NOTICE OF MEETING

Notice is hereby given of the Meeting of the Infrastructure Committee to be held in the Council Chamber, First Floor, Te Hinaki Civic Building, 101 Esk Street, Invercargill on Tuesday 2 May 2023 at 3.00 pm

Cr I R Pottinger (Chair)
Mayor W S Clark
Cr A J Arnold
Cr R I D Bond
Cr P M Boyle
Cr T Campbell
Cr A H Crackett
Cr G M Dermody
Cr P W Kett
Cr D J Ludlow
Cr N D Skelt
Cr L F Soper
Rev E Cook – Māngai – Waihōpai
Mrs P Coote – Kaikaunihera Māori – Awarua

MICHAEL DAY
CHIEF EXECUTIVE

Infrastructure Committee - Public

02 May 2023 03:00 PM

Agenda Topic — Page

Public Excluded Session

Moved , seconded that the public be excluded from the following parts of the proceedings of this meeting; namely,

a) Confirmation of Minutes of the Public Excluded Session of the Infrastructure Committee held on 4 April 2023
b) 3 Waters Transition – Programme Update

The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter, and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are as follows:

General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under Section 48(1) for the passing of this resolution
(a) Confirmation of Minutes of the Public Excluded Session of the Infrastructure Committee held on 4 April 2023	**Section 7(2)(i)** Enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations)	**Section 48(1)(a)** That the public conduct of this item would be likely to result in the disclosure of information for which good reason for withholding would exist under Section 7
(b) 3 Waters Transition – Programme Update	**Section 7(2)(h)** Enable any local authority holding the information to carry on, without prejudice or disadvantage, commercial activities **Section 7(2)(i)** Protect information where the making available of the information would be likely unreasonably to prejudice the commercial position of the person who supplied or who is the subject of the information	**Section 48(1)(a)** That the public conduct of this item would be likely to result in the disclosure of information for which good reason for withholding would exist under Section 7

MINUTES OF INFRASTRUCTURE COMMITTEE, HELD IN THE COUNCIL CHAMBERS, FIRST FLOOR, TE HINAKI CIVIC BUILDING, 101 ESK STREET, INVERCARGILL ON TUESDAY 4 APRIL 2023 AT 3.00 PM

Present:
Cr I R Pottinger (Chair)
Mayor W S Clark
Cr A J Arnold
Cr R I D Bond
Cr P M Boyle
Cr T Campbell
Cr A H Crackett
Cr G M Dermody
Cr D J Ludlow
Cr N D Skelt
Cr L F Soper
Rev E Cook – Māngai – Waihōpai

In Attendance:
Cr B R Stewart
Mr M Day – Chief Executive
Ms E Moogan – Group Manager – Infrastructure
Mr S Gibling – Group Manager – Leisure and Recreation
Mrs P Christie – Acting Group Manager – Finance and Assurance
Mr J Shaw – Interim GM – Consents and Compliance
Mr A Cameron – Chief Risk Officer
Mr M Morris – Manager – Governance and Legal
Mr R Pearson – Manager – Strategic Asset Planning
Mr P Nolan – Manager – Infrastructure Operations
Ms L McCoy – Asset Manager – Transport
Mr G Caron – Digital and Communications Advisor
Ms M Cassiere – Executive Governance Officer

1. Apology

Cr Kett

Moved Cr Soper, seconded Cr Dermody and **RESOLVED** that the apology be accepted.

2. Declaration of Interest

Nil.

3. Public Forum

Nil.

4. Minutes of the Meeting of Infrastructure Committee Held on Tuesday 7 March 2023

A4423399

Moved Cr Boyle, seconded Cr Crackett and **RESOLVED** that the minutes of the Infrastructure Committee held on Tuesday 7 March 2023 be confirmed.

5. Solid Waste Update

A4432498

Mr Peter Nolan was in attendance and provided a summary of the report. He noted that recycling had increased due to an increase in tonnages coming through.

Note: Mayor Clark and Cr Campbell joined the meeting at 3.04 pm.

In response to queries around the details of the school sustainability network programme and how its impact would be monitored, it was noted that this programme was delivered by The Sustainability Trust and teachers would be taught about inclusion of waste reduction in their teaching curricula. It was noted that the Trust was also seeking a facility in Invercargill through which education around waste reduction would be provided free of charge.

In response to a query about the type of monitoring around the expected change as a result of an investment, it was noted there were no insights at the moment however, it was expected that the schools would report their improvements.

In the response to a query about whether the Trust would stipulate that schools monitor and report back on effectiveness, it was noted that this aspect had not been considered by staff however, it would be free of charge and a good way forward.

In response to a query about whether a communication strategy around the campaign of minimisation in schools was considered, it was noted that a communication or the education strategy had been prepared and that the budget was being worked on at present. This would then be presented to the Waste Advisory Group (WasteNet) for their acceptance and implementation.

In response to queries about whether Para Kore had been approached to work with Council and if they had, why was there no mention of them in the report, it was noted that they had been approached for metrics on improvements made by them. It was also noted that the non – inclusion was an oversight.

In response to a query about the timeline in the education campaign for adults on good habits around recycle materials, it was noted that the waste minimisation education strategy had been divided into residential and commercial. There would also be a focus on the recycling aspect as part of the minimisation strategy. The timeline for the campaign for adults would be in the new financial year.

In response to a query about the budget for the education campaign, Ms Moogan noted that background information to provide context around the national stance would be helpful. She said that central government was considering standardisation of what was being collected and recycled by councils nationwide, and they had recently

made some announcements. Council had not pushed hard on the recycling message and there had not been a clear direction on what should be collected by councils, however, now that the direction had been provided and would have to be standardised by early next year. Work could now commence around the message campaign about what good recycling would look like going forward. She also noted that although Council held the direct contract for recycling, waste education was part of WasteNet and would come out of the joint budget of WasteNet.

Moved Cr Ludlow, seconded Cr Campbell and **RESOLVED** that the Infrastructure Committee:

1. Receive the report "Solid Waste Update".
2. Note the waste to landfill data and trends.
3. Note the recycling data and trends.

6. Bluff Wastewater Consent Renewal

A4369618

Ms Erin Moogan spoke to the report. She noted that nationally there were discussions on what could and could not be done in terms of wastewater consents moving forward, and whether it would be appropriate to continue to discharge to water-based environments, and that this would be a key element through this process. She also noted that to ensure there were no assumptions on what the consent would look like, an extensive working group was being proposed for the process. She said that the process would transition over the current timetable for the new Three Waters entity however, the process would have to commence before the new entity was in place to ensure there would be sufficient time for the entity to get consent in place. She also clarified that there was a typographical error in the report and said that the new entity was to start in 1 July 2024 and not 1 July 2023.

In response to a query whether the working group included a member of the Bluff Community Board, it was noted in the affirmative and that it was an oversight that the name was not included.

A query was raised about defining staff members by their iwi as included in the report. It was noted that Council had not done consent of this type for quite a while and officers had reached out to their peers for advice. They were advised that in addition to including elected members and Mana Whenua representatives, it would be beneficial to also include a staff representative who was a member of an iwi. The team had suggested that it would be preferable if the staff representative was someone with a South Island Ngāi Tahu perspective.

Discussion took place on the appropriateness of defining the iwi of someone and whether there were too many Council staff in the working group.

In response to a query about why Environment Southland was a stakeholder when Council would be submitting to them for consent, it was noted that it was to ensure that Council was doing everything correctly as part of the process.

Moved Cr Soper, seconded Cr Boyle and **RESOLVED** that the Infrastructure Committee:

1. Receive the report 'Bluff Waste Water Consent Renewal'.
2. Note the Bluff Wastewater Treatment consent renewal process be started as per the attached program.
3. Note that an initial project group be formed and consultant RFP be drafted.

7. Transport Procurement Strategy for National Land Transport Activities

A4428670

Mr Russell Pearson spoke to the report. He noted that this report was a follow-on from the draft procurement strategy which was brought to Council in December 2022. It was a key strategy as it would entitle Council to be able to claim subsidy from Waka Kotahi. A letter of endorsement had been provided by Waka Kotahi and that the transport procurement strategy aligns with Council's procurement strategy as well.

Moved Cr Bond, seconded Cr Campbell and **RESOLVED** that the Infrastructure Committee:

1. Receive the report "Transport Procurement Strategy for National Land Transport Activities".

Recommends to Council:

2. To adopt the Invercargill City Council Transport Procurement Strategy (Financial Assisted Land Transport Activities) 2022 -2025.

8. ANZAC Day Road Closure

A4429231

Mr Russell Pearson spoke to the report and noted that this was a procedural process to allow for temporary closure of roads for events.

Mr Andrew Cameron was invited to speak about the new development around public events. He said that when Council land or facilities were used for events, there was an expectation of a joint responsibility between the person conducting a business or undertaking (PCBU) and Council. What it meant was that by allowing public to host events in Council land or facilities, Council would not be absolved of the health and safety obligations for those events. As such, moving forward event organisers would be asked to also provide evidence of their workplace health and safety plan.

In response to a query whether enough of Kelvin Street was being closed off for the event, it was noted that Council's traffic management planner responded to requests by the event planner and that further segments for closure had not been requested.

In response to queries whether there were ANZAC Day traffic management plan for other places apart from Invercargill, such as Bluff and whether were people aware that they could request for road closures, it was noted that the Bluff road was managed by

Waka Kotahi and that such issues would have to be addressed to them, and not to Council. With regard to others, most event organisers and planners were aware that they need to apply and speak with Council about their events and provide relevant information.

It was noted that the tweak to the process would be for event organisers and planners to provide the health and safety plan along with the other pieces of information.

In response to query whether Council was supposed to review and approve those health and safety plans, it was noted that Council should not do that. It would be for the event organiser should showcase their health and safety plan.

In response to queries about where would Council's liability begin and whether Council needed to simply see the health and safety plan, it was noted that Council used the legislation to formally close the road on a temporary basis, and that approvals could be provided subject to appropriate plan being received by Council.

Discussion took place whether recommendation three should be altered to include the words 'subject to receiving an appropriate health and safety plan for the event'. It was noted that moving forward, inclusion of a health and safety plan would be part of the process and therefore recommendation three did not require any alterations.

It was noted that a report on Council's liabilities be brought back to the Committee.

Moved Cr Soper, seconded Cr Boyle and **RESOLVED** that the Infrastructure Committee:

1. Receive the report titled "Temporary Road Closures – ANZAC Day 2023".
2. Resolve that the proposed event outlined in the report will not impede traffic unreasonably.
3. Approves the temporary road closures for Gala Street and Victoria Avenue on 25 April 2023 as outlined in Appendix 1 (A4429234), as permitted under the Local Government Act 1974 (Section 342 and Schedule 10).

9. Closed Circuit Television Update April 2023

A4443421

Mr Russell Pearson spoke to the report and noted that assessment for the requirement for closed circuit television (CCTV) cameras in the city had been completed. He said that the working group strongly endorsed installation of CCTV cameras for all regions, and not only the city centre. He also said that recommendation 7 had been amended and would be read as recommendation 6c.

In response to a query whether the system would be set up and governed by Council, it was noted that the equipment would be stored in Council and owned by Council, and streaming would be permitted to those parties as allowed under Council's privacy policy.

In response to a query about the impact on the Privacy Act due to the ability of using the system, it was noted that Council would be owner of the information and could determines who would be permitted to the information. What they do with the information would not be in Council's control. The privacy obligation would rest with

Council however, as soon as the information was handed over then Council would have fulfilled its duty under the Privacy Act.

It was also noted that should the information be used in an inappropriate manner and privacy was breached, then Council would be liable. It would be the duty of Council, under the Privacy Act, to ensure that the collection would be appropriate to be given to another agency, and that recipient of the information would be the appropriate authority to receive the information. Council would be liable since the obligation of the collection of the information would rest with the collector of the information which would be Council in this case.

It was noted that Council's CCTV policy would be revised and update the privacy policy as well.

Moved Cr Skelt, seconded Cr Soper and **RESOLVED** that the Infrastructure Committee:

1. Receives the report "Closed Circuit Television Update – April 2023".
2. Endorses the implementation of City wide focus and with extended budget.
3. Confirms that the City Centre is the priority area to progress.

Moved Cr Soper, seconded Cr Skelt and **RESOLVED** that the Infrastructure Committee **recommends to Council:**

4. That Council requests staff to allocate additional budget of up to $200,000 for the 2023/2024 year for the CCTV project, noting this will have a rates percentage increase for the 2023/2024 year of 0.02%.
5. Requests staff complete the Privacy Impact Assessment and review of Council Privacy Policy be completed and implemented prior to the system going live.

Moved Cr Soper, seconded Cr Skelt and **RESOLVED** that the Infrastructure Committee **recommends:**

6. **That Council** notes that:
    i. Capital funding for CCTV (of up to $550,000) could be included as a Long Term Plan request for the additional regions; and
    ii. Operational costs, estimated to be $150,000 per annum be also included in budgets.

10. Activities Report

A4440816

Ms Erin Moogan spoke to the report. She provided a verbal update about the disruptions to the streets around stormwater work, crossing Dee Street to up above Herbert Street. As part of the work, the team were required to go quite deep under the road, which led to an archaeological find. As such, the work would now have to take place under an archaeological authority to document the find and therefore, further time would be added to complete the stormwater work. Since the Easter holiday period was fast approaching, it was decided that the work would be closed up and reopened the road for the holidays. The work would then start again after the holidays.

In response to a query about why Don Street was dug up again, it was noted that the main project had been completed however, there were quality issues and the defects were now being corrected. This work would be done at the cost of Downers.

In response to a query whether the new homes opened to take up the slack, it was noted that construction on the new homes had not yet started. It was also noted that a programme to upgrade old housing stock was in place which meant that initially more houses would not be added to the housing stock.

In response to a query whether the number of people on the waiting list would reduce significantly, it was noted that there would not be a significant decrease with Council's current investment profile.

In response to a query about whether potholes were developing quickly since the last report said there were 7 potholes and this report said there were 30 potholes, it was noted that the number 30 seemed a more likelier number but the information would be checked and provided.

Moved Rev Cook, seconded Cr Dermody and **RESOLVED** that the Infrastructure Committee:

1. Receives the report "Activities Report".
2. Notes the traffic signal outage in February as a result of lightning strike and the associated upgrade of the network.
3. Note the milestone completion of works in Esk and Don Streets and the great outcomes and feedback in this space.

11. Public Excluded Session

Moved Cr Dermody, seconded Rev Cook and **RESOLVED** that the public be excluded from the following parts of the proceedings of this meeting, namely:

a. Confirmation of Minutes of the Infrastructure Committee held on Tuesday 7 March 2023

b. Volumes and Cost of Kerbside Collection

c. Contract 944 – Road Resurfacing 2021 – 23 – Contract Term Extension

The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter, and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are as follows:

General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under Section 48(1) for the passing of this resolution
	Section 7(2)(i)	**Section 48(1)(a)**
a. Confirmation of Minutes of the Infrastructure Committee held on	Enable any local authority holding the information to carry on,	That the public conduct of this item would be likely to result in the disclosure of

	Tuesday 7 March 2023	without prejudice or disadvantage, negotiations (including commercial and industrial negotiations)	information for which good reason for withholding would exist under Section 7
b.	Volumes and Cost of Kerbside Collection	**Section 7(2)(i)** Enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations)	**Section 48(1)(a)** That the public conduct of this item would be likely to result in the disclosure of information for which good reason for withholding would exist under Section 7
c.	Contract 944 – Road Resurfacing 2021 – 23 – Contract Term Extension	**Section 7(2)(b)(ii)** Protect information where the making available of the information would be likely unreasonably to prejudice the commercial position of the person who supplied or who is the subject of the information	**Section 48(1)(a)** That the public conduct of this item would be likely to result in the disclosure of information for which good reason for withholding would exist under Section 7

There being no further business, the meeting finished at 4.25 pm.

ADOPTION OF THE CODE OF PRACTICE FOR SUBDIVISION, LAND USE, AND DEVELOPMENT FOR CONSULTATION

To:	Infrastructure Committee
Meeting Date:	Tuesday 2 May 2023
From:	Rhiannon Suter, Manager – Strategy and Policy and Russell Pearson, Manager – Strategic Asset Planning
Approved:	Erin Moogan - Group Manager - Infrastructure
Approved Date:	Thursday 27 April 2023
Open Agenda:	Yes

Purpose and Summary

This report provides the committee with the draft Code of Practice for Subdivision, Land Use, and Development for adoption for consultation. This Code is intended to replace the current bylaw.

Recommendations

That the Infrastructure Committee:

1. Receive the report "Adoption of the Code of Practice for Subdivision, Land Use, and Development for Consultation."
2. Note that the draft Code of Practice for Subdivision, Land Use, and Development has been developed in collaboration with Southland District Council and is intended to replace the existing separate Bylaw.
3. Agree to consult the community on revoking the Code of Practice for Land Development and Subdivision Infrastructure Bylaw.
4. Agree to consult the community on amending the District Plan to update the reference to the new document.
5. Adopt for consultation the draft Code of Practice for Subdivision, Land Use and Development – Option 1 (A4474536)
6. Adopt the proposed consultation process within the Invercargill District Council Plan 2019 – Plan Change 2 (A4505390)
7. Adopt the terms of reference for the Hearing Panel, to be made up of three members from Invercargill District Council and three members from Southland District Council (A4492736)
8. **Recommend to Council** the following delegates to the Hearing Panel – ***insert names [three delegates and one alternate]***

Background

When providing consents for new developments and subdivisions Council has requirements which developers need to meet in relation to connecting infrastructure such as three waters and roading. At present these standards are laid out in the Code of Practice for Land Development and Subdivision Infrastructure Bylaw which is due to expire at the end of June 2023. Developers are required, by their Resource Consent, to prepare detailed engineering plans which can demonstrate that they meet the Bylaw (at present) and submit these to Council for review and approval. This proposed change means the technical engineering information requirements will be in a Code of Practice rather than a Bylaw.

It is important to commence the consultation process now in order to ensure that the new Code of Practice will be in force in July 2023 in order to avoid a situation where Council has no enforceable standards. Council officers have been working with Southland District Council officers over the last eighteen months to produce the new appended Code of Practice.

For many years the developers and consultants have commented that each Council has different standards to meet and this can be both confusing and costly for both designing and supplying specific components (such as manhole covers etc.) to that Council. This new Code of Practice looks to align both Invercargill City and Southland District to one agreed standard which will make the process for the developers a much more effective outcome. It is expected this will be welcomed by the industry.

The current Bylaw and SDC Code are relatively old documents and a refresh of terminology, the standards and parts now required along with the design philosophy (e.g. stormwater designs) used in the industry.

The base document used by the ICC Bylaw (NZS 4404) is a document developed in 2010 and has not been updated since, and whilst still relevant it needs a Southland based approach applied which aligns to current best operational practice across Southland as a whole. The assets formed from these subdivisions are typically vested with Councils at completion and then are required to be maintained by Council.

The Engineering teams at both Councils have worked closely to agree what is best practice. This is something that over the years has not occurred with each Council having set their own expectations and desires into the drawings and methods used and this has caused some potential for confusion and mistakes with contractors doing works.

In previous ICC documents the Landscape elements in the Bylaw have been relatively light in information and the new Code is an opportunity to further develop this area.

As part of the review a number of opportunities were identified:

- A different regulatory structure which would be more flexible and responsive to changes in engineering knowledge and technology and current practice in relation to issues such as Te Ao Māori, climate change and water management.
- Alignment with Southland District Council in order to provide a more cohesive experience for developers across the region.

Te Ao Marama Inc. were involved in the process for developing the new Code of Practice but will also require more time to provide more in-depth process. The new Code of Practice format means that the Code of Practice can be updated more frequently in the future.

Issues and Options

Analysis

Engineering standards and knowledge of issues such as Te Āo Māori, climate change and effective water management has moved considerably since the establishment of the Bylaw in 2016.

A bylaw is a somewhat unusual mechanism to use for regulating infrastructure standards for new developments. Many Councils use Code of Practice status documents, which enable more frequent updating and the enforcement is under the District Plan/ Resource Management Act 1991. This has been assessed as the most appropriate model for Invercargill, which has taken no enforcement action under the existing bylaw. New consents will refer to the requirements of the Code of Practice and enforcement will be managed under the relevant terms of the District plan/ Resource Management Act 1991. As noted above, Council will continue to receive detailed plans for review and be able to discuss the engineering detail through the approval; process all that would change is there is a better ability to update the Code and to take enforcement action where and if needed.

Many of the developers who work within Invercargill, also work within the Southland District. There is a significant opportunity to provide a more consistent experience for them by aligning with Southland District Council to create one single document.

The attached draft has been produced by teams working across Invercargill and Southland District Councils, with the support of specialist infrastructure consultants.

There are a number of changes which are needed to align the previous ICC and SDC documents as they have different base information. A good example of this is that the ICC standard detail drawings have been agreed to be used as the baseline as it is recognised that over time the industry had been using these in the SDC area.

The proposed Code remains aligned to NZS 4404 which is the national standard in this Land Development area.

The key changes included in the draft for consultation are summarised below.

Climate Change

From the draft Code of Practice: Climate change is likely to increase the magnitude and frequency of some hazards, therefore it is important to incorporate risk management in the design of infrastructure supporting new developments to maintain the same level of service throughout the design lifetime. The design of infrastructure for land development and subdivision needs to provide for the impact of sea level rise and the increased frequency of extreme weather events especially storm water impacts. To this end requirements for stormwater design set out in the Code of Practice include requirements for climate change and define the storm events to be designed to for primary and secondary drainage systems.

General

The Code of Practice represents an alignment of minimum standards and guidance across both the SDC and ICC, to provide consistent minimum standards and guidance for assets that

both Councils will accept as part of their networks. This will also help bring efficiency to the market by having common infrastructure requirements across both Councils.

References in the Code of Practice to other engineering publications, and central government requirements, have been updated to reflect current industry best practice and assist in regulatory compliance.

Roading

The Waka Kotahi One Network Framework, which is the new national classification system to assist Council in benchmarking roads has been incorporated into the Code of Practice. This looks to ensure the network is fit for purpose for all modes of transport placing an emphasis on movement and place, integrating transportation with urban planning.

The number of different road types in the road hierarchy has been reduced in order to simplify the types of roads that can be built within Council's network, and to comply with the Waka Kotahi One Network Framework.

Whole of life asset cost considerations have been updated, which designers must take into account when selecting proposed roading assets. This seeks to further reinforce that the right assets are being selected based on their long-term costs, not just their capital costs.

Minor changes and updates to roading infrastructure specifications throughout the Code of Practice have been updated to reflect current good practice.

Three waters

The Code of Practice maintains a catchment-based approach with consideration of changes in catchment hydrology, rainfall patterns, and sea level rise from climate change effects.

The Code of Practice specifically promotes opportunities in stormwater design to use or replicate natural drainage systems, with emphasis on low-impact design. It also now promotes sustainable drainage solutions aim to store, treat, dissipate, and reuse as much stormwater as is possible at the source, thereby reducing total volumes being transported via networks away from the development.

Requirements for stormwater design have been updated accounting for latest climate change statistics, including designing for climate change affected storm events in relation to primary and secondary drainage systems.

The Code of Practice seeks to improve standards relating to water quality, in conjunction with our Stormwater bylaw.

Specifications and standard engineering drawings have been updated to reflect current good practice. References to specific assets available from market suppliers in Southland have been updated.

Specifications and standard engineering drawings in relation to water supply have been updated to ensure assets are being placed in appropriate locations, and to reflect latest best practice in supply of safe drinking water.

Landscaping and Community Facilities

The Code of Practice has been updated to include reference to the latest Reserves Management Plans, and activity management plans.

Guidance has been updated on construction of facilities/amenities within reserves such as sports fields and playgrounds, open spaces, and access tracks.

Significance

The issue is significant as consultation on bylaws in line with the special consultative procedure is required under the Local Government Act. Following establishment of a new Code of Practice targeted consultation with affected parties will be sufficient to enable further changes.

Consultation is also required on a District Plan Change under Schedule 1 Clause 5A to amend the reference from the Bylaw to the new Code of Practice. Consultation on this will take place alongside the Bylaw consultation.

Options

Option 1 – Revoke the ICC Bylaw and replace with a combined Invercargill/ Southland District Code of Practice

This would result in a new Code of Practice which reflects current practice, is more easily updated and aligns with Southland District, allowing a more consistent experience for developers. This is the recommended option.

Option 2 – Revoke the ICC Bylaw and replace with an Invercargill District Code of Practice

This option would result in a new Code of Practice with the benefits as outlined above, with the exception of alignment with Southland District.

Option 3 – Consult on and replace the existing ICC bylaw as written

This option would result in an updated version of the existing bylaw. This option is not recommended as it will result in a bylaw which does not reflect current practice, does not align with Southland District and is under an enforcement structure which makes review more difficult and is not required for enforcement,

Community Views

This issue is primarily of interest to developers and the technical consultants who work with them. Relevant companies have been involved in a pre-engagement workshop in preparation of the draft Code of Practice. Initial feedback was positive, noting consultants looked forward to engaging on the detail during the consultation process. The collaboration with Southland District Council was seen as a very positive step towards a more consistent experience for developers. There was recognition of the importance of reflecting more up to date standards on water and climate change.

Consultation on the proposed new Code of Practice will take place between 8 May and 8 June 2023. Materials will be available online at letstalk.icc.govt.nz, at the Civic Administration Building, the Bluff Service Centre and the Library as well as at relevant locations within the Southland District. It will be expected that a range of questions will be asked by the consultants through the consultation to clarify any historical understandings which will now be consolidated into the new Code.

It is expected that the community will see this as a positive step in aligning the development standards.

Implications and Risks

Strategic Consistency

The draft Code of Practice aligns with the District Plan and is consistent with the relevant national standard (NZS 4404).

Financial Implications

There are no significant financial implications to Council for the change in status of the Code of Practice. Collaboration with Southland District Council and Te Ao Marama Inc. will be required on an ongoing basis to make further changes as required.

It is noted that the developers and suppliers are likely to be able to get better value in time in that there is only one standard and specification to meet.

Legal Implications

The change in status from a Bylaw to a Code of Practice will change the enforcement mechanism and the consultation requirements for updating the Code of Practice in the future. Enforcement will take place via the District Plan/ Resource Management Act 1991 mechanisms. The implications of this are limited as no enforcement have taken place under the Bylaw mechanism over the last seven years which the Bylaw has been in force. The Resource Management Act provides better options where enforcement is needed than the very basic options available under a Bylaw. While it is not expected that there will be a sudden increase in enforcement actions it adds another set of useful tools to help officers. Consultation requirements will be reduced, focusing on targeted rather than widespread public consultation, which will make it easier to keep the Code of Practice current.

Council is required under the Resource Management Act 1991 to follow the correct process in undertaking a Plan Change: under Schedule 1 Clause 5A; Option to give limited notification of proposed change or variation of the RMA as the Code of Practice consultation undertaken has identified all persons directly affected by the Code of Practice and by extension its adoption in the District Plan. Engagement has commenced with relevant developers and consultations who use the Code of Practice. In addition public advertising will alert the general public to the proposed changes in order that they can submit if desired, although this is not anticipated due to the technical nature of the document.

Climate Change

The Code of Practice has been updated to reflect current engineering practice in the area of climate change. Climate change is likely to increase the magnitude and frequency of some hazards, therefore it is important to incorporate risk management in the design of infrastructure supporting new developments to maintain the same level of service throughout the design lifetime. The design of infrastructure for land development and subdivision needs to provide for the impact of sea level rise and the increased frequency of extreme weather events especially storm water impacts. To this end requirements for stormwater design set out in the Code of Practice include requirements for climate change and define the storm events to be designed to for primary and secondary drainage systems.

Risk

The risk presented by the change of status is assessed as low as appropriate enforcement functions exist under the District Plan. The risk presented by the Code of Practice requiring outdated standards will be reduced through supporting more frequent review of the Code of Practice. A review after the first year is intended to allow more fulsome reflection of Te Āo Māori and to deal with any issues presenting through the first year of operation of the Code, as well as any changes made to the National Standard.

Again, it is noted that detailed engineering plans are reviewed based on the Code and these when approved are constructed. Any issues in design or interpretation is identified and corrected at this approval stage.

Next Steps

Following adoption for consultation, consultation will commence on 8 May 2023, with the Invercargill members of hearing panel delegated by Council at the May Council meeting. Hearings are planned for 19/20 June 2023.

Attachments

1. Attachment 1 - Draft Code of Practice for Consultation (A4474536)

2. Attachment 2 – District Plan 2019 Plan Change 2 (A4505390)

3. Attachment 3 - Terms of Reference for the Hearing Panel (A4492736)

Southland District Council and Invercargill City Council

Subdivision, Land Use, and Development Code of Practice 2023

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Contents

Foreword

The purpose of this Code of Practice (CoP) is to set out how to manage and regulate Subdivision, Land Use, and Development within the Southland District and Invercargill City.

This CoP seeks to ensure that subdivision, land use and development within the Southland District and Invercargill City takes place in a manner which is environmentally, socially and culturally sustainable whilst balancing the need to be technically robust.

This robustness is very important in order to ensure works undertaken in new developments are durable and future focused, will not impose costs (both environmental and financial) and difficulties onto future generations, nor expose Southland District Council or Invercargill City Council and its communities to undue future liabilities and costs.

This CoP supersedes the Southland District Council Subdivision and Land Development Bylaw 2012, and the Invercargill City Council Code of Practice for Land Development and Subdivision Infrastructure Bylaw 2016.

Section 1. Introduction

1.1 General

The CoP is a document that sets out network asset design and construction requirements for the Southland District and Invercargill City.

These requirements will aid council in achieving the objectives and levels of service as set out in the Long Term Plans and Resource Management Plans.

1.2 Purpose

It is intended to provide consistent minimum standards and guidance for assets that council will accept as part of its network. This includes requirements suitable for ongoing operations and maintenance of these assets. It also includes requirements relevant to network assets which will remain in private ownership but connect to public assets.

1.3 Relationship with Ngāi Tahu ki Murihiku

The Invercargill City Council and Southland District Council acknowledge and gracefully respect Ngāi Tahu ki Murihiku as Rangatira over the Murihiku takiwā, having rights and responsibilities to protect the environment "mō tātou, ā mō ka uri, ā muri ake nei" – for us and our children after us.

Ngāi Tahu ki Murihiku is made up of four Papatipu Rūnanga being Te Rūnanga o Awarua, Te Rūnanga o Hokonui, Te Rūnanga o Oraka Aparima and Waihopai Rūnaka, who hold equally, mana whenua and kaitiaki status over the takiwā. Ngāi Tahu ki Murihiku will bring a depth of knowledge, experience and values which will expand the knowledge base of infrastructure providers and invariably strengthen this CoP.

Across infrastructure planning and design, users of this CoP are encouraged to adopt a partnering approach with mana whenua to ensure Ngāi Tahu ki Murihiku values and aspirations are accurately reflected within infrastructure project planning from inception. This collaborative approach will result in outcomes that have the greatest benefit for all whom it is designed to serve, unlocking economic, environmental, social and cultural benefits.

Te Tangi a Tauira (The Cry of the People) is the Iwi Management Plan providing strategic planning directions important to Papatipu Rūnanga o Murihiku, with policies to guide users of this CoP.
The CoP is a document intended to evolve over time, and its relationship with the values and aspirations of Ngāi Tahu whānui will similarly evolve.

1.4 Relationship with the Building Act

The Building Act provides a national framework for building control to ensure that buildings are safe and sanitary and have suitable means of escape from fire. The Building Regulations made under the Act provide the mandatory requirements for building control in the form of the New Zealand Building Code. The Building Code contains the objective, functional requirements, and performance criteria that building works shall achieve.

Where the development of land and subdivision infrastructure involves the creation of structures with associated site works, including specific aspects of stormwater management and the interaction of buildings, fences, and walls with stormwater flows, the requirements of the Building Act shall be observed. Nothing in this Code of Practice shall detract from the requirements of the Building Act or the Building Code.

1.5 Document Structure

The CoP document has been laid out with the following chapters:

1. Introduction
2. References and Abbreviations
3. General Requirements and Procedures
4. Earthworks and Geotechnical Requirements
5. Roads
6. Stormwater
7. Wastewater
8. Water Supply
9. Network Utility Services
10. Landscape
11. Community Facilities

Section 1 of this CoP outlines matters of general application and general requirements to be observed.

Section 2 lists the referenced documents and abbreviation for this CoP.

Section 3 to 11 of this CoP provides specific provisions on particular types of infrastructure to be provided.

The CoP also provides best practice land development and subdivision infrastructure techniques in low impact design, climate change, and urban design.

The provisions of this CoP does not reduce the responsibility of professionals to exercise their judgement and devise appropriate solutions for the particular circumstances of each development.

The Council standards as set out in this document are intended to reflect the minimum standard required by the Council. They should not be seen as a replacement for professional engineering design.

Section 2. References and Abbreviations

2.1 Referenced Documents

Reference is made in this CoP to the following documents. Where an Act or Standards document is referenced, this must be the current version including any associated amendments or applicable successor.

2.1.1 Local Planning Documents:

Environment Southland regional Council - Regional Plans

Invercargill District Council Code of Practice for Land Development and Subdivision Infrastructure Bylaw: 2016

Southland District Plan: 2018

Southland 10 year Long Term Plan: 2018 – 2028

2.1.2 New Zealand Standards

NZS 1170	Structural design actions
NZS 3104	Specifications for concrete production
NZS 3109	Concrete construction
NZS 3114:	Specification for concrete surface finishes
NZS 3116	Concrete segmental and flagstone paving
NZS 3121	Water and aggregate for concrete
NZS 3501	Specification for copper tubes for water, gas and sanitation
NZS 3604	Timber-framed buildings
NZS 4058	Specification for pre-cast concrete drainage and pressure and non-pressure pipes
NZS4121	Design for access and mobility: Buildings and associated facilities
NZS 4241	Public toilet
NZS 4402	Methods of testing soils for civil engineering purposes
NZS 4404	Land development and subdivision infrastructure
NZS 4431	Code of practice for earth fill for residential development
NZS 4442	Welded steel pipes and fittings for water, sewage and medium pressure gas
NZS 4501	Code of practice for the location and marking of fire hydrants
NZS 4522	Underground fire hydrants and surface box frames and fittings
NZS 5828	Playground equipment and surfacing
NZS 6803	Acoustics – Construction Noise
NZS 7643	Code of Practice for the installation of un-plasticised PVC pipe systems
NZS 8409	New Zealand standard for the management of agrichemicals
NZS 8630	New Zealand handbook – tracks and outdoor visitor structures
NZS/AS 1657	Fixed platforms, walkways, stairways and ladders. Design, construction and installation
NZS/BS 21	Pipe threads for tubes and fittings
NZS/BS 5163	Specification for predominantly key operated cast iron gate valves for water works purposes

SA/SNZ TS 1158.6	Lighting for roads and public spaces – Part 6 Luminaires – Performance
NZS 5828	Playground equipment and surfacing
SNZ PAS 4509	New Zealand Fire Service firefighting water supplies code of practice

2.1.3 Joint Australian/New Zealand Standards

AS/NZS 1100	Technical drawing: structural engineering drawing
AS/NZS 1158	Lighting for roads and public spaces AS/NZS 1254 PVC-U pipes and fittings for stormwater and surface water applications
AS/NZS 1260	PVC-U pipes and fittings for drain, waste and vent applications
AS/NZS 1477	PVC pipes and fittings for pressure applications
AS/NZS 1546	On-site domestic wastewater treatment units
AS/NZS 1547	On-site domestic wastewater management
AS/NZS 2032	Installation of PVC pipe systems
AS/NZS 2033	Installation of polyethylene pipe systems
AS/NZS 2041.4	Buried Corrugated Metal Structures - Helically formed sinusoidal pipes
AS/NZS 2280	Ductile iron pipes and fittings
AS/NZS 2544	Grey iron pressure fittings
AS/NZS 2566	Buried flexible pipelines
AS/NZS 2638	Gate valves for water works purpose – resilient-seated
AS/NZS 2890	Parking facilities
AS/NZS 3000	Electrical installations (Australian/New Zealand wiring rules)
AS/NZS 3500	Plumbing and drainage
AS/NZS 3518	Acrylonitrile butadiene styrene (ABS) compounds, pipes and fittings for pressure applications
AS/NZS 3690	Installation of ABS pipe systems
AS/NZS 3725	Design for installation of buried concrete pipes
AS/NZS 4793	Mechanical tapping bands for waterworks purposes
AS/NZS 3845	Road safety barrier systems
AS/NZS 3879	Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS pipes and fittings
AS/NZS 4020	Testing of products for use in contact with drinking water
AS/NZS 4058	Precast concrete pipes (pressure and non-pressure)
AS/NZS 4065	Concrete utility services poles
AS/NZS 4087	Metallic flanges for water works purposes
AS/NZS 4129	Fittings for polyethylene (PE) pipes for pressure applications
AS/NZS 4130	Polyethylene (PE) pipes for pressure applications
AS/NZS 4131	Polyethylene (PE) compounds for pressure pipes and fittings
AS/NZS 4158	Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
AS/NZS 4331	Metallic flanges – Part 2: Cast iron flanges
AS/NZS 4441	Oriented PVC (PVC-O) pipes for pressure applications
AS/NZS 4676	Structural design requirements for utility services poles
AS/NZS 4677	Steel utility services poles
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4765	Modified PVC (PVC-M) pipes for pressure applications
AS/NZS 4793	Mechanical tapping bands for waterworks purposes
AS/NZS 4819	Rural and Urban Addressing
AS/NZS 4998	Bolted unrestrained mechanical couplings for waterworks purposes

AS/NZS 5065	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

2.1.4 Australian Standards

AS 1579	Arc-welded steel pipes and fittings for water and wastewater
AS 1646	Elastomeric seals for water works purposes
AS 1741	Vitrified clay pipes and fittings with flexible joints - Sewer quality
AS 1906	Retroreflective materials and devices for road traffic control purposes
AS 2129	Flanges for pipes
AS 2200	Design charts for water supply and sewerage
AS 2638	Gate valves for waterworks purposes – Resilient seated
AS 2700	Colour Standards for general purposes
AS 2870	Residential slabs and footings - Construction
AS 3571	Plastics piping systems - Glass-reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin
AS 3572	Glass filament reinforced plastics
AS 3681	Application of polyethylene sleeving for ductile iron piping
AS 3996	Access covers and grates
AS 4181	Stainless steel clamps for water purposes
AS 4702	Polymeric cable protection covers

2.1.5 British Standards

BS EN 295:	Vitrified clay pipes and fittings and pipe joints for drains and sewers
Part 1	Requirements
Part 2	Quality control and sampling
Part 3	Test methods
Part 4	Requirements for special fittings, adaptors and compatible accessories
Part 6	Requirements for vitrified clay manholes
Part 7	Requirements for vitrified clay pipes and joints for pipe jacking
Part 10	Performance requirements
BS EN 805	Water supply - Requirements for systems and components outside buildings
BS 3412	PE materials for moulding and extrusion

2.2 Other Publications

2.2.1 General

Ministry for the Environment. New Zealand urban design protocol. Wellington: Ministry for the Environment 2005.

Ministry for the Environment. National Environment Standard – Telecommunication Facilities. Wellington: Ministry for the Environment. 2016.

Ministry of Justine. National guideline for crime prevention through environmental design in New Zealand. Wellington: Ministry of Justine.

2.2.2 Earthworks and Geotechnical Requirements

BRANZ. *BRANZ Study Report 004, Assessment of slope stability at building sites*. BRANZ and Worley

Consultants Ltd, 1987.

Cook, D, Pickens, G A, and MacDonald, G. 'The role of peer review', Report by Crawford S A. NZ *Geomechanics News* (Dec 1995).

Crawford, S A, and Millar, P J. 'The design of permanent slopes for residential building development', EQC Research Project 95/183, *NZ Geomechanics News* (June 1998).

New Zealand Geotechnical Society Inc. *Field description of soil and rock.* New Zealand Geotechnical Society Inc, 2005.

New Zealand Geotechnical Society Inc. 'Geotechnical issues in land development'. Proceedings of New Zealand Geotechnical Society Symposium, Hamilton, 1996.

2.2.3 Roads

Auckland Regional Transport Authority (ARTA). *Bus stop infrastructure design guidelines*. Auckland: ARTA, 2009.

Austroads codes and guides, 2009. (Subject to the relevant New Zealand supplement).

Austroads. Guide to road design – Part 1-8: Austroads.

Austroads. Guide to Pavement Technology Part 2: Pavement Structural Design, Austroads, 2019

Austroads. Guide to traffic management - Part 8: Local area traffic management. Austroads, 2008.

Austroads. Guide to Road Safety Part 6 Road Safety Audit, Austroads, 2019

Austroads guide to bridge Technology Part 8: Hydraulic design of Waterway Structures, June 2019,

Cement and Concrete Association of Australia. *Guide to residential streets and paths*. Cement and Concrete Association of Australia, 2004.

Waka Kotahi New Zealand Transport Agency. – it is noted that many of Waka Kotahi guidelines and reference manuals are now online documents. https://www.nzta.govt.nz/

Bridge manual. (SP/M/022) 2nd ed. Wellington: Waka Kotahi NZ Transport Agency, 2013.*Chipsealing in New Zealand*. Wellington: Waka Kotahi NZ Transport Agency Available at: https://www.nzta.govt.nz/resources/chipsealing-new-zealand-manual/chipsealing-in-new-zealand/

Cycle network and route planning guide. Waka Kotahi NZ Transport Agency Available at

Cycling network guidance - All updates | Waka Kotahi NZ Transport Agency (nzta.govt.nz)

Cycling standards and guidance – planning and design. Wellington: Waka Kotahi NZ Transport Agency. Cycling standards and guidance | Waka Kotahi NZ Transport Agency (nzta.govt.nz)

Economic Evaluation Manual. Waka Kotahi NZ Transport Agency. 2013. Available at: https://www.nzta.govt.nz/resources/economic-evaluation-manual

Pedestrian planning and design guide. Wellington: Waka Kotahi NZ Transport Agency, 2009. Available at: http://www.nzta.govt.nz/resources/pedestrian-planning-guide/docs/pedestrian-planning-guide.pdf

Manual of Traffic Signs and Markings (MOTSAM) Part I – Traffic Signs & Part II – Markings. Wellington: Waka Kotahi NZ Transport Agency, 2010

Traffic control devices manual. Wellington: Waka Kotahi NZ Transport Agency, 2008

Traffic control devices manual (TCD manual) | Waka Kotahi NZ Transport Agency (nzta.govt.nz)

Road safety audit procedures for projects (Manual number TFM9). Wellington: Transfund New Zealand, 2013. Available at: https://www.nzta.govt.nz/resources/road-safety-audit-procedures.

RTS 11: Urban roadside barriers and alternative treatments. Wellington: Land Transport Safety Authority, 2001. Available at: http://www.nzta.govt.nz/resources/road-traffic-standards/docs/rts-11.pdf

RTS 14 '*Guidelines for facilities for blind and vision-impaired pedestrians.* Wellington: Waka Kotahi NZ Transport Agency, 2015. Available at: https://www.nzta.govt.nz/assets/resources/road-traffic-standards/docs/rts-14.pdf

RTS 18: New Zealand on-road tracking curves for heavy vehicles. Wellington: Land Transport New Zealand, 2007. Available at: http://www.nzta.govt.nz/resources/road-traffic-standards/rts-18.html

Stormwater treatment standard for state highway infrastructure. Wellington: Waka Kotahi New Zealand

Transport Agency, 2010. https://www.nzta.govt.nz/resources/stormwater-management/stormwater-management/

Waka Kotahi (NZTA) specifications (available at: http://www.nzta.govt.nz/resources/index.html)

B/2	Construction of Unbound Granular Pavement Layers
F/1	Earthworks Construction
F/2	Pipe Subsoil Drain Construction
F/3	Pipe Culvert Construction
M/1	Bitumen for Pavements
M/1-A	Asphalt Binders
M/4	Crushed Basecourse Aggregate
M/6	Sealing Chip
M/10	Dense Graded Asphaltic Concrete
M/13	Adhesion Agents
M/27	Stone Mastic Asphalt
P/3	First Coat Sealing
P/4	Resealing
P/17	Bituminous Reseals
P/33	Coloured Surfacing
T/10	Skid Resistance Deficiency Investigation and Treatment Selection

United Kingdom Department for Transport. *Manual for streets.* London: Thomas Telford Publishing, 2007.

United Kingdom Transport Research Laboratory. *TRL661 - The manual for streets: evidence and research.* TRL, 2007.

2.2.4 Stormwater, Wastewater, and Water Supply

Auckland Regional Council
Technical Publication No. 124 (TP124) *Low impact design manual for the Auckland region*, 2000.

Technical Report 2008-20 *Application of low impact design to brownfield sites*.

Technical Report 2009-83 *Integration of low impact design, urban design and urban form principles*

Australasian Society for Trenchless Technology (ASTT). *Guidelines for horizontal directional drilling, pipe bursting, microtunnelling and pipe jacking*. Greenwood, Western Australia: ASTT, 2009.

Austroads. *Guide to road design - Part 5: Drainage design*. Austroads, 2008.

Hicks, D M, and Mason, P D. *Roughness characteristics of New Zealand rivers*, Wellington: Water Resources Survey, DSIR Marine and Freshwater, 1991.

Janson, Lars-Eric. *Plastics pipes for water supply and sewage disposal*. 2003.

Lamont, P. 'Metrication: Hydraulic data and formulae.' *Water Services* Volume 81, numbers 972/3/4 (Reprinted by Kent Meters Ltd, UK)

Ministry for the Environment.
Coastal hazards and climate change - Guidance for local government.
Wellington: Ministry for the Environment, 2017.

Preparing for climate change - A guide for local government in New Zealand.
Wellington: Ministry for the Environment, 2008.

Preparing for coastal change - A summary of coastal hazards and climate change guidance for local government.
Wellington: Ministry for the Environment, 2017.

Preparing for future flooding - A guide for local government in New Zealand.

Wellington: Ministry for the Environment, 2010.

Tools for estimating the effects of climate change on flood flow - A guidance manual for local government in New Zealand. Wellington: Ministry for the Environment, 2010.

Ministry of Health. *Drinking-water standards for New Zealand 2005 (Revised 2018)*. Wellington: Ministry of Health, 2018.

Ministry of Business, Innovation & Employment. NZ Building Code – E1, B2, G13, G14, and associated acceptable solutions and verification methods. Wellington: Ministry of Business, Innovation & Employment. 2019

Najafi, M. *Trenchless technology - Pipeline and utility design, construction, and renewal*. McGraw-Hill, 2005.

New Zealand Water and Wastes Association (Water New Zealand). *New Zealand gravity pipe inspection manual.* Wellington: New Zealand Water and Wastes Association, 2020.

Stein, D. *Trenchless technology for installation of cables and pipelines*. Germany: Stein & Partner, 2005.

Uni-Bell. *Handbook of PVC pipe*. 4th ed. Dallas: Uni-Bell PVC Pipe Association, 2001.

Underground Utilities – Seismic Assessment and Design Guidelines and associated Technical Note 15 – Manhole Flotation

Water New Zealand. *NZ Infiltration and Inflow Control Manual*. *2rd Edition,* 2015.

Water New Zealand. *New Zealand Gravity Pipe Inspection Manual 4rd edition*. 2020.

Water New Zealand. Drinking Water Standards for New Zealand. 2018.

Water Services Association of Australia (WSAA):

WSA 02-2014	Gravity Sewerage Code of Australia
WSA 03-2011	Water Supply Code of Australia
WSA 04-2005	Sewage Pumping Station Code of Australia
WSA 06-2008	Vacuum Sewerage Code of Australia
WSA 07-2007	Pressure Sewerage Code of Australia

2.2.5 Network Utility Services

Department of Labour. *Guide for safety with underground services*. Wellington: Department of Labour, 2002.

NZ Electricity Code of Practice. Current and voltage ratings.

New Zealand Utilities Advisory Group (NZUAG). *National code of practice for utilities' access to the transport corridors.* Wellington: NZUAG, 2019.

Note - The NZUAG code of practice is an interim measure until a national code of practice is approved under the Utilities Access Act 2010.

2.2.6 New Zealand Legislation

The provisions of this CoP shall be read subject to the provisions of regional and District Plans and to any applicable statutes, regulations, bylaws, and any subsequent amendments, including (but not limited to):

Building Act 2004, Building Regulations, and New Zealand Building Code (NZBC) 1992

Civil Defence Emergency Management Act 2002

Civil Defence Emergency Management Amendment Act 2016

Conservation Act 1987

Electricity Act 1992

Electrical safety regulations 2009

Housing Accords and Special Housing Areas Act 2013

Health and Safety in Employment Act 1992
Health (Drinking Water) Amendment Act 2007
Heritage New Zealand Pouhere Taonga Act 2014
Infrastructure (Amendments Relating to Utilities Access) Act 2010
Land Transfer Act 2017
Land Transport Rule (Traffic Control Devices) 2004
Local Government Act 1974 and Local Government Act 2002
Property Law Act 2007
Reserves Act 1977
Resource Management Act 1991
Unit Titles Act 2010
Utilities Access Act 2010

2.3 Related Documents

When interpreting this CoP it may be helpful to refer to other documents, including but not limited to:

2.3.1 General

Land Information New Zealand. *New Zealand geodetic datum 2000 (NZGD2000)*
Ministry for the Environment. *Climate change effects and impacts assessment - A guidance manual for local government*. 2nd ed. Wellington: Ministry for the Environment, 2008.

Climate Change Projections for New Zealand: Atmospheric projections based on simulations undertaken for the IPCC 5th Assessment 2nd edition, MfE, 2018

National Climate Risk Assessment for New Zealand, 2020

National Adaptation Plan, Ministry for the Environment, 2022

Interim guidance on the use of new sea-level rise projections, Ministry for the Environment, 2022

Te hau mārohi ki anamata Towards a productive, sustainable and inclusive economy AOTEAROA NEW ZEALAND'S FIRST EMISSIONS REDUCTION PLAN, Ministry for the Environment, 2022

2.3.2 Earthworks and Geotechnical Requirements

Auckland Regional Council. Technical Publication No. 90 (TP90) *Erosion and sediment control: guidelines for land disturbing activities in the Auckland Region.* Auckland: Auckland Regional Council, 1999.

Ministry for the Environment. *Planning for development of land on or close to active faults - A guideline to assist resource management planners in New Zealand*. Wellington: Ministry for the Environment, 2004.

Sanders, W, and Glassey, P. (Compilers). *Guidelines for assessing planning policy and consent requirements for landslide prone land,* GNS Science Miscellaneous Series 7. Lower Hutt: Institute of Geological and Nuclear Sciences Limited, 2007.

2.3.3 Roads

Jones, P, Boujenko, N, and Marshall, S. *Link and place - A guide to street planning and design*. London: Landor Books, 2007.

Ministry of Justice. *National guidelines for crime prevention through environmental design in New Zealand Part 1: Seven qualities of safer places, and Part 2: Implementation guide*. Wellington: Ministry of Justice, 2005.

Ministry of Transport *Government policy statement on land transport funding 2012/12 - 2021/22.* Wellington: Ministry of Transport, July 2011.

Ministry of Transport. *Safer journeys - New Zealand's road safety strategy 2010 - 2020.* Wellington: Ministry of Transport, 2010.

National Code of Practice for Utilities, Access to the Transport Corridors.

New Zealand Waka Kotahi Transport Agency

Traffic note 48 - Light vehicle sizes and dimensions: Street survey results and parking space requirements - Information. Land Transport New Zealand, December 2004. Available at: http://www.nzta.govt.nz/resources/traffic-notes/docs/traffic-note-48.pdf

Manual of traffic signs and markings (MOTSAM) Parts 1 - 4

Waka Kotahi (NZTA) Code of practice for temporary traffic management (CoPTTM: Part 8 of the Traffic Control Devices manual (TCD Manual).

Waka Kotahi (NZTA) register of network standards and guidelines. Wellington: Waka Kotahi (NZTA), 2020. Available at: http://www.nzta.govt.nz/resources/nzta-register-network-standards-guidelines/

SNZ HB 44:2001 *Subdivision for people and the environment*. Wellington: Standards New Zealand, 2001.

National Code of Practice for Utilities, Access to the Transport Corridors

Concrete Masonry Association of Australia. *Concrete segmental pavements - Design guide for residential accessways and roads*. Sydney: Concrete Masonry Association of Australia, 2014.

2.3.4 Stormwater, Wastewater, and Water Supply

Auckland Council. *On-site stormwater management manual*. Auckland: Auckland City Council, 2002.

Auckland Council. *Soakage design manual.* Auckland: Auckland City Council, 2003.

Auckland Council. *Stormwater management devices in the Auckland region*. Auckland Council guideline document, GD2017/001 (GD01)

Auckland Council. Technical Publication No. 10 (TP10) *Design guideline manual stormwater treatment devices,* 2003.

Auckland Council. Technical Publication No. 108 (TP108) *Guidelines for stormwater runoff modelling in the Auckland region*, 1999.

Auckland Council. Technical Report TR2013/018: *Hydraulic Energy Management - inlet and outlet design for treatment devices,* 2013

Auckland Council. *Water Sensitive Design for Stormwater*. March 2015 Guideline Document 2015/004

Auckland Council. Technical Report TR2013/040: *Stormwater Disposal via Soakage,* 2013

Christchurch City Council. *Waterways, wetlands and drainage guide - Part A: Visions and Part B: Design.* 2003.

Environment Protection Authority (EPA) Victoria. *Maintaining water sensitive urban design elements*. Melbourne: EPA Victoria, 2008.

Greater Wellington Regional Council. Fish friendly culverts. June 2003. Available at:

http://www.gw.govt.nz/assets/council-publications/fishfriendlyculv.pdf

New Zealand Water Environment Research Foundation (NZWERF) *On-site stormwater management guideline*. Wellington: NZWERF, 2004.

New Zealand Society of Large Dams (NZSOLD). *Dam safety Guidelines*. 2015

National Institute of Water and Atmospheric Research (NIWA). *New Zealand Fish Passage Guidelines, for structures up to 4 metres.* 2018

North Shore City Council. *Bioretention guidelines*. Takapuna: North Shore City Council, 2008.

Puddephatt, J, and Heslop, V. *Guidance on an integrated process - Designing, operating and maintaining low impact urban design and development devices*. Landcare Research, July 2008.

Sustainable urban drainage systems (SUDS) design manuals for countries in the United Kingdom

Water sensitive urban design (WSUD) manuals from various Australian states and cities

2.3.5 Websites

Auckland Council	https://www.aucklandcouncil.govt.nz
Austroads	http://www.austroads.com.au
Ministry for the Environment	http://www.mfe.govt.nz
National Pest Plant Accord	http://www.biosecurity.govt.nz/nppa
Heritage New Zealand	http://www.heritage.org.nz
New Zealand Legislation	http://www.legislation.govt.nz
New Zealand Waka Kotahi Transport Agency	http://www.nzta.govt.nz/
Plastics Industry Pipe Association of Australia:	http://www.pipa.com.au
Trips Database Bureau	https://www.transportationgroup.nz/trips-database-bureau/
Water Services Association of Australia	http://www.wsaa.asn.au/

2.4 Definitions

For the purposes of this CoP, the following definitions shall apply:

Annual exceedance probability (AEP)	The probability of exceedance of a given occurrence, generally a storm, in a period of one year (1% AEP is equivalent to a 1 in 100 year storm).
Carriageway	That part of road corridor consisting of the traffic lanes, sealed shoulders and other sealed areas, sometimes defined between kerbs, including sealed parking and loading areas when provided within the carriageway.
Corridor Manager	Means, (a) In relation to a road (as defined in Section 315(1) of the Local Government Act 1974, and which includes State Highways and Government roads), the local authority or other person that has jurisdiction over the road. (b) In relation to a motorway (as defined in Section 2(1) of the Government Roading Powers Act 1989), the New Zealand Transport Agency. (c) In relation to railway land, the licensed access provider who controls access to the land.
Crime prevention through environmental design (CPTED)	Has a set of four principles: surveillance, access management, territorial reinforcement, and quality environments of the built environment. These CPTED principles lead to a reduction in the incidence and fear of crime as well as an improvement in the quality of life.
Developer	An individual or organisation having the financial responsibility for the development project. Developer may include the owner.
Developer's Professional Advisor/Designer	The person, appointed by the developer, who shall be responsible for: (a) The investigation, design and obtaining of approvals for construction.

	(b) Contract administration and supervision of construction. (c) Certification upon completion of construction.
Drinking water	As defined in the Health (Drinking Water) Amendment Act.
Dwelling unit	Any building or group of buildings, or part thereof used, or intended to be used principally for residential purposes and occupied, or intended to be occupied by not more than one household.
Earthworks	Any alteration to the contours, including the excavation and backfilling or recompaction of existing natural ground and the stripping of vegetation and topsoil .
Footpath	That part of any road or other area as is laid out or constructed by authority of Council primarily for pedestrians; and may include the edging, kerbing, and channelling of the road.
Freeboard	A provision for flood level design estimate imprecision, construction tolerances, and natural phenomena (such as waves, debris, aggradations, channel transition, and bend effects) not explicitly included in the calculations.
Geo-professional	A chartered professional engineer (CPEng) or an engineering geologist with recognised qualifications and experience in geotechnical engineering, and experience related to land development.
Ground	Describes the material in the vicinity of the surface of the earth whether soil or rock.
Independent qualified person (IQP)	A specialist approved by Council and having the appropriate skills and qualification to carry out specific procedures.
Local authority	As defined in the Local Government Act 2002 and includes territorial authorities and regional councils.
Low impact design	An approach to land development and stormwater management that recognises the value of natural systems in order to mitigate environmental impacts and enhance local amenity and ecological values.
Movement lane	That part of the formed and sealed road that serves the link function in a road. It may have a shared use for other activities such as walking, cycling, parking and play.
Network utility operator	Has the same meaning given to it by Section 166 of the Resource Management Act.
Owner	In relation to any land or interest in land, includes an owner of the land, whether beneficially or as trustee, and their agent or attorney, and a mortgagee acting in exercise of power of sale; and also includes the Crown, the Public Trustee, and any person, TA, board, or other body or authority however designated, constituted, or appointed, having power to dispose of the land or interest in land by way of sale.
Potable water	As defined in the Health (Drinking Water) Amendment Act.
Primary flow	The estimated surface water run-off specified to be managed by the primary stormwater system. This flow may

	be piped or contained within relatively narrow confines under public control by reserve or easement.
Private road	Any roadway, place, or arcade laid out within a district on private land by the owner of that land intended for the use of the public generally and has the same meaning given to it by Section 315 of the Local Government Act 1974.
Private way	Any way or passage over private land within the Southland District, the right to use which is confined or intended to be confined to certain persons or classes of persons, and which is not thrown open or intended to be open to the use of the public generally and includes any shared access or right of way and has the same meaning given to it by Section 315 of the Local Government Act 1974.
Receiving water	The water body that receives the discharge from the stormwater conveyance system and is usually a watercourse, stream, river, pond, lake, or the sea.
Road	Has the same meaning given to it by Section 315 of the Local Government Act 1974.
Road Reserve	The land vested for use as road, whether formed or not.
Secondary flow	The estimated surface water run-off in excess of the primary flow. In most cases this flow will be managed in an overland flow path or ponding area that is protected by public ownership or easement.
Stormwater	Rainwater that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels, or pipes into a defined surface water channel, open watercourse, or a constructed infiltration facility.
Street	Has the same meaning as 'road' as defined by Section 315 of the Local Government Act 1974.
Surface water run-off	All naturally occurring water, other than subsurface water, which results from rainfall on the site or water flowing onto the site, including that flowing from a drain, stream, or river.
Survey plan	A survey plan under Section 2 of the Resource Management Act.
Swale	A constructed watercourse shaped or graded in earth materials and stabilised with site-suitable vegetation or rocks, for the safe conveyance and water-quality improvement of stormwater run-off.
Target operating speed	The desired maximum speed for motor vehicles identified by the designer to suit the land use context and road classification. This speed can be managed by physical and psychological devices such as narrowed movement lanes, reduced forward visibility, parking, slow points, build outs, leg lengths, chicanes, planting, landscaping, street furniture, and art works.
Territorial authority	A territorial authority (TA) defined in the Local Government Act 2002.
Wāhi tapu	Means a place sacred to Māori in the traditional, spiritual, religious, ritual, or mythological sense.
Wastewater	Water that has been used and contains unwanted dissolved or suspended substances from communities, including homes, businesses, and industries.

2.5 Abbreviations

The following abbreviations are used in this CoP:

AADT/ADT	Annual Average Daily Traffic/Average Daily Traffic
ABS	acrylonitrile butadiene styrene
AEP	annual exceedance probability
AV	air valve
°C	degrees Celsius
CBD	central business district
CBR	California bearing ratio
CCTV	closed circuit television
CLS (SCL)	concrete lined steel (steel concrete lined)
CPTED	crime prevention through environmental design
DI	ductile iron
DN	nominal diameter under the pipe manufacturing standard
du	dwelling unit
ESA	equivalent standard axle
FAC	free available chlorine
FAR	floor-to-area ratio
FL	flange
FSL	finished surface level
GL	ground level
g/m3	grams per cubic metre
GRP	glass reinforced plastic
H	head (in metres)
Hr	hour
Ha	hectare
HDD	horizontal directional drilling
IQP	independent qualified person
Km	kilometre
km/hr	kilometres per hour
kPa	kilopascal
L	litre(s)
LA	local authority
LID	low impact design
M	metre
MDD	maximum dry density
MH	manhole or maintenance hole
min	minute(s)
MPa	megapascal
MS	maintenance shaft
m/s	metres per second
m3/s	cubic metres per second
Mm	millimetres
NAASRA	National Association of Australian State Road Authorities
NES	National Environmental Standard

NIWA	National Institute of Water and Atmospheric Research
NPS	National Policy Statement
NZBC	New Zealand Building Code
NZHPT	New Zealand Historic Places Trust
NZTA	Waka Kotahi NZ Transport Agency
OSH	Occupational Safety and Health
P	person
PE	polyethylene
PE 80B	polyethylene with minimum required strength (MRS) of 8 MPa as defined in AS/NZS 4130 and AS/NZS 4131
PE 100	polyethylene with MRS of 10 MPa as defined in AS/NZS 4130 and AS/NZS 4131
PF	peaking factor
PIPA	Plastics Industry Pipe Association of Australia Ltd
PN	nominal pressure class (maximum rated operating pressure)
PP	polypropylene
PRV	pressure reducing valve
PVC	polyvinyl chloride
PVC-U	unplasticised polyvinyl chloride
PVC-M	modified polyvinyl chloride
PVC-O	orientated polyvinyl chloride
RMA	Resource Management Act
RRJ	rubber ring joint
s.	section
Soc	socket
STP	specified test pressure
TA	territorial authority
TMS	terminal maintenance shaft
UV	ultraviolet
VC	vitrified clay
vpd	vehicles per day

Section 3. General Requirements and Procedures

3.1 Scope

Section 1 of this CoP outlines matters of general application and general requirements to be observed.

Schedules containing information to be provided in certificates or as-built plans are included within this section.

3.2 Infrastructure Development Process

3.2.1 General

The infrastructure development process is illustrated in a schematic flowchart including as-built process in Figure 1-1. This flowchart is intended for developer and relevant parties to understand the roles and responsibilities at each stage of the submission at a high level. The detailed requirements and procedures of each stage are listed in the following sections.

