263	-20	1243	542	1243	2281	0	0	542
9/12/2019	36.4	242	7928	-20	7908	542	7908	9000	0	647	542
10/12/2019	0	242	0	0	0	542	0	8458	0	0	542
11/12/2019	0	242	0	0	0	542	0	7916	0	0	542
12/12/2019	0	242	0	0	0	542	0	7373	0	0	542
13/12/2019	0	242	0	0	0	542	0	6831	0	0	542
14/12/2019	1.2	242	261	-20	241	542	0	6530	0	0	542
15/12/2019	0.2	242	44	-20	24	542	0	6011	0	0	542
16/12/2019	0	242	0	0	0	542	0	5469	0	0	542
17/12/2019	1.4	242	305	-20	285	542	0	5212	0	0	542
18/12/2019	14.276	242	3109	-20	3089	542	3089	7759	0	0	542
19/12/2019	10.124	242	2205	-20	2185	542	2185	9000	0	402	542
20/12/2019	0	242	0	0	0	542	0	8458	0	0	542
21/12/2019	15.4	242	3354	-20	3334	542	3334	9000	0	2250	542
22/12/2019	0	242	0	0	0	542	0	8458	0	0	542
23/12/2019	0	242	0	0	0	542	0	7916	0	0	542
24/12/2019	0.2	242	44	-20	24	542	0	7397	0	0	542
25/12/2019	0	242	0	0	0	542	0	6855	0	0	542
26/12/2019	0	242	0	0	0	542	0	6312	0	0	542
27/12/2019	0	242	0	0	0	542	0	5770	0	0	542
28/12/2019	0.198	242	43	-20	23	542	0	5251	0	0	542
29/12/2019	0.802	242	175	-20	155	542	0	4863	0	0	542
30/12/2019	0	242	0	0	0	542	0	4321	0	0	542
31/12/2019	5.2	242	1133	-20	1113	542	1113	4891	0	0	542
1/01/2020	0	242	0	0	0	600	0	4291	0	0	600
2/01/2020	0	242	0	0	0	600	0	3691	0	0	600
3/01/2020	5.4	242	1176	-20	1156	600	1156	4248	0	0	600
4/01/2020	0.2	242	44	-20	24	600	0	3671	0	0	600
5/01/2020	0	242	0	0	0	600	0	3071	0	0	600
6/01/2020	0.2	242	44	-20	24	600	0	2495	0	0	600
7/01/2020	0.2	242	44	-20	24	600	0	1918	0	0	600
8/01/2020	0	242	0	0	0	600	0	1318	0	0	600
9/01/2020	0	242	0	0	0	600	0	718	0	0	600
10/01/2020	0	242	0	0	0	600	0	118	482	0	118
11/01/2020	0	242	0	0	0	600	0	0	600	0	0
12/01/2020	0	242	0	0	0	600	0	0	600	0	0
13/01/2020	0	242	0	0	0	600	0	0	600	0	0
14/01/2020	20	242	4356	-20	4336	600	4336	4336	0	0	600
15/01/2020	0	242	0	0	0	600	0	3736	0	0	600
16/01/2020	0	242	0	0	0	600	0	3136	0	0	600
17/01/2020	0	242	0	0	0	600	0	2536	0	0	600
18/01/2020	0	242	0	0	0	600	0	1936	0	0	600
19/01/2020	0	242	0	0	0	600	0	1336	0	0	600
20/01/2020	0	242	0	0	0	600	0	736	0	0	600
21/01/2020	0	242	0	0	0	600	0	136	464	0	136
22/01/2020	0	242	0	0	0	600	0	0	600	0	0
23/01/2020	0	242	0	0	0	600	0	0	600	0	0
24/01/2020	0.6	242	131	-20	111	600	0	0	489	0	111
25/01/2020	0	242	0	0	0	600	0	0	600	0	0
26/01/2020	0	242	0	0	0	600	0	0	600	0	0
27/01/2020	0	242	0	0	0	600	0	0	600	0	0
28/01/2020	3.8	242	828	-20	808	600	808	808	0	0	600
29/01/2020	2	242	436	-20	416	600	0	623	0	0	600
30/01/2020	3.8	242	828	-20	808	600	808	831	0	0	600
31/01/2020	8.6	242	1873	-20	1853	600	1853	2084	0	0	600
