

Gore District Council Decisions



NOTIFICATION UNDER s95A AND s95B AND DETERMINATION UNDER s104

Resource Management Act 1991

Application reference	SC26014
Applicant	Mark Rigby (MMMC Rigby Properties Ltd)
Proposal	Application under Section 88 of the Resource Management Act 1991 (RMA) for a ten-lot subdivision.
Location	Land to the south of Maud Street, Gore
Legal Description	Lot 4-10 Deposited Plan 927
Zone - Operative District Plan	Residential A
Zone - Proposed District Plan	General Residential Zone
Activity Status	Restricted Discretionary
Decision Date	18 August 2026

SUMMARY OF DECISIONS

1. Pursuant to sections 95A-95F of the Resource Management Act 1991 (**RMA**) the application will be processed on a **non-notified** basis given the findings of Section 5 of the Section 95A and 95B report. This decision is made by Werner Murray, on 18 August 2026 under delegated authority pursuant to Section 34A of the RMA.
2. Pursuant to Section 104 and Section 104C of the RMA, consent is **GRANTED SUBJECT TO CONDITIONS** outlined in this report of the Section 104 decision imposed pursuant to Section 220 of the RMA. This consent can only be implemented if the conditions in this report are complied with by the consent holder. The decision to grant consent was considered by Werner Murray, under delegated authority pursuant to Section 34A of the RMA.

1. THE PROPOSAL

Consent is sought to create a 10-lot subdivision at the land to the south of Maud Street, Gore. The existing title is proposed to be subdivided as follows:

Proposed Lot	
Lot 1	1,162m ² Vacant Land
Lot 2	1,160m ² Vacant Land
Lot 3	1,348m ² Vacant Land
Lot 4	1,348m ² Vacant Land
Lot 5	1,000m ² Vacant Land
Lot 6	1,021m ² Vacant Land
Lot 7	1,000m ² Vacant Land
Lot 8	1,800m ² Vacant Land
Lot 9	1,023m ² Vacant Land
Lot 10	1,000m ² Vacant Land

The applicant has provided a detailed description of the proposal, the site and locality in Sections 3, 4, 5, 6 of the report entitled “*Subdivision Consent Application*”, prepared by Hamish Weir of Southern Horizons, and submitted as part of the application (hereon referred to as the applicant’s AEE and attached as Appendix 2). This description is considered accurate and is adopted for the purpose of this report. The scheme plan can be found in Figure 1 below.

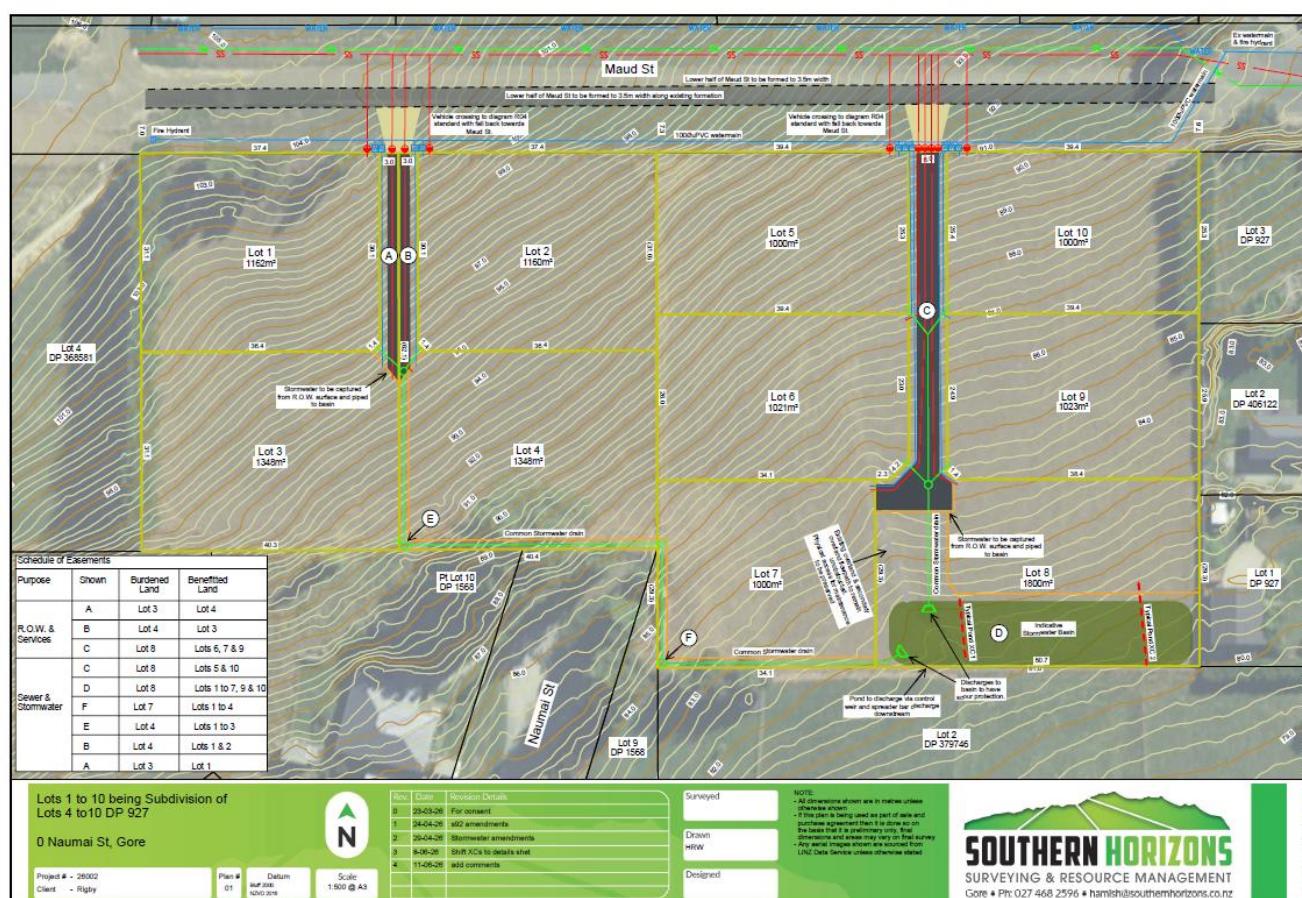


Figure 1 – Proposed Scheme Plan

The proposal has been considered and assessed under the Operative Gore District Plan (ODP) and the Proposed District Plan (PDP) which came into legal effect January 30th, 2026.

Background

This application has involved extensive discussions between the processing planner (Molly O'Sullivan and Werner Murray), internal council departments and the Applicant.

Following comments received by Gore District Council's 3Waters team (Aaron Green and Riaan Rossouw), Building manager (Tony Osbourne) and Roading manager (Murray Hasler) a Request for Further Information (hereby referred to as an RFI) was sent to the Applicant on April 16th, 2026 under Section 92(1) of the Resource Management Act 1991.

Mr. Green provided initial comments and Mr. Rossouw took over the consent for 3Waters. The stormwater design contained within the proposal was initially considered to be unsatisfactory. Mr. Rossouw, Miss O'Sullivan and Mr. Murray carried out extensive discussions with the Applicant in order to resolve outstanding matters via the RFI process.

Mr. Hasler raised concerns regarding the provision of a footpath and other public realm infrastructure such as streetlighting in addition to the sealing of only half of the carriage way of Maud Street. The Applicant proposed to only provide infrastructure on the southern side of the road rather than upgrade the entirety of Maud Street. This was done in an attempt to ensure that infrastructure was paid for in a fair and equitable way between developments given that the Council development contributions policy is in obedience.

Mr. Murray, Miss O'Sullivan attended meetings with Council's 3Waters and Roading internal departments at GDC in order to resolve outstanding RFI matters. Matters were considered resolved on August 4th, 2026 following the Applicant volunteering the following conditions.

Approved plans

1. The activity must be undertaken in accordance with the application made to the Council on 01/04/2026 and the following plans, prepared by Hamish Weir at Southern Horizons (dated 11/06/2026)
 - "Lots 1 to 10 being Subdivision of Lots 4 to 10 DP 927" Plan no. 1 (11/06/2026)

Potable water

1. The consent holder shall be responsible for providing appropriate water supply reticulation (including rider mains, fire hydrants and necessary incidental equipment) from the Water Supply along Maud Street that is adequate to serve the subdivision, and all design and construction including provision for firefighting is to be in accordance with the requirements of the Bylaw. The proposed 100mmØ main extension indicated on the scheme plan shall terminate with a fire hydrant at the western end.
2. Standard 20mm diameter water connections shall be provided to the boundaries of all Lots (from the new watermain or rider main) with separate approved Acuflo metered stop valves and boxes.

Wastewater

1. The consent holder shall install foul sewer reticulation to the boundary of each lot, being a low pressure rising sewer connection which shall connect which shall discharge into council's existing wastewater main in Maud Street, that is adequate to serve the subdivision and all design and construction of this reticulation shall meet the requirements of the Bylaw.
2. The wastewater connections to the boundary of each lot must include Boundary Assembly Kits within the design. Receiving manholes should also be designed to be directed downwards.
3. Designs shall be submitted to Council for certification prior to installation.

Electricity

1. The consent holder shall provide an operational electrical and telecommunications connection to each Lot prior to certification under s224(c).
 - a. It is the responsibility of the consent holder to meet the costs associated with the installation of the electricity and telecommunication reticulation necessary to meet the needs of the subdivision.

Earthworks

1. Any change in ground levels must not cause increased run-off to adjacent properties.
2. If, at the completion of the earthworks operations, any public road, footpath, landscaped areas or service structures that have been affected/damaged by contractor(s), consent holder, developer, person involved with earthworks or building works, and/or vehicles and machineries used in relation to earthworks and construction works, must be reinstated to the satisfaction of the Chief Executive at the expense of the consent holder.
3. Prior to 224c it shall be demonstrated that any construction activity that may generate sediment discharge can be managed and remediated (pipes and basin may need to be cleaned) by lot owners once works are complete.

Stormwater

1. The consent holder shall install stormwater reticulation and stormwater disposal as outlined in the Technical Memorandum provided by Warren Ladbroke included in Appendix B.
2. Flow velocities in stormwater collection devices may in some instances need to be addressed via specific design. With particular regard being given to
 - i. The design of pipes and manholes on steep sections, especially for 90o bends.
 - ii. Erosion protection at the discharge points into the stormwater basin. Especially the high exit velocities with high erosion potential of the material in the pond
3. Ensure that all infrastructure is appropriately sized and specific consideration of scour protection is made. Stormwater shall be collected at the southern section of both RoW and conveyed via pipe work to the stormwater basin. The conditions of the consents shall be to the satisfaction of Suitably Qualified and Experienced Person.
4. Prior to 224c the final design of the stormwater infrastructure plan shall be submitted to council for certification.

5. Note - Elements of the stormwater system are of special concern due to the steep nature of the site and overland flow paths that will direct overland flow to the basin shall be appropriately surfaced to prevent long term scour. Hydraulic calculations to show the specific design flows, velocities, etc. with appropriate design of the stormwater system elements to safely convey these;
6. Overland flow paths to be maintained as per scheme plan.
7. All impervious surfaces to be diverted to stormwater basin

Stormwater Basin

1. The consent holder shall plant appropriate vegetation species as identified by a Suitably Qualified and Experienced Person. If any plant or tree should die or become diseased it shall be replaced within the next available planting season.

Roading

Standard bylaw condition

1. Design road in accordance table 3.1 to the following parameters:

Parking Lanes (m)	1 x 2.5
Traffic Lanes (m)	1 x 3.5
Carriageway Width (m)	6
Footpaths No.	1 x 1.4

2. Install a subsoil drain on the uphill side of Maud Street formation to ensure water does not get under the north edge of seal.
3. A 1.4 m wide footpath will be required on Maud Street.
4. The ROW to be design in accordance with the Bylaw.

Surface treatment

5. Right of Way surfacing treatment shall be asphalt.
6. Maud Street carriage way surface treatment be a 2 Coat Chip Seal.
7. Kerbing shall be provided along Maud Street toward frank street to ensure continuation of cut off from the land to the north.
8. Design of Maud Street and Right of Way to be in accordance with the Bylaw with exception of the dispensation to reduce the formed width of Maud Street to 5m.

Footpaths

9. The consent holder shall install a footpath along the south side of Maud Street in accordance with the requirements of the Subdivision and Land Development Bylaw 2019.

Street Lighting

10. The consent holder shall install street lighting in accordance with the requirements of the Subdivision and Land Development Bylaw 2019.

Note – The consent holder may apply for a dispensation under the Bylaw upon knowledge of the final cost price of the completed works to the roading, footpath and street infrastructure is made available to Council.

Where there are multiple development sites, the cost of infrastructure may be shared. At the time of lodgement, the Development Contribution policy was in obedience and as such the usual mechanism for the recovery of the cost of growth is not possible. As such the applicant wishes to discuss potential options under the Bylaw once detailed design has further progressed.

Easements

1. All easements for services shall be duly granted.

Maintenance Period

1. The maintenance period of the Stormwater infrastructure shall be 24 months. Upon completion the applicant shall provide a report from a SQEP that the stormwater basin is in good order and is functioning as intended. Commenting on the performance of any overland flow beyond the site.

Note – The maintenance period may be extended if the stormwater infrastructure not functioning as intended.

Consent Notice

CN 1 Impervious areas exceeding 420m² on each lot shall require specific stormwater design at time of building consent (This includes dwelling, accessory buildings and driveway but not decks)

CN 2 Impervious areas shall drain to the stormwater basin. This shall be demonstrated at Building Consent Stage.

CN 3 During construction activity on any of the subject lots any sediment discharge needs to be managed and remediated (pipes and basin may need to be cleaned) by the lot owners responsible for the discharge.

CN 4 The lot owners shall undertake the following annual maintenance of the Stormwater Basin and reticulated network;

1. Sumps and slots drains cleaned out
2. Manholes or inspection chambers visually inspected and any accumulated sediment removed
3. Stormwater basin plantings weeded, dead plants replaced and overgrown plants cut back
4. Stormwater basin weir and disbursement spreader inspected for blockage or sediment removed

Advice Note

Council intends to extend the existing footpath along the western side of Frank Street to the intersection of Frank Street and Maud Street, with the intention of connecting and aligning with the existing footpaths.

2. SITE DESCRIPTION

The site is legally described as Lot 4-10 Deposited Plan 927 (held in Record of Title SL163/173). Under the ODP the site is located in Residential A Zone and in the PDP is identified as being within the General Residential Zone. Land directly to the west is Zone Rural (ODP) and General Rural (PDP).

The land is vacant agricultural land used for pastoral grazing. To the north is open undeveloped land with one residential dwelling just north, further away than the undeveloped land. To the east there are residential dwellings along Frank Street. To the south is Naumai Street with various residential dwellings along the cul-de-sac road. The site and its surroundings can be seen below in Figure 1.



Figure 2 – Site highlighted in blue and surroundings.

3. ACTIVITY STATUS

3.1 Gore District Plan

Gore District Council currently have an Operative District Plan (ODP) and Proposed District Plan (PDP).

Council notified decision on the PDP on 30 January 2026. There are a number of appeals on these decisions. Where there are rules in the PDP that are treated operative under s.86F of the RMA, corresponding rules in the ODP are treated as inoperative.

Consent is required under Section 9(3) of the RMA for breaches to a District Rule as defined in s43AAB, being the rules in the ODP and PDP which are listed below.

Operative District Plan

The site is zoned Residential A in the Operative District Plan and the proposed activity requires resource consent under the ODP for the following reason:

- A **restricted discretionary** activity pursuant to Rule 8.10(4)(c) as the application proposed lots that exceed than the minimum lot size of 400m². Council's discretion is restricted to:
 - i. suitability of the allotments for activities permitted within the zone in which they are located;
 - ii. suitability of the land for subdivision, including presence of any natural or other hazards, including contaminated land;
 - iii. ability to provide services (water, sewage, storm water, power and telecommunications);
 - iv. impacts on the council and other infrastructure services;
 - v. future use of the land and the need to consider any associated resource consents;
 - vi. within residential and rural areas lot size, dimensions and potential for future subdivision of the land;
 - vii. within residential and rural areas the desirability of providing building platforms;
 - viii. provision of easements;
 - ix. impacts on any heritage or archaeological values;
 - x. impacts on natural features and landscapes, ecological or cultural values;
 - xi. impacts water quality, including groundwater; and
 - xii. provision of all transport modes, including the movement of pedestrians and cyclists.

Proposed District Plan

The site is zoned General Residential in the Proposed District Plan and the proposed activity requires resource consent under the PDP for the following reason:

Rules treated as operative (s86F):

- A **restricted discretionary** activity pursuant to Rules SUB-R7 as the application proposed lots that exceed the minimum required lot size of 400m². Council's discretion is restricted to
 - i. The suitability of *subdivision* design, orientation, *allotment* sizes and dimensions.
 - ii. Internal *roading* design and provision, including *roading* connections for future *subdivision* on *adjoining land*.
 - iii. *Site access*.
 - iv. Provision for cyclists and *pedestrians*.
 - v. The *effects* of traffic generation on the safe and efficient operation of the *transport network*.
 - vi. *Earthworks*, including the alteration of contours, and retention of existing natural features.
 - vii. The provision of *esplanade reserves* and *esplanade strips*.
 - viii. The adequacy of measures to address the risk of *natural hazards* including overland flows.
 - ix. Provision for servicing, including water supply, fire-fighting water supply, *wastewater* treatment and disposal, *stormwater* design and disposal, electricity and *telecommunications*;
 - x. The provision for, or *access* to, open space and recreation.
 - xi. *Effects* on natural features and landscapes, *ecosystems* and indigenous biodiversity.
 - xii. Easements.
 - xiii. Impacts on Ngāi Tahu cultural values listed in MW-1.2.
 - xiv. *Reverse sensitivity* on adjacent *land* uses, *airports*, rail lines and State Highways.