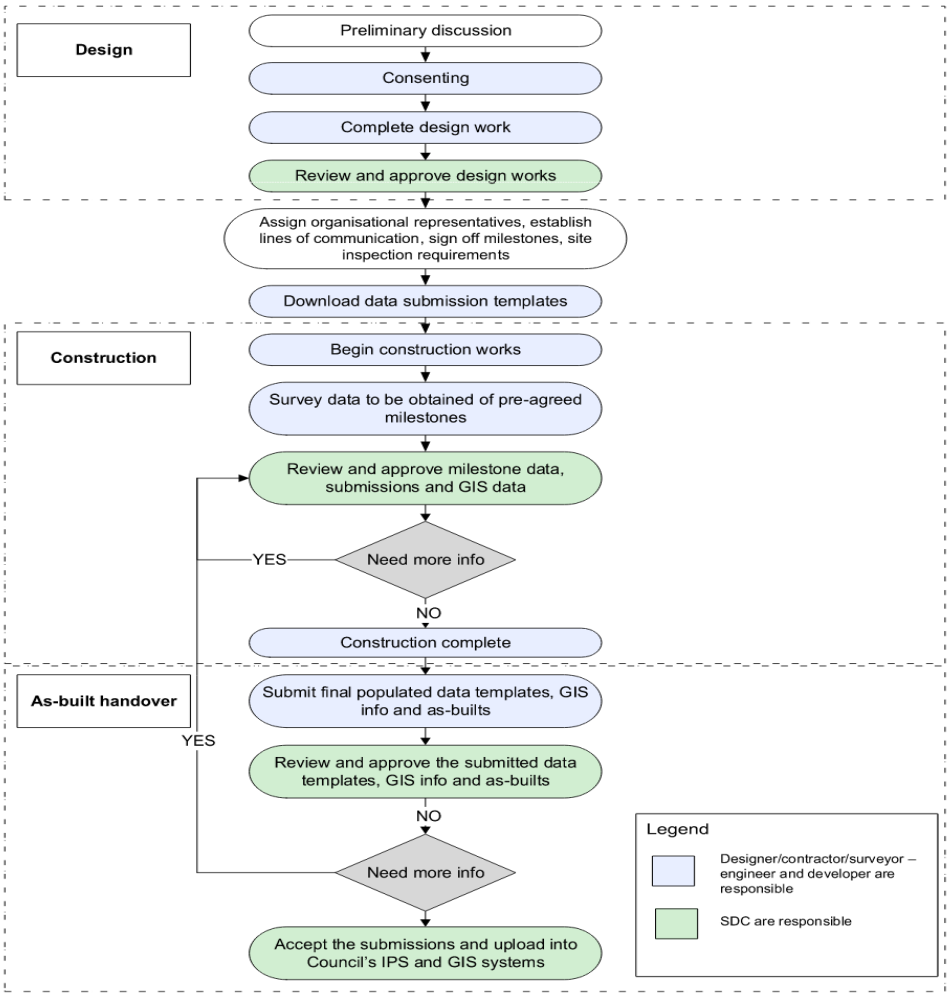


Figure 1-1: Flowchart of the as-built handover process (blue cells indicate tasks undertaken by the developer and other parties, green cells indicate tasks undertaken by Council)

The responsibility for the site-specific design rests on the Designer of the works. Suitable investigations depending on the nature of the works, the site conditions and circumstances shall be advised by the Designer.

The Designer will need to consider all risks to lifeline systems (Infrastructure) in the event of a natural disaster, including the potential effects of climate change.

3.2.2 Consenting

To apply a resource consent for subdivision or development of land, or as otherwise considered necessary by Council when considering applications to construct infrastructure, Council will require documents to be submitted as indicated in accordance with this CoP.

3.2.2.1 Landowner Consent

Where construction is required on another property, written evidence of the affected landowner's consent is required (proof of ownership shall be included within the documentation provided).

The Council will need to understand any proposed easement details at the design approval stage and at during the as built acceptance process.

3.2.3 Preliminary discussion

The Council encourages Designers and/or the Developers Advisor to meet with Council and other possible stakeholders, in the early stages of the design development to discuss any proposed works. The aim of these early discussions is to confirm how the development will meet the Council's standards and integrate with existing networks and infrastructure. These meetings being of a technical nature need suitably qualified and experienced designers to attend to guide their clients on the way forward.

As part of the preliminary discussions the developer shall start consultation with Council on matters such as:

- Vesting of Land
- Creation of Easements
- Landscape design and construction at an early stage of the design development. This is because the Council may seek input from the relevant Community Board or Community Development Area Subcommittee in relation to landscape issues, prior to its approval of any proposed landscaping.
- Stormwater systems including secondary flow paths shall be considered when landscape designs are determined, so as to avoid conflict or failure of these systems.

3.2.4 Design

3.2.4.1 Standard Design Basis

Proposals submitted on a standard design basis shall conform to this CoP.

3.2.4.2 Investigation

All investigation, calculations, design, supervision, and certification of the infrastructure outlined in this CoP shall be carried out by or under the control of persons who:

(a) are experienced in the respective fields.
(b) hold appropriate membership in the respective professional bodies or are recognised by the Council as having proven experience.
(c) have appropriate professional indemnity insurance and public liability insurance.

3.2.4.3 Environment Southland (Southland Regional Council) Requirements

Environment Southland exercises control over infrastructure associated with land development and subdivision.

The requirements of relevant plans from Environment Southland on stormwater shall be met. Environment Southland requirements will generally be limited to effects of stormwater on the natural environment. Environment Southland's Regional Water Plan and their proposed Southland Water and Land Plan, Coastal Plan also apply.

Authorisation will be required from Environment Southland for the discharge of stormwater unless the discharge is to an existing and consented stormwater system and meets any conditions which apply to that existing system. Environment Southland's Stormwater Discharges Information Guide - January 2013 refers. Other activities often associated with stormwater infrastructure which need to be authorised by Environment Southland include: the diversion of natural water during construction, the permanent diversion of natural water as a consequence of the development, activities in the bed or on the banks of a natural waterway and damming of a waterway.

The discharge of clean stormwater and other activities where effects are considered minor may be authorised as a permitted activity subject to certain conditions in the Regional Plan. Authorisation may also be by way of a comprehensive consent held by Council for a particular areas or catchments.

In other circumstances site specific discharge permits and water permits shall be obtained. Advice should be sought from Environment Southland at the earliest stage of planning for stormwater infrastructure and receiving waters.

Discharge and temporary water permits required during construction shall be applied for by the developer and exercised in the name of the developer.

3.2.4.4 Catchment Management Planning

Stormwater management planning should be carried out on a sub-catchment or catchment-wide basis. Where the proposed development is in an area covered by an Environment Southland Water Plan / water and land plan, designers will be required to comply with the design philosophy in the plan.

If there is no catchment management plan for the area of the proposed development, the stormwater planning requirements should be discussed with Environment Southland at an early stage.

The implications of future development on adjoining land should be on the basis of replicating the pre-development hydrological regime whereby the maximum rate of discharge and peak flood levels post-development are no greater than pre-development.

3.2.4.5 Water Quality

Stormwater treatment devices will be required to avoid adverse water quality effects on receiving waters. The type of potential contaminants shall be identified and then treatment devices designed to address the particular issues. The need for treatment devices shall be considered for every discharge even when it is not a direct discharge to a receiving water, for instance where the discharge is to an existing network. In this instance specific approval from Council will be required.

3.2.4.6 Connection to the Public System

Where the connection of individual lots and developments (including lateral pipelines) are to the public system they shall meet the requirements in guideline and be approved by the Council.

All services within the boundaries of the road reserve shall be property of Council or other utility company once formally taken over by that organisation.

Unless specifically arranged otherwise and protected by an easement, services through privately owned allotments shall be the responsibility of the landowner.

3.2.4.7 Roading Design

Development design shall ensure connectivity to properties and roads that have been developed, or that have the potential to be developed in the future.

Unless otherwise approved by the Council through a resource consent decision, all new allotments shall have physical connections to power and telecommunications utilities.

3.2.4.8 Documents to Be Submitted For Design Approval

Prior to, or as a condition of, granting a resource consent for subdivision or development of land, or as otherwise required by a District or Regional Plan, or as otherwise considered necessary by Council when considering applications to construct infrastructure, Council will require documents to be submitted including the following:

(a) Design and construction documentation including drawings, specifications, and calculations for the following:

(i) Earthworks and geotechnical requirements;

(ii) Roading and site access including a design and access statement and a road safety audit. The Access Statement shall cover the relevant aspects listed in the CoP.

Road Safety Audit - Proposals that provide for new roads to vest in the Council shall be subject to the Waka Kotahi NZ Transport Agency Road safety audit procedures for projects unless the Council decides that audits are not required at any or all of the stages. The developer's professional advisor may recommend that audits are not required at any or all of the stages and complete an 'exemption declaration' as described in the procedures and submit it as part of the application process to be considered by Council. The 'exemption declaration' shall be prepared by a suitably qualified road safety auditor.

Safety audits shall cover all road users, including the needs of pedestrians, cyclists, and disabled/elderly users. Where appropriate, the requirements of these groups may demand specific audit procedures.

Future Development - Where existing and/or further subdivision, adjacent to the one under consideration, is provided for in the Southland District or Environment Southland Regional plans, Council may require enhanced infrastructure to cater for that development.

(iii) Stormwater;

The approval process for land development and subdivision design and construction and documents and supporting information on stormwater drainage infrastructure to be provided at each stage of the process shall be in accordance with Section 1 of this CoP and to be approved by the Council. Specific information to be provided on any concept plans or scheme plans for development or subdivision incorporating stormwater infrastructure shall include details such as proposed capacities, storage, overland flow paths, structural details and the like.

Stormwater infrastructure requires approval from Council and unless Council holds a comprehensive, or network consent for the catchment, consents from the Regional Council to discharge, divert, or dam water will also be required.

In these circumstances it is good practice:

(a) To consult with the Council prior to consent application.

(b) To lodge applications with the Council at the same time so that land use and water-related resource consents can, if required, be dealt with at a joint hearing under Section 102 of the RMA.

(iv) Wastewater;

Wastewater infrastructure proposed in the subdivision requires approval from Council. Applications for design approval shall include the information outlined in Section 4 and Section 9 of this CoP.

If the scope of the development is sufficiently large to include its own pumping station, then reference should be made to WSA 04.

Structure Plan - Council may provide a structure plan setting out certain information to be used in design, such as flows, sizing, upstream controls, recommended pipe layout, or particular requirements of Council. Where a structure plan is not provided, the designer shall determine this information by investigation using this CoP and normal engineering principles.

Future Development – Where further subdivision, upstream of the one under consideration, is provided for in the district or regional plan, Council may require wastewater infrastructure to be constructed to the upper limits of the subdivision to provide for the needs of this development. Peak flows and cleansing velocities shall be taken into account when designing for additional latent capacity. All infrastructure proposed to service future development will require the approval of Council.

Pumping Stations - Pump stations to service new subdivision areas will be permitted only where there is prior agreement with Council on need and positioning.

Pump stations shall meet the performance standards detailed in this CoP and any referenced documents.

(iv) Water supply;

Water supply infrastructure requires approval from the Council. Design drawings compatible with Council's requirements and the design parameters included in this CoP shall be provided to Council for approval.

The designer is responsible for all aspects of the water system design, excepting those aspects nominated and provided to the designer by Council.

If the scope of the development is large and includes its own water source, treatment or reservoirs, reference shall be made to WSA 03.

Detailed plans and design calculations shall be submitted to Council. In addition the requirements outlined in this CoP shall be met.

Structure Plan - Council may provide a structure plan setting out certain information to be used in the design, such as flows, sizing, upstream controls, recommended pipe layout, or other particular requirements of the Council. Where a structure plan is not provided, the designer shall determine this information by investigation using the CoP and engineering principles and shall agree these parameters with Council prior to the design.

Future Development - Where further subdivision, adjacent to the one under consideration, is provided for in the Southland District or Environment Southland Regional plans, Council may require water supply infrastructure to be sized and or installed to cater for such future development.

(v) Network Utility Services;

(vi) Landscape;

All proposed planting to be located within the publicly vested areas shall be agreed with Council prior to installation. So that the suitability ad long term maintenance implications can be assessed and agreed.

(vii) Community Facilities.

(b) A geotechnical engineers-professional's report on the suitability of the land for subdivision or development.

(c) Other reports as considered necessary by Council in the circumstances of the proposed infrastructure in order to meet the requirements of the CoP.

(d) Safety in Design register that records design decisions made through the planning and design process to mitigate health and safety risks during the investigation, construction, operation and maintenance, and demolition of the infrastructure.

(e) A design certificate in the form of the certificate in Schedule 2A.

3.2.4.9 Approval Of Design

When it is satisfied that the design meets the requirements of this CoP, or in the case of an alternative design, that the design satisfies the requirements, Council shall notify the owner that the design has been approved and endorse the plans, specifications, and other documents accordingly.

For the purpose of this approval Council may require the owner to make amendments to any plans, specifications, and other documentation and to submit further or other reports. In considering project design and giving its approval, Council shall act without undue delay.

3.2.4.10 Alternative Design Basis

Proposals submitted on an alternative design basis may differ from this CoP and shall apply specifically to a particular proposal. Council approval of an alternative design does not confer approval in general by the Council to any design criteria, construction technique or material forming part of the alternative design.

An explanation of the design basis or construction method is to be submitted, for approval in principle. It will be considered on its merits and may be approved provided that the design results in infrastructural development equivalent or superior in performance to that complying with this CoP.

Alternative designs need to provide flexibility to meet the circumstances and requirements peculiar to the site, or as a means of encouraging innovative design, or to meet the principle of life-cycle costing.

3.2.4.11 Life-Cycle Costing

Life-cycle costing may be used to consider options within a proposal or a proposal as a whole. In undertaking a life-cycle costing, consideration shall be given to the initial costs borne by the developer and the maintenance and replacement costs borne by the future owners or Council. A reasonable balance shall be maintained between these short-term and long-term costs.

3.2.5 Datum and Coordinate Systems

All reduced level information shall be in metres in terms of the Southland District Council Datum and shall be referred to a permanent benchmark identified on the plans. The SDC vertical and horizontal datum is defined using New Zealand Vertical Datum 2016 (NZVD2016).

3.2.6 Drawings

3.2.6.1 General

Design drawings shall be prepared in accordance with Council's latest published practices/requirements. Except where otherwise notified, the requirements are as set out in this CoP.

All drawings shall be provided in the forms required by Council. Hand drawn plans or Hand drawn mark ups will not be accepted except for the smallest of projects.
Drawings should not contain any linked, embedded objects or external referencing.
Drawings shall be to adequate detail to clearly illustrate the proposals and enable assessment of compliance with this CoP and enable accurate construction.

3.2.6.2 Composition of drawings

Design drawings generally include the following:

a) A locality plan giving the overall layout and location.
b) Detailed plans, longitudinal sections, cross sections, and diagrams of the proposed developments.
c) Separate drawing sets for the various networks being constructed, e.g., – for roading, for car parks, for potable water, for stormwater and for wastewater.
d) Special details where the standard drawings are not sufficient.
e) A north point and level datum, the scale or scales used, the date of preparation and the date of any amendments, the designer's name and contact details, and a unique contract and drawing number or identifier.

3.2.6.3 Scale

The scale for plans is generally 1:500 but other accepted scales may be used to suit the level of detail on the plans. Special details shall be to scales appropriate for clarity.

3.2.6.4 Content of drawings

The following information when relevant shall be shown on the design drawings:

a) The extent of the construction showing existing and proposed roads, and the relationship with adjacent construction, services, or property.

b) Significant existing vegetation to be removed and any special or protected trees, areas of heritage significance, and existing water bodies that may be affected by the construction

c) The extent of earthworks, including earthworks on proposed reserves, existing and proposed contours, areas of cut and fill, batter slopes, subsoil drainage, and sediment control measures both temporary and permanent.

d) The design of proposed roads (and their connections with existing roads), including longitudinal and cross section plans, horizontal and vertical geometry and levels, typical cross sections, details of proposed pavement surface, kerbing, swales, berms, footpaths, cycle paths, tree planting, road marking and signals, and all other proposed road furniture.

e) The horizontal and vertical location and alignment, lengths, sizes, materials, minimum cover, position relative to other services of all proposed water, wastewater, and stormwater systems and service connections, valves, hydrants, manholes, bends, tees, meters and backflow devices, and services that may be reconnected or plugged, and any proposed overland stormwater flow path.

f) Details and location of mechanically restrained portions of pipelines, pipeline bridges, pumping stations, reservoirs, intake and outlet structures and the location of surface obstructions, hazards, or other features that may be affected by the construction.

g) For water mains, the nominal static pressure head at the point of connection and at the lowest point; design pressure and maximum design pressure.

h) Details and location of existing and proposed telecommunications, electricity and gas supply, and street lighting layout, including proposed underground and above ground junction boxes, transformers and similar equipment. This information is typically provided by the service authorities once other design drawings are finalised and approved

i) Details of proposed landscaping of roads and allotments, and details of proposed reserve development including earthworks, hydrological features, walkways and accessways, landscaping features, landscaping structures, tree planting, revegetation, hard and soft surface treatment, park and road furniture, and playground equipment.

j) The location of any natural waterways or wetlands within the site or in close proximity to a boundary. The location in plan and level of the water's edge and shoulder of the banks shall be indicated

k) Typical pre-existing and post development cross sections through any natural waterways or wetlands

l) The proposed proximity of buildings to the water's edge or the shoulder of the banks, or both.

m) Clear identification of the extent of any river, stream, or coastal floodplains on, or in close proximity to the site and overland flow paths within the site

n) Confirm the level datum is as defined within this document.

Territorial Authorities (TA's) may require some of the information following, particularly (p) and (q), in order to assess possible effects of a proposed development.

Applications for design approval shall include the information outlined in 2.2.3.8 of this CoP. In addition the following information shall be provided:

a) A plan showing the proposed location of existing and proposed stormwater infrastructure and flow paths.

b) Detailed long sections showing the levels and grades of proposed stormwater infrastructure in terms of the SDC datum.

c) Details and calculations prepared which demonstrate that agreed levels of service will be maintained. All applications to develop within a flood plain shall be supported by detailed calculations and plans to determine the floodplain boundaries and building floor levels to meet the freeboard requirements in 6.3.5.1.

d) Details and calculations prepared which clearly indicate any impact on adjacent area or catchment that the proposed infrastructure may have.

e) Operations and maintenance guidelines for any water quantity and or quality control structures shall be submitted to Council for design approval along with other documents. The guidelines should describe the design objectives of the structure, describe all major features, explain operations such as recommended means of sediment removal and disposal, identify key design criteria, and identify on-going management and maintenance requirements such as plant establishment, vegetation control, and nuisance control.

3.2.7 Low Impact Design

Low impact design (LID) is both a design approach and a range of structural techniques that can be applied to urban development and stormwater management. As a design approach, LID provides an opportunity to identify and recognise natural features and integrate these into the design of development layouts in order to minimise environmental impacts or enhance natural features. The integration of natural processes in the design stage of a development can result in more attractive, multifunctional landscapes with greater social, environmental, cultural, and transport outcomes.

Low impact design solutions that use natural processes and add value to urban environments are the preferred approach.

3.2.8 Climate Change

Climate change is likely to increase the magnitude and frequency of some hazards, therefore it is important to incorporate risk management in the design of infrastructure supporting new developments to maintain the same level of service throughout the design lifetime. The design of infrastructure for land development and subdivision needs to provide for the impact of sea level rise and the increased frequency of extreme weather events especially storm water impacts. To this end requirements for stormwater design set out in Section 6 include requirements for climate change and define the storm events to be designed to for primary and secondary drainage systems.

Requirements for climate change with respect to sea level rise are specifically detailed in sections and 6.3.6.2.

3.2.9 Urban Design Protocol

The New Zealand urban design protocol seeks to ensure that the design of buildings, places, spaces, and networks that make up our towns and cities, work for all of us, both now and in the future. Council is a signatory to the New Zealand Urban Design Protocol. The New Zealand urban design protocol identifies seven essential design qualities for good urban design:

(a) Context: seeing that buildings, places, and spaces are part of the whole town or city.

(b) Character: reflecting and enhancing the distinctive character, heritage, and identity of our urban environment.

(c) Choice: ensuring diversity and choice for people.

(d) Connections: enhancing how different networks link together for people.

(e) Creativity: encouraging innovative and imaginative solutions.

(f) Custodianship: ensuring design is environmentally sustainable, safe, and healthy.

(g) Collaboration: communicating and sharing knowledge across sectors, professions, and with communities.

The New Zealand urban design protocol has been the primary influence on the urban layouts that are encouraged in this CoP.

3.2.10 Construction Phases

3.2.10.1 Pre-Construction

Construction shall not commence on site unless and until:

(a) Resource consents have been issued, except when no such consents are required.

(b) Council have approved any other consents and the drawings, specifications, and calculations for the specific infrastructure that is required in accordance with Section 4 of this CoP.

3.2.10.2 Notification of Construction Programme

The developer shall notify Council, in writing, of the names and addresses of contractors to whom it is proposed to award the contracts, and the nature of the construction in each case.

Unless Council requires otherwise, the developer shall notify Council in writing when the following phases of construction are reached and such other phases as the Council may determine to enable inspection to be carried out:

(a) Commencement of construction.

(b) Prior to concrete construction.

(c) Prepared earthworks and subsoil drainage prior to filling.

(d) Completed earthworks and prepared subgrade.

(e) Water, wastewater, and stormwater reticulation prior to backfilling.

(f) Water and wastewater reticulation during pressure testing.

(g) Finished basecourse before the commencement of road sealing.

(h) Disinfection of water mains.

At least 48 hours notice shall be given by the developer. Further construction phases shall not proceed until inspection has been made.

3.2.10.3 Construction

All construction carried out in any development shall be carried out by persons who:

(a) Have the appropriate experience in the relevant areas.

(b) Have the appropriate equipment.

(c) Have the appropriate public liability insurance.

(d) Meet the requirements of the Health and Safety in Employment Act.

3.2.10.4 Earthworks Construction

Earthworks shall be carried out to the standards detailed in the CoP.

The construction control testing shall be carried out by a testing laboratory or competent person under the control of the geo-professional, and to the recognised testing standards as deemed appropriate. The testing laboratory shall have recognised registration or quality assurance qualifications.

3.2.10.5 Stormwater Construction

The construction of pipelines shall be carried out in accordance with the requirements of AS/NZS 2032 (PVC), AS/NZS 2033 (PE), AS/NZS 2566 Parts 1 and 2 (all buried flexible pipelines), or AS/NZS 3725 (concrete pipes).

On site disposal of stormwater may be permitted where:

(a) No piped system is immediately available or will not be available within 10 years of the subdivision application.

(b) No piped system is available immediately adjacent or within a reasonable distance of the site.

For clarification of what constitutes a "reasonable distance" refer to Section 9.8 of this CoP.

Areas where construction has taken place shall be reinstated to the condition required by Council.

3.2.10.6 Wastewater Construction

The construction of pipelines shall be carried out in accordance with the requirements of AS/NZS 2032 (PVC), AS/NZS 2033 (PE), AS/NZS 2566 Part 1 and 2 (all buried flexible pipelines), AS/NZS 3725 (concrete pipes), or AS 1741 or BS EN 295 (VC).
Areas where construction has taken place shall be reinstated to a condition as required by Council.

3.2.10.7 Water Supply Construction

Excavation of existing carriageways shall conform to Council's road opening procedures where these exist. Excavation in existing carriageways shall be carried out in a safe manner with the minimum disruption to traffic and pedestrians.

3.2.10.8 Road Construction

Construction shall comply with the requirements of Council and as a minimum to the Waka Kotahi NZ Transport Agency standards set out in this CoP.

3.2.11 Documentation Held On Site

A full set of up to date approved drawings shall be maintained on site at all times. These drawings shall be made available to Council staff during site inspections.

3.2.12 Variations To The Approved Design

Should the approved design need amending in any way that impacts upon the principles of the approved design. The developer shall resubmit the revised design for approval and obtain that approval prior to construction.

3.2.13 Inspections And Hold Points

Throughout this CoP there are a number of construction points which require notification to Council in advance so that the works can be inspected. The developer shall treat these as hold points and shall not progress until such time that Council confirms acceptance or approval to proceed. To avoid delays to the developers construction programme this requirement highlights the need to provide adequate notice (5 days preferable, 2 days absolute minimum).

3.2.14 Supervision Of Construction

Council will require completion certification for construction and supervision be submitted to it on completion. Such certification may be required from the contractors undertaking the construction, or the developer, or the developer's professional advisor (if any). The certificates shall be in the form given in Schedules 2B and 2C in this CoP.

The level of supervision undertaken in connection with any construction shall be agreed between Council and the developer, or, if appointed, the developer's professional advisor or the IQP as the case may be, and shall be appropriate to the circumstances considering the size and importance of the project, the complexity of the construction, and the experience and demonstrated skill in quality management of the person undertaking the construction.

Council will require completion certification for construction and supervision be submitted to it on completion. The certificates shall be in the form given in Schedules 2B and 2C in the CoP. Such

certification may be required from the contractors undertaking the construction, or the developer, or the developer's professional advisor (if appointed).

3.2.15 Connecting To Existing Services

Connection of water, wastewater, stormwater, and other services to existing systems will normally be carried out by the appropriate network utility operator at the cost of the developer, except that at the discretion of the network utility operator connections may be made by the owner, or contractor employed by the owner, if appropriately qualified and under the network utility operator's supervision. The developer shall give the network utility operator five working days notice of intention to connect to existing services. Where required, new services shall be tested and approved by the network utility operator prior to connection.

3.2.16 Inspection And Acceptance

Council may, at its discretion, also require a water test to be carried out. Such testing shall be carried out as specified in Section 8.7

3.2.17 Maintenance

The developer shall maintain the infrastructure until it is formally taken over by Council or to a date specified in a bond or consent condition for completion of uncompleted infrastructure. The developer shall not be responsible for damage caused by other activities (outside the developer's control) such as building construction by others or for fair wear and tear or vandalism caused by public use of the roads that have been taken over by Council or network authority.

3.2.18 Testing

Any infrastructure required to be tested and witnessed by Council/the utility operator shall be pre-tested and proved satisfactory by the developer before testing by the network utility operator is requested.

3.2.19 Reinstatement

Areas where construction has taken place shall be reinstated to the condition required by Council and shall be no less than the original condition pre-works.

3.2.20 Asset Handover Process

3.2.20.1 Completion documentation

On completion of all subdivision, land use and development infrastructure, as built data and information is required for submission to Council. Figure 2-2 presents high-level requirements for as-built asset data and the developer shall provide Council with the following:

a) The geotechnical reports and as-built plans required by Section 4.4 of this CoP.

b) As-built plans of all infrastructure showing the information set out in Schedule 2D. As-built plans will be required in hard copy and in an electronic format (as laid out in this document) for major subdivisions. The electronic data is to use the New Zealand Transverse Mercator (NZTM) co-ordinate system or the current standard co-ordinate system recognised by the governing body (LINZ).

   i. If electronic data does not meet Council's format requirements or is deemed to be of inadequate quality, Council will return to the developer for error correction.

c) Evidence that all testing required by this CoP has been carried out and that the test results comply with the requirements of this CoP.

d) Evidence that reticulation and plant to be taken over by network utility operators have been installed to their standards and will be taken over, operated and maintained by the network utility operator concerned.

e) Design certificate as per Schedule 2A

f) An updated Safety in Design register. This should be an updated form prepared at the completion of design to indicate what risks have been closed out during the construction phase.

g) Completion certificates as per Schedules 2B and 2C.

h) Certification by a suitably qualified person where they have recommended a specific design and construction has been undertaken in accordance with that recommendation. The certification shall state that the suitably qualified person supervised the construction and it has been completed in accordance with the recommended design principles.

i) Other documentation required by Council including, but not limited to, operation and maintenance manuals, and warranties for new facilities involving electrical or mechanical plant, and asset valuations for all infrastructures to be taken over by Council.

More specific requirements on roads, 3 waters, and community resources are listed in the following sections.

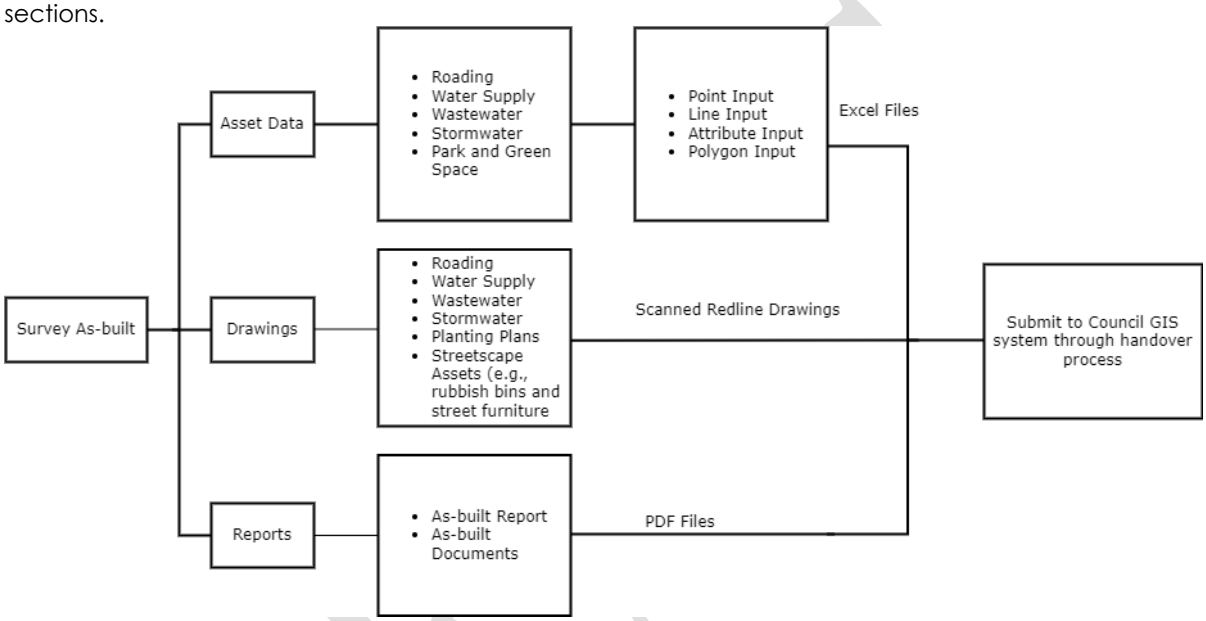


Figure 1-2. A diagram on the as-built data requirements for submission (high-level).

3.2.20.2 Roads

Roading specific tests are required for assets to be vested on the completion of the subdivision development or infrastructure build. The testing results are to be submitted to Council as part of the roading asset handover process. The list of required tests is presented in the Table 1-1. For assets that are not to be vested, developers shall provide a declaration to state that all CoP standards have been met.

Waka Kotahi will roll out a national RAMM database guideline in late 2022. Council will be adopting the updated national RAMM database guideline as a minimum requirement plus any other Council specific requirements.

Table 1-1. Test requirements for roads

Material Type	Testing Required	Test Method	Frequency of Testing
Design and site investigation	Subgrade CBR/test pits provided for any investigations undertaken to inform the design		
Roading Plans	Long section and cross sections etc		
Laboratory Tests			
Source properties (all granular materials, including sealing chip)	Weathering, Crushing	NZS 4407	2 test / source
Subbase and Basecourse	Maximum Dry Density (NZ Vibrating compaction)	NZS 4402	1 test/source for each granular layer at minimum frequency of one test per 5,000m2 of material laid frequency of one test per 5,000m2 of material laid
Subbase	Particle Size Distribution, Sand Equivalent, Log-Log graph, The slope (n), Coefficient of Uniformity (Cu) & Curvature (Cc)	NZS 4407	Lots <2,000m3 2 samples Lots >2,000m3 2 samples Plus 1 sample for each additional 1,000m3
Basecourse	Particle Size Distribution, % crushed faces, Sand Equivalent, Log-Log graph, The slope (n), Coefficient of Uniformity (Cu) & Curvature (Cc)	NZS 4407	Lots <1,000m³ 2 samples Lots >1,000m3 2 samples Plus 1 sample for each additional 500m3
Running Course	Particle Size Distribution, Sand Equivalent	NZS 4407	1 sample
Sealing Chip	ALD/AGD (Gr 2-4) only Particle Size Distribution Cleanness Value	NZS 4407 NZTA M06	Lots <100m3 2 samples Lots 100-400m3 3 samples Lots >400m3 4 samples Plus 1 sample for each additional 100m3
Sealing Chip	Polished Stone Value (PSV)	BS EN 1097-8 NZTA T/10	Per source
Concrete K&C and Footpaths	Slump and strength		
Field Tests			
Subbase	Field Dry Density – Nuclear Density Meter	NZS 4407 TNZ B/02	1 set of tests/1,000m2 of surface area 0.5m lifts in culvert trenches

Construction Tolerances	Tolerances / Stringing	TNZ B/02	Every 20m
Basecourse	Field Dry Density – Nuclear Density Meter, (including field and oven water contents)	NZS 4407 TNZ B/02	1 set of tests/1,000m2 of surface area
Surfacing	Spray sheets / Mix design	TNZ P/3 M/10 NZTA Z8:2020	NZTA Z8:2020 Minimum Standard for Inspection, Sampling and Testing
Underground services	description, as builts and photos		
Street lighting	all relevant information		
Site visit check lists	ITP		

3.2.20.3 3 waters

The as-built handover documents for 3 waters infrastructure will include drawings, excel sheets and reports. These need to be based on site survey, georeferenced CAD or Shape files with coordinates and descriptions. Table 1-2 lists the requirements for 3 waters as-built asset information. Detailed requirements can be found in the "Southland District Council Infrastructure Assets Data Model Specification" (working draft).

The details of all pipes should include:

- Type
- Material
- Length
- Structural details (i.e. pressure class, stiffness rating & load rating)
- Diameter
- Off-set, segment and overall length dimensions should all correctly add up and agree once drawn into GIS.

Table 1-2. Requirements of as-built asset information for 3 waters assets

Excel Spreadsheet
▪ Coordinate system
▪ Asset Type for each record
▪ XYZ/Northing Easting and Height coordinates
CAD Files
▪ Coordinate system
▪ Well labelled objects
▪ Historic/abandoned pipes
▪ Legend with a breakdown of layers (e.g., 'Water_lateral', 'Water_Main', 'Water_Toby')
▪ Existing infrastructure and type of work (e.g., dug up, abandoned, replaced)
▪ New infrastructure clear and readable
▪ Parcels or reference for adding to Council system
As-built Report
▪ The date of construction
▪ Drain layers name, registration
▪ The address of the work
▪ Contract number, work order or purchase order
▪ What/who this project/work was for and who the owners of the various assets that have been created are
▪ Existing infrastructure and type of work (e.g., dug up, abandoned, replaced)

3.2.20.4 Community Resources

Community resources includes community facilities, open space, water facilities, community services and heritage and culture in SDC. Table 1-3 presents the requirements of asset handover for the community resource activities.

Table 1-3. Requirements of asset handover for community resource activities

Sub-activity	Land use and services	Requirements of asset handover
Community facilities	Community centre and halls	Treat as a building asset, for which the as-built information below should be collected: 1. As-built design drawings 2. Vendor supply information (shop drawings and technical dataset) 3. Operation and maintenance information 4. Survey information of the locations of key assets
	Offices and libraries	
	Public toilets	
	Dump stations	
	Amenity buildings	
Open space	Reserve	Asset handover submission need to specify based on the nature of the facilities: paths/tracks, seats, signage, bridges, board walk, fences, drinking fountains. For which the as-built information below should be collected: 1. As-built design drawings 2. Vendor supply information (shop drawings and technical dataset) 3. Operation and maintenance information 4. Survey information of the locations of key assets
	Community Park	
	Nature Park	
	Sports field	Asset handover submission need to specify based on the nature of the facilities: paths/tracks, seats, signage, bridges, board walk, fences, drinking fountains, artificial surface, training nets, clubrooms. For which the as-built information below should be collected: 1. As-built design drawings 2. Vendor supply information (shop drawings and technical dataset) 3. Operation and maintenance information 4. Survey information of the locations of key assets
	Streetscaping	Asset handover submission need to specify based on the nature of the facilities: paths/tracks, seats, signage, bridges, board walk, fences, drinking fountains. For which the as-built information below should be collected: 1. As-built design drawings 2. Vendor supply information (shop drawings and technical dataset) 3. Operation and maintenance information 4. Survey information of the locations of key assets
	Linear Park	
	Playground	Asset handover submission need to specify based on the nature of the facilities: play equipment, soft fill, wooden edging, seats, shade, drinking fountains, paths, signage. For which the as-built information below should be collected: 1. As-built design drawings

Sub-activity	Land use and services	Requirements of asset handover
		2. Vendor supply information (shop drawings and technical dataset) 3. Operation and maintenance information 4. Survey information of the locations of key assets
	Golf Course	Leased
Community services	Cemeteries	Asset handover submission need to specify based on the nature of the facilities: cemetery beams (Concrete strips), sheds, memorial walls, seats and shelters. For which the as-built information below should be collected: 1. As-built design drawings 2. Vendor supply information (shop drawings and technical dataset) 3. Operation and maintenance information 4. Survey information of the locations of key assets
	Community housing units	Treat as a building asset, for which the as-built information below should be collected: 1. As-built design drawings 2. Vendor supply information (shop drawings and technical dataset) 3. Operation and maintenance information 4. Survey information of the locations of key assets
Water facilities	Wharf/jetty	
	Boat ramp	
	Navigation aid	
	Swimming pontoon	
	Retaining walls	
	Viewing platform	

3.2.20.5 Approval of uncompleted work

Where in the opinion of Council it is assessed as reasonable, and unlikely to materially affect the safe operation of public assets and expectations and interests of the public and directly affected private parties, the Council may approve the deferral of completion of an element of a consented and approved work, subject to satisfactory bonds being arranged.

3.2.20.6 Bonds and Charges for Uncompleted works

Bonds to cover uncompleted works, especially where a subdivision or development has been substantially completed, are recognised as an acceptable procedure and should be permitted at the discretion of Council. Acceptance of a bond for uncompleted works shall not be unreasonably withheld.

Bonds shall be secured by an appropriate guarantee or shall be in cash and lodged with Council. Where necessary bonds shall be executed and registered.

The amount of the bond shall be the estimated value of the uncompleted work plus 50% to cover additional costs estimated to be incurred by Council in the event of default.

3.2.20.7 Reserves and Land Protection Covenants

Layout plans and location of reserves and land protection covenants shall be discussed with Council prior to the lodgement of finalised plans. Development plans for all future reserves shall be submitted with application for engineering approval, and no work is to be carried out on site before Council approval is issued.

All reserve development shall be completed in accordance with the plans approved by the Council. Development may include earthworks, drainage, planting, paths, structures (such as seating, tables, litter bins, fencing, barriers, signs, and play equipment) and facilities (such as toilets, changing sheds and footpath lighting) as specified by the Council.

3.2.20.8 Certification

The developer shall keep records of all testing and commissioning to be provided to Council as part of asset handover process.

3.2.20.9 As built drawings

General

Full as-built documentation is to be submitted for all infrastructure, whether on Council projects, private developments or Waka Kotahi NZ Transport Agency (Waka Kotahi (NZTA)) work.

All as-built information will be issued in the approved format and of a quality acceptable to Council prior to the issue of Section 224(c).
If electronic data does not meet Council's format requirements or is deemed to be of inadequate quality, Council reserves the right return to the developer for error correction.

The as-built documentation shall consist of:

- one set of paper prints showing the plan location of all new infrastructure features and utilities and any that have been either removed or retired as a consequence of the project.
- for all except very limited developments involving only one or two pipes, a digital copy of the plan information.
- a digital table of asset information such as pipe type, pipe diameter, pipe lengths, position co-ordinates, levels, depths, etc.

Except for minor works, all As-built plans are to be prepared under the supervision and certified as to accuracy by a Licensed Cadastral Surveyor.
The documents are to be prepared in a format suitable for downloading into Council's GIS.

Detailed requirements for each of these are set out below.

Plan Coverage

Plans shall show:

- Accurate property boundary positions.
- The datums for levels and for coordinate positions.
- Local benchmarks for level and position, if applicable.
- All roading features (kerb and channel, footpaths).
- Street lighting and transformers.
- All wastewater, stormwater and water supply surface features.
- All pipelines with gravity and rising mains identified.
- Pipelines and other assets removed from the site.
- Superseded or disconnected pipelines still remaining at the site.
- The location of all cable to be taken over by Council.
- The location of any non-council utility services sited by agreement on Council reserves.
- Areas of filling showing the extent of and depth of fill (appropriate grid or fill contours).
- Correct road names as approved by Council.
- All alterations from the original design shall be shown on the plan with reference made in accompanying correspondence to the Engineer's approval for the alterations.

Plan Prints

Hard copy plan prints shall be prepared in accordance with accepted good engineering design practice. They shall be easy to follow and clear to read. Draughting shall comply with AS/NZS 1100.

Digital Plans

Digital plans are to be prepared in a format such as DXF, DWG or Shapefile that can be imported into Council's GIS. Council's preference is for plan to be provided in Shapefile format. Surveyors and draughtsmen are advised to contact the Council office to check particular requirements. A digital (PDF version of the drawings shall also be provided.

Plans are to be prepared in accordance with the following conventions:

- The coordinate system shall match that used by the Council GIS (GD 2000).
- Each utility asset type is to be placed on a specific separate level.
- The level is to be given a meaningful name (such as sewer mains or street lights) with this name being consistently used for all plans.
- Only information relevant to the level is to be placed on that level.
- Each pipe is to be represented by a single line representing the pipe centreline.
- Each pipe shall run continuously between manholes and be broken at manholes.
- Water mains with bends are to be drawn as one continuous line.
- Pipes are not to be broken at service lines, sump leads or laterals junctions.
- Line work is to be accurately snapped to point features and to be accurately joined at junctions and bends.
- Point assets on water mains, such as valves, hydrants, tees are to be snapped on to the main, not breaking it.
- Manholes are to be located by the point at the centre of the manhole lid. Other surface features such as sumps, valves and hydrants are to be represented by the point at their centre.
- Gravity flow stormwater and sewer pipes are to be numbered in the direction of flow.
- Pressure networks are to be generally numbered in the direction of falling pressure.
- Each point feature and each line end on the plan is to be uniquely numbered with position and descriptive details relevant to each point being attached in a table, as set out in the next section.

Digital Tables

The following tables of information are to be supplied in digital format:
For all facilities:

- Feature number.
- Feature type.
- X, Y, Z co-ordinates.
- Additional information as below.

For underground facilities:

- Depths to manhole inverts and to pipe inverts entering manholes through drop connections.
- Depths of lateral service pipes at property terminations.
- Position of lateral connections relative to property side boundaries.
- Descriptive information. Descriptive information shall include such aspects as material type, pipe class, pipe diameter, manhole diameter, hydrant manufacturer relevant to the type of asset being described and sufficient to fully specify what has been installed.

For street-lighting:

- Descriptive information about poles such as make, model, material, height.
- Information on the mounting arm or bracket and final mounting height.
- Information on the luminare such as make, model type.

Conventions to be followed in populating the tables with information are:

- The feature number may be any unique whole number allocated by the licensed cadastral surveyor, but the numbers used are to be sequential.
- The feature type is to be the commonly used name such as sump, valve, and manhole with the naming being consistent over the project.
- Co-ordinate positions shall be accurate to within +/-100 mm.
- Levels shall be accurate to within +/-20 mm and expressed in terms of mean sea level.
- The local origin of levels shall be recorded.
- Pipe lengths are to be in metres.
- Levels are to be in metres.
- Diameters and other descriptive dimensions are to be in millimetres.

All text in tables is to be in UPPER CASE lettering.

As-built information for individual connections to Council infrastructure will be in a format as agreed with Council engineering staff.

3.2.20.9.1 As-built drawings and documentation for earthworks and subsoil drains

Where earthworks have occurred, an as-built plan shall be prepared showing finished contours. The plans shall also show original contours where earthworks have occurred to illustrate the extent and depth of cuts and fills. Alternative methods of representing earthwork depths may be acceptable including plans showing lines joining all points of equal depth of cut and fill at appropriate vertical intervals.

The as-built plans shall also record the position, type, and size of all subsoil drains and their outlets, and show any areas of fill or natural ground which the geo-professional considers do not comply with this Standard or areas where the standards have been varied from the original construction specification.

These plans shall be made available to Council and the developer in conjunction with the geotechnical completion report.

For all developments where a geo-professional is engaged the geo-professional shall submit a geotechnical completion report to the developer and Council accompanied by a statement of professional opinion as set out in Schedule 0 2A in the CoP. The geotechnical report shall identify any specific design requirements which would necessitate the building design deviating from NZS 3604.

3.2.20.9.2 Roading

On completion of construction, information and documents as required by Council shall be provided by the developer's professional advisor. (See Schedule 0 2D for further information.) The information provided shall provide sufficient detail to enable Council to complete the road assessment and maintenance management (RAMM) database input.

3.2.20.9.3 CCTV inspections

The developer shall supply to Council, prior to acceptance of the subdivision closed circuit television (CCTV) inspection records electronically for all newly constructed foul sewer and stormwater mains. A pan and tilt camera shall be used and lateral connections shall be inspected from inside the main. Inspection data shall be provided digitally in a format for capture into Council's Hansen Information Management System (e.g., Flexidata or similar).

When any defect is identified in the CCTV survey, remedial work shall be carried out to the satisfaction of the Engineer and a further CCTV inspection carried out to confirm correction of the defect.

Pipe systems of 1200 mm diameter or less shall be inspected using CCT prior to acceptance by Council.

CCTV inspections and deliverables shall be in accordance with New Zealand Gravity Pipe Inspection Manual 4th Edition and the requirements of Council.

Schedule 2A Design Certificate – Land Development/Subdivision

ISSUED BY:

(approved certifier firm/suitably qualified design professional)

TO:

(developer/owner)

TO BE SUPPLIED TO: Southland District Council / Invercargill City Council (delete one)

FOR:

(description of land development/subdivision)

AT:

(address)

……has been engaged by……..……..……..
(Consultant/designer) *(Developer/owner)*
to provide……services for the land development and/or subdivision described above.

I……have the qualifications and experience relevant to this project as set our herein and have designed the land development/subdivision and confirm that the design is to the current engineering practice, and that I believe on reasonable grounds that it satisfies all relevant resource consent conditions, all relevant Southland District Council / Invercargill City Council (delete one) requirements and applicable codes and standards.

I/My practice holds professional indemnity insurance to the amount of $……and includes run-off cover.

…… Date……
(Signature of approved certifier on behalf of the approved certifier firm)

……
(Name, title, and professional qualifications)

Note – This statement shall only be relied upon by the Southland District Council or the Invercargill City Council. Liability under this statement accrues to the approved certifier firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the relevant Council on this land development/subdivision, whether in contract, tort, or otherwise (including negligence), is limited to the sum of $…… (insert).

Schedule 2B Contractor's Certificate Upon Completion of Land Development and/or Subdivision

ISSUED BY:

(approved certifier firm/suitably qualified design professional)

TO:

(developer/owner)

TO BE SUPPLIED TO:

Southland District Council / Invercargill City Council (delete one)

FOR:

(description of land development/subdivision)

AT:

(address)

……..……has contracted to……..……..……..……..
(Contractor) *(Principal))*

to carry out and completed certain land development and/or subdivision construction in accordance with a contract, titled Contract No. …….. for……..
(Contractor)

I……..……a duly authorized representative of ……..
(Duly authorised agent)) *(Contractor)*

hereby certify that …….. has carried out and completed
(Contractor)

the construction, other than those outstanding works listed below, in accordance with the contract and in accordance with approved engineering drawings and specifications.

…… Date……
(Signature of authorised agent on behalf of)

……
(Contractor)

…… ……..……
(Address)

Outstanding works:

Schedule 2C Certification Upon Completion of Land Development/Subdivision

ISSUED BY: (approved certifier firm)

TO: (developer/owner)

TO BE SUPPLIED TO: Southland District Council / Invercargill City Council (delete one)
(territorial authority)

FOR: (description of land development/subdivision)

AT: (address)

……has been engaged by……..
(Consultant/designer) *(Developer/owner)*
to provide construction observation review and certification services for the above subdivision which is described in the specification and shown on the drawings numbered…… approved by the Southland District Council / Invercargill City Council (delete one).

I have sighted the Southland District Council / Invercargill City Council (delete one) consent and conditions of subdivision and the approved specification and drawings.

On the basis of periodic reviews of the construction and information supplied by the contractor in the course of construction, I believe on reasonable grounds that the infrastructure other than those outstanding works listed below, is complete and has been constructed in accordance with:

(a) The approved engineering drawings and specifications and any approved amendments;
(b) The Councils' Engineering Standards; and
(c) The manufacturer's instructions

…… Date……
(Signature of approved certifier on behalf of the approved certifier firm)

……
(Name, title, and professional qualifications)

Note – This statement shall only be relied upon by the Southland District Council or the Invercargill City Council. Liability under this statement accrues to the approved certifier firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the relevant Council on this land development/subdivision, whether in contract, tort, or otherwise (including negligence), is limited to the sum of $…… (insert).

Outstanding Works:

Schedule 2D AS-Built Plans/Documentation

Information given on as-built drawings, whether submitted electronically or as paper plans, shall include but shall not be limited to:

(a) Stormwater and wastewater reticulation - including the coordinated positions of manholes, manhole inverts, inverts of pipes and lid levels, measurements to house connections, and laterals and their length and position. Positions of connections and laterals shall be both coordinated and referenced to adjacent manhole lids and boundary pegs. All levels shall be in terms of datum defined by Council.

(b) Stormwater management devices - as-built plans for low impact stormwater management devices and non-reticulated components.

(c) Flood and secondary flow information, flood water levels and the extent of any overland secondary flows shall be shown where these have been obtained or derived during the design.

(d) Water reticulation - including the position of mains, location of hydrants, valves, tees, reducers, connections, tobies, water meters, and specials. All features shall be accurately dimensioned, coordinated, and referenced so that they can be accurately relocated in the field.

(e) Ducts - measurements to ducts installed by the developer for utilities.

(f) Labelling of pipes and ducts to cover nominal and actual diameters (ID and/or OD), pipe material and class, year laid, jointing type, manufacturer, model references.

(g) Road names where available - as approved by Council.

(h) Coordinates and levels of all utility surface features to be taken over by Council including tobies, and water meters.

(i) The coordinates of at least two points on each plan in terms of an appropriate geodetic or cadastral datum and the origin of the plan level datum.

(j) Geotechnical completion report and as-built drawings as detailed in this CoP. As-built surface contours covering all areas of disturbed and cut/fill ground.

(k) Road construction, including location, structural details, and details of road marking, signals, lighting, and signs, landscape features, seating, and other amenities and features.

(l) Road pavement and surfacing information.

(m) Landscape features, seating, and other amenities and features.

Section 4. Earthworks and Geotechnical Requirements

4.1 Scope

This section sets out requirements for the assessment of land stability and the design and control of earthworks to ensure a suitable stable platform for the construction of buildings, roads, and other structures with no adverse impacts. A low impact design approach is preferred. Geotechnical assessment shall be undertaken by a geo-professional defined in 0 of this CoP where:

(a) The assessment of land stability requires specialist expertise.
(b) The construction of earthworks associated with any development requires initial planning and design to ensure that banks and batters remain stable and that fill material is placed in such a way that it remains stable and can support the future loads imposed on it.
(c) There is historical fill which has not been undertaken in accordance with any Bylaw or where natural slopes, banks, or batters are involved.
(d) The assessment of ground for the foundations of buildings, roads, services, and other infrastructure requires specialist expertise as weak ground may require special design.
(e) The wide range of soil types, physical conditions, and environmental factors applying in different areas make it difficult to specify precise or prescriptive requirements for land stability assessment or earthworks.

In setting design, construction requirements, or development limitations the designer shall take account of all relevant standards and Council requirements. Where geotechnical assessment isn't required earthworks must be carried out in such a manner that complies with this CoP.

For clarification, the contents of this section do not apply to normal agricultural and forestry practices such as ploughing and root raking.

Note: NZS 4431 is applicable to the construction of earth fill for residential development including residential roading.

4.2 General

4.2.1 Objective

The objective of this section is to set out some, but not necessarily all of the matters which need to be considered in planning and constructing a land development project. The aim is to provide information for professionals involved in designing and constructing a land development project and to require geotechnical expertise in projects where land stability could be an issue or where earthworks other than of a minor nature will occur.

The geo-professional needs to be involved in the choice of final land form. This decision depends on many factors which may be specific to the development.

These include the relationship with surrounding landscapes, the size of the development, the proposed and existing roading patterns, the preservation of natural features, wāhi tapu, and other historic and archaeological sites, the land stability and underlying structural geology, the function and purpose of the development and the potential for flooding, and erosion and other natural hazards and events including earthquakes.

The aim is to also give guidance on the identification of and assessment of the order of importance of the above factors which will vary from project to project.

4.2.2 Referenced Documents

A selection of useful guidance material on geotechnical and geomechanical issues in land development is set out in the Referenced Documents under Section 2 of this CoP. Related documents list additional material that may be useful.

4.2.3 Southland District Council Geotechnical requirements

Where any proposed development involves the assessment of slope stability or the detailed evaluation of the suitability of natural ground for the foundations of buildings, roading, and other structures, or the carrying out of bulk earthworks, then a geo-professional shall be appointed by the developer to carry out the following functions:

(a) Check Regional and District Plans, records, and requirements prior to commencement of geotechnical assessment.

(b) Prior to the detailed planning of any development, to undertake a site inspection and such investigations of subsurface conditions as may be required, and to identify geotechnical hazards affecting the land, including any special conditions that may affect the design of any pipelines, underground structures, or other utility services.

(c) Before construction commences, to review the drawings and specifications defining any earthworks or other construction and to submit a written report to Council on the foundation and stability aspects of the project.

(d) Before and during construction, to determine the extent of further geo-professional services required (including geological investigation).

(e) Any work necessary to manage the risk of geotechnical instability during the construction process.

(f) Before and during construction, to determine the methods, location, and frequency of construction control tests to be carried out, determine the reliability of the testing, and to evaluate the significance of test results and field inspection reports in assessing the quality of the finished work.

(g) During construction, to undertake regular inspection consistent with the extent and geotechnical issues associated with the project.

(h) On completion, to submit a written report to Council attesting to the compliance of the earthworks with the specifications and to the suitability of the development for its proposed use including natural ground within the development area. Where NZS 4431 is applicable, the reporting requirements of that Standard shall be used as a minimum requirement.

4.3 Design

4.3.1 Design Factors

The design process shall include, but not be limited to:

(a) Preliminary site evaluation.

(b) Identification of special features to be retained/protected.

(c) Low impact design considerations.

(d) Selection of the choice of landform.

(e) Stability assessment.

(f) Assessment of special soil types where applicable.

(g) Setting of compaction standards for fill material.

(h) Erosion, sediment, and dust control.

(i) Seismic considerations.

(j) Geothermal issues where applicable.

4.3.2 Preliminary Site Evaluation

During the preliminary site evaluation phase the developer's professional advisor shall engage a geo-professional at an early stage to undertake a preliminary site evaluation and prepare a geotechnical assessment report.

In cases where more than a visual appraisal is deemed to be required, particular attention will need to be given to the following matters, as appropriate, which should normally be considered prior to preparing a proposal for development:

(a) **Low impact design factors:**

The preliminary site evaluation needs to take into account low impact design factors. These include consideration of maintaining and improving natural waterway features and optimising waterway crossing locations. Protection of well-drained soils and natural soakage areas also need to be taken into account.

(b) **Drainage:**

Identify the existing natural drainage pattern of any area and locate any natural springs or seepage. Where any overland flow paths or natural surface or subsurface drainage paths are interfered with or altered by earthworks, then appropriate measures must be taken to ensure that adequate alternative drainage facilities are provided to ensure there is no increase in flood hazard risk to the site or adjoining properties.

(c) **Slope stability:**

Some natural slopes exist in a state of only marginal stability and relatively minor disturbance such as trenching, excavation for streets or building platforms, removal of scrub and vegetation, or the erection of buildings, can lead to failure. Signs of instability include cracked or hummocky surfaces, crescent-shaped depressions, crooked fences, trees or power poles leaning uphill or downhill, uneven surfaces, swamps or wet ground in elevated positions, plants such as rushes growing down a slope, and water seeping from the ground. In addition, a simple desktop study of aerial photographs may show indications of historic failures as well as faulting, resulting in linear ground features. Refer to BRANZ Study Report 004, Crawford and Millar 1998, or the New Zealand Geotechnical Society publications Field description of soil and rock and Geotechnical issues in land development. For a sample checklist for geotechnical assessments refer to Crawford and Millar 1998. Existing or potential surface creep effects also need to be investigated and reported upon.

(d) **Foundation stability:**

A study of the general topography of the site and its surroundings may indicate areas which have previously been built up as a result of natural ground movement or by the deliberate placing of fill material. Unless such fill has been placed and compacted under proper control, instability or long-term differential settlement could occur causing damage to superimposed structures, roads, services, or other structures.

(e) **Stream instability:**

There is a potential for instability through changes to the current ground conditions, such as stream erosion.

(f) **Local conditions:**

A wide range of soil types exist throughout New Zealand which may need special consideration. Expansive soils, volcanic soils, soft alluvial sediments, and compressible soils are examples of these. Liquefaction of saturated non-cohesive soils should also be considered. Council may have information on the soil types in its area, including potentially contaminated land.

(g) **Peer review:**

Where risk for the land prior to development is assessed as being medium to very high risk, a peer

review of the geotechnical assessment for the proposed development may be required and this would need to be carried out by an independent geo-professional. (For guidance see *NZ Geomechanics News* (Crawford and Millar) for risk classification and (Cook et al) for peer review.)

4.3.3 Landform Selection

The final choice of landform shall represent the most desirable compromise between the development requirements and the preservation of natural features and the natural character and landscape amenity values of the site including the retention of natural watercourses. Landform selection needs to take into account low impact design principles including retention of existing landforms and natural features where possible, and avoiding earthworks where there are existing habitats of indigenous species, wetlands, or areas of high natural character. The design shall take into account the following factors in making the selection of the final choice of the landform:

(a) The choice of a suitable landform may be specific to a particular site. An earthworks approach that respects and reflects the natural topography of the site is preferred. Considerations for carrying out earthworks include:
  (i) the minimisation of the risk of damage to property and/or roads occurring through ground movement in the form of slips, subsidence, creep, erosion, or settlement;
  (ii) the minimisation of the risk of damage to property and/or roads occurring through flooding, or surface water run-off;
  (iii) the development of a more desirable roading pattern with improved accessibility to and within the site and the creation of a better sense of orientation and identity for the area as a whole;
  (iv) the efficiency of overall land utilisation including the quality of individual sites and amenity areas around buildings, the economics of providing engineering services, and the standard of roading and on-site vehicular access;
  (v) the need to create suitably graded areas for playing fields and other community facilities;
  (vi) the enhancement of the general environmental character of the area.

(b) The general nature and shape of the ground including:
  (i) the geological nature and distribution of soils and rock;
  (ii) existing and proposed drainage conditions, and the likely effects on groundwater;
  (iii) previous history of ground movements in similar soils in the area;
  (iv) performance of comparable cuts and fills (if any) in adjacent areas, and
  (v) air photography and other sources of information which should be reviewed and incorporated into any slope stability assessment.

(c) Soil data as applicable for areas which:
  (i) are intended to form in-situ bases for fills;
  (ii) are intended to yield material for the construction of fills;
  (iii) are intended to be exposed as permanent batters; and
  (iv) are to remain as permanent slopes or cut areas.

(d) Borings, probings, or open cuts as necessary to:
  (i) classify the soil strata by field and visual methods;
  (ii) evaluate the likely extent and variation in depths of the principal soil types; and
  (iii) establish the natural groundwater levels.

(e) Soil information required for:
  (i) further sampling and testing which may be required on representative soil types;
  (ii) relating subsequent soil test properties to relevant strata over the site;
  (iii) assessment and design for slope stability;
  (iv) assessment and design for foundations suitable for the finished site;
  (v) assessment and design for road subgrades.

The test data appropriate in different areas should be determined by the geo-professional.

4.3.4 Stability Criteria

In making an assessment of the stability of slopes and earth fills, the geo-professional shall use accepted criteria and analysis methods. Stability criteria applicable to land development in New Zealand are published or recommended by the New Zealand Geotechnical Society (see Referenced Documents).

4.3.5 Special Soil Types

If special soil types are known to exist in a locality or are identified, then a geo-professional shall be engaged to advise on appropriate measures for incorporation of these soils into a development. Special soil types include, but are not limited to:

(a) Soils with high shrinkage and expansion.

(b) Compressible soils.

(c) Volcanic soils.

(d) Soils subject to liquefaction.

(e) Soils prone to dispersion (such as loess).

(f) Any excluded soils from the definition of good ground as defined in NZS3604:2011, as amended by B1/AS1 or its successor.

4.3.6 Compaction Standards for Fill Material

The standard of compaction and method of determination shall be as set out in NZS 4431. Where NZS 4431 is not applicable, the methods and standards of compaction shall be specified by the geo-professional.

Note: Commercial and industrial developments often have specialised requirements for fill materials and compaction. In these cases the requirements of NZS 4431 may not be applicable. The geo-professional should set the fill standards and procedures for these developments.

4.3.7 Erosion, Sediment, And Dust Control

4.3.7.1 Minimisation Of Effects

Earthworks shall be designed and constructed in such a way as to minimise soil erosion and sediment discharge. Where necessary permanent provision shall be made to control erosion and sediment discharge from the area of the earthworks.

Generation of dust during and after the earthworks operation shall be considered during the planning and design phase. If necessary, specific measures shall be incorporated to control dust.

4.3.7.2 Protection Measures

Where surface water could cause batter erosion or internal instability through infiltration into the soil, open interceptor drains shall be constructed in permanent materials, and benches in batter faces should be sloped back and graded longitudinally and transversely to reduce spillage of stormwater over the batter.

Water from stormwater systems shall be prevented from flowing into fill or into natural ground near the toe or sides of the fill.

No stormwater or wastewater soakage systems shall be constructed in fill or natural ground which could impair the stability of the ground.

Protection measures shall include the following as appropriate:

a) Erosion control mechanisms:
   (i) temporary drains to be constructed at the toe of steep slopes to intercept surface run-off and to lead away for treatment where required before discharge to a stable watercourse or pipe stormwater system;
   (ii) surface water to be diverted away from or prevented from discharging over batter faces and other areas of bare earth by bunds formed to intercept surface run-off and treated where required prior to discharge through stable channels or pipes, preferably into stable watercourses or piped stormwater systems;
   (iii) the upper surface of fills to be shaped and compacted with rubber-tyred or smooth-wheeled plant when rain is impending, or when the site is to be left unattended to minimise water infiltration;
   (iv) the completed battered surfaces of fills to be topsoiled and vegetated, or otherwise resurfaced to reduce run-off velocities;
   (v) control of erosion and sediment discharge may require planting, environmental matting, hydroseeding, drainage channels, or similar measures at an early stage in the earthworks construction phase;
   (vi) dust control may require frequent watering during construction along with establishment of the permanent surface at an early stage in the construction phase.