1/02/2020	0	242	0	0	0	587	0	1497	0	0	587
2/02/2020	0	242	0	0	0	587	0	909	0	0	587
3/02/2020	0	242	0	0	0	587	0	322	265	0	322
4/02/2020	0.4	242	87	-20	67	587	0	0	520	0	67
5/02/2020	2.2	242	479	-20	459	587	0	0	128	0	459
6/02/2020	0	242	0	0	0	587	0	0	587	0	0
7/02/2020	0	242	0	0	0	587	0	0	587	0	0
8/02/2020	0	242	0	0	0	587	0	0	587	0	0
9/02/2020	3	242	653	-20	633	587	633	633	0	0	587
10/02/2020	0	242	0	0	0	587	0	46	541	0	46
11/02/2020	0	242	0	0	0	587	0	0	587	0	0
12/02/2020	0	242	0	0	0	587	0	0	587	0	0
13/02/2020	0	242	0	0	0	587	0	0	587	0	0

14/02/2020	0	242	0	0	0	587	0	0	587	0	0
15/02/2020	1.2	242	261	-20	241	587	0	0	346	0	241
16/02/2020	0	242	0	0	0	587	0	0	587	0	0
17/02/2020	0	242	0	0	0	587	0	0	587	0	0
18/02/2020	3.8	242	828	-20	808	587	808	808	0	0	587
19/02/2020	7.6	242	1655	-20	1635	587	1635	1856	0	0	587
20/02/2020	4.6	242	1002	-20	982	587	982	2250	0	0	587
21/02/2020	0.2	242	44	-20	24	587	0	1687	0	0	587
22/02/2020	0	242	0	0	0	587	0	1099	0	0	587
23/02/2020	0.2	242	44	-20	24	587	0	536	52	0	536
24/02/2020	10.2	242	2222	-20	2202	587	2202	2202	0	0	587
25/02/2020	0	242	0	0	0	587	0	1614	0	0	587
26/02/2020	0	242	0	0	0	587	0	1027	0	0	587
27/02/2020	0	242	0	0	0	587	0	440	147	0	440
28/02/2020	0	242	0	0	0	587	0	0	587	0	0
29/02/2020	0	242	0	0	0	587	0	0	587	0	0
1/12/2020	17.6	242	3833	-20	3813	542	3813	3813	0	0	542
2/12/2020	0.8	242	174	-20	154	542	0	3425	0	0	542
3/12/2020	0	242	0	0	0	542	0	2883	0	0	542
4/12/2020	0.2	242	44	-20	24	542	0	2364	0	0	542
5/12/2020	0	242	0	0	0	542	0	1822	0	0	542
6/12/2020	2.6	242	566	-20	546	542	546	1826	0	0	542
7/12/2020	0	242	0	0	0	542	0	1284	0	0	542
8/12/2020	18.6	242	4051	-20	4031	542	4031	4773	0	0	542
9/12/2020	11	242	2396	-20	2376	542	2376	6606	0	0	542
10/12/2020	13.025	242	2837	-20	2817	542	2817	8881	0	0	542
11/12/2020	19.175	242	4176	-20	4156	542	4156	9000	0	3495	542
12/12/2020	0.6	242	131	-20	111	542	0	8568	0	0	542
13/12/2020	0	242	0	0	0	542	0	8026	0	0	542
14/12/2020	0	242	0	0	0	542	0	7484	0	0	542
15/12/2020	0	242	0	0	0	542	0	6942	0	0	542
16/12/2020	0	242	0	0	0	542	0	6399	0	0	542
17/12/2020	0	242	0	0	0	542	0	5857	0	0	542
18/12/2020	0	242	0	0	0	542	0	5315	0	0	542
19/12/2020	0	242	0	0	0	542	0	4773	0	0	542
20/12/2020	0	242	0	0	0	542	0	4230	0	0	542
21/12/2020	0	242	0	0	0	542	0	3688	0	0	542
22/12/2020	0	242	0	0	0	542	0	3146	0	0	542
23/12/2020	2.8	242	610	-20	590	542	590	3194	0	0	542
24/12/2020	18.4	242	4008	-20	3988	542	3988	6639	0	0	542
25/12/2020	16	242	3485	-20	3465	542	3465	9000	0	561	542
26/12/2020	0	242	0	0	0	542	0	8458	0	0	542