3.2 National Environmental Standard for Assessing Contaminants in Soil to Protect Human Health 2011 ("NES-CS")

Based on the applicants review of Council records, the piece of land to which this application relates is not a HAIL site, and therefore the NES-CS does not apply.

3.3 Activity Status Summary

Overall, the application is being considered and processed as restricted discretionary under the ODP and the PDP.

4. NOTIFICATION ASSESSMENT

Sections 95A – 95F (inclusive) of the Resource Management Act 1991 ('RMA') set out the steps the Council is required to take in determining whether or not to publicly notify an application or notify on a limited basis.

4.1 Public notification – Section 95A

In accordance with section 95A, the following steps have been followed to determine whether to publicly notify the resource consent application:

Step 1 – Mandatory public notification

Mandatory public notification, is not required because:

- The applicant has not requested public notification.
- Public notification is not required as a result of a refusal by the applicant to provide further information or refusal of the commissioning of a report under section 92(2)(b) of the RMA .
- The application does not involve exchange to recreational reserve land under section 15AA of the Reserves Act 1977.

Step 2 – Public notification is precluded

Public notification is not precluded as follows:

- There are not rules in a plan or National Environmental Standard that preclude notification.
- The application is not:
 - a controlled activity; or
 - a boundary activity as defined by section 87AAB that is restricted discretionary, discretionary or non-complying.

Step 3 – Public notification is required in certain circumstances

- There are no rules in a plan or National Environmental Standard that require notification.
- A consent authority must publicly notify an application if notification is not precluded by Step 2 and the consent authority decides, in accordance with s95D, that the proposed activity will have or is likely to have adverse effects on the environment that are more than minor. An assessment in this respect is undertaken as follows:

The following effects must be disregarded:

- Effects on the owners or occupiers of land on which the activity will occur and on adjacent land.
- Trade competition and the effects of trade competition.
- Any persons that have provided their written approval and as such adverse effects on these parties have been disregarded.

Written Approval/s

No written approvals have been provided in relation to this application.

The following effects may be disregarded:

- An adverse effect of the activity if a rule or national environmental standard permits an activity with that effect – referred to as the “permitted baseline”. The relevance of a permitted baseline to this application is as follows:

Permitted Baseline

The consent authority **may** disregard an adverse effect of the activity if a rule or national environmental standard permits an activity with that effect. In this case, as all subdivision requires resource consent, there is no permitted baseline.

Assessment of Environmental Effects

The Assessment of Effects provided at section 11 of the applicant’s AEE, is comprehensive and is considered accurate. It is therefore adopted for the purposes of this report with the following additions.

Operative District Plan

- *suitability of the land for subdivision, including presence of any natural or other hazards, including contaminated land;*

The subdivision is consistent with what the ODP enables in Residential A Zone. All of the proposed allotments meet the specified area threshold of 400m² identified in both district plans and are considered acceptable in regard to their design and orientation.

The site is not subject to any natural hazard overlays

The site will require earthworks to be able to suitably accommodate development on the site. The applicant has provided some clarification on what the earthworks will entail. This is discussed further below in this report.

- *ability to provide services (water, sewage, storm water, power and telecommunications);*

None of the site is currently connected to any servicing infrastructure. The applicant proposes to connected all of the lots to services from Maud Street which currently contains an existing water rider main. Powernet’s network extends along Maud Street, and no restrictions are expected from connecting the proposed lots. The applicant demonstrates that there is a possibility for the site to be serviced by both fibre and wireless connection.

The Council’s 3 Waters Manager, Aaron Green, reviewed the application and provided the following comments in regards to stormwater;

“Stormwater

Given existing runoff issues in this area, a swale or subsoil drain is required along the southern boundary of Lots 3, 4, 7, and 8 to ensure no adverse runoff effects from these sections.

The preferred discharge option is a pump station connecting to the existing 150mm stormwater main on Maud Street. The pump station will require duty/standby pumps and have a generator plug installed for use during power outages. Communications for this station must align with the Council system for alarms and monitoring.

Each property must also have a cleaning eye installed 300mm outside the boundary, housed in a green-lidded box."

An RFI was prepared and subsequently issued to the Applicant seeking information on the proposed stormwater provisions based on Mr. Green's comments above. The Applicant's response came in two parts with one received on April 24th addressing the roading matters (discussed further below) and the stormwater matters from the Applicant's stormwater expert, Warren Ladbroke, on April 30th.

The proposal includes a detention basin in the southeast corner of the site to the south of proposed Lot 8. Stormwater is proposed to be captured through common stormwater drains from the proposed roading access between proposed Lots 1 to 4 and then between proposed Lots 5, 6, 9 and 10. Following extensive discussions and redesign of the overall stormwater provisions on site, while the stormwater infrastructure has been agreed the approach is subject to detailed design approval. This is addressed in the volunteered conditions within this application.

Overall, with the redesign of the stormwater system and the technical memorandum provided by the applicant from a suitably qualified and experienced person (Warren Ladbroke) it is considered that with the implementation of the proposed stormwater infrastructure the potential adverse effects on the surrounding environment will be no more than minor.

- *impacts on the council and other infrastructure services and water quality, including groundwater*

No part of the stormwater detention system for this development is proposed to be vested as council infrastructure. This has been agreed as part of the RFI process and relevant conditions have been included within this decision report as volunteered by the applicant.

It is noted that, there is a potential to mitigate overland flows should development be proposed for the land to the north of Maud Street in the future. It may be possible to install a pipe that could be vested with council from the southern boundary of the land to the north to the detention basin included in this application. Volunteered easement conditions allow for this to occur should it be deemed necessary, noting that there may be practical reasons why this may not be able to occur.

Conditions have also been volunteered by the Applicant to address connection to reticulated water and wastewater infrastructure. The sites will be connected to the water supply along Maud Street without impacting the water or ground water quality. Each site will have their own low pressure rising sewer connection discharging into reticulated infrastructure on Maud Street.

Overall, potential adverse impacts on the surrounding environment are considered no more than minor.

- *future use of the land and the need to consider any associated resource consents;*

The land is zoned residential, the proposed lots are anticipated to be used for residential activity. The lots exceed the anticipated lot size for the zone, no further resource consent is required for the activity to be carried out on site so long as the future buildings associated with the residential activity are in compliance with the rules and standards set out in the General residential Zone Chapter.

Overall, the potential adverse effects on the wider environment are considered no more than minor.

- *within residential and rural areas lot size, dimensions and potential for future subdivision of the land* and the desirability of providing building platforms.

The proposed allotments exceed the minimum lots size for the Residential A Zone, there is no further subdivision anticipated for the lots. However, should further subdivision occur in the future resource consent would be required subject to the District Plan as all subdivision required resource consent. The lots have been designed specifically to provide larger residential lots within the urban area allowing for future resident it's to experience the 'rural city living' Gore strives for.

No building platforms are proposed within this application.

Overall, it is considered the potential adverse effects on the surrounding environment will be no more than minor.

- *provision of easements*

Easements are proposed as part of this application to allow for vehicle access onto the site. Easements A and B provide access to proposed Lots 1 to 4 while Easement C provide access for Lots 5 to 10.

Easement D covers the stormwater detention basin to the south of proposed Lot 8.

- *impacts on any heritage or archaeological values; impacts on natural features and landscapes, ecological or cultural values;*

The site is not subject to any overlays regarding heritage, archaeological value, natural features and landscapes, ecological or cultural values. The potential adverse impacts are therefore considered negligible.

- *provision of all transport modes, including the movement of pedestrians and cyclists.*

Access to the site is proposed from Maud Street which in turn is accessed off of Frank Street. The applicant decided to use Maud Street as the primary access rather than Naumai Street following a pre-application meeting with Council's 3Waters and Roading managers (Mr. Green and Mr. Hasler).

Maud street is an unsurfaced road, the applicant proposes a formation 3.5m in width along the street including two vehicle crossings to allow for access to the subject site located south of the proposed formed road. Kerbing and channelling is proposed for the southern end of the formed road but the applicant proposes to not finalise the northern end of the road, instead seeking a bond from owners of neighbouring land to the north of Maud Street who would equally benefit from the upgrading of the road.

Proposed District Plan

- *The suitability of subdivision design, orientation, allotment sizes and dimensions.*

The proposed lots all exceed the minimum lot size requirement of 400m² expected within the General Residential Zone. The lots design, orientation and dimension are anticipated for the zone.

Overall, it is considered potential adverse effects are no more than minor.

- *Access, internal roading design and provision, including roading connections for future subdivision on adjoining land.*

There are two vehicle access proposed within the site. One serving proposed Lots 1-4 and the other serving proposed lots 5-10. The vehicle accesses will connect to Maud Street on the 3.5m sealed carriage way provided for within this application. The internal roading design is considered to be acceptable for the providing access to all lots. It allows for direct access to and from Maud Street. Should further subdivision occur on neighbouring land, the relevant upgrading of the remaining stretch of Maud Street will be required and addressed as subdivision stage.

Overall, it is considered that the potential adverse impact on the surrounding environment is no more than minor.

- *Provision for cyclists and pedestrians.*

A footpath is proposed along the southern side of Maud Street as part of this application, built in accordance with the Subdivision and Land Development Bylaw 2019 as per the volunteered conditions attached to this application.

Overall, it is considered that pedestrians and cyclists are provided for as a result of this application and therefore the potential adverse effects are considered less than minor.

- *The effects of traffic generation on the safe and efficient operation of the transport network.*

The traffic generation incurred by this development is anticipated. The proposed sites significantly exceed the minimum lot sizes permitted for the General Residential Zone. The levels of traffic will be significantly less than if all of the lots were proposed to the minimum lot size.

Two residential dwellings are located at the end of Maud Street, who already utilise the road reserve. The lands to the north of the proposed subdivision is currently vacant.

Overall, it is considered that the transport network will continue to be used safely and efficiently and potential adverse effects on the surrounding environment will be no more than minor.

- *Earthworks, including the alteration of contours, and retention of existing natural features.*

No earthworks are proposed to be included as part of this subdivision application. The Applicant has volunteered earthworks conditions to be attached to the decision of this application in preparation for earthworks associated with future development.

Overall, it is considered that with the inclusion of the volunteered conditions the potential adverse effects on the surrounding environment are no more than minor.

- *The provision of esplanade reserves and esplanade strips.*

The site does not adjoin any lake, river or pond therefore an esplanade reserve and /or strip is not relevant to the application. Adverse effects are considered negligible.

- *The adequacy of measures to address the risk of natural hazards including overland flows.*

The site is not located within an area that has been identified to be a risk of natural hazards. The potential adverse impact of overland has been addressed in the stormwater design included in this application and has been adequately addressed through the conditions volunteered by the applicant.

Overall, the potential adverse impacts on the surrounding environment are considered no more than minor.

- *Provision for servicing, including water supply, fire-fighting water supply, wastewater treatment and disposal, stormwater design and disposal, electricity and telecommunications;*

The provision of services on site has been addressed in the assessment above. The site will be appropriately serviced in regard to water, wastewater and stormwater, none of which is to be vested into council infrastructure. Final stormwater provision is subject to design approval. The Applicant is responsible for the provision of the necessary firefighting water supply as set out in the Subdivision and Land Development Bylaw 2019. This is addressed in the conditions volunteered by the Applicant.

Overall, it is considered that the potential adverse effects on the environment are no more than minor.

- *The provision for, or access to, open space and recreation.*

The sites exceed the minimum lot sizes anticipated for the area, providing access to open outdoor living space on site. The rugby and football club along with the aquatic centre can be accessed via Robertson Street to the south of the site.

Overall, it is considered that the potential adverse effects are considered no more than minor.

- *Effects on natural features and landscapes, ecosystems and indigenous biodiversity.*

No natural features, landscapes, ecosystem and/or indigenous biodiversity are identified to be on site. Therefore, potential adverse effects are considered no more than minor.

- *Easements.*

As assessed above, various easements have been proposed. Volunteered conditions address the provision of easements.

Overall, it is considered that the potential adverse effects will be no more than minor.

- *Impacts on Ngāi Tahu cultural values listed in MW-1.2.*

There are no specified cultural values considered to be impacted as a result of this proposal. Overall, the potential adverse effects are considered no more than minor.

- *Reverse sensitivity on adjacent land uses, airports, rail lines and State Highways.*

The site is not located within or adjacent to an airport, railway or highway overlay. Adjacent land is all zoned General Residential, same as the subject site.

Overall, potential adverse effects are considered no more than minor.

Conclusion: Effects On The Environment

On the basis of the above assessment, in terms of s95D, it is assessed that the proposed activity will not have adverse effects on the environment that are more than minor.

Step 4 – Public Notification in Special circumstances

- There are no special circumstances that warrant public notification.

4.2 Limited notification – Section 95B

In accordance with section 95B, the following steps have been followed to determine whether to give limited notification of the application:

Step 1 – Certain affected groups or persons must be notified

- There are no protected customary rights groups or customary marine title groups affected by the proposed.
- The proposal is not on or adjacent to, and will not affect, land that is the subject of a statutory acknowledgment.

Step 2 – Limited notification precluded

- The activity is not subject to a rule or National Environmental Standard that precludes limited notification.
- The application is not for a controlled activity (other than for a subdivision of land) under a district plan.

Step 3 – Certain other affected persons must be notified

- Under Step 3, if the proposal is a boundary activity, only the owner/occupier of the infringed boundary can be considered. The activity is not a boundary activity.
- For any other activity, a consent authority must notify an application on any person, if notification is not precluded by Step 2, and the consent authority decides, in accordance with s95E, that the proposed activity will have or is likely to have adverse effects on that person that are minor or more than minor.

An assessment in this respect is therefore undertaken as follows:

Considerations in assessing adverse effects on persons under s95E

- a) The consent authority **may** disregard an adverse effect of the activity on a person if a rule or national environmental standard permits an activity with that effect (a “permitted baseline”). The relevance of the permitted baseline to this application is outlined in the above s95D assessment of environment effects.
- b) The consent authority **must** disregard an adverse effect of the activity on the person if the effect does not relate to a matter for which a rule or a national environmental standard reserves control or restricts discretion; and
- c) The consent authority **must** have regard to every relevant statutory acknowledgement specified in Schedule 11.
- d) The consent authority **must** disregard effects on those parties who have provided written approval.

Assessment: Effects on Persons

Taking into account the exclusions in sections 95E, the following outlines an assessment as to whether the activity will have or is likely to have adverse effects on persons that are minor or more than minor.

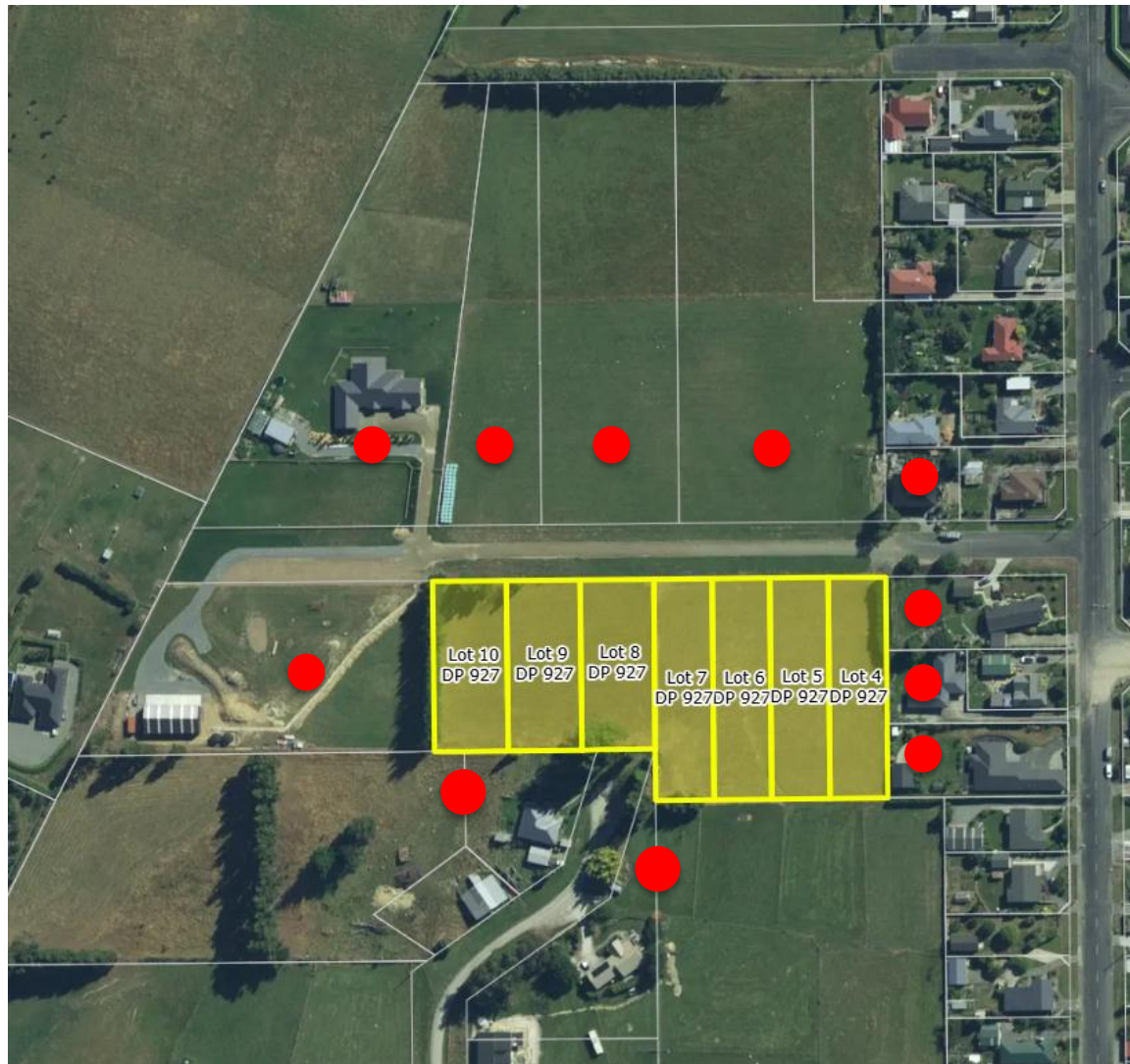


Figure 3 – Adjacent properties shown by red dots

The subdivision meets the standard for minimum lot sizes within Residential A and General Residential Zones. The Operative and Proposed District Plans have therefore anticipated the adverse effects associated with existing and future development of this density on such lots and deemed them appropriate. All future development on the lots would be required to adhere to District Plan bulk and location standards, specifically boundary rules which ensure effects on neighbourhood properties are acceptable.