(b) Sediment management devices:
   (i) the surfaces of fills and cuts to be graded to prevent ponding;
   (ii) sediment traps and retention ponds to be constructed where they are necessary. These should be cleaned out, as required, to ensure that adequate sediment storage is maintained, with appropriate plans for decommissioning;
   (iii) temporary barriers or silt fences using silt control geotextiles, to be used to reduce flow velocities and to trap sediment;
   (iv) sections of natural ground to be left unstripped to act as grass (or other vegetation) filters for run-off from adjacent areas.

4.3.8 Seismic Considerations

The geo-professional shall consider the seismic effects on earth fills, slopes, and liquefiable ground and shall take these into account in design and construction of any development in accordance with the scale of the development.

4.4 Final Documentation

4.4.1 Geotechnical Completion Report

For all developments where a geo-professional is engaged the geo-professional shall submit a geotechnical completion report to the developer and Council accompanied by a statement of professional opinion as set out in Schedule 4A. The geotechnical report shall identify any specific design requirements which would necessitate the building design deviating from NZS 3604.

The expected level of site movement from reactive soil (expansive soils) under AS 2870:1996 shall be identified by their respective class and included in the geotechnical completion report. The soil properties used in determining the class are to be recorded in the report. The site subsoil class to the provisions of NZS 1170.5 Section 3 and NZS 1170.5 Supp 1 C3.1.3 shall be identified in the geotechnical completion report.

The report shall describe the extent of inspection, revisit and review all inferences and assumptions made during the investigation, assess the results of testing and state the geo-professional's professional opinion on the compliance of the development with the standards set by the geo-professional. The report shall also include all geotechnical reports prepared for the development.

Documentation on the testing of the soils for compaction shall be included in the geotechnical completion report. This documentation shall clearly show the areas in which compaction met the required standards, as well as any areas requiring retesting, and areas which did not meet the standards.

For developments where there are no earthworks the geotechnical completion report will comprise the geotechnical assessment report. For large or more complex developments where there may have been several stages of geotechnical reporting, all prior reports covering the subject area of land under certification shall be included in the geotechnical completion report. The geotechnical completion report shall identify areas that provide good ground as defined in NZS 3604. Those areas that require specific design for stability and foundation design shall also be noted.

4.4.2 As-Built Drawings for Earthworks and Subsoil Drains

Please refer to Section 3.2.20 of this CoP and the requirements in Schedule 2D.

Where earthworks have occurred, an as-built plan shall be prepared showing finished contours. The plans shall also show original contours where earthworks have occurred to illustrate the extent and depth of cuts and fills. Alternative methods of representing earthwork depths may be acceptable including plans showing lines joining all points of equal depth of cut and fill at appropriate vertical intervals.

The as-built plans shall also record the position, type, and size of all subsoil drains and their outlets, and show any areas of fill or natural ground which the geo-professional considers do not comply with this Standard or areas where the standards have been varied from the original construction specification.

These plans shall be made available to Council and the developer in conjunction with the geotechnical completion report.

4.5 Schedule 4A Statement of Professional Opinion on Suitability of Land for Building Construction

DEVELOPMENT:

DEVELOPER:

LOCATION:

I, …… of ……
(full name) (name and address of firm)

Hereby confirm that:

1. I am a geo-professional as defined in Section 2.4 of the SDC & ICC Subdivision, Land Use, and Development Code of Practice 2023 and was retained by the developer as the geo-professional on the above development
2. The extent of my preliminary investigations are described in my report(s) number: …….. dated: …….. and the conclusions and recommendations of that/those document(s) have been re-evaluated in the preparation of this report. The extent of my inspections during construction, and the results of all tests and/or re-evaluations carried out are as described in my geotechnical completion, report dated:
3. In my professional opinion, not to be construed as a guarantee, I consider that (delete as appropriate):
   (a) The earth fills shown on the attached Plan No:…… have been placed in compliance with the requirements of the Southland District Council / Invercargill City Council, and my specification.
   (b) The completed works take into consideration land slope and foundation stability considerations, subject to the appended foundation recommendations and earthworks restrictions, (which should be read in conjunction with the appended final site contour plan).
   (c) Subject to 3(a) and 3(b) of this Schedule, the original ground not affected by filling is suitable for the erection of buildings designed according to NZS 3604 provided that:
      i. ……
      ii. ……
   (d) Subject to 3(a) and 3(b) of this Schedule the filled ground is suitable for the erection of buildings designed according to NZS 3604 provided that:
      i. ……
      ii. ……
   (e) The original ground not affected by filling and the filled ground are not subject to erosion subsidence or slippage in accordance with the provisions of Section 106 of the Resource Management Act 1991 provided that:
      i. ……
      ii. ……
4. This professional opinion is furnished to the Southland District Council / Invercargill City Council and the developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.
5. This certificate shall be read in conjunction with my geotechnical report referred to in Clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

(Signed) (Date)

(name, title and professional qualifications

Section 5. **Roads**

5.1 Scope

This section sets out requirements for the design and construction of roads for land use, development and subdivision. It provides engineering design and construction guidance, information on requirements, and references Roading Standard Details in Appendix B.

5.2 General

5.2.1 Objective

The objective is to provide roads that are safe for all road users and designed to the context of their environment. Roads shall be capable of carrying all utility services underground, provide for the management of stormwater, and contribute to quality urban design.

To this end a design report shall be prepared and submitted for Council Approval in respect of any new road, or road upgrade. The report shall include the design philosophy applied and confirmation of how the following design aspects have been resolved/selected. It should include the proposed materials to be used for the construction. The report shall also include a full set of design drawings.

5.2.2 Related Standards and Guidelines

A selection of currently available documents which provide an appropriate basis for road design is set out in the referenced documents. Related documents also list additional material that may be useful. These are not exclusive other Standards, guidelines, and design responses may be used where appropriate but must be accepted by Council.

Reference shall also be made to SDC's Roading Policy 2008, and Policy Procedures 2008, Rev 1 2015, or ICC's Roading and Traffic Bylaw 2022, or any future updates to the same.

5.2.3 Road Purpose

Roads serve a number of purposes that enhance quality of life in neighbourhoods, towns, and cities; improve opportunities for business in commercial areas; and meet a range of local, regional, and national goals for access, mobility, and land use. More explanation is available in NZS4404 Section 3. A road will serve the following functions:

- Creating access
- Providing a link for connection and movement of people via commercial or private vehicles, public transport, on foot, by bicycle or by other modes
- As a corridor for utility and amenity infrastructure

5.2.4 Classification Framework

Waka Kotahi (NZTA) has recently issued a One Network Framework which is the new national classification system to assist council in benchmarking their roads. It looks to ensure the network is fit for purpose for all modes of transport placing an emphasis on movement and place, integrating transportation with urban planning. Council intends to incorporate the principles into its planning hierarchy. Appendix A of the One Network Framework – current classification guidance provides a classification tables which identifies the route metrics, the land use zones and street categories.

Table 5-1 Road Functional Criteria (Land Use and Area Type Matrix Describing Typical Place And Transport Context)

		Route Descriptor					
Route function		M1	M1	M2	M3	M4	M5
	Movement Significance	**Major**	**Major**	**Significant**	**Moderate**	**Minor**	**Low**
	Scale of People Movement	**Typically > 20,000 per day**	**Typically > 20,000 per day**	**10,000 to 25,000 per day**	**3,000 to 12,000 per day**	**300 to 4,000 per day**	**Typically < 500 per day**
	Link – Place Context	**Link function**	→			←	**Place function**
	Through traffic	Highest capacity routes which have the greatest through movement function	Provides high capacity through movement between and within regions and between key places within districts	Carries predominantly medium capacity through traffic movements between and within districts between places.	Collects traffic from local streets in order to connect with arterials	Primary role is to service adjacent property.	Primary role is to serve adjacent property, minimal through traffic.
	Network connectivity	Connects regions and nationally significant; airports, ports and economic activity generators	Connects regions and principal sectors of the region and activity centres within a district	Connects major places within a District.	Connect two arterials, or access roads and streets with arterial links.	Connect to other roads, streets, lanes and Collectors	Primary connect to roads, streets and other lanes
	Frontage access	Provides little or no access to adjoining land	Provides controlled access to adjoining land	Managed accesses but many also serve adjacent activities	May provide access to adjacent key activities. Significant access adjoining property	Access to adjoining local shops, trade units, residential and rural properties	Property frontage may be shared with movement lane
	Goods movement (Freight)	Provides highest capacity to or facilities that promote safe and efficient freight carriage	Provides quality access to or facilities that promote safe and efficient freight carriage	Provides access to or facilities that promote safe and efficient freight carriage where there is enduring demand	Provides for the transport of neighbourhood related freight		
	Tourism	Provides high service levels (North Island) and amenity (South Island) with reliable journey times for long distance tourist traffic	Provides access to tourist facilities in areas of high tourist demand such as rest stop and viewing points	Provides access to tourist facilities in areas of high tourist demand including rural rest stop and viewing points	Provides tourist facilities access in areas of high tourist demand		

For Customer Levels of service, Road User and Place Service levels refer to Tables 5-2 and 5-3.

For additional Neighbourhood Place Service levels refer to NZS 4404:2010 Land Development and Subdivision Infrastructure, Part 3 Roads.

Notes:

1. The most appropriate Route descriptor in Table A is best identified as the one closest aligned with the most functions.
2. The most appropriate Route descriptor may reflect a planned future state rather than the present state.
3. A route may change its Route descriptor along its length (e.g. M1 Major to M2 Significant).
4. If the most appropriate Route descriptor is identified as say an M1 - Major BUT has one significantly lower function, it suggests this function needs addressing.

Table 5-2 Customer Level of Service

		Route Description					
		MAJOR	MAJOR	SIGNIFICANT	MODERATE	MINOR	LOW
Level of Service	**Safety**		Fatal, serious crash and RISA risk addressed and crime prevention through environmental design principles applied in risk priority order				
	Journey Time	High speed travel environment	Generally moderate to fast travel time environment in urban and rural areas	Generally moderate travel time environment in urban areas. Moderate to fast speed in rural areas	Generally moderate travel time environment with short lengths of lowered speed in urban areas. Moderate to high speed in rural areas	Generally low speed environment in urban areas. Moderate speed in rural areas	Walking pace environment in urban areas. Low speed in rural areas
	Delay predictability	Minimal delays to journey times achieved	Minimal delays during peak journey times achieved outside holiday seasons and events	May experience variable delays and reduced speeds depending on other activities on the network and conditions	May experience predictable significant delays depending on other activities on the network and conditions	May experience significant delays accessing higher level roads	Variable delays experienced
	Frontage Access	Limited friction from adjoining land	Controlled side friction from adjoining land	Managed side friction from adjacent properties	Side friction from adjoining property	Frontage form used to reduce operating speeds	Unrestricted frontage access
	Resilience and Security	Mitigate the risk to connectivity by providing robust infrastructure in Emergency response plans	Mitigate the risk to connectivity by providing robust infrastructure in Emergency response plans	Mitigate the risk to connectivity by robust infrastructure or alternative routes as the route critical demand requires	Vehicle access available for foreseeable events	Emergency vehicle access available for foreseeable events	Emergency vehicle access normally available

For Road User Service Levels refer to Table 5-3 below.

For Place Function Service Levels refer to Table 5-3 and NZS 4404 Land Development and Subdivision Infrastructure, Part 3 Roads

Table 5-3 Service Levels

Context		Road User Movement			Movement and Place			Place	
Table	C	PUBLIC TRANSPORT	FREIGHT	GENERAL TRAFFIC	CYCLE	PEDESTRIAN CROSSING	PARKING LOADING AND STOPPING	WALKING	AMENITY AND UTILITIES
	A	No trip delay, All day frequent service, Always runs to timetable may be on separate lanes	No delays or trip variability may be on separate lanes	No delays or trip variability may be on separate lanes	Separate cycle path. Minimal delays	Crossing regularly available. 40 km/hr operating speed. Minimal delays	Adequate parking, loading and stopping facilities	Quality pedestrian facilities in pedestrian friendly speed environment	Quality furniture, hard and soft landscaping both sides in pedestrian friendly speed environment. Accessible utilities
	B	No route delay, Peak period frequent service, Always runs to timetable may be on shared HOV lane	No delays or trip variability may be on shared HOV lane	No delays or trip variability.	Separation lane with minimal delays, less than 45 km/hr operating speed	Crossing available in required locations. Less than 45 km/hr operating speed. Minimal delays	Parking and stopping restrictions generally provided to meet demand	Pedestrian facilities provide to meet demand. Less than 45 km/hr operating speed	Soft & hard landscape both sides in pedestrian friendly speed environment. Accessible utilities
	C	Some route delay, 85% runs to timetable, Peak period frequent service and separate lane	Some route delays minimal trip variability. Share HOV lane	Some route delays minimal trip variability. Shared lanes	Separate on road cycle lane. Greater than 45 km/hr operating speed	Crossing available in managed locations. Average peak period crossing delay 45 sec	Parking and stopping restrictions during business hours or to assist travel times	Formed and sealed footpaths each side of road. Less than 45 km/hr operating speed	Hard landscape with minimal planting both sides. Accessible utilities
	D	Off peak runs to timetable, Shared facilities	Peak stop at every intersection. Shared lanes	Peak stop at every intersection. Shared lanes	Separate on road cycle lane. Less than 60 km/hr operating speed	Controlled crossings available in required locations. Average peak period crossing delay 45 sec. May be over 50 km/hr operating speed.	Time limit parking and stopping. Peak period clearways	Formed and sealed footpath one side of road	Hard landscape both sides. Accessible utilities
	E	Peak stop at every intersection. Shared lanes	Peak stop at every intersection. Shared lanes	Peak stop at every intersection. Shared lanes	Bicycle share wide movement lane. Greater than 60 km/hr operating speed	Crossing generally limited to controlled locations. Greater than 50 km/h operating speed.	Loading and stopping, off-peak only	Formed footpath one side of road	Hard landscape one side. Utilities may be in footpath or movement lane
	F	No separate facility takes at least 5 minutes to clear intersection during peak periods	No separate facility takes at least at least 5 minutes to clear intersection	Shared movement lane. Takes at least 5 minutes to clear intersection	Bicycle share movement lane. Greater than 60 km/hr operating speed	Crossing limited to controlled locations. Average peak period crossing delay 120 sec	None permitted	No footpaths	No amenity strip. Utilities in movement lane

Note: This table is indicative only and will be fully developed by a Network Operating Framework Working Group

5.2.5 Network Connectivity

Well-connected networks (roads and other links) are achieved with smaller block sizes and regular connections. Network connectivity shall be designed to achieve:

(a) Shorter travel distances.
(b) An increased number of alternative routes for all types of users.
(c) Increased opportunity for interaction.
(d) Improved access to public transport, cycling and walking networks, and access to destinations.
(e) Access to and from state highways limited to arterial routes, or as agreed with Waka Kotahi (NZTA).

The design process shall ensure the following maximum walking distances from a lot to a connector/collector or arterial road:

(a) Rural: No maximum distance. The design should maximise future connectivity to a suburban network.
(b) Suburban: 400 m. A shorter distance shall be considered near centres and major public transport routes.
(c) Urban: 300 m.

Where factors, such as topography or barriers, limit the ability to achieve the network connectivity standard, the designer shall optimise network connectivity and access to the maximum extent practical. The designer shall maximise connectivity to existing development.

5.2.6 Design And Access Statement

A design and access statement shall be submitted with the application for design approval.

The statement shall cover all relevant aspects of Section 5.2 and 5.3 of this CoP and specifically address:

(a) Road dimensions and layout.
(b) Link and place functions.
(c) Connectivity.
(d) How target operating speeds will be achieved.
(e) How Low Impact Development (LID) principles have been considered for stormwater run-off from the roads.

In addition a design and access statement shall evaluate the effects of the proposed development at its ultimate extent (and staged, where applicable) on the surrounding communities and transportation network.

Design and access statements allow the basis of the road design to be independently reviewed, and should be sufficient to illustrate the reasons for the design selections.

5.2.7 Road Safety Audit

Proposals that provide for new roads to vest in Council shall be subject to the Waka Kotahi (NZTA) Road safety audit procedures for projects unless Council decides that audits are not required at any or all of the stages. The developer's professional advisor may recommend that audits are not required at any or all of the stages and complete an 'exemption declaration' as described in the procedures and submit it as part of the application process to be considered by Council. The 'exemption declaration' shall be prepared by a suitably qualified road safety auditor.

Safety audits should cover all road users, including the needs of pedestrians, cyclists, and disabled/elderly users. Where appropriate, the requirements of these groups may demand specific audit procedures. The records and documentation from safety audits must be submitted to Council as part of the asset handover process.

5.3 Design

5.3.1 General requirements

The Design of Roads covered by this document shall be in accordance with the Waka Kotahi (NZTA) One Network Framework.

5.3.1.1 Cross section

In the case of urban and peri-urban roads (as defined in the Waka Kotahi (NZTA) One Network Framework), road widths shall be selected to ensure that adequate movement lanes, footpaths, berms, and batters can be provided to retain amenity values (including landscaping) and enable utility services to be provided safely and in economically accessible locations.

For rural roads design shall consider for the carriageway, sealed shoulders and space for the control of road surface water runoff, and clear space to allow for services should be allowed as detailed in the standard details later in this document.

Road widths shall be planned to cope with estimated long-term traffic volumes and account for community needs even though construction may be carried out only to shorter-term requirements. For guidance, the minimum cross section requirements including total road reserve widths are shown in Table 5-4. However, it should be noted that greater widths may be required to address the following situations:

(a) Potential frequent use by heavy vehicles or commercial vehicles
(b) Potential frequent use by vehicles towing boat trailers.
(c) Compatibility with existing road widths in the community.
(d) Widening where the geometry may influence sight distance of rural roads.
(e) The provision of cycle ways or shared paths where present or planned on the adjoining roadway.
(f) Specific width requirements needed to accommodate service authority's
(g) Specific requirements for public transport
(h) For other provisions such as on street parking

Alternative carriageway widths may be adopted to suit particular design considerations. The submitted proposal shall be subject to specific design consideration and approval by Council. Road cross sections

may include landscaped features, painted median facilities, or variations to parking provision.

5.3.1.2 Carriageway Width

Carriageway widths should be in accordance with Table 5-4. In urban areas, carriageways with a width of 6 m will require parking bays on at least one side of the carriageway for part or all of the road length.

In the case of a rear access lane, the concept relies heavily on minimal garage setback from the lane frontage. Rear access lanes are required to provide for manoeuvring for access to/from garages. Where the garages are located on or close to the lane edge the manoeuvring requirement may necessitate a wider lane dimension or increased setback. In this sense, a key function of the lane is to operate akin to an aisle within a car parking area and needs to be designed accordingly. A single lane sealed width with widening at the garage locations for turning is the minimum requirement. Sealing the entire lane increases opportunities for the lane to be used in a social sense. It is therefore desirable for the entire lane to be sealed. It is accepted that a narrow berm for services may be necessary.

The designer shall consider the environment, purpose, and function of the road being designed. In developing a design cross section the designer shall consider the relationships between speed, parking and its frequency, and the shared or recessed nature of parking in the movement lanes. Alternative carriageway widths may be adopted to suit particular design considerations. These shall be subject to specific design consideration and approval by Council. Such cross sections may include landscaped features, painted median facilities, or variations to parking provision.

5.3.1.3 Traffic Lanes

No more than one movement lane in each direction is typical. Streets in urban areas and centres may include a single movement lane operating as a one-way street.

5.3.1.4 Cyclists

Cyclists shall be provided with separate movement lanes if identified in a local or regional cycle network.

5.3.1.5 Side Roads

Side and rear access should not be the primary access. All carriageways shall be sealed for a minimum length of 20 m from the intersection with another road. This may need to be extended due to topography requirements.

5.3.1.6 Rural Roads

Shoulder widths on rural roads need to be assessed for each project based on the speed environment of the area, terrain including geometry, and crash history. Table 5-4 provides guidance for a standard width based on hierarchy. However, for high-speed environments where high non-motorised use is expected or where identified in a cycle strategy (e.g. where a route is a promoted tourist or recreational route), shoulder widths may need to be increased to optimise overall road safety.

5.3.1.7 Provision for Utility Providers

In some circumstances an increased overall road reserve may be necessary for utilities provision or increased amenity, landscape or urban design element. Specific design shall be undertaken and agreed with the territorial authority where road reserves are to be reduced. In other circumstances, reserve widths may be reduced if a one way road, or development is on one side of the road.

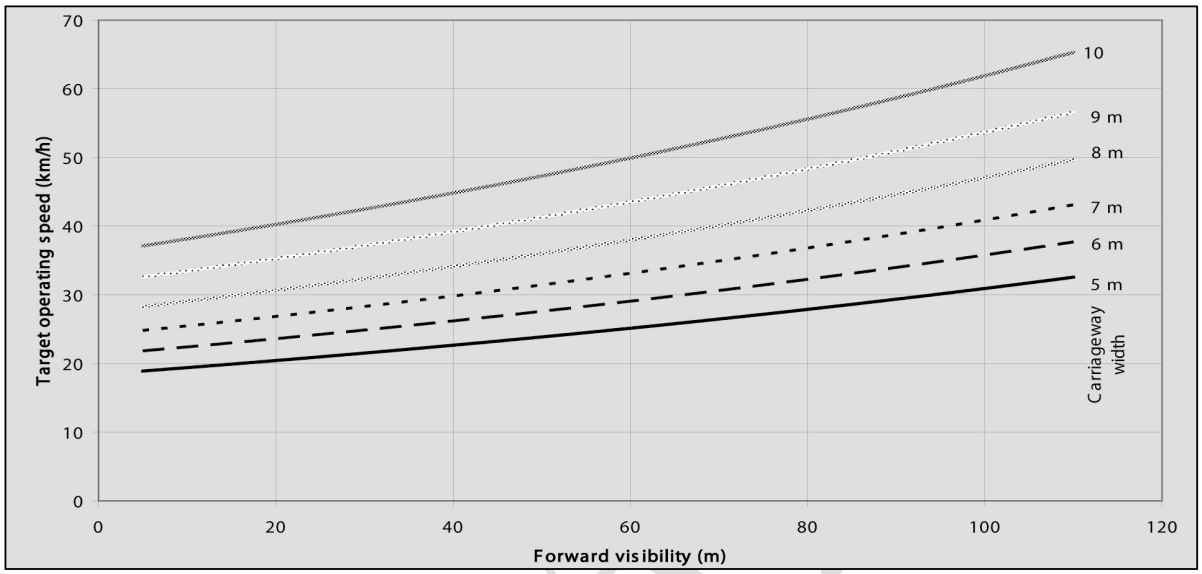
5.3.2 Target operating speed

Traffic management shall be included in road design to ensure that the target operating speed shown in Figure 5-1 is achieved. Target operating speed can be managed by physical and psychological devices such as narrowed movement lanes, reduced forward visibility, parking, slow points, build outs,

leg lengths, chicanes, raised platforms, planting and landscaping, and street furniture and art works. However, the target operating speed shall not be out of context with adjoining or neighbouring roads.

The Austroads *Guide to traffic management - Part 8*: *Local area traffic management* provides suitable guidance for designing to a target operating speed. Reference can also be made to the *Manual for streets* (UK Department for Transport 2007).

Figure 5-1 Influence of Road Geometry on Speed



5.3.3 Road Geometric Design

5.3.3.1 Design Parameters

Roads shall be designed to accepted standards generally satisfied by Table 5-4 of this CoP, relevant Austroads guides, and guides listed in Referenced Documents and Related Documents for other facilities. If there is potential for expansion through the subdivision then the appropriate standard shall be used to cater for this potential.

Specific Geometric design parameters shall firstly be in accordance with the Austroads Guide to Rroad Design - Part 3: Geometric design, and as detailed in this CoP.

5.3.3.2 Sight Distance

All roads shall be designed with sight distances that match the target operating speed. Where necessary, engineering measures may be undertaken to reinforce driver behaviour and appropriate speeds.

On M4 connector/M3 collector and M1 – M2 arterial roads, sight distance criteria at intersections as well as for stopping, overtaking, on curves, and to avoid obstructions should be applied in accordance with the relevant Austroads guides; primarily Part 3: Geometric Design, and 4A: Intersections and Crossings - General.

5.3.3.3 Widening On Horizontal Curves

In some areas the developed road geometry may be constrained, horizontal alignments may involve low radius curves, or the proportion of commercial vehicles may predominate. In such instances, movement lanes shall be assessed to determine the need for localised additional width, for example on low radius horizontal curves where the passage of vehicles has the potential to reduce safety.

5.3.3.4 Vertical Grade

Minimum gradient is 0.5%. Maximum gradients shall be as per Section 5.3.17.1. Steeper gradients may be acceptable for shorter lengths of road in hilly country or low overall speed environments subject to Council approval. Where the gradient of a public road is steeper than 12.5%, Council approval will be required.

5.3.3.5 Cross Fall

A movement lane may include a single lane operating in a one-way configuration or in two directions. Normal camber for sealed roads is 3%, and 6% for unsealed roads. Maximum super elevation is 6% for sealed and unsealed roads, unless required due to site constraints, which may be agreed with Council as an exception.

Table 5-4 Road Design – Cross section Standards

Movement Significance	Street Type	Units Served (Indicative only)	Average Daily Traffic AADT (veh/day)	Parking Lanes (m)	Traffic Lanes (m)	Carriageway Width (m)+	Kerb Type	Footpaths No. x m	Minimum Legal Width (m)
Sealed Roads									
Commercial/Industrial									
M2 – Significant	Arterial	N/A	1000 +	2 x 2.5	2 x 3.5	12	Vertical	Both sides, sealed full width from kerb to property boundary (min. 1.4 m)	**20**
M3 – Moderate	Collector	N/A	< 1000	1 x 2.5	2 x 3.5	9.5	Vertical	Both sides, sealed full width from kerb to property boundary (min. 1.4 m)	**20**
M4 - Minor	Local	N/A	< 500	2 x 2.5	1 x 3	8	Vertical	Both sides, sealed full width from kerb to property boundary (min. 1.4 m)	**17**
Urban Residential									
M2 – Significant	Arterial	100 +	1000 +	2 x 2.5	2 x 3.5	12	Vertical	Concrete: 2 x 1.5 Asphalt: 2 x 1.8	**20**
M3 – Moderate	Collector	< 100	< 1000	2 x 2.5	2 x 3	11	Vertical	Concrete: 2 x 1.5 Asphalt: 2 x 1.8	**20**
M4 - Minor	Local	< 50	< 500	2 x 2.5 (recessed)	2 x 3	6	Vertical or mountable	Concrete: 2 x 1.5 Asphalt: 2 x 1.8	**20**
M5 - Low	Cul-de-sac	≤ 20	< 200	1 x 2.5 (recessed)	2 x 3	6	Vertical or mountable	Concrete: 1 x 1.5 Asphalt: 1 x 1.8	**15**
M5 - Low	Private (Right of Way)	4 to 6	N/A	Nil	1 x 3	3*	Vertical or mountable	Nil	**4.5**
M5 - Low	Private (Right of Way)	1 to 3	N/A	Nil	1 x 3	3	Vertical or mountable	Nil	**3.5**
Rural/Rural Lifestyle									
M2 – Significant	Arterial	N/A	1000 +	Nil	2 x 3.5	7	**	Concrete: 1 x 1.5*** Asphalt: 1 x 1.8***	**20**
M3 – Moderate	Collector	N/A	< 1000	Nil	2 x 3.0	6	**	Concrete: 1 x 1.5*** Asphalt: 1 x 1.8***	**20**
M4 - Minor	Local	< 100	< 500	Nil	2 x 3.0	6	**	Concrete: 1 x 1.5*** Asphalt: 1 x 1.8***	**20**
M5 - Low	Long cul-de-sac (< 100 m)	≤ 20	N/A	Nil	2 x 3.0	6	**	Nil	**15**
M5 - Low	Short cul-de-sac (< 50 m)	≤ 10	N/A	Nil	2 x 3.0	6	**	Nil	**12**
M5 - Low	Private (Right of Way)	1 to 6	N/A	Nil	3	3*	Nil	Nil	**6**
Unsealed Roads									
M3 – Moderate	Collector	N/A	100 +	Nil	N/A	7.0	Nil	Nil	**20**
M4 - Minor	Local	N/A	< 100	Nil	N/A	6.5	Nil	Nil	**15**
M5 - Low	Track	N/A	N/A	Nil	N/A	Site Specific	Nil	Nil	**6**

* Passing bays (with a minimum 6 m carriageway width) are required every 50m in urban areas, and every 100 m in rural areas. Where a private way adjoins a Collector or higher, it shall also have a 6m carriageway width for a minimum length of 6m from the road boundary.

** Kerb and channel or dished channel may be required for scour protection.

*** Footpaths may not be required in rural and rural /residential situations.

Note 1 – All urban rights of way shall be hard surfaced for their full length.

Note 2 - Carriageway width is defined as kerb-face to kerb-face in urban situations. It does not include shoulder width for rural/rural lifestyle, or unsealed roads.

Note 3 – Dedicated provision for cyclists will be required on identified cycling routes for any Collector road and above. See Section 5.3.12 for further guidance.

This table is to be used as a guide only and will be subject to particular Council requirements for each situation. NB. Urban/Rural definition is based on speed limit, ie, urban roads are those with a speed limit of 70 km/hr or less, rural > 70 km/hr.

5.3.3.6 Stormwater

Roads shall be designed to account for stormwater and keep potential groundwater below structural pavement layers. On rural roads, this may be accomplished through the use of side drains or swales. All roads, including footpaths and cycleways, shall be adequately drained in accordance with good engineering practice. Roads also have the potential to provide stormwater ponding and overland flow paths in extreme events.

In soils of adequate permeability and favourable topography, the use of low impact design soakage systems and devices shall be considered to provide benefits of attenuating peak flows and improving run-off quality. For detailed design criteria for soakage systems and devices see 5.3.20.2 6.3.8.6, and 6.3.8.9.

Any design should be coordinated with the relevant landscape design requirements covered in Section 10 of this CoP.

5.3.4 Pavement Structural Design

Generally pavements shall be flexible designs. Other types of pavements shall be subject to Council approval. Pavements shall be designed in accordance with the Austroads and Waka Kotahi guides with a design life of 30 years.

C5.3.3
For roads of connector/collector class or above, structural design shall be undertaken by mechanistic design methods. For other roads, mechanistic or other industry standard chart-based methods may be used.

5.3.4.1 California Bearing Ratio Design Method for Rigid and Flexible Pavements

Soaked California bearing ratio (CBR) values of the pavement subgrade shall be used and the pavement designed for the estimated number of equivalent standard axle (ESA) loadings over a 30-year design life.

5.3.4.2 California Bearing Ratio Tests

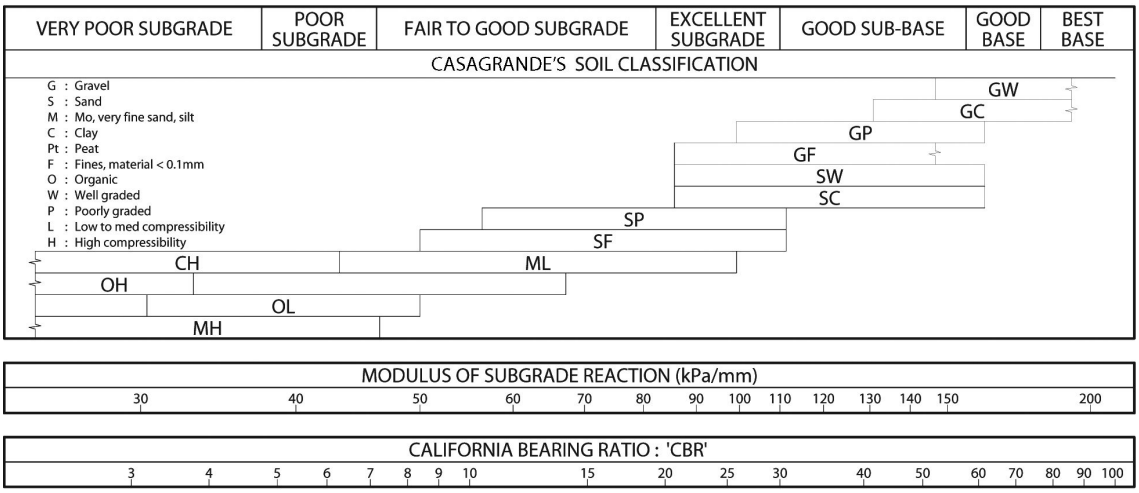
CBR values shall generally be determined in the laboratory according to 6.1 of NZS 4402.6.

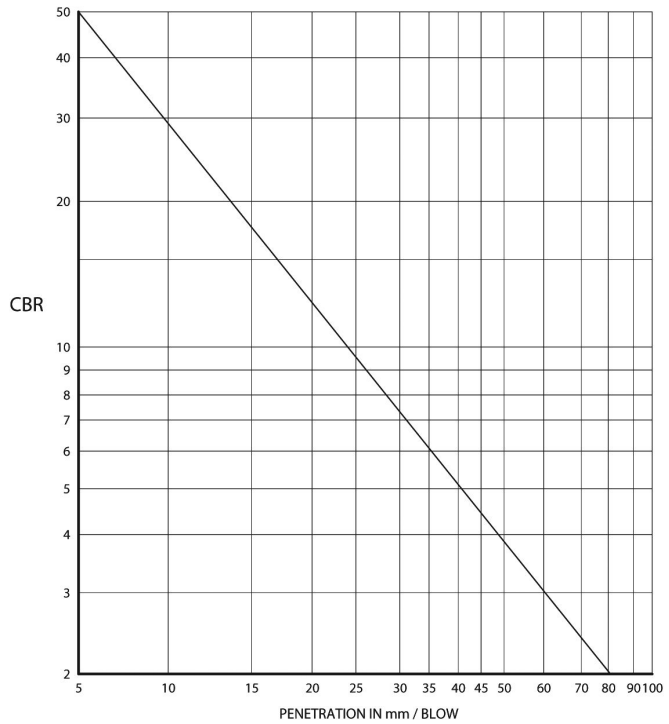
For local roads an alternative method of determining subgrade CBR in non-granular materials by Scala Penetrometer may be acceptable for clay and colluvial materials. Figure 5-2 shows a correlation between Scala penetration and CBR values. This should be used conservatively.

The CBR value used in the design shall be the 10th percentile value of the CBR tests taken on the subgrade material. A selection of tests shall be taken at 150, 300, and 450 mm below final subgrade level.

Where CBR values are required for aggregates, these shall be based on laboratory tests prepared on the fraction passing the 19 mm sieve but a CBR of more than 30 shall never be used. The use of CBR on metal layers shall only be in conjunction with consideration of the CBR and stiffness of lower layers.

Figure 5-2 Parameter Relationship





CORRELATION OF DYNAMIC CONE mm PER BLOW AND CALIFORNIAN BEARING RATIO (SCALA PENETROMETER)

5.3.4.3 Pavement Surfacing

Acceptable surfacing for carriageways includes asphaltic concrete (40 mm minimum thickness), chip seals, in situ concrete or concrete pavers. Surface texture and skid resistance should comply with T/10 requirements. Unsealed carriageways may be accepted in rural areas at the discretion of Council. The whole of life cost for the surfacing treatment shall be shown by the designer.

5.3.5 Safety Barrier Provisions

5.3.5.1 Pedestrian Protection

Where safety barriers for pedestrian and cyclists are necessary, they shall comply with the design requirements of the New Zealand Building Code and NZS/AS 1657 Fixed platforms, walkways, stairways and ladders. Design, construction and installation.

5.3.5.2 Vehicle Barriers

Where safety barriers for vehicles in urban areas are necessary, they shall comply with the design requirements of Austroads Guide to Road design Part 6 Roadside Design, Safety and Barriers and use Waka Kotahi NZTA approved systems as stated in M/23. Further guidance can be found in Waka Kotahi (NZTA) RTS 11: *Urban roadside barriers and alternative treatments*.

5.3.5.3 Rural Vehicle Barriers

Where safety barriers for vehicles in rural areas are necessary, they shall comply with the design requirements in AS/NZS 3845.

5.3.6 Parking, Passing, And Loading

Parking and loading can be provided either on or off-street. Facilities shall meet the needs of the area and the requirements of Council as per Section 5.5 of this CoP and shall be addressed in the design and access statement (see Section 5.2.6). Further guidance can be found on the Trips Database Bureau website https://www.transportationgroup.nz/trips-database-bureau/.

Passing provision shall be in accordance with requirements of Council.

Acceptable and alternative on-street car park and loading dimensions should be taken from AS 2890.5 and/or Austroads guides. Off-street car park and loading dimensions should be taken from the New Zealand Building Code.

Parking and loading shall not be provided so that it has the potential to obstruct the movement of emergency or service vehicles along a road. Alternate provision within sites may be demonstrated in addition to the requirements of the District Plan, particularly when establishing rules for new subdivisions.

5.3.6.1 Parking Provision

In general a wider standard total carriageway cross section can be developed where parking is shared in the movement lane, however if this is not a frequent occurrence then the outcome will be an unnecessarily wide road and the target speed outcome will not be achieved without other managed intervention.

Where parking is less frequent, consideration shall be given to narrowing the travelling carriageway and recessing the parking or to introducing landscaping into the carriageway to reduce the appearance of apparent formed width. Where the designer proposes to develop a shared street design', a full description and assessment of the frequency and extent of interactions of this nature shall be described in the design and access statement.

5.3.6.2 Parking Bays

Each parking area shall be a minimum 2.1 m x 6 m, and is used for loading it shall be a minimum 2.5 m x 12 m, each with appropriate entry and departure tapers outside of the movement lane.

5.3.7 Intersection and Alignment Design

The angle of intersection should be 90°, although a minimum angle of 70° can be used when justified by other constraints. Carriageway alignment may be offset within the street reserve to achieve the required target operating speed for the road.

All road intersections in residential areas below M2 (arterial) class should have a kerb radius at intersections of 9 m. An alternative and reduced kerb radius may be considered to enhance pedestrian facility in low speed environments, and shall be subject to the approval of Council.

Intersections in all other 50 km/hr or lower speed environments shall have the lot corners splayed by a minimum of 4 m along both boundaries, although these may be dispensed with in low target operating speed situations provided that there is adequate provision for pedestrians and utility services. Corner boundary splays shall be subject to specific design in higher speed environments, to ensure safe visibility at intersections.

All major intersections, and those in rural, industrial or commercial areas, should have a minimum kerb radius of 15 m with corner splays of 6 m, or subject to specific design. Reference can also be made to Austroads guides.

Intersections between M4 (connector)/M3 (collector) roads or intersections of M4 (connector)/M3 (collector) roads with M2 (arterials) shall be a minimum distance of 150 m apart, centre line to centre line.

5.3.8 No-Exit Roads

'No-exit' roads should not be provided where through roads and connected networks can be designed. Where no-exit roads are provided, they should ensure connectivity for pedestrians and cyclists.

No-exit roads and lanes shall provide for road turning at the end of the road for an appropriate vehicle as described in *RTS 18: New Zealand on-road tracking curves for heavy vehicles*.

The design of turning facilities for light vehicles shall be in accordance with AS 2890.5. See Figure 5-3 and Figure 5-4 for acceptable solutions.

An on-road turning area may provide for parking or landscaping in the centre of the turning area. The minimum kerb gradient around turning heads shall be 0.5%. Appropriate drainage shall be provided.

5.3.9 Bus Stops

Bus stops shall be provided for on connector/collector roads or arterials in accordance with Council direction in consultation with the regional transport authority. Bus stops may be designed in accordance with the Waka Kotahi public transport design guidance (https://www.nzta.govt.nz/walking-cycling-and-public-transport/public-transport/public-transport-design-guidance/).

5.3.10 Services Within Roads

Refer to Section 9.3.2 for requirements on locations for transformers and other utility components, mailboxes, and refuse collection.

5.3.11 Special Road And Footpath Provisions Near Places Of Assembly

Designs for areas adjacent to places of public assembly including schools, hospitals, shopping areas, and public halls, shall incorporate special provisions such as extra parking spaces, stopping lay-bys, widened footpaths, bus and taxi stops, pedestrian crossings, loading zones, and any associated facilities to ensure the safety of concentrations of vehicles and pedestrians. These designs shall be subject to Council's approval.

5.3.12 Footpaths, Accessways, Cycle Paths, And Berms

Pedestrians, cyclists, and berms shall be provided for in accordance with table Table 5-4 and associated notes. Dimensions, strength, durability, and finish shall be appropriate to their use and

expected loadings. Paths shall be designed in accordance with Austroads guides and Waka Kotahi (NZTA) design guidelines (*https://www.nzta.govt.nz/walking-cycling-and-public-transport/walking/walking-standards-and-guidelines/)*, and Standard Drawings in Appendix B.

Where accessways separate from the roads are to be illuminated, they shall be to the standard of illumination recommended in AS/NZS 1158.3.1.

5.3.12.1 Footpaths And Accessways

Footpaths may be required on one or both sides of the carriageway. Generally, footpaths shall be provided where potentially more than six households will be serviced. (Refer Table 5-4).

The width of footpaths shall be appropriate to the expected foot traffic, with guidelines as follows:

In all cul-de-sacs or other roads with a legal width of 15 m or less, footpaths shall preferably be located immediately behind the kerbs. In other locations a grass berm may separate the footpath and the kerb. Refer Standard Drawing R3.

Footpaths shall be a minimum of 1.5 m wide in concrete, or 1.8 m wide in asphalt, surfaced over their full width. The crossfall should be no greater than 2% and approval is required by Council to vary this. No crossfall shall exceed 4%. Wider footpaths or areas of local widening will often be required by Council where higher use or other needs dictate such widening. If a footpath is shared as a cycle path width shall be as per Section 5.3.12.2.

Accessways should be provided at no-exit roads or where necessary to improve connectivity. They shall be designed for user safety using crime prevention through environmental design (CPTED) principles and should:

(a) Be direct and no greater than two properties long.
(b) Have good sight lines for passive surveillance with fences a maximum height of 1.2 m for 10 m from the road frontage, or no fencing.
(c) Be sited to ensure high levels of community use.
(d) Be amenity landscaped without compromising safety.
(e) Have provision for the disposal of stormwater.
(f) Be provided with pedestrian level lighting.
(g) Have a legal width not less than 5.5 m.

5.3.12.2 Cycle Paths

Separate cycle paths shall be provided where good design requires separation from the carriageway or a different route to be selected. Cycle paths on the road carriageway shall be a minimum 1.8 m wide. Where cycle paths are shared with footpaths, they shall be a minimum 2.4 m wide and signed appropriately.

Stormwater disposal shall be provided to all off-road cycle paths. Lighting is to be provided where appropriate.

Cycle facilities shall be designed to the standards as set out in the Austroads guides and the Waka Kotahi (NZTA) Cycle guidelines *(https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/)*.

5.3.12.3 Footpath And Cycle Path Surfacing

The choice of surface finish shall be to Council's approval with a general guideline being that the finish should match with adjacent footpath finishes.

All footpaths and cycle paths shall be surfaced with a permanent surfacing layer appropriate to the surrounding environment and level of use expected.

Acceptable surfacing for footpaths and cycle paths are:

(a) Concrete.

(b) Asphaltic concrete.

Other acceptable surfacing for footpaths are:

(c) Pavers only as approved by Council.

(d) Metal surfaces may be appropriate in rural areas, particularly where a sealed footpath already exists on the opposite side of the road.

In all cases the surfacing shall be placed over compacted basecourse which in turn shall be placed over a firm subgrade with all organic soft material removed.

5.3.12.4 Berms

Grassed or planted berms between the road legal boundary and carriageway shall be provided in accordance with the landscape character intent for each street type within the development. For streets with high pedestrian activity, a full footpath (with no berms) may be more appropriate. Residential streets with a lower pedestrian activity may have a ribbon footpath (planted berms between footpath and carriageway, and between footpath and road boundary).

In all cases the combined berm and footpath width shall be as required by Council to be adequate to enable landscaping and all current and expected services to be installed.

Where a berm crossfall greater than 1 in 12.5 is proposed, the designer shall produce a cross section along suitable individual property access locations to show that the sag or summit curves at crossings can be satisfactorily negotiated by a 99th percentile car.

Berms shall be of adequate width to:

(a) Achieve safe clearances between the carriageway edge and any obstacle.

(b) Allow running of utility services and placing of lighting poles within the berm unless approved otherwise by the utility provider or Council.

(c) Provide adequate space between the road reserve boundary and the carriageway edge to enable residents to safely enter the road traffic.

(d) Allow room for efficient road edge and edge drain maintenance.

(e) Allow adequate space for the effective operation and maintenance of any form of stormwater management device.

5.3.13 Traffic Signs, Road Markings And Road Furniture

The design shall incorporate all required road marking, signs, and other facilities as per the Manual of Traffic Signs and Markings (MoTSAM) and other appropriate standards. Roads should be designed to minimise the need for traffic signs and marking.

Designs shall satisfy the Waka Kotahi (NZTA) manual TCD Part 5, and Transport Rule (Traffic Control Devices) 2004 and linked traffic sign specification, and the Waka Kotahi (NZTA) *Pedestrian planning and design guide*.

Road markings shall be installed in accordance with MOTSAM Part 2. All road markings and traffic signs shall be approved by Council.

All fire hydrants shall be marked in accordance with NZS/BS 750.

Road name signs shall comply with Council's current road names standards and their mounting shall be provided by the developer to Council's requirements.

Developers are encouraged to suggest names for new roads. However all names for new roads, including named private ways, are to be approved by Council. Names must comply with the New Zealand Geographic Board's rules. Road names should be short (25 characters or less), not hyphenated or multiple words, readily pronounced and spelt and not resemble other existing names (including geographic feature names) in either spelling or pronunciation.

A road name will be required for every private access lane servicing more than eight properties, in order to facilitate easy property addressing.

Seats, signs, and other street furniture shall be designed and placed in accordance with Council's requirements. Furniture used should unless expressly approved otherwise be compatible with a Council's existing street furniture.

Also refer to Section 18 Appendix B – In City Standard Details ICC/SDC Standard Details for the Council's requirements on signs, markings and road furniture. Any changes from the details must be approved by the TA.

5.3.14 Trees and Landscaping

Refer to Section 10 for specific guidance on trees and landscaping. The following principles should also be considered:

a) Safety Issues, including:
   - shading of the road
   - sight distances at intersections
   - entrances and curves
   - clarification of road definitions
   - shade light effect of the planting
   - frost shading
   - clearance to high voltage power lines

b) Asset preservation, including:
   - water channel and drain integrity
   - seal and road surface integrity

c) Utility Protection, including:
   - Water, wastewater, telephone
   - stormwater, tile drainage, power and telephone
   - high voltage power lines

d) Equity issues to ensure a fair approach to existing and new planting proposals.

e) Ownership and maintenance. There shall be clear demarcation and agreement identifying who will own and maintain the landscaping once the maintenance period is completed.

5.3.15 Road Lighting

All road lighting shall be designed and installed in compliance with the recommendations of AS/NZS 1158, Ausgrid technical specification for Public Lighting Equipment – LED luminaires, Oct 2014, Austroads road design chapter 6 guides, or other guidelines adopted by Council at the particular time of design.

A lighting design which shall include an Isolux diagram is to be submitted to Council, for checking and approval prior to construction. This shall include all the necessary certification documentation such as a Producer Statement.

Lighting designs are required to be completed with NZTA M/30 compliant luminaires that are appropriate to be used in the Council's lighting network. Luminaires shall be dark skies compliant (3000k).

All lighting shall be LED category PR3, PP3 or V3 and in compliance with AS/NZS 1158. All lighting is to be installed in compliance with NZTA M/26 specification for lighting columns unless approved by the Invercargill City Council. Higher Standards may need to be applied based on the function of the road, path or car park in the roading network.

5.3.16 Bridges And Culverts

Bridges and culverts may require separate resource and building consents. All bridges and culverts shall be designed in accordance with the Waka Kotahi (NZTA) *Bridge manual.*

Particular features to be considered/covered include:

(a) Widths/lengths: All bridges and culverts shall be designed with a width to accommodate movement lane, cycle, and pedestrian needs of the road and guardrails which accommodate over width vehicles.

(b) Roadside barriers: See Section 5.3.5.

(c) Batter slope protection: All culverts shall have anti-scour structures to protect batter slopes, berms, and carriageways.

(d) Clearance over traffic lanes: Where passing above traffic lanes, bridges shall have the full clearance of 5.2 m to provide clearance for over dimension vehicles able to operate without a permit.

(e) Foundations: All bridges and culverts shall be founded to resist settlement or scour. Abutments shall be designed to ensure bank stability and provide erosion or scour protection as applicable.

(f) For waterway design see Section 6.

5.3.17 Private Ways, Private Roads, And Other Private Accesses

Access to all lots, dwellings, or multi-unit developments shall be considered at the time of subdivision/development and should where possible be formed at that time.

Where access to the lot is to a garage or car deck to be constructed as part of the buildings this shall be noted on the design drawings. This is likely to have been considered as part of the resource consent process.

Accesses shall be designed and constructed to the following requirements or in accordance with Council's specific requirements including those within District Plans, unless alternative designs by the developer's professional advisor are approved by Council.

5.3.17.1 Plan and Gradient Design

Table 5-4 and Table 5-5 should be used as guides to the width of elements required for accesses and crossings.

A maximum 3-point turning head in the common area shall be provided at the end of all accesses serving three or more rear lots or dwelling units. Circular, L, T, or Y shaped heads are acceptable. Suitable dimensions are shown in Figure 5-3 and Figure 5-4.

For accesses serving fewer than three lots or dwelling units, turning heads in the common area are not required where it can be shown that adequate turning area is available within each lot or private area.

Centre line grades should:

(a) Not be steeper than 1 in 5 although gradients of 1 in 4.5 may be used on straight lengths of access over distances of up to 20 m. The first 5 m of any access shall be not steeper than 1 in 8. A greater length of transition shall be provided where necessary on non-residential accesses.

(b) Not be less than 1 in 250.

(a) and (b)
Council may approve exceptions provided the design includes suitable vertical transitions and adequate safety at the point where the access meets the footpath or road.

All accesses shall be shaped with either crown or crossfall of not less than 2%.

To allow vehicles to pass, single lane accesses shall have widening to not less than 6 m over a 7.5 m length (plus tapers) at not more than 50 m spacing. Rural accesses may have the same dimension passing bays at up to 100 m distances where visibility is available from bay to bay.

5.3.17.2 Stormwater Design

All shared urban accesses shall be surfaced and have their edges defined by a structural edge. The design shall demonstrate consideration of a sustainable approach to stormwater management rather than kerbed collection, channelling, and disposal, if possible.

Rural accesses shall be formed with safe water tables/edge drains along but adequately clear of each side of the access (minimum 1 m).

Accesses sloping up from the road shall have a stormwater collection system at the road reserve boundary so as to avoid stormwater run-off and debris migration onto the public road. Except in rural areas, stormwater shall discharge via an appropriately sized and designed stormwater system acceptable to Council. Rural side drains may discharge directly to the roadside drain or where accesses pass over the side drain they shall be provided with a culvert of size appropriate for the design flow and approved by Council.

Accesses that slope down from the road shall be designed to ensure that road stormwater is not able to pass down the access. Side drainage in context with the area shall be provided to stop the concentration and discharge of stormwater and debris onto adjacent properties or any land which could be at risk of instability or erosion. Where an overland flow path departs from the road reserve, accesses shall be designed to direct secondary flow away from building floors and to follow designed overland flow paths.

Commercial and industrial accesses shall drain from their sumps through a lead directly or through a stormwater treatment device to a public stormwater main.

5.3.17.3 Pavement Design

Private pavements shall be designed as for public roads, and residential/rural pavements shall have a minimum formation thickness in accordance with Austroads guidelines.

All road pavements shall be provided with adequate supporting design to ensure that it will have a life of 30 years.

Acceptable surfacing for accesses includes asphaltic concrete (25 mm minimum thickness), chip seals, in situ concrete or concrete pavers.

Figure 5-3 Dimensions Of No-Exit Road Turning Areas

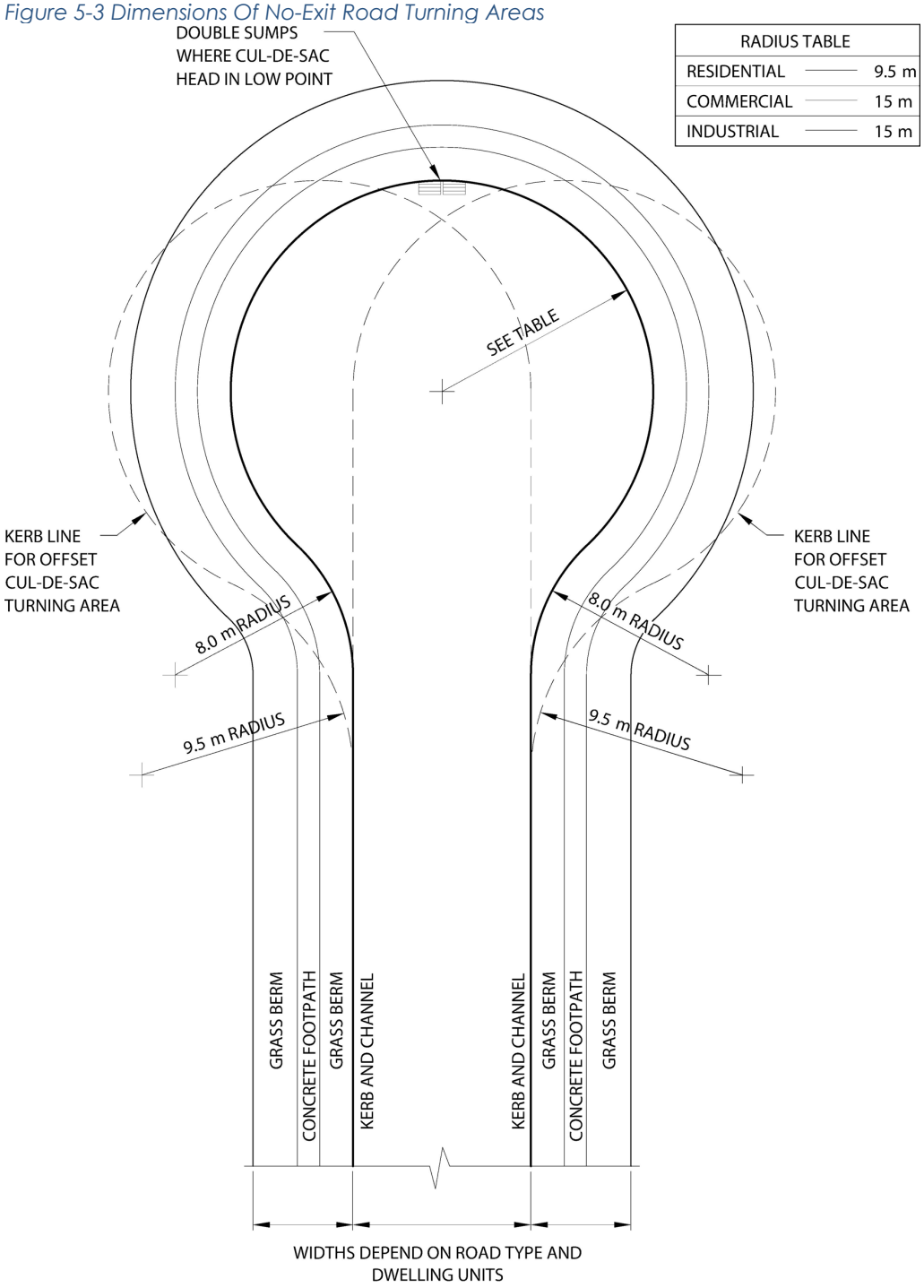
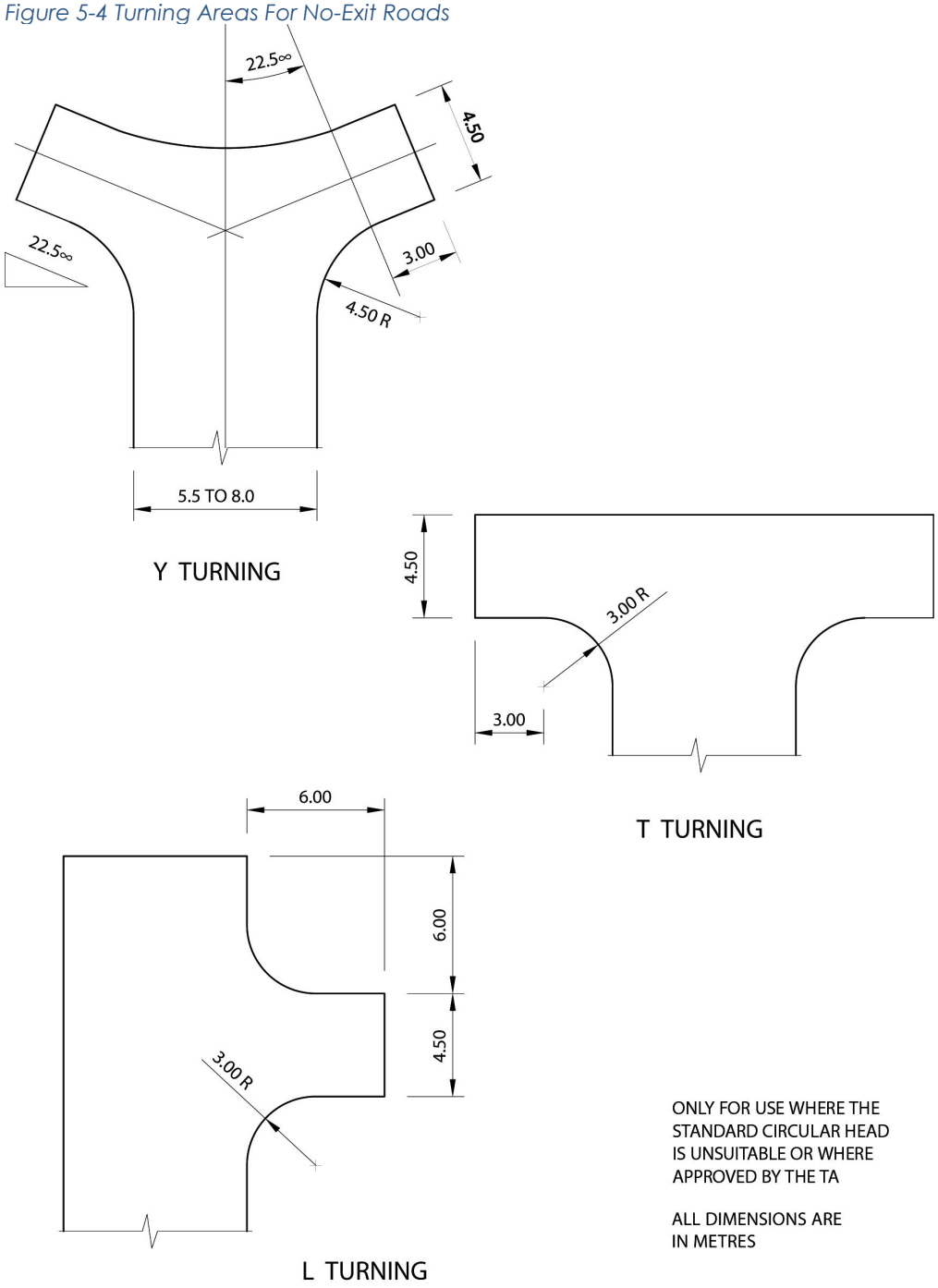


Figure 5-4 Turning Areas For No-Exit Roads



5.3.18 Vehicle Crossings

All regularly used vehicle crossings (e.g. urban, rural, residential, commercial and industrial) are formed, surfaced and drained to allow safe and effective vehicle access from carriageway to the property boundary and in locations giving visibility equal to the safe stopping distance for the carriageway speed limit.

Vehicle crossings shall be constructed in accordance with Standard Drawings R21 – R23 in urban areas, and R28 – R30 in rural areas.

The sight distances outlined in the "Sight Distances" figure in Section 5.5.1 shall be used as a guide when assessing the adequacy of visibility at new accessways. No access to an individual plot shall be located within a clear distance of 5m from any corner (channel line) or intersection in the road that it connects to. The preferred separation wherever possible is 9m from the tangent of the intersection.

At the time of subdivision or development, any existing crossing providing access to the road shall be upgraded to Council's standard or permanently removed. All spacing's between crossings (whether farm access or otherwise) shall be maintained as set out above. This requirement also applies to existing crossings where a lot is being subdivided.

5.3.18.1 Urban

Vehicle crossings shall be provided between the edge of the movement lane and the road boundary at the entrance to all private ways and lanes to any lots, front or rear where access points are clearly identifiable at the subdivision or development stage, and in all commercial and industrial areas,

Where access points are not clearly identifiable at the subdivision or development stage, crossings shall be constructed at the building consent stage.

Vehicle crossings shall be designed to enable the 99th percentile car to use them without grounding any part of the vehicle, and shall be designed in accordance with the Waka Kotahi (NZTA) Pedestrian planning and design guide. Structural design shall be adequate to carry the loads to be expected over its design life. All crossings shall be surfaced with asphalt, concrete, or paving stone as approved by Council.

Where stormwater drainage is provided by swale or open drain, drainage crossings shall be provided as specified in 5.3.17.2.

5.3.18.2 Rural

All shared crossings and any crossings where the location is obvious at the design stage shall be installed at the development stage. Other crossings shall be provided at the building consent stage.

Crossings shall be provided between the surfaced road edge and the lot boundary at a defined and formed access point to every rural lot. The crossing shall be sealed to not less than the standard of the road surface and to the road boundary. If the access slopes up from the road the crossing shall be sealed to a minimum distance of 10 m from the edge of the carriageway.

The crossing shall not obstruct the side drain. Where the side drain is shallow and only carries small flows during rain, the crossing may pass through the side drain. Where the side drain is of an unsuitable shape or carries flows for significant parts of the year the side drain shall be piped under the crossing. Pipes and end treatments shall be sized appropriately for the catchment intercepted but shall be a minimum of 300 mm diameter. Culverts shall extend a minimum of 1 m beyond the edges of the crossing.

Rural crossings shall be designed so that vertical curvature transitions are suitable for the passage of the 99th percentile car and control of stormwater and debris run-off.

5.3.19 Fencing

Fencing shall be provided along the road reserve boundaries of all rural subdivisions unless agreed otherwise by Council. Standards and requirements shall be in accordance with Council's fencing policy at the time, or in the absence of a policy shall be agreed to with the Council. This shall also apply to fencing of pedestrian, cycle, and reserve accesses in rural areas.

5.3.20 Road Run-Off

5.3.20.1 Integration Of Road Run Off With Development Stormwater System

Stormwater management for a subdivision needs to integrate the control of stormwater from the proposed roading network with the overall stormwater system for the land development phase and final subdivision layout. Such planning needs to integrate the control of stormwater peak flows and pollutant removal as set out in Section 6 of this CoP with the aim of minimising downstream negative effects and mitigating road instability and erosion problems. Some guidance on integrated catchment management is set out in Waka Kotahi (NZTA) *Stormwater treatment standard for state highway infrastructure*.