27/12/2020	2.2	242	479	-20	459	542	0	8375	0	0	542
28/12/2020	0	242	0	0	0	542	0	7832	0	0	542
29/12/2020	0	242	0	0	0	542	0	7290	0	0	542
30/12/2020	0	242	0	0	0	542	0	6748	0	0	542
31/12/2020	0	242	0	0	0	542	0	6206	0	0	542
1/01/2021	0.4	242	87	-20	67	600	0	5673	0	0	600
2/01/2021	0	242	0	0	0	600	0	5073	0	0	600
3/01/2021	0.6	242	131	-20	111	600	0	4583	0	0	600
4/01/2021	0.6	242	131	-20	111	600	0	4094	0	0	600
5/01/2021	0	242	0	0	0	600	0	3494	0	0	600
6/01/2021	0	242	0	0	0	600	0	2894	0	0	600
7/01/2021	0	242	0	0	0	600	0	2294	0	0	600
8/01/2021	28.798	242	6272	-20	6252	600	6252	7946	0	0	600
9/01/2021	1.402	242	305	-20	285	600	0	7632	0	0	600
10/01/2021	0	242	0	0	0	600	0	7032	0	0	600
11/01/2021	0.2	242	44	-20	24	600	0	6455	0	0	600
12/01/2021	0	242	0	0	0	600	0	5855	0	0	600
13/01/2021	0	242	0	0	0	600	0	5255	0	0	600
14/01/2021	0	242	0	0	0	600	0	4655	0	0	600
15/01/2021	0	242	0	0	0	600	0	4055	0	0	600
16/01/2021	0	242	0	0	0	600	0	3455	0	0	600
17/01/2021	0	242	0	0	0	600	0	2855	0	0	600
18/01/2021	15.8	242	3441	-20	3421	600	3421	5677	0	0	600
19/01/2021	0	242	0	0	0	600	0	5077	0	0	600
20/01/2021	2.8	242	610	-20	590	600	0	5066	0	0	600
21/01/2021	4.6	242	1002	-20	982	600	982	5448	0	0	600
22/01/2021	2.2	242	479	-20	459	600	0	5307	0	0	600
23/01/2021	0	242	0	0	0	600	0	4707	0	0	600
24/01/2021	1.8	242	392	-20	372	600	0	4479	0	0	600
25/01/2021	0.8	242	174	-20	154	600	0	4034	0	0	600
26/01/2021	0	242	0	0	0	600	0	3434	0	0	600
27/01/2021	0	242	0	0	0	600	0	2834	0	0	600
28/01/2021	0	242	0	0	0	600	0	2234	0	0	600
29/01/2021	0	242	0	0	0	600	0	1634	0	0	600
30/01/2021	0	242	0	0	0	600	0	1034	0	0	600
31/01/2021	0	242	0	0	0	600	0	434	166	0	434
1/02/2021	0	242	0	0	0	587	0	0	587	0	0
2/02/2021	0	242	0	0	0	587	0	0	587	0	0
3/02/2021	0	242	0	0	0	587	0	0	587	0	0
4/02/2021	0	242	0	0	0	587	0	0	587	0	0
5/02/2021	0	242	0	0	0	587	0	0	587	0	0
6/02/2021	0	242	0	0	0	587	0	0	587	0	0
7/02/2021	0	242	0	0	0	587	0	0	587	0	0
8/02/2021	0	242	0	0	0	587	0	0	587	0	0
9/02/2021	0.2	242	44	-20	24	587	0	0	564	0	24

10/02/2021	1.2	242	261	-20	241	587	0	0	346	0	241
11/02/2021	17.8	242	3877	-20	3857	587	3857	3857	0	0	587
12/02/2021	0.2	242	44	-20	24	587	0	3293	0	0	587
13/02/2021	0	242	0	0	0	587	0	2706	0	0	587
14/02/2021	0	242	0	0	0	587	0	2119	0	0	587
15/02/2021	0	242	0	0	0	587	0	1531	0	0	587
16/02/2021	18.26	242	3977	-20	3957	587	3957	4901	0	0	587
17/02/2021	6.34	242	1381	-20	1361	587	1361	5675	0	0	587
18/02/2021	0	242	0	0	0	587	0	5088	0	0	587
19/02/2021	0	242	0	0	0	587	0	4500	0	0	587
20/02/2021	0	242	0	0	0	587	0	3913	0	0	587