The subject site is surrounded by lots of varying sizes. The dwellings to the directly to the west and north west are located within the General Residential Zones (beyond that is the Rural / General Rural Zone) they in turn are also located on sites that exceed the minimum lot size anticipated for the Residential A/General Residential Zone reflecting more the Rural Zone than the residential lots along Frank Street.

With regard to Lot 2 DP 379746 located to the south of the site is downstream from the proposed development. The applicant and Mr. Ladbroke, the applicant's stormwater expert, have considered pre-and-post development stormwater flows that will leave the detention basin in the event that it overflows. Given that the applicant's engineer considers that post development stormwater flows will not exceed pre development stormwater flows, it is considered that any stormwater effects on this property would be less than minor.

Overall, it is considered that the proposed subdivision will not create lots or future uses that will be out of character of the area or detract from the existing amenity values of neighbouring persons so long as the anticipated servicing works and road formation are carried out prior to any development commencing on site. Therefore, the adverse effects are considered to be less than minor and there are no persons that would be directly affected by the proposed subdivision.

Conclusions: Effects on Persons

In terms of section 95E of the RMA, and on the basis of the above assessment, no person is considered to be adversely affected.

Step 4 – Special Circumstances for Limited Notification

- There are no special circumstances that warrant limited notification of the application.

5. DECISION PURSUANT TO S95A AND S95B OF THE RMA

For the reasons set out above, under s95A and s95B of the RMA, the application is to be processed on a non-notified basis.

6. SECTION 104 ASSESSMENT

6.1 Matters for consideration

This application must be considered in terms of Section 104 of the RMA.

Subject to Part 2 of the RMA, Section 104 sets out those matters to be considered by the consent authority when considering a resource consent application. Considerations of relevance to this application are:

- (a) *any actual and potential effects on the environment of allowing the activity; and*
- (ab) *any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and*
- (b) *any relevant provisions of:*
 - (i) *A national environmental standard;*
 - (ii) *other regulations;*
 - (iii) *a national policy statement;*
 - (iv) *a New Zealand coastal policy statement;*
 - (v) *a regional policy statement or proposed regional policy statement;*
 - (vi) *a plan or proposed plan; and*

- (c) *any other matter the consent authority considers relevant and reasonably necessary to determine the application.*

6.2 Effects on the Environment

Actual and potential effects on the environment have been outlined in the section 95 report. Conditions of consent can be imposed under s108 of the RMA as required to avoid, remedy or mitigate adverse effects.

6.3 Relevant District Plan Provisions

Operative District Plan

The relevant operative objectives and policies are contained within Part 3 Land Use Activities Framework and 8 Subdivision of the Operative District Plan.

Chapter 3 Land Use Activities – A Framework

Objectives

- (1) Maintain and enhance the amenity values of the various localities within the District whilst respecting the different values and characteristics that exist within each area.
- (2) Ensure that the effects of land use activities do not adversely affect the quality of the environment and are compatible with the characteristics and amenity values of each locality
- (7) Ensure that the effects of earthworks and other land disturbance are avoided, remedied or mitigated.
- (8) Avoid where practical the adverse effects of land use activities upon infrastructure.

Policies

- (1) Establish zones that reflect the characteristics and amenity values of the area.
- (2) Control the adverse effects of land use activities on the environment.
- (10) Recognise that earthworks and disturbance of the ground is a necessary part of undertaking many activities.
- (11) Ensure that the effects of earthworks and other land disturbance are avoided, remedied or mitigated.
- (12) Require any adverse effects of land use activities upon infrastructure to be rectified.

The proposal maintains and enhances the amenity values of both the Residential zone which the subject site is located within the Rural zone which the site neighbours. The proposed residential activity does not adversely affect the quality of the character and amenity values of the environment in which it is located (Objectives 1 and 2 Policy 2). Earthworks are not included within this proposal but conditions have been volunteered to ensure that potential adverse effects are avoided, remedied or mitigated in the future as they are necessary to establish a residential platform given the topography of the site as expected by Objective 7 and Policy 10 and 11.

Chapter 8 Subdivision

Objectives

- (1) To facilitate the orderly subdivision and development of land.
- (2) To ensure that the size and shape of new allotments created, and the design standards for access and infrastructure, is suitable and appropriate for the location and future use of the land.
- (3) To ensure that developers pay all reasonable costs associated with the subdivision and subsequent development of land.
- (5) To ensure land development and servicing is undertaken to Council's standards.
- (6) To avoid adverse effects on the Council's reticulated infrastructure services.
- (7) To ensure that land subdivision results in allotments that are suitable for activities anticipated by the zone in which they are located.
- (8) Avoid adverse effects on water quality, including groundwater, from the development of subdivided land.

Policies

- (1) Control the subdivision of all land.
- (2) Avoid adverse effects of subdivision on the functioning of existing services, infrastructure and roading.
- (3) Require works associated with subdivision to be carried out in conformity with Council's standards.
- 4) Encourage, where practical, the undergrounding of all services associated with the development of subdivided land.
- (5) Avoid any off-site effects of development of subdivided land.
- (9) Require land development to be undertaken in compliance with the Gore District Council Subdivision and Land Development Bylaw 2011
- (10) Have regard to the potential for the land subject to any subdivision consent, and other land in the locality to be further subdivided in the future.
- (12) Encourage the adoption of practices that will minimise the extent of off-site effects on the Council's infrastructure services.
- (13) Have regard to the potential impacts arising from the subdivision and future use of land on water quality, including groundwater.

Each lot is able to be connected to their own reticulated services without impacting the functioning existing services and infrastructure or incurring off-site effects as per Objective 6 and 8 and Policy 2, 5, 12 and 13. The lots will all have established legal access through the newly formed Maud Street and relevant easements proposed in the application, the lots all exceed the minimum lot size for the zone as per Objective 1 and 2.

Overall, it is considered that the subdivision will have acceptable effects on the amenity and character of the residential area. The proposal will be consistent with the objectives and policies of the Operative District Plan.

Proposed District Plan

The relevant operative objectives and policies are contained within Part 1 Urban Form and Development, Part 2 District Wide Matters Subdivision (SUB) chapter and Part 3 Area Specific Matters General Residential Zone (GRZ) chapter of the Proposed District Plan.

Urban Form and Development UFD

UFD-O1 The District develops in a cohesive, and structured way that:

1. maintains a compact urban form;
6. provides for the safe, effective and efficient use and provision of new and existing infrastructure;
7. meets the community's short, medium and long-term housing, business and social infrastructure needs;

UFD-O2 There is sufficient land to meet the short, medium, and long-term housing demand for the District, that provides development capacity for up to 860 new dwellings as follows:

1. in the short to medium term in:
2. the existing residential area;

UFD-O3 A variety of housing types and sizes are available across the District in quality living environments to meet the community's diverse social and economic housing needs in the following locations:

1. suburban housing forms in the Residential Zones;
2. medium to high density housing within the Town Centre, Local Centre, Neighbourhood

UFD-O7 Urban environments are liveable, connected, accessible, safe and well-designed spaces for the community to live, work and play in, which:

1. incorporate natural features, water management and topography into design to minimise environmental effects;
3. have safe connected and efficient transport networks; and
4. are adequately serviced by utilising and/or upgrading existing infrastructure or with new infrastructure or additional infrastructure.

As per UFD-O1 the proposal contributes to the districts development in a cohesive and structured way. The site is located within the General Residential Zone and contributed to Gore's short- and medium-term housing provision (UFD-O1.6 and UFD-O2.1 and 2). As per UFD-O7 the proposal allows for a connected liveable residential development allowing inhabitants to live, work and play in.

Subdivision SUB

Objectives

SUB-O1 To facilitate the orderly subdivision and development of land.

SUB-O2 Ensure subdivision achieves patterns of land development that are compatible with the purpose, function, character and qualities of each zone.

SUB-O3 Infrastructure required to serve the subdivision of land is provided in an integrated, efficient and co-ordinated manner.

Policies

SUB-P1 Enable subdivision that creates allotments that can accommodate anticipated land use and are consistent with the purpose, character and qualities of the applicable zone.

SUB-P2 Require size and shape of new allotments created, and the provisions for access and infrastructure, to be suitable for the location and future use of the land.

SUB-P3 Design and layout subdivisions to avoid, remedy or mitigate any constraints on the ability for allotments created to be developed.

SUB-P6 Require works associated with subdivision to be carried out in conformity with Council's standards.

SUB-P7 Ensure subdivision is appropriately serviced and integrated with existing or planned infrastructure that is provided in a safe, efficient, integrated and co-ordinated manner by:

Requiring infrastructure networks to have sufficient capacity to accommodate the additional development, with any necessary upgrades to be completed at the time of subdivision;

- Requiring infrastructure to be installed at the time of subdivision, except for on-site infrastructure that cannot be determined until the allotment is developed or for boundary adjustments;
- Requiring allotments to connect to the Council's reticulated systems where practicable;
- Ensuring that sufficient provision has been made for legal and physical access to each allotment created by the subdivision;
- In urban areas, require access to and provision for walking and cycling infrastructure through subdivision design;
- Requiring allotments to have access to a water supply suitable for firefighting;
- Requiring all sites to have legal and physical access to electricity and opportunity for telecommunications;
- Requiring subdivision designs to provide for the treatment and safe disposal of stormwater that avoids any increase in overland flows, flooding or erosion risk;

SUB-P19 Recognise that there is an expectation by future landowners that the key effects of and resources required by anticipated land uses will have been resolved through the subdivision approval process.

SUB-P20 In relation to Development Areas, require any subdivision to achieve the outcomes sought by the Outline Development Plan for the Development Area.

SUB-P21 Discourage non-compliance with minimum allotment sizes.

The proposal adequately addresses SUB-O1, 2 and 3 as well as SUB-P1, 2 and 3. The applicant is a comprehensive subdivision that achieved development that is compatible with the character

and quality of the zone in which it is located. Extensive discussions have occurred to ensure that the land has the capacity to accommodate the requirements set out by SUB-P7 and that the design of the subdivision is appropriate for the provisions of services and infrastructure which is addressed by volunteering conditions and subject to final design approval.

General Residential Zone GRZ

Objectives

GRZ-O1 Existing and future residential needs are met within the District.

GRZ-O3 The purpose, amenity and character of the residential zones is maintained and not compromised by non-residential activities.

GRZ-O4 Development is provided with appropriate infrastructure and adverse effects on infrastructure networks are managed so that the operation, maintenance, upgrade and development of the infrastructure is not compromised.

Policies

GRZ-P1 Enable residential development which provides a range of housing typologies that are consistent with a compact urban character by managing the density of development and the scale of built form.

GRZ-P7 Require development to demonstrate sufficient infrastructure capacity or implement appropriate upgrades so that development does not compromise existing infrastructure, including transportation networks and other critical services.

GRZ-P8 Recognise the positive effects of low-impact stormwater design in enhancing environmental quality and sustainable development outcomes, while avoiding any increase in the risk of flooding or erosion.

GRZ-P10 Avoid activities that are incompatible with the character, qualities and purpose of the General Residential Zone, except where the activity is critical infrastructure that has a functional need or operational need for its location.

The proposed subdivision is considered to contribute to the existing and future residential needs of the district (GRZ-O1). The subdivision provides for residential activity as per GRZ-O3 and provides appropriate infrastructure and managed so that the operation, maintenance, upgrade and development of the infrastructure is not compromised GRZ-O4.

As per GRZ-P8, conditions have been volunteered addressing how the risk of flooding and erosion are to be managed throughout the lifetime of the development. All activities proposed within this application are compatible with the General Residential Zone as per GRZ-P10.

Overall, the application is compatible with the objectives and policies set out in the relevant chapters of the Proposed District Plan.

Weighting

In this case, as the conclusions reached in the above assessment lead to the same conclusion under both the ODP and PDP, no weighting assessment is required.

7. SECTION 106 REQUIREMENT FOR SUBDIVISION

A consent authority may refuse to grant a subdivision consent, or may grant a subdivision consent subject to conditions, if it considers that the land is or is likely to be subject to, or is likely to accelerate material damage from natural hazards, or where sufficient provision for legal and physical access to each allotment has not been made. In this case, natural overland flows existing on site have been addressed through the stormwater infrastructure provision. The site is not subject to any natural hazard overlays and therefore no material damaged is anticipated for the site. The overland flows which are present on site have been adequately addressed and any risk is mitigated through volunteered conditions. All lots have appropriate legal access off of Maud Street through the proposed easements located on site.

8. PART 2 OF THE RMA

The purpose of the RMA is to promote the sustainable management of natural and physical resources.

Section 5 – Purpose

The proposed activity takes into account Section 5 of the RMA. The proposed activity will sustain natural and physical resources and whilst enabling people and communities to provide for their social, economic and cultural well-being. As assessed above, the proposal is compliant with standards set out in the ODP and PDP meaning effects are less than minor.

Section 6 – Matters of national importance

Attention has been given to matters of national importance. This site does not contain any outstanding natural features or landscapes, nor any area of significant indigenous vegetation. It is considered the proposal is appropriate within this residential landscape.

Section 7 – Other matters

Particular regard has been given to the maintenance and enhancement of amenity values (section 7(c)) and maintenance and enhancement of the quality of the environment (section 7(f)). The amenity of the land and surrounding area will be maintained, and the proposed activity will not have adverse effects on the quality of the environment.

Section 8 – Treaty of Waitangi

This site is not within any known heritage sites or statutory acknowledgement areas and therefore, this recommendation is not inconsistent with the principles of the Treaty of Waitangi.

Overall, the proposal is considered to meet the purpose and principles of the RMA.

9. DECISION ON RESOURCE CONSENT

Pursuant to Section 104C of the RMA, consent is **Granted Subject to Conditions** to carry out a ten-lot subdivision subject to the following conditions imposed pursuant to Section 220 of the RMA:

Consent Conditions

1. The activity must be undertaken in accordance with the application made to the Council on 01/04/2026 including and the following plans, prepared by Hamish Weir at Southern Horizons (dated 11/06/2026)
 - “Lots 1 to 10 being Subdivision of Lots 4 to 10 DP 927” Plan no. 1 (11/06/2026)

Potable water

1. The consent holder shall be responsible for providing appropriate water supply reticulation (including rider mains, fire hydrants and necessary incidental equipment) from the Water Supply along Maud Street that is adequate to serve the subdivision, and all design and construction including provision for firefighting is to be in accordance with the requirements of the Bylaw. The proposed 100mmØ main extension indicated on the scheme plan shall terminate with a fire hydrant at the western end.
2. Standard 20mm diameter water connections shall be provided to the boundaries of all Lots (from the new watermain or rider main) with separate approved Acuflo metered stop valves and boxes.

Wastewater

1. The consent holder shall install foul sewer reticulation to the boundary of each lot, being a low pressure rising sewer connection which shall connect which shall discharge into council's existing wastewater main in Maud Street, that is adequate to serve the subdivision and all design and construction of this reticulation shall meet the requirements of the Bylaw.
2. The wastewater connections to the boundary of each lot must include Boundary Assembly Kits within the design. Receiving manholes should also be designed to be directed downwards.
3. Designs shall be submitted to Council for certification prior to installation.

Electricity

1. The consent holder shall provide an operational electrical and telecommunications connection to each Lot prior to certification under s224(c).
 - a. It is the responsibility of the consent holder to meet the costs associated with the installation of the electricity and telecommunication reticulation necessary to meet the needs of the subdivision.

Earthworks

1. Any change in ground levels must not cause increased run-off to adjacent properties.
2. If, at the completion of the earthworks operations, any public road, footpath, landscaped areas or service structures that have been affected/damaged by contractor(s), consent holder, developer, person involved with earthworks or building works, and/or vehicles and machineries used in relation to earthworks and construction works, must be reinstated to the satisfaction of the Chief Executive at the expense of the consent holder.
3. Prior to 224c it shall be demonstrated that any construction activity that may generate sediment discharge can be managed and remediated (pipes and basin may need to be cleaned) by lot owners once works are complete.

Stormwater

1. The consent holder shall install stormwater reticulation and stormwater disposal as outlined in the Technical Memorandum provided by Warren Ladbrook included in Appendix B.
2. Flow velocities in stormwater collection devices may in some instances need to be addressed via specific design. With particular regard being given to
 - iii. The design of pipes and manholes on steep sections, especially for 90o bends.
 - iv. Erosion protection at the discharge points into the stormwater basin. Especially the high exit velocities with high erosion potential of the material in the pond
3. Ensure that all infrastructure is appropriately sized and specific consideration of scour protection is made. Stormwater shall be collected at the southern section of both RoW and conveyed via pipe work to the stormwater basin. The conditions of the consents shall be to the satisfaction of Suitably Qualified and Experienced Person.
4. Prior to 224c the final design of the stormwater infrastructure plan shall be submitted to council for certification.
5. Note - Elements of the stormwater system are of special concern due to the steep nature of the site and overland flow paths that will direct overland flow to the basin shall be appropriately surfaced to prevent long term scour. Hydraulic calculations to show the specific design flows, velocities, etc. with appropriate design of the stormwater system elements to safely convey these;
6. Overland flow paths to be maintained as per scheme plan.
7. All impervious surfaces to be diverted to stormwater basin

Stormwater Basin

1. The consent holder shall plant appropriate vegetation species as identified by a Suitably Qualified and Experienced Person. If any plant or tree should die or become diseased it shall be replaced within the next available planting season.