5.3.20.2 Design

Roads shall be shaped with cross fall to shed water off the carriageway. Roads shall have longitudinal fall sufficient to convey surface water to low points along kerb line or other surface water channels depending on the site context. For stormwater run-off design see Section 6 of this CoP.

5.3.20.3 Subsurface Drains

Where considered necessary by Council or the developer's professional advisor, piped subsurface drainage shall be provided to protect road formations from deterioration or loss of strength caused by a high watertable and as part of swale stormwater systems. Design shall be in accordance with Waka Kotahi (NZTA) specification F/2.

Piped subsurface drains shall be provided on each side of all urban roads where the natural subsoils have inadequate permeability or unacceptably high water table to enable long term strength of the new pavement to be maintained. Piped subsurface drains shall be provided on the upslope side of all urban roads in hill areas and on the down side also where the down slope is in cut.

All piped subsurface drains shall discharge by gravity into a suitable component of the public stormwater system or approved discharge point.

For two typical details of under-kerb drainage and subsoil drainage see Figure 5-5.

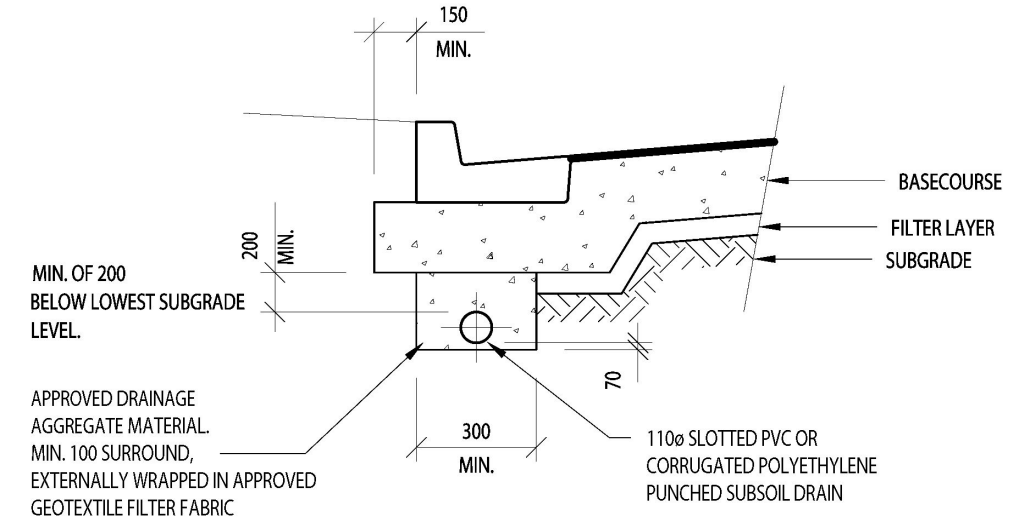
5.3.20.4 Side Drains/Water Tables

Rural roads shall have normal camber (see Standard Drawings) to side drains/water tables formed on each side of the carriageway except where the road is on embankment above adjacent land without available formed drains. In such cases the road may be designed so as to provide for sheet run-off to the adjacent land surface provided natural pre-existing drainage patterns are not altered.

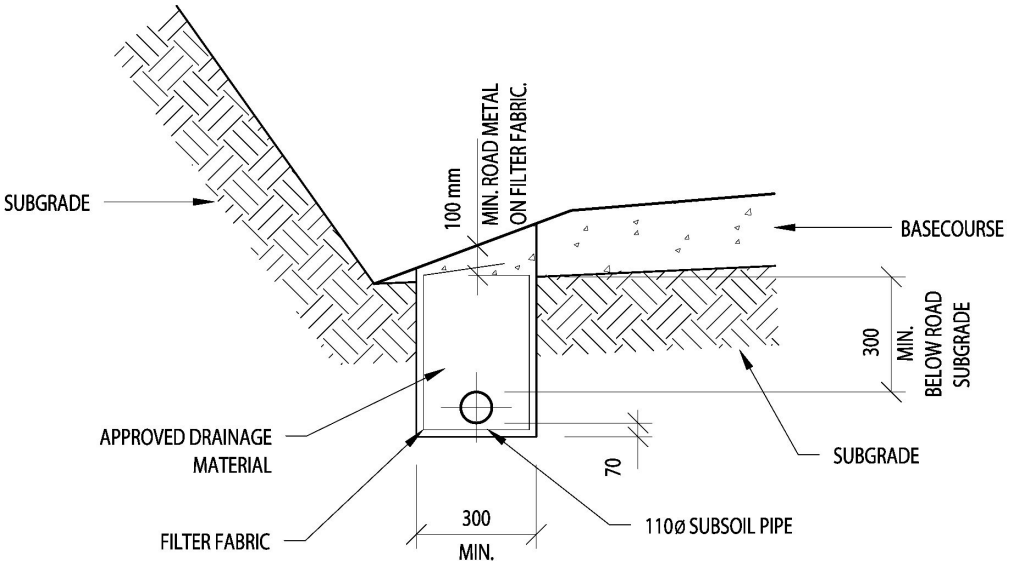
For all situations where side drains are required they shall be sized to suit the flows discharging to them. Side drains shall be intercepted at regular intervals and discharge via open drains or pipes to an appropriate discharge point. All discharge points shall have outlets protected from scour and shall be located to minimise the risk of slope instability.

Such discharges shall be subject to the approval of affected property owners and be shown to be neither diverting catchments nor significantly changing peak flows or flow patterns.

Figure 5-5 Subsoil drains



UNDER KERB DRAINAGE



SUBSOIL DRAINAGE

All dimensions are in millimetres.

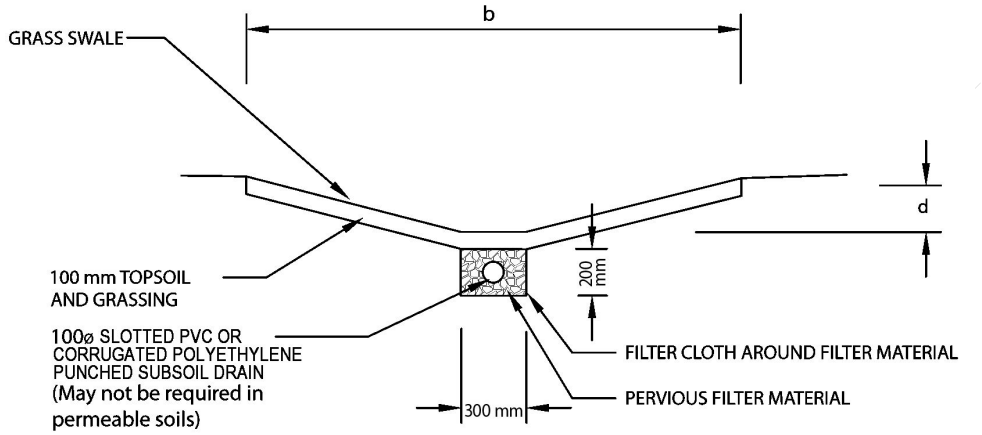
5.3.20.6 Swales

Swales should be used wherever appropriate to allow for infiltration to reduce peak discharge flows and to provide stormwater treatment. They can be located either in the berm area or in the centre of the road and must be of sufficient width to accommodate services (if needed), plant growth and maintenance.

Where swales are used, they shall be designed by a suitably qualified person in accordance with Council requirements or one of the publications listed in Referenced Documents or Related Documents that cover swale design. Typical details that may be used in swale design are shown in Figure 5-6 to Figure 5-8.

See Section 6.3.8.6 for swale design and Section 10 on landscaping design and practice.

Figure 5-6 Typical swale detail (1)



SWALE CROSS SECTION

NOTE –

1. Effective catchment area drained = impervious area + 0.72 x pervious area.
2. Maximum swale slope up to 5%. Steeper swales require check dams (see figures 3.6(B) and 3.6(C)).
3. Dimensions 'b' and 'd' to be sized for conveyance of 10% AEP event.
4. Existing ground is regraded, compacted, topsoiled (100 mm depth), and grassed.
5. Side slopes no steeper than 1v:3h if planted (not mown).
6. Side slopes no steeper than 1v:5h if grassed (mown).

Figure 5-7 Typical check dams in swale detail

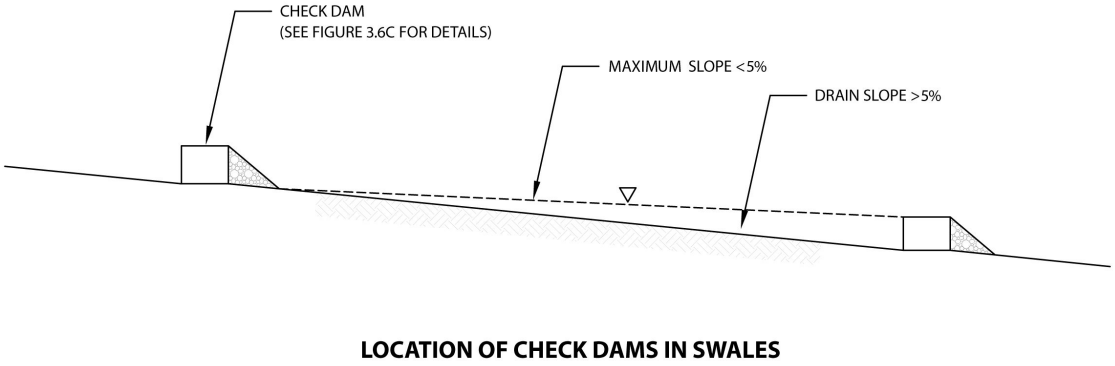
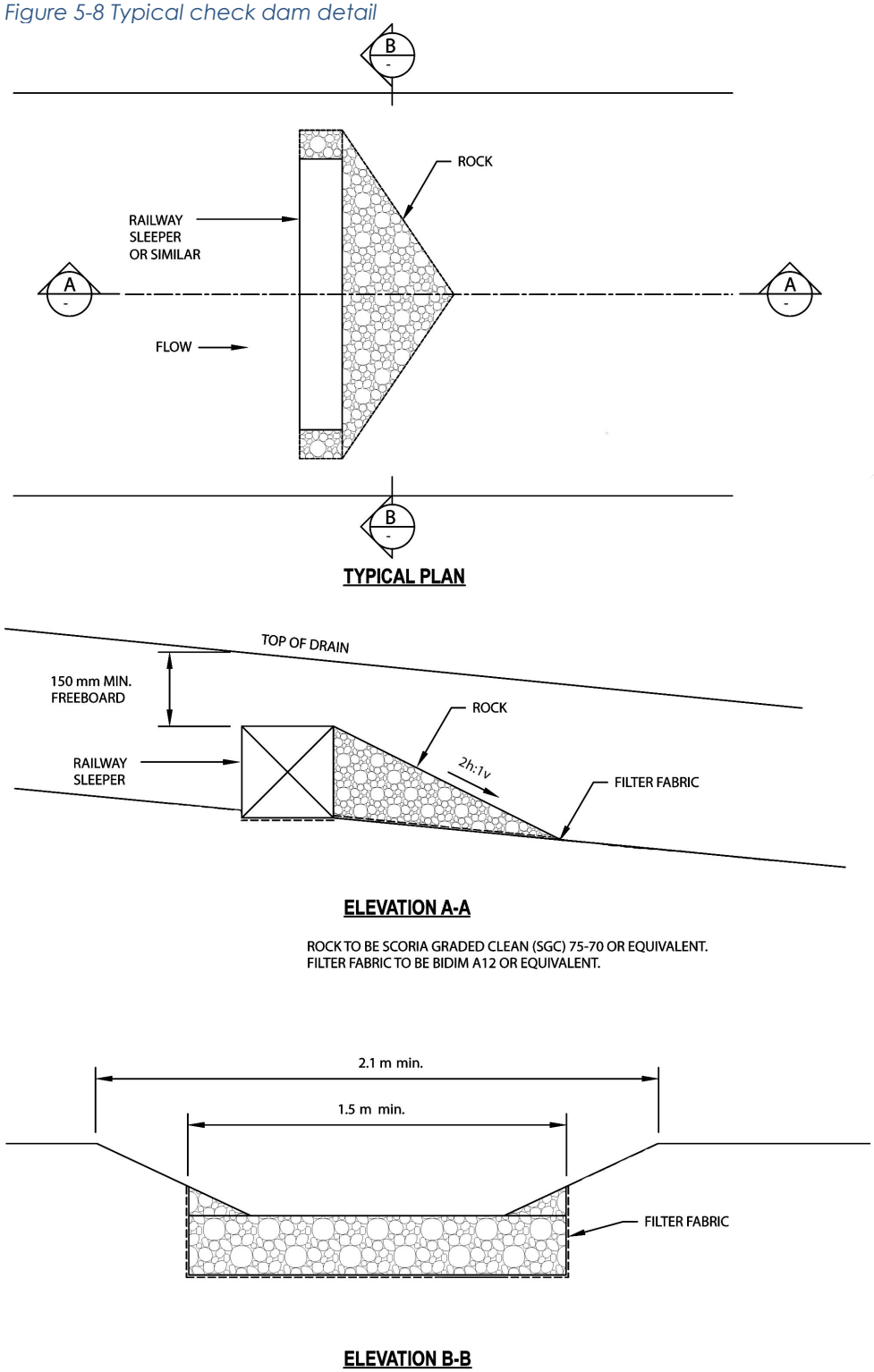


Figure 5-8 Typical check dam detail



5.3.20.7 Kerbs And Channels

Where kerbs and channels are to be provided on carriageways they should comply with Standard Drawing R5 to R7. Mountable or nib kerbs, or their slip-formed equivalent may be used subject to the approval of Council. Mountable kerbs shall be reinforced minimum 30MPa concrete. Pedestrian crossings (pram crossing) should be provided for disability access at regular intervals and at locations

where pedestrians are reasonably expected to transition between footpaths and the street, including all road intersections and pedestrian crossings.

The crossings shall be sited to facilitate normal pedestrian movements in the road and where possible sumps shall be sited so as to reduce the flow of stormwater in the channel at the crossing entrance. Pram and wheelchair crossings shall conform to Standard Drawing R5, and satisfy the Waka Kotahi (NZTA) Pedestrian planning and design guide.

5.3.20.8 Sumps

Sumps used in all public places shall comply with Council's current standard details.

Stormwater sumps are classified as three types according to the design of their inlets:

(a) Grated only inlet sumps: Grated inlets are effective in intercepting gutter flows. They also provide access openings for maintenance. Grated inlets are prone to blockage and problems of increased pavement maintenance in the immediate vicinity of the inlet, therefore, their use in street gutters are discouraged. They are suitable for non-kerbed situations such as yards, end of ditches, open car parks, accessways, driveways, medians, and ponding areas. Standard Drawings D12-14 show details of common types of grated inlet.

(b) Back entry inlet sumps: Back entry inlets are less affected by blockage, and they are more effective in intercepting flows in sag areas.

(c) Combined grates and back entry inlet sumps: This system of combining a back entry with the traditional grated inlet significantly improves flow intake and is less prone to blockage from debris. This type of inlet should be used in all situations where possible. Standard Drawing R13A shows a typical example of this type of inlet.

These diagrams are for typical Southland geometry and catchments. Where situations are atypical (steep hills, extreme rainfall), the Engineer may require a modification to or an alternative design to accommodate these needs.

5.3.20.8.1 Sumps shall be located:

(a) To ensure that the total system design flow enters the pipe system and that surface flows across intersections are minimised. In hill areas the total design flow shall include run-off from any upslope hillsides that are not specifically drained. In many cases this will mean the use of closely spaced or specially designed sumps to ensure that the flow to which the pipe system is designed can actually get into the system.

(b) At all points in a surface system where a change in gradient is liable to result in ponding due to change in flow velocities or on bends where there may be a tendency for water to leave the kerb and channel.

(c) Not further apart than 90 m along any surface system.

5.3.20.8.2 Sump design

Sumps should be designed to intercept and convey stormwater run-off flow from design storm of the AEP set out by Council, or otherwise stated in Section 6 of this CoP, while allowing a reasonable frequency and degree of traffic interference. Depending on the road classification, as specified by Council, portions of the road may be inundated during major storm events. See Section 6.3.4 secondary flows for allowable floodwater depths.
The following general guidelines should be used in the design of sumps:

(a) General safety requirements

  (i) provide for the safety of the public from being swept into the stormwater system; the maximum allowable opening shall not exceed 100 mm in width;

  (ii) openings are sufficiently small to prevent entry of debris that would clog the stormwater system;

  (iii) openings be sized and oriented to provide for safety of pedestrians and cyclists. Cycle-friendly sump grates shall be used where required by Council. These grates may be built

either with bars transverse to the side channel direction or closely spaced bars in a wavy pattern in a longitudinal direction.

(b) Sump inlet capacities

Inlet capacities of any sump used should be determined using manufacturers' and suppliers' data which should be based on either rational analysis or first principle calculations, otherwise sump inlet capacities should be calculated using approved design methods where applicable. When no proper data is available, the capacity of the single 675 x 450 back entry sump with standard grating should be limited to 28 L/s.

The calculated sump inlet capacities should be reduced to account for partial blockage of the inlet with debris as follows:

On-grade grated back entry sump	10% reduction
On-grade grated sump	50% reduction
On-sag grated sump	50% reduction
On-sag grated back entry sump	Include back entry capacity only

(c) The use of silt traps is encouraged in all sumps to provide partial treatment to stormwater at the source, but in all cases, trapped sumps should be used where discharge to a soakage device is permitted.

5.3.20.8.3 Sump gratings

Sump grating areas shall be sized generously to allow for partial blockage to ensure that flows within the channel do not bypass sumps when velocities are high.

Cycle-friendly sump grates shall be used where cyclists can be expected or when required by Council. These gratings may be built either with bars transverse to the side-channel direction or closely spaced bars in a wavy pattern in a longitudinal direction.

5.3.20.8.4 Sump leads

Leads should be designed to be of sufficient size to convey all the design capacity of the sump to the system. The minimum size of the lead for all types of sumps shall be 200 mm diameter, but 300 mm diameter is desirable to minimise inlet losses and blockage risk. For double sumps and other high capacity sumps the minimum size of lead required is 300 mm diameter.

5.3.20.8.5 Secondary flow provisions

At all points where sump blockage may occur, or where design capacity of the primary drainage network may be exceeded thereby leading to overland flows into private property, the provision of designed secondary flow paths protected by public ownership or easement shall be made (see Section 6.3.4).

5.4 Construction

5.4.1 Introduction

These requirements apply to flexible pavements. For rigid pavements, such as concrete pavements refer to Austroads guides, and the *Guide to residential streets and paths* as listed in Referenced Documents.

Roads shall be constructed to the alignments and standards detailed in the approved drawings using approved materials, using construction specifications to provide the required design life.

Road construction includes all associated construction required to complete adjacent footpaths, berms, and road reserve areas.

Road Construction shall comply with the requirements of Council and as a minimum to the Waka Kotahi standards set out in Section 3 of this CoP.

5.4.2 Materials for flexible pavements

5.4.2.1 Transition Layer

A transition layer may be required for traffic loading in excess of 1 x 10^5 ESA where the subgrade is soft, to prevent ingress of the soft soils into the pavement layers. The use of geogrid, geotextile filter fabric or similar for the transition layer shall only be used at the approval of Council. The transition layer shall be compatible with the grading of adjacent layers and be regarded as part of the total depth of the sub-base layer.

5.4.2.2 Sub-Base

The sub-base layer immediately beneath the basecourse shall have a permeability of at least 10^{-4} m/s for a depth of at least 100 mm.

The material used as sub-base shall be hard rock material with the largest aggregate size not larger than 60% of the depth of the layer or 65 mm. The material shall be sufficiently free draining so as not to be susceptible to undue weakening at highest in-service moisture content.

5.4.2.3 Basecourse

The thickness of the basecourse layer when used with other metal aggregate layers shall not be less than 100 mm.
Acceptable basecourse specifications are:

(a) Complying with M/4 specification.
(b) Local basecourse acceptable to Council.

This may be used for local roads in residential areas and footpaths, kerb crossings, and shared accessways.

5.4.2.4 Road Surfacing

Unless specified otherwise, all roads and private ways within city or township areas shall be finished with a chip sealed surface. Other accepted surface materials such as asphalt, paving blocks, or similar impervious treatments will require the approval of Council. The designer shall provide the whole of life cost for the surfacing selected. Note where chip seal is to be utilised, a second coat seal will be required between 12 – 24 months after the initial sealing date.

The carriageway of roads in rural lifestyle blocks shall be sealed if:

(a) The subdivision is immediately adjacent to an existing developed urban resource area and has the potential to create a dust nuisance.
(b) The longitudinal grade on roading is greater than 8% or scour is likely to be a problem because of the nature of the ground or of the construction materials.
(c) The number of allotments serviced by the road is greater than 10.

Council may also require the carriageway to be sealed if there is a strong possibility that the number of allotments serviced will exceed 10 through further subdivision within 10 years.

Council may waive sealing if the road servicing the development adjoins an existing unsealed road.

5.4.2.5 Acceptable Surfacing Materials

All movement lanes shall be provided with a permanent, hard wearing surfacing layer, which shall be either impermeable or formed over an impermeable base. The surfacing shall be capable of carrying all stresses expected during its lifetime. Acceptable surfacing options may include:

(a) Hot laid asphaltic concrete of minimum compacted thickness 40 mm, laid over a waterproofing sealcoat.

i. Asphaltic concrete of at least 25 mm, but subject to specific design, may be used as an alternative to chip sealing.

ii. The asphaltic concrete shall comply with Waka Kotahi Specifications M10 or M27.

(b) Other asphaltic concrete mixes such as friction course or macadam wearing mix laid over a waterproofing coat.

(c) Chip seals of various types, providing the equivalent of two bound chip coatings. A second coat seal will be required between 12 - 24 months after the first coat installation. The second coat seal sealing date will be subject to Council approval.

The following are less preferred but if promoted the Council will look for additional materials/contributions for maintenance of such.

(a) Concrete block pavers.

(b) Stone block surfacing where designed for aesthetic effects.

Interlocking paving blocks may be used on cul-de-sacs or wherever traffic speeds are generally less than 50 km/hr so that the tyre noise does not become obtrusive. Blocks shall be manufactured in accordance with NZS 3116 and shall be of minimum 50 MPa crushing strength and minimum 80 mm thickness. The blocks shall be laid in a herringbone pattern. The road design and block abrasion resistance shall be approved by the Engineer.

To resist scuffing and local load effects, minimum surfacing standards as given in Table 5-5 shall apply to the named facilities.

Use of concrete or stone block paving in public traffic areas shall require the specific approval of Council.

Table 5-5 Recommended surfacing standards

Facility	Minimum Surfacing
Residential turning head	Segmental concrete pavers, concrete, 40mm asphaltic concrete
Public carparks (excl. parallel parks)	Segmental concrete pavers, concrete, 40mm asphaltic concrete
Commercial and industrial turning head	Segmental concrete pavers, concrete, 50mm asphaltic concrete
Traffic islands and bus stops	Segmental concrete pavers, concrete, 50mm asphaltic concrete

5.4.2.6 Road Surface Tolerances and Texture

The finished surface of new roads shall meet the roughness requirments specified under the TNZ TM 7003 v1. This includes a maximum roughness no greater than 70 NAASRA counts/km to a 100m rolling average, with the target value being 60 NAASRA counts/km. No abrupt or abnormal deviations shall occur and no areas shall pond water. The surface shall be of uniform texture expected by best trade practice and satisfy density standards applicable to the surfacing being used. The skid resistance and surface texture of roads where design speeds exceed 70 km/hr, shall comply with Waka Kotahi (NZTA) specification T/10 and its accompanying notes.

Where hard surfacing is required for areas that are not movement lanes, alternative materials and porous pavements that achieve the durability, maintenance, and amenity requirements are acceptable with the approval of Council.

C5.4.2.6

In the cases of narrow traffic islands and bus stops, where loading is concentrated, the use of stabilised base course is also desirable.

5.4.2.7 Road Surfacing Materials

All materials used in road surfacing shall comply with the appropriate Waka Kotahi (NZTA) specifications. Proposed specification details shall be provided to Council prior to construction.

The following surfacing options will be acceptable for roads covered by this CoP.

5.4.2.8 Chip Seal Surfacing

A first coat seal is the initial seal on a prepared unsealed surface, which is usually a basecourse. The first coat seal may either be a:

a) Single coat chipseal: a single sprayed application of sealing binder followed immediately with a single application of chip which is spread and rolled into place or
b) Two coat chipseal: also known as a "first coat two coat" is a chipseal with two applications of binder and two applications of chip applied in the following sequence:
    a. an application of sprayed binder followed immediately with an application of a large size chip;
    b. a second application of sprayed binder, and another application of finer chip.

    Both coats are applied one after the other with little to no time delay between coats.

Two coat chip seals are usually constructed using grade 3 and 5 chips (Waka Kotahi M/6) and 180/200 penetration grade bitumen (Waka Kotahi M/1) in accordance with Waka Kotahi Specifications P/3 and P/4. The binder application rate for the seals shall be designed to suit the conditions and chip size.

Acceptable and compatible chip sizes for two coat chipseals are:

- Local roads: First coat: grade 4, second coat: grade 6
- Other roads: First coat: grade 3, second coat: grade 5 or 6.
- For cycle and parking lanes the chip size for the second application of chip for a two coat chipseal shall be a grade 6 size.

5.4.2.9 Reseals/Second Coat Seals

The developer shall allow for a second coat seal to be carried out between 12 - 24 months after the first coat installation. The second coat seal sealing date will be subject to Council approval. These are to be constructed in accordance with Waka Kotahi specifications M/6, M/1 and P/4.

A reseal is typically applied after a second coat seal on an existing sealed, asphalt, concrete or timber surface. These shall be constructed in accordance with Waka Kotahi specifications M/6, M/1 and P/4.

5.4.2.10 Hot Laid Asphaltic Concrete Surfacing

Hot laid asphaltic concrete surfacing shall comply with Waka Kotahi (NZTA) specification M/10, M/27 or equivalent approved by Council. The mix used shall be appropriate to the end use and thickness being placed. When using Waka Kotahi (NZTA) specification M/10 AC series mixes (AC10/AC14/AC20), these shall be paver laid to avoid an open or segregated surface.

A waterproofing seal coat, using asphaltic binder or emulsion, and grade 5 chip, with the requirement that the seal coat comprises a minimum of 1.0 L/m^2 of residual penetration grade bitumen, shall be laid prior to surfacing with asphaltic concrete of 50 mm or lesser thickness. No cut back shall be used in such coats as it can cause flushing of the asphalt overlay.

When using Waka Kotahi (NZTA) specification M/10 compliant mixes on roads of connector/collector class, Waka Kotahi (NZTA) guidelines on skid resistance and surface texture shall be incorporated in the mix design.

5.4.2.11 Other Asphalt Mixes

For special uses other asphalt-based hot mixes may be used such as open grade porous asphalt or macadam wearing mix. When used they shall be placed over a waterproof under layer and shall be designed according to current specifications and guides. In no case shall the laid thickness be less than 25 mm.

5.4.2.12 Concrete

All concrete for roads shall come from a special grade plant as defined in NZS 3109. Concrete of not less than 30 MP at 28-day strength shall be used for any road or crossing slabs.

Concrete for kerbs and channels shall be of not less than 20 MPa, 28-day strength except for vehicle crossings and mountable kerb, which require 30Mpa at 28-day strength.

5.4.2.13 Concrete Pavers

Design and material standards shall comply with NZS 3116. Paver thickness shall be as defined in NZS 3116 for the appropriate traffic loading classification.

When used in roads the basecourse underlayer shall be given a waterproofing seal coat before the sand and pavers are laid, except where part of a porous pavement is approved by Council.

When used for bus stops or at raised crossings the basecourse shall be cement stabilised under the raised zone and for at least 3 m on either side of the raised zone.
Pavers shall be laid to 5 mm above the lips of channels and other draining features.

5.4.3 Subgrade Preparation

The top of subgrade level should be formed to the road shape to ensure water drains effectively. For full details of subgrade preparation refer to Waka Kotahi (NZTA) F/1 specification.

Even in cases where the subgrade has been tested as part of the design its condition shall be reviewed on exposure during construction and pavement thicknesses adjusted accordingly.

The results of such testing or review along with any consequent adjustments to pavement layer thicknesses shall be advised to Council before placing of pavement layers commences.

Any identified wet spots in the subgrade shall be drained to the under-channel drainage system. Where the wet area is below the level of the under-channel drain, it shall be drained using approved filter drainpipes connected to the nearest stormwater system.

Between the date the subgrade is completed and the application of the first metal-course aggregate, the subgrade shall be maintained true to grade and cross section. Should potholes, soft spots or ravelling develop in the subgrade, the area so affected shall be scarified and clean material added and recompacted.

5.4.4 Spreading And Compaction Of Metal Course Aggregates

The metal course aggregates shall be placed on the prepared subgrade in layers. The aggregate layers shall be of adequate thickness and stiffness to ensure that with adequate compaction the minimum required deflections are achieved.

5.4.5 Sub-Base

Sub-base material shall be placed in layers thin enough to ensure requisite compaction and CBR standards are achieved. Sub-base shall be compacted in accordance with Waka Kotahi (NZTA) B/2 specification to achieve a mean of 95% of maximum dry density (MDD) and a minimum of 92% of MDD.

The layers shall be so placed that when compacted they will be true to the grades and levels required. The laying procedure shall be arranged to minimise segregation. Grader use shall be restricted to essential shaping and final trimming, with minimum working of the final surface.

The sub-base layer may be used by construction traffic, but such traffic shall be managed to ensure no detrimental effects to the final road construction.

While not mandatory, it is recommended that the sub-base deflection be tested in addition to testing of the basecourse deflections.

5.4.6 Basecourse

Basecourse shall be placed in layers not exceeding 150 mm. It shall be placed and compacted to Waka Kotahi (NZTA) B/2 specification density requirements to achieve a mean of 98% MDD and a minimum of 95% MDD.

Where approved by Council, cement stabilised basecourses should be placed and compacted in accordance with the Waka Kotahi (NZTA) B/5 specification.

To assist compaction, water may be added as a fine mist spray to achieve optimum moisture content. Particular care shall be taken to avoid excess water reaching the formation or sub-base course.

Fine aggregate may be hand spread in a comparatively dry state over any open textured portion of the final compacted aggregate surface. The fine aggregate shall be vibrated or rolled into the interstices of the basecourse. The use of such surface choking material shall be kept to a minimum. Special attention shall be paid to the consolidation of the edges of the basecourse.

The construction of the basecourse shall be carried out in a manner that will ensure the production of a stone mosaic surface after sweeping.

5.4.7 Maintenance Of Basecourse

The finished aggregate surface shall be maintained at all times true to grade and cross section by placement of a 'running course', watering as required, trimming, planning, rolling, and taking appropriate measures to ensure the even distribution of traffic.

Every precaution shall be taken to ensure that the surface of the basecourse does not pothole, ravel, rut or become uneven, but should any of these conditions become apparent, the surface shall be patched with suitable aggregate and completely scarified and recompacted. The basecourse shall be maintained to the specified standards until covered with an impermeable surfacing layer.

5.4.8 Basecourse Preparation for Surfacing

Any loose or caked material shall be removed from the surface without disturbing the compacted base, and the material so removed shall be disposed of. The surface shall then be swept clean of any dust, dirt, animal deposits, or other deleterious matter. The surface of the road at the time of surfacing shall be clean, dry and uniform, tightly compacted, and shall present a stone mosaic appearance. Immediately prior to any form of surfacing a strip 600 mm wide contiguous to each channel or seal edge shall be sprayed with an approved ground sterilising weed killer at the manufacturer's recommended rate of application.

For second coat sealing, repairs shall be carried out prior to sealing. Areas to be patched shall be cleaned and loose material removed before application of an emulsion tack coat and asphaltic patching material. The repairs shall provide a finished surface flush with the levels and grades of the surrounding pavement, and shall not hold water.

Where repairs are required to the carriageway and dense graded hot mix asphalt is used, a texturing coat maybe required. Where it is required, a minimum stand down period of 6 months should be undertaken to limit the potential for flushing of the texturing coat.

Prior to commencement of sealing the surface preparation shall be inspected by Council. Shoulders are to be compacted to Waka Kotahi B/02 specifications.

5.4.9 Deflection testing prior to surfacing

Where required by Council prior to placing the surfacing layer (except for cast in situ concrete roads) deflections shall be tested by the Benkelman beam method (see Table 5-6). At least 95% of all tests shall comply with the standards appropriate to the road type. Where Council does not have its own deflection standards Table 5-6 shall be considered as a minimum standard. In addition no test shall give deflections greater than 25% above the specified maximum.

Table 5-6 Benkelman beam standards

Residential	Deflections		Commercial Industrial Rural	Deflections	
	Average	Maximum		Average	Maximum
M5 – Low - Lane	1.50 mm	1.80 mm	Lane	1.00 mm	1.20 mm
M4 - Local road	1.50 mm	1.80 mm	Local road	1.00 mm	1.20 mm
Connector/ collector	1.25 mm	1.50 mm	Connector/ collector	1.00 mm	1.20 mm
Arterial	1.00 mm	1.20 mm	Arterial	1.00 mm	1.20 mm

Readings shall be taken in the wheel path in both lanes and at a maximum interval of 10 m. Other methods of determining deflection such as Falling Weight Deflectometer shall be acceptable if designed in accordance with the appropriate Austroads Guides.

5.4.10 Surfacing Specification

Chipsealing construction standards shall comply with Waka Kotahi (NZTA) specifications P/3 and P/4.

Asphaltic concrete construction standards shall comply with Waka Kotahi (NZTA) specification M/10. Add section

5.4.11 Bitumen Application Rate

Bitumen application rate for chipseals and tack coats shall be assessed based on current Waka Kotahi (NZTA) design methods and ambient weather conditions at the time of construction.

5.4.12 Footpaths And Cycle Paths

Standard Drawing R05 provides a guide to Council footpath construction standards. Footpaths shall have having a minimum CBR test value of 5 (allowable bearing pressure of approximately 80 kPa).

5.4.12.1 Concrete

Concrete footpaths and cycle paths shall be formed over not less than 100 mm of compacted AP20 crushed gravel. The formation is to be thoroughly compacted by rolling before any concrete is placed. Porous areas shall be blinded with sand prior to placing concrete.

The foundation shall be evenly trimmed to a crossfall of 1 in 50. If the foundation is dry, it shall be moistened in advance of placing concrete.

The concrete paths shall be laid with construction joints at intervals of not greater than 3 m. If paths are constructed by continuous pour techniques, clean, true, well-oiled 5 mm thick steel strips at least 40 mm deep shall be inserted at 3 m intervals to facilitate controlled cracking. These strips shall be carefully removed after the concrete has set. Alternatively, the joints may be cut by means of a concrete-cutting saw. In this case the cutting shall be carried out not more than 48 hours after pouring and shall be to a depth of 40 mm. These joints may also be typically tooled into the concrete when

the concrete is still plastic. Alternatively, the use of metal crack inducers may be used with the approval of Council.

Minimum concrete thickness for paths is 100 mm. Concrete in both footpaths and kerb and channel shall be cured for at least seven days during dry weather.

Concrete used in footpaths shall be of at least 20 MPa, 28-day strength. Concrete for crossings shall be 30 MPa, 28-day strength as detailed in 5.4.2.12.

Concrete used in footpaths shall be of at least 20 MPa, 28-day strength, with the exception of the following situations that require minimum compressive strength of 30Mpa, with a 125 mm depth reinforced with 665 mesh.

- vehicle crossings,
- where the mountable kerb is used,
- areas specified by the engineer

Where required, vehicle and pedestrian crossings shall be constructed in accordance with Council Standard Drawings R01-3. Tactile pads may be required at pedestrian kerb crossings.

5.4.12.2 Asphaltic Concrete

Asphaltic concrete footpaths and cycle paths shall be placed over not less than 100 mm of compacted AP20 over AP40 crushed gravel sub-base as per table on Standard Drawing R05 after removal of all organic and soft subgrade. Asphaltic concrete shall be laid in a minimum layer thickness of 25 mm of DG7 M/10 material. Asphalt concrete paths shall not puddle water and shall be edged with either concrete or ground treated timber where abutting berms or other grassed areas.

5.4.12.3 Concrete Pavers

The designer must show the whole of life cost of concrete pavers in relation to concrete and asphaltic concrete footpath construction. Where concrete pavers are the preferred treatment, they shall be 80 mm depth of 50 MPa interlocking paving blocks shall be placed on 30 mm of sand with not less than 150 mm of compacted basecourse of AP40 crushed gravel after removal of all organic and soft subgrade. Laying shall be in accordance with NZS 3116. Pavers shall be laid to 5 mm above tops of channels and other drainage features.

Where a footpath is constructed around the head of a cul-de-sac turning head the depth of construction shall be increased to accommodate wheel loads from turning trucks as follows:

(a) 125 mm concrete reinforced with 665 mesh.
(b) 50 mm of asphaltic concrete on 300 mm depth of AP 40 crushed compacted gravel.
(c) 80 mm paving blocks on 30 mm of sand on 250 mm of AP 40 with 150 mm x 250 mm concrete edgings.

5.4.12.4 Surface Finish Tolerances

Surface finish and tolerances on footpaths shall comply with the appropriate design requirements.

5.4.13 Construction - Vehicle Crossings

Residential

Residential crossings shall be 125 mm thick concrete reinforced with central 665 mesh with a 30Mpa 28-day strength, on a compacted subgrade

Commercial and Industrial

Construction shall be 150 mm thick concrete reinforced with one layer of 665 mesh placed centrally with a 30Mpa 28-day strength. Channels across the entrance of commercial/industrial crossings shall incorporate two D12 reinforcing bars full length.

Alternative vehicle crossing designs for residential, commercial and industrial areas using hotmix may be used subject to specific approval. See Standard Drawing R04.

Rural

Rural crossings shall be constructed with an appropriate depth of compacted granular hardfill. For typical situations the accepted depth is 250 mm, but this should be varied to suit local ground conditions and actual truck loading.

The primary purpose of rural crossings is to protect the edge of existing seal and prevent loose material migrating to the main road. Therefore the crossing shall be formed to cover the anticipated or (in the case of existing unsealed crossings) the existing swept vehicle area, with the full area of vehicle exit and entry from the carriageway to the legal boundary being covered.

5.4.14 Kerb And Channel

Kerb and channel may be either cast in situ or extruded.

For cast in situ kerb and channel, formwork shall be clean dressed timber or steel sections adequately oiled or otherwise treated to allow ease of striking without staining or damaging of the stripped concrete surface.

No formwork shall be stripped until at least two days have elapsed from time of pouring concrete.

For extruded kerb and channel, concrete used shall be of such consistency that after extrusion it will maintain the kerb shape without support. The extrusion machine shall be operated to produce a well compacted mass of concrete free from surface pitting.

Concrete used in kerbs and channels shall be of at least 20 MPa, 28-day strength. Concrete for kerbs and channels at crossings, and all mountable kerbs, shall be 30 MPa, 28-day strength. The use of mountable kerb will require the prior approval of Council.

Finished tolerances and standards shall satisfy the design standards. Standard kerb and channel shapes are provided later in this CoP. Refer to the standard detail drawings provided in Appendix B.

5.4.15 Berms and landscaping

Berms shall be formed after all other construction has been completed. Berms once formed to the required shape (including batter slopes of 2:1(H:V) or less) shall include a 100 mm thick layer of topsoil free of weeds, stones, and other foreign matter and shall finish 15 mm above adjacent footpath level to allow for settlement.

After placing and spreading topsoil, the berm shall be either sown or planted, or both, and maintained free of weeds for the contract maintenance period. The seed mix shall be approved by Council.

When sown, rather than planted, grass coverage of not less than 90% shall be achieved within 1 month of sowing and before completion documentation will be accepted for processing by Council.

For additional requirements for swales see Section 5.3.20.6.

Any landscaping in the road reserve shall be in accordance with Section 10 of this CoP.

Clear demarcation shall be required and agreed identifying who will own and hence maintain the berms and landscaping once the maintenance period is completed.

5.4.16 Surface Finish And Tolerances On Kerbs, Paths And Accessways

Kerbs and channel

All curves both horizontal and vertical shall be tangential to straights and the lines and levels of kerbs shall be such as to give the finished kerbs smooth lines free of kinks and angles. Construction joints shall be placed in all unreinforced kerb and channel at 10 m centres.

Workmanship standards shall be such that, on straights, kerbing shall not deviate from a straight line by more than 6 mm in any length of 3 m. Similar standards shall apply to the gradient line. No visible ponding in new channels shall occur.

The exposed faces of the kerb and channel shall present smooth, uniform appearance free from honey-combing or other blemishes to at least U3 standard in NZS 3114.

Paths And Accessways
Concrete paths and accessways shall be finished with a crossfall to shed water and an even non-skid brush surface to finish U5 in NZS 3114.

The surface of other paths/accessways shall be of uniform texture as would be expected from best trade standards for the surfacing used. Crossfalls of 2% shall be provided or by agreement with Council.

The surface of all paths/accessways shall not deviate by more than 6 mm from a 3 m straight edge at any point and no abrupt changes in line or level shall occur. No path/accessway shall pond water.

5.4.17 Progress Inspections

The contractor shall give notice to Council as appropriate to allow the conduct of all inspections required to facilitate eventual acceptance of the project by Council.

5.4.18 Installation Of Traffic Services, Road Furniture, Benchmarks

Traffic lines and utility services shall be painted and marked after initial surfacing and sweeping has been completed. Road furniture and survey reference marks shall be installed, prior to final inspections being made by Council.

5.4.19 As-Built And Completion Documentation

On completion of construction, information and documents as required by Council shall be provided by the developer's professional advisor. (See Schedule 2D and Section 3.2.20 for further information.) The information provided shall provide sufficient detail to enable Council to complete the road assessment and maintenance management (RAMM) database input.

5.5. Parking And Access Layouts

Figure 5-9 Angled Parking Layout

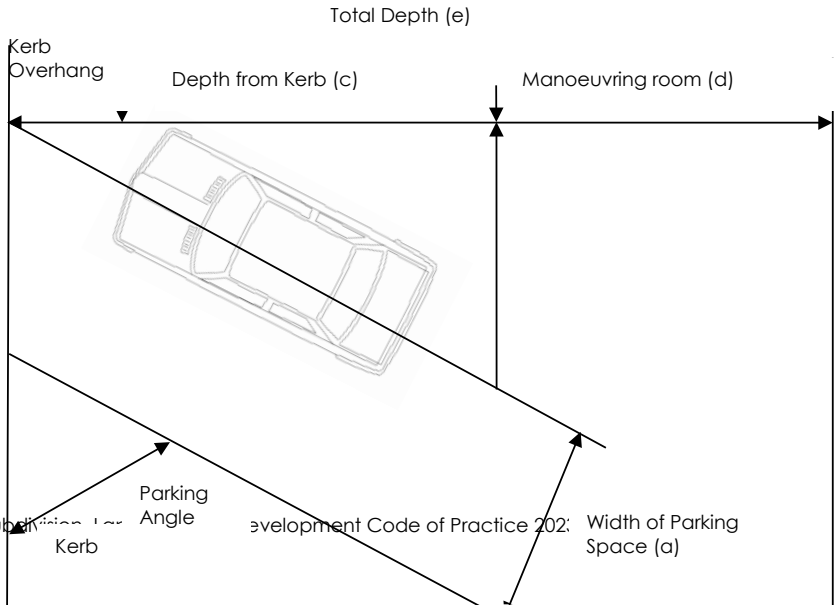


Table 5-7 Parking Dimensions

Type of Parking		Stall Width (a)	Stall Depth		Manoeuvre Width (d)	Total Depth (e)	
			From wall (b)	From kerb (c)		One row	Two rows
Parking Angle	Type	ALL MEASUREMENTS ARE IN METRES					
90°	Nose in	2.4 2.5 2.6 2.7	5.1	4.1	7.9 7.6 7.2 6.8	13.0 12.7 12.3 11.9	18.1 17.8 17.4 17.0
75°	Nose in	2.4 2.5 2.6 2.7	5.4	4.4	6.4 5.8 5.2 4.6	11.8 11.2 10.6 10.0	17.3 16.6 16.0 15.4
60°	Nose in	2.4 2.5 2.6 2.7	5.4	4.5	4.5 4.2 3.9 3.6	9.9 9.6 9.3 9.0	15.3 15.0 14.7 14.4
45°	Nose in	2.4 2.5 2.6 2.7	5.0	4.2	3.6 3.5 3.4 3.3	8.6 8.5 8.4 8.3	13.6 13.5 13.4 13.3
30°	Nose in	2.4 2.5 2.6 2.7	4.3	3.7	3.0	7.3	11.6
0°	Parallel	2.5	Stall length 6.0 m		3.7	6.2	8.7

1. Parallel parking spaces (Parking angle – 0°) shall be 6.0 m long, except where one end of the space is not obstructed in which case the length of a space may be reduced to 5.0 m.
2. Minimum aisle and accessway widths shall be 3.0 m for one way flow and 5.5 m for two way flow. Recommended aisle and accessway widths are 3.5 m for one way flow and 6.0 m for two way flow.
3. Maximum kerb height = 150 mm.
4. In addition to the minimum requirements for a standard car, as shown above, a minimum stall width of 3.0 m shall be allowed for angled disabled parking.
5. The above table and diagram provide details on minimum car-park widths as a general guide. Consideration needs to be made of the use of the parking, for example where there are likely to be a high incidence of campervans or SUVs, parks may need to be wider. Guidelines on lighting, carpark surface and other issues may be found in the Traffic Control Devices Manual Part 13 (https://www.nzta.govt.nz/resources/traffic-control-devices-manual/) and should be considered in the overall scheme.
6. On-road parking requirements shall meet the requirements of the Traffic Control devices manual.

Disabled Parking requirements and spaces shall comply with NZS 4121. Code of practice for design for access and use of buildings and facilities by disabled persons.

The following are the minimum number of disabled carparks required which must meet a minimum width of 3.0 m.

Table 5-8 Disabled Parking Numbers

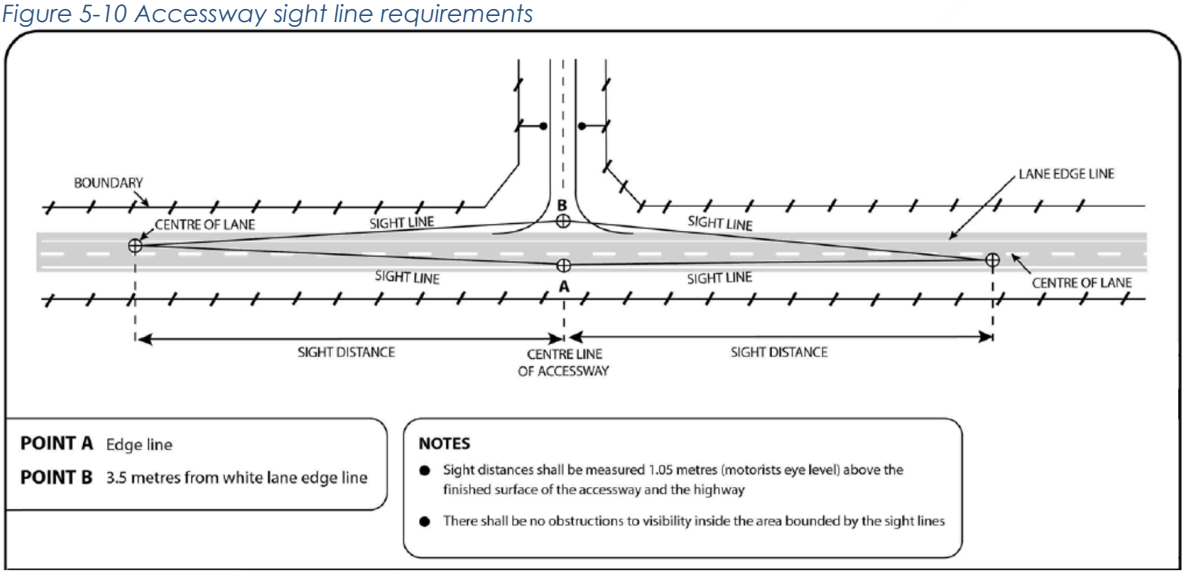
Total number of car parks	Number of accessible spaces
1 - 20	Not less than 1
21 - 50	Not less than 2
For every additional 50 parks	Not less than 1

5.5.1 Accessway Sight Lines

For new accessways onto existing roads, the location shall consider the available sight lines to approaching main road traffic to ensure safety for exiting and entering vehicles. Sightlines shall be provided in accordance to the operating speed of the main road. Wherever possible the sight line shall be created by clearing vegetation and other obstructions to the satisfaction of Council.

For both rural and urban locations sight lines shall be provided in accordance with Figure 5-10 below. Further review is required with Council if these requirements cannot be met.

Figure 5-10 Accessway sight line requirements



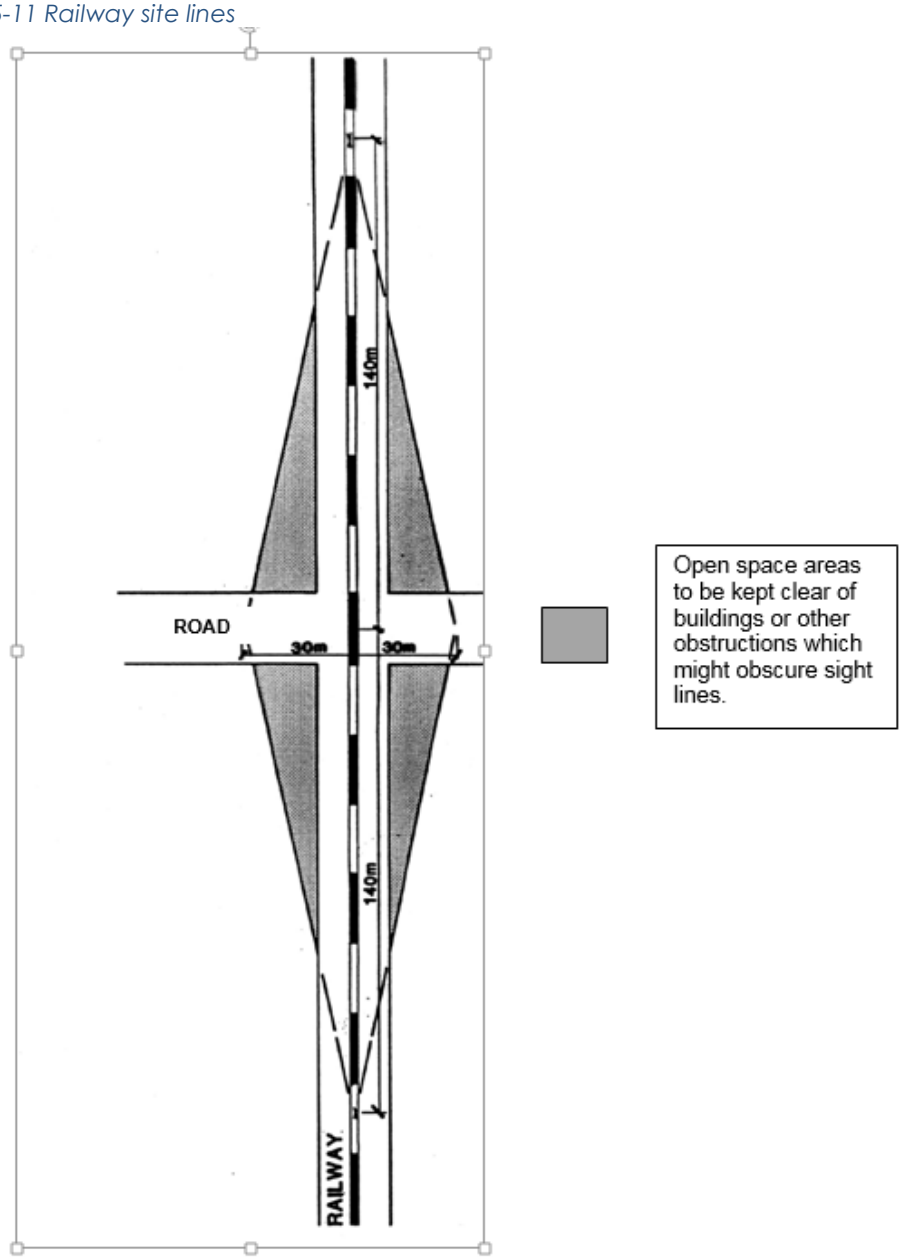
Operating Speed (km/h)	Minimum Sight Distance (m)		
	Local Road	Collector	Arterial
40	30	35	70
50	40	45	90
60	55	65	115
70	85	85	140
80	105	105	175
90	130	130	210
100	160	160	250
110	190	190	290
120	230	230	330

5.5.2 Railway Sight Line Restriction

Where a railway and a road intersect on the same level, the approval of the rail provider and the road controlling authority must be obtained in relation to the design of the level crossing. Generally, no building or vegetation which would block the sight lines shall be permitted within an area bounded by lines connecting points of 30 m along the centreline of the road measured in each direction from the

centreline of the nearest railway track to points 140 m along the nearest railway track measured in each direction from the centreline of the road as more particularly shown in the Figure 5-11 below:

Figure 5-11 Railway site lines



Notes:

- Dispensation to dimensions given may be possible through application to KiwiRail dependant upon train movements or speeds in the area.
- Where there are two or more rail tracks the 30 m sight line applies from the centre line of the nearest track.

Section 6. Stormwater

6.1 Scope

This section sets out requirements for the design and construction of stormwater systems for land development and subdivision. The significant issues for stormwater management are the protection of people, property, infrastructure, and the receiving environment. Stormwater management requires the integration of land use, roading, and ecological factors. A catchment-based approach is required with consideration of changes in catchment hydrology, rainfall patterns, and sea level rise from climate change effects.

Opportunities exist with stormwater design to use or replicate the natural drainage system. Grassed swales, natural or artificial waterways, ponds and wetlands, for example, may in certain circumstances be not only part of the stormwater system, but also a preferred solution especially if low impact on receiving waters downstream is critical. Low impact design is the preferred approach, particularly where there is a requirement to replicate the pre-development hydrological regime. Nevertheless piped stormwater systems will often be required either in support of low impact systems or as the primary system.

Sustainable drainage solutions aim to store, treat, dissipate, and reuse at source as much as is possible. Thereby reducing total volumes being transported via networks away from the development. The tools listed below all work towards this end.

Stormwater systems serve a number of purposes including the management of storm surface water run-off, treatment of such run-off, and groundwater control. All aspects need to be considered in design and achieved with minimal adverse effects on the environment.

6.2 General

6.2.1 Objectives

The primary objective of a stormwater system is to manage storm surface water run-off thereby to minimise adverse effects on the environment.

The stormwater system shall include provision for:

(a) A level of service to Council's customers in accordance with the authority's policies.
(b) Minimised adverse environmental and community impact.
(c) Protection from potential adverse effects to aquatic ecosystems.
(d) Compliance with environmental requirements.
(e) Adequate system capacity to service the fully developed catchment.
(f) Long service life with consideration of maintenance and whole life-cycle costs. Including resistance to tree root invasion, external corrosion, suitable structural strength.
(g) Application of low impact design solutions.

6.2.2 Legislation And Guidance Manuals

Referenced legislation is listed in Section 2 of this CoP.

A selection of guidance manuals which may provide a useful resource or basis for stormwater design and management is set out in the referenced documents. They are non-statutory but may be required to be complied with under this CoP and/or the Regional or District Plans.

6.2.3 Effects Of Land Use on Receiving Waters

Impervious surfaces and piped stormwater systems associated with development have an effect on catchment hydrology. Faster run-off of storm flows, reduction in base flows, and accelerated channel erosion and depositions alter the hydrology and adversely affect the quality of receiving waters. Development should aim to minimise the increase in the frequency at which pre-development discharges are exceeded across a range of design rainfall events as this has implications for the biodiversity of the aquatic biological community.

The effects of rural development on receiving waters are generally less significant. The modification to stream hydrology is generally minor. However, any reduction in riparian vegetation increases sediment loads and nutrient concentrations are likely to reduce aquatic biodiversity.

6.2.4 Catchment Management Planning

Stormwater management planning should be carried out on a subcatchment or catchment-wide basis. Where the proposed development is in an area covered by a local authority comprehensive catchment management plan, designers will be required to comply with the design philosophy in the plan.

If there is no catchment management plan for the area of the proposed development, the stormwater planning requirements should be discussed with the Las at an early stage.

The implications of future development on adjoining land should be on the basis of replicating the pre-development hydrological regime whereby the maximum rate of discharge and peak flood levels post -development are no greater than pre-development.

Any catchment management planning issues should be discussed with Council at an early stage.

6.2.5 System Components

The stormwater system conveys storm surface run-off and shallow groundwater from the point of interception to soakage areas, attenuation areas, or the point of discharge to receiving waters. Components of the primary system may include roadside channels, swales and sumps, stormwater pipelines, subsoil drains, outlet structures, soakage areas, wetlands, ponds, and water quantity and quality control structures. Secondary surface flow paths to convey primary system overflows will also be required.

These different system components are set out on standard construction drawings contained in Appendix B. The drawings are copyright waived and may be adapted by subdivision developers for incorporation into specific designs.

6.2.6 Catchments And Off-Site Effects

All stormwater systems shall provide for the management of stormwater run-off from within the land being developed together with any run-off from upstream catchments. In designing downstream facilities the upstream catchment shall be considered to be fully developed to the extent defined in the operative District Plan or structure plan unless Council advises that the upstream catchment will be required to be controlled for off-site effects at the time of its development.

For all land development infrastructure (including projects involving changes in land use or coverage) the design of the stormwater system shall include the evaluation of stormwater run-off changes on upstream and downstream properties. This evaluation will be required at the resource consent stage and may be linked to a requirement to replicate the pre-development hydrological regime.

Upstream flood levels shall not be increased by any downstream development unless any increase can be shown to have not more than a minor impact on the upstream properties.

Downstream impacts could include (but are not limited to) changes in flow peaks and patterns, flood water levels, contamination levels and erosion or silting effects, and effects on the existing stormwater

system. Where such impacts are more than minor, mitigation measures such as peak flow attenuation, velocity control, and treatment devices will be required.

Fish passage shall be maintained. This is likely to be a requirement of any authorisation from Environment Southland.

6.2.7 Water Quality

Stormwater treatment devices may be required to avoid adverse water quality effects on receiving waters. The type of potential contaminants should be identified and then treatment devices designed to address the particular issues. The need for treatment devices should be considered for every discharge even when it is not a direct discharge to a receiving water, for instance where the discharge is to an existing network. In this instance specific approval from the Council will be required.

6.2.8 Climate Change

Climate change is expected to increase the intensity and frequency of heavy rainfall events, even in areas where mean annual rainfall is predicted to decrease. In low-lying coastal areas higher sea levels will also affect rivers, streams, and stormwater outfalls. The performance of stormwater systems in these areas will need to take into account higher predicted downstream sea levels.

Rainfall design charts shall be adjusted to take into account the predicted increase in rainfall intensities from the effects of climate change. To do this the designer shall use the following factors:

- Temperature increase of 1.5°C
- Design Horizon of 2050 – (NZ has signed up to the Kyoto agreement to limit to 1.5°C at 2050)
- RCP 6 (representative concentration pathway)
- Design event duration 6hrs

Using the NIWA – Hirds website = https://niwa.co.nz/information-services/hirds/help

A percentage increase on the design rainfall depth can be identified.

(Example 2020 design is a 30 year design horizon (up to 2050) which from the Hirds table for a 1°C increase gives a factor of 11.2%. This then needs to be multiplied by 1.5 (for the design temperature rise) which gives an overall climate change multiplication factor of 16.8%)

C6.2.9
Refer to the following Ministry for the Environment publications for guidance on climate change:
'Preparing for climate change - A guide for local government in New Zealand' for guidance on adjusting rainfall design charts at selected locations within each regional council area.
'Preparing for coastal change - A guide for local government in New Zealand' for guidance on coastal hazards and climate change.
'Tools for estimating the effects of climate change on flood flow - A guidance manual for local government in New Zealand' for incorporating climate change in flood flow estimation.
'Preparing for future flooding - A guide for local government in New Zealand' provides an overview of the expected impacts of climate change on flooding.

6.3 Design

Council should be consulted to confirm design requirements to suit each and any development site. The designer shall liaise with Council, prior to commencement of design, to ensure that sufficient prerequisite information is available to undertake the design.

6.3.1 Design life

All stormwater systems shall be designed and constructed for an asset life of at least 100 years. Some low impact design devices such as rain gardens and other soakage systems may require earlier

renovation or replacement. In addition M&E systems have a finite design life depending upon the components.

6.3.2 Structure plan

Council may require a structure plan setting out certain information to be used in design, such as flows, sizing, upstream controls, pipe layout, treatment, or mitigation requirements. Environment Southland's Water Plan, and its future Water and Land Plan, detail the appropriate stormwater management options for the given structure plan area. Where a structure plan is not provided, the designer shall determine the information by investigation using any water plans for the area, this CoP, and any requirements of Council, as appropriate.

6.3.3 Future Development

Where further subdivision, upstream of the one under consideration, is provided for in the district or regional plan, Council may require stormwater infrastructure to be constructed to the upper limits of the subdivision.

Additionally, Council may require further capacity to be provided in the stormwater system to cater for existing or future development upstream.

6.3.4 System Design

Stormwater systems shall be considered as the total system protecting people, land, infrastructure, and the receiving environment.
A stormwater system consists of primary and secondary systems:

Primary systems

A primary system designed to accommodate flows up to a specified design rainfall event. In the Southland District this is defined as a 1 in 10 year event, also known as a 10% Annual Exceedance Probability (AEP) event. In the Invercargill City this is defined as a 1 in 5 year event, also known as a 20% AEP event.

In addition, depending upon the site, there is normally a requirement to limit the discharge from the site to a particular flow rate. Defined as the pre-development flow rate. This is normally achieved by the provision of attenuation storage.

Secondary systems

A secondary system is intended to manage excess runoff over and above the primary network capacity. Thereby ensuring that the effects of stormwater run-off from events that exceed the capacity of the primary system, are managed. This includes occasions when there are blockages in the primary system limiting its capacity. This is defined as being for flows between the 1 in 10 year for SDC or 1 in 5 year for ICC, and a 1 in 100 year events (i.e. between a 10% (SDC) or 20% (ICC), and a 1% AEP event).

Secondary systems shall consist of ponding areas and overland flow paths to manage excess run-off. Where possible, secondary systems shall be located utilising the development highways and/or on land that is, or is proposed to become public land. If located on private land, the secondary system shall be protected by legal easements in favour of Council or by other encumbrances prohibiting earthworks, fences, or other structures that may restrict the flows.

Secondary systems shall be designed so that erosion or land instability will not occur. Where necessary the design shall incorporate special measures to protect the land against such events.

Ponding or secondary flow on local roads shall be limited to a 100 mm maximum height at the centre line during the 1 in 100 year event and flows such that the carriageway is passable in a 1 in 20 year event (5% AEP) design storm.

C6.3.4.2
The Austroads 'Guide to road design - Part 5: Drainage design' provides more information on major and minor stormwater design and acceptable volume and velocity for surface flow.