21/02/2021	0	242	0	0	0	587	0	3326	0	0	587
22/02/2021	0	242	0	0	0	587	0	2739	0	0	587
23/02/2021	0	242	0	0	0	587	0	2151	0	0	587
24/02/2021	3.8	242	828	-20	808	587	808	2372	0	0	587
25/02/2021	0	242	0	0	0	587	0	1784	0	0	587
26/02/2021	0	242	0	0	0	587	0	1197	0	0	587
27/02/2021	0	242	0	0	0	587	0	610	0	0	587
28/02/2021	0	242	0	0	0	587	0	23	565	0	23
1/12/2021	16.998	242	3702	-20	3682	542	3682	3682	0	0	542
2/12/2021	0.4	242	87	-20	67	542	0	3207	0	0	542
3/12/2021	0	242	0	0	0	542	0	2665	0	0	542
4/12/2021	8	242	1742	-20	1722	542	1722	3845	0	0	542
5/12/2021	8.6	242	1873	-20	1853	542	1853	5156	0	0	542
6/12/2021	4.8	242	1045	-20	1025	542	1025	5639	0	0	542
7/12/2021	61.008	242	13288	-20	13268	542	13268	9000	0	9364	542
8/12/2021	61.906	242	13483	-20	13463	542	13463	9000	0	12921	542
9/12/2021	5.686	242	1238	-20	1218	542	1218	9000	0	676	542
10/12/2021	0.4	242	87	-20	67	542	0	8525	0	0	542
11/12/2021	0	242	0	0	0	542	0	7983	0	0	542
12/12/2021	2.002	242	436	-20	416	542	0	7856	0	0	542
13/12/2021	20.198	242	4399	-20	4379	542	4379	9000	0	2693	542
14/12/2021	3.4	242	741	-20	721	542	721	9000	0	178	542
15/12/2021	41.2	242	8973	-20	8953	542	8953	9000	0	8411	542
16/12/2021	4.6	242	1002	-20	982	542	982	9000	0	440	542
17/12/2021	7.6	242	1655	-20	1635	542	1635	9000	0	1093	542
18/12/2021	1	242	218	-20	198	542	0	8656	0	0	542
19/12/2021	0	242	0	0	0	542	0	8113	0	0	542
20/12/2021	0	242	0	0	0	542	0	7571	0	0	542
21/12/2021	0	242	0	0	0	542	0	7029	0	0	542
22/12/2021	0.4	242	87	-20	67	542	0	6554	0	0	542
23/12/2021	0	242	0	0	0	542	0	6011	0	0	542
24/12/2021	0	242	0	0	0	542	0	5469	0	0	542
25/12/2021	0	242	0	0	0	542	0	4927	0	0	542
26/12/2021	0	242	0	0	0	542	0	4385	0	0	542
27/12/2021	0	242	0	0	0	542	0	3842	0	0	542
28/12/2021	0	242	0	0	0	542	0	3300	0	0	542
29/12/2021	14.2	242	3093	-20	3073	542	3073	5831	0	0	542
30/12/2021	1.2	242	261	-20	241	542	0	5530	0	0	542
31/12/2021	0	242	0	0	0	542	0	4988	0	0	542
1/01/2022	0	242	0	0	0	600	0	4388	0	0	600
2/01/2022	0	242	0	0	0	600	0	3788	0	0	600
3/01/2022	0	242	0	0	0	600	0	3188	0	0	600
4/01/2022	0	242	0	0	0	600	0	2588	0	0	600
5/01/2022	0	242	0	0	0	600	0	1988	0	0	600
6/01/2022	0	242	0	0	0	600	0	1388	0	0	600
7/01/2022	0.2	242	44	-20	24	600	0	811	0	0	600
8/01/2022	0	242	0	0	0	600	0	211	389	0	211
9/01/2022	0	242	0	0	0	600	0	0	600	0	0
10/01/2022	0	242	0	0	0	600	0	0	600	0	0
11/01/2022	0	242	0	0	0	600	0	0	600	0	0
12/01/2022	3.2	242	697	-20	677	600	677	677	0	0	600
13/01/2022	0	242	0	0	0	600	0	77	523	0	77
14/01/2022	0.6	242	131	-20	111	600	0	0	489	0	111
15/01/2022	0	242	0	0	0	600	0	0	600	0	0