Roading

1. Design road in accordance table 3.1 to the following parameters:

Parking Lanes (m)	1 x 2.5
Traffic Lanes (m)	1 x 3.5
Carriageway Width (m)	6
Footpaths No.	1 x 1.4

2. Install a subsoil drain on the uphill side of Maud Street formation to ensure water does not get under the north edge of seal.
3. A 1.4 m wide footpath will be required on Maud Street.
4. The ROW to be design in accordance with the Bylaw.

Surface treatment

5. Right of Way surfacing treatment shall be asphalt.
6. Maud Street carriage way surface treatment be a 2 Coat Chip Seal.
7. Kerbing shall be provided along Maud Street toward frank street to ensure continuation of cut off from the land to the north.
8. Design of Maud Street and Right of Way to be in accordance with the Bylaw with exception of the dispensation to reduce the formed width of Maud Street to 5m.

Footpaths

9. The consent holder shall install a footpath along the south side of Maud Street in accordance with the requirements of the Subdivision and Land Development Bylaw 2019.

Street Lighting

10. The consent holder shall install street lighting in accordance with the requirements of the Subdivision and Land Development Bylaw 2019.

Note – The consent holder may apply for a dispensation under the Bylaw upon knowledge of the final cost price of the completed works to the roading, footpath and street infrastructure is made available to Council.

Where there are multiple development sites, the cost of infrastructure may be shared. At the time of lodgement, the Development Contribution policy was in obedience and as such the usual mechanism for the recovery of the cost of growth is not possible. As such the applicant wishes to discuss potential options under the Bylaw once detailed design has further progressed.

Easements

1. All easements for services shall be duly granted.

Maintenance Period

1. The maintenance period of the Stormwater infrastructure shall be 24 months. Upon completion the applicant shall provide a report from a SQEP that the stormwater basin is in good order and is functioning as intended. Commenting on the performance of any overland flow beyond the site.

Note – The maintenance period may be extended if the stormwater infrastructure not functioning as intended.

Consent Notices

1. Impervious areas exceeding 420m² on each lot shall require specific stormwater design at time of building consent (This includes dwelling, accessory buildings and driveway but not decks)
2. Impervious areas shall drain to the stormwater basin. This shall be demonstrated at Building Consent Stage.
3. During construction activity on any of the subject lots any sediment discharge needs to be managed and remediated (pipes and basin may need to be cleaned) by the lot owners responsible for the discharge.
4. The lot owners shall undertake the following annual maintenance of the Stormwater Basin and reticulated network;
 1. Sumps and slots drains cleaned out
 2. Manholes or inspection chambers visually inspected and any accumulated sediment removed
 3. Stormwater basin plantings weeded, dead plants replaced and overgrown plants cut back
 4. Stormwater basin weir and disbursement spreader inspected for blockage or sediment removed

Advice Notes

1. Council intends to extend the existing footpath along the western side of Frank Street to the intersection of Frank Street and Maud Street, with the intention of connecting and aligning with the existing footpaths.

Administrative Matters

The costs of processing the application are currently being assessed and you will be advised under separate cover whether further costs have been incurred.

This resource consent is not a building consent granted under the Building Act 2004. A building consent must be obtained before construction can begin.

This resource consent must be exercised within five years from the date of this decision subject to the provisions of section 125 of the RMA.

If you have any enquiries please contact the duty planner on phone (03) 209 0330 or email planning@goredc.govt.nz.

Prepared by



Molly O'Sullivan
Planning Consultant

Reviewed by



Werner Murray
Delegate

Appendix A: Approved Plans

Appendix B: Warren Ladbroke Technical Memorandum

APPENDIX A – APPROVED PLANS



Lots 1 to 10 being Subdivision of
Lots 4 to 10 DP 927

0 Naumai St, Gore



Project # - 26002
Client - Rigby

Plan #
01

Datum
Bluff 2000
NZVD 2016

Scale
1:500 @ A3

Rev.	Date	Revision Details
0	23-03-26	For consent
1	24-04-26	s92 amendments
2	29-04-26	Stormwater amendments
3	8-06-26	Shift XCs to details shet
4	11-06-26	add comments

Surveyed

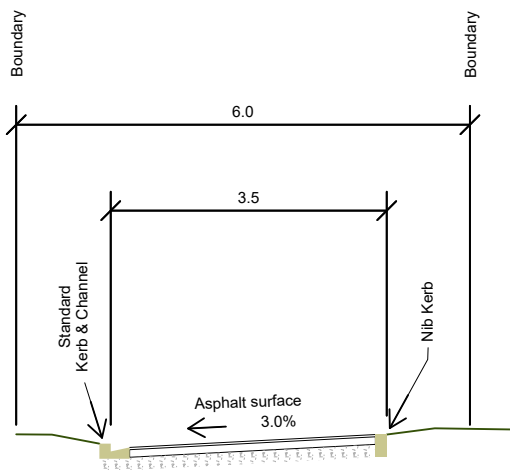
Drawn
HRW

Designed

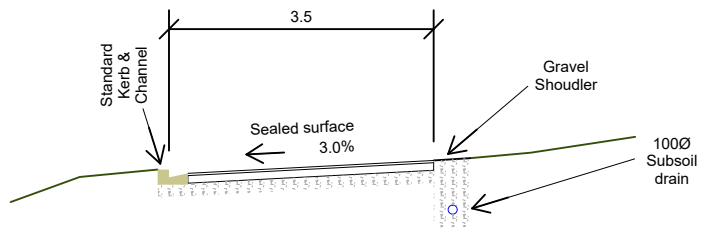
NOTE:
- All dimensions shown are in metres unless otherwise shown
- If this plan is being used as part of sale and purchase agreement then it is done so on the basis that it is preliminary only, final dimensions and areas may vary on final survey
- Any aerial images shown are sourced from LINZ Data Service unless otherwise stated



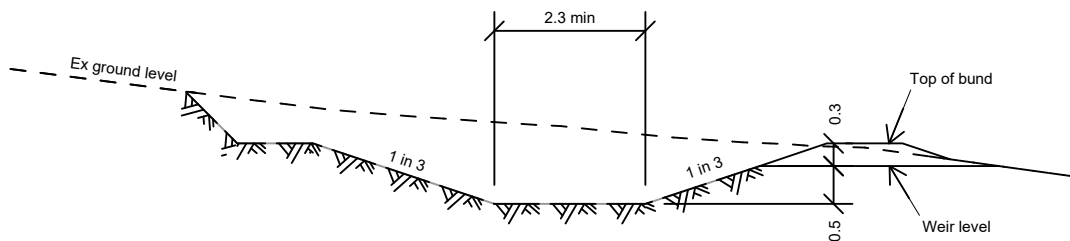
SOUTHERN HORIZONS
SURVEYING & RESOURCE MANAGEMENT
Gore • Ph: 027 468 2596 • hamish@southernhorizons.co.nz



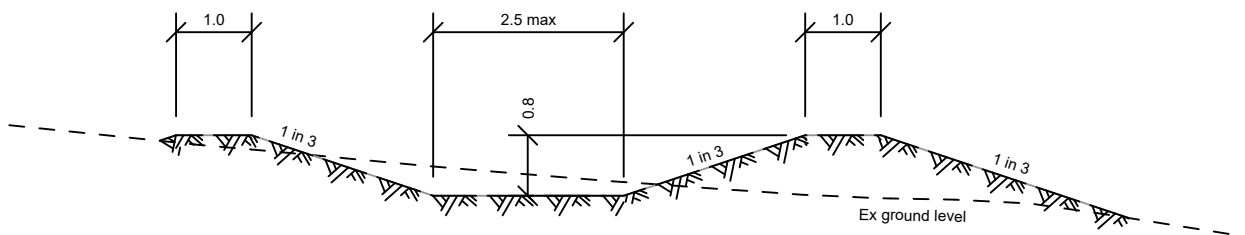
Typical R.O.W.
Cross Section



Typical Maud Street Cross Section



Typical Pond
Cross Section 1



Typical Pond
Cross Section 2

Typical Cross Section Details

0 Naumai St, Gore



Scale
1:1000 @ A4

Project & Plan # - 26002 02
Client - Rigby

Rev.	Date	Revision Details
0	8-06-26	Add Details

Surveyed

Drawn
HRW

Designed

SOUTHERN HORIZONS
SURVEYING & RESOURCE MANAGEMENT
Gore • Ph: 027 468 2596 • hamish@southernhorizons.co.nz

APPENDIX B – WARREN LADBROOK TECHNICAL MEMORANDUM

WARREN D. LADBROOK

E: WARREN@LADBROOK.NET

C: 022.044.7202

TECHNICAL MEMO

Re: Stormwater for Maud Street Development, Gore

Date: 23 June 2026

This Technical Memo (TM) is in specific reference to the stormwater solutions for the housing development proposed at Maud St, Gore. This TM is not a Detailed Design, but rather provides a conceptual stormwater solution to confirm viability, and as the basis for preliminary costing.

The proposed solution must ensure that post-development stormwater discharge will not exceed pre-development discharge.

Further, this TM will confirm the following key features:

- hydrological flows pre/post development,
- stormwater collection, and
- stormwater disposal.

Location

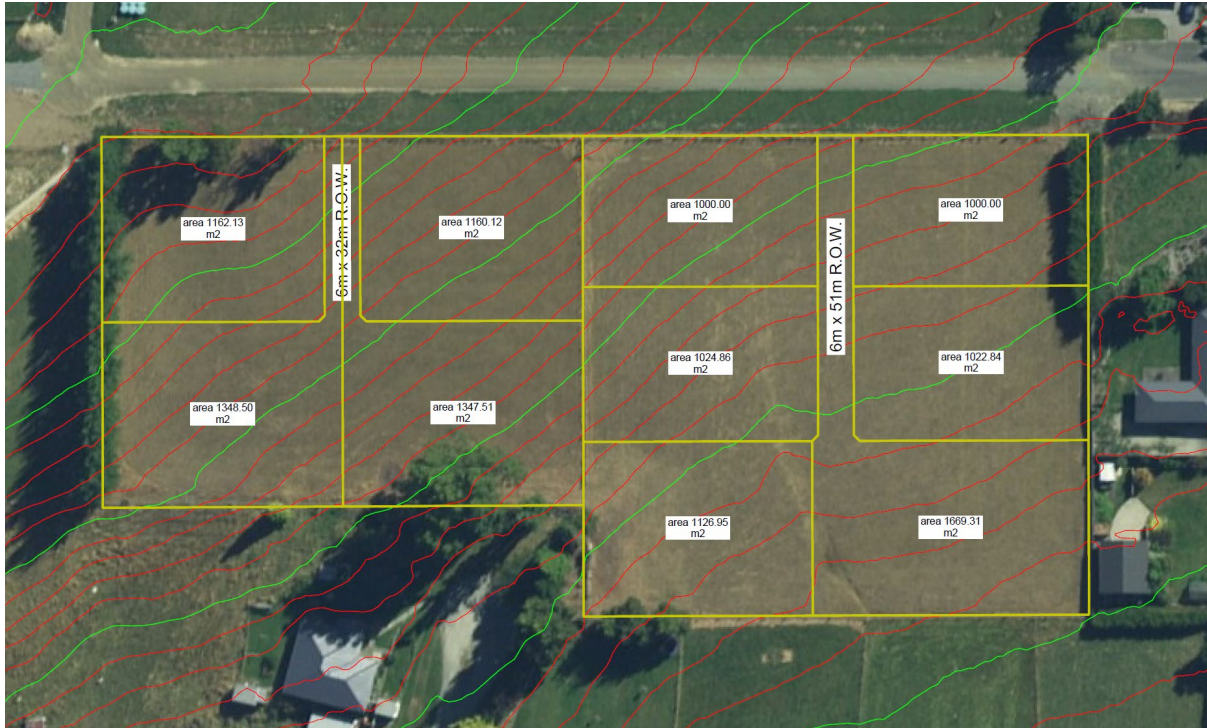
This site is located on the South Side of Maud St, Gore, at the following coordinates (WGS 1984), and as shown in the Figure below:

168.9235, -46.1 Degrees.



Proposed Development

The site consists of ten (10) lots as shown in the figure below.



Each lot will include one residential dwelling of ~300m², one outbuilding of ~70m², plus an impervious driveway of ~50m². Two common access driveways will be required of ~300m² in total. The balance of each lot will consist of lawn and gardens.

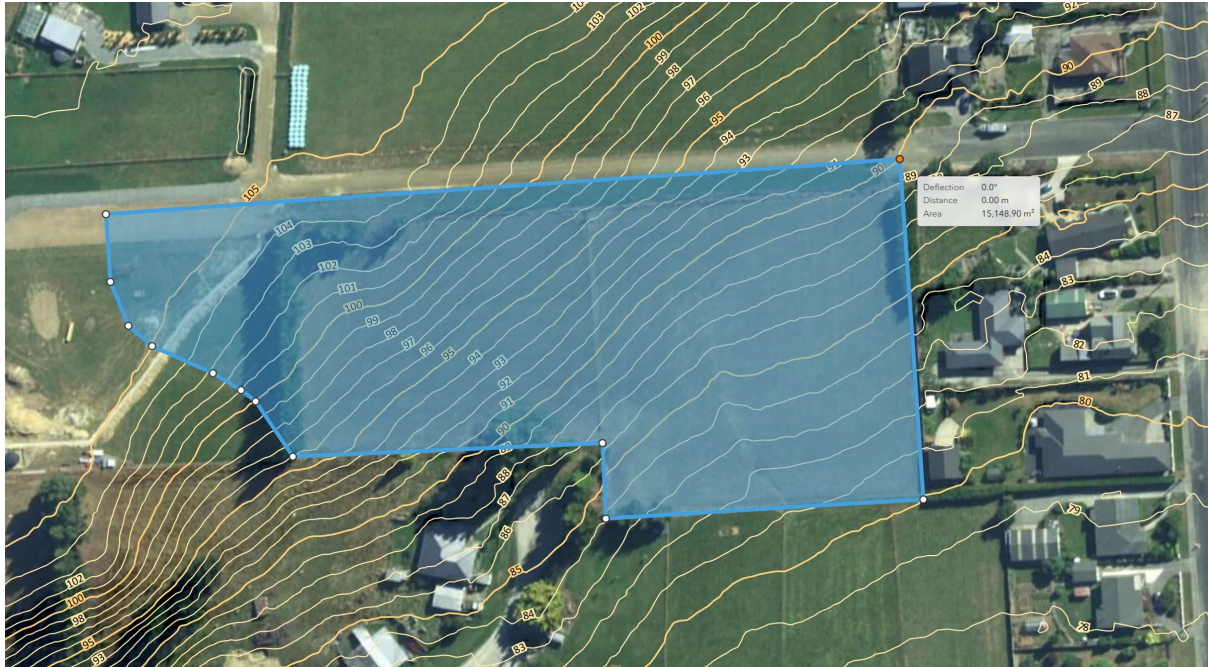
Existing Catchment Hydrology

This development is fully within one catchment, with stormwater runoff towards the Southeast boundary, with slopes between 10-30% as shown on the following map:



A shallow swale/channel is evident on site, as indicated above.

The Catchment boundary is shown in the following figure, with an upstream boundary along the kerb associated with proposed paving, based on an assumption that runoff from the road will be routed towards the East, and Frank St.