6.3.5 Design Criteria

The designer should liaise with Council, prior to commencement of design, to ensure that sufficient prerequisite information is available to undertake the design.

When the design process includes the use of a hydrological or hydraulic model, all underlying assumptions (such as run-off coefficients, time of concentration, and catchment areas) shall be clearly stated so that a manual check of calculations is possible. A copy of the model may be required by Council for either review or records or both.

The designer shall undertake the necessary design and prepare design drawings compatible with Council's design and performance parameters. Designers shall ensure the following aspects have been considered and where appropriate included in the design:

(a) The size of pipes, ponds, swales, wetlands, and other devices in the proposed stormwater management system.
(b) How the roading stormwater design is integrated into the overall stormwater system.
(c) The type and class of materials proposed to be used.
(d) System layouts and alignments including:
    (i) route selection;
    (ii) topographical (defining sub-catchments) and environmental aspects (defining runoff coefficients) (see Section 7.3.4.3);
    (iii) easements;
    (iv) clearances from underground services and structures (see Section 7.3.7.9 and 7.3.7.10);
    (v) provision for future extensions;
    (vi) location of secondary flowpaths.
(e) Hydraulic adequacy (see Section 6.3.10.5).
(f) Property service connection locations and sizes (see Section 6.3.13)

For catchments less than 50 ha, surface water run-off using the Rational Method will generally be accepted. For larger catchments, or where significant storage elements (such as ponds) are incorporated, surface water run-off should be determined using an appropriate hydrological or hydraulic model.

The New Zealand Building Code (NZBC) clause E1/VM1 provides guidance in the design of pipes, culverts, and open channel hydraulics.

The design shall be based on the Rational Formula:
ie: Q=k*C*i*A where
Q is the design flow rate in litres/sec
k is 2.78 x 10^{-3}
C is the coefficient of run-off having the following values:]

Table 6-1 runoff coefficients for various surface types

Description of surface	C
Natural surface types	
Bare impermeable clay with no interception channels or run-off control	0.70
Bare uncultivated soil of medium soakage	0.60
Heavy clay soil types:	

Description of surface	C
pasture and grass cover	0.40
bush and scrub cover	0.35
cultivated	0.30
Medium soakage soil types:	
pasture and grass cover	0.30
bush and scrub cover	0.25
cultivated	0.20
High soakage gravel, sandy and volcanic soil types:	
pasture and grass cover	0.20
bush and scrub cover	0.15
cultivated	0.10
Parks, playgrounds and reserves:	
mainly grassed	0.30
predominantly bush	0.25
Gardens, lawns, etc	0.25
Developed surface types	
Fully roofed and/or sealed developments	0.90
Steel and non-absorbent roof surfaces	0.90
Asphalt and concrete paved surfaces	0.85
Near flat and slightly absorbent roof surfaces	0.80
Stone, brick and precast concrete paving panels	
with sealed joints	0.80
with open joints	0.60
Unsealed roads	0.50
Railway and unsealed yards and similar surfaces	0.35
Land use types	
Industrial, commercial, shopping areas and town house developments	0.65
Residential areas in which the impervious area is less than 36% of gross area	0.45
Residential areas in which impervious area is 36% to 50% of gross area	0.55

Note:

- where the impervious area exceeds 50% of gross area the chosen run-off coefficient shall be based on the conditions likely to exist after the full catchment development allowable by the District Plan.
- the run-off coefficient C is the variable in the rational formula least able to be precisely determined, and represents the integrated effects of such things as infiltration, storage, evaporation, natural retention and interception, all of which affect the time distribution and peak rate of run-off.
- the run-off coefficients given assume saturated ground conditions from previous rain and shall be used in the calculation of surface water run-off.

"i" is the average intensity of the design rainfall in mm/hr. This is based on a 10-year return period (see Section 6.3.6 for reference to design storms) and is determined by the formula:

$$\mathbf{i} = \frac{\mathbf{955}}{\mathbf{19} + \mathbf{0.75t}}$$

- where t = duration of the design storm = te + tf
- where te = time of entry of the stormwater into the system. For residential sections te is assumed to be 10 minutes.
- tf = time of network flow compressing time of flow in pipes.
- A = the area of the contributing catchment in hectares.

Therefore, Q can be rewritten as follows:

$$\mathbf{Q} = \frac{\mathbf{1000CA}}{\mathbf{7.16 + 0.28t}}$$ litres/sec]

6.3.6 Design Storms

All new primary stormwater systems shall be designed to cope with climate change adjusted design storms (see Section 6.2.8 for definition) with a 1 in 10-year return period (10% AEP) for the Southland District Council, and a 1 in 5-year return period (20% AEP) for the Invercargill City Council. All new secondary systems shall be designed to cope with a 1 in 100-year return period (1% AEP) design storm.

Rainfall intensity design charts developed from local data should be used if available. High Intensity Rainfall Design Systems (HIRDS) data available from NIWA is considered a suitable source for rainfall design data.

6.3.6.1 Freeboard

The minimum freeboard height additional to the computed top water flood level of the 1 in 100yr (1% AEP) design storm should be as follows or as specified in the district or regional plan:

Freeboard	**Minimum height**
Habitable dwellings (including attached garages)	0.6 m
Commercial and industrial buildings	0.3 m
Non-habitable residential buildings and detached garages	0.2 m

The minimum freeboard shall be measured from the top water level to the building platform level or the underside of the floor joists or underside of the floor slab, whichever is applicable.

6.3.6.2 Tidal Areas

In tidal areas, design criteria should be discussed with Council at an early stage. Storm surge, tsunami hazards, climate change, and sea level rise need to be taken into account in accordance with the Ministry for the Environment guidance manual *Interim guidance on the use of new sea-level rise projection 2022*.

6.3.6.3 Hydraulic Design of Stormwater Systems

The hydraulic design of stormwater pipes should be based on either the Colebrook-White formula or the Manning formula or the Rational formula. System capacity shall be determined from the Colebrook-White or Manning coefficient as shown in Table 6-2. The Colebrook-White and Manning formulae can be found in *Metrication: Hydraulic data and formulae* (Lamont). Manufacturers' specifications should also be referred to.

Refer to 'Roughness characteristics of New Zealand rivers' by D M Hicks and P D Mason for further guidance on the selection of Manning's 'n' values.
This handbook emphasises that the Manning's 'n' values can vary significantly with flow and the selected value should be based on the graphs of Manning's 'n' versus discharge presented for each site.

Table 6-2 Guide to roughness coefficients for gravity stormwater pipes concentrically jointed and clean

Description	Colebrook-White coefficient k (mm)	Manning roughness coefficient (n)
Circular pipes		
PVC	0.6	0.011
PE Polypropylene	0.6	0.009 - 0.011
Vitreous clay	1.0	0.012
Concrete - machine made to AS/NZS 4058	1.5	0.012
Corrugated metal	-	0.024
GRP (glass reinforced plastic)	0.6	0.011
Culverts		
Concrete pre-cast (pipes and boxes)	1.5	0.012
Open channel		
Straight uniform channel in earth and gravel in good condition	-	0.0225
Unlined channel in earth and gravel with some bends and in fair condition	-	0.025
Channel with rough stony bed or with weeds on earth bank and natural streams with clean straight banks	-	0.030
Winding natural streams with generally clean bed but with some pools and shoals	-	0.035
Winding natural streams with irregular cross section and some obstruction with vegetation and debris	-	0.045
Irregular natural stream with obstruction from vegetation and debris	-	0.060
Very weedy irregular winding stream obstructed with significant overgrown vegetation and debris	-	0.100
NOTE - Refer to Metrication: Hydraulic data and formulae (Lamont).		

6.3.6.4 Energy Loss Through Structures

Energy loss is expressed as velocity head:
Energy loss: $H_e = kV^2/2g$; where

- k is the entrance loss coefficient
- V is velocity (m/s)
- g= 9.81m/s^2

The entrance loss coefficient table and energy loss coefficient graph in NZBC Clause E1/VM1 provide k values for flow through inlets and access chambers respectively.

For bends, see Table 4.3

6.3.6.5 Determination Of Water Surface Profiles

Stormwater systems shall be designed by calculating or computer modelling backwater profiles from an appropriate outfall water level. On steep gradients both inlet control and hydraulic grade line analysis shall be used and the more severe relevant condition adopted for design purposes. For pipe networks at manholes and other nodes, water levels computed at design flow shall not exceed finished ground level while allowing existing and future connections to function satisfactorily.

In principle, each step in the determination of a water surface profile involves calculating a water level upstream (h_2) for a given value of discharge and a given start water level downstream (h_1).

This can be represented as:
$h_2 + V_2^2 / 2g = h_1 + V_1^2 / 2g + H_f + H_e$
where V is velocity,
H_f is head loss due to boundary resistance within the reach (for pipes, unit head loss is read from Manning's flow charts, for example),

H_e is head loss within the reach due to changes in cross section and alignment (see Table 6-3 for loss coefficients).

Table 6-3 Loss coefficients for bends

Bends	k
MH properly benched with radius of bend	
1.5 x pipe diameter	0.5 to 1.0
Bend angle	
90 °	0.90
45°	0.60
22.5°	0.25

6.3.7 Stormwater Pumping

Stormwater pumping should be avoided wherever possible. However, in certain circumstances for low lying areas, and where gravity drainage is difficult to achieve, stormwater pumping may be required to achieve the appropriate levels of service and protection.

The consequences and risk of pump malfunction and power outages should be considered carefully.

Sea level rise scenarios may need to be assessed in line with the proposed NES on sea level rise and assessed in line with the Ministry for the Environment guidance manual *Coastal hazards and climate change - Guidance manual for local government, Dec2017*. Such assessments are likely to indicate the need to design for or at least plan for stormwater pumping in the future to ensure levels of service are maintained throughout asset life.

6.3.8 Low Impact Design

Low impact design (LID) aims to use natural processes such as vegetation and soil media to provide stormwater management solutions as well as adding value to urban environments. The main principles of low impact design are reducing stormwater generation by reducing impervious areas, minimising site disturbance, and avoiding discharge of contaminants. Stormwater should be managed as close to the point of origin as possible to minimise collection and conveyance. Benefits include limiting discharges of silt, suspended solids, and other pollutants into receiving waters, and protecting and enhancing natural waterways.

Effective implementation of LID principles typically requires more planning and design input than piped stormwater systems. Aspects in the design process requiring specific consideration include provision of Attenuation, Swales, soakaways, secondary flow paths, land requirements, and provision for effective operation and maintenance.

The developer shall implement low impact design principles for the treatment of stormwater. Where the developer does not believe that low impact design methods will be suitable the developer shall provide reasons for this for approval by the Council.

Useful guidance on low impact design practices can be found in the Christchurch City Council's *Waterways, Wetlands and Drainage Guide* which sets out a philosophy that encourages people to work with natural features and processes in the landscape.

Additional guides that may be useful are listed in Referenced Documents and Related Documents.

6.3.8.1 Low Impact Design Stormwater System

Low impact design is a type of stormwater system that aims to minimise environmental impacts by:

(a) Reducing peak flow discharges by flow attenuation.
(b) Eliminating or reducing discharges by infiltration or soakage **(**dependent upon ground conditions).
(c) Improving water quality by filtration.
(d) Installing detention devices for beneficial reuse (rainwater harvesting for irrigation and toilet flushing).

6.3.8.2 Low Impact Design Process

Key design considerations include:

(a) Design objective. The need to be clear about what is being designed for is important to informing decisions on the type of device and maintenance approach that is appropriate in a given context. Low impact devices offer many opportunities to deliver multiple outcomes in addition to their stormwater functionality.
(b) Device selection. The proper design and position of a product or device within the stormwater treatment train is important. It is critical to select a device or product that is fit for purpose, robust, and effective for delivering the design objective over its design life. Problems with the operation and maintenance of a device can occur when it is inappropriate for a given location or is undersized for its purpose. The respective position of the various components in the treatment train is an important consideration in ensuring the sustained effectiveness of the system.
(c) Integrated approach. Ensure that those who will become responsible for the ongoing operation and maintenance of low impact devices are involved in the design process. This is critical to informing the development of a practical design that will enable ease of maintenance and develop ownership for ensuring the device performs as it was intended.
(d) Design for maintenance. Maintenance of devices shall be considered early in the design process. This will assist in the identification of features that will facilitate the ease and efficiency of ongoing operation and maintenance of devices. Elements to consider in the design for the maintenance and operation of the systems include:
    (i) access;
    (ii) vegetation;
    (iii) mulch;
    (iv) sediment;
    (v) mechanical components;
    (vi) vandalism and safety.

6.3.8.3 Low Impact Design Devices

The types of low impact design devices that could be considered for use include:

(a) Detention ponds.
(b) Wetlands.
(c) Vegetated swales.
(d) Rain gardens.
(e) Rainwater tanks.
(f) Soakage devices (pits and soak holes).
(g) Filter strips.
(h) Infiltration trenches/basins.
(i) Permeable paving.

(j) Green roofs.
(k) Tree pits.

6.3.8.4 Detention Ponds

Stormwater ponds are an accepted method of improving stormwater quality and reducing peak downstream flow rates to replicate the pre-development hydrological regime.

Detention ponds can be of the 'dry' (detention) or 'wet' (retention) type and can be 'on-line' or 'off-line'. The type of pond required should be discussed with the SDC at an early stage.

Specific matters to be considered in pond design include:
(a) Side slope stability.
(b) Shallow ledges or batters for safety.
(c) Ease of access and maintenance including mowing and silt clean out.
(d) Shape and contour for amenity and habitat value.
(e) Effectiveness of inlet and outlet structures.
(f) Overflow design and scour protection.
(g) Fish passage.
(h) Pest control (for example mosquitoes and blue-green algae).
(i) Species to be planted.
(j) Potential effect on downstream aquatic ecology and habitat.
(k) Maintenance requirements.
(l) Lifetime costs do not exceed those of a fully piped network.

If Council is to be responsible for pond maintenance it shall be located on land owned by, or to be vested in, Council or protected by an appropriate easement.

6.3.8.5 Wetlands

Constructed wetlands can be designed to provide flood protection, flow attenuation, water quality improvement, recreational and landscape amenity, and provision for wildlife habitat.

Specific matters to be considered in wetland design include:
(a) Catchment area greater than 1 ha.
(b) Size calculated to achieve water quality volume.
(c) Forebay to capture coarse sediments.
(d) Depth not to exceed 1 m.
(e) Sufficient hydraulic capacity for flood flows.
(f) Sufficient detention time for sediment retention (Low velocity flows).
(g) Species to be planted.
(h) Lifetime costs do not exceed those of a fully piped network.

If Council is to be responsible for wetlands maintenance it shall be located on land owned by, or to be vested in, Council or protected by an appropriate easement.
Reference shall be made to Christchurch City Councils *Waterways, Wetlands and Drainage Guide* which sets out a philosophy that encourages people to work with natural features and processes in the landscape. Management of a waterway or wetland frequently includes its restoration and protection. Stormwater drainage is integrated with all other 'values' (ecology, landscape, recreation, heritage and culture) to form the foundation of a philosophy that is multi-disciplinary and sustainable.

One key item to highlight is the need for suitable consultation with local communities and mana whenua.]

6.3.8.6 Vegetated Swales

Vegetated swales are stormwater channels that are often located alongside roads or in reserves. While their primary function is conveyance, filtration through the vegetation provides some water quality treatment.

Specific matters to be considered in swale design include:

(a) Catchment area not greater than 4 ha.
(b) Longitudinal slope 1% - 5%.
(c) Slopes flatter than 1% may require subsoil drainage.
(d) Slopes greater than 5% may require check dams to reduce effective gradient to less than 5%.
(e) Southland District Council: Capacity for a 1 in 10 yr (10% AEP) event.
Invercargill City Council: Capacity for a 1 in 5 yr (20% AEP) event.
(f) Velocity not greater than 1.5 m/s in the design primary storm event unless erosion protection is provided.
(g) Grass length 50 mm - 100 mm.
(h) Species to be planted.
(i) Lifetime costs do not exceed those of a fully piped network.

An option for swales with very flat longitudinal slopes and high watertables is a wetland swale.

Typical details that may be used in swale design are shown in Figure 5-5, Figure 5-7, and Figure 5-8.

6.3.8.7 Rain Gardens

Rain gardens are engineered bioretention systems designed to use the natural ability of flora and soils to reduce stormwater volumes, peak flows, and contamination loads. Rain gardens also provide value through attractive design and planting.

Specific matters to be considered in rain garden design include:

(a) System designed to manage a 1 in 10 yr (10% AEP) event in the Southland District, and 1 in 5 yr (20% AEP) event in Invercargill City, event without significant scour or erosion.
(b) Overland flow paths to accommodate flows in excess of the design storm.
(c) Entry and overflow positions to restrict short circuiting.
(d) Geotextile on side walls.
(e) An underdrain with a minimum of 50 mm gravel cover.
(f) Pavement design in vicinity of device.
(g) Soil composition.
(h) A ponding area.
(i) Species to be planted.
(j) Access for maintenance.
(k) Lifetime costs do not exceed those of a fully piped network.

6.3.8.8 Rainwater Tanks

Rainwater tanks can be designed to harvest water for non-potable uses such as toilet flushing and irrigation. This can significantly reduce the demand on the potable water supply from Council. Where required by Council, rainwater tanks can be configured to provide peak flow attenuation, to reduce stream channel erosion and the load on the stormwater system, with or without reuse.

Specific matters to be considered in rainwater tank design include:

(a) Capacity: Typically 2,000 L - 5,000 L for domestic reuse and 6,000 L - 9,000 L for dual reuse and attenuation.
(b) Primary screening to keep out leaves and other coarse debris.

(c) First-flush diverters to collect first 0.4 mm from roads and other potentially contaminated areas for treatment.
(d) Backflow prevention.
(e) Low level mains top-up valve.
(f) Overflow outlet.
(g) Gravity or pumped.
(h) Tight-fitting cover.
(i) Cool location.
(j) Aesthetics and convenience.
(k) Lifetime costs do not exceed those of a fully piped network.

6.3.8.9 Soakage Devices

Soakage devices such as soak pits and soak holes, filter strips, infiltration trenches/basins, permeable paving, green roofs, and tree pits can also be considered for managing stormwater from roofs, parking areas, and roads.

Specific matters to be considered in soakage system design include:

a) Southland District Council: Capacity adequate for a 1 in 10 yr (10% AEP) event; or
Invercargill City Council: Capacity adequate for a 1 in 5 yr (20% AEP) event.
b) Rate of soakage determined through a soakage test with an appropriate reduction (safety factor) (of at least 0.5) applied to accommodate loss of performance over time.
c) Capacity to accommodate the maximum potential impermeable area.
d) Overland flow paths to accommodate flows in excess of the design storm.
e) Confirmation that the soakage system will not have an adverse effect on surrounding land and properties from land stability, seepage, or overland flow issues.
f) Soakage system to be located above static groundwater level and away from other critical elements that may be susceptible to flooding.
g) Pre-treatment device to minimise pollution (interception of hydrocarbons) and silt ingress will be required.
h) Access for maintenance.
i) Interception of hydrocarbons

For guidance on disposal using soakage on individual lots refer to NZBC clause E1/VM1.

Council require a geotechnical assessment to be carried out by an appropriately qualified geo-professional to determine the suitability of soil and groundwater characteristics for any proposed soakage system.
A discharge permit may be required from the regional council for discharge to soakage.

National and international references that may be able to be used in the design and maintenance of such systems are listed in Referenced Documents and Related Documents.

6.3.9 Natural And Constructed Waterways

Where waterways are to be incorporated in the stormwater system, they shall be located within a reserve of sufficient width to contain the full 1 in100yr return period (1% AEP) design storm flow with a minimum freeboard of 500 mm.

Grass berms in reserves shall have a side slope of 1 in 10 where possible. A maximum side slope of up 1 in 5 may be accepted in extraordinary situations, and will require agreement by the Council. Vehicular access to berms shall be provided for maintenance purposes.

Reserves should be designed to accommodate off-road pedestrian and cycle access for recreational use. Planted riparian margins should be provided each side of the waterway (see Section 10.2.4).

Where flow rates are going to change as a consequence of the works all channel infrastructure shall be assessed for the need for additional protection against scour and erosion of the stream banks and stream bed.

If the watercourse is to be in private property and be maintained by Council it shall be protected by an easement.

6.3.10 Pipelines And Culverts

6.3.10.1 Location And Alignment Of Public Mains

The preferred location of public mains shall be within the road reserve or within other public land.

Where required easements shall be provided for stormwater pipelines located on private property.

A straight alignment between manholes (MHs) is required unless there are special circumstances. See Sections 7.3.7.6 and 7.3.7.7 for further guidance on curved alignments for pipelines.

6.3.10.2 Materials

Section 8.7 sets out acceptable system uses for various pipe materials. Stormwater pipe types as listed, or as amended may be used for stormwater infrastructure.

For materials for which there is no New Zealand or Australian Standard the specific approval of Council is required.

6.3.10.3 Minimum Pipe Sizes

Minimum pipe sizes for public mains and sump laterals unless otherwise specified shall be:

Single sump outlets	150 mm internal diameter
Public mains	150 mm internal diameter where only taking house laterals

6.3.10.4 Minimum Cover

Minimum cover shall be determined by the property connections which require a minimum depth at the property boundary of at least 1 m where the section contours grade to the road. Where there are no property connections to govern the cover over the main the minimum cover shall be 600 mm in private property and 900 mm in the road reserve.

6.3.10.5 Minimum Gradients And Flow Velocities

In flat areas gradients should be as steep as possible to control silt deposition. The minimum velocity should be at least 0.9 m/s at a 1 in 10 yr (10% AEP) design flow in the Southland District, or at least 0.9 m/s at a 1 in 5 yr (20% AEP) design flow in the Invercargill City. For velocities greater than 3.0 m/s see 0.

6.3.10.6 Culverts

In designing culverts the effects of inlet and outlet (tailwater) controls shall be considered.

Culverts under fills shall be of suitable capacity to cope with the 1 in 10 yr (10% AEP) design storm in the Southland District, and a 1 in 5 yr (20% AEP) design storm in Invercargill City, with no surcharge at the inlet, unless the fill is part of a stormwater detention device or has been designed to act in surcharge. All culverts shall be provided with adequate wingwalls, headwalls, aprons, scour protection, removable debris traps or pits to prevent scouring or blocking. Special consideration shall be given to the effects of surcharging or blocking of culverts under fill.

Fish passage through culverts shall always be maintained.

Refer to the Waka Kotahi (NZTA) *Bridge manual* for waterway design at bridges and culverts and Austroads guide to bridge Technology Part 8: Hydraulic design of Waterway Structures.

6.3.10.7 Inlets And Outlets

On site disposal of stormwater may be permitted where:
(a) No piped system is immediately available or will not be available within 10 years of the subdivision application.
(b) No piped system is available immediately adjacent or within a reasonable distance of the site.

For clarification of what constitutes a "reasonable distance" refer to Section 9.8 of this CoP.

Where a pipeline discharges into a natural or constructed waterway, or vice versa, consideration shall be given to energy dissipation or losses, erosion control, and land instability. This is often achieved by an appropriately designed headwall structure.
For outlets the design shall ensure non-scouring velocities at the point of discharge. Acceptable outlet velocities will depend on soil conditions, but should not exceed 2 m/s without specific provision for energy dissipation and velocity reduction.

Where inlets or outlets are located on or near natural waterways their appearance in the riparian landscape and likely effect on in-stream values shall be considered. Methods could include cutting off the pipe end at an oblique angle to match soil slope, constructing a headwall from local materials such as rock or boulders, planting close to the structure, and locating outlets well back from the water's edge.

Direct discharge to a waterway or the sea may require a discharge consent from the regional council unless authorised by a comprehensive consent held by Council, or is a permitted activity in a regional plan. Environment Southland's stormwater Discharges Information Guide, February 2013 refers.

6.3.10.8 Outfall Water Levels

Where a pipeline or waterway discharges into a much larger system the peak flows generally do not coincide. Backwater profiles should produce satisfactory water levels when assessed as follows:

Method 1

(a) Determine the time of concentration and set the design rainfall event for the smaller system.
(b) Determine the peak flow in the smaller system for the design event.
(c) Determine receiving waterway peak water level for the design rainfall event in (a).
(d) Starting with the level from (c) determine the smaller system profile at a flow of 75% of the flow from (b).

Method 2

(e) Determine the receiving waterway mean annual flood water level.
(f) Starting with the level from (e) determine the smaller system water profile at the flow from (b).

Results

(g) Select the higher of the two profiles determined for design purposes.

Similarly, for tidal outfalls, peak flow may or may not coincide with extreme high tide levels. A full dynamic analysis and probability assessment may be required.
Sea level rise shall be taken into account (see 6.3.6.2).

6.3.10.9 Subsoil Drains

Subsoil drains are installed to control groundwater levels. Perforated or slotted pipe used under all areas subject to vehicular traffic loads shall comply with Waka Kotahi (NZTA) specification F/2 and Waka Kotahi (NZTA) F/2 notes. It is good practice to provide regular inspection points.

Bedding and backfill material around a subsoil drain pipe shall be more free-draining than the in situ soil. If filter fabrics are used their susceptibility to clogging, thereby reducing the through flow, should be considered.

Groundwater control shall always be considered when an open drain is piped.

In the absence of any other more appropriate criterion the design flow for subsoil systems shall be based on a standard of 1 mm/hr which gives us a flow of 2.78 L/s/ha.
Refer to manufacturer's literature for information on pipe materials, filter fabrics, bedding, and filter design.

6.3.10.10 Bulkheads For Pipes On Steep Grades

Bulkheads, or anti-scour blocks, shall be detailed on the design drawings and shall be in accordance with drawing CM – 003 of NZS 4404. Spacing of bulkheads shall be:

Table 6-4 Spacing Of Bulkheads For Pipes On Steep Grades

Grade (%)	Requirement	Spacing (s)
15-35	Concrete bulkhead	S= 100/Grade (%)
>35	Special design	Refer to TA

6.3.10.11 Trenchless Technology

See 7.3.6.8 and 0 for guidance on the use of trenchless technology.

6.3.11 Manholes

6.3.11.1 Standard Manholes

Access chambers or Manholes (MHs) shall be provided at all changes of direction, gradient and pipe size, at branching lines and terminations and at a distance apart not exceeding 120 m unless approved otherwise. They shall be easily accessible and located clear of any boundary. All public mains shall terminate with a MH or Cleaning eye (CE) at the upstream end.

See 7.3.8.2 and 0 of this CoP for further guidance on the location of MHs.

On pipelines equal to or greater than 1 m diameter, the spacing of MHs may be extended with the approval of Council.

Standard Drawings D12 - D21 for manholes shall be adopted for stormwater systems.

Manholes should not incorporate step irons or ladders on safety grounds, they tempt those un-trained in confined spaces to enter such chambers.

6.3.11.2 Manhole Materials

MHs may be manufactured in concrete, or from suitable plastics materials, including glass reinforced plastic (GRP), polyethylene, PVC or polypropylene, or from concrete/plastic lined composites.

MH materials selection shall be suitable for the level of aggressiveness of the surrounding groundwater.

6.3.11.3 Size Of Manholes

The standard internal diameter of circular MHs is 1050 mm and preferred nominal internal diameters are 1050 mm, 1200 mm, and 1500 mm. However, for shallow systems, DN 375/400 or 600 mm minimum diameter (Inspection chambers) may be permitted (see 6.3.11.4).

When considering the appropriate MH diameter, consideration shall be given by the designer to the base layout to ensure hydraulic efficiency and adequate working space in the chamber. Where the effective working space is reduced by internal drop pipes, a larger diameter may be required. Where there are several inlets, consultation with Council on the layout of the chamber is recommended.

The base layout of MHs shall comply with SDC Standard Details D12 - D21.

6.3.11.4 Shallow Manholes (or inspection chambers)

For shallow systems (less than 1.2 m to invert) a DN 375/400 or 600 mm minimum diameter MH may be permitted subject to approval by Council. Such small diameter MHs shall be classified as maintenance shafts (MSs) for the purposes of the spacing covered under this Standard. See SDC Standard Details D02.

6.3.11.5 Manhole Connections

Open cascade is permitted into MHs over 2.0 m in depth and for pipes up to and including 300 mm diameter providing the steps are clear of any cascade. Other situations may be considered and require Council approval.

The bases of all MHs shall be benched and haunched to a smooth finish to accommodate the inlet and outlet pipe. No rendering/plastering within the MH is permitted.

New inlet pipes shall be cut back to the inside face of the MH and provided with a smooth finish. All chambers are to be made watertight with epoxy around all openings.

Minor pipelines connecting to a MH at or below design water level in the MH shall do so at an angle of not greater than 90^{o} to the main pipeline direction of inflow.

Minor pipelines connecting at above design water level may do so at any angle.

6.3.11.6 Flotation

In areas where liquefaction during an earthquake is likely or the watertable is at a level that may adversely impact the infrastructure all Maintenance Structures shall be designed in accordance with *Underground Utilities – Seismic Assessment and Design Guidelines* and associated *Technical Note 15 – Manhole Flotation* (or applicable successor).

6.3.12 Connection To The Public System

Where the connection of individual lots and developments are to the public system they shall meet the following requirements:

(a) Connection shall be by gravity flow via laterals to public mains or waterways, or to a swale, or rainwater tanks. Where there is no other option connection can be made to a roadside kerb subject to approval of Council.

(b) All new urban lots shall be provided with individual service laterals, unless

on-site disposal is approved by Council.

(c) Each connection shall be capable of serving the whole of the lot. Where, for physical reasons, this is not practicable a partial service to the building area only may be acceptable (subject to approval of Council).

(d) The minimum internal diameter of connections shall be:

(i) 100 mm for residential lots;

(ii) 150 mm for commercial and industrial lots and connections serving two dwellings or residential lots;

(iii) the size of connections serving three or more dwellings or residential lots shall be based on calculations as per the design standards (unless otherwise approved by Council).

(e) The connection shall be of a type capable of taking the spigot end of an approved pipe.

(f) Where the stormwater pipeline is outside the lot to be served, a connection pipeline shall be extended to the boundary of the lot and be marked by a 50 mm x 50 mm timber stake extending to 600 mm above ground level and painted blue.

(g) Connection to stormwater systems such as vegetated swales, soakpits, or soakage basins is acceptable provided the system is approved by Council.

(h) All connections to pipelines or MHs shall be sealed by removable caps until such time as they are required.

(i) Connections shall be indicated accurately on as-built plans in accordance with the requirements set out in Section 3.

(j) The minimum depth of the connection at the property boundary shall be 1 m.

6.3.13 Connection Of Lateral Pipelines To Public Mains

All connections to 150 mm diameter mains shall be via 45° "Y" junctions. Mains greater than 150 mm diameter including 225 mm diameter shall be made using 45° "Y" junctions or saddles. For mains greater than 225 mm diameter, square (90°) saddles may be used. Cutting saddles into pipes shall be carried out via core drilling. Saddles shall be specifically manufactured for the pipe they are being attached to and appropriate allowances made for the pipe wall thickness. The saddle shall use epoxy, electro fusion, stainless steel bolts or straps to secure the saddle in place. Concrete encasement of the saddle to the exterior of the main pipe is required.]

A hole may be made in a 900 mm diameter and larger main to effect a connection. The connection shall be properly dressed and patch repaired (epoxy) from inside the main to ensure that no protrusions exist.

When the lateral being connected is larger than 300 mm in diameter it shall be connected at a MH.

6.4 Approval Of Proposed Infrastructure

The approval process for land development and subdivision design and construction and documents and supporting information on stormwater drainage infrastructure to be provided at each stage of the process shall be in accordance with the requirements of this CoP (primarily laid out in Section 2 and 2.2.20).

6.4.1 Information To Be Provided

(a) A plan showing the proposed location of existing and proposed stormwater infrastructure.

(b) Detailed long sections showing the levels and grades of proposed pipelines in terms of datum.

(c) Long sections shall include full details of pipe and manhole materials and sizes.

(d) Details and calculations prepared which demonstrate that agreed levels of service will be maintained.

(e) Details and calculations prepared which clearly indicate any impact on adjacent area or catchment that the proposed infrastructure may have.

(f) Appropriate operating manuals, pump information, and instructions for pump stations and pressure systems if proposed.]

6.5 Construction

6.5.1 Pipeline Construction

The construction of pipelines shall be carried out in accordance with the design and requirements of AS/NZS 2032 (PVC), AS/NZS 2033 (PE), AS/NZS 2566 Parts 1 and 2 (all buried flexible pipelines), or AS/NZS 3725 (concrete pipes).

6.5.2 Trenching

Guidance is provided in SDC Standard Details D09 and D10.

Where a pipeline is to be constructed through areas with unsuitable foundations such material shall be removed and replaced with other approved material or alternatively, other methods of construction shall be carried out to the approval of Council to provide an adequate foundation, and side support, for the pipeline.

6.5.3 Reinstatement

Areas where construction has taken place shall be reinstated to the condition required by Council and shall be no less than the original condition pre-works.

6.5.4 Inspection And Acceptance

Pipe systems of 1200 mm diameter or less shall be inspected using closed circuit television (CCTV) prior to acceptance by Council.

CCTV inspections and deliverables shall be in accordance with New Zealand pipe inspection manual and the requirements of Council.

Council may, at its discretion, also require a water test to be carried out. Such testing shall be carried out as specified in Section 2 of this CoP and shall not use a hydrant for water supply for the test.

6.6 Acceptable Pipe And Fitting Materials

(Informative)

Table 4.5 gives information on acceptable pipe and fitting materials. The information is sourced with permission from the Water Services Association of Australia. Refer also to WSA 02 (Sewerage Code of Australia) and WSA 03 (Water Supply Code of Australia) for further information.

NOTE - Refer also to WSA 02 (Sewerage Code of Australia) and WSA 03 (Water Supply Code of Australia)

Table 4-5 Acceptable pipe materials and Standards

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
PVC-U	AS/NZS 1260 (Class SN 4, 8, or 16 as required by TA)	□	-	□	-	Gravity applications only. Well established methods of repair. Suitable for aggressive groundwater, anaerobic conditions and tidal zones. Can be used for trenchless installation with suitable end load resistant joints.
PVC-O	AS/NZS 4441 (Series 1 or Series 2, as required by Council)	-	□	-	□	Improved fracture toughness compared with PVC-U. Improved fatigue resistance compared with PVC-U and PVC-M. NOTE - Use only DI fittings in pumped mains to achieve full fatigue resistance. Has increased hydraulic capacity compared with PVC-U and PVC-M. Suitable for aggressive groundwater, anaerobic conditions, and tidal zones. Specific design for dynamic stresses (fatigue) required for pressure sewer applications.
PVC-U	AS/NZS 1477 (pressure) (Series 1 or Series 2, as required by Council)	-	□	-	□	Well established methods of repair. Alternative installation techniques possible, for example slip lining. Suitable for aggressive groundwater, anaerobic conditions, and tidal zones. Can be used for trenchless installation with suitable end load resistant joints. Specific design for dynamic stresses (fatigue) required for pressure sewer applications.
PVC-M	AS/NZS 4765 (Series 1 or Series 2, as required by Council)	-	□	-	□	Improved fracture toughness compared with PVC-U. Has increased hydraulic capacity compared with PVC-U. Inferior fatigue resistance compared with PVC-U and PVC-O. Suitable for aggressive groundwater, anaerobic conditions and tidal zones. Specific design for dynamic stresses (fatigue) required for pressure sewer applications.
PE (PE 80B or PE 100 as required by Council)	AS/NZS 4130	-	□	-	□	Generally for pressure applications. Can be easily curved to eliminate the need for bends. Alternative installation techniques possible, for example pipe cracking, direction drilling, and slip lining. Can be welded to form an end load resistant system. Compression couplings and end load resistant fittings are available in smaller diameters. Pipe longitudinal flexibility accommodates large differential ground settlement. Fusion jointing requires skilled installers and special equipment. Retrospective installation of fittings/repair complicated. Specific design for dynamic stresses (fatigue) required for pressure sewer applications. ≤ DN 125 available in long coiled lengths for fewer joints. Suitable for aggressive groundwater, anaerobic conditions or tidal zones. Suitable for ground with high subsidence potential, for example fill or mining areas.
PE (Stiffness Class SN 4, 8,	AS/NZS 5065	□	-	□	-	Only for gravity applications. Can be easily curved. Alternative installation techniques possible, for example pipe cracking and slip lining.

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
10, or 16 as required by Council)						Can be welded to form an end load resistant system. Fusion jointing requires skilled installers and special equipment. Retrospective installation of fittings/repair complicated. Smaller diameters available in long coiled lengths for fewer joints. Suitable for aggressive groundwater, anaerobic conditions, or tidal zones.
GRP	AS 3571.1	□	□	□	-	Alternative installation techniques possible, for example slip lining. UV resistant (special product). Custom made fittings can be manufactured. Suitable for use without additional corrosion protection in areas where stray electrical currents occur. Low impact resistance and ease of damage to thermosetting resin, makes GRP susceptible to damage during transportation, and installation, in above ground installations, from vandalism, or when damaged as a consequence of nearby excavation. Suitable for aggressive groundwater, anaerobic conditions or tidal zones.
GRP	AS 3571.2	-	-	-	□	Alternative installation techniques possible, for example slip lining. UV resistant (special product). Custom made fittings can be manufactured. Suitable for use without additional corrosion protection in areas where stray electrical currents occur. Low impact resistance and ease of damage to thermosetting resin, makes GRP susceptible to damage during transportation, and installation, in above ground installations, from vandalism, or when damaged as a consequence of nearby excavation. Suitable for aggressive groundwater, anaerobic conditions, or tidal zones.
VC	BS EN 295	□	-	☑	-	Gravity applications only. Has benefits for particularly aggressive industrial wastes. Not recommended for active seismic (earthquake) zones, or unstable ground.
RRRC/RCRRJ (rubber ring joint reinforced concrete)	AS/NZS 4058	□	-	□	-	Requires protection from hydrogen sulphide attack in sewer applications, by plastic lining or selection of appropriate cement additives.
CLS (SCL) (concrete lined welded steel)	NZS 4442 AS 1579	-	□	-	□	Cement mortar lined, PE coating below ground or heavy duty coating above ground High mechanical strength and toughness. Available in long lengths. RRJ and welded joints available. Custom made, specially configured steel fittings can be made to order. Can be welded to form a system that will resist end load and joint permeation. UV resistant/vandal proof/impact resistant (where PE coated). Cathodic protection (CP) can be applied to electrically continuous pipelines to

Pipe materials	Standard applicable	Stormwater (Gravity)	Wastewater (Pressure sewer/ rising main)	Wastewater (Gravity)	Water supply (Pressure)	Notes
						provide enhanced corrosion protection. PE lined and coated - RRJ As above for CLS (SCL). Suitable for conveying soft water. Corrosion resistant under all conditions. General notes Standard Portland cement mortar not resistant to H^2S attack, at any high points or discharge points in the main. High alumina cement has improved resistance. Welded joints require skilled installers and special equipment. Welded joints require reinstatement of protection systems on site. Special design required for welded installations parallel, and adjacent to high voltage (> 66 kV) transmission lines. Cathodic protection requires regular monitoring and maintenance. Seal coating may be required over cement mortar linings, when conveying soft water, or in low flow extremities of reticulation mains, to prevent potentially high PH. Suitable for high load applications such as railway crossings and major roads. Large diameters are available. Suitable for aerial or suspended pipeline applications.
DI (ductile iron pipe)	AS/NZS 2280 AS 3681	-	□	-	□	Fatigue analysis not normally required (pressure sewer applications). High mechanical strength and toughness. Ease of jointing. UV resistant/vandal proof/impact resistant. Well established methods of repair. Suitable for high pressure and above ground pipelines. Restrained joint systems available. Sufficient ring stiffness to not rely on side support, for structural adequacy for the usual water supply installation depths. Elevated PH may occur when conveying soft water, or in low flow extremities of reticulation mains. PE sleeving is required, and must be carefully applied and repaired when damaged. Standard Portland cement mortar not resistant to H2S attack, at any high points or discharge points in the main. (Wastewater applications. High alumina cement has improved resistance.) Not suitable for aggressive groundwater, anaerobic conditions, or tidal zones.
ABS	AS/NZS 3518 AS/NZS 3690 AS/NZS 3879	-	□	-	□	Specific design for dynamic stresses (fatigue required for pressure sewer applications).

Section 7. Wastewater

7.1 Scope

This section sets out requirements for the design and construction of wastewater systems for land development and subdivision. Section 5 primarily addresses reticulated systems, but reference is also made to on-site wastewater systems where applicable.

If the scope of the development is sufficiently large to include its own pumping station, then reference should be made to the Water Services Association WSA 04-2005, Sewage Pumping Station Code of Australia – 2005.

7.2 General

7.2.1 Objectives

The objectives of the design are to ensure that the wastewater system is functional and complies with the requirements of Council's wastewater systems.
In principle the wastewater system shall provide:

(a) A single gravity connection for each property or where gravity is not feasible a pumped connection.
(b) A level of service to Council's customers in accordance with the authority's policies.
(c) Minimal adverse environmental and community impact.
(d) Compliance with environmental requirements.
(e) Compliance with statutory occupational, health and safety (OSH) requirements.
(f) Adequate hydraulic capacity to service the full catchment.
(g) Long service life with minimal maintenance and least life-cycle cost.
(h) Zero level of pipeline infiltration on commissioning of pipes.
(i) Low level of pipeline infiltration/exfiltration over the life of the system.
(j) Resistance to entry of tree roots.
(k) Resistance to internal and external corrosion and chemical degradation.
(l) Structural strength to resist applied loads.
(m) 'Whole of life' costs that are acceptable to Council.

7.2.2 Referenced Documents And Relevant Guidelines

Wastewater designs shall incorporate all the special requirements of Council and shall be in accordance with the most appropriate Standards, codes, and guidelines including those set out in Referenced Documents. Related Documents lists additional material that may be useful.

7.3 Design

7.3.1 Design Life

All wastewater systems shall be designed and constructed for an asset life of at least 100 years. Some components such as pumps, valves, and control equipment may require earlier renovation or replacement. Refer to WSA 02-2002 for the classification of life expectancy for various components in conventional gravity systems.

7.3.2 Structure Plan

Council may provide a structure plan setting out certain information to be used in design, such as flows, sizing, upstream controls, recommended pipe layout, or particular requirements of Council. Where a structure plan is not provided, the designer shall determine this information by investigation using this CoP and engineering principles.

7.3.3 Future Development

Where further subdivision, upstream of the one under consideration, is provided for in the district or regional plan, Council may require wastewater infrastructure to be constructed to the upper limits of the subdivision to provide for the needs of this development.

Additionally, Council may require additional capacity to be provided in the wastewater system to cater for existing or future development upstream. Peak flows (PF) and self cleansing velocities should be taken into account when designing for additional latent capacity.

All infrastructure proposed to service future development will require the approval of Council.

7.3.4 System Design

7.3.4.1 Catchment Design

Pipes within any project area shall be designed to be consistent with the optimum design for the entire catchment area and any future extension of the system shall be accommodated. This may affect the pipe location, diameter, depth, and maintenance structure location and layout. Designers shall adopt best practice to ensure a system with lowest life-cycle cost.

Pipes shall be designed with sufficient depth and capacity to cater for all existing and possible development of the catchment. Where future extension of the pipe is possible, it may be necessary to carry out preliminary designs for large areas of subdivided and un-subdivided land. This design shall use safety factors defined by Council for hypothetical subdivision and service for layouts to determine the necessary depth and diameter for an extension.

7.3.4.2 Extent Of Infrastructure

Where pipes are to be extended in the future, the ends of pipes shall extend past the far boundary of the development by a distance equivalent to the depth to invert and be capped off, unless otherwise agreed to by Council. This ensures that a future extension of the pipe does not require unnecessary excavation within lots or streetscapes already developed.

7.3.4.3 Topographical Considerations

In steep terrain the location of pipes is governed by topography. Gravity pipelines operating against natural fall create a need for deep installations which may require trenchless installation. The pipe layout shall conform to natural fall as far as possible.

7.3.4.4 Geotechnical Investigations

The designer shall take into account any geotechnical requirements determined under Section 2 of this CoP.

7.3.5 Design Criteria

7.3.5.1 Design Flow

The design flow comprises domestic wastewater, industrial wastewater, infiltration, and direct ingress of stormwater.

The design flow shall be calculated based on 0.7 litre/second/hectare (l/s/ha).] Alternatively, the following design parameters can also be used if approval is granted by Council. Justification for the variables proposed must be provided as part of the approval submissions:

(a) Residential flows:

(i) average dry weather flow of 180 to 250 litres per day per person;

(ii) dry weather diurnal peaking factor (PF) of 2.5;

(iii) dilution/infiltration PF of 2 for wet weather;

(iv) number of people per dwelling 2.5 to 3.5.

> *For small contributing catchments, PFs can be significantly higher but, due to the requirement for a minimum pipe size of DN 150, such flows will not govern the design.*

(b) Commercial and industrial flows

Where flows from a particular industry or commercial development are known they should be used as the basis of design. Where there is no specific flow information available and Council has no design guide, Table 5-1 is recommended as a design basis. These flows include both sanitary wastewater and trade wastes and include peaking factors.

Table 5-1 Commercial and industrial flows

Industry type (water usage)	Design flow (litre/second/hectare)
Light	0.4
Medium	0.7
Heavy	1.3

Any commercial property that discharges anything other than sanitary waste shall require a trade waste agreement before connecting to the network.

7.3.5.2 Hydraulic Design Of Gravity Pipelines

The hydraulic design of gravity wastewater pipes should be based on either the Colebrook-White formula or the Manning formula. The coefficients to be applied to the various materials are shown in Table 5-2. Gravity pipes should be designed to be between 25% and 75% full for the peak flow.

Table 5-2 Guide To Roughness Coefficients for Gravity Pipelines

Material	Colebrook-White coefficient **k** (mm)	Manning roughness coefficient (n)
VC	1.0	0.012
PVC	0.6	0.011
PE	0.6	0.009 - 0.011
GRP	0.6	0.011
Concrete machine made to AS/NZS 4058	1.5	0.012
PE or epoxy lining	0.6	0.011
PP	0.6	0.009 - 0.011

Material	Colebrook-White coefficient **k** (mm)	Manning roughness coefficient (n)
NOTE - (1) These values take into account possible effects of rubber ring joints, slime, and debris. (2) The n and k values apply for pipes up to DN 300. (3) For further guidance refer to WSA 02:1999 Table 2.4, Metrication: *Hydraulic data and formulae* (Lamont), or the *Handbook of PVC pipe* (Uni-Bell).		

7.3.5.3 Minimum Pipe Sizes

Irrespective of other requirements, the minimum sizes of property connection and reticulation pipes shall be not less than those shown in Table 5-3

For infill situations, particularly where upgrading of existing DN 100 connections in sound condition and at reasonable grades would be impractical, it is common practice for up to six dwelling units to use the existing connection. However, such connections would not normally be taken over as public pipes by Council.

Table 5-3 Minimum Pipe Sizes For Wastewater Reticulation And Property Connections

Pipe	Minimum size **DN** (mm)
Connection servicing 1 dwelling unit	100
Connection servicing more than 1 dwelling unit up to 10 units	100
Connection servicing commercial and industrial	150
Reticulation servicing residential lots	150
NOTE - In practical terms, in a catchment not exceeding 250 dwelling units, and where no pumping station is involved, DN 150 pipes laid within the limits of Table 7.4 and Table 7.5 will be adequate without specific hydraulic design.	

7.3.5.4 Limitation On Pipe Size Reduction

In no circumstances shall the pipe size be reduced on any downstream section.

7.3.5.5 Minimum Grades For Self-Care

Self-cleaning of grit and debris shall be achieved by providing grades that allow a minimum design velocity of 0.6m/s at peak dry weather flow.

Table 5-4 Minimum Grades For Wastewater Mains

Pipe size DN	**Absolute minimum grade** (%)
150	0.55
200	0.33

300	0.25

Table 5-5 Minimum Grades For Property Connections And Permanent Ends

Situation	Minimum grade (%)
DN 100 property connections	1.65
DN 150 property connections	1.20
Permanent upstream ends of DN 150, 200, and 300 pipes in residential areas with population ≤20 persons	1.00

7.3.5.6 Maximum Velocity

The preferred maximum velocity for peak wet weather flow is 3.0 m/s. Where a steep grade that will cause a velocity greater than 3.0 m/s is unavoidable refer to WSA 02 for precautions and design procedures.

7.3.5.7 Gravity Wastewater Applications

See Section B for appropriate gravity pipe standards for wastewater.

The pipe shall be designed to:

(a) Have adequate capacity and grade.
(b) Have adequate grade and hence velocity for self-cleaning.
(c) Be deep enough to provide gravity service to all lots.
(d) Comply with minimum depth requirements to ensure mechanical protection and safety from excavation.
(e) Avoid all underground services, while maintaining all the necessary clearances.
(f) Allow for various drops and losses through MHs.

7.3.5.8 Pressure And Vacuum Wastewater Applications

The introduction of pressure or vacuum systems into a network requires approval from Council. See also 7.3.12 Design of pressure and vacuum wastewater applications shall consider the following:

(a) Selection of pipe material and PN class shall take account of design for dynamic operation stresses (fatigue), and water temperature. Refer to Plastics Industry Pipe Association of Australia Ltd (PIPA) guidelines for PVC and PE pipes (http://www.pipa.com.au), or WSA-07.
(b) Sump and pump design.
(c) Maintenance requirements.
(d) Access for servicing and maintenance.

7.3.6 Structural Design

7.3.6.1 General

The structural design of piped systems shall be in accordance with AS/NZS 2566.1, or AS/NZS 3725, including the structural design commentary AS/NZS 2566.1 Supplement 1. Details of the final design requirements shall be shown on the drawings.

7.3.6.2 Seismic Design

All pipes and structures shall be designed with adequate flexibility and special provisions to minimise risk of damage during earthquake. Historical experience in New Zealand earthquake events suggests that suitable pipe options, in seismically active areas, may include rubber ring joint PVC or PE pipes. Rocker pipes with flexible joints shall be provided at all junctions between pipes and manholes and other rigid structures.

7.3.6.3 Structural Consideration

Pipelines shall be designed to withstand all the forces and load combinations to which they may be exposed including internal forces, external forces, temperature effects, settlement, and combined stresses.

7.3.6.4 Internal Forces

Pipelines shall be designed for the range of expected pressures, including transient conditions (surge and fatigue) and maximum static head conditions. For rising mains, surge analysis should be undertaken to assess transient conditions resulting from different pump stop and valve closure scenarios to assess the amplitude and frequency of positive and negative pressures. Rising mains should be designed to accommodate the transient pressure envelope.

7.3.6.5 External Forces

The external forces to be taken into account shall include:

(a) Trench fill loadings (vertical and horizontal forces due to earth loadings).
(b) Surcharge.
(c) Groundwater.
(d) Dead weight of the pipe and the contained water.
(e) Other forces arising during installation.
(f) Traffic loads.
(g) Temperature (expansion/contraction).

The consequences of external forces on local supports of pipelines shall also be considered.

7.3.6.6 Geotechnical Investigations

The designer should take into account any geotechnical requirements determined under Section 4 of this CoP. Where required, standard special foundation conditions shall be referenced on the drawings.

7.3.6.7 Pipe Selection For Special Conditions

Pipeline materials and jointing systems shall be selected and specified to ensure:

(a) Structural adequacy for the ground conditions and water temperature.
(b) Water quality considering the lining material.
(c) Compatibility with aggressive or contaminated ground.
(d) Suitability for the geotechnical conditions.
(e) Compliance with Council's requirements.

7.3.6.8 Trenchless Technology

Trenchless technology may be preferable or required by Council as appropriate for alignments passing through or under:

(a) Environmentally sensitive areas.
(b) Built-up or congested areas to minimise disruption and reinstatement.
(c) Railway and major road crossings.

(d) Significant vegetation.
(e) Vehicle crossings.

Wastewater pipes used for trenchless installation shall have suitable mechanically restrained joints, specifically designed for trenchless application, which may include integral restraint, seal systems, or heat fusion welded joints.

Trenchless installation methods may include:

For new pipes:

(f) Horizontal directional drilling (HDD) (PVC with restraint joint/fusion welded PE).
(g) Uncased auger boring/pilot bore microtunnelling/guided boring (PVC with restraint joint/fusion welded PE).
(h) Pipe jacking (GRP/vitrified clay (VC)/ reinforced concrete).

For pipe rehabilitation/renovation:

(i) Slip lining/grouting (PVC with restraint joint/fusion welded PE).
(j) Closefit slip lining (PVC with restraint joint/fusion welded PE).
(k) Static pipe bursting (PVC with restraint joint/fusion welded PE).
(l) Reaming/pipe eating/inline removal (PVC with restraint joint/fusion welded PE).
(m) Soil displacement/impact moling (fusion welded PE).
(n) Cured in place pipe (thermoset resin with fabric tube).

Any trenchless technology and installation methodology shall be chosen to be compatible with achieving the required gravity pipe gradient - refer to manufacturer's and installer's recommendations.

The following details including location of access pits and exit points shall be submitted to Council for approval:

(o) Clearances from services and obstructions.
(p) The depth at which the pipeline is to be laid to ensure minimum cover is maintained.
(q) The pipe support and ground compaction.
(r) How pipes will be protected from damage during construction.
(s) Any assessed risk to abutting surface and underground structures.

> *Further information on trenchless technologies may be found in 'Trenchless technology for installation of cables and pipelines' (Stein), 'Trenchless technology - Pipeline and utility design, construction, and renewal' (Najafi), and 'Guidelines for horizontal directional drilling, pipe bursting, microtunnelling and pipe jacking' (Australasian Society for Trenchless Technology).*

7.3.6.9 Marking Tape Or Pipe Detection Tape

Appropriate marking tape or detection tape shall be installed at the top of the embedment zone, or tied to the pipe during HDD, to aid future location of the pipe. Refer to Figure 5.1 of AS/NZS 2032.

7.3.7 System Layout

7.3.7.1 Pipe Location

The preferred layout/location of pipes within roads, public reserves, and private property may vary and shall be to the requirements of Standard Diagram R2.
Pipes should be positioned as follows:

(a) Within the street according to the locally applicable utilities allocation code. In the absence of a code, a location clear of carriageways is preferred.

(b) Within public land with the permission of the controlling authority.
(c) Within reserves but outside the 1 in 100 year flood area.
(d) Within private property parallel to front, rear, or side boundaries.

7.3.7.2 Materials

Section 4.7 sets out various acceptable pipe and fittings materials for wastewater system uses.

7.3.7.3 Pipes In Reserves And Public Open Space

Pipes in reserves and public open space shall be located in accordance with Council's requirements. Consideration for access to maintain, away from trees and other potential intrusions, and outside any areas defined for stormwater storage/flows should be made.

Crossings of roads, railway lines, waterways, and underground services shall, as far as practicable, be at right angles.

7.3.7.4 Pipes in Private Property

Where pipes are designed to traverse any vacant or occupied public or private properties, the design shall as far as practicable allow for possible future building plans, preclude maintenance structures and specify physical protection of the pipe within or adjacent to the normal building areas and all engineering features (existing or likely) on the site, such as retaining walls.

The design shall allow access for all equipment required for construction and future maintenance. Except where obstructions or topography dictate otherwise, pipes shall run parallel to boundaries at minimum offsets of 1.0 m.

Where pipes are designed to traverse properties containing existing structures such as retaining walls, buildings, and swimming pools, the current and future stability of the structure shall be considered. Pipes adjacent to existing buildings and structures shall be located clear of the 'zone of influence' of the foundations.

If this is not possible, protection of the pipe and associated structures shall be specified for evaluation and approval by Council.

Where pipes to be vested to Council are designed to traverse private properties, they should be protected by legal easements when required by Council.

7.3.7.5 Minimum Cover

Minimum cover shall be determined by the property connections which require a minimum depth at the property boundary of at least 1 m. Where there are no property connections to govern the cover over the main the minimum cover shall be 600 mm in private property and 900 mm in the road reserve.

7.3.7.6 Horizontal Curves

Horizontal curves shall only be used where authorised by Council.

The term 'curved pipes' is used to describe either cold bending of flexible pipe during installation or small deflections at joints for rubber ring jointed flexible and rigid pipes. The radius of curvature and pipe deflection shall meet manufacturer's specifications. Curved alignments are used in curved streets to conform with other services and to negotiate obstructions, particularly in easements. The use of curves in locations other than curved street alignments shall be justified by significant savings in life-cycle cost. The straight line pipe is usually preferred as it is easier and cheaper to set out, construct, locate, and maintain in the future.

7.3.7.7 Vertical Curves

Vertical curves may be specified where circumstances provide a significant saving or where maintenance structures would be unsuitable or inconvenient. The curvature limitations for vertical curves are the same as those for horizontal curves in 5.3.7.6

7.3.7.8 Underground Services

The location of underground services affecting the proposed pipe alignment shall be determined. Where pipes will cross other services, the depth of those services shall be investigated, and exposed where necessary. Services upstream of the project area may affect the design. A future extension of the pipe that will cross existing and proposed upstream services may determine the level for the current project infrastructure.

7.3.7.9 Clearance From Underground Services

Where a pipe is designed to be located in a road which contains other services, the clearance between the pipe and the other services shall comply with SNZ HB 2002, unless Council has its own specific requirements.

For normal trenching and trenchless technology installation, clearance from other service utility assets shall not be less than the minimum vertical and horizontal clearances shown in Table 5-6. Written agreement on reduced clearances and clearances for shared trenching shall be obtained from Council and the relevant service owner.

Table 5-6 Clearances between wastewater mains and laterals and other underground services

Utility (Existing service)	**Minimum horizontal clearance for new pipe size ≤DN 300** (mm)	**Minimum vertical clearance**(1) (mm)
Gas mains	300(2)	150
Telecommunication conduits and cables	300(2)	150
Electricity conduits and cables	500	225
Drains	300(2)	150
Water mains	1000(3)/600	500

NOTE -

(1) Vertical clearances apply when wastewater pipes and other underground services cross one another, except in the case of water mains when a vertical separation shall always be maintained, even when the wastewater pipe and water main are parallel. The wastewater pipe should always be located below the water main to minimise the possibility of backflow contamination in the event of a main break.

(2) Clearances can be further reduced to 150 mm for distances up to 2 m when passing installations such as poles, pits, and small structures, providing the structure is not destabilised in the process.

(3) When the wastewater pipe is at the minimum vertical clearance below the water main (500 mm) maintain a minimum horizontal clearance of 1000 mm. This minimum horizontal clearance can be progressively reduced to 600 mm as the vertical clearance increases to 750 mm.

7.3.7.10 Clearance From Structures

Pipes adjacent to existing buildings and structures shall be located clear of the 'zone of influence' of the building foundations. If this is not possible, a specific design shall be undertaken to cover the following:

(a) Protection of the pipeline.
(b) Long term maintenance access for the pipeline.
(c) Protection of the existing structure or building.

The protection shall be specified by the designer for evaluation and acceptance by Council.

7.3.7.11 Bulkheads For Pipes On Steep Grades

For bulkheads, or anti-scour blocks, see Section 4.3.10.10 and NZS 4404:2010 drawing CM – 003.

7.3.8 Maintenance Structures

7.3.8.1 General

This describes the requirements for structures which permit access to the wastewater system for maintenance.

Maintenance structures include:

(a) Manholes (MH's).
(b) Maintenance shafts (MS's).
(c) Cleaning eyes (CE's)

7.3.8.2 Location Of Maintenance Structures

The selection of a suitable location for maintenance structures may influence the pipe alignment. Generally, a minimum clearance of 1.0 m should be provided around maintenance structures clear of the opening to facilitate maintenance and rescue. Council may determine other specific requirements subject to the individual site characteristics.

The design shall include maintenance structures at the following locations:

(a) Intersection of pipes except for junctions between mains and property connections.
(b) Changes of pipe size.
(c) Changes of pipe direction, except where horizontal curves are used.
(d) Changes of pipe grade, except where vertical curves are used.
(e) Combined changes of pipe direction and grade, except where compound curves are used.
(f) Changes of pipe invert level.
(g) Changes of pipe material, except for repair/maintenance locations.
(h) Permanent or temporary ends of a pipe.
(i) Discharge of a pressure main into a gravity pipe.

Table 5-7 Acceptable MH, MS, and TMS options for wastewater reticulation

Application	**Acceptable options**(1)		
	MH	MS	Cleaning Eye
Intersection of pipes(2)	YES	NO	NO

Application	Acceptable options(1)		
	MH	MS	Cleaning Eye
Change of pipe grade at same level	YES	YES for DN 150 pipe only and using vertical bend	NO
Change of grade at different level	YES MH with internal/external drops	NO	NO
Change in pipe size	YES MH is the only option	NO	NO
Change in horizontal direction	YES within permissible deflection at MH	YES MS prefabricated units or MS used with horizontal bends of max 33° deflection	NO
Change of pipe material	YES	NO	NO
Permanent end of a pipe(3)	YES	NO	YES
Pressure main discharge point	YES MH is the only option and shall include a vent	NO	NO

NOTE -

(1) Where person entry is required down to the level of the pipe, a MH is the only option.

(2) This table refers to reticulation mains. DN 100 connections can be made to any maintenance structure or, using a proprietary junction, at any point along the main.

(3) Some TAs permit the use of London Junction or Rodding Eye at the end of the pipe, but it is recommended that cleaning eyes are used.

7.3.8.3 Maintenance Structure Spacing

For reticulation pipes, the maximum distance between any two consecutive maintenance structures shall be 120 m.

Where a combination of MHs and MSs is used along the same pipe, the maximum spacing between any two consecutive MHs shall not exceed 400 m irrespective of how many MSs are used between the two MHs (see Figure 5-1).

7.3.8.4 Manholes

7.3.8.4.1 Manhole Materials

MH's may be manufactured in concrete, or from suitable plastics materials, including GRP, polyethylene, PVC or polypropylene, or from concrete/plastic lined composites.

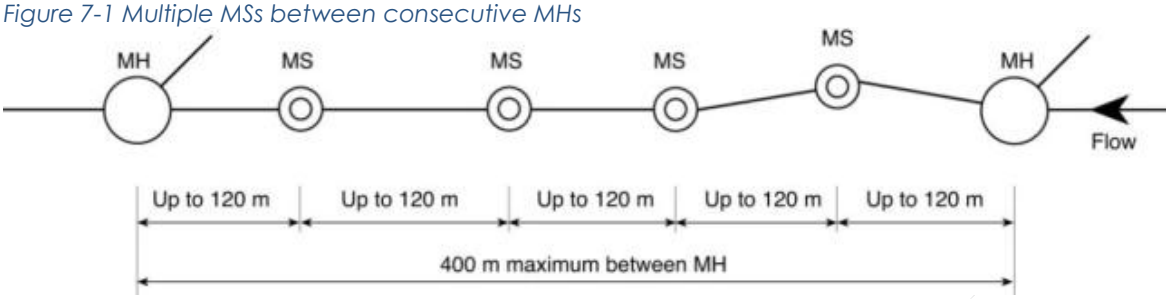
MH materials selected shall be suitable for the level of aggressiveness of the wastewater and surrounding groundwater.

There is to be no rendering/plastering to be done on the inside of manholes. Acceptable alternatives include concrete with a smooth finish, granolithic mortar or using epoxy products.