16/01/2022	0	242	0	0	0	600	0	0	600	0	0
17/01/2022	0.2	242	44	-20	24	600	0	0	576	0	24
18/01/2022	0	242	0	0	0	600	0	0	600	0	0
19/01/2022	0	242	0	0	0	600	0	0	600	0	0
20/01/2022	0	242	0	0	0	600	0	0	600	0	0
21/01/2022	1.8	242	392	-20	372	600	0	0	228	0	372
22/01/2022	0	242	0	0	0	600	0	0	600	0	0
23/01/2022	0	242	0	0	0	600	0	0	600	0	0
24/01/2022	0	242	0	0	0	600	0	0	600	0	0
25/01/2022	0	242	0	0	0	600	0	0	600	0	0
26/01/2022	0.6	242	131	-20	111	600	0	0	489	0	111
27/01/2022	6.4	242	1394	-20	1374	600	1374	1374	0	0	600
28/01/2022	0	242	0	0	0	600	0	774	0	0	600
29/01/2022	0	242	0	0	0	600	0	174	426	0	174
30/01/2022	0	242	0	0	0	600	0	0	600	0	0
31/01/2022	0	242	0	0	0	600	0	0	600	0	0
1/02/2022	0	242	0	0	0	587	0	0	587	0	0
2/02/2022	0	242	0	0	0	587	0	0	587	0	0
3/02/2022	0	242	0	0	0	587	0	0	587	0	0
4/02/2022	0	242	0	0	0	587	0	0	587	0	0
5/02/2022	0.4	242	87	-20	67	587	0	0	520	0	67
6/02/2022	93.4	242	20343	-20	20323	587	20323	9000	0	10735	587

7/02/2022	29.4	242	6403	-20	6383	587	6383	9000	0	5796	587
8/02/2022	0	242	0	0	0	587	0	8413	0	0	587
9/02/2022	0	242	0	0	0	587	0	7826	0	0	587
10/02/2022	3	242	653	-20	633	587	633	7872	0	0	587
11/02/2022	0	242	0	0	0	587	0	7284	0	0	587
12/02/2022	21	242	4574	-20	4554	587	4554	9000	0	2251	587
13/02/2022	39.8	242	8668	-20	8648	587	8648	9000	0	8061	587
14/02/2022	13.8	242	3006	-20	2986	587	2986	9000	0	2398	587
15/02/2022	0	242	0	0	0	587	0	8413	0	0	587
16/02/2022	0	242	0	0	0	587	0	7826	0	0	587
17/02/2022	0	242	0	0	0	587	0	7238	0	0	587
18/02/2022	0	242	0	0	0	587	0	6651	0	0	587
19/02/2022	0	242	0	0	0	587	0	6064	0	0	587
20/02/2022	2.2	242	479	-20	459	587	0	5936	0	0	587
21/02/2022	30.6	242	6665	-20	6645	587	6645	9000	0	2993	587
22/02/2022	0	242	0	0	0	587	0	8413	0	0	587
23/02/2022	0	242	0	0	0	587	0	7826	0	0	587
24/02/2022	0	242	0	0	0	587	0	7238	0	0	587
25/02/2022	0	242	0	0	0	587	0	6651	0	0	587
26/02/2022	0	242	0	0	0	587	0	6064	0	0	587
27/02/2022	0	242	0	0	0	587	0	5477	0	0	587
28/02/2022	0	242	0	0	0	587	0	4889	0	0	587

APPENDIX H

WATER CONSUMPTION DATA & CALCULATIONS

Address	Roof Area (m^2)	Land Area (m^2)	2019/20 units (m3)	2020/21 units (m3)	2021/22 units (m3)	Average daily use l/d	Adjusted for summer use	Average Summer rainfall used	Total Water Used	Household 2007	Savings due to metering & modern fittings	Saving percentage
Ōtaki												
250m² houses on 800m² sites												
8 Sue Ave	242	703	234	172	217	569	683.0	442.0	1125.0	1560	435	28%
10 Sue Ave	230	802	78	62	45	169	202.8	433.0	635.8	1560	924	59%