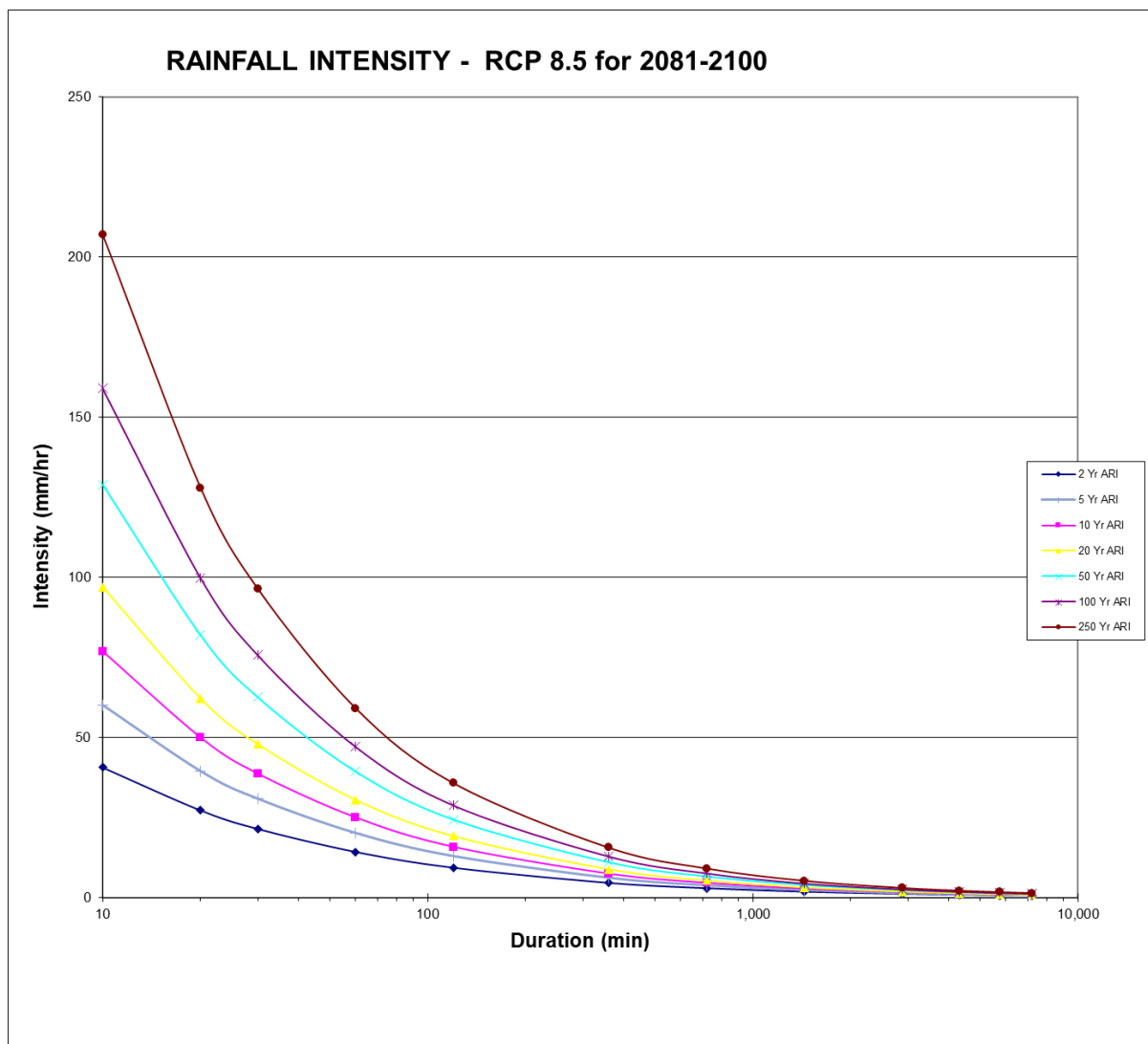
As noted, the Catchment size is 1.51 Ha, including a small segment on the adjacent property to the West. It is possible that the treeline along the Western boundary provides a natural barrier for off-site flow, however, this area has been included in the calculations for the purposes of confirming the feasibility of the proposed solution.

Rainfall intensity data for this site is based on the High Intensity Rainfall Design System (HIRDS) V4 as administered by the National Institute of Water and Atmospheric Research (NIWA).

The table of resultant rainfall intensities for RCP8.5 (2081-2100) are as follows:

HIRDS Version 4.0														
High Intensity Rainfall Design System														
Table of rainfall intensities (mm/hr)														
Location: Maud St														
RCP 8.5 for 2081-2100														
Rainfall Intensity (mm/hr) for all ARI Years														
ARI	AEP	Duration												
		10m	20m	30m	60m	2h	6h	12h	24h	48h	72h	96h	120h	
1.58	0.633	35.7	24	19	12.7	8.33	4.17	2.66	1.7	1.08	0.821	0.678	0.586	
2	0.5	40.7	27.3	21.5	14.3	9.35	4.62	2.94	1.86	1.17	0.894	0.737	0.634	
5	0.2	60.1	39.5	30.9	20.2	13	6.25	3.9	2.42	1.5	1.13	0.927	0.794	
10	0.1	77	50.1	38.8	25.1	15.9	7.54	4.66	2.85	1.75	1.31	1.07	0.911	
20	0.05	97	62.3	48	30.6	19.3	8.98	5.47	3.31	2.01	1.5	1.21	1.03	
30	0.033	110	70.5	54.1	34.3	21.4	9.89	5.98	3.6	2.17	1.61	1.3	1.1	
40	0.025	121	76.7	58.7	37.1	23	10.6	6.37	3.81	2.29	1.7	1.37	1.16	
50	0.02	129	82	62.6	39.4	24.4	11.1	6.67	3.98	2.38	1.76	1.42	1.2	
60	0.017	137	86.4	65.9	41.3	25.5	11.6	6.94	4.13	2.46	1.82	1.46	1.23	
80	0.013	149	93.9	71.4	44.6	27.4	12.3	7.36	4.35	2.59	1.9	1.53	1.29	
100	0.01	159	99.9	75.8	47.2	28.9	13	7.71	4.54	2.69	1.97	1.58	1.33	
250	0.004	207	128	96.5	59.2	35.8	15.7	9.18	5.34	3.11	2.26	1.81	1.51	

This further resolves to the rainfall curves shown in the graph that follows:



The site is assumed to consist of medium soakage pasture and grass, as can be seen in the picture below (looking towards the Southeast):



A 10-minute Time of Concentration has been adopted for hydrology calculations

Based on the existing topography, the weighted runoff coefficient has been calculated as 0.383 per the table below:

					Existing Catchment Size:				1.51	Ha
Catchment Area: Maud St.					Pre-Development Area (A)					
Runoff Coefficients (C):					0-5%	5-10%	10-20%	≥20%		C _i x A _i
Natural Surfaces:										
Bare impermeable clay	0.65	0.70	0.75	0.80						0.00
Bare soil of medium soakage	0.55	0.60	0.65	0.70						0.00
Heavy clay soils - Pasture / Grass	0.35	0.40	0.45	0.50						0.00
Heavy clay soils - Bush and Scrub	0.30	0.35	0.40	0.45						0.00
Heavy clay soils - Cultivated	0.25	0.30	0.35	0.40						0.00
Medium soakage soils - Pasture / Grass	0.25	0.30	0.35	0.40			0.51	1.00		0.58
Medium soakage soils - Bush and Scrub	0.20	0.25	0.30	0.35						0.00
Medium soakage soils - Cultivated	0.15	0.20	0.25	0.30						0.00
High soakage soils - Pasture / Grass	0.15	0.20	0.25	0.30						0.00
High soakage soils - Bush and Scrub	0.10	0.15	0.20	0.25						0.00
High soakage soils - Cultivated	0.05	0.10	0.15	0.20						0.00
Parks and reserves - grassed	0.25	0.30	0.35	0.40						0.00
Parks and reserves - bush	0.20	0.25	0.30	0.35						0.00
Gardens and lawns	0.20	0.25	0.30	0.35						0.00
Developed Surfaces:										
Fully roofed and/or sealed	0.90	0.90	0.90	0.90						0.00
Steel and non-absorbent roofing	0.90	0.90	0.90	0.90						0.00
Asphalt / Concrete Pavement	0.85	0.85	0.85	0.85						0.00
Near flat / slightly absorbent roofing	0.80	0.80	n/a	n/a						0.00
Stone, brick, and concrete pavers - sealed joints	0.80	0.80	0.80	0.80						0.00
Stone, brick, and concrete pavers - unsealed joints	0.60	0.60	0.60	0.60						0.00
Unsealed roads	0.50	0.50	0.50	0.50						0.00
Porous Pavement	0.40	n/a	n/a	n/a						0.00
Unsealed yards	0.35	0.35	0.35	0.35						0.00
Rainwater Harvesting Roof System	0.20	0.20	0.20	0.20						0.00
					0.00	0.00	0.51	1.00		0.58
					Weighted C =					0.383

Consequently, the maximum pre-development discharge from this site is approximately 0.256m³/s for the 1% Annual Exceedance Probability (AEP) event, and 0.124m³/s for the 10% AEP.

Catchment Area: Maud St.			
		Pre-Development	
		Max. Discharge	
AEP	Return Period (yrs)	(m ³ /s)	(l/s)
50%	2	0.1	65
20%	5	0.1	97
10%	10	0.1	124
5%	20	0.2	156
2%	50	0.2	207
1%	100	0.3	256
0.4%	250	0.3	333

These levels of discharge are the existing condition on the site, and may not be exceeded post-development.

For clarity, post-development conditions may include discharge from the site, at rates which are no greater than listed above.

Soils

SouthMaps Soil classification identifies this area as consisting of Waikoikoi-Chatton soils. Neither of these soil types are suitable for stormwater disposal to land.

Post-Development Catchment Hydrology

The catchment areas, rainfall intensity curves, and time of concentration will remain unchanged

The primary change to the catchments will be the runoff coefficient, with the post-development composition estimated in the table below, and with a weighted runoff coefficient of 0.509 as shown:

					Proposed Catchment Size:				1.51	Ha
Catchment Area: Maud St.					Post-Development Area (A)					
Runoff Coefficients (C):					0-5%	5-10%	10-20%	≥20%		C _i x A _i
Natural Surfaces:										
Bare impermeable clay	0.65	0.70	0.75	0.80						0.00
Bare soil of medium soakage	0.55	0.60	0.65	0.70						0.00
Heavy clay soils - Pasture / Grass	0.35	0.40	0.45	0.50						0.00
Heavy clay soils - Bush and Scrub	0.30	0.35	0.40	0.45						0.00
Heavy clay soils - Cultivated	0.25	0.30	0.35	0.40						0.00
Medium soakage soils - Pasture / Grass	0.25	0.30	0.35	0.40						0.00
Medium soakage soils - Bush and Scrub	0.20	0.25	0.30	0.35						0.00
Medium soakage soils - Cultivated	0.15	0.20	0.25	0.30						0.00
High soakage soils - Pasture / Grass	0.15	0.20	0.25	0.30						0.00
High soakage soils - Bush and Scrub	0.10	0.15	0.20	0.25						0.00
High soakage soils - Cultivated	0.05	0.10	0.15	0.20						0.00
Parks and reserves - grassed	0.25	0.30	0.35	0.40						0.00
Parks and reserves - bush	0.20	0.25	0.30	0.35						0.00
Gardens and lawns	0.20	0.25	0.30	0.35			0.06	1.00		0.37
Developed Surfaces:										
Fully roofed and/or sealed	0.90	0.90	0.90	0.90	0.37					0.33
Steel and non-absorbent roofing	0.90	0.90	0.90	0.90						0.00
Asphalt / Concrete Pavement	0.85	0.85	0.85	0.85	0.02	0.06				0.07
Near flat / slightly absorbent roofing	0.80	0.80	n/a	n/a						0.00
Stone, brick, and concrete pavers - sealed joints	0.80	0.80	0.80	0.80						0.00
Stone, brick, and concrete pavers - unsealed joints	0.60	0.60	0.60	0.60						0.00
Unsealed roads	0.50	0.50	0.50	0.50						0.00
Porous Pavement	0.40	n/a	n/a	n/a						0.00
Unsealed yards	0.35	0.35	0.35	0.35						0.00
Rainwater Harvesting Roof System	0.20	0.20	0.20	0.20						0.00
					0.39	0.06	0.06	1.00		0.77
					Weighted C =					0.509

Consequently, the maximum post-development discharge from this site is approximately 0.340m³/s for the 1% AEP event, and 0.164m³/s for the 10% AEP.

Catchment Area: Maud St.							
Pre-Development				Post-Development			
Return		Max. Discharge		Return		Max. Discharge	
AEP	Period (yrs)	(m ³ /s)	(l/s)	Period (yrs)	(m ³ /s)	(l/s)	
50%	2	0.1	65	2	0.1	87	
20%	5	0.1	97	5	0.1	128	
10%	10	0.1	124	10	0.2	164	
5%	20	0.2	156	20	0.2	207	
2%	50	0.2	207	50	0.3	276	
1%	100	0.3	256	100	0.3	340	
0.4%	250	0.3	333	250	0.4	442	

Stormwater discharge post-development will increase by 0.084m³/s for the 1% AEP event, and 0.040m³/s for the 10% AEP. The increased discharge must be attenuated or discharged off-site, and not discharged onto downstream properties.

Stormwater Collection

Stormwater can be collected in informal swales, formal channels, or piped systems. Any of these options are acceptable, providing they are consistent with Gore District Council standards. The downstream device (swale, channel, or pipe) must accommodate a peak flow of $0.4\text{m}^3/\text{s}$ with a maximum velocity of 2.5m/s .

Piped systems require less land, and can easily route stormwater from catch basins, drop inlets, or scruffy dome inlets. A scruffy dome inlet is probably the best option for this application, and can be located in suitably landscaped collection points, providing these are designed and constructed as low spots where stormwater is directed. These collection points should also include some volume capacity for sediment collection. A scruffy dome is shown in the photo below.



Stormwater Disposal

Given the soils are not suitable for land disposal, there are only two other viable alternatives.

1. **Attenuate and Store.** Stormwater would be collected and the discharge limited to less than pre-developed flows by means of a control structure. This option would require a large storage device, but would operate by gravity.
2. **Attenuate and Pump.** Stormwater would be collected and then pumped up to the existing stormwater pipe in Maud St., which discharges by gravity to the East (and then down Frank St.). This option would require a smaller storage device, but includes the cost of a pump station. Further, this option could also include controlled off-site discharge, at less than pre-developed flows.

Both of these options are considered on the pages that follow.

Attenuate and Store:

To design the size of storage device that is required, I have considered a storm event which includes the future intensity for every time increment between 10 min and 24 hours (1,440 min). In this approach, every critical storm can be accommodated on account of the peak intensities and long durations being fully considered by the design.

The table on the left below, shows the intensities for each of seven AEP storm events from 10 min to 1,440 minutes (24 hours). The peak runoff from each event is then shown in the middle table, and then the corresponding volume of runoff is given in the table on the right.