7.3.8.4.2 Preferred Layout

Each MH base shall be formed as shown in SDC Standard Details D12-D21:

Figure 7-1 Multiple MSs between consecutive MHs



7.3.8.4.3 Allowable Deflection Through MHs

A maximum allowable deflection through a MH shall be no more than 90 degrees.

7.3.8.4.4 Internal Falls Through MHs

Where the outlet diameter at a MH is greater than the inlet diameter, the minimum fall through the MH shall be not less than the difference in diameter of the two pipes, in which case the pipes shall be aligned soffit to soffit.

On pipes where the internal fall across the base of the MH is not achievable due to a large difference between the levels of incoming and outgoing pipes (see SDC Standard Detail - D13), then internal or external drops shall be provided.

7.3.8.4.5 Effect Of Steep Grades On MHs

Where a pipe of grade >7% drains to a MH, the following precautions shall be taken if the topography and the connection pipes allow for:

(a) No change of grade is permitted at inlet to a MH.
(b) Steep grades are to be continuous through the MH at the same grade.
(c) Depth of MH is to exceed 1.5 m to invert for DN 150, DN 200, and DN 225 pipes.
(d) Depth of MH is to exceed 2.0 m deep for DN 300 pipes.
(e) Change of direction at the MH is not to exceed 45°.
(f) No drop junctions or verticals are to be incorporated in the MH.
(g) Inside radius of channel inside the MH is to be greater than 6 times the pipe diameter.
(h) Benching is to be taken 150 mm above the top of the inlet pipe.

To avoid excessively deep channels within MHs, steep grades (>7%) shall be 'graded-out' at the design phase where practicable. Grading the channel of the MH shall be limited to falls through MHs of up to 0.15 m. Where the depth of the channel within the MH would be greater than 2 x pipe diameter, then an internal or external drop structure shall be provided.

> ***C5.3.8.4.5***
> *For further guidance on handling steep grades, refer to WSA 02.*

7.3.8.4.6 Flotation

In areas where liquefaction during an earthquake is likely or the watertable is at a level that may adversely impact the infrastructure all Maintenance Structures shall be designed in accordance with *Underground Utilities – Seismic Assessment and Design Guidelines* and associated *Technical Note 15 – Manhole Flotation* (or applicable successor).

7.3.8.4.7 Covers

Watertight MH covers with a minimum clear opening of 600 mm in diameter, complying with AS 3996, shall be used, unless Council has an alternative standard. AS 3996 gives direction for the class of cover for particular locations and applications (See SDC Standard Detail - D11.)

7.3.8.4.8 Bolt-Down Covers

Where required by Council, bolt-down metal access covers (watertight type) shall be specified on MHs:

(a) In systems where the possibility of surcharge exists.

(b) Along creeks subject to flooding above the level of the cover, in tidal areas, or in any location where surface waters could inundate the top of a MH.

Sealed entry holes with restricted access should be used in geothermal conditions and for deep manholes.

MHs should, where practicable, be located on ground that is at least 300 mm above the 1 in 100-year flood level. Where this is not practicable, bolt-down access covers may be specified by Council. It will also be necessary to specify the tying together of MH components where bolt-down covers are specified and precast components are used.

7.3.8.5 Maintenance Shafts

Where maintenance shafts (MSs) have been approved by Council, and where it is expected that human access below ground will not be required, MSs can be used on DN 150, DN 200, and DN 225 pipes as an alternative to MHs, providing 5.3.8.8.1 and
5.3.8.8.2 are satisfied. See SDC Standard Detail - D22.

Typical MS configurations are:

(a) Straight through MSs.

(b) Angled MSs - see 5.3.8.8.1a).

MSs can also be used in conjunction with an inspection chamber.

7.3.8.5.1 Limiting Conditions

The following conditions apply to the use of MSs:

(a) MSs shall only be used on DN 150, DN 200, and DN 225 pipes.

(b) MSs shall not be used instead of MHs at junctions.

(c) Depth of MSs shall:

  (i) be within the allowable depth limit for the particular pipeline system;

  (ii) not exceed the MS manufacturer's stated allowable depth limit;

  (iii) be within the depth limit imposed by Council.

(d) MSs shall be restricted to pipeline gradients and depths where the deviation from vertical of the MS riser shaft (that is, projected centre line of base to centre line at surface) is a maximum of 0.3 m measured at the surface.

(e) MSs shall not be used at discharge points of pumping mains.

7.3.8.5.2 Design parameters

MSs shall only be used at the design locations detailed in Figure 7-1. The following requirements shall apply:

(a) Directional and gradient changes at MSs shall be achieved by using either:
  (i) close-coupled horizontal or vertical manufactured bends immediately adjacent to the MS
  (ii) MS units specially manufactured with internal horizontal or vertical angles to suit design requirements (maximum horizontal deviation of 90°).

(b) MSs at changes of grade shall be located on the pipe with the lesser of the two gradients to minimise the deviation from the vertical of the riser shaft.

(c) Straight through type and angled MSs can incorporate up to two higher level property connections discharging directly into the riser shaft.

For construction details see SDC Standard Detail - D22.

7.3.8.6 Cleaning eyes

Where terminal maintenance shafts (TMSs) and/or cleaning eyes have been authorised by Council and where it is expected that human access below ground will not be required, TMSs/CEs may be used on DN 150, DN 200, and DN 225 pipes as an alternative to MHs, providing the conditions detailed in this Standard are satisfied.
For construction details see SDC Standard Detail D7.

7.3.8.6.1 Design Parameters

A TMS may only be used as a terminating structure under the following conditions:

(a) At the permanent end of a wastewater pipe.

(b) On DN 150, DN 200, and DN 225 pipes.

(c) After the last MH (with no intermediate MS) provided it is spaced no further than 120 m from that MH, as shown in Figure 5.1.

(e) Subject to the limiting conditions detailed in 5.3.8

7.3.8.6.2 Property Connections Into A Permanent End

TMSs may incorporate a maximum of two higher level property connection branches discharging directly into the riser shaft. Where a property connection is required directly ahead of the permanent end of the pipe (for example, a connection at the end of a no-exit road), a MS may be used instead of a TMS to accommodate the straight through connection. In such a case, a DN 100 connection will require a reducer immediately adjacent to the MS.

7.3.8.6.3 Dead Ends

Pipes need not terminate at a MH or MS, if the pipe is to be extended in the future.

7.3.9 Venting

In urban developments, pipes will normally be adequately ventilated within private property. However, there are some situations where vent shafts will be required such as:

(a) At pumping stations.

(b) At MHs where pumping stations discharge to a gravity pipe.

In such situations vent shafts shall be installed as per the requirements of WSA 02 and WSA 04.

7.3.10 Connections

Connections link private systems to the public system or other approved outlet point. Private systems extend through to the public system, except where Council accepts responsibility for that part of the pipe outside private property.

7.3.10.1 General Considerations

The property connection should be designed to suit the existing situation and any future development. Each connection shall be capable of serving the entire building area of the property (unless specific approval is obtained from Council).

7.3.10.2 Requirements Of Design

The design shall specify the requirements for the property connections including:

(a) Plan location and lot contours.

(b) Invert level at property boundary or junction with the main as applicable.

7.3.10.3 Number Of Connections

It is normal practice to provide one connection per lot. Provision of additional connections shall be subject to justification by the developer and approval by Council.

For multiple occupancies (unit title, cross lease, or company lease), service of the whole property is normally achieved by providing a single point of connection to a TA system. Connection of the individual units is by joint service pipes owned and maintained by the body corporate, tenants in common or the company as the case may require. In this instance the whole of the multiple occupancy shall be regarded as a single lot.

Alternatively, if authorised by Council, developers have the option of providing wastewater facilities to the individual titles or tenements in new developments by:

(a) Constructing individual connections which shall be owned and maintained by the body corporate, tenants in common or the company.

(b) Extending the public line into the lot and providing a separate connection to each unit.

7.3.10.4 Location of connection

The connection shall be located to service the lowest practical point on the property and where possible:

(a) Be clear of obstructions, such as trees, tree roots, paved areas.

(b) Be easily accessible for future maintenance.

(c) Be clear of any known future developments, such as swimming pools or driveways.

(d) Avoid unnecessarily deep excavation >1.5 m where practicable.

(e) Be within or on the property boundary.

7.3.10.5 Connection Depth

Connection depths shall be set to drain the whole serviced area recognising the following factors:

(a) Surface level at plumbing fixtures of buildings (existing or proposed).

(b) Depth to invert of pipe at plumbing fixture or intermediate points.

(c) Minimum depth of cover over connection for mechanical protection.

(d) Invert of public main at junction point.

(e) Allowance for crossing other services (for clearances see Table 5-6).

(f) Provision for basements.

(g) Allowance for head loss in traps and fittings.

(h) Minimum depth of the connection at the property boundary shall be at least 1 m.

The designed invert level at the end of the connection shall be not higher than the lowest calculated level consistent with these factors.

7.3.11 Pumping Stations

Pump stations to service new subdivision areas will be permitted only where there is prior agreement with Council on need, positioning and requirements. It is noted that with all mechanical and electrical equipment designs and requirements are changing all the time and hence the need to refer to council prior to design and construction to ensure up to date requirements are agreed and covered. The following is hence an indication of requirements only.

Pump stations shall meet the following performance standards:

- the pump well shall be underground and have lockable aluminium or stainless steel lids complete with the supply of standard Council padlocks for all opening lids.
- Valve chambers shall be below ground level, attached but separate to the pump well. provision shall be made to bypass the pumps in case of breakdown. Non-return valves shall be ball-valves full-bore opening. Valve chambers shall have lockable aluminium or stainless steel lids complete with the supply of standard Council padlocks.
- residential pump stations shall be designed for a peak flow rate of 1 m^3 per person per day of the fully developed catchment. Pump stations with non-residential catchments will be subject to specific design and must be approved by the Engineer.
- the capacity of the wet-well between start and stop levels shall be such as to limit pump starts to no more than 10 per hour.
- pump stations shall have emergency storage in case of mechanical or electrical failure or blockage of the pumps or rising main. The storage must be located at such a level as to prevent overflow from any manholes, gully traps, pump station lids or any other outlet from the system. Emergency storage capacity equal of eight hours at the design average, dry weather, daily 220 litres per person per day flow is to be provided.
- all pump stations shall have an approved and controlled overflow system which discharges in such a manner to ensure maximum storage is used prior to discharge.
- a rigid ventilation pipe shall be provided with breather cap at least 3 m above ground level.
- a 25 mm diameter water supply shall be provided to the immediate vicinity of the station. The supply shall be fitted with an above-ground backflow preventer in accordance with the requirements of the Water Supply Protection Regulations and the Engineer.
- if required (for larger pump stations servicing more than 15 properties) a Mag Flow meter complete with all electrical and data cables shall be fitted to the main outlet of the pump station.
- the actual site of the pumping station shall be on a separate lot with an accessway (if required) to a formed road. Resource consent may be required for the installation, and where necessary must be obtained by the developer prior to the commencement of engineering works. The site shall be developed to prevent entry of surface runoff into the station.
- permanently surfaced vehicle access and manoeuvring areas shall be provided to the station.
- the area around the pumping station shall be fenced if required to the Engineer's satisfaction, and such that Council shall not become a party to fencing costs.
- the power supply to the station shall be underground.
- the main switchboard shall be mounted on a concrete plinth which extends at least 1,200 mm from the front of the switchboard and 300 mm on the other three sides.

A design drawing of a typical pumping station is available at Council's Invercargill office. The proposed pump station and it's components shall be approved by Council prior to construction. Pumps shall include the following as a minimum:

- there shall be a minimum of two pumps in all pump stations.
- pumps shall be of a make approved by the Engineer, three phase submersible type designed for each to take the full flow and be capable of passing a 75 mm diameter solid.
- pumps shall be controlled so that while one pump is acting as duty pump, the other is on automatic stand-by.
- each pump shall have power factor correction to 0.95 or better.
- each pump shall have a multi-pin plug for cable connection/disconnection.

- if available each pump shall also have oil seal monitoring and thermistor or micro-therm protection (oil seal monitors supplied by pump supplier).
- Pump control shall include:
- multi-trode level stick with 3 x floatless relay switches (Omron or similar approved). Alternatively an ultrasonic level transducer with pump controller unit or a pressure transducer with pump controller unit can be used (prior approval from SDC Engineer required). Multi-trode to have "Start", "Stand-by", and "High" switches. That is duty pump starts at "Start" and stand-by pump starts at "Stand-by". Both run together until stop level. "High" switch triggers alarm.
- 2 x back-up float switches for "High-high" (overflow) (to be back-up supplied from back-up 12V DC battery) and "Low" levels. Floats to be hard wired to start both pumps if "High-high" tripped and both stop at stop level or when "Low" float tripped.
- the electrical control cabinet shall be above ground level, constructed from a powder-coated stainless steel, weather proof, lockable enclosure (to IP 56 rating). The internal main switchboard metalwork arranged into cubicles (layout to be approved by SDC Engineer).

The enclosure shall be large enough to house the following items:

- the internal main switchboard metalwork, including supply authority metering.
- 1 x selector switch for Mains/Off/Generator.
- 1x load break main switch isolator appropriately sized, minimum 63A and HRC or circuit breaker type distribution board.
- 1 No. direct on line motor starter per pump (may need to be reduced voltage starter based on the supply authorities requirements) complete with overload protection, ammeter, hours run, run and fault light indication and auto/off/manual selector switches.
- phase failure protection for each pump motor.
- high and low well level indication lights.
- each pump shall have a multi pin plug and socket for cable connection/ disconnection.
- 1 x 10A single phase RCD protected switch socket.
- 1 x 72 mm voltmeter c/w phase selector switch.
- 1 x portable generator appliance 3 phase plus neutral inlet and plug. Door to be lockable whilst under emergency power.
- 1 x light complete with switch.
- 1 x anti condensation heater and thermostat.
- all electrical work will be carried out by a suitably qualified electrical contractor.
- The control system shall be as agreed:
- Council's standard padlock and latch.]

7.3.12 Pressure Sewers And Vacuum Sewers

Pressure sewers shall be designed and installed in accordance with the standards of Council, with consideration in the design for cyclic dynamic stresses. Refer to Water New Zealand, Pressure Sewer National Guidelines on Ownership Models, Design Requirements, Technical Specifications and Operation & Maintenance, Feb 2020, reference can also be made to the PIPA design guidelines (http://www.pipa.com.au). If Council has no applicable standards, then they shall be designed in accordance with WSA 02 and WSA 07

Vacuum sewers shall be designed and installed in accordance with the standards of Council. If Council has no applicable standards, then they shall be designed in accordance with WSA 06.

7.3.13 On-Site Wastewater Treatment And Disposal

On-site wastewater treatment and disposal shall be designed and installed in accordance with the standards of Council. If Council has no applicable standards, then they shall be designed in accordance with AS/NZS 1546.1 and AS/NZS 1547.

7.4 Method of Disposal

On-site disposal of wastewater may be permitted where:

(a) No piped system is immediately available or will not be available within 10 years of the subdivision application.

(b) No piped system is available immediately adjacent or within a reasonable distance of the site. For clarification of what constitutes a "reasonable distance" refer to 7.8 of this CoP.

(c) The site is capable of disposing of treated effluent without harmful effects on the environment or to public health.

In all other cases wastewater is to be collected and disposed of to an existing Council system, via a localised pump station if necessary.

7.5 Private On-Site Disposal Systems

Septic tanks for on-site domestic wastewater treatment must be designed in accordance with AS/NZS 1546.1:1998, On-Site Domestic Wastewater Treatment Units, Part 1, Septic Tanks.

On-site disposal systems shall be designed and constructed in accordance with AS/NZS 1547: 2000, On-Site Domestic Wastewater Management or its applicable successor.

Where on-site disposal is proposed the developer will be required to demonstrate the ability of the ground to accept and dispose of the treated effluent in accordance with the above standard.

The disposal area shall be wholly contained within the allotment serviced.

If ground conditions are considered to be marginal in any way Council will require a specific design, based on-site investigations, to be submitted at the time of subdivision application.

On site treatment/disposal systems must comply with the Regional Effluent Land Application Plan, and the proposed Water and Land Plan, for Southland.

Wastewater/effluent must not contaminate drinking water supplies or adversely affect water used for recreational use or the gathering of food.]

7.6 Approval Of Proposed Infrastructure

7.6.1 Information To Be Provided

Applications for design approval shall include the information outlined in Section 1 and Section 1.2.19 of this CoP. In addition the following information shall be provided:

(a) A plan showing the proposed location of existing and proposed wastewater infrastructure.

(b) Detailed long sections showing the levels and grades of proposed wastewater pipelines in terms of datum.

(c) Long sections shall include full details of pipe and manhole materials and sizes.

(d) Details and calculations prepared which demonstrate that agreed levels of service will be maintained.

(e) Details and calculations prepared which clearly indicate any impact on adjacent area or catchment that the proposed infrastructure may have.

(f) Appropriate operating manuals, pump information, and instructions for pump stations and pressure systems if proposed.

7.7 Construction

7.7.1 Pipeline Construction

The construction of pipelines shall be carried out in accordance with the requirements of AS/NZS 2032 (PVC), AS/NZS 2033 (PE), AS/NZS 2566 Part 1 and 2 (all buried flexible pipelines), AS/NZS 3725 (concrete pipes), or AS 1741 or BS EN 295 (VC).

7.7.2 Trenching

See Standard Details D23 and D24 for guidance.]

Where a pipeline is to be constructed through areas with unsuitable foundations such material shall be removed and replaced with other approved material or alternatively, other methods of construction shall be carried out to the approval of Council to provide an adequate foundation and side support if required for the pipeline.

7.7.3 Reinstatement

Areas where construction has taken place shall be reinstated to a better standard than the original condition or as required by Council.

7.7.4 Inspection And Acceptance

Pipeline inspection and recording by closed circuit television (CCTV) shall be carried out prior to acceptance by Council.

CCTV inspections and deliverables shall be in accordance with *New Zealand pipe inspection manual* and the requirements of Council.

7.7.5 Leakage Testing Of Gravity Pipelines

Before a new pipeline is connected to the existing system, a successful field test shall be completed. The test shall be carried out as specified in Section 4.7.1.

7.7.6 Leakage Testing Of Pressurised Sewers

Requirements for field testing of pressurised sewers are given in Section 6.7.3.

Section 8. Water Supply

8.1 Scope

This section sets out requirements for the design and construction of drinking water supply systems for land development and subdivision. It covers the design of both the localised reticulation system and the larger distribution network.

Water reticulation design is generally described in 'performance based' terms combined with 'deemed to comply' solutions. The designer is responsible for all aspects of the water system design, excepting those aspects nominated and provided to the designer by Council.

If the scope of the development is large and includes its own water source, treatment or reservoirs, reference should be made to the Water Services Association - WSA 03.

Detailed plans and design calculations (where appropriate) shall be submitted to Council. In addition the requirements outlined in Section 1 of this CoP shall be met.

8.2 General Requirements

8.2.1 Objectives

The objectives are to ensure that the water reticulation system is functional, the required quality and quantity of water is supplied to all customers within Council's designated water supply area, and Council's requirements are satisfied.
The design shall ensure an acceptable water supply for each property including fire flows, depending on Council policies by providing either:

(a) A water main allowing an appropriate point of supply to each property.

(b) A service connection from the main for each property.

The designer shall consider:

(c) Council's policies, customer charters, and contracts.

(d) The hydraulic adequacy of the system.

(e) The ability of the water system to maintain acceptable water quality.

(f) The structural strength of water system components to resist applied loads.

(g) The requirements of SNZ PAS 4509.

(h) Environmental requirements.

(i) The environmental and community impact of the works.

(j) The 'fit-for-purpose' service life for the system.

(k) Optimising the 'whole-of-life' cost.

(l) Each component's resistance to internal and external corrosion or degradation.

8.2.2 Referenced Documents And Relevant Guidelines

Relevant legislation is listed in the Referenced Documents Section B of this CoP.

Water designs shall incorporate all the special requirements of Council and shall be in accordance with the most appropriate Standards, codes, and guidelines including those set out in Referenced Documents, the Civil Defence Emergency Management Act 2002, and *Drinking-water standards for New Zealand 2005* (Revised 2018).

8.3 Design

8.3.1 Design Life

All water supply systems shall be designed and constructed for an asset life of at least 100 years. Some components such as pumps, metering, control valves, and control equipment may require earlier renovation or replacement. Refer to WSA 03 for the classification of life expectancy for various components of water supply systems.

8.3.2 System Design

Water mains shall be designed with sufficient capacity to cater for all existing and predicted development within the area to be served and to meet the requirements of SNZ PAS 4509, and NZ Fire Service, Fire Fighting Water Supplies Code of Practise.

The water demand allowance in the subdivision design shall include provision for:

(a) Population targets.

(b) The area to be serviced.

(c) Individual properties proposed by the developer.

Adjustment may be required to cater for the known performance (demand-based flows) of the existing parts of the water system.

The water supply system for any development shall also be designed to supply:

(b) Any properties that lie between that development and the extent of the existing supply system and

(c) Properties beyond that development which form part of the zone council wishes to eventually reticulate.

For capacity beyond that required for the development in question, Council may contribute monies being the actual difference in cost between pipe and fittings required for the ultimate development and that for the particular development.

8.3.3 Design Criteria

8.3.3.1 Hydraulic Design

The diameter, material type(s), and class of the water main shall be selected to ensure that:

(a) The main has sufficient capacity to meet peak demands while maintaining minimum pressure.

(b) All consumers connected to the main receive at all times an adequate water supply and pressure.

The hydraulic design shall meet:

(a) A peak hourly demand pressure no less than 250Kpa; and

(b) Firefighting demand plus two thirds of peak hourly demand no less than 100Kpa.

8.3.3.2 Network Analysis

Where required by Council, a network analysis of the system shall be undertaken. The system shall be analysed using a mathematical model of the network to ensure adequate water supply is available to all consumers connected to the system for all defined modes of operation. The analysis shall include all elements within the system and shall address all demand periods including peak demand, low demand flows, and fire flows.

8.3.3.3 Peak Flows

Water demands vary on a regional basis depending on a variety of climatic conditions and consumer use patterns. Council should be able to provide historically-based demand information appropriate for design. Where peak demands are required for the design of a distribution system, the value shall be calculated from the following formulae:

Peak Day Demand (over a 12-month period) = Average Day Demand x PF

Unless specified otherwise by Council:

(a) PF = 1.5 for populations over 10,000.

(b) PF = 2 for populations below 2,000.

Peak Hourly Demand = Average Hourly Demand (on peak day) x PF (over a 24-hour period)

Unless specified otherwise by Council:

(a) PF = 2 for populations over 10,000.

(b) PF = 5 for populations below 2,000.

8.3.3.4 Head Losses

The head loss through pipe and fittings at the design flow rate shall be less than:

(a) 5 m/km for DN ≤150.

(b) 3 m/km for DN ≥200.

Head loss can be calculated using one of a number of standard hydraulic formulae. The final calculation method and formulae used to calculate head loss shall be determined by Council.

8.3.3.5 Hydraulic Roughness Values

The hydraulic roughness values considered in the analysis shall take account of the pipe material proposed, all fittings and other secondary head losses, and the expected increase in roughness over the life of the pipe. The designer should check with Council to ascertain if it has any requirements to use a specific formula and or roughness coefficients. If there are no specific requirements then it is recommended that the Colebrook-White formula is used (see Table 6-1).

Table 6-1 Hydraulic roughness values

Material	**Colebrook-White coefficient** **k** (mm)]	**Manning roughness coefficient** (n)
PVC	0.003 - 0.015	0.008 - 0.009
PE	0.003 - 0.015	0.008 - 0.009
Ductile iron cement mortar lined	0.01 - 0.06	0.006 - 0.011
Mild steel cement mortar lined	0.01 - 0.06	0.006 - 0.011
GRP	0.003 – 0.015	0.008 - 0.009
NOTE - The values show a range of roughness coefficients. The lower value in the range represents the expected value for clean, new pipes laid straight. The higher value in the range represents the typical maximum expected for the product. It cannot be an absolute maximum, as the factors detailed in AS 2200 can lead to even higher roughness values in some circumstances. Recommendations on the appropriate roughness coefficient for a particular fluid may be obtained from the pipe supplier. Refer also to AS 2200 Table 2 and notes.		

8.3.3.6 Minimum Flows

The minimum flow shall be the greater of:

(a) 25 L/min for normal residential sites.

(b) Fire flows as specified in SNZ PAS 4509.

8.3.3.7 Minimum Water Demand

The minimum peak domestic demand shall be specified by Council, or:

(a) Daily consumption of 250 L/p/day, applied to an occupancy rate of at least 2.5 persons / dwelling.

(b) Peaking factor of up to 5.

(c) Firefighting demands as specified in SNZ PAS 4509.

(d) The network should be designed to maintain appropriate nominated pressures for both peak demand (average daily demand in L/s x peaking factor) and firefighting demand scenarios. These figures should be applied to mains of 100 mm diameter or greater. Mains less than 100 mm in diameter can be sized using the multiple dwellings provisions of AS/NZS 3500.1 Table 6-2

The network is to be designed to suit both scenarios of:

- Peak hourly demand no less than 250Kpa; and
- Firefighting plus two thirds of peak hourly demand no less than 100Kpa.

8.3.3.8 Sizing Of Mains

Table 6-2 and Table 6-3 may be used as a guide for sizing mains.

Table 6-2 Empirical guide for principal main sizing

Nominal diameter of main DN	**Capacity of main (single direction feed only)**			
fixed	**Residential** (lots)	**Rural residential** (lots)	**General/ light industrial** (ha)	**High usage industrial** (ha)
100	40	10	-	-
150	160	125	23	-
200	400	290	52	10
250	650	470	84	24
300	1000	670	120	35
375	1600	1070	195	55

Table 6-3 Empirical guide for sizing rider mains

DN 50 Rider mains		
Pressure	**Maximum number of dwelling units**	
	One end supply	**Two end supply**
High > 600 kPa	20	40
Medium 400 - 600 kPa	15	30
Low < 400 kPa	7	15

8.3.3.9 Pressure Zones

In some cases, a 'PRV zone' may be used to control the pressure delivered to an area. In these cases the designer shall consult with Council to confirm pressure requirements.

8.3.3.10 Maximum Pressure Requirements

An output of the hydraulic design of a pipeline is the specification of the maximum pressure that may be imposed on the pipeline during operation.

Inputs to the design process include:

(a) Static head of supply.

(b) The range of pressure and flows required to provide an acceptable level of service to the end-user (minimum pressure) and to avoid water leakage (maximum pressure).

The outputs of water main hydraulic design shall include:

(c) Size of mains.

(d) Maximum and minimum design pressure.

(e) The pressure class/rating of pipeline system components.

(f) Surge analysis results.

(g) Hydraulic loss functions.

(h) Specification of the maximum allowable operating pressure.

(i) Flow and pressure compliance with peak demand and firefighting demand scenarios.

8.3.3.11 Design Pressure

The design pressures are the limiting pressures for operation of a pipeline system including any allowance for variation of usage in the future.

The minimum design pressure is either the minimum pressure defined by Council or some higher pressure selected to control (minimise) the range of pressures experienced over the normal diurnal variation in the system.

Unless otherwise specified by Council, the design pressure shall be between 250 kPa and 800 kPa (25 m to 80 m).

A minimum pressure rating of each pipeline component is to be provided to Council with the as-built details.

C8.3.5.9

A design pressure of 250 kPa to 800 kPa is set as this provides for approximately 200 kPa for two-storey dwellings at the upper floor and less than excessive pressures for dwellings constructed on lots below the position of the main. Specific additional consideration to these pressures may be needed in areas of significant contour.

8.3.3.12 Operating Pressure/Working Pressure

The operating pressure shall not exceed the rerated pressure class/rating or the operating pressure limit of the pipeline components at that location.

The design pressure (head) for the mains to be installed shall be based on the following:
Design pressure, (m) =Maximum Supply Pressure, (m above the level datum used for the ground level)
+ Surge Allowance, (m) - Lowest Ground Level (GL) of the proposed main, (m above datum).

The design pressure (m head) shall be used for:

(a) Selection of pipe materials and classes.
(b) Selection of pipe fitting types and classes.

The minimum pressure for design scenarios shall be in accordance with Section 6.3.3.7.

8.3.3.13 Pipe PN Class (Pressure Rating)

Pipe PN class is selected on the basis of the design pressure (head) calculated for the various sections of the reticulation network. This may be varied by specific operational requirements specified by Council but is normally defaulted to a minimum PN12 (12 bar).

8.3.3.14 Water Quality

A number of factors in a network can adversely affect the quality of the water in the system. The network design shall ensure that the water quality at each property complies with the *Drinking-water standards for New Zealand 2005* (Revised 2008). The requirement to protect water supplies from the risk of backflow is stated in the Health (Drinking Water) Amendment Act Section 69ZZZ and this shall be adhered to.

8.3.3.15 Materials

All parts of the water supply system in contact with drinking water shall be designed using components and materials that comply with AS/NZS 4020.

8.3.3.16 Prevention Of Backflow

Drinking water supply systems shall be designed and equipped to prevent backflow. The location and operation of hydrants, air valves, and scours shall ensure no external water enters the system through negative pressure from normal operation. All connections shall be fitted with backflow prevention devices.

8.3.3.17 Water Age

Drinking water supply systems shall be designed to minimise water age to ensure no unacceptable deterioration of water quality. This shall include:

(a) Mains with dead ends should be avoided by the provision of linked mains or looped mains. Particular care shall be taken at the boundaries between supply zones where dead ends shall be minimised.
(b) Mains for short runs shall be reduced in size or looped, for example no-exit roads (see Figure 6.5).
(c) Provision of large diameter mains capacity shall be staged by the initial provision of a smaller main, followed by additional mains as the demand increases. Discussions should be held with Council on staging, as multiple mains may not be desirable and larger mains with a scouring programme may be preferred instead.

8.3.4 Flow Velocities

In practice it is desirable to avoid unduly high or low flow velocities. Pipelines shall be designed for flow velocities within the range of 0.5 to 2.0 m/s. In special circumstances, velocities of up to 3.0 m/s may be acceptable.

For pumping mains an economic appraisal may be required to determine the most economical diameter of pumping main to minimise the combined capital and discounted pumping cost. The resulting velocity will normally lie in the range 0.8 m/s to 3.0 m/s.

The following factors shall be considered in determining flow velocity:

(a) Stagnation.
(b) Turbidity (large fluctuations in flow rates can dislodge the biological slime or stir up settled solids in pipelines).

(c) Pressure.
(d) Surge.
(e) Pumping facilities.
(f) Pressure reducing devices.
(g) Pipe lining materials.

8.3.4.1 Surge Analysis

During the design stage a surge analysis shall be undertaken for any pipeline within a pumped system or system containing automated valves. The source of any significant pressure surges or high-pressure areas shall be identified and remedial measures to minimise pressure surges designed and specified.

For water mains in pumped systems, a detailed surge analysis shall be conducted unless otherwise directed by Council to ensure:

(a) The appropriate surge pressure is included in the calculated design head.
(b) Surge control devices are included in the system design, where identified by the detailed analysis, to protect the network or control pressure fluctuations in the supply to customers, or both.

NOTE - Surge can also be managed by soft starts on pump motors, variable speed drives, and speed controls on valve closures, for example.

8.3.5 System Layout

8.3.5.1 General

Water mains are usually located in the road. The location shall be in accordance with Standard Drawing R2. Where approved by Council water mains may be located in private property or public reserve, where in this case easements shall be required.

Water mains should:

(a) Be aligned parallel to property boundaries.
(b) Should not traverse steep gradients.
(c) Should be located to maintain adequate clearance from structures and other infrastructure.

8.3.5.2 Reticulation Layout

A principal water main of not less than nominal internal diameter (DN) 100, fitted with fire hydrants, shall be laid on one side of all public roads and no-exit roads in every residential development. A DN 50 rider main may be laid to lots not fronted by the principle main but still within fire protection of a hydrant subject to approval by Council. The principal mains serving commercial and industrial areas shall be at least DN 150. This requirement may be relaxed in short no-exit roads as long as adequate firefighting coverage is available.

8.3.5.3 Mains Layout

In determining the general layout of mains, the following factors shall be considered:

(a) Main location to allow easy access for repairs and maintenance.
(b) Whether system security, maintenance of water quality, and ability to clean mains meet operational requirements.
(c) Location of valves for shut-off areas and zone boundaries (see 6.3.14).
(d) Avoidance of dead ends by use of looped mains or rider mains.
(e) Provision of dual or alternate feeds to minimise service risk.

8.3.5.4 Water Mains In Private Property

Water mains are not normally permitted within private property. In extraordinary circumstances when their presence has been agreed by the Council, then they will require a registered easement. Water mains located within private property will require an appropriately sized and registered easement in accordance with Council's requirements.

C8.3.8.4
For some TAs, an easement over private property is not the preferred option and may only be used as a temporary solution for landlocked subdivisions pending future permanent supply within a road. A typical situation where Council may approve water mains in easements is a fire main in a right of way.

8.3.5.5 Types Of System Configuration

Network layouts shall be established in accordance with Council practice. Interconnected ring systems should be provided when feasible. Refer to WSA 03 for further information.

8.3.5.6 Water Mains Near Trees

Locating water mains within the root zone of trees should be avoided if possible. Where this is not practicable, careful attention to pipe material selection is necessary to minimise risk of pipe failure due to root intrusion.

8.3.5.7 Shared Trenching

Where shared trenching is approved by Council and utility service owners, a detailed design shall be submitted for approval by those parties and shall include:

(a) Relative location of services (horizontal and vertical) in the trench.
(b) Clearances from other services.
(c) Pipe support and trenchfill material specifications.
(d) Embedment and trenchfill compactions.
(e) Trench and / or individual service] markings.
(f) Services' location from property boundaries.
(g) Any limitations on future maintenance.
(h) Special anchoring requirements, such as for bends and tees.

Where approved by Council and utility service owners, shared trenching may also be used for property service connections.

8.3.5.8 Rider Mains And Duplicate Mains

A rider main may be laid to lots not fronted by the principle main but still within fire protection of a hydrant subject to approval by Council. A rider main may be laid to lots not fronted by the principal main, but still within fire protection of a hydrant, subject to approval by the Council. Duplicate mains are required to provide adequate fire protection in the following cases:

(a) Arterial roads or roads with a central dividing island.
(b) Roads with split elevation.
(c) Roads with rail or tram lines.
(d) Urban centres.
(e) Parallel to large distribution mains that are not available for service connections.
(f) Commercial and industrial areas nominated by Council.
(g) Where required by SNZ PAS 4509.

8.3.5.9 Crossings

Water main crossings of roads, railway lines, and underground services shall, as far as practicable, be at right angles. Mains should be located and designed to minimise maintenance and crossing restoration. Council may require extra mechanical protection for the pipes or different pipe materials to minimise the need for future maintenance.

8.3.5.10 Crossings Of Waterways Or Reserves

All crossings of waterways or reserves shall be specific designs to suit Council's requirement.

Crossings shall, as far as practicable, be at right angles to the waterway or reserve. Reference should be made to Council to establish whether it prefers elevated crossings or below waterway invert crossings. When the pipeline is placed under the invert level of a waterway it may require mechanical protection by concrete encasement or steel or other acceptable pipe duct. Different pipeline materials may need to be used for the crossing.

8.3.5.11 Location Marking Of Valves And Hydrants

Hydrant location markings shall be according to SNZ PAS 4509. Additionally reinforced concrete marker posts shall be set in the ground opposite the hydrant or valve and close to property boundaries. Marker posts shall have inscribed letters as below.
"V" to indicate sluice valves, painted white
"AV" to indicate air valves, painted red
"SV" to indicate scour valves, painted blue]
The location marking of stop valves, service valves, and fire hydrants shall be to SNZ PAS 4509 and SDC Standard Details W13 and W14.

8.3.5.12 Connection to the Council's reticulated water supply

Connection to the Council's reticulated water supply will be required unless:

(a) No piped system is immediately available or will not be available within 10 years of the subdivision application.

(b) No piped system is available immediately adjacent or within a reasonable distance of the site.

For clarification of what constitutes a "reasonable distance" refer to Section 7.8 of this CoP.

8.3.6 Clearances

8.3.6.1 Clearance From Underground Services

Where a pipe is designed in a road the location of the pipe from other services shall comply with the Code as defined in 9.2.2, unless Council has its own requirements.
For normal trenching and trenchless technology installation, clearance from other service utility assets shall not be less than the minimum vertical and horizontal clearances shown in Table 6-4. Written agreement on reduced clearances and clearances for shared trenching shall be obtained from Council and the relevant service owner prior to the commencement of construction.

Table 6-4 Clearances between water mains and underground services

Utility (Existing service)	**Minimum horizontal clearance** (mm)		**Minimum vertical clearance**[1] (mm)
	New main size		
	DN ≤200	**DN >200**	
Water mains DN >375	600	600	500

Utility (Existing service)	**Minimum horizontal clearance** (mm)		**Minimum vertical clearance**[1] (mm)
	New main size		
	DN ≤200	**DN >200**	
Water mains DN ≤375	300[2]	600	150
Gas mains	300[2]	600	150
Telecommunications conduits and cables	300[2]	600	150
Electricity conduits and cables	500	1000	225
Public mains	300[2]	600	150[3]
Wastewater pipes	1000/600[4]	1000/600[4]	500[3]
Kerbs	150	600[5]	150 (where possible)

NOTE -

(1) Vertical clearances apply when water mains cross another utility service, except in the case of wastewater when a vertical separation shall always be maintained, even when the main and wastewater pipe are parallel. The main should always be located above the wastewater pipe to minimise the possibility of backflow contamination in the event of a main break.

(2) Clearances can be further reduced to 150 mm for distances up to 2 m when passing installations such as poles, pits, and small structures, providing the structure is not destabilised in the process.

(3) Water mains should always cross over wastewater and stormwater drains.

(4) When the wastewater pipe is at the minimum vertical clearance below the water main (500 mm), maintain a minimum horizontal clearance of 1000 mm. This minimum horizontal clearance can be progressively reduced to 600 mm as the vertical clearance is increased to 750 mm.

(5) Clearance from kerb and channel shall be measured from the nearest edge of the concrete. For water mains ≤375 clearances can be progressively reduced until the minimum of 150 mm is reached for mains DN ≤200.

(6) Where a main crosses other services, it shall cross at an angle as near as possible to 90°.

8.3.6.2 Clearance From Structures

Pipes adjacent to existing buildings and structures shall be located clear of the 'zone of influence' of the building foundations. If this is not possible, a specific design shall be undertaken to cover the following:

(a) Protection of the pipeline.

(b) Long term maintenance access for the pipeline.

(c) Protection of the existing structure or building.

The protection shall be specified by the designer for evaluation and acceptance by Council.

Sufficient clearance for laying and access for maintenance is also required. Table 6-5 may be used as a guide for minimum clearances for mains laid in public streets.

Table 6-5 Minimum clearance from structures

Pipe diameter DN	**Clearance to wall or building** (mm)
<100	600
100 - 150	1000
200 - 300	1500
375	2000
NOTE - These clearances should be increased for mains in private property (even with easements) as access is often more difficult and damage risk greater.	

8.3.6.3 Clearance From High Voltage Transmission Facilities

Water mains constructed from metallic materials shall generally not be located close to high voltage transmission lines and other facilities. Special design shall be undertaken if it is necessary to locate such mains close to such facilities.

8.3.6.4 Deviation Of Mains Around Structures

Deviation of a pipeline around an obstruction can be achieved by deflection of the pipeline at joints, to the angular deflection limits stated by the pipe joint manufacturer and with suitably restrained fitting bends. Permitted angular deflection varies with pipe material, pipe wall thickness, pipe PN class, joint type, design and geometry. Some joint types are specifically designed to accommodate angular deflection. Butt welded or electrofusion collared PVC and PE pipes may also be curved along the pipe barrel, between joints, to a minimum radius of curvature not less than that stated by the pipe manufacturer.

8.3.7 Pipe Selection

The selection of the appropriate pipe material, sizes, and classes shall be based on the designed system demands.

8.3.7.1 Standard Pipe Sizes

The principal main shall be standardised as DN 100, 150, 200, 225, 250, 300, 375, 450, 525, 575, or 600 mm nominal diameter only. Pipe sizes shall be in accordance with the table below:

Standard pipe size according to material type			
Nominal diameter (mm)	Polyethylene (PE)	Polyvinylchloride (PVC)	
		uPVC	PVC-O
50	DN63	DN50	DN50
100	DN125	DN100	DN100
150	DN180	DN150	DN150
200	DN250	DN200	DN200
250	DN315	DN250	DN250
300	DN355	DN300	DN300

Note:

1. For PE pipe: Comply with AS/NZS 4130, pressure rating PN12.5Mpa
2. For uPVC pipe: Comply with AS/NZS 1477 series 1 or 2, pressure rating PN12Mpa
3. For PVC-O: Comply with AS/NZS 4441 series 1 or 2, pressure rating PN12

8.3.7.2 Minimum Pipe Sizes

Minimum pipe diameters shall be as follows, where DN is the nominal pipe diameter:

(a) DN 50 for rider mains in residential zones.

(b) DN 100 for residential zones.

(c) DN 150 for industrial or commercial zones.

Council may also specify minimum pipe diameters for other identified areas such as CBDs.

8.3.7.3 Pipe Materials

For acceptable pipe materials and Standards see Section 4.7.1.

8.3.8 Fire Flow

The water reticulation system shall be designed to comply with SNZ PAS 4509.

8.3.9 Fire Protection Services

Many commercial and industrial developments require installation of special fire protection services. While it is the responsibility of the site owner to provide these fire services, the developer shall design the water reticulation system to meet the required demands, where these are known in advance.

Where a development cannot be connected to a high pressure supply the following will apply for each dwelling ≤ 200m^2 (any larger dwelling shall have a specifically designed system for fire protection services).

Each allotment will require:

(a) A minimum of 20,000 litres shall be maintained at all times as a static fire fighting reserve within a 30,000 litre tank. Alternatively, a 7,000 litre fire fighting reserve is to be made available for each dwelling in association with a domestic sprinkler system. Underground tanks or tanks that are partially buried (provided that the top of the tank is no more than 1 metre above ground level) may be accessed by an opening in the top of the tank and couplings are not required.

A fire fighting connection in accordance with SNZ PAS 4509:2008 is to be located within 90 m of any proposed building site. The Fire Service connection point/coupling/fire hydrant must be located so that it is not compromised in the event of a fire.

(b) Heavy-duty vehicle access a minimum of 4 m wide to a connection site on a hardstand area suitable for fire service appliance parking. Access shall be maintained at all times to the hardstand areas. The connection site shall be within 6 m of the water source.

(c) Fire Service coupling connections that are compatible with Fire Service equipment. The fittings are to comply with the following standard, being either:

70 mm instantaneous couplings (female) to SNZ PAS 4509, or

100 mm and 140 mm suction coupling (female) to SNZ PAS 4509 with the hose tail of the same diameter as the threaded coupling, eg 140 mm coupling to have 140 mm hose tail.

Alternatively, communal water supply tanks servicing a number of properties may be utilised provided that:

- at least two tanks are located within 135 m of each building.
- each tank has at least 45 m^3 capacity.
- permanent couplings as detailed above for private tanks are installed at each tank.]

8.3.10 Structural Design

8.3.10.1 General

For installation conditions beyond those shown on the drawings, the pipeline installation shall be specifically designed to resist structural failure. The design shall be in accordance with AS/NZS 2566.1 including the structural design commentary AS/NZS 2566.1 Supplement 1. Details of the final design requirements shall be shown on the drawings.

8.3.10.2 Seismic Design

All pipes and structures shall be designed with adequate flexibility and special provisions to minimise risk of damage during earthquake. Historical experience in New Zealand earthquake events suggests that suitable pipe options, in seismically active areas, may include rubber ring joint PVC pipes, or PE pipes. Specially designed flexible joints shall be provided at all junctions between pipes and rigid structures (such as reservoirs, pump stations, bridges, and buildings) in natural or made ground.

8.3.10.3 Structural Consideration

Pipelines shall be designed to withstand all the forces and load combinations to which they may be exposed including internal forces, external forces, temperature effects, settlement, and combined stresses. The water main design shall include the selection of the pipeline material, the pipe class, and selection of appropriate bedding material to suit site conditions.

8.3.10.4 Internal Forces

Pipelines shall be designed for the range of expected pressures, including transient conditions (surge and fatigue) and maximum static head conditions. In the case of transient conditions the amplitude and frequency shall be estimated. The allowance for surge included in the maximum design pressure shall not be less than 200 kPa. Transfer and distribution mains subject to negative pressure shall be designed to withstand a transient pressure of at least 80 kPa below atmospheric pressure. A surge safety factor of 2 may be applied to the normal operating pressure to estimate the surge pressure in lieu of a detailed surge analysis.

8.3.10.5 External Forces

The external forces to be taken into account shall include:

(a) Trench fill loadings (vertical and horizontal forces due to earth loadings).
(b) Surcharge.
(c) Groundwater.
(d) Dead weight of the pipe and the contained water.
(e) Other forces arising during installation.
(f) Traffic loads.
(g) Temperature (expansion/contraction).

The consequences of external forces on local supports of pipelines shall also be considered.

8.3.10.6 Geotechnical Investigations

The designer should take into account any geotechnical requirements determined under Section 2 of this CoP.

Where required, standard special foundation conditions shall be referenced on the drawings.

8.3.10.7 Pipe Selection For Special Conditions

Pipeline materials and jointing systems shall be selected and specified to ensure:

(a) Structural adequacy considering ground conditions and water temperature.
(b) Water quality considering lining material.
(c) Compatibility with aggressive or contaminated ground.
(d) Suitability for the geotechnical conditions.

(e) Compliance with Council's requirements.

8.3.10.8 Above-Ground Water Mains

The design of above-ground water mains shall include the design of pipeline supports, maintenance and access requirements, control of unbalanced thrusts, and shall address exposure conditions, such as corrosion protection, UV protection, freezing of water mains, and temperature derating.

In such situations the pipe materials, support, and restraint for the pipes and fittings shall be detailed on the drawings.

8.3.10.9 Trenchless Technology

Trenchless technology may be required for alignments passing through or under:

(a) Environmentally sensitive areas.
(b) Built-up or congested areas to minimise disruption and reinstatement.
(c) Railway, water course and major road crossings.
(d) Significant vegetation.
(e) Vehicle crossings.

Pressure pipes used for trenchless installation shall have suitable mechanically restrained joints, specifically designed for trenchless application, which may include integral restraint seal systems, or heat fusion welded joints.
For information on trenchless installation methods see Section 7.3.6.8

C8.3.12.9
Further information on trenchless technologies may be found in 'Trenchless technology for installation of cables and pipelines' (Stein), 'Trenchless technology - Pipeline and utility design, construction, and renewal' (Najafi), and 'Guidelines for horizontal directional drilling, pipe bursting, microtunnelling and pipe jacking' (Australasian Society for Trenchless Technology).

8.3.10.10 Embedment

8.3.10.10.1 Minimum Pipe Cover

Pipelines shall have minimum cover in accordance with Council or utility owner's requirements. Where Council does not have specific requirements, the minimum covers as described in AS/NZS 2566.2 may be used.

8.3.10.10.2 Minimum Trench Width

Pipe trench width design considerations shall be based on the minimum side clearances detailed in Standard Drawing – W10.

8.3.10.11 Pipeline Restraint

Anchorage shall be provided at bends, tees, reducers, valves, and dead ends where necessary.

C6.3.12.11
In-line valves, especially those DN 100 or larger, should be anchored to ensure stability under operational conditions. See NZS 4404 WS-005.

8.3.10.11.1 Thrust Blocks

The design of thrust blocks shall be based on the maximum test pressure.

Thrust blocks shall be designed to resist the total unbalanced thrust and transmit all load to the adjacent ground. Calculation of the unbalanced thrust shall be based on the maximum design pressure, or as otherwise specified by Council.

Restraint joint systems, specifically designed to resist the total unbalanced thrust, and support all thrust load, may be used, instead of thrust blocks. These may include mechanical restraint coupling joints, or integral restraint seal systems.

Typical contact areas for selected soil conditions and pipe sizes are shown in Standard Drawings W8 & W9.

Thrust blocks for temporary infrastructure shall be designed to the requirements for permanent thrust blocks.

8.3.10.11.2 Anchor Blocks

Anchor blocks are designed to prevent movement of pipe bends in a vertical direction. They shall consist of sufficient mass concrete to prevent pipe movement as shown in Standard Drawings W8 & W9.

8.3.10.11.3 Restrained Joint Water Mains

Commercially available mechanically restrained jointing systems may be used to avoid the need for thrust and anchor blocks subject to the approval of Council.

8.3.11 Reservoirs And Pumping Stations

Where reservoirs or pumping stations are required, reference shall be made to Council for its specific requirements.

WSA 03 contains design criteria for pumping stations and reservoirs.

8.3.12 Valves

8.3.12.1 General

Valves are used to:

(a) Isolate reticulation mains from distribution mains.
(b) Isolate smaller reticulation mains from larger reticulation mains.
(c) Isolate planning zone boundaries, for example, industrial, residential, or commercial.

Valves shall be provided:

(d) Each side of state highways, arterial roads, and railway and tram crossings.
(e) Adjacent to street intersections (for ease of location).
(f) In the footway, clear of roadway, where possible.
(g) Valves shall generally be placed on two of the three legs at a tee intersection or on three of the four legs of a four way intersection so as to limit the number of properties without water during shutdown.

Subject to these considerations, valve numbers shall be minimised.

Council should be consulted to establish the local requirement for connection type (flange or socket), as well as any other issues such as valve anchoring requirements.

8.3.12.2 Siting Of Valves

For standardization, valves shall be placed in line with transverse street boundaries. The siting of valves shall take a holistic view of the existing infrastructure and proposed additions, and safety in design for future maintenance. General principles to be considered shall include:

(a) Valves shall be sited to provide the control (such as flow, pressure, isolation, and diversion) required by Council.

(b) Ready access to valves to enable their safe operation. Account shall be taken of traffic and other site peculiarities.

(c) Minimisation of inconvenience to the public by avoiding clustering of surface fittings in the footpath at intersections.

(d) Optimisation of the number and location of valves to meet Council's operation and maintenance requirements, safe working, and to minimise the effect of a shutdown on Council's customers.

8.3.12.3 Gate valves

Valves shall have anti-clockwise rotation of the input spindle for closure, unless otherwise specified by Council. Gate valves DN ≤50 (commonly called peet valves) shall be clockwise closing unless otherwise specified by Council.

Buried gate valves shall be operated from above ground and shall be designed to facilitate the use of a standard key and bar. An extension spindle shall be incorporated as necessary to ensure the top of the spindle is 350 mm below the FSL.
Valves DN ≥80 shall be gate valves. In-line valves shall be the same diameter as the reticulation main.

8.3.12.3.1 Gate Valve Spacing Criteria

For Diameters than 80mm, the number of property service connections in a shut-off area shall be in accordance with Table 6-6. When assessing property service numbers, unit title and strata title properties such as apartment buildings and multi-unit developments shall be counted as multiple connections. All connections having an alternative supply may be excluded when assessing property service numbers. The overriding maximum spacing between in-line valves shall be in accordance with Table 6.6.

Table 6-6 Valve spacing criteria

Water main size DN	**Number of property service connections (nominal)**	**Maximum spacing** (m)
≤150	40	300*
200-300	100	750
375	150	1000
* In rural areas, the maximum spacing is 500 m.		

8.3.12.3.2 Pressure Zone Dividing Valves

Pressure zone dividing valves and hydrants shall be installed in one of the following arrangements (see Figure 6-2):

(a) Valves in a paired configuration with a standard fire hydrant located between them. Installation in this manner permits the valves to be checked for leakage. The valve on the low pressure side of the pair will normally be closed in order for the fire hydrant to be used for firefighting purposes with the supply from the higher pressure zone.

(b) A valve with a standard fire hydrant on each side.

8.3.12.3.3 Secure Service Connections For Maintaining Supply To Critical Users

Additional stop valves may be provided at a service connection to a customer requiring a greater security of supply such as hospitals and large industrial or commercial developments. Figure 6-3 illustrates typical arrangements to facilitate partial isolation of the main while maintaining supply to the customer.

Figure 6-1 Branch valve adjacent to main

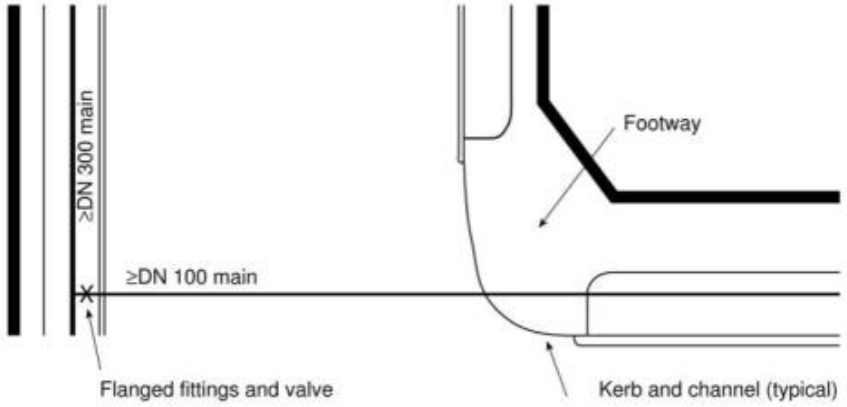


Figure 6-2 Valve and hydrant combinations for pressure zone dividing valves

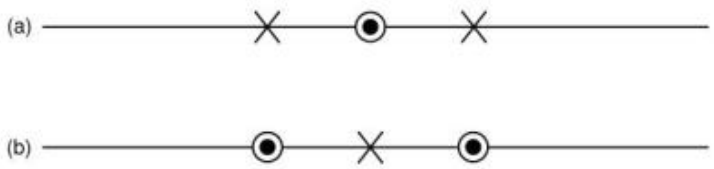
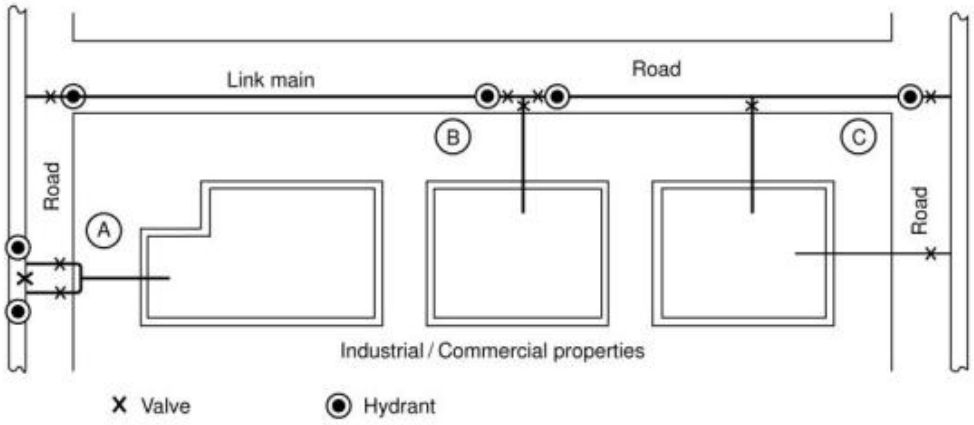


Figure 6-3 Secure connection



NOTE:

(1) Example A - feed from two directions off a large diameter water main. The arrangement is more complicated than Example B, but is justified by the cost of an additional large diameter stop valve which would be required if using Example B.

(2) Example B - feed from two directions off a smaller diameter main. This is a simpler arrangement than Example A, but requires two valves on the main.

(3) Example C - feed from two separate mains.

8.3.12.4 Butterfly Valves

Butterfly valves shall only be used with the approval of Council.

C6.3.14.4
Butterfly valves are not normally used in reticulation mains as they hinder swabbing operations, and the quick closing action can induce high surge pressures.

8.3.12.5 Pressure Reducing Valves

Pressure reducing valves (PRV) are outside the scope of this Standard. Refer to WSA 03.

C8.3.14.5
A PRV is used to reduce the pressure upstream of the PRV to a desired lower downstream pressure. The PRV works automatically to maintain the desired downstream pressure. Refer to WSA 03 for design criteria.

8.3.12.6 Air Valves

8.3.12.6.1 Installation Design Criteria

Investigation into the need for air valves (AVs) shall be made for all high points on mains, particularly at points more than 2 m higher than the lower end of the section of water main and particularly if the main has a steep downward slope on the downstream side.

Where the hydraulic head is less than 10 m, special consideration shall be given to the type of AV to prevent water leakage from the valve. AVs shall be installed with an isolating valve to permit servicing or replacement without having to shutdown the main.

Combination AVs, that is (dual) AVs incorporating an AV (large orifice) and an air release valve (small orifice) in a single unit, are generally the preferred type for distribution and transfer mains, and where required on reticulation mains.
The nominal size of the large orifice of air valves shall be DN 80 for installation on mains. This size has an exhaust capacity of approximately 0.3 m^3/s.

C8.3.14.6.1
Water mains with only a few service connections or a configuration that leads to air accumulation may require combination air valves to automatically remove accumulated air that may otherwise cause operational problems in the water system. The configuration of the distribution network for both the change in elevation and the slope of the water main governs the number and location of air valves required.

8.3.12.6.2 Air Valves Location

Air valves shall not be located in major roadways or in areas subject to flooding. When required, air valves shall be located:

(a) At summits (high points).
(b) At intervals of not more than 800 m on long horizontal, ascending, and descending sectors.
(c) At every increase in downward slope.
(d) At every reduction in upward slope.
(e) On the downstream side of PRVs.
(f) On the downhill side of major isolating valves.
(g) At blank ends.

Where the air valve is in a valve chamber, the design shall ensure adequate venting for effective operation and drainage to prevent backflow contamination.

8.3.12.7 Scours and pump-out branches

Scours and pump-out branches are provided in the distribution network for maintenance purposes. They are designed to allow draining of water from the mains by gravity or use of a mobile pump.

Hydrants may be used for flushing and draining on water mains DN <300.

C8.3.14.7
On mains DN ≥300, scours are more effective in draining and provide greater flushing velocities than hydrants.

Scours and pump-out branches shall incorporate appropriate measures to prevent back siphonage into the water supply system.

There shall be adequate drainage facilities to receive the flow resulting from flushing and draining operations.

Scours shall:

(a) Drain the water main by gravity or have provision for pump-out within a period of one hour, or both.

(b) Have a diffuser fitted at the discharge point if there is a likelihood of environmental or asset damage.

(c) Not be subject to inundation.

8.3.12.7.1 Scour Sizes

Scours shall be sized in accordance with Table 6-7.

Table 6-7 Minimum scour size

Main size DN	**Scour size** DN
DN ≤200	80
DN >200 - DN ≤300	100
DN >300 - DN ≤375	150

8.3.12.7.2 Scour locations

Scours shall be located at:

(a) Low points at the ends of water mains.

(b) Low points between in-line stop valves.

Scours shall drain to a point where the discharge is readily visible to prevent the scour valve inadvertently being left open.

Typical discharge locations include:

(c) An approved pit that is to be pumped out each time the scour is operated (called a pump scour).

(d) A kerb and channel.

(e) An open-grated street drainage sump.

(f) A natural water course (with energy dissipater).

Scours shall not:

(g) Cause damage when operated.

(h) Discharge to closed stormwater structures.

(i) Discharge across roadways.

(j) Discharge directly to waterways, unless in compliance with the appropriate consent requirements.

8.3.12.8 Flushing Points **ICC deleted this**

Flushing points, in the form of a hydrant, shall be installed at the end of reticulation mains (see SDC Standard Detail W1).

8.3.13 Hydrants

8.3.13.1 General

Hydrants are installed on reticulation mains for firefighting or operational purposes. Operational purposes include mains flushing, chlorination, to allow the escape of air during charging, and the release of water during dewatering of the water main, where air valves and scours are not installed.

8.3.13.2 Hydrants For Firefighting

The spacing of hydrants for firefighting shall be in accordance with SNZ PAS 4509.

8.3.13.3 Hydrant Installation

Fire hydrants shall not be fitted to reticulation mains DN <100 or to distribution or transfer mains without the prior written approval of Council.

8.3.13.4 Hydrants For Reticulation System Operational Requirements

Additional to firefighting requirements, hydrants shall be provided at:

(a) High points on reticulation mains to release air during charging, to allow air to enter the main when dewatering, and for manual release of any build up of air, as required, where automatic combination AVs are not installed.

(b) Localised low points on water mains to drain the water main where scours are not installed.

Adequate drainage facilities shall be provided to receive the hydrant flows from dewatering and flushing operations.

C8.3.15.4

AVs are not normally required on reticulation mains in residential areas where the configuration of mains and service connections will usually eliminate small amounts of air accumulated during operation; hydrants should be placed as close as possible to stop valves to facilitate maintenance activities such as cleaning of water mains.

8.3.13.5 Hydrants At Ends Of Mains

If a scour is not provided, a hydrant shall be installed as close as possible to the end of every main DN ≥100.

C8.3.15.5
Apart from the firefighting function, a hydrant also allows the section of dead end main to be flushed regularly to ensure acceptable on-going water quality. This is particularly important in new subdivisions where only a small number of properties may be connected initially and where the main has been laid in a larger than required size with the expectation that it will be extended at a future date.

8.3.14 Connections

8.3.14.1 Connection Of New Mains To Existing Mains

In specifying connection detail the designer shall consider:

(a) Pipe materials, especially potential for corrosion.
(b) Relative depth of mains.
(c) Standard fittings.
(d) Pipe restraint and anchorage.
(e) Limitations on shutting down major mains to enable connections.
(f) Existing cathodic protection systems.

Connections from the end of an existing main shall be designed to address any differing requirements for the pipes being connected, particularly restraint, spigot/socket joint limitations, and corrosion protection. The designer shall consider the potential for insufficiently restrained/ anchored stop valves near the connection.

All connections to the existing reticulation shall be made by a contractor approved by Council.

8.3.14.2 Property Service Connections

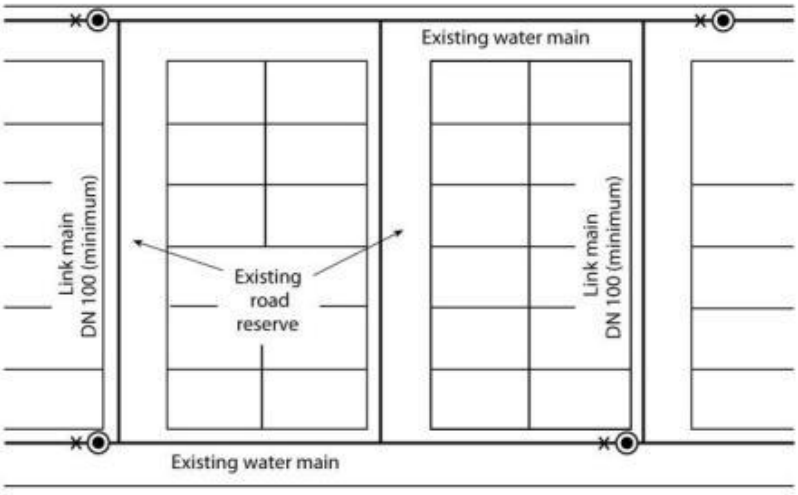
Property service connections shall be DN25mm PE pipe installed perpendicular to the main, terminating 1.0 m inside the property boundary (refer Standard Drawing WXX). Each property connection shall be fitted with an Accuflow manifold system complete with stopcock and backflow protection. Pipe shall be PE80B of pressure rating 12.5 bar. Tapping bands shall be the full encirclement type to AS/NZS 4793 for all pipes except PE. For PE pipes, approved thermoplastic tapping saddles shall be used.