12 Sue Ave	225	906	286	275	262	752	902.2	429.0	1331.2	1560	229	15%
14 Sue Ave	218	617	138	100	100	309	370.5	423.0	793.5	1560	766	49%
16 Sue Ave	244	617	84	73	56	195	233.5	443.0	676.5	1560	884	57%
20 Sue Ave	473	907	161	125	73	328	393.5	534.0	927.5	1560	632	41%
22 Sue Ave	219	887	46	44	39	118	141.4	424.0	565.4	1560	995	64%
24 Sue Ave	283	615	74	67	94	215	257.6	468.0	725.6	1560	834	53%
26 Sue Ave	223	554	96	77	70	222	266.4	427.0	693.4	1560	867	56%
28 Sue Ave	213	858	61	53	79	176	211.6	418.0	629.6	1560	930	60%
30 Sue Ave	337	848	36	38	35	100	119.5	491.0	610.5	1560	950	61%
32 Sue Ave	230	854	150	158	200	464	556.9	433.0	989.9	1560	570	37%
34 Sue Ave	219	886	132	129	142	368	441.8	424.0	865.8	1560	694	45%
36 Sue Ave	249	1641	79	61	64	186	223.6	447.0	670.6	1560	889	57%
38 Sue Ave	218	1052	154	125	735	926	1111.6	423.0	1534.6	1560	0	0%
40 Sue Ave	215	1002	80	93	90	240	288.3	420.0	708.3	1560	852	55%
42 Sue Ave	230	884	109	116	65	265	317.9	433.0	750.9	1560	809	52%
44 Sue Ave	297	948	102	136	132	338	405.6	475.0	880.6	1560	679	44%
25 Sue Ave/2 Moy Pl	244	745	140	133	69	312	374.9	443.0	817.9	1560	742	48%
27 Sue Ave	219	798	77	82	86	224	268.6	424.0	692.6	1560	867	56%
29 Sue Ave	174	668	59	32	67	144	173.2	368.0	541.2	1560	1019	65%
31 Sue Ave	239	688	217	213	186	563	675.3	439.0	1114.3	1560	446	29%
33 Sue Ave	271	808	76	72	78	206	247.7	461.0	708.7	1560	851	55%
35 Sue Ave	269	929	107	93	103	277	332.2	460.0	792.2	1560	768	49%
4 Moy Pl	247	632	109	119	122	320	383.7	446.0	829.7	1560	730	47%
6 Moy Pl	283	948	62	59	85	188	225.8	468.0	693.8	1560	866	56%
8 Moy Pl	269	858	172	154	225	503	604.0	460.0	1064.0	1560	496	32%
10 Moy Pl	224	562	108	124	170	367	440.7	428.0	868.7	1560	691	44%
12 Moy Pl	190	747	54	57	49	146	175.4	392.0	567.4	1560	993	64%
3 Moy Pl	251	579	216	134	126	435	521.8	449.0	970.8	1560	589	38%
5 Moy Pl	235	602	93	96	85	250	300.4	436.0	736.4	1560	824	53%
7 Moy Pl	260	628	89	48	37	159	190.7	455.0	645.7	1560	914	59%
9 Moy Pl	212	906	70	60	61	174	209.4	417.0	626.4	1560	934	60%
Median			96	93	85							
								Average	812	1560	748	48%
								Median	736.4	1560	824	53%

Waikanae Beach						
Med Density						
15 Te Ara Kawakahia		63	57	53	158	189.6
17 Te Ara Kawakahia		37	40	41	108	129.4
19 Te Ara Kawakahia		163	228	209	548	657.7
21 Te Ara Kawakahia		83	113	171	335	402.3
23 Te Ara Kawakahia		55	53	56	150	179.8
25 Te Ara Kawakahia			47	64	152	182.5
27 Te Ara Kawakahia				52	142	171.0
29 Te Ara Kawakahia				112	307	368.3
31 Te Ara Kawakahia				265	726	871.5
33 Te Ara Kawakahia			60	60	164	197.3