Catchment Area: Maud St.								Catchment Area: Maud St.								Catchment Area: Maud St.							
Intensity (mm/hr) for Given Return Periods (Formulae from HIRDS)								Stormwater Runoff (m ³ /s) for Given Return Periods:								Volume Runoff (m ³) for Given Return Periods:							
Time (min)	2	5	10	20	50	100	250	Time (min)	2	5	10	20	50	100	250	Time (min)	2	5	10	20	50	100	250
10	40.7	65.1	77.0	97.0	129.0	159.0	207.0	10	0.09	0.13	0.16	0.21	0.26	0.34	0.44	10	52.2	77.1	98.9	124.4	166.5	203.9	265.5
20	27.2	36.0	50.0	62.3	81.8	99.7	127.9	20	0.06	0.08	0.11	0.13	0.17	0.21	0.27	20	69.9	92.3	128.3	159.7	209.9	255.8	328.2
30	21.5	28.2	38.8	48.0	62.6	75.8	96.4	30	0.05	0.06	0.08	0.10	0.13	0.16	0.21	30	82.7	108.6	149.3	184.5	240.7	291.5	370.8
40	18.2	23.7	32.4	39.9	51.7	62.3	78.7	40	0.04	0.05	0.07	0.09	0.11	0.13	0.17	40	93.1	121.6	166.0	204.3	265.0	319.5	404.0
50	15.9	20.7	28.1	34.4	44.5	53.5	67.3	50	0.03	0.04	0.06	0.07	0.10	0.11	0.14	50	102.0	132.8	182.0	220.9	285.4	342.8	431.6
60	14.3	18.5	25.0	30.6	39.4	47.2	59.1	60	0.03	0.04	0.05	0.07	0.08	0.10	0.13	60	109.9	142.5	192.5	235.3	303.0	363.0	455.2
70	13.0	16.8	22.7	27.6	35.5	42.4	53.0	70	0.03	0.04	0.05	0.06	0.08	0.09	0.11	70	116.9	151.2	203.5	248.2	318.6	380.7	476.0
80	12.0	15.5	20.8	25.3	32.4	38.7	48.2	80	0.03	0.03	0.04	0.05	0.07	0.08	0.10	80	123.3	159.2	213.5	259.8	332.7	396.7	494.7
90	11.2	14.4	19.3	23.4	29.9	35.6	44.3	90	0.02	0.03	0.04	0.05	0.06	0.08	0.09	90	129.3	166.5	222.7	270.4	345.5	411.3	511.6
100	10.5	13.5	18.0	21.8	27.9	33.1	41.1	100	0.02	0.03	0.04	0.05	0.06	0.07	0.09	100	134.8	173.2	231.2	280.3	357.3	424.6	527.0
110	9.9	12.7	16.9	20.5	26.1	31.0	38.4	110	0.02	0.03	0.04	0.04	0.06	0.07	0.08	110	139.9	179.5	239.1	289.4	368.3	436.9	541.3
120	9.4	12.0	16.0	19.4	24.6	29.1	36.0	120	0.02	0.03	0.03	0.04	0.05	0.06	0.08	120	144.8	185.4	246.5	297.9	378.5	448.4	554.6
130	9.0	11.5	15.2	18.3	23.3	27.5	34.0	130	0.02	0.02	0.03	0.04	0.05	0.06	0.07	130	149.3	191.0	253.5	306.0	388.1	459.2	567.0
140	8.6	10.9	14.5	17.5	22.1	26.1	32.2	140	0.02	0.02	0.03	0.04	0.05	0.06	0.07	140	153.7	196.3	260.1	313.6	397.1	469.3	578.7
150	8.2	10.5	13.8	16.7	21.1	24.9	30.6	150	0.02	0.02	0.03	0.04	0.05	0.06	0.07	150	157.8	201.3	266.3	320.7	405.6	478.9	589.6
160	7.9	10.0	13.3	16.0	20.2	23.8	29.2	160	0.02	0.02	0.03	0.03	0.04	0.05	0.06	160	161.8	206.1	272.3	327.6	413.7	487.9	600.0
170	7.6	9.7	12.7	15.3	19.3	22.8	28.0	170	0.02	0.02	0.03	0.03	0.04	0.05	0.06	170	165.5	210.7	278.0	334.1	421.4	496.5	609.8
180	7.3	9.3	12.3	14.7	18.6	21.9	26.8	180	0.02	0.02	0.03	0.03	0.04	0.05	0.06	180	169.2	215.0	283.4	340.3	428.7	504.7	619.2
200	6.9	8.7	11.4	13.7	17.2	20.3	24.8	200	0.01	0.02	0.02	0.03	0.04	0.04	0.06	200	176.0	223.3	293.6	352.0	442.4	520.0	636.6
220	6.5	8.2	10.7	12.9	16.1	18.9	23.1	220	0.01	0.02	0.02	0.03	0.03	0.04	0.05	220	182.4	230.9	303.1	362.8	455.0	534.0	652.6
240	6.1	7.7	10.1	12.1	15.2	17.8	21.7	240	0.01	0.02	0.02	0.03	0.03	0.04	0.05	240	188.3	238.0	311.9	372.9	466.7	546.9	667.2
260	5.8	7.3	9.6	11.5	14.3	16.8	20.4	260	0.01	0.01	0.02	0.02	0.03	0.04	0.04	260	193.9	244.7	320.2	382.2	477.6	558.9	680.8
280	5.5	7.0	9.1	10.9	13.6	15.9	19.3	280	0.01	0.01	0.02	0.02	0.03	0.03	0.04	280	199.2	250.9	327.9	391.1	487.8	570.1	693.5
300	5.3	6.7	8.7	10.4	12.9	15.1	18.3	300	0.01	0.01	0.02	0.02	0.03	0.03	0.04	300	204.2	256.8	335.3	399.3	497.3	580.6	705.3
320	5.1	6.4	8.3	9.9	12.3	14.4	17.5	320	0.01	0.01	0.02	0.02	0.03	0.03	0.04	320	209.0	262.4	342.2	407.2	506.3	590.5	716.4
340	4.9	6.1	8.0	9.5	11.8	13.8	16.7	340	0.01	0.01	0.02	0.02	0.03	0.03	0.04	340	213.5	267.7	348.8	414.6	514.7	599.8	726.8
360	4.7	5.9	7.7	9.1	11.3	13.2	16.0	360	0.01	0.01	0.02	0.02	0.02	0.03	0.03	360	217.8	272.8	355.0	421.7	522.7	608.5	736.6
390	4.5	5.6	7.3	8.6	10.7	12.4	15.0	390	0.01	0.01	0.02	0.02	0.02	0.03	0.03	390	223.9	279.9	363.9	431.6	534.0	620.8	750.3
420	4.3	5.3	6.9	8.2	10.1	11.7	14.2	420	0.01	0.01	0.01	0.02	0.02	0.03	0.03	420	229.7	286.6	372.2	440.9	544.4	632.2	762.9
450	4.1	5.1	6.6	7.9	9.6	11.1	13.4	450	0.01	0.01	0.01	0.02	0.02	0.02	0.03	450	235.1	292.9	379.9	449.6	554.1	642.7	774.6
480	3.9	4.9	6.3	7.4	9.1	10.6	12.8	480	0.01	0.01	0.01	0.02	0.02	0.02	0.03	480	240.2	298.7	387.2	457.7	563.2	652.5	785.4
510	3.7	4.7	6.0	7.1	8.7	10.1	12.2	510	0.01	0.01	0.01	0.02	0.02	0.02	0.03	510	245.0	304.3	394.1	465.4	571.7	661.7	795.5
540	3.6	4.5	5.8	6.8	8.4	9.7	11.6	540	0.01	0.01	0.01	0.01	0.02	0.02	0.02	540	249.6	309.5	400.6	472.7	579.6	670.2	804.9
570	3.5	4.3	5.6	6.6	8.0	9.3	11.1	570	0.01	0.01	0.01	0.01	0.02	0.02	0.02	570	254.0	314.5	406.8	478.5	587.1	678.2	813.7
600	3.4	4.1	5.4	6.3	7.7	8.9	10.7	600	0.01	0.01	0.01	0.01	0.02	0.02	0.02	600	258.1	319.2	412.6	486.0	594.1	685.7	821.9
630	3.2	4.0	5.2	6.1	7.4	8.6	10.3	630	0.01	0.01	0.01	0.01	0.02	0.02	0.02	630	262.1	323.6	418.2	492.2	600.8	692.8	829.5
660	3.1	3.9	5.0	5.9	7.2	8.3	9.9	660	0.01	0.01	0.01	0.01	0.02	0.02	0.02	660	265.9	327.9	423.5	498.0	607.0	699.5	836.7
690	3.0	3.7	4.8	5.7	6.9	8.0	9.5	690	0.01	0.01	0.01	0.01	0.01	0.02	0.02	690	269.5	331.9	428.5	503.6	613.0	705.7	843.5
720	3.0	3.6	4.7	5.5	6.7	7.7	9.2	720	0.01	0.01	0.01	0.01	0.01	0.02	0.02	720	273.0	335.7	433.3	508.9	618.6	711.6	849.9
750	2.8	3.4	4.4	5.2	6.3	7.2	8.6	750	0.01	0.01	0.01	0.01	0.01	0.02	0.02	750	276.5	342.9	442.3	518.8	628.9	722.5	861.4
840	2.6	3.2	4.2	4.9	5.9	6.8	8.1	840	0.01	0.01	0.01	0.01	0.01	0.01	0.02	840	285.5	349.4	450.6	527.8	638.2	732.1	871.7
900	2.5	3.1	4.0	4.6	5.6	6.4	7.6	900	0.01	0.01	0.01	0.01	0.01	0.01	0.02	900	291.1	355.4	458.2	536.1	646.6	740.8	880.8
960	2.4	2.9	3.8	4.4	5.3	6.1	7.2	960	0.01	0.01	0.01	0.01	0.01	0.01	0.02	960	296.2	360.9	465.2	543.7	654.1	748.5	888.8
1,020	2.3	2.8	3.6	4.2	5.1	5.8	6.8	1,020	0.00	0.01	0.01	0.01	0.01	0.01	0.01	1,020	301.9	366.0	471.6	550.6	660.9	755.4	895.9
1,080	2.2	2.7	3.4	4.0	4.8	5.5	6.5	1,080	0.00	0.01	0.01	0.01	0.01	0.01	0.01	1,080	306.5	370.6	477.5	557.0	667.0	761.5	902.1
1,140	2.1	2.6	3.3	3.8	4.6	5.2	6.2	1,140	0.00	0.01	0.01	0.01	0.01	0.01	0.01	1,140	309.6	374.8	483.0	562.9	672.6	766.9	907.5
1,200	2.0	2.5	3.2	3.7	4.4	5.0	5.9	1,200	0.00	0.01	0.01	0.01	0.01	0.01	0.01	1,200	313.5	378.7	488.1	568.3	677.5	771.8	912.3
1,260	2.0	2.4	3.0	3.5	4.2	4.8	5.7	1,260	0.00	0.01	0.01	0.01	0.01	0.01	0.01	1,260	317.1	382.3	492.8	573.3	682.0	776.0	916.4
1,320	1.9	2.3	2.9	3.4	4.1	4.6	5.4	1,320	0.00	0.00	0.01	0.01	0.01	0.01	0.01	1,320	320.5	385.6	497.2	577.9	685.9	779.8	919.9
1,380	1.8	2.2	2.8	3.3	3.9	4.4	5.2	1,380	0.00	0.00	0.01	0.01	0.01	0.01	0.01	1,380	323.7	388.7	501.2	582.1	689.5	783.0	922.9
1,440	1.8	2.1	2.7	3.2	3.7	4.3	5.0	1,440	0.004	0.005	0.006	0.007	0.008	0.009	0.011	1,440	326.6	391.4	505.6	586.9	692.6	785.8	925.3

The table on the left on the following page, shows the allowable discharge, based on the previous identified pre

Allowable Discharge (m³) for Given Return Periods:									Required Storage (m³) (Discharging at pre-developed flows):						
	2	5	10	20	50	100	250								
Time (min)	0.065 m³/s	0.097 m³/s	0.124 m³/s	0.156 m³/s	0.207 m³/s	0.256 m³/s	0.333 m³/s	Time (min)	2	5	10	20	50	100	250
10	39.2	57.9	74.2	93.5	124.4	153.3	199.6	10	13.0	19.1	24.5	30.9	41.1	50.6	65.9
20	78.5	115.9	148.5	187.0	248.8	306.6	399.2	20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	117.7	173.8	222.7	280.6	373.1	459.9	598.7	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	157.0	231.8	297.0	374.1	497.5	613.2	798.3	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	196.2	289.7	371.2	467.6	621.9	766.5	997.9	50	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	235.4	347.7	445.4	561.1	746.3	919.8	1,197.5	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	274.7	405.6	519.7	654.7	870.6	1,073.1	1,397.1	70	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	313.9	463.6	593.9	748.2	995.0	1,226.4	1,596.7	80	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	353.2	521.5	668.2	841.7	1,119.4	1,379.7	1,796.2	90	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	392.4	579.5	742.4	935.2	1,243.8	1,533.0	1,995.8	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	431.7	637.4	816.6	1,028.8	1,368.2	1,686.3	2,195.4	110	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	470.9	695.4	890.9	1,122.3	1,492.5	1,839.6	2,395.0	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	510.1	753.3	965.1	1,215.8	1,616.9	1,992.9	2,594.6	130	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140	549.4	811.2	1,039.4	1,309.3	1,741.3	2,146.2	2,794.2	140	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	588.6	869.2	1,113.6	1,402.9	1,865.7	2,299.5	2,993.7	150	0.0	0.0	0.0	0.0	0.0	0.0	0.0
160	627.9	927.1	1,187.9	1,496.4	1,990.0	2,452.8	3,193.3	160	0.0	0.0	0.0	0.0	0.0	0.0	0.0
170	667.1	985.1	1,262.1	1,589.9	2,114.4	2,606.1	3,392.9	170	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180	706.3	1,043.0	1,336.3	1,683.4	2,238.8	2,759.4	3,592.5	180	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	784.8	1,158.9	1,484.8	1,870.5	2,487.6	3,066.1	3,991.7	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	863.3	1,274.8	1,633.3	2,057.5	2,736.3	3,372.7	4,390.8	220	0.0	0.0	0.0	0.0	0.0	0.0	0.0
240	941.8	1,390.7	1,781.8	2,244.6	2,985.1	3,679.3	4,790.0	240	0.0	0.0	0.0	0.0	0.0	0.0	0.0
260	1,020.3	1,506.6	1,930.3	2,431.6	3,233.8	3,985.9	5,189.1	260	0.0	0.0	0.0	0.0	0.0	0.0	0.0
280	1,098.8	1,622.5	2,078.7	2,618.7	3,482.6	4,292.5	5,588.3	280	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300	1,177.2	1,738.4	2,227.2	2,805.7	3,731.3	4,599.1	5,987.5	300	0.0	0.0	0.0	0.0	0.0	0.0	0.0
320	1,255.7	1,854.3	2,375.7	2,992.8	3,980.1	4,905.7	6,386.6	320	0.0	0.0	0.0	0.0	0.0	0.0	0.0
340	1,334.2	1,970.2	2,524.2	3,179.8	4,228.8	5,212.3	6,785.8	340	0.0	0.0	0.0	0.0	0.0	0.0	0.0
360	1,412.7	2,086.1	2,672.7	3,366.9	4,477.6	5,518.9	7,185.0	360	0.0	0.0	0.0	0.0	0.0	0.0	0.0
390	1,530.4	2,259.9	2,895.4	3,647.4	4,850.7	5,978.8	7,783.7	390	0.0	0.0	0.0	0.0	0.0	0.0	0.0
420	1,648.1	2,433.7	3,118.1	3,928.0	5,223.9	6,438.7	8,382.5	420	0.0	0.0	0.0	0.0	0.0	0.0	0.0
450	1,765.9	2,607.6	3,340.8	4,208.6	5,597.0	6,898.6	8,981.2	450	0.0	0.0	0.0	0.0	0.0	0.0	0.0
480	1,883.6	2,781.4	3,563.6	4,489.2	5,970.1	7,358.5	9,580.0	480	0.0	0.0	0.0	0.0	0.0	0.0	0.0
510	2,001.3	2,955.3	3,786.3	4,769.7	6,343.3	7,818.4	10,178.7	510	0.0	0.0	0.0	0.0	0.0	0.0	0.0
540	2,119.0	3,129.1	4,009.0	5,050.3	6,716.4	8,278.3	10,777.5	540	0.0	0.0	0.0	0.0	0.0	0.0	0.0
570	2,236.8	3,302.9	4,231.7	5,330.9	7,089.5	8,738.2	11,376.2	570	0.0	0.0	0.0	0.0	0.0	0.0	0.0
600	2,354.5	3,476.8	4,454.5	5,611.5	7,462.7	9,198.2	11,975.0	600	0.0	0.0	0.0	0.0	0.0	0.0	0.0
630	2,472.2	3,650.6	4,677.2	5,892.0	7,835.8	9,658.1	12,573.7	630	0.0	0.0	0.0	0.0	0.0	0.0	0.0
660	2,589.9	3,824.5	4,899.9	6,172.6	8,208.9	10,118.0	13,172.4	660	0.0	0.0	0.0	0.0	0.0	0.0	0.0
690	2,707.7	3,998.3	5,122.6	6,453.2	8,582.0	10,577.9	13,771.2	690	0.0	0.0	0.0	0.0	0.0	0.0	0.0
720	2,825.4	4,172.1	5,345.3	6,733.7	8,955.2	11,037.8	14,369.9	720	0.0	0.0	0.0	0.0	0.0	0.0	0.0
780	3,060.8	4,519.8	5,790.8	7,294.9	9,701.4	11,957.6	15,567.4	780	0.0	0.0	0.0	0.0	0.0	0.0	0.0
840	3,296.3	4,867.5	6,236.2	7,856.0	10,447.7	12,877.4	16,764.9	840	0.0	0.0	0.0	0.0	0.0	0.0	0.0
900	3,531.7	5,215.2	6,681.7	8,417.2	11,194.0	13,797.2	17,962.4	900	0.0	0.0	0.0	0.0	0.0	0.0	0.0
960	3,767.2	5,562.9	7,127.1	8,978.3	11,940.2	14,717.0	19,159.9	960	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,020	4,002.6	5,910.5	7,572.6	9,539.5	12,686.5	15,636.9	20,357.4	1,020	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,080	4,238.1	6,258.2	8,018.0	10,100.6	13,432.8	16,556.7	21,554.9	1,080	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,140	4,473.5	6,605.9	8,463.5	10,661.8	14,179.0	17,476.5	22,752.4	1,140	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,200	4,709.0	6,953.6	8,908.9	11,222.9	14,925.3	18,396.3	23,949.9	1,200	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,260	4,944.4	7,301.2	9,354.3	11,784.0	15,671.6	19,316.1	25,147.4	1,260	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,320	5,179.9	7,648.9	9,799.8	12,345.2	16,417.8	20,235.9	26,344.9	1,320	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,380	5,415.3	7,996.6	10,245.2	12,906.3	17,164.1	21,155.7	27,542.4	1,380	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1,440	5,650.8	8,344.3	10,690.7	13,467.5	17,910.4	22,075.6	28,739.9	1,440	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The volume for a pond with uniform side slopes and a square base is as follows:

$$V = h \cdot b^2 + 2z \cdot h^2 \cdot b + \frac{4}{3} z^2 \cdot h^3$$

Allowing for freeboard no less than (NLT) 0.3m, side slopes of 3H:1V, a maximum water depth of 1.5m, and a storage volume of NLT 50.6m³, will require pond of approximately 15m x 15m. Given the existing topography, this pond would extend a few metres further into the hill on account of the side slopes running up the hill. An indicative 15m x 18m pond is shown below, with discharge centered on the existing shallow channel.