8.3.14.3 Termination Points

Termination points or dead ends should be avoided to prevent poor water quality. Alternative configurations such as a continuous network, link mains, looped mains, and the use of reticulation mains smaller than DN 100, particularly in no-exit roads, should be considered (see Figure 6-4 and Figure 6-5).

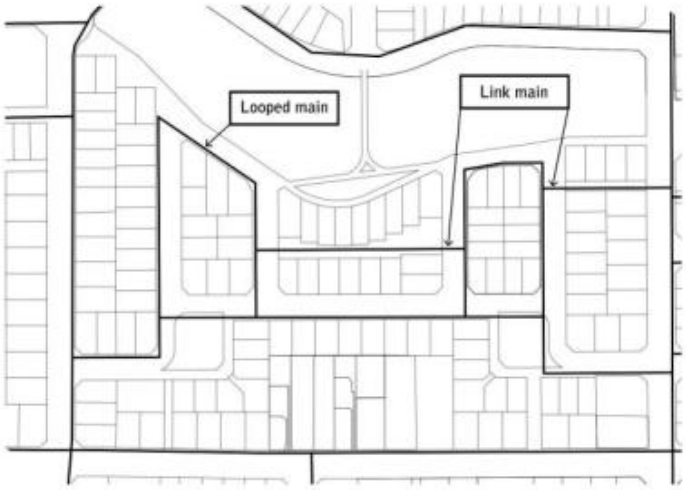
Refer to Standard Drawing W17 for stopcock specifications.

Figure 6-4 Elimination of termination points



NOTE – Rider mains are not shown.

Figure 6-5 Looped and link principal mains



Note - Rider mains are not shown

8.3.14.4 Permanent Ends Of Water Mains

The DN 100 main shall be laid to a point where all properties are provided with the fire protection required by SNZ PAS 4509.

A method of flushing shall be provided at the end of the water main, which shall be suitably anchored.

8.3.14.5 Temporary Ends Of Water Mains

Water mains shall be laid to within 1 m of the boundary of a subdivision where the main is to be extended in the future.

Temporary dead-end mains shall terminate with a hydrant followed by a gate valve. The valve and hydrant shall be suitably anchored so that the future extension can be carried out without the need to disrupt services to existing customers.

Where a development is staged, mains shall be constructed to terminate approximately 2 m beyond the finished road construction to ensure that future construction does not cause disruption to finished installations.

8.4 Approval Of Proposed Infrastructure

8.4.1 Information to be provided

Design drawings compatible with Council's concept plan and the design parameters included in this CoP shall be provided to Council for approval. Applications for design approval shall include the information outlined in Section 3 of this CoP. Designers shall ensure the following aspects have been considered and where appropriate included in the design:

(a) The size (or sizes) of pipework throughout the proposed reticulation system.
(b) Selection of appropriate pipeline material type/s and class.
(c) Mains layouts and alignments including:
    (i) route selection;
    (ii) topographical and environmental aspects;
    (iii) easements;
(iv) foundation and geotechnical aspects;
(v) clearances, shared trenching requirements;
(vi) provision for future extensions.
(d) Hydraulic adequacy including:
    (i) compliance with the required maximum and minimum operating (working) pressure;
    (ii) acceptable flow velocities;
    (iii) compliance with the estimated water demand, including firefighting.
(e) Property service connection locations and sizes.
(f) Types and locations of appurtenances, including:
    (i) stop valves;
    (ii) pressure reducing valves (PRVs);
    (iii) hydrants and fire services;
    (iv) scours and pump-out branches;
    (v) termination details.
(g) Locations and details of thrust blocks and anchors, see NZS 4404 WS-004 and WS-005.
(h) Preparation of final design drawings, plans (and specifications if applicable).

8.5 Construction

8.5.1 Excavation

Excavation of existing carriageways shall conform to Council's road opening procedures where these exist. Excavation in existing carriageways shall be carried out in a safe manner with the minimum disruption to traffic and pedestrians.

8.5.2 Embedment

Pipes and fittings shall be surrounded with a suitable bedding material in accordance with NZS 4404 CM-001 and NZS 2566.

8.5.3 Backfilling and reinstatement

8.5.3.1 Carriageways

Backfilling shall be in accordance with the requirements of Council.

Pipe trenches within a carriageway shall be backfilled using an approved hardfill placed immediately above the pipe embedment and compacted in layers not exceeding 200 mm in loose depth.

In existing sealed roads, the top section of the trench shall be backfilled as specified by 5.4.2.3. The depth of base course and type of finishing coat seal shall conform to the standard of the existing road construction.

8.5.3.2 Berms

Pipe trenches under grass berms and footpaths shall be backfilled in accordance with the requirements of NZS 4404 CM-001.

8.5.3.3 Detector Tape

Open trenching - backfill shall be placed up to the bottom of the existing road basecourse. At this point, where required by Council, the contractor shall provide and lay metallic 'detector' tape coloured blue, stipulating 'Danger - Water Main Below' (or similar).

8.5.3.4 Tracer Wire (for installation by trenchless method)

Tracer wire in the form of a continuous 4 mm^2 multi strand (minimum 4) polythene sleeved copper cable, shall be installed with all non-metallic pipes to allow detection. The wire shall be strapped to the pipe wall by means of a minimum of two complete wraps of heavy duty adhesive tape, at a maximum of 3.0 m intervals. The wire shall have some slack to allow for bends in laying and for future installation of tapping saddles.

The tracer wire shall run continuously between valves and hydrants. At each valve or hydrant the wire shall be ducted to surface level through a length of polyethylene pipe ending immediately below the lid, The tracer wire shall be long enough to extend 600 mm minimum above ground level when uncoiled.

The excess length shall be neatly coiled in the valve or hydrant box.

The tracer wire shall be tested for continuity between surface boxes using an electronically generated tone and detector probe or alternative approved method.

8.5.4 Pressure Testing Of Water Mains

Before a new water main is connected to the existing reticulation, a successful pressure test shall be completed. The system test pressure is applied to test the integrity of construction of the pipeline system. The system test pressure will be the pressure rating of the pipe used,] generally exceeds the actual design pressure of the system (maximum 1.25 times the maximum rated operating pressure of the lowest rated component in the system). See Section 6.7 for the appropriate testing procedure.

8.5.5 Disinfection Of Water Mains

Disinfection of the water mains shall be carried out following successful pressure testing and backfilling as specified in section 0. The disinfection solution shall be collected and disposed of in an appropriate manner (to an approved disposal site).

8.5.6 Discharge Of Testing Water

Discharge of testing or chlorinated water from pipelines may require a resource consent from the regional council.

8.5.7 Water Sampling

Council may require water samples to be taken for water quality compliance purposes.

8.6 Rural Water Supplies

Sufficient information shall accompany subdivision applications to ascertain:

(a) If the property is connected to any rural water supply scheme.

(b) If the new allotments will be connected to any scheme.

The application process to connect to any scheme is independent of the subdivision process: a connection is not compulsory and if a connection cannot be made this does not negate the subdivision application.

Prior to making application for the issue of the Section 224(c) certification by the Council, the consent holder shall:

(a) Apply to the Strategic Water and Waste Department for installation of separate water connections to each allotment requiring a supply. A scheme plan for any alterations to the rural water scheme shall be included with the application, and all applications shall be subject to Council's usual terms, conditions and fees, and any special conditions that may apply.

Note (a): Only applies when the water allocated to the property is to be redistributed.

(b) Arrange for all existing internal water supply lines that cross the new subdivisional boundaries to be disconnected. The disconnections shall be left uncovered until they have been inspected by Council or its representative, to verify that disconnection has been completed. The consent holder shall notify Council's Strategic Water and Waste Department, telephone (03) 214 9746. At least two working days prior notice is required.

(c) Arrange for a surveyor to prepare as-built drawings showing the revised water reticulation layout, detailed within an accuracy of +/- 0.5 m. Certification of the scheme plan will not be completed until this verification has been made.

Note (c): Only applies when the water allocated to the property is to be redistributed.

(d) Pay Council's fees to cover processing, inspection costs and updating of records by Water and Waste Services.

(e) Arrange for Council's maintenance contractor to install any new connection to an existing main and any new tank fittings.

Any internal reticulation crossing a proposed boundary shall be disconnected. The Surveyor shall be required to confirm, when lodging the survey plan of subdivision for seal that this has been done.

This condition will be imposed on all consents where the existing property is connected to a rural water scheme. This condition protects the owner of an allotment connected to a scheme from having other properties connect via their property, as well as ensuring continuation of supply for all consumers.

Where water allocations are assigned to new parties through a subdivision process, Council will continue to bill the previously designated parties until a change of ownership is formally advised.

Where a property is within a rural water supply scheme area but is not connected no condition will be imposed requiring the property to be connected. However, applicants are encouraged to consider the benefits of connecting to a scheme. Applications for connection to any rural water supply scheme shall be made by a separate application through Council's Strategic Water and Waste Department.

There must be a minimum of **TWO DAYS** storage of water on each lot. Some water schemes are for the purpose of supplying stock only (not for human consumption or irrigation).

8.7 Field Testing Of Pipelines

8.7.1 Scope

This Section is based on some of the test methods in AS/NZS 2566.2, Section 6, and associated appendices. It specifies suggested methods of test and their application to field testing of pipelines for the purpose of determining pipeline acceptability. Field testing includes leak or hydrostatic

pressure testing, as appropriate, for pressure and non-pressure pipelines. Testing may also be carried out in accordance with the material-specific and application-specific test methods of AS/NZS 2032, AS/NZS 2033, and AS/NZS 2566.2.

8.7.1.1 Purpose Of Field Testing

The purpose of field testing is to:

(a) Reveal the occurrence of faults in the laying procedure, for example, joints incorrectly installed or pipes damaged.

(b) Reveal the occurrence of faults in the assembly procedure of pipeline components, for example, tapping bands, maintenance structures, frames, and covers.

(c) In the case of pressure pipelines, determine that the pipeline will sustain a pressure greater than its design pressure without leakage.

(d) In the case of non-pressure pipelines, determine that the pipeline satisfies the requirements for infiltration and exfiltration.

(e) Test the installed structural integrity of the pipeline.

Field testing is not intended to supplement or replace the test requirements of product standards.]

8.7.2 Non-pressure pipelines - Field leakage testing

Leakage testing is used to reveal locations of potential infiltration and exfiltration due to the inclusion of damaged pipes, seals, or incorrectly made joints in the pipeline at the completion of installation.

Leakage testing for acceptance of non-pressure pipelines shall be carried out by at least one of the following methods:

(a) Low pressure air testing.

(b) Hydrostatic testing.

NOTE - Air tests provide qualitative data only, as air pressure losses cannot be related directly to water leakage rates.

For pipeline test sections installed below the watertable, and for submarine pipelines, the test pressure used for the hydrostatic test, and for the air test, shall be increased to maintain the required differential between internal and external pressure.

A pipeline failing to meet the requirements of the air tests may be retested using the hydrostatic test method.

NOTE - Failure is still probable.]

8.7.2.1 Low pressure air test

The test length shall be acceptable where the gauged pressure exceeds 18 kPa (or not more than 7 kPa less than the pressure at the start of the test) for the time interval shown in Table 6-8 after the shut-off of the air supply.

Table 6.8 is based on an air test pressure of 25 kPa (in excess of any external hydrostatic pressure due to groundwater) and, on this basis, air volume losses shall not exceed the greater of:

(a) A rate of 0.0009 $m^3/(min \times m^2)$ of pipe wall area.

(b) A rate of 0.056 m^3/min, which is regarded as the lowest detectable individual air leak.

Column 2 and column 3 of Table 6.8 give the times and lengths up to which (b) prevails over (a).
NOTE - For safety reasons air test pressures in excess of 50 kPa should not be applied.]

Table 6-8 Low pressure air and vacuum tests - Minimum time intervals for 7 kPa pressure change in pipeline

DN	**Minimum time** (minutes)	**Maximum length for minimum time to apply** (metres)	**Test length** (metres)				
			50	**100**	**150**	**200**	**250**
			Minimum test duration (minutes)				
80	1.5	231	1.5	1.5	1.5	1.5	1.6
100	2	185	2	2	2	2	3
150	3	123	3	3	3	5	6
225	4	82	4	5	8	10	13
300	6	62	6	9	14	18	23
375	7	49	7	14	22	29	36
450	9	41	10	21	31	41	52
525	10	35	14	28	42	56	70
600	11	31	18	37	55	73	92
675	13	27	23	46	70	93	116
750	14	25	29	57	86	115	143
900	17	21	41	83	124	165	207
1000	19	19	51	102	153	204	255
1050	20	18.8	56	112	169	225	281
1200	23	15	73	147	220	294	367
1500	28	12	115	230	344	459	574

NOTE -
The time interval may be reduced for a proportionate reduction in the allowable pressure drop. Where there is no detectable change in pressure after 1 hour of testing, the section under test shall be deemed acceptable.
This table is based on the following equation:

$T = 1.02 D_i k L q$

where

T = time for a 7 kPa pressure drop, in seconds
D_i = pipeline internal diameter, in metres
q = allowable volume loss in cubic metre/minute/square metre taken as 0.0009 $m^3/min.m^2$
$k = 0.054DL$ but not less than 1
L = length of test section, in metres.

Columns 2 and 3 have been calculated with $k = 1.0$.
The appropriate air or vacuum test/pressure method for pipes larger than DN 750 should be established by reference to the specifier.

8.7.2.1.1 Low Pressure Air Test Procedure

The procedure shall be as follows:

(a) Pump in air slowly until a pressure of 25 +5,−0 kPa is reached. Where the pipeline is below the watertable this pressure shall be increased to achieve a differential pressure of 25 kPa. In no circumstances should the actual pressure exceed 50 kPa.

NOTE - Rapid pressurisation may cause significant air temperature changes, which will affect the testing accuracy.

(b) Maintain the pressure for at least 3.0 minutes.

(c) Where no leaks are detected, shut off the air supply.

(d) Where the pipeline fails the test, repressurise to 25 +5,−0 kPa and check for leaks by pouring a concentrated solution of soft soap and water over accessible joints and fittings.

(e) Repair any defects, then repeat steps (a) to (c).

(f) With the air supply shut off, monitor the pressure for the time intervals given in Table 6.8.

The test length shall be acceptable where the pressure drops by 7 kPa, or less, over the required (tabulated) test period.

NOTE -

(1) The test length of pipeline should be restricted to pipeline sections between maintenance holes (the most convenient places for inserting test plugs or fixing temporary bulkheads). The method should not be used for test lengths in excess of 250 m and for pipe diameters larger than 1500 mm.

(2) The procedure for low pressure air testing of large diameter pipelines is potentially hazardous because of the very large forces to be resisted by temporary plugs or bulkheads and the serious consequences of accidental bulkhead blow-out. A relief valve, with a 50 kPa maximum setting, should be installed on all pressurising equipment.]

8.7.2.2 Hydrostatic Test

The test length shall be acceptable where the specified allowable make up water is not exceeded. Where not specified, the allowable make up water shall be 0.5 L/hour per metre length per metre diameter.]

8.7.2.2.1 Hydrostatic Test Procedure

The procedure shall be as follows:

(a) The test pressure shall be not less than 20 kPa, or 20 kPa above the groundwater pressure at the pipe soffit at its highest point, whichever is the greater, and not exceed 60 kPa at the lowest point of the section.

(b) Steeply graded pipelines shall be tested in stages where the maximum pressure, as stated above, will be exceeded if the whole section is tested in one length.

(c) The pressure shall be maintained for at least two hours by adding measured volumes of water where necessary.

(d) Any visible leaks detected shall be repaired and the pipeline shall be retested.]

8.7.3 Pressure Pipelines-Field Hydrostatic Pressure Testing

The hydrostatic pressure test method shall be as specified.

Hydrostatic pressure testing requires selecting an appropriate configuration of method, pressure, and length of test section.

Test parameters and details shall be determined with due consideration to the following:

(a) Pipe material.

(b) Pipe diameter.

(c) Length of test section.

(d) Duration of the test.

(e) Magnitude of test pressure and rate of pressurisation.

(f) Presence of air in the pipeline.
(g) Time required for saturation of porous liners.
(h) Potential movement of pipeline thrust restraints.
(i) Design pressure for thrust and anchor supports.
(j) Accuracy of test equipment.
(k) Ambient temperature changes during testing.
(l) Presence of leaks in equipment used for testing or equipment attachment points (such as sealing plugs).
(m) Potential for leaks in the pipeline.

NOTE - It is advisable to begin testing early in the pipeline installation to confirm adequacy of laying procedures and, where appropriate, to increase the length tested progressively as experience is gained.]

8.7.3.1 Selection Of Test Pressure

Selection of test pressure
The hydrostatic test pressure at any point in the pipeline shall be:
(a) Not less than the design pressure.
(b) Not more than 25% above the rated pressure of any pipeline component.

NOTE - The design pressure is the maximum system pressure at a point in the pipeline, considering future developments, static pressure, dynamic pressure, and an allowance for short-term surge pressure (water hammer), as determined by analysis.
Compressed air testing shall not be permitted for pressure pipe.]

8.7.3.2 Selecting Test Lengths

The pipeline length tested shall be either the whole, or a section (capable of being isolated), of the pipeline depending on the length and diameter, the availability of water, and the spacing between sectioning valves or blank ends.
The pipeline shall be divided into test sections such that:
(a) The hydrostatic test pressure at any point in the pipeline is:
    (i) not less than the design pressure; and
    (ii) not more than 25% above the rated pressure of any pipeline component; and
(b) Water is available for the test together with facilities for its disposal, in accordance with regulatory requirements, after the test.

NOTE -
(1) Pipelines longer than 1000 m may need to be tested in several sections. Where long lengths are to be tested, radio or other electronic means of communication between test operatives, to coordinate test procedures and thus minimise the test duration, is desirable.
(2) Long test sections may incorporate a large number of mechanical (that is, flanged) joints, which should be checked for leakage. The longer the test section the harder it is to locate a leak, or discriminate between a leak and the other effects, such as the absorption of air into solution under pressure.]

8.7.3.3 Pre-Test Procedures

The pre-test procedures are as follows:
(a) All required temporary and permanent thrust blocks, or other pipeline thrust-resisting methods, including integral joint-restraint systems, shall be in place, and all concrete shall be adequately cured (normally a minimum of seven days).
(b) Blank flanges or caps shall be installed at the beginning and end of the test section. Testing shall not take place against closed valves unless they are fully restrained and it is possible to check

for leakage past the valve seat. Mechanical ends that are not end load resistant shall be temporarily strutted or anchored, to withstand the test pressures without movement.

NOTE - Temporary supports should not be removed until the pipeline has been depressurised. All test personnel should be informed of the loading limits on temporary fittings and supports.

(c) Where practicable, all bolted joints shall be left exposed to allow for re-tensioning during or after testing.

(d) Compacted embedment and fill material shall be placed to leave all joints, service connections and ball valves exposed wherever possible.

(e) For PE pipelines, the pressurising time shall not exceed 45 minutes:

NOTE - The pressurising time affects the duration of the PE pipeline test.

(f) The test equipment shall be placed in position and checked for satisfactory operation.

(g The pump shall be of adequate size to raise and maintain the test pressure:

NOTE - A pump that is too small may increase the test duration or where too large it may be difficult to control the pressure.

(h) Two calibrated test gauges shall be used to cross check gauge accuracy.

(i) Slowly fill the test length of pipeline with water, preferably from the lowest point, ensuring air is vented at the high point valves. Allow a period, in the range of three hours to 24 hours, for the temperature of the test length and the test water to stabilise and for dissolved air to exit the system. The recommended rate of filling shall be based on a flow velocity of 0.05 m/s, calculated from the following equation:

$Qf \leq 12.5\pi D^2$

where

Qf = filling rate, in litres per second

D = pipe diameter, in metres

NOTE - The slow rate of 0.05 m/s avoids air entrainment when the filling water is cascading through downward gradients along the pipeline.

The period of stabilisation will depend on pipe dimensions, length, material, longitudinal profile, and air exit points. For cement-mortar lined pipe, the pipeline shall be filled at least 24 hours before the commencement of the test, to allow the lining to become saturated.

NOTE - A firm foam swab may be used ahead of the fill water to assist air removal especially where the pipeline undulates. Extract the swab at a high-point wash-out.

Typical pressure test equipment and location are shown in Figure 6-6 and Figure 6-7.]

8.7.3.3 Post-Test Procedures

After testing, pipelines shall be depressurised slowly. All air venting facilities shall be open when emptying pipelines. The test water shall be drained to an approved waterway and all connection points shall be reinstated.]

Figure 6-6 Typical pressure pipeline under field hydrostatic test

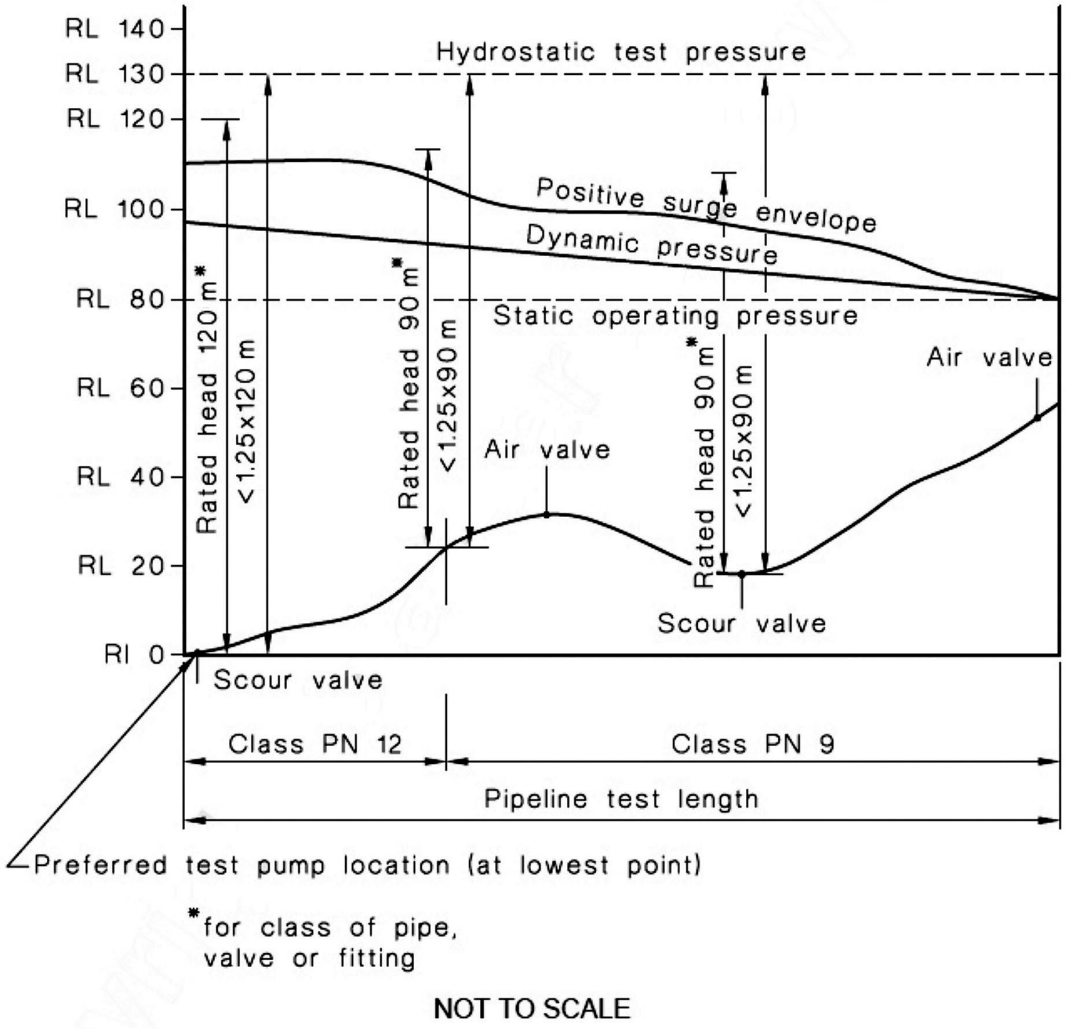
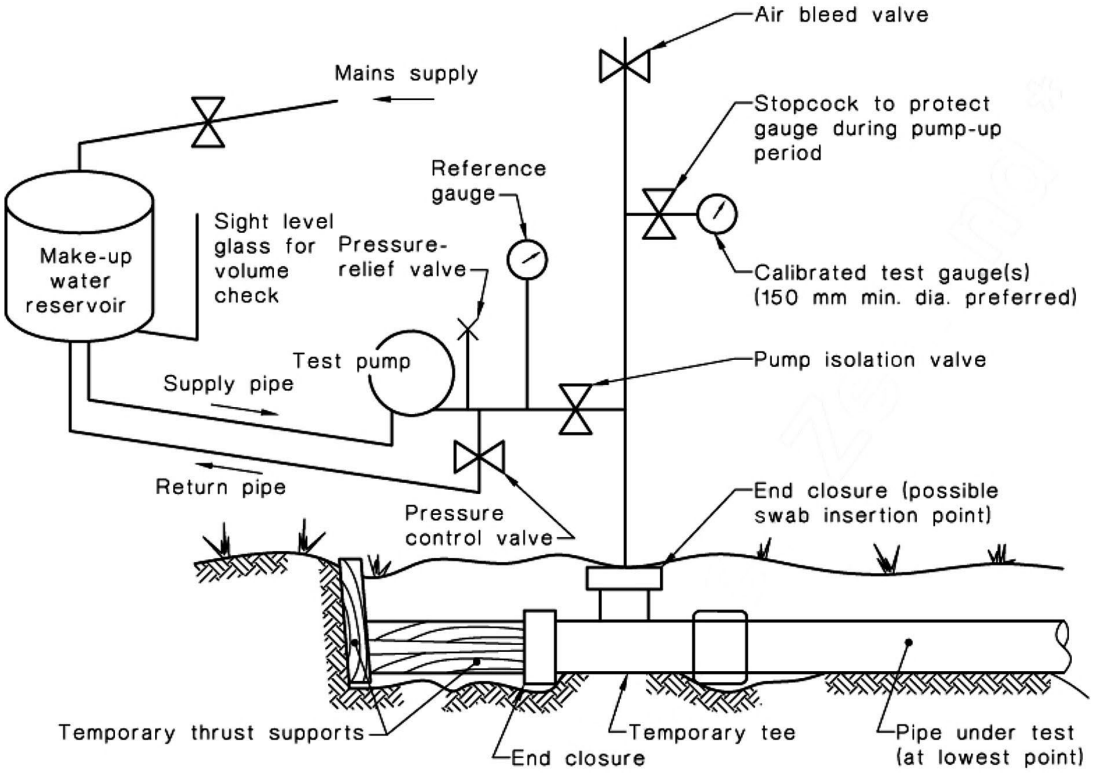


Figure 6-7 Typical field pressure test equipment layout



8.7.3.5 Constant pressure test (water loss method) - PVC, DI, GRP, and steel pipelines

This test is applicable for PVC, DI, GRP, and steel pipelines. The test length may be several kilometres in length.

8.7.3.3.1 Details of Procedure

The procedure shall be as follows:

(a) Close all valves apart from the test pump input and pressurise the test length to the specified test pressure (STP) - (see 6.7.3.1).

(b) Apply and then maintain the test pressure by the addition of measured and recorded quantities of make-up water at regular intervals over a period, in the range of 1 hour to 12 hours.

(c) Where pressure measurements are not made at the lowest part of the test length, make an allowance for the static head, between the lowest point of the pipeline and the point of measurement, to ensure that the test pressure is not exceeded at the lowest point.

The quantity of make-up water necessary to maintain the test pressure shall comply with the following equation:

$Q \leq 0.14LDH$

where

Q = allowable make-up water, in litres per hour

L = length of the test length, in kilometres

D = nominal diameter of the test length, in metres

H = average test head over length of pipeline under test, in metres

NOTE - The make-up water is not a leakage allowance, but is an allowance to cover the effects of the test head forcing small quantities of entrapped air into solution. Normally the test should last for a minimum of two hours and be concluded within five to eight hours. The make-up water requirement should reduce with time as air goes into solution. Where, after 12 hours the make-up water still exceeds the allowable limit, testing should cease and the cause of loss investigated.]

8.7.3.3.2 Acceptance

(a) The test length shall be acceptable where there is no failure of any thrust block, pipe, fitting, joint, or any other pipeline component.
(b) There is no physical leakage.
(c) The quantity of make-up water necessary to maintain the test pressure complies with 6.7.3.5.1.]

8.7.3.4 Constant Pressure Test (Water Loss Method) For Viscoelastic Pressure Pipelines

This test is applicable to PE, PP, and ABS pressure pipelines. The test lengths may be several kilometres in length.

NOTE - This method is based on VAV P78, as outlined in AS/NZS 2566.2, Appendix A
The procedure shall be as follows:

(a) Purge the air from pipeline.
(b) Apply the specified test pressure (STP) (see 6.7.3.1) to the test length.
(c) Shut off main and allow pressure to settle for 12 hours (pressure will drop significantly).
(d) Re-apply and maintain test pressure for 5 hours by successively pumping a sufficient amount of water.
(e) Measure and record water volume (V_1 in litres) required to maintain this pressure between Hour 2 and Hour 3.
(f) Measure and record water volume (V_2 in litres) required to maintain this pressure between Hour 4 and Hour 5.
(g) Calculate:
$0.55V_1 + Q$
where Q is the allowable make-up volume obtained from C3.5.1.
C3.6.2 Acceptance

The test length shall be acceptable where:

(a) The test length shall be acceptable where there is no failure of any thrust block, pipe, fitting, joint, or any other pipeline component.
(b) There is no physical leakage; and
(c) $V_2 \leq 0.55\ V_1 + Q$.]

8.7.3.5 Pressure Rebound Method For Viscoelastic Pressure Pipelines

This test is applicable to PE, PP, and ABS pressure pipelines up to and including DN 315, where a short test time is required.

NOTE - This test is based on BS EN 805:2000, Appendix A (refer to AS/NZS 2566.2).]

8.7.3.5.1 Pressure Measurement rig

The test rig shall be a recently calibrated pressure transducer, data logger, and check pressure gauge that has a dial of at least 100 mm diameter and a pressure range that places the specified test pressure (STP) (see 6.7.3.1) in the range 35% to 70% of the gauge's full scale. The transducer and the check gauge shall read within ±5% of each other. If they do not agree within this tolerance, the equipment shall be recalibrated or replaced.]

8.7.3.5.2 Procedure

The test procedure has the following three phases:

(a) A preliminary phase in which the pipeline is —
(i) depressurised and allowed to relax after the 6.7.3.3 pre-test procedure;

(ii) pressurised quickly to the test pressure and maintained at this pressure for a period of time without further water being added;

(iii) the pressure is allowed to decay by viscoelastic creep;

(iv) provided the pressure drop does not exceed a specified maximum, the pressure test can proceed to the second phase.

(b) A phase in which the volume of air remaining in the pipeline is assessed against an allowable maximum.

(c) The main test phase in which the pipeline is maintained at the test pressure for a period of time and decay due to viscoelastic creep commenced. The creep is interrupted by a rapid reduction of the pressure in the pipeline to a specified level. This rapid reduction in pressure results in contraction of the pipeline with an increase (rebound) in pressure. If, during the rebound period, the pressure versus time record shows a fall in pressure, the pipeline fails the test.]

8.7.3.5.3 Preliminary Phase

The procedure shall be as follows:

(a) Reduce pressure to just above atmospheric at the highest point of the test length, and let stand for 60 minutes. Ensure no air enters the line.

(b) Raise the pressure smoothly to STP in less than 10 minutes. Hold the pressure at STP for 30 minutes by pumping continuously, or at short intervals as needed. Do not exceed STP.

(c) Inspect for leaks during the 30 minute period, then shut off pressure.

(d) Allow the pressure to decay for 60 minutes.

(e) Measure the pressure remaining at 60 minutes (P_{60}).

(f) If $P_{60} \leq 70\%$ of STP the test is failed. The cause shall be located and rectified. Steps (a) to (e) shall be repeated. If $P_{60} > 70\%$ of STP, proceed to the air volume assessment.]

8.7.3.5.4 Air Volume Assessment

SDC: [The procedure shall be as follows:

(a) Quickly (<5 min) reduce pressure by ΔP (10%-15% of STP).

(b) Measure water volume bled out (ΔV).

(c) Calculate $\Delta V_{max\ allowable}$ as follows:

$\Delta V_{max\ allowable} = 1.2 \times V \times \Delta P(1/E_W + D/E_R)$

where

1.2 = air allowance

V = pipe volume, in litres

ΔP = measured pressure drop, in kilopascals

D = pipe internal diameter, in metres

E_R = pipe material modulus, in kilopascals (see Table C2)

E_W = bulk modulus of water, in kilopascals (see Table C3);

(d) If $\Delta V > \Delta V_{max\ allowable}$ the test has failed. The cause shall be located and rectified. The preliminary phase shall be repeated. If $\Delta V \leq \Delta V_{max\ allowable}$, proceed to the main test phase.

NOTE - ΔV and ΔP should be measured as accurately as possible, especially where the test length volume is small.]

8.7.3.5.5 Main Test Phase

Observe and record the pressure rise for 30 minutes.

In the event of failure, locate and repair leaks. If failure is marginal or doubtful, or if it is necessary to determine leakage rate, use a reference test (see 8.7.3.4).

NOTE - Figure 6-7 gives an example of a full pressure test with the main test phase extended to 90 minutes.

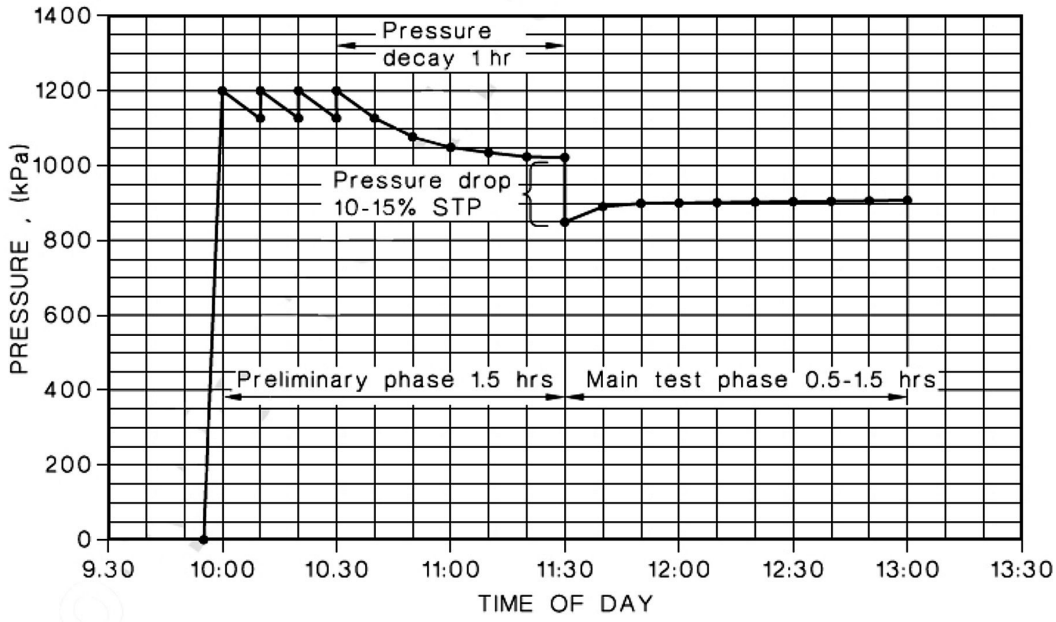
Table 6-9 Pipe E material modulus for PE 80B and PE 100

Temp (°C)	**PE 80B - *E* Modulus** (kPa×10³)			**PE 100 - *E* Modulus** (kPa×10³)		
	1 h	**2 h**	**3 h**	**1 h**	**2 h**	**3 h**
5	740	700	680	990	930	900
10	670	630	610	900	850	820
15	600	570	550	820	780	750
20	550	520	510	750	710	680
25	510	490	470	690	650	630
30	470	450	430	640	610	600

Table 6-10 Bulk modulus Ew - Water

Temperature (°C)	**Bulk Modulus** (kPa×10³)
5	2080
10	2110
15	2140
20	2170
25	2210
30	2230

SDC: *[Figure 6-8 Typical successful modified rebound test for a PE pipeline]*



8.7.3.5.6 Acceptance

The test length shall be acceptable if:

(a) There is no failure of any thrust block, pipe, fitting, joint, or any other pipeline component.

(b) There is no physical leakage.
(c) The pressure rises or remains static in the 30-minute period.

If doubt exists about the pressure recovery, the monitoring period may be increased to 90 minutes, and any pressure drop that does occur shall not exceed 20 kPa over the 90-minute period.

If the pressure drops by more than 20 kPa during the 90-minute extended period, the test fails.

Repetition of the main test phase shall only be done by carrying out the whole test procedure, including the relaxation period of 60 minutes described in 6.7.3.7.3.]

8.7.3.6 Visual Test For Small Pressure Pipelines

This test is applicable for small pipelines of all materials (less than 200 m in length), and pipelines where pipeline joints have been left exposed for the test operation (such as coiled pipe).]

8.7.3.6.1 Procedure

The procedure shall be as follows:

(a) The test pressure (see 6.7.3.1) shall be applied and the test section isolated by closing the high point air release valves and the pump feed valve.
(b) The test section shall be visually inspected for leakage at all joints, especially bolted joints, all fittings, service connections, and ball valves.
(c) Pressure gauges shall be checked to ensure that pressure has not fallen significantly indicating an undetected leak.
(d) Any detected leak shall be repaired and the section shall be retested.
(e) Where no leak is detected, high point air release valves shall be opened, the pipeline shall be depressurised to slowly drain the line into an approved waterway and all connection points shall be reinstated.

8.7.3.6.2 Acceptance

The test length shall be acceptable where:

(a) There is no failure of any thrust block, pipe, fitting, joint, or any other pipeline component.
(b) There is no physical leakage.
(c) There is no pressure loss indicative of a leak.

8.8 Water Supply Disinfection Specification

8.8.1 Disinfection Of Pipelines And Fittings

After flushing the main to remove all debris and air, the main shall be filled with water containing a free available chlorine concentration of 15 g/m^3 ± 5 g/m^3 and allowed to stand for a minimum of 12 hours for all new mains. At the end of the disinfection period, the free available chlorine (FAC) concentration shall be at least 5 g/m^3. If the FAC is less than 5 g/m^3 at the completion of the period, the disinfection shall be repeated until a satisfactory result is obtained. Note that the main should not be drained after flushing unless all high points are 'vented' to allow for complete removal of air.

Under no circumstances will the use of handfuls of hypochlorite powder or chlorine tablets dumped into the pipe and hydrant tees be an acceptable practice.

The sterilising solution should be fed by gravity or pumped into one end of the main and the 'flushing' water in the pipe displaced out of the opposite end of the main until tests carried out show that the water being displaced contains the full FAC concentration. The authorised officer will arrange for testing of the FAC concentration and, to this end, the contractor shall give 24 hours notice of intention to sterilise.

The contractor shall provide all temporary fittings necessary to allow for the introduction of the sterilising solution to and its removal from the main.
See also 8.8.3.

8.8.2 Methods Of Introducing The Sterilising Solution

Methods of introducing sterilising solution will depend on the volume of solution required for the particular main and the availability of appropriate equipment.

In general, wherever the pipe volume is less than 10 m^3, the most practical method is to add sufficient calcium or sodium hypochlorite (powder or solution) to a potable water tanker suitable for carrying potable water to achieve the desired 15 g/m^3 FAC concentration. (This may require two tankers full).

For greater quantities, the sterilising solution may be injected into the main using a portable gas chlorinator or a hypochlorinator. An approved backflow preventer shall be installed if either of these options is used.

8.8.3 Disposal Of Sterilising Solution

After the satisfactory completion of the sterilising process, the chlorine solution shall be flushed into the sanitary wastewater pipe or, alternatively, retained in a temporary surface storage pond until Council's authorised officer is satisfied that the FAC has reduced to a satisfactory concentration before being allowed to flow down the stormwater drainage system or into a natural watercourse.

8.8.4 Acceptable Method For Sterilising Mains

(a) Use sodium hypochlorite solution. This solution usually has 10% or 15% FAC.

(b) Obtain a clean water tanker, as used for potable drinking water. The tanker should have a known water capacity.

(c) Measure the required amount of sodium hypochlorite solution into a beaker and pour it into the empty tanker.

NOTE - The final strength of the chlorine to water is to be 15 g/m^3 ±5 g/m^3.

(d) Fill the tanker to the appropriate volume and ensure the solution is well mixed.

(e) Charge the new main with the chlorinated water from the tanker at one end of the main or into a new hydrant through a standpipe. All service pipes and hydrants shall be left open and allowed to run for a couple of minutes. The services and hydrants shall then be closed to allow the highest end of the main to fill completely.

NOTE - The main should ideally be charged from the highest point. This will allow the water to be gravity fed into the main. If this is not possible the water tanker shall have a truck mounted pump to pump the chlorinated water in.

(f) Seal off the main and leave it charged with the chlorinated water for 24 hours.

(g) Take samples and test for residual chlorine.

(h) After 24 hours flush the main well until the chlorine smell is gone. Once the main is connected into the reticulation system it should be flushed thoroughly before the services are connected up.

NOTE - For large mains, a water tanker may not have the required capacity so a dose pump system shall be used and approved by the authorised officer.

Example:

A. Calculate the volume of the mains to be chlorinated, that is, 85 m of 100 mm dia. main

$$\text{Vol.} = \frac{85 \times \pi \times 0.1^2}{4} = 0.67\ m^3$$

$$= 667.6\ \text{litres}$$

Plus 110 m of 150 mm dia. main

$$\text{Vol.} = \frac{110 \times \pi \times 0.15^2}{} = 1.944\ m^3$$

$$\frac{}{4} = 1.944 \text{ litres}$$

Total volume = 1,944 + 667.6 = 2,611.6 litres

B. The total volume of 2,611.6 litres is less than the volume of the water tanker (say 5,000 litres) so calculate how many millilitres of sodium hypochlorite is required for the 5,000 litre tanker to give a final solution of 15 g/m^3.

$$v = \frac{V \times c}{s \times 10}$$

v = volume of sodium hypochlorite in ml
V = volume of water tanker
c = concentration of final solution in g/m^3
s = strength of concentrated hypochlorite in % FAC

$$v = \frac{5000 \times 15}{15 \times 10]} = 500 \text{ ml}$$

Section 9. Network Utility Services

1.1 Scope

This section sets out requirements for the provision of stormwater, wastewater, and water supply systems, power, telecommunications and gas, and their locations in the road. The scope of these provisions applies to both future and existing roads and applies equally to all network utility services.

The developer shall provide satisfactory evidence to Council's Corridor Manager that the network utility operators are prepared to reticulate the subdivision and that agreement on the financial arrangements for the installation of each supply has been reached.

Note - Network utility services in roads are subject to the Utilities Access Act 2010 and the Infrastructure (Amendments Relating to Utilities Access) Act 2010. The national code of Practise for Utility Operators Access to Transportation corridors July 2019.

1.2 General

1.2.1 Legislation

Referenced legislation and documents are listed in the Referenced Documents section B of this CoP.

1.2.2 Definitions

For the purpose of Section 7 the following definitions shall apply:
Code means the national code of practice approved in accordance with the Utilities Access Act 2010.

Corridor Manager has the same meaning given to it by the Utilities Access Act 2010.

1.2.3 Context

The developer is required to make all arrangements with the appropriate network utility operators for the supply and installation of stormwater, wastewater, water supply, and electric power and to the extent applicable for the provision of telecommunication and gas reticulation.

The developer shall provide satisfactory evidence to Council's Corridor Manager that the network utility operators are prepared to reticulate the subdivision and that agreement on the financial arrangements for the installation of each supply has been reached. The following applies to each utility:

(a) Stormwater, wastewater, and water supply. Where water supply and wastewater pipes, and stormwater systems are in the road reserve, they shall be installed at the time of road construction to the requirements of Council's Corridor Manager and Council's Strategic Water and Waste Department.

(b) Electricity. The supply of electricity will generally be by means of an underground system. Ducts shall be installed at the time of road construction to the requirements of the electrical supply authority and Council's Corridor Manager. Where the developer is intending to provide electricity other than by underground connections, the developer shall provide alternative supply arrangements for approval by Council.

c) Telecommunications. Arrangements shall be made with the telecommunication supplier for the reticulation of telecommunication facilities. Where only part of this reticulation is being supplied initially, the arrangements shall include the requisite space being maintained for the installation of the remainder of the reticulation at a later date. Ducts will be installed by the developer at the time of carriageway formation to the requirements specified by the telecommunications supplier and be approved by Council's Corridor Manager.

(d) Gas. Where a reticulated gas supply is proposed to service a development the developer shall provide plans to the gas supply authority and Council's Corridor Manager. All pipes/ducts shall be installed at the time of road construction in accordance with the approved plans.

The developer shall follow the requirements of the Code to the extent that they apply to the utility installation for the development.

1.3 Design

1.3.1 Plans

Copies of the plans of the development/subdivision shall be forwarded by the developer to all of the affected network utility operators at an early date to facilitate the design of the reticulation.

NOTE
It is important that all of the affected network utility operators are advised by the developer of any amendments to the development plan. Information when available on the type of dwellings and likelihood of more than one dwelling on any lot, will be valuable for design purposes.

1.3.1.1 In preparing the engineering plans consideration shall be given to the requirements of the network utility operators and Council's Corridor Manager for

(a) The minimum depth of cables and pipes.

(b) The network utility operator's desired position for the cable and piping within the road berm as agreed with Council's Corridor Manager.

(c) The minimum separation distances between power or telecommunication cables, and gas or water mains.

(d) The width of berm which shall be clear of other services and obstructions to enable efficient cable-laying operations.

Common trenching for power and telecommunication cables is commonly adopted at a distance of between 0.6 m and 1.2 m from the boundary. The possibility of common trenching should be discussed with each of the network utility operators during the design phase.

NOTE:
Reference should be made to each network utility operator and Council's Corridor Manager for their specific requirements. Refer to the Code for further information.

1.3.2 Utilities above ground

Utilities should preferably be sited within the road berm or on land which will legally become part of the road but which is set back outside the normal road line. Alternatively but significantly less preferred hence requires suitable justification, separate lots (public utility reserves) or easements over private property may be used. If there are any concerns raised about the safety of above ground structures, the risk should be assessed in accordance with the requirements of the Code and any significant risks mitigated.

Similarly the locations of mail boxes and refuse collections and refuse storage must be carefully considered during the design development to ensure that safe access for the provider and normal road user is maintained. These shall be within the road right of way but set back from the road line.

1.4 Construction

1.4.1 Underground Cabling

Underground cable laying shall be achieved by the most appropriate method considering the nature of subsoil and potential damage to infrastructures and shall be to the approval of Council's Corridor Manager.

1.4.2 Materials

Materials and sizes of ducts and pipes shall comply with the requirements of the network utility operators and the colours should be in accordance with the Department of Labour's *Guide for safety with underground services.*

1.4.3 Conversion To Underground On Existing Roads

Where a proposed subdivision fronts on to an existing road, the conversion of overhead reticulation to underground will in some instances be desirable. Agreement on the feasibility and benefit shall first be agreed between the network utility operator and Council.

1.4.4 Commercial And Industrial Subdivisions

The servicing requirements for commercial and industrial areas are often indeterminate. Close liaison between the developer and the network utility operator is advisable, particularly immediately before cabling is installed so that changes can be incorporated to accommodate extra sites or the requirements of a particular industry.

1.4.5 Location of services

1.4.5.1 Position In The Road

Position and depth shall be agreed with the appropriate network utility operator and Council's Corridor Manager in accordance with the provisions of the Code.

1.4.5.2 Recording Of Underground Services

Council shall maintain a procedure for recording the location of their underground services on plans which are readily available to the public at Council's main office. It is unlikely that Council will be able to provide a service for utility services other than those for which it is immediately responsible.

These will usually be stormwater, wastewater, and rural and urban water supply. Other authorities or network utility operators are required to maintain similar records of the existence and detailed location of their services for ready reference.

1.4.5.3 Accuracy And Tolerance

It is essential that all services be laid to predictable lines if there is to be a reasonable opportunity of laying new services in existing systems. In addition to specifying the location of any service in the road berm, there should also be a tolerance which shall on no account be exceeded without proper measurement and recording on the detailed record plan. Tolerance of ±300 mm in the horizontal and ±100 mm in the vertical is a practicable requirement.

1.4.6 Trenches

When new subdivision construction is undertaken the backfilling and compaction of trenches to a state of stability consistent with the future of the surface shall be carried out in accordance with the Code and to the satisfaction of Council's Corridor Manager.

Where underground services are laid after the initial construction of the subdivision or where they are extended from an existing area into a new one, special attention shall be given to the opening and reinstatement of trenches in accordance with the Code and to the satisfaction of Council's Corridor Manager.

1.5 Connection to Electricity and Telecommunications Services

Unless otherwise approved by Council through a resource consent decision, all new allotments shall have physical connections to power and telecommunications utilities.

1.6 Positioning of Lateral Connections

Wherever possible connections shall be made at the following positions on the road frontage of each property as identified below, unless otherwise approved by Council:

Power and Telephone	immediately adjacent to the boundary
Stormwater	1 m from lower elevation side boundary
Sewer	1.5 m from lower elevation side boundary
Water	centre of road frontage
Gas	centre of road frontage

All piped connections shall extend to 0.5 m inside the property boundary.

The depth of connection at the property frontage shall be:

Power and Telephone	minimum 600 mm cover, if installed
Stormwater and Sewer	minimum 750 mm cover, preferred depth 900 mm cover, but sufficient to service all future building connections at grades set out in the Building Code
Water	450 mm cover
Gas	Minimum 450 cover (low pressure) Minimum 600 cover (intermediate pressure)

The position of stormwater and sewer laterals shall be shown by incorporating a vertical riser on the service line and extending to 200 mm above ground level. The top of the riser shall be securely capped. Sewer laterals are to be painted red to clearly distinguish them from storm laterals.

Water connections shall include a toby valve clearly marked with a cover.
See standard drawing W06.

1.7 Status of Laterals

All services within the boundaries of the road reserve shall be property of Council or other utility company once formally taken over by that organisation.

Unless specifically arranged otherwise and protected by an easement, services through privately owned allotments shall be the responsibility of the landowner.
Accordingly, in the construction of new services to rear allotments, Council's policy is as follows:

(a) A separate connection to be provided to each allotment wherever possible.

(b) Where various allotments are serviced by a common right of way or access lot, a public drain is to be constructed along the right of way. The public drain is to be constructed to Council's standards with manholes at each end (or manhole and cleaning eye where permitted by the Engineer) and maintenance access for Council is to be provided via a registered easement in gross.

(c) Where a separate connection is not possible or not easily achievable, then a drain in common may be constructed provided that:
   (i) all of the affected landowners are in agreement with this option;
   (ii) the common drain is to be registered against the affected titles;
   (iii) no more than seven lots are to be serviced by any one common private drain.

(d) The costs of registering easements and agreements against titles shall be borne by the developer.

In the case of common sewers or storm drains, Council will require manholes at each end of the service, or one manhole and one cleaning eye depending on the length, in order to maintain the line and remedy any blockage. In the case of common water supplies Council will require the installation of appropriate valving in order to isolate the supply.

1.8 Definition of "Reasonable Distance"

The definition of "a reasonable distance" shall be assessed on a case-by-case basis and take into consideration such factors as the relative cost of the in-property reticulation and the extensions to connect to the existing services, the lengths of connections and any difficulties in making a connection at grade. However, in general terms, an application is expected to include connection to existing services where any of the following apply:

(a) The subdivision is wholly or partially within the Urban Zone as defined by the Southland District Plan.

(b) The centre of the subdivision is within 500 m of the boundary of the Urban Zone.

(c) The centre of the subdivision is within 500 m of an existing service.

Section 10. **Landscape**

10.1 Scope

This section sets out requirements for the design and construction of landscape and planting for land development and subdivision. This section applies to all landscape areas requiring planting and revegetation whether in road reserves, swales, rain gardens, ponds/wetlands, recreation reserves, or other public reserves, and private land.

10.2 General

10.2.1 Approval

Consultation with Council on landscape design and construction at an early stage of the design development is required. The Council may seek input from the relevant Community Board in relation to landscape issues, prior to its approval of any proposed landscaping. If landscape infrastructure proposed is over and above the minimal level of service, Council has to agree to the increase in cost.

Stormwater systems including secondary flow paths shall be considered when landscape designs are determined, so as to avoid conflict or failure of these systems. Note that these become stormwater assets under the Three Waters legislation.

10.2.2 Environmentally Responsible Design

Landscape design has application throughout the subdivision and development process. Landscape design should be considered in the early stages of a development and at this initial concept stage it is important to establish objectives for overall landscape design involving the appropriate professionals to assess the natural systems, vegetation, and landscape features. This includes consideration of protecting, maintaining, and restoring existing natural ecosystems, vegetation, and landscape features; responding to the surrounding landscape character and context; and cultural and heritage elements; and contributing to ecological and habitat biodiversity. Provision of amenity open space and access is required to make open space connections, access to and location of watercourses, and provision of reserves and streetscape to provide a framework of coherence and amenity.

10.2.3 Reserves and Land Protection Covenants

Layout plans and location of reserves and land protection covenants must be discussed with Council prior to the lodgement of finalised plans. Development plans for all future reserves shall be submitted with the application for engineering approval, no work is to be carried out on site before Council approval is issued.

All reserve development works shall be completed in accordance with the plans approved by Council. Development may include earthworks, drainage, planting, paths, structures (such as seating, tables, litter bins, fencing, barriers, signs, and play equipment) and facilities (such as toilets, changing sheds and footpath lighting) as specified by Council.

10.2.4 Ecological, Functional, and Aesthetic Opportunities

Planting provides a range of ecological, functional, and aesthetic opportunities for environmental enhancement:

(a) Ecological:
- (i) provides, protects, and maintains terrestrial biodiversity and habitat;
- (ii) reduces the amount of sediment and pollutants entering waterways;
- (iii) maintains and enhances water quality and habitat;
- (iv) reduces surface water flooding;

(v) increases stability and contributes to erosion control;
(vi) supports carbon sequestration;
(vii) supports ecosystem functioning including nutrient recycling, water retention, purification, and sediment control;
(viii) provides wildlife habitat value.

(b) Functional:
(i) defines space;
(ii) provides shade, shelter, and privacy;
(iii) screens unsightly outlooks and provides visual barriers;
(iv) ameliorates sound and reduces pollution;
(v) assists driver recognition of road link and place context;
(vi) reduces glare and reflection and provides urban cooling;
(vii) assists in the control of erosion;
(viii) creates physical barriers;
(ix) provides recreation and amenity value;
(x) provides edible species;
(xi) provides opportunities for enhancing health, and should not be detrimental to it.

(c) Aesthetic:
(i) frames views;
(ii) emphasises landform and landscape features;
(iii) provides visual unity in the environment;
(iv) reduces the visual impact of the roadway;
(v) softens hard surfaces and bare areas;
(vi) provides colour, form, and texture;
(vii) provides visual lineage within and between regions;
(viii) provides identity and environment.

10.2.5 Landscape and Planting Opportunities

Opportunities for landscaping are diverse, ranging from specimen tree planting to planting associated with existing indigenous vegetation, traffic management devices, riparian margins, wetlands, swales, rain gardens, ponds, reserves, and specific landscape features in the development.

10.3 Design

10.3.1 Location

The design shall be submitted to Council, in line with Council's Tree Plan (or applicable successor) for approval prior to installation.

Landscaping and planting should be designed to respond to the overall environmental context such as vegetation and water bodies, cultural and heritage elements, local road geometry, stormwater and reserve design, and utilities placement. Planting may include specimen trees, edible gardens, rain gardens, swales, and other amenity garden features.

Infrastructural services should be planned at the same time as the landscape design so that tree and garden planting location does not compromise the integrity and efficient operation of services. If particular landscape conditions or objectives are required for a subdivision or development then these will need to be taken into account prior to undertaking detailed engineering design.

Consideration shall be given to the location of trees that will grow into large specimens and paved surfaces, as root migration/growth can adversely impact on the sub-base and levelness of the paving.

In addition consideration must be given to the potential long term impacts to the neighbouring properties. Aspects such as shade, maintenance access, falling leaves and the like.

10.3.2 Reserve Location and Layout

Reserve location and layout design shall take into account adjoining land uses and areas to ensure there is an appropriate provision of recreation assets and landscaping in accordance with Council's plans and policies. The design of access routes into and through a reserve should ensure linkages with existing networks, consider future developments both of the reserve and adjoining areas, take into account topography, and shall follow Crime Prevention through Environmental Design (CPTED) principles.

10.3.3 Existing Vegetation and Trees

All existing vegetation and trees to be retained shall be cordoned off to protect the root zone and vegetation, prior to the commencement of construction and the cordon shall remain in place until completion of construction.

Existing trees to be retained are to be protected by temporary fencing in a circle with a radius equal to the maximum crown extension (drip line). A qualified person shall be used to determine the protected area and supervise construction.

At no time shall anything be deposited in the root zones of protected vegetation and trees. If installation is required under existing vegetation trenchless technology should be considered, if this is not practicable advice from a suitably qualified person should be sought to minimise damage to the vegetation.

A tree or vegetation plan and construction methodology shall be supplied to Council including:

(a) Position and design of temporary protective fencing or other methods of protection.
(b) Arboricultural maintenance required.
(c) Methods of protection of the tree and root zone where construction is to occur near the root zone and tree canopy.
(d) Maintenance required for long term health and stability of the tree or vegetation.

10.3.4 New trees and road geometry

Separation and sight distances should be considered when planting on roads. Vegetation shall not be planted or allowed to grow in a position which will prevent the driver of a vehicle from having a clear and unobstructed view of official traffic signs or signals, rapid number, approaching or merging traffic or any corner, bend, intersection or vehicle crossing.

Vegetation shall not be planted or allowed to grow in a position that will reduce the effectiveness of road management.

In areas where ice can form on roads, vegetation shall not be planted, in a position that will shade a road between the hours of 10.00 am and 2.00 pm on the shortest day of the year. The exception to this standard is where topography is already preventing the direct access of sunlight on to the road or where the vegetation existed at the time of notification of the Plan.

Alternative location and design proposals shall also be considered, such as provision of trees in a dedicated area or 'non-services' berm in the road reserve. Tree planting in groups can help accentuate road perception (see Section 3.3.14). Strategically placed, grouped plantings of trees are often of greater benefit and impact than individual trees placed linearly in a roadside berm.

10.3.5 Planted grass areas, berms, swales, or rain gardens

Berms, swales, or rain gardens shall be of sufficient width to allow for adequate growth of the plants and ease of maintenance. Narrow grass strips should be avoided. It is important to provide adequate means for tree growth and ongoing tree health at the same time as allowing for infiltration of water.

10.3.6 Quality control

All plants shall be sound, healthy, vigorous, and free of any defects which may be detrimental to plant growth and development. In addition, plants should have vigorous root and branch systems and plants supplied in pots should not be root bound. To ensure that plants adapt and thrive once planted they should be 'hardened off' prior to planting. Only species adapted to the site conditions shall be planted.

10.3.7 Landscaping structures

Landscaping structures include (but are not limited to) sculptures, walls, fences, screens, bollards, entranceways, and posts. The materials should be robust to suit their purpose and ideally reflect the local character. The design of the landscape structure shall be considered as an integral part of the development and surroundings to fulfil both functional and aesthetic requirements. Durability and maintenance requirements shall be considered. Structures shall not:

(a) Inappropriately limit safe sight lines.
(b) Be a hazard to pedestrians, people with disabilities, cyclists, or vehicle traffic.

Entranceway wall structures shall be located fully on private land unless Council approval is obtained. Any other immovable landscape structure (for example boulders) shall be located to prevent obstructing access to underground services.
Structures shall be designed to safely withstand appropriate loadings. Structures not exempt under the Building Act shall only be constructed on receipt of a building consent.
Playground equipment shall comply with NZS 5828 and Standards NZ Handbook 5828.1.

All retaining walls including those not requiring a building consent should be constructed to resist lateral earth pressures and those from any surcharge loading that may be present.

10.3.8 Walkways and cycleways

Any paving though reserves shall be constructed to the same standard and composition as set out for street footpaths in the locality, unless otherwise authorised by Council as per Standards NZ Handbook 8630:2004.

10.3.9 Fencing of reserves

The permanent fencing of common boundaries of any reserve including esplanade, reserve accessways, and road boundaries, may be required. Standards and requirements shall be in accordance with the Fencing Act 1978 and/or any replacement versions. Under normal circumstances Council do not require fencing between a reserve and the public Road. However, Council will require a fencing covenant to be registered on all titles of properties with a common boundary to reserve land, absolving the Council against all costs of erection and maintenance of fences on common boundaries.

10.3.10 Planting period and irrigation

Planting programmes where possible shall occur in the season that optimises growing conditions for plants and trees and maximises plant establishment.

Council may require provision for permanent or temporary irrigation of specimen trees, gardens, or plantings. Irrigation of trees shall be required by the developer during the first two summer seasons following planting. Provision for watering during the establishment of plants may be required for gardens that are not otherwise irrigated.

10.4 Construction and Maintenance

10.4.1 Introduction

It is the developer's responsibility to ensure that the landscaping meets the required standards at the termination of the five year maintenance period, unless otherwise agreed with Council. The developer is responsible (and may be bonded) for the routine maintenance and replacement of the planting including dead wooding, weed control, mulching, replacing dead trees, shrubs, and plants, and watering for a defined period from the date Council issues the Section 224 completion certificate under the RMA.

10.4.2 Soil and Fertility

The developer shall be responsible for the supply and spreading of soil. Topsoil should be correctly stored and handled when stripped and respread.

All soil used for landscaping shall be free from any contaminants that may affect human health. Any soil which is to be utilised for landscaping purposes, that has been on a site used for Hazardous Activities or Industries, shall be tested for levels of contamination, which shall prove that it is suitable prior to use.
A soil test shall be undertaken to determine the composition and type of fertiliser to be applied to the area being developed. A proprietary fertiliser or soil ameliorant suited to the species shall be applied where the existing soil is deficient in minerals and nutrients, plants are showing signs of lack of fertility, or to ensure maximum health and vigour.

Application rates and type of fertiliser or soil ameliorant should be selected according to species and soil fertility.

10.4.3 Weeds and Litter Control

At the end of the maintenance period there shall generally be no weeds within 2 m of any tree planting or in garden beds. Weeds should be controlled in an appropriate manner. When hoeing/pulling weeds care shall be taken to avoid damage to plants and their roots. The soil shall not be mixed with mulch when removing weeds. Any spraying should be kept to a minimum near swales, rain gardens, ponds, riparian margins, and adjacent properties.
All areas once established shall be kept free of litter and debris, including paper, plastic, stones, bricks, bottles, glass, cans, and other forms of inorganic matter.