35 Te Ara Kawakahia		183	170	182	489	586.5
37 Te Ara Kawakahia		30	33	32	87	104.1
39 Te Ara Kawakahia		79	95	113	262	314.6
41 Te Ara Kawakahia		85	85	66	216	258.7
Median		79	60	65		
Raumati Beach						
Med-density						
1/2 Matatua Road		37	52	50	127	152.4
2/2 Matatua Road		68	66	79	195	233.5
3/2 Matatua Road		44	87	158	264	316.8
4/2 Matatua Road		77	192	77	316	379.3
5/2 Matatua Road		39	47	47	121	145.8
6/2 Matatua Road		245	89	133	426	511.9
7/2 Matatua Road		192	309	205	645	773.9
Median		68	87	79		
Medium density median	73					
250m² houses on 800m² sites median	91					
Medium density reduction	20%					

d alone - 150-200m^2 house on 300-400m^2 section					
2 Phoenix Court	66	60	60	170	203.9
4 Phoenix Court	203	289	287	711	854.0
6 Phoenix Court	74	70	72	197	236.8
8 Phoenix Court	42	41	48	120	143.6
10 Phoenix Court	45	44	44	121	145.8
12 Phoenix Court	50	49	55	141	168.8
1 Phoenix Court	75	73	78	206	247.7
3 Phoenix Court	33	28	18	72	86.6
5 Phoenix Court	37	37	34	99	118.4
7 Phoenix Court	86	102	219	372	446.2
9 Phoenix Court	106	118	96	292	350.8
11 Phoenix Court	93	88	86	244	292.7
	70	65	66		
Paraparaumu					
Stand alone - 150m^2 house on 300m^2 section					
1 Jade Lane	149	108	28	260	312.4
3 Jade Lane	192	136	113	403	483.4
5 Jade Lane	158	103	138	364	437.4
7 Jade Lane	139	184	158	439	527.3
9 Jade Lane (1 Bluewater Pl)		147	232	519	623.2
42 Waterstone Ave	88	135	128	321	384.8
44 Waterstone Ave	27	26	28	74	88.8
46 Waterstone Ave	132	85	201	382	458.2
48 Waterstone Ave (7 Bluewater Pl)	161	280	53	451	541.5
59 Waterstone Ave	107	184	237	482	578.8
61 Waterstone Ave	342	320	266	847	1017.3
63 Waterstone Ave	255	295	310	785	942.8
4 Springhaven Lane	205	258	170	578	693.9
6 Springhaven Lane	275	269	279	752	902.2
8 Springhaven Lane	130	140	106	343	412.2
10 Springhaven Lane (21 Bluewater)	114	110	115	310	371.6
11 Bluewater Pl (65 Waterstone)	308	177	163	592	710.4
15 Bluewater Pl	36	40	49	114	137.0
17 Bluewater Pl	64	82	100	225	269.7
19 Bluewater Pl	228	150	92	429	515.2
2 McGregor Pl	179	250	154	532	639.1
4 McGregor Pl	52	48	67	153	183.1
6 McGregor Pl	124	132	135	357	428.6
8 McGregor Pl	53	69	102	205	245.6
10 McGregor Pl	43	61	50	141	168.8
12 McGregor Pl	50	40	33	112	134.8
14 McGregor Pl	49	46	46	129	154.6
16 McGregor Pl	68	75	72	196	235.7
18 McGregor Pl	85	93	63	220	264.2
20 McGregor Pl	146	147	135	391	469.2

22 McGregor Pl	27	22	24	67	80.0
24 McGregor Pl	40	48	55	131	156.8
26 McGregor Pl	52	51	50	140	167.7
28 McGregor Pl	82	97	80	237	283.9
	114	109	104		