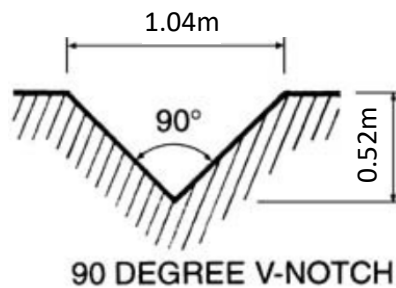


WDL

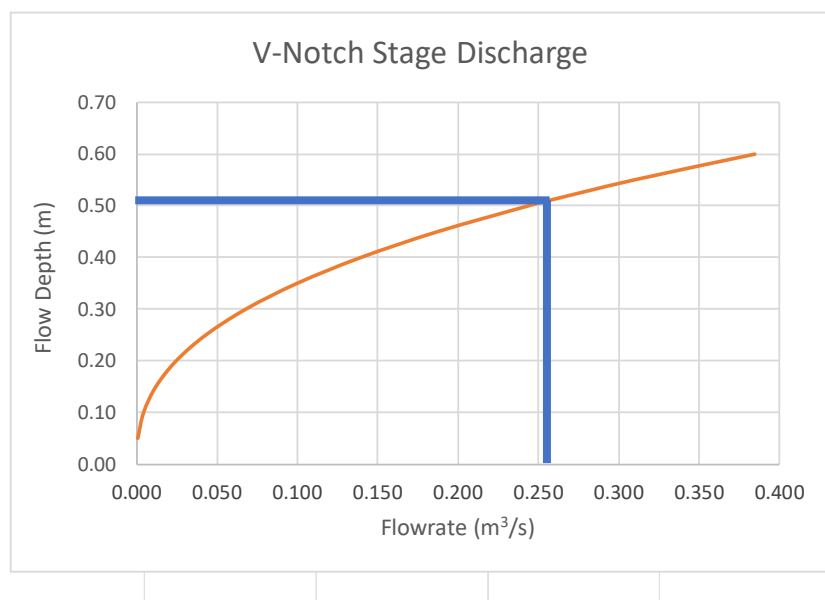
An outlet control would be required for a pond structure, such that pre-developed flowrates are not exceeded. This can easily be achieved by the use of an appropriate outlet such as an orifice and weir, with the design subject to the staged storage pond parameters at the Detailed Design stage. There are numerous types of weirs as are shown below (rectangular, v-notch or triangular, trapezoidal, and circular), and there are additional compound shapes that can be formed by combining any of these shapes:



A V-Notch weir cast into a drop manhole with a 90° base angle, and a depth of 0.52m, will carry the pre-development 1%AEP flow of 0.256m³/s at a depth of 0.51m. An open top will allow water to overtop the manhole crest if the V-Notch is blocked in any way. The V-Notch flow calculations are shown below:



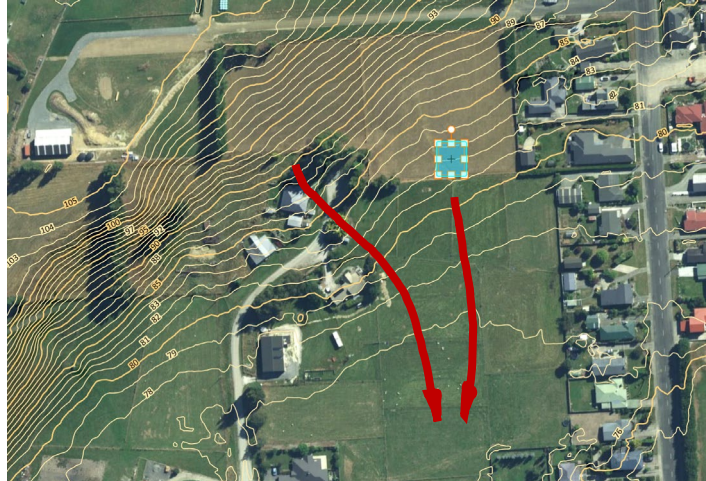
V-Notch Stage Discharge	
(°):	90.0
Discharge (C):	1.38
Depth (m):	Flow (m ³ /s)
0.60	0.385
0.55	0.310
0.51	0.256
0.50	0.244
0.45	0.187
0.40	0.140
0.35	0.100
0.30	0.068
0.25	0.043
0.20	0.025
0.15	0.012
0.10	0.004
0.05	0.001



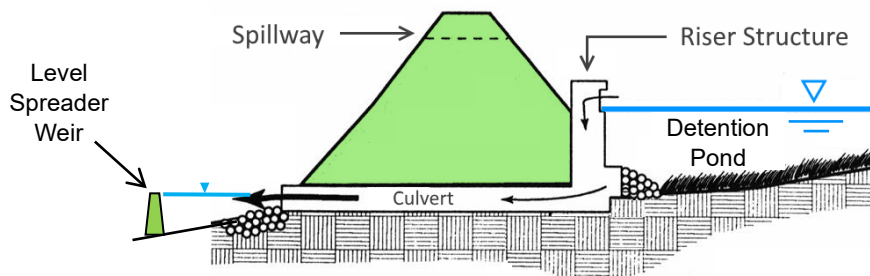
This data indicates that the pond must be no less than 0.52m deep to the top of the manhole outlet structure, with a pond emergency overflow at no lower than 0.53m.

WDL

The form of the discharge should be similar to existing conditions. An existing swale is evident in the topography, where concentrated flow would be expected. Portions of the existing discharge presently run towards the house on the West side of the Southern border, and it is considered better that this flow is interrupted and rerouted towards the open space on the East. Ultimately, all the stormwater from this site ends up in the same flat areas at the base of the hill.

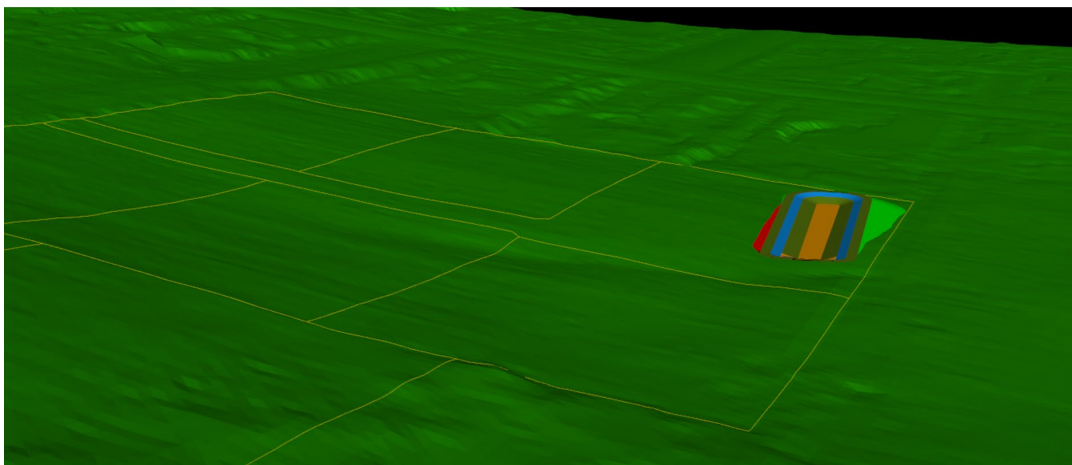


If necessary, it's possible that a low level weir could be used to dissipate flow over a wider area, and emulate sheet flow from the current site. This is conceptually shown in the indicative cross-section below:



NTS

The lowest corner of the site is the optimal location for a stormwater pond, and as shown in the 3D graphic below (internal boundaries may need to move):



Attenuate and Pump:

In this option, storage is still required, however, the rate of discharge is governed by the size of the pump(s) that are used. Stormwater pump systems are usually much larger than wastewater pump stations on account of the much larger volumes and flowrates for any given area.

Wastewater

Unless there are easements provided for gravity sewer, this site will almost certainly require a small pump station for wastewater generated by the 10 homes in this development. Small package plants are readily available for situations like this, and a standard size should be readily available. This TM does not address the design parameters for the Wastewater system, but does recognise that a wastewater pump station would need to be collocated in a low spot near the stormwater system.

Stormwater

Small package plants are not readily available for stormwater systems due to the high variability of storage and flow requirements. However, standard components can easily be used to assemble an effective solution, as further described here, and as can be provided by suitable contractors/suppliers.

The picture below show a typical pump station installation, by Hynds, and which requires much less land than a pond system as previously described.



Attenuation is provided by large wet-wells which are buried below ground. The size of these structures are based on the relationship between stormwater inflow and pumped outflow.

GoreDC maps show a 150mm PVC stormwater line within the gravel road section of Maud St, discharging towards the East into a 225mm Concrete stormwater pipe which continues discharging towards the East, where it connects into the 450mm Concrete stormwater pipe running down Frank St.

A notional 6m x 12m pump station site is shown in the low spot in the figure below, together with a force main running uphill to connect into the 225mm concrete stormwater pipe at the existing manhole. There is approximately 10 m grade difference between the pump station and the manhole in Maud St.



For stormwater there are generally three different pump system approaches:

1. Submersible (wet-well)
2. Centrifugal (radial flow)
3. Axial Flow (propeller)

Submersible

- Very common.
- Installed underwater like wastewater pump stations.
- Compact size.
- Can handle solids.
- Low to moderate flowrates.

Centrifugal

- Dry pit installation.
- Higher head (lift) capacity.
- Higher flowrates than submersibles.
- Can handle moderate solids.
- Commonly used by local government.

Axial Flow

- Low head (lift) and high flow (floodwater).
- Best for very large applications.

WARREN D. LADBROOK

E: WARREN@LADBROOK.NET

C: 022.044.7202

While a submersible may be an intuitive solution, it is important to first consider what size pump will be necessary from a hydraulic modelling perspective.

A range of four available pump sizes were selected for initial evaluation, as shown below. Flygt pumps are recommended for applications like this, as excellent pumps with a long and proven history. Pump curves were not considered for this first stage of analysis, just the peak flows.



Flygt

N 3102

- Flows up to 245 m³/h
- Heads up to 29 m
- Power ratings 3.1 - 4.2 kW
- Discharge connection sizes 80 - 150 mm
- Pump weights 105 - 117 kg

[Read More](#)

☐ Compare



Flygt

N 3127

- Flows up to 350 m³/h
- Heads up to 42 m
- Power ratings 4.7 - 7.4 kW
- Discharge connection sizes 80 - 150 mm
- Pump weights 147 - 160 kg

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☐ Compare



Flygt

N 3153

- Flows up to 800 m³/h
- Heads up to 66 m
- Power ratings 7.5 - 15 kW
- Discharge connection sizes 80 - 250 mm
- Pump weights 207 - 324 kg

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☐ Compare



Flygt

N 3171

- Flows up to 1100 m³/h
- Heads up to 85 m
- Power ratings 15 - 22 kW
- Discharge connection sizes 100 - 250 mm
- Pump weights 287 - 422 kg

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Two different AEP return periods were considered for attenuation and pump sizing, being the 10% AEP and 1% AEP. The table below shows the relationships between storage and nominal pump flowrates for both stormwater inflow conditions, and without any offsite discharge.

		Pump (m3/h): 245	Pump (m3/h): 350	Pump (m3/h): 800	Pump (m3/h): 1100				Pump (m3/h): 245	Pump (m3/h): 350	Pump (m3/h): 800	Pump (m3/h): 1100
		(l/s) 68	(l/s) 97	(l/s) 222	(l/s) 306				(l/s) 68	(l/s) 97	(l/s) 222	(l/s) 306
	10% AEP	Volume Runoff	Storage Vol.	Storage Vol.	Storage Vol.			1% AEP	Volume Runoff	Storage Vol.	Storage Vol.	Storage Vol.
	(m3)	(m3)	(m3)	(m3)	(m3)			(m3)	(m3)	(m3)	(m3)	(m3)
Time (min)							Time (min)					
10	98.8	58	40	0	0		10	203.9	163	146	71	21
20	128.3	47	12	0	0		20	255.8	174	139	0	0
30	149.3	27	0	0	0		30	291.5	169	117	0	0
40	166.0	3	0	0	0		40	319.5	156	86	0	0
50	180.2	0	0	0	0		50	342.8	139	51	0	0
60	192.5	0	0	0	0		60	363.0	118	13	0	0
70	203.5	0	0	0	0		70	380.7	95	0	0	0
80	213.5	0	0	0	0		80	396.7	70	0	0	0
90	222.7	0	0	0	0		90	411.3	44	0	0	0
100	231.2	0	0	0	0		100	424.6	16	0	0	0
110	239.1	0	0	0	0		110	436.9	0	0	0	0
120	246.5	0	0	0	0		120	448.4	0	0	0	0
130	253.5	0	0	0	0		130	459.2	0	0	0	0
140	260.1	0	0	0	0		140	469.3	0	0	0	0
150	266.3	0	0	0	0		150	478.9	0	0	0	0
160	272.3	0	0	0	0		160	487.9	0	0	0	0
170	278.0	0	0	0	0		170	496.5	0	0	0	0
180	283.4	0	0	0	0		180	504.7	0	0	0	0
200	293.6	0	0	0	0		200	520.0	0	0	0	0
220	303.1	0	0	0	0		220	534.0	0	0	0	0
240	311.9	0	0	0	0		240	546.9	0	0	0	0
260	320.2	0	0	0	0		260	558.9	0	0	0	0
280	327.9	0	0	0	0		280	570.1	0	0	0	0
300	335.3	0	0	0	0		300	580.6	0	0	0	0
320	342.2	0	0	0	0		320	590.5	0	0	0	0
340	348.8	0	0	0	0		340	599.8	0	0	0	0
360	355.0	0	0	0	0		360	608.5	0	0	0	0
390	363.9	0	0	0	0		390	620.8	0	0	0	0
420	372.2	0	0	0	0		420	632.2	0	0	0	0
450	379.9	0	0	0	0		450	642.7	0	0	0	0
480	387.2	0	0	0	0		480	652.5	0	0	0	0
510	394.1	0	0	0	0		510	661.7	0	0	0	0
540	400.6	0	0	0	0		540	670.2	0	0	0	0
570	406.8	0	0	0	0		570	678.2	0	0	0	0
600	412.6	0	0	0	0		600	685.7	0	0	0	0
630	418.2	0	0	0	0		630	692.8	0	0	0	0
660	423.5	0	0	0	0		660	699.5	0	0	0	0
690	428.5	0	0	0	0		690	705.7	0	0	0	0
720	433.3	0	0	0	0		720	711.6	0	0	0	0
780	442.3	0	0	0	0		780	722.5	0	0	0	0
840	450.6	0	0	0	0		840	732.1	0	0	0	0
900	458.2	0	0	0	0		900	740.8	0	0	0	0
960	465.2	0	0	0	0		960	748.5	0	0	0	0
1,020	471.6	0	0	0	0		1020	755.4	0	0	0	0
1,080	477.5	0	0	0	0		1080	761.5	0	0	0	0
1,140	483.0	0	0	0	0		1140	766.9	0	0	0	0
1,200	488.1	0	0	0	0		1200	771.8	0	0	0	0
1,260	492.8	0	0	0	0		1260	776.0	0	0	0	0
1,320	497.2	0	0	0	0		1320	779.8	0	0	0	0
1,380	501.2	0	0	0	0		1380	783.0	0	0	0	0
1,440	505.0	0	0	0	0		1440	785.8	0	0	0	0

The table above shows that at least 21 m³ of storage is required for the nominal peak pump rate of 1,100m³/hr (306 l/s).

It is understood that 3m diameter concrete wet-well risers are readily available in the South Island, could easily be constructed to a depth of 6.0m (6 x 1.0m risers), and would yield a storage capacity of approximately 35m³ (5.0m water depth, plus 1m for alarm, freeboard and emergency).

The static discharge head for the pump is approximately 15m (5m within the wet-well, 9m to the discharge point into the Maud St manhole, and ~1m for fittings).

WDL

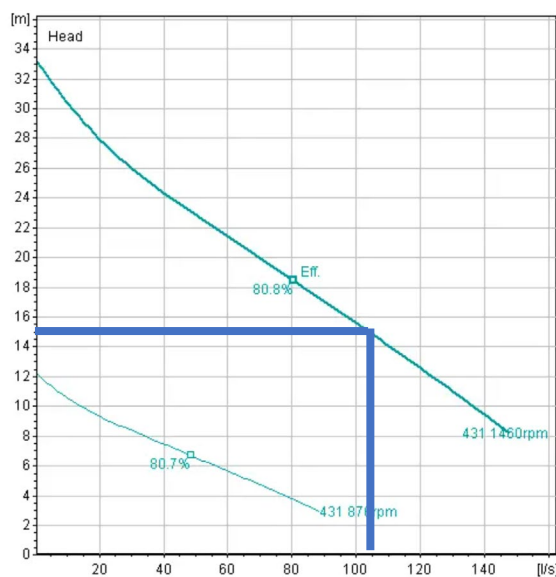
The exact sizing of a pump for a specific application is both an art and a science since each pump has a range of operating conditions, flowrate and head (lift), at different efficiency levels, can be fitted with different impellers, can operate at different speeds, have different power inputs, and more. It is also noted that every pump will convey a lower flow when the Head (lift) is higher, and correspondingly can move much higher volumes when the Head (lift) is lower.

It is prudent to have two pumps operating in an alternating Duty + Assist configuration. In this setup, one pump would operate for lower stormwater flow conditions, and the second pump would kick in when water levels rose (indicating higher inflows than the Duty pump capacity). This enables pumping over a wider range of flows (specifically to better accommodate lower flow conditions).

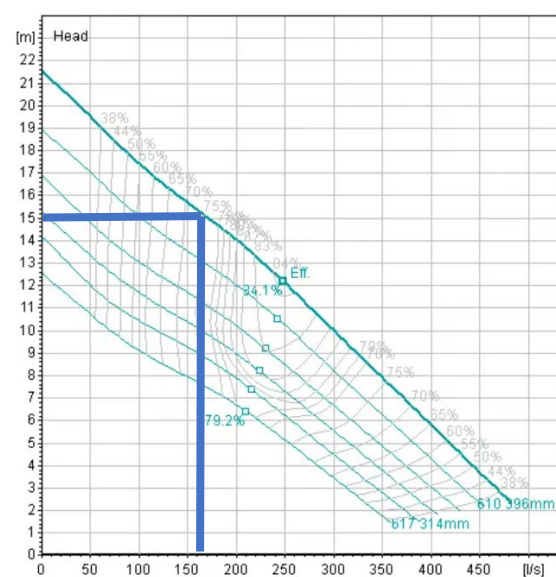
Therefore, the target design would include two pumps capable of ~150 l/s at 15m total dynamic head (lift), and operate within the central portion of the pump curves (not on the edges of pump capability).

After reviewing the various pump curves for the pumps shown previously, it became apparent that there are two primary options, with the associated pump curves shown below.

N 3171 MT 3 phase 4 poles SmartRun 50hz Metric



N 3202 LT 3 phase 6p 50hz Metric



Flygt N 3171 MT 3 phase 4 poles SmartRun 50hz Metric, pumping ~105 l/s (a reduced flowrate on account of the Head (lift)); or

Flygt N3202 LT 3 phase 6p 50 Hz Metric, pumping ~165 l/s (a larger pump size than originally anticipated).

The N 3171 model has a lower power rating, includes a 150mm discharge outlet instead of a 300mm discharge, weighs considerably less (287-422kg, compared to 640-780 kg), and is likely to be much cheaper than the larger alternative.

Both of these specific pump options have been modelled in the table below, in a DUTY, and DUTY+ASSIST configuration.

		DUTY	DUTY+ASSIST	DUTY	DUTY+ASSIST			DUTY	DUTY+ASSIST	DUTY	DUTY+ASSIST
		Pump (m3/h):	Pump (m3/h):	Pump (m3/h):	Pump (m3/h):			Pump (m3/h):	Pump (m3/h):	Pump (m3/h):	Pump (m3/h):
		378	756	594	1188			378	756	594	1188
		(l/s)	(l/s)	(l/s)	(l/s)			(l/s)	(l/s)	(l/s)	(l/s)
		105	210	165	330			105	210	165	330
		10% AEP	1% AEP	10% AEP	1% AEP			10% AEP	1% AEP	10% AEP	1% AEP
		Volume Runoff	Storage Vol.	Storage Vol.	Storage Vol.			Volume Runoff	Storage Vol.	Storage Vol.	Storage Vol.
Time (min)	(m3)	(m3)	(m3)	(m3)	(m3)	Time (min)	(m3)	(m3)	(m3)	(m3)	(m3)
10	98.8	36	0	0	0	10	203.9	141	78	105	6
20	128.3	2	0	0	0	20	255.8	130	4	58	0
30	149.3	0	0	0	0	30	291.5	103	0	0	0
40	166.0	0	0	0	0	40	319.5	68	0	0	0
50	180.2	0	0	0	0	50	342.8	28	0	0	0
60	192.5	0	0	0	0	60	363.0	0	0	0	0
70	203.5	0	0	0	0	70	380.7	0	0	0	0
80	213.5	0	0	0	0	80	396.7	0	0	0	0
90	222.7	0	0	0	0	90	411.3	0	0	0	0
100	231.2	0	0	0	0	100	424.6	0	0	0	0
110	239.1	0	0	0	0	110	436.9	0	0	0	0
120	246.5	0	0	0	0	120	448.4	0	0	0	0
130	253.5	0	0	0	0	130	459.2	0	0	0	0
140	260.1	0	0	0	0	140	469.3	0	0	0	0
150	266.3	0	0	0	0	150	478.9	0	0	0	0
160	272.3	0	0	0	0	160	487.9	0	0	0	0
170	278.0	0	0	0	0	170	496.5	0	0	0	0
180	283.4	0	0	0	0	180	504.7	0	0	0	0
200	293.6	0	0	0	0	200	520.0	0	0	0	0
220	303.1	0	0	0	0	220	534.0	0	0	0	0
240	311.9	0	0	0	0	240	546.9	0	0	0	0
260	320.2	0	0	0	0	260	558.9	0	0	0	0
280	327.9	0	0	0	0	280	570.1	0	0	0	0
300	335.3	0	0	0	0	300	580.6	0	0	0	0
320	342.2	0	0	0	0	320	590.5	0	0	0	0
340	348.8	0	0	0	0	340	599.8	0	0	0	0
360	355.0	0	0	0	0	360	608.5	0	0	0	0
390	363.9	0	0	0	0	390	620.8	0	0	0	0
420	372.2	0	0	0	0	420	632.2	0	0	0	0
450	379.9	0	0	0	0	450	642.7	0	0	0	0
480	387.2	0	0	0	0	480	652.5	0	0	0	0
510	394.1	0	0	0	0	510	661.7	0	0	0	0
540	400.6	0	0	0	0	540	670.2	0	0	0	0
570	406.8	0	0	0	0	570	678.2	0	0	0	0
600	412.6	0	0	0	0	600	685.7	0	0	0	0
630	418.2	0	0	0	0	630	692.8	0	0	0	0
660	423.5	0	0	0	0	660	699.5	0	0	0	0
690	428.5	0	0	0	0	690	705.7	0	0	0	0
720	433.3	0	0	0	0	720	711.6	0	0	0	0
780	442.3	0	0	0	0	780	722.5	0	0	0	0
840	450.6	0	0	0	0	840	732.1	0	0	0	0
900	458.2	0	0	0	0	900	740.8	0	0	0	0
960	465.2	0	0	0	0	960	748.5	0	0	0	0
1,020	471.6	0	0	0	0	1020	755.4	0	0	0	0
1,080	477.5	0	0	0	0	1080	761.5	0	0	0	0
1,140	483.0	0	0	0	0	1140	766.9	0	0	0	0
1,200	488.1	0	0	0	0	1200	771.8	0	0	0	0
1,260	492.8	0	0	0	0	1260	776.0	0	0	0	0
1,320	497.2	0	0	0	0	1320	779.8	0	0	0	0
1,380	501.2	0	0	0	0	1380	783.0	0	0	0	0
1,440	505.0	0	0	0	0	1440	785.8	0	0	0	0

The table above shows the Flygt N 3171 on the left side, and the larger Flygt N3202 on the right side for each of the two AEP scenarios.

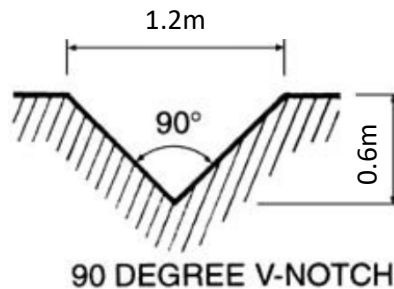
Based on this data, **it is recommended that the Flygt N 3171 pumps are used in this application, or an approved equal.** The Duty pump will be able to handle the majority of stormwater flows for most AEP events, and will only need the Assist pump for the highest intensity rainfall events.

Even so, for the 1% AEP 10 min event, the volume of stormwater will exceed the capacity of the wet-well. Therefore, it is recommended that a V-Notch overflow weir is included in the design of the wet-well, such that stormwater will be able to overflow in a controlled manner, and in a defined location. This overflow will also provide emergency discharge in the event of prolonged power failure.

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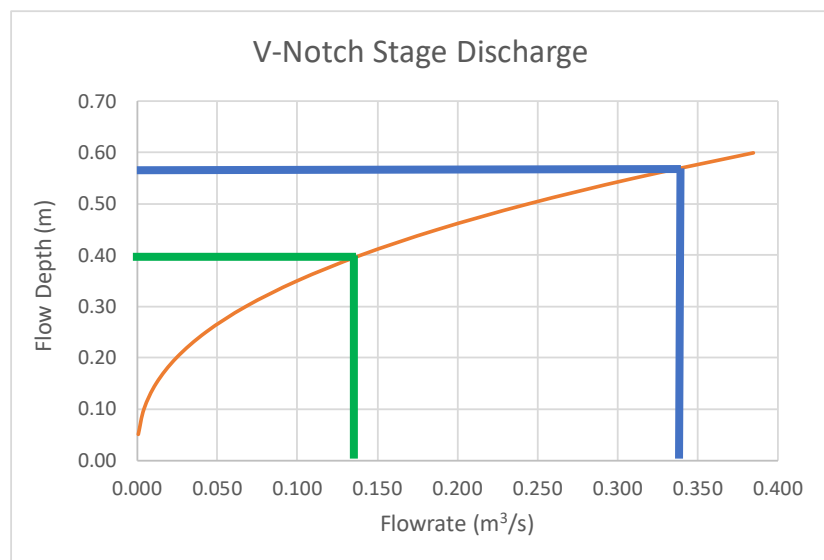
Power failure is the most common problem encountered by pump stations, and therefore provision must be included for alternative power – usually in the form of a plug for an emergency generator.

The V-Notch weir should be cast into the top riser for the wet-well, and consist of a 90° base angle, a depth of 0.6m and a width of 1.2m. This will require the top of the wet-well to be located approximately 0.8m above the ground, to allow for rip-rap energy dissipation to be placed below the weir, and extending along the discharge channel towards the existing natural drainage swale.



The nominal staged capacity of the V-Notch weir is shown in the table below, based on a standard sharp crested shape. Variations in the cross-sectional shape of the V-Notch weir may slightly change the stage discharge curve.:

V-Notch Stage Discharge	
Angle (°):	90.0
Discharge (C):	1.38
Depth (m):	Flow (m ³ /s)
0.60	0.385
0.55	0.310
0.50	0.244
0.45	0.187
0.40	0.140
0.35	0.100
0.30	0.068
0.25	0.043
0.20	0.025
0.15	0.012
0.10	0.004
0.05	0.001



As can be seen from the graph above, in blue, the 1% AEP peak flow of 0.34m³/s can be discharged from the V-Notch weir with a flow depth of ~0.57m. Therefore, the V-Notch weir can fully accommodate the peak stormwater flow condition during any emergency where the pumps are not operational.

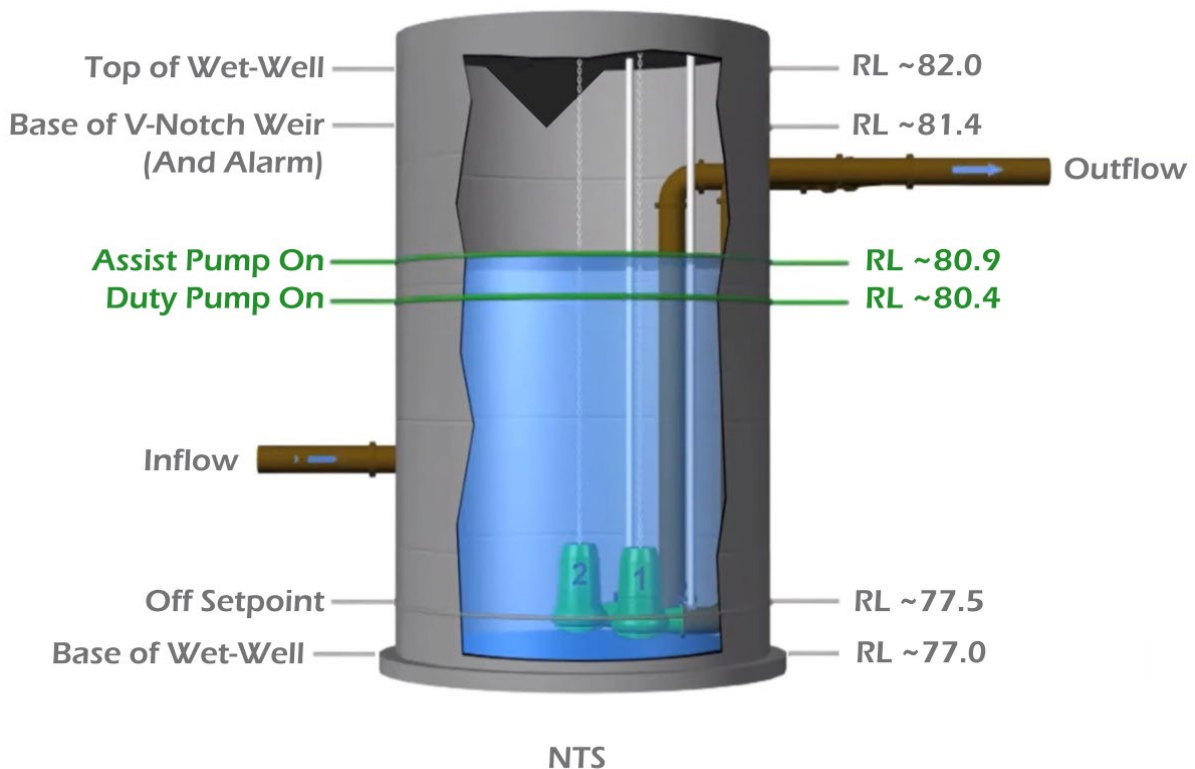
The combined Duty-Assist pump capacity is 0.21m³/s, being 0.13m³/s lower than the 1% AEP peak flow of 0.34m³/s. As shown in the V-Notch Stage Discharge graph, in green, this excess flow of 0.13m³/s can be discharged with a flow depth of ~0.4m during the peak inflow, while both pumps are operational. Further, this off-site

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discharge of $0.13\text{m}^3/\text{s}$ is less than the 1% AEP pre-development flow condition of $0.256\text{m}^3/\text{s}$.

Subsequently, an indicative wet-well operational configuration is shown in the figure below. Detailed design will be required to refine the size, depth, and associated set-points – and in alignment with both pump manufacturer and Gore DC requirements.

ALTERNATING DUTY-ASSIST PUMP STATION CONCEPT



This concept assumes that a combined 0.5m is required for Suction Clearance (base of wet-well to eye of impeller), and Minimum Pump Suction (eye of impeller to pump off setpoint).

The elevation of Inflow and Outflow pipe can vary, in accordance with minimum cover requirements, at a nominal 1.0m below grade.

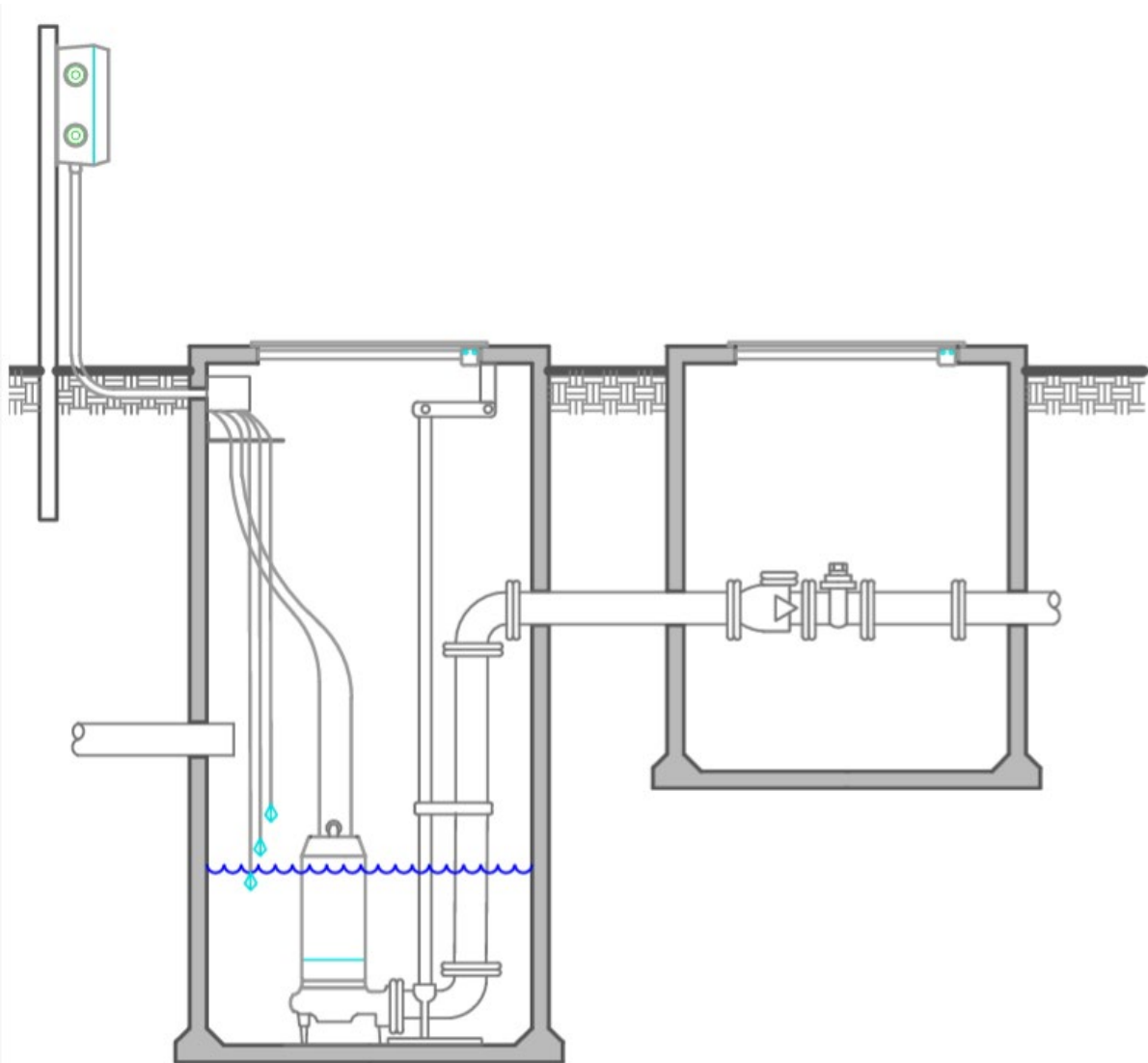
If additional flow buffering is required, the depth of the wet-well can be increased accordingly. The wet-well depth should not be any less than what is indicated above. Steps should be included within the wet-well, but access should be considered a Confined Space. A lockable lid should be included to prevent unauthorised access.

Pumps should be configured to cycle no more than 10 times per hour, and preferably less than 6 times per hour. Alternating the Duty Pump should make it possible to avoid short cycle operation.

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A separate valve chamber will be required, to include both check valves and gate valves on each piped discharge, and then typically the two outlets combine into one force main pipe routed up to the discharge point in Maud St. This chamber should also feature a lockable lid, interior steps, and an appropriate method for draining any water that enters the chamber. The figure below provides an indicative section of a valve chamber, albeit not to scale, and should not be located too near the wet-well.

An electrical control panel will also be required, to include all necessary pump controls. This panel and controls should be placed within a ground mounted weather resistant box as can be seen on page 12, rather than a rack mounted configuration as indicated in the graphic below.



The pump station needs to be located within a lockable, fenced enclosure, with adequate room for maintenance vehicles to maneuver as required. An access easement will also need to be provided, together with a suitable pavement.

This TM does not include detailed design, but rather provides a conceptual design to demonstrate the viability of this solution.

Conclusion

Based on the information contained within this TM, I can confirm that there are two viable stormwater solutions for the proposed Maud St. development.

- **Attenuate and store**, within an on-site pond system, discharging off-site at less than peak pre-development flow rates.
- **Attenuate and pump**, with an on-site pump station, discharging into an existing 225mm concrete stormwater pipe in Maud St.

The first option will take up more land, which has an associated cost, but will likely have much lower total construction costs.

The second option will take up less land, but will likely have higher construction costs.

At this time, I do not have enough information about the cost of land, nor the cost of construction, to make an informed recommendation about which of these options is best for the Owner. However, I can confirm that either option is viable, constructible, and should be able to obtain necessary Resource Consents.

This TM does not include Detailed Design, but has clearly outlined the conceptual solution for both a pond system, and a pump system, both of which can attenuate post-development stormwater flows to pre-development rates. There may be numerous variations of these two alternatives which will be viable.

This report is based on the information available to me at the time of writing, and as included within the TM.

A handwritten signature in black ink, appearing to read 'Warren D. Ladbrook', with a stylized, cursive script.

Warren D. Ladbrook, PE, CPEng, IntPE, F.Engr.NZ