10.4.4 Planting Grass Areas

Grass areas and berms shall be formed after all other construction has been completed. The grass areas and berms shall incorporate not less than 100 mm compacted thickness of friable weed and stone free topsoil (generally made up of a compositions of approximately 1 - 5% sand, 7 - 16% humus or organic material, and no more that 30% weight in clay) placed over a base material capable of allowing root penetration and sustaining growth. The maximum slope for grass areas intended to be mown is 1:5.

Heavily compacted soils shall be ripped to a depth of 300 mm with rip lines 1 m apart, and rolled, before any laying of topsoil. The ground profile shall be smooth and free of ruts and depressions prior to grassing. Ripping to decompact soils should not be undertaken within the dripline of trees to be retained. Grass areas and berms shall be graded to edges (for example, pavement or footpath) allowing for approximately 15 mm of settlement.

Rural berms shall be topsoiled to the same standards as urban berms unless they make use of already grassed undisturbed ground.

The area for grass seeding shall be free of all weed species. Grass seed mixes shall be either an approved dwarf cultivar rye grass or an approved turf species blend. Other special purpose grass seed and plant species may be used in special areas such as swales and rain gardens.

A sward coverage of not less than 90% shall be achieved within one month of sowing, and before completion documentation shall be provided for processing by Council. All established grass shall be mown to a range specified by Council. A common mowing height range is a minimum height of 50 mm and maximum height of 100 mm. All grass edges shall be maintained in a neat and tidy manner.

10.4.5 Mulch

Mulch shall be applied to tree and garden areas to conserve moisture and reduce weed growth, except in riparian margins. Typically mulch will be cambium grade bark mulch, clean, free of sawdust and dirt, and with individual pieces no larger than 100 mm; mulched trees/branches that have no viable seeds; or stone mulches. Mulch for planting beds shall be a uniform 100 mm in final depth. Edges shall be formed to hold the mulch without spillage on to adjacent surfaces.

Before mulching soil should be damp to a depth of 300 mm. Mulching should be carried out on an ongoing basis to all garden beds and juvenile trees to maintain specified depth at end of maintenance period.

Mulch shall only be spread after the soil surface is levelled off to remove bumps and hollows. Weeds and grass are to be removed prior to mulching. Plants shall not be damaged or buried during the mulching process. Where it is known that bark mulch affects certain species or will be lost due to wind, slope of the land, or for some other reason, alternative mulches shall be considered and used.

10.4.6 Specimen Tree Planting

Specimen trees are defined as trees with a trunk diameter of 25 mm to 100 mm when measured at 1400 mm above ground level. Larger trees can be used with the approval of Council.

Those contractors involved in specimen tree planting and maintenance should be competent horticultural/arboricultural practitioners and therefore follow accepted industry standard procedures for tree planting. Establishment and initial maintenance are critical to the long-term viability of the specimen tree.

Specimen trees shall be sound, healthy, vigorous, and free of any defects (relative to the species). Specimen trees are to be a minimum of PB 95 (planter bag of 95 pint capacity approximately 54 L) grade when planted. A recommended minimum height for specimen trees is 2.5 m at the time of planting to aid early establishment unless the local conditions of a site require consideration of alternatives, for example, an exposed site may require small, well-hardened trees. Specimen trees between 1.5 - 2.5 m may be allowed with the approval of Council.

Given the generally modified nature of soil in subdivisions it is essential that a suitable tree planting pit be prepared. The approach shall be to have:

(a) Ground free from debris and rubbish.

(b) Ground cultivated to a depth of 1 m and a width of 1 m to break up any compaction, fracture subsoil, and afford drainage to hard rock areas.

(c) Sides of planting holes crumbled and not smooth.

(d) Topsoil incorporated into the upper level of planting holes.

(e) Each tree fertilised with an appropriate amount of slow release fertiliser, as per the manufacturer's recommendations.

(f) Final planted depth consistent with finished ground level.

(g) Each tree adequately staked to withstand movement in natural wind conditions and to meet Council standards.

(h) Trees secured with expandable ties at approximately 1/3 of their height or as high as required to support the tree (to be checked every six months) or anchored below ground with a root ball anchor.

(i) Soil firmed sufficiently to force any air pockets from planting holes.

(j) Trees watered immediately following planting.

(k) Trees radially mulched to a distance of 500 mm or to drip line, whichever is the greater area and a depth of 100 mm.

(l) Staking uniformly low and visually consistent throughout the subdivision stage.

Ground-treated timber stakes should only be used if the stakes are to be removed once the trees are stable, that is at the end of a maintenance period.

The onus is on the developer to ensure that trees are protected during the further development of the subdivision (that is, the construction of dwellings/buildings) and during the defined maintenance period.

10.4.7 General Amenity Planting

Before topsoil is added all stripped and graded ground intended for planting should be cultivated to a depth appropriate to the plant species including a sufficient depth to break up any compaction. There should be friable topsoil for shrubs and ground cover appropriate to the depth of the root ball.

10.4.8 Revegetation Planting and Existing Vegetation

Revegetation planting shall be a minimum grade of PB3 (planter bag) or root trainers and shall be planted at a density and size of plant that achieves a coverage ratio specified by Council's Tree Plan Plants shall be spaced unevenly in the planting layout to encourage a natural appearance and setting.

Assisted natural revegetation is a technique using native seedling establishment complemented with weeding, thinning, and mulching and is an option that may be considered.

Edges of existing vegetation, to be retained where appropriate, shall be planted to mitigate the effects of wind funnelling. Mulches can be used in these areas to minimise the establishment of weed species.

10.4.9 Ponds, Wetlands, and Riparian Margins Planting

Ponds, wetlands, and riparian margins should have site specific planting plans prepared by a suitably qualified person and submitted to Council for approval of designs. Access shall be provided for future removal and/or maintenance.

Any water body (not including natural lakes) shall take into consideration the likelihood of people falling into the pond. Furthermore, the design shall provide appropriate access that a person who has fallen into the pond can climb out.

10.4.10 Pruning

Trees should be selected and located to minimise ongoing pruning costs and requirements. All pruning of street trees shall be undertaken by a suitably qualified arborist. All pruning shall be undertaken to recognised arboricultural practices.

Pruning should be carried out on shrubs to maintain a high standard of presentation, display, and plant vigour. Paths, roads, and all other accessways should be kept clear of excess growth. Pruning may also be necessary to ensure signs are not obscured. Where appropriate, pruning should allow for adequate sight visibility to ensure the safety of road and footpath users. However, there are situations where planting should be used to restrict visibility and slow traffic or frame views.

Vegetation shall not be allowed to grow in a position which will prevent the driver of a vehicle from having a clear and unobstructed view of official traffic signs or signals, rapid number, approaching or merging traffic or any corner, bend, intersection or vehicle crossing.

Vegetation shall not be allowed to grow in a position that will reduce the effectiveness of road management.

In areas where ice can form on roads, vegetation shall not be allowed to grow, in a position that will shade a road between the hours of 10.00 am and 2.00 pm on the shortest day of the year. The exception to this standard is where topography is already preventing the direct access of sunlight on to the road or where the vegetation existed at the time of notification of the plan.

Vegetation shall be maintained in a condition which prevents damage to the road surface, road structures or drainage devices.

All weak, dead, diseased, and damaged growth should be removed, and pruning carried out to maintain the desired shape and size. Pruning should not be carried out during leaf burst or leaf fall. The following pruning techniques (for shrubs) should be employed where appropriate:

(a) Tips to be pinched or purged as appropriate for species to give desired shape and size.
(b) Form pruning of young plants to ensure compact form and shape.
(c) Undercutting of groundcovers at edges generally.
(d) Plants are to be pruned so that they do not smother neighbouring plants.

10.4.11 Maintenance

Landscape plans shall ensure that future maintenance requirements have been considered so that ongoing costs are minimised. The maintenance period will vary depending on the nature type of planting and should be covered in specifications and as required by Council.

The developer shall:

(a) Remove from the area all temporary services, machinery, and surplus materials that have been used for the construction, and leave the site in a tidy condition.
(b) Clean all paths and surrounding areas.
(d) Clear and weed all channels.
(e) Ensure that all damaged, vandalised, stolen, or dead plants are replaced to maintain numbers and unity of display.
(f) Ensure that amenity planting beds are cleaned to remove prunings, dead or damaged leaves, and any other object or material, including retail attachments such as plant labels. The edges of the beds shall be left evenly shaped and sloped.

Land to be vested for reserves purposes shall as a minimum meet the following general requirements:

(g) The land is to be free of noxious weeds, tree stumps (above ground) and other specified vegetation.
(h) All previous fences, farm utilities, building remains, and rubbish are to be removed or disposed of to the satisfaction of Council.
(i) Land to be mown shall be accessible to suitable mowing equipment, and is to have an established turf type seed grass cover.
(j) Drainage reserves, ponds, lakes, channels, and streams requiring maintenance shall have suitable access for machinery.
(k) All boundaries are to be surveyed and clearly pegged.
(l) Any proposed landscape planting or furniture/structures shall be completed.
(m) The land is to be free of easements/services unless previously agreed in writing by Council.
(n) Any rights of way or easements are to be formalised at no cost to Council.

Section 11. Community Facilities

11.1 Purpose

The purpose of this chapter is to outline the standards for the design and creation of community facilities that are to be vested in the Council. The aim is to achieve a high standard of accessibility, public health and safety, variety, multifunctional use, and environmental value, whilst maintaining whole-of-life affordability.

The community facilities covered in this CoP include parks, reserves, council-owned buildings (e.g., library, hall), playground, public toilets, sport fields, cemetery, and water facilities. These assets provide the community and visitors with access to Council services and activities.

11.2 Performance Outcomes

Community facilities play an important role in serving communities by provides them with the opportunity to access services, activities and interact socially with other members of the community. The facilities enable the communities to be more socially connected and active and makes Southland a desirable place to live. The way a subdivision relates to community facilities is very important for their usability, amenity and public safety.

The performance outcomes for the design and creation of community facilities and associated assets sought by this CoP are as follows:

- Providing a local hub where residents and visitors can access services or engage in social activities, catering for the changing demand
- Providing accessible facilities and safe public places for communities, clubs, organisations and individuals to enjoy sporting, social, cultural, educational and recreational pursuits
- Providing safe, clean and accessible public toilets and dump stations across Southland District for both residents and visitors
- Providing benefits to both the environment and public health in Southland District by reducing the likelihood of human waste impacts and raising community appreciation and use of Council's facilities.
- Providing facilities that are affordable and accessible to operate and maintain
- Providing facilities and assets that are completed to a high standard of presentation prior to vesting in the Council; and
- Providing plantings that meet amenity, natural character, beautification (including colour), ease of maintenance whilst avoiding off-site effects.

11.3 Referenced Documents

11.3.1 District Plan Requirements

This section addresses matters that are specific to the Council asset creation or activities that may have an impact on an asset. They are subject to Activity Management Plans. Key provisions of the Activity Management Plans that preside over the design and creation of community facilities are urban design, subdivision and reserves and open space sections.

11.3.2 Internal Standards

Table 11-1 sets out additional documents that may be useful references for designers

Table 11-1 Useful references for Community Facilities and Associated Asset Design and Provision

Reserves Management Plan
Activity Management Plans
Tree Plan
Donations Guidelines (ICC)

11.3.3 External Standards

Community facilities and associated assets will be designed and created in a manner consistent with this document. Additional requirements may be specified from the documents set out in Section 1 of this CoP. Where an Act or National Standards document is referenced, this will be the current version including any associated amendments.

Recreation Aotearoa Open Spaces Maintenance Specification
NZS 5828 Playground Standards
Standards NZ Handbook 5828.1 Playground Standards
Standards NZ Handbook 8630:2004 Track and Structure Handbook

11.3.4 General

Gaps in neighbourhood park/reserve provision identified in Activity Management Plans or an indicative reserve is identified in a structure plan or outline development plan (including the need to protect natural or archaeological features, linkages, viewpoints or rest areas) must be used to assist in determining appropriate sites for community resource.

11.3.5 Financial Contributions – (Southland District Council only)

Refer to Section 2.14 – Financial Contributions, Southland District Plan (or applicable successor).

11.3.6 Process of determining design purpose

Prior to lodging subdivision applications, developers must undertake pre-application workshop with the relevant team members within the Council. The teams could include planners, Transport team, 3 waters team and community facilities team and any other teams that may be relevant. The purpose of these discussions is to form the agreement on the matters relevant to the subdivision or adjacent areas and ensure that urban design goals are met in the design of both private and public spaces, and any areas for utility or transportation purposes.

Following pre-application workhops with the Council's teams, the location and size of community resource (e.g., a reserve) will be included in the scheme plan submitted with the subdivision application. The vesting of the community resource, its classification and any development requested by or agreed to be the Council will be a condition of the consent. There is a requirement for a concept plan to be submitted for the development of community resource. The community resource is required

to be presented for vesting in accordance with these standards. Development of the community resource will generally be undertaken following vesting and in consultation with the community.

11.4 Community Facilities

All built assets (e.g. signs, fences, artworks, lighting, structures and furniture) must be approved by Council prior to installation. They must be robust, low-maintenance, and safe for use by the public. Consider the life-cycle of built assets, to reduce the frequency of renewing or replacing such assets in the future. Consider colours and construction materials in aesthetic terms, for built assets that form part of a reserve.

Note that the developer is responsible for gaining all necessary building consents required under the Building Act.

11.4.1 Sport fields

The Council objectives are to provide and develop sports fields that meet the needs of the local community and, in the case of district facilities, the needs and aspirations of the greater community. Provide fully accessible sports fields with surfacing that allows easy access where specified. Not all sites will be suitable and some that are may not require such facilities.

Obtain approval from the Council for the design proposal for the sports field within a reserve, including the types of recreation opportunity. This prevents oversupply of facilities in other reserves nearby. It should also simplify the numbers and options and hence simplify operations and maintenance costs.

All play facilities must comply with:

- Sports Field Development Guide 2020 (Recreation Aotearoa) ;
- Open Spaces Maintenance Specification 3.2-3.7 (Recreation Aotearoa)

11.4.2 Playgrounds and Play Structures

The Council's objective is to provide and develop interesting and exciting playgrounds that meet the needs of the local community and, in the case of district facilities, the needs and aspirations of the greater community. Provide fully accessible playgrounds with surfacing that allows easy access where specified. Not all sites will be suitable and some that are may not require formal play facilities.

Approval shall be obtained from the Council for the design proposal for the play space including the types and style of equipment.
All play facilities must comply with:
NZS 5828:2015 Playground equipment and surfacing;
Parks and Waterways Access Policy.

Use the following resources for the design of playgrounds:

- Barrier Free NZ
- Sport and Recreation Victoria The Good Play Space Guide: "I can play too"

11.4.3 Seats and picnic tables

The design of proposed seating and tables must be consistent with the character of the reserve and its locality, in accordance with Recreation Aotearoa Open Spaces Maintenance Specifications.

11.4.4 Boundary Fencing

The Council promotes the concept of open frontages onto reserves. Funding of boundary fencing must comply with the Fencing Act 1978. The Act does not apply to fences alongside legal roads or esplanade reserves. Funding of boundary fences will also be in accordance with any registered fencing covenants

11.4.5 Public Toilets

The provision of toilet facilities is essential to allow people with disabilities to use parks. Consider the needs of that locality and the numbers of expected visitors at any one time when determining the requirement for toilet facilities. Locate toilets to be easily and in close proximity to playgrounds.

Design the toilet and its access to conform to NZBC / G1, Public Toilets and Design for Access and Mobility.

11.5 Open Space

11.5.1 Parks and Reserves

Parks and reserves shall be located and designed so that they are connected with the existing roading network and, where possible, existing reserves, access ways and open spaces to provide routes and return loops for recreational use, encourage sustainable transport choices by allowing for continuous off-road journeys and contribute to creating larger open space areas. Consideration should be given to how the development will link to the surrounding landscape, including existing areas of open space, and to other public areas, such as schools, town centres, community facilities or public transport. They must not be made of "left over" land, the location and design must be informed by the neighbourhood context and the particular aspects of the sites. Parks and reserves must be designed and presented in accordance with these standards prior to the application for section 224(c) certificate approval.

The level of service for the location of community parks and reserves in relation to residential properties shall be in accordance with relevant Council activity management plans. Parks and reserves shall be of an even and regular shape that allows for maximum usable space and ease of maintenance. They shall be highly visible in order to maximise amenity, safety and open space benefits for the surrounding community and to allow the parks and reserves to be easily found by users, and meet the following standards:

- Have a minimum 30 metre road frontage on at least one side;
- Have additional access points provided to connect to the road network within the subdivision and adjoining areas;
- Have access crossings provided for maintenance vehicles and equipment;
- Be located and orientated to maximise daylight and sunlight hours;
- Located to ensure that potential hazards to public safety (such as site stability or contamination) do not exist or it is possible to remedy or mitigate any hazard.

Natural features or features of local and/or cultural interest or significance such as streams, remnant native forest or specimen trees will be identified and included within the reserve where appropriate and agreed to by the Council.

11.5.2 Esplanade Reserves

The circumstances, where esplanade reserves and or esplanade strips under this chapter must be provided or considered adjoining lakes, rivers or the coast, are prescribed within the District Plans. The Council may seek to purchase additional areas to add to the environmental, amenity and recreational value of the reserve network. Paths on esplanade reserves must be provided where they are an integral part of a walking/cycling connection within the subdivision or wider area. Given the generally long and linear nature of these reserves, visibility and accessibility must be maximised to enhance the amenity, safety and open space benefits for the surrounding community and to allow them to be easily located. Where possible conservation and landscape reserves/special interest site reserves must have a minimum of 20 metres road frontage, with good access for pedestrians and maintenance vehicles.

11.5.3 Public Gardens/Formal Gardens

Public gardens and formal gardens must have a minimum 30 metre road frontage, with good pedestrian and maintenance vehicle access. Prior to any construction a detailed landscaping plan highlighting the proposed species of plants shall be submitted to Council for approval. Areas to be considered include not only the visual appearance but the type and scale of long term maintenance required in accordance with Recreation Aotearoa Open Spaces Maintenance Specifications.

11.5.4 Other Facilities

The Council requires the following standards to be met in the design and location of other community resource facilities.

If lighting is required for community parks, the design shall be consistent with AS/NZS1158 Lighting for Roads and Public Spaces and must be approved by the Council prior to construction. Where reserve signage is required, it will be approved by Council.

11.6 Water Facilities

11.6.1 Structures

Structures are installed at the discretion of the Council. These include: jetties, wharves, boatramps and swimming pontoons. The design of structures must fulfil both functional and aesthetic requirements. They must be durable and not require a high level of maintenance.

Note that the developer is responsible for gaining all necessary building consents required under the Building Act.

11.7 Community Services

11.7.1 Cemeteries

The Council may seek to purchase additional land for the purpose of Cemeteries, particularly land adjacent to existing cemeteries to meet identified levels of service.

11.8 Construction - Access and Boundary Treatment

This section outlines the standards and design for access to and within reserves and boundary treatments. The following standards are required in the design of access to and within reserves.

11.8.1 Access

The design and standards of formation for paths and tracks within reserves are outlined in Table 11-3.

The location of paths and plantings on reserve access ways and walkways must be designed to ensure the path receives maximum sunlight hours in winter and minimises frosting. A vehicle crossing access permit is required or the crossing needs to be approved through the submission of Engineering Plans as part of the subdivision process. Consultation with the Council must be undertaken to determine if parking areas and access roadways are required.

Track Type	Markers	Gradient	Steps	Width	Surface	Structure	Furniture	Vegetation Clearance
Path / Accessway Our intention is that these will be multi-use, accessible paths	Requires signage stating they are multi-use, accessible paths. Signage required at entrances & junctions	Maximum: 5° (1 in 11.4)	No steps	Minimum: 2m	Even & well-formed of Durable material. Maximum Discontinuity height: 5mm	Minimum: 2m No stiles, turnstiles or kissing gates	Seats & tables may be provided	Minimum Width: equal to path width Minimum height: 2.5m Windfall and hangers cleared with 48 hours of notice

Table 11-3 Path, Track, and Road Category Standards within Reserves

Appendix A – Designer Check List

The designer checklist for subdivision application and construction:

Note: This list is produced to clarify the design requirements and holding points in the subdivision application process. The aim of this list is to guide the developer/developer's advisor to follow the correct and effective steps to be efficient in the subdivision application and construction. The implementation of the steps listed in this document will ensure that delays are kept to a minimum. Please inquire with the Council when in question.

Activities Developer to follow:

REFERENCE FROM COP	ACTIVITY REQUIRED	Y/N/NA
Section 1 – General requirements and Procedures		
3.2.1	Appoint a designer of the work.	
3.2.2	Preliminary Discussions to define Council requirements prior to design	
3.2.4.3	Consultation with Regional Council (Environmental Southland) on Stormwater impacts to the natural environment aspects	
3.2.4.8	Design Approval docs to include: • Earthworks and geotechnical requirements; • Roading and site access including a design and access statement and a road safety audit • Stormwater infrastructure shall include details such as proposed design parameters, primary systems capacities, storage, secondary systems including overland flow paths, and structural details of components • Wastewater infrastructure design drawings compatible with Council's requirements and the design parameters included in the CoP shall be provided. • Water supply infrastructure design drawings compatible with Council's requirements and the design parameters included in the CoP shall be provided. Landscape; • All proposed planting to be located within the publicly vested areas shall be agreed with Council prior to installation. • Proposed network utility service designs. • Safety in Design register	
3.2.4.8	A geo-professional's report on the suitability of the land for subdivision or development.	
3.2.4.8	Other reports as considered necessary by Council in the circumstances of the proposed infrastructure in order to meet the requirements of the CoP.	
3.2.4.8	A design certificate in the form of the certificate in Schedule 2A.	
3.2.6	Design drawings complying with requirements spelled out in the CoP	
3.2.8	Climate change – confirmation of impacts to design such as sea level change and increased stormwater events	

3.2.10	Construction Pre- construction Permits are in place Notification of the Construction Programme in writing Suitable qualification/experience of Construction Personnel Documentation to be held on site Variations to the approved design Inspections and Hold Points – Notification to Council Completion Certification Services Connections Testing Pre-vesting maintenance Reinstatements	
Section 2 - Geotechnics		
4.1	The designer shall take account of all relevant standards and Council requirements in terms of construction requirements, or development limitations.	
2.2.3	A geo-professional shall be appointed by the developer to carry out the defined functions.	
4.4.1	Preparation of a Geotechnical Completion Report	
4.4.2	As built drawings for Earthworks and subsoil drains	
4.5	Schedule 4A	
Section 3 - Roads		
0	Design Philosophy/design report including design drawings and detailing proposed materials.	
5.2.4 5.3.1	The Waka Kotahi NZTA One Network Framework should be used as the basis for the definition of the road design.	
5.2.6	Prepare and submit a design Access Statement	
0	Proposals that provide for new roads to vest in Council shall be subject to the Waka Kotahi (NZTA) Road safety audit procedures for projects unless Council decides that audits are not required at any or all of the stages.	
5.3.1	Design Requirements	
5.3.3	Geometric design	
5.3.4	Pavement Structural Design	
5.3.12.1	Footpath design – Council confirmation of requirements	
0	Road construction shall be carried out to the alignments and standards detailed in the approved drawings and with the specified materials so as to provide the intended design life.	
5.4.17	Progress Inspections at key construction stages.	
5.4.19	As built handover documentation	
Section 4 – Storm water		
6.2.1	Compliance with design objectives	
6.2.6	All stormwater systems shall provide for the management of stormwater run-off from within the land being developed together with any run-off from upstream catchments.	

6.2.8	Rainfall design charts shall be adjusted to take into account the predicted increase in rainfall intensities from the effects of climate change.	
0	Design – Council shall be consulted for the design requirements for a particular site	
0	The designer shall undertake the necessary design and prepare design drawings compatible with Council's design and performance parameters.	
0	The developer shall implement low impact design principles for the treatment of stormwater. Where the developer does not believe that low impact design methods will be suitable the developer shall provide reasons for this for approval by the Council.	
6.4	Approval of proposed Stormwater infrastructure	
6.5.4	Inspection and Acceptance	
Section 5 - Wastewater		
7.2.1	Objectives	
7.2.2	Wastewater designs shall incorporate all the special requirements of Council and shall be in accordance with the most appropriate Standards, codes, and guidelines including those set out in Referenced Documents.	
0	Applications for design approval shall include the information outlined in Section 2 of this CoP. In addition the following information shall be provided: A plan showing the proposed location of existing and proposed wastewater infrastructure. Detailed long sections showing the levels and grades of proposed wastewater pipelines in terms of datum. Long sections shall include full details of pipe and manhole materials and sizes. Details and calculations prepared which demonstrate that agreed levels of service will be maintained. Details and calculations prepared which clearly indicate any impact on adjacent area or catchment that the proposed infrastructure may have. Appropriate operating manuals, pump information, and instructions for pump stations and pressure systems if proposed.	
Section 6– Water Supply		
0	Detailed plans and design calculations (where appropriate) shall be submitted to Council.	
0	Objectives	
8.4	Approval of Proposed Infrastructure	
8.5.4	Pressure Testing of Mains	
8.5.5	Disinfection of Mains	
8.5.6	Discharge of Test water	
8.5.7	Water Sampling	
8.7	Field Testing of Pipelines	

Section 7 – Network Utility Services		
9.1	The developer shall provide satisfactory evidence to Council's Corridor Manager that the network utility operators are prepared to reticulate the subdivision and that agreement on the financial arrangements for the installation of each supply has been reached.	
9.2.3	The developer is required to make all arrangements with the appropriate network utility operators for the supply and installation of stormwater, wastewater, water supply, and electric power and to the extent applicable for the provision of telecommunication and gas reticulation.	
9.3.1	Copies of the plans of the development/subdivision shall be forwarded by the developer to all of the affected network utility operators at an early date to facilitate the design of the reticulation.	
0	In preparing the engineering plans consideration shall be given to the requirements of the network utility operators and Council's Corridor Manager for: • The minimum depth of cables and pipes. • The network utility operator's desired position for the cable and piping within the road berm as agreed with Council's Corridor Manager. • The minimum separation distances between power or telecommunication cables, and gas or water mains. • The width of berm which shall be clear of other services and obstructions to enable efficient cable-laying operations. Common trenching for power and telecommunication cables is commonly adopted at a distance of between 0.6 m and 1.2 m from the boundary. The possibility of common trenching should be discussed with each of the network utility operators during the design phase.	
9.4.1	Underground cable laying shall be achieved by the most appropriate method considering the nature of subsoil and potential damage to infrastructures and shall be to the approval of Council's Corridor Manager.	
9.5	Unless otherwise approved by Council through a resource consent decision, all new allotments shall have physical connections to power and telecommunications utilities.	
Section 8 - Landscaping		
10.2.1	Consultation with Council on landscape design and construction at an early stage of the design development is required. The Council may seek input from the relevant Community Board or Community Development Area Subcommittee in relation to landscape issues, prior to its approval of any proposed landscaping.	
10.2.3	Layout plans and location of reserves and land protection covenants must be discussed with Council prior to the lodgement of finalised plans. Development plans for all future reserves shall be submitted with the application for engineering approval, no work is to be carried out on site before Council approval is issued.	
10.2.3	All reserve development works shall be completed in accordance with the plans approved by Council.	
10.3	The design shall be submitted to Council for approval prior to installation	

10.3.2	Reserve location and layout design shall take into account adjoining land uses and areas to ensure there is an appropriate provision of recreation assets and landscaping in accordance with Council's plans and policies.	
10.3.3	All existing vegetation and trees to be retained shall be cordoned off to protect the root zone and vegetation, prior to the commencement of construction and the cordon shall remain in place until completion of construction	
10.3.4	In selecting species for planting, take into account the overall composition, low maintenance, and longevity, as well as the need to comply with Council's planting policies. The relevant Community Board, Community Development Area Subcommittee or Council shall approve the species to be planted before the planting is undertaken.	
10.3.8	Any paving though reserves shall be constructed to the same standard and composition as set out for street footpaths in the locality, unless otherwise authorised by the relevant Community Board or Community Development Area Subcommittee.	
0	Landscape plans shall ensure that future maintenance requirements have been considered so that ongoing costs are minimised.	
Section 9 – Community Facilities		
11.3.7	Process of determining design purpose Prior to lodging subdivision applications, developers must undertake pre-application workshop with the relevant team members within the Council. The teams could include planners, Transport team, 3 waters team and community facilities team and any other teams that may be relevant. The purpose of these discussions is to form the agreement on the matters relevant to the subdivision or adjacent areas and ensure that urban design goals are met in the design of both private and public spaces, and any areas for utility or transportation purposes. Following pre-application workshops with the Council's teams, the location and size of community resource (e.g., a reserve) will be included in the scheme plan submitted with the subdivision application. The vesting of the community resource, its classification and any development requested by or agreed to be the Council will be a condition of the consent. There is a requirement for a concept plan to be submitted for the development of community resource. The community resource is required to be presented for vesting in accordance with these standards. Development of the community resource will generally be undertaken following vesting and in consultation with the community	
11.4	All built assets (e.g. signs, fences, artworks, lighting, structures and furniture) must be approved by Council prior to installation.	
11.4	Maintenance required during establishment	
11.4	Presentation of community facilities for vesting	

Appendix B – Standard Drawings

SUBJECT: Plan Change 2 – District Plan

PLAN CHANGE 2 – Variation in District Plan wording due to adoption of Code of Practice

1.0 INTRODUCTION

1.1 Status Of Report

This report has been prepared on the basis of information available to consider ***Plan Change 2***.

The purpose of this report is to assist the Council in its deliberations. It highlights those matters that are considered appropriate for Council to consider in making their decision.

The recommendations in this report are for the guidance of the Invercargill City Council. The Council Committee is not bound by any of the recommendations of this report.

1.2 Scope Of Report

Section 42A of the Resource Management Act 1991 provides that an officer of a local authority may provide the local authority with a report on any matter described in Section 39(1

Appendix A outlines the recommended changes to the Plan provisions.

Interpretation: In this report, the following meanings shall apply:

- "District Plan" means the Invercargill City District Plan
- "The Act" means the Resource Management Act 1991
- "Council" means the Invercargill City Council
- "Plan Change" means Plan Change 2 to the Invercargill City District Plan.

2.0 EXECUTIVE SUMMARY

Plan Change 2 has been proposed due to the repeal of the Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure by the Strategy and Policy Team as the Code of practice was required to be renewed. It is considered necessary to undergo a Plan Change to ensure the District Plan is current and accurate.

We intend to undertake the Plan Change under Schedule 1, 5A of the Resource Management Act 1991 which is Option to give limited notification of proposed change or variation.
This process requires that the local authority must give limited notification to all persons identified as being directly affected by the proposed change and variation.
This is from the assessment from Engineering Services, Legal Counsel, Strategy and Policy and Planning that the criteria of all affected parties have identified as part of the change of the Code of Practice.

3.0 SIGNIFICANT ISSUES ARISING FROM PLAN CHANGE 2

Where an external document is referred to in the District Plan it is important that this document be current, enforceable and easily found. Updating the District Plan so that it refers to the current Code of Practice is necessary and sensible. This Plan Change supports the District Plan Policies and Objectives and will continue to ensure that the appropriate information is used when determining engineering requirements.

4.0 DECISIONS ON SUBMISSIONS

4.1 Clause 10 of the First Schedule of the Resource Management Act 1991 requires that the local authority shall include reasons for accepting or rejecting any submissions.

5.0 OVERALL RECOMMENDATION

5.2 Adopts the proposed process under Schedule 1, 5A of the RMA 1991 recommended within the Invercargill City Council District Plan 2019 – Plan Change 2.

APPENDIX A

RECOMMENDED CHANGES TO DISTRICT PLAN

APPENDIX A: RECOMMENDED CHANGES TO THE PLAN PROVISIONS

[Text introduced by Plan Change 1 has a double underline, deletions have a double strikethrough]

Part 1 – Introduction and Interpretation

DEF, Page 12 - Code of practice for Land Development and Subdivision Infrastructure

Means the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure adopted by the Invercargill City Council on 1 July 2016.~~
Currently active Invercargill City Council Code of Practice for Subdivision and Infrastructure as adopted by the Invercargill City Council

Part 2 – Issues, Objectives and Policies

INF – Infrastructure overview, (Pg. 7, Paragraph 7)

.. Where subdivision and/or land use is undertaken, the provision of infrastructure, and/or any requirement to expand or upgrade existing infrastructure is considered as part of the consenting process. The Council has also developed the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure which* aims to ensure that infrastructural works undertaken as part of a subdivision or land use development are done to an acceptable means of compliance with Acts and Council requirements. This Code of Practice ~~bylaw~~ sits outside the District Plan but will assist in achieving some of the desired outcomes. ..

SUB – Subdivision, Overview, (Pg. 56, Paragraph 4)
.. Note: The ~~Invercargill City Council Bylaw 2016/1 Code of Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* controls the standards to which works and infrastructure are to be constructed in new development.

SUB – Subdivision, Objectives (Pg. 60)
SUB-M5 - Recognise and enforce the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* for the development, operation, upgrading and replacement of infrastructure carried out as part of a subdivision.

RES3Z – Residential 3 (Large Lot) Zone
RES3Z – Residential 3 (Large Lot) Zone, Issues

RES3Z- P7 – Infrastructure – Reticulated Sewerage (Pg.104)
Explanation: The overall density of development enabled in the Residential 3 Zone is insufficient to provide for the effective treatment and disposal of effluent. As a consequence, development in the zone is required to connect to the Council's reticulated sewerage system. The full costs of connecting to the sewerage system are the responsibility of the developer without any contribution from the Council. The sewerage infrastructure installed is also required to be constructed in accordance with the standards and procedures

set out in the ~~Council's Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure.*

RES3Z – P8 – Infrastructure – Water (Pg.104)

.. Explanation: Connection to the Council's reticulated water supply is not a requirement for the Residential 3 Zone nor can the Council guarantee that water supply will be available throughout the zone. Developers will be responsible at a cost to them, with no contribution from the Council, for any extensions and connections to the Council's reticulated water supply. Where water reticulation is installed as part of any development undertaken it is required to be constructed in accordance with the standards and procedures of the ~~Council's Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure*..

RES3Z – Residential (Large Lot) Zone, Policies

RES4Z – P1 – Deferred Zoning (Pg. 111, Paragraph 4)

…The development, operation, maintenance, upgrading and replacement of infrastructure is provided for in the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure*
and require authorisation pursuant to that ~~Bylaw~~ Code of Practice. Infrastructure intended to be vested in Council ownership, unless otherwise approved, is required to be designed and constructed to meet the requirements of the ~~Bylaw~~ Code of Practice …

RES4Z–P8 – Infrastructure – Costs: (Pg. 114)

Explanation: The Council has no intention of paying for extensions or connections to its services within this zone. The developer will bear the responsibility of installing the required infrastructure and any consequential upgrades to that infrastructure. The infrastructure will be required to be constructed in accordance with the standards and procedures set out in the ~~Council's Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* .

RES4Z–P9 - Infrastructure – Reticulated Sewerage (Pg. 114)

Explanation: The overall density of development enabled in the Residential 4 Zone will not allow for the effective treatment and disposal of effluent on-site. As a consequence, development in the zone is required to connect to the Council's reticulated sewerage system where allotments are less than two hectares. The full costs of connecting to the sewerage system are the responsibility of the developer without any contribution from the Council. The reticulated sewerage infrastructure is required to be constructed in accordance with the standards and procedures set out in the ~~Council's Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* .

RES4Z-P10 – Infrastructure – Water: (Pg. 115, Paragraph 3)

…Connection to the Council's reticulated water supply is not a requirement for this zone nor can the Council guarantee that water supply will be available throughout the zone. The Council has no intention of extending water services to this area of the District. Developers will be responsible at cost to them, with no contribution from the Council, for any extensions and connections to the Council's reticulated water supply. Where water reticulation is installed as part of any development it is required to be Invercargill City District Plan Part Two Page 115 August 2019 Residential 4 (Residential Transition) Zone constructed in accordance with the standards and procedures of the ~~Council's Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* .. …

RURZ – Rural Zones, Policies

RURZ-P6 – Deferred Zoning: (Pg. 126, Paragraph 3)

… The development, operation, maintenance, upgrading and replacement of infrastructure is provided for in the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* and require authorisation pursuant to that ~~bylaw~~ Code of Practice. Infrastructure intended to be vested in Council ownership, unless otherwise approved, is required to be designed and constructed to meet the requirements of the ~~Bylaw~~ Code of Practice…

RURZ-P7 – Transportation: (Pg.126, Paragraph 4)

…The development, operation, maintenance, upgrading and replacement of infrastructure is provided for in the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* and require authorisation pursuant to that ~~bylaw~~ Code of Practice. Infrastructure intended to be vested in Council ownership, unless otherwise approved, is required to be designed and constructed to meet the requirements of the ~~Bylaw~~ Code of Practice.

RURZ-P8 Deferred Zone Infrastructure –Reticulated Sewerage: (Pg.127, Paragraph 3)

The development, operation, maintenance, upgrading and replacement of infrastructure is provided for in the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* and require authorisation pursuant to that ~~Bylaw~~ Code of Practice.. Infrastructure intended to be vested in Council ownership, unless otherwise approved, is required to be designed and constructed to meet the requirements of the ~~Bylaw~~ Code of Practice.

RURZ-P9 – Deferred Zone Infrastructure – Costs: (Pg.127, Paragraph 2)

… Explanation: The Council has no intention of paying for extensions or connections to its services within this area of the District. The developer will bear the responsibility of installing the required infrastructure and any consequential upgrades to that infrastructure before the development of this zone to allotments with an area of less than two hectares is provided for. The infrastructure, unless otherwise approved, will be required to be constructed in accordance with the standards and procedures set out in the ~~Council's Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* . …

PART 3 – RULES

UTIL – Utilities – General

UTIL – R1: (Pg.10)

Note: The development, operation, maintenance, upgrading and replacement of infrastructure is provided for in the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* . …

and may require authorisation pursuant to that ~~bylaw~~ Code of Practice. Infrastructure intended to be vested in Council ownership, unless otherwise approved, is required to be designed and constructed to meet the requirements of the ~~Bylaw~~ Code of Practice

SOIL – Soils, Minerals and Earthworks
Earthworks and Mineral Extraction.

SOIL–R1 (Pg.57, Paragraph 3)
… 3. The removal and deposition of material for the purposes of work in compliance with ~~Council's Bylaw 2016/1 Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* …

RES3Z Residential 3 (Large Lot) Zone

RES3Z-R19 (Pg.75, Paragraph 2)
- Services
- Note: Any extension of, and connection to, Council's infrastructure will require authorisation pursuant to the ~~Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* ...

RES4Z Residential 4 (Residential Transition) Zone

RES4Z-R19 (Pg. 82, Paragraph 2)
- Services
- Note: The developer will be responsible for costs of any extension of, and connection to, Council's infrastructure. Extensions and connections will require authorisation pursuant to ~~the Invercargill City Council Bylaw 2016/1 Code of Practice for Land Development and Subdivision~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure* ..

APPENDIX 11 – 1
Appendix 11 – Transport Standards

APP11-1 Car Parking Standards:

Notes:
1. On-road parking requirements: On-road parking spaces are not detailed in the Invercargill City District Plan and are to be designed, constructed and signposted in accordance with the ~~Invercargill City Council Bylaw Code of Practice for Land Development and Subdivision Infrastructure~~ *Invercargill City Council Code of Practice for Subdivision and Infrastructure.*

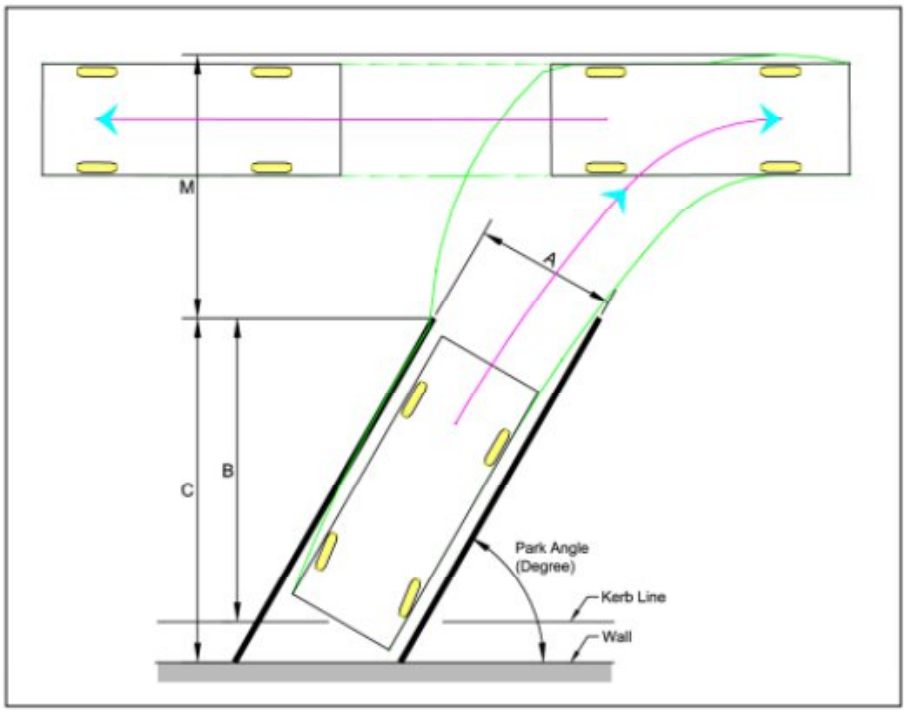
2. Accessible car parking spaces: Accessible car parking spaces are not detailed in the Invercargill City District Plan and are to be calculated, designed, constructed and signposted in accordance with the requirement in the New Zealand Building Code.

Car Parking Areas:
1. Car parking spaces shall comply with Figure 1 and Table 1.
2. Gradient: The gradient of car parking spaces shall be no more than 1 in 20 in any one direction.
3. Where the required parking area is outside the building, it shall connect to the building via a pedestrian access route.

Appendix 11-1, Figure 1.

- To be removed and replaced with the *"Proposed replacement Appendix 11 – 1, Figure 1."*

Figure 1



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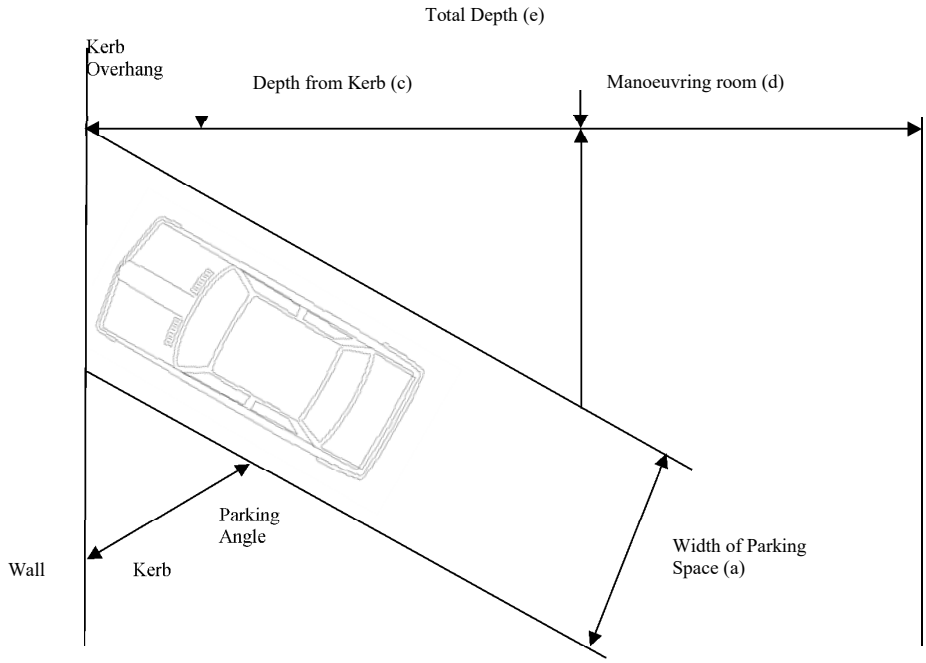
Proposed replacement Appendix 11-1, Figure 1

- To be implemented to replace the *Appendix, 11-1 Figure 1.*



Appendix 11-1, Table 1

- To be removed and replaced with the *"Proposed replacement Appendix 11 – 1, Table 1."*

Table 1: Car Park Dimensions

ANGLE DEGREE	A	B	C	M	B + M	C + M
0	2.3	2.3	2.3	3.0	5.3	5.3
30	2.5	4.5	4.9	2.9	7.4	7.8
45	2.5	5.1	5.6	3.7	8.8	9.3
60	2.5	5.3	6.0	4.6	9.9	10.6
90	2.5	4.8	5.4	5.8	10.6	11.2

Note: Maximum kerb height = 150mm

Note: Maximum kerb height = 150mm Car Parking Circulation Roadway:

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Proposed replacement Appendix 11 – 1, Table 1.

- To be implemented to replace the "*Appendix, 11-1 Table 1.*"

Table 5-7 Parking Dimensions

Type of Parking		Stall Width (a)	Stall Depth		Manoeuvre Width (d)	Total Depth (e)	
			From wall (b)	From kerb (c)		One row	Two rows
Parking Angle	Type	ALL MEASUREMENTS ARE IN METRES					
90°	Nose in	2.4 2.5 2.6 2.7	5.1	4.1	7.9 7.6 7.2 6.8	13.0 12.7 12.3 11.9	18.1 17.8 17.4 17.0
75°	Nose in	2.4 2.5 2.6 2.7	5.4	4.4	6.4 5.8 5.2 4.6	11.8 11.2 10.6 10.0	17.3 16.6 16.0 15.4
60°	Nose in	2.4 2.5 2.6 2.7	5.4	4.5	4.5 4.2 3.9 3.6	9.9 9.6 9.3 9.0	15.3 15.0 14.7 14.4
45°	Nose in	2.4 2.5 2.6 2.7	5.0	4.2	3.6 3.5 3.4 3.3	8.6 8.5 8.4 8.3	13.6 13.5 13.4 13.3
30°	Nose in	2.4 2.5 2.6 2.7	4.3	3.7	3.0	7.3	11.6
0°	Parallel	2.5	Stall length 6.0 m		3.7	6.2	8.7

No Changes to text Appendix 11 – 1, (4 – 6)

4. Vehicle circulation routes shall have:

a. A width of no less than 3.5 metres for one way circulation routes and 6.5 metres for two way circulation routes. Where pedestrians have to use the circulation roadway to reach a pedestrian access route the widths shall be increased by 800mm.

b. A grade of no more than 1 in 8.
Note: For ramp grades greater than 1 in 8, a transition is required at changes in grade to avoid scraping the underside of vehicles or stranding them on humps.

c. Height clearances of no less than 2.1m.

5. Where a circulation route roadway crosses a pedestrian access route, adequate visibility shall be provided. At the crossing, the circulation roadway shall have a gradient no more than 1 in 20 for a distance of 6.0 metres back from the pedestrian access route and visibility displays shall be provided. Queuing Spaces:

6. Spaces for queuing of vehicles shall be provided between the street and any vehicle control points. To permit a free flow of traffic into the car parking area without adversely affecting traffic flows in surrounding areas, the queuing space shall be no less than given in Table 2.

Table 2: Queuing Spaces

STORAGE CAPACITY OF CAR PARK (NUMBER OF VEHICLES)	LENGTH OF QUEUING SPACE (M)
0-20	6.0
21-50	10.5
51-100	15.0
101-150	19.5
151-200	24.0

Notes:

i. Values based on a length of 6.0 metres (99%ile) for the first car and 4.5 metres (50%ile) for subsequent cars.

ii. For storage capacity greater than 200 vehicles, refer to AS 2890.1

Spaces and Circulation for Courier Van Delivery Vehicles:

7. Where buildings are required to be serviced only by courier vans, the loading space shall be no less than 6.0 metres long, 3.0 metres wide and 3.2 metres high. Circulation roadways between the street and loading spaces for courier vans shall:
a. Provide a height clearance of no less than 3.0 metres.

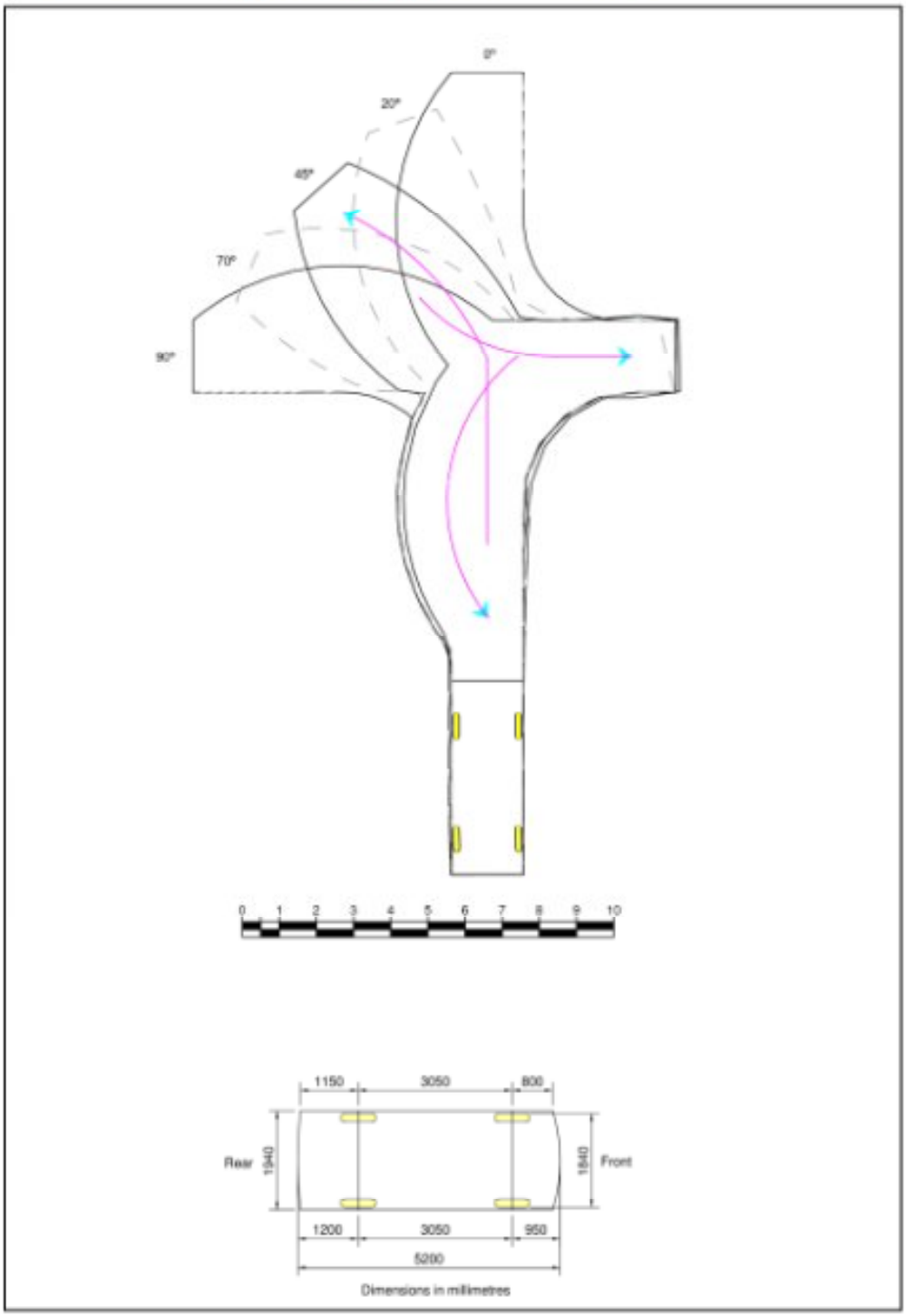
b. Have geometrics complying with paragraphs 4 (a) and (b) and 5.

Note: Where buildings are required to be serviced by vehicles larger than courier vans, circulation roadways and loading spaces should be specifically designed.

Appendix 11-2

- No Change

APP11-2 Manoeuvring Standard for Private Passenger Vehicles:



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Appendix 11 – 3
Appendix 11-3, Table 1.

APP11-3 Private Ways and Right of Ways:

1. Private ways and right of ways are to be designed and constructed to comply with the standards set out in Table 1.

Table 1: Private Way and Right of Way Standards

Residential 1, 1A, and 2 Zones			
Number of Lots	2-3	4-6	7+
Minimum Width	3.6 metres	4.5 metres	9 metres
Formed Movement lane	3 metres (sealed 5 metres in from property boundary)	3 metres (sealed 5 metres in from property boundary)	6 metres (sealed 5 metres in from property boundary)
Drainage	Interceptor sump required where more than 40m² of impermeable area is graded towards the street.	Interceptor sump required where more than 40m² of impermeable area is graded towards the street.	Interceptor sump required where more than 40m² of impermeable area is graded towards the street.
Passing Bays	-	-	Every 50m, as set out in Figure 1.
Turning Heads	-	-	As set out in Figure 2.
Footpaths	-	-	Single sided, 1.5m width for concrete or 1.8m width for asphalt.
Lighting	-	-	Constructed and designed in accordance with Class P4 of *AS/NZS 1158*.

Residential 3 Zone			
Number of Lots	1-3	4-6	7+
Minimum Width	4 metres	4.5 metres	9 metres
Formed Movement lane	3 metres (sealed 5 metres in from property boundary)	3 metres (sealed 5 metres in from property boundary)	6 metres (sealed 5 metres in from property boundary)
Drainage	Interceptor sump required where more than 40m² of impermeable area is graded towards the street.	Interceptor sump required where more than 40m² of impermeable area is graded towards the street.	Interceptor sump required where more than 40m² of impermeable area is graded towards the street.
Passing Bays	-	-	Every 50m, as set out in Figure 1.
Turning Heads	-	-	As set out in Figure 2.
Footpaths	-	-	Single sided, 1.5m width for concrete or 1.8m width for asphalt.

Residential 3 Zone			
Number of Lots	1-3	4-6	7+
Minimum Width	4 metres	4.5 metres	9 metres
Lighting	-	-	Constructed and designed in accordance with Class P4 of *AS/NZS 1158.*
Residential 4, Rural, and Otatara Zones			
Number of Lots	2-6	7+	
Minimum Width	6 metres	9 metres	
Formed Movement lane	In accordance with Figure 3.	6 metres	
Drainage	-	-	
Passing Bays	Every 200 metres	-	
Turning Heads	-	-	
Footpaths	-	-	
Lighting	-	-	

Note: Commercial and Industrial development will be considered on a case-by-case basis in consultation with the Council's Roading Manager.

APP11 – 3
Private Ways and Right of Ways
"Proposed Appendix 11-3 Table 1"

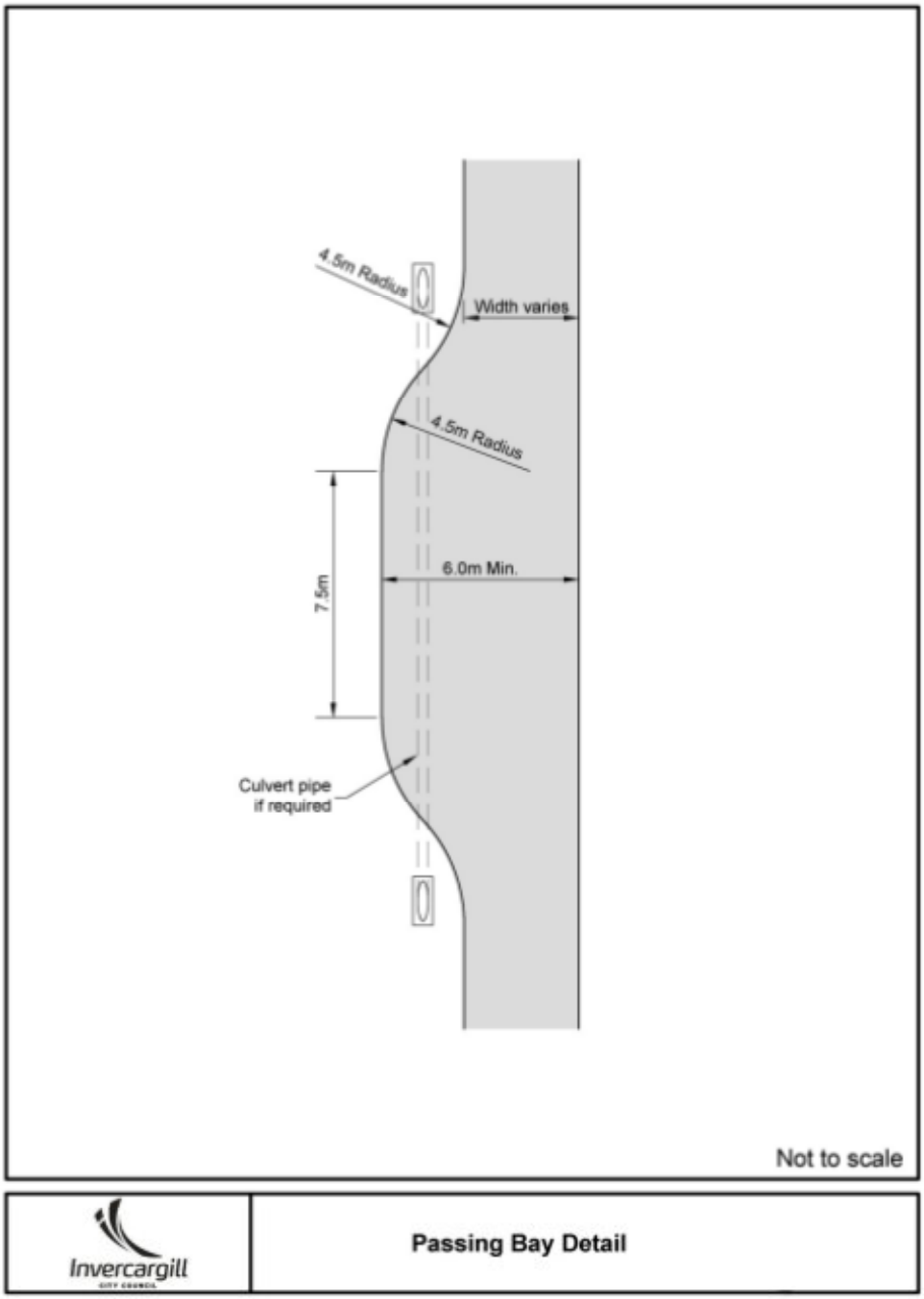
- Private ways and right of ways are to be constructed to comply with the standards set out in table 1
- Table 1.

Residential		
Units Served	1 - 3	4 – 6
Minimum Legal Width (m)	3.5	4.5
Carriageway width (m)	3	3*
Drainage	Interceptor sump required where more than 40m2 of impermeable area is graded towards the street.	Interceptor sump required where more than 40m2 of impermeable area is graded towards the street.
Kerb type	Vertical or mountable	Vertical or mountable
Rural / Rural Lifestyle		
Units Served	1 – 6	
Minimum Legal Width (m)	6	
Carriageway width (m)	3*	
Kerb type	Nil	

*Passing bays (with a minimum 6m carriageway width) are required every 50m in urban areas, and every 100m in rural areas. Where a private way adjoins a Collector or higher, it shall also have a 6m carriageway width for a minimum length of 6m from the road boundary.

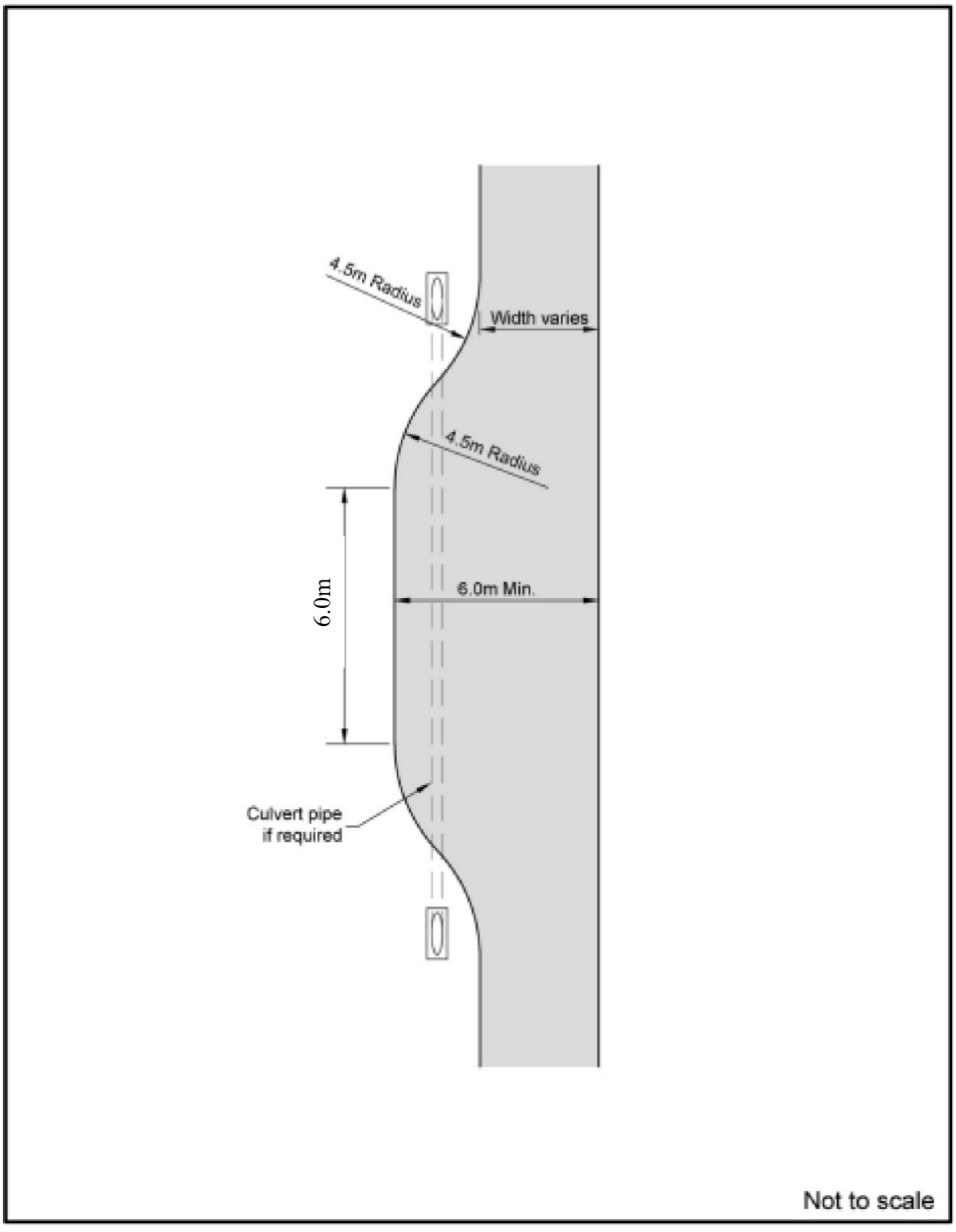
- **Appendix 11-3**
- Figure 1 – Change from 7.5m to 6.0m Length
- ***Appendix 11-3, Figure 1***

Figure 1 - Passing Bay Detail



Proposed Appendix 11-3, Figure 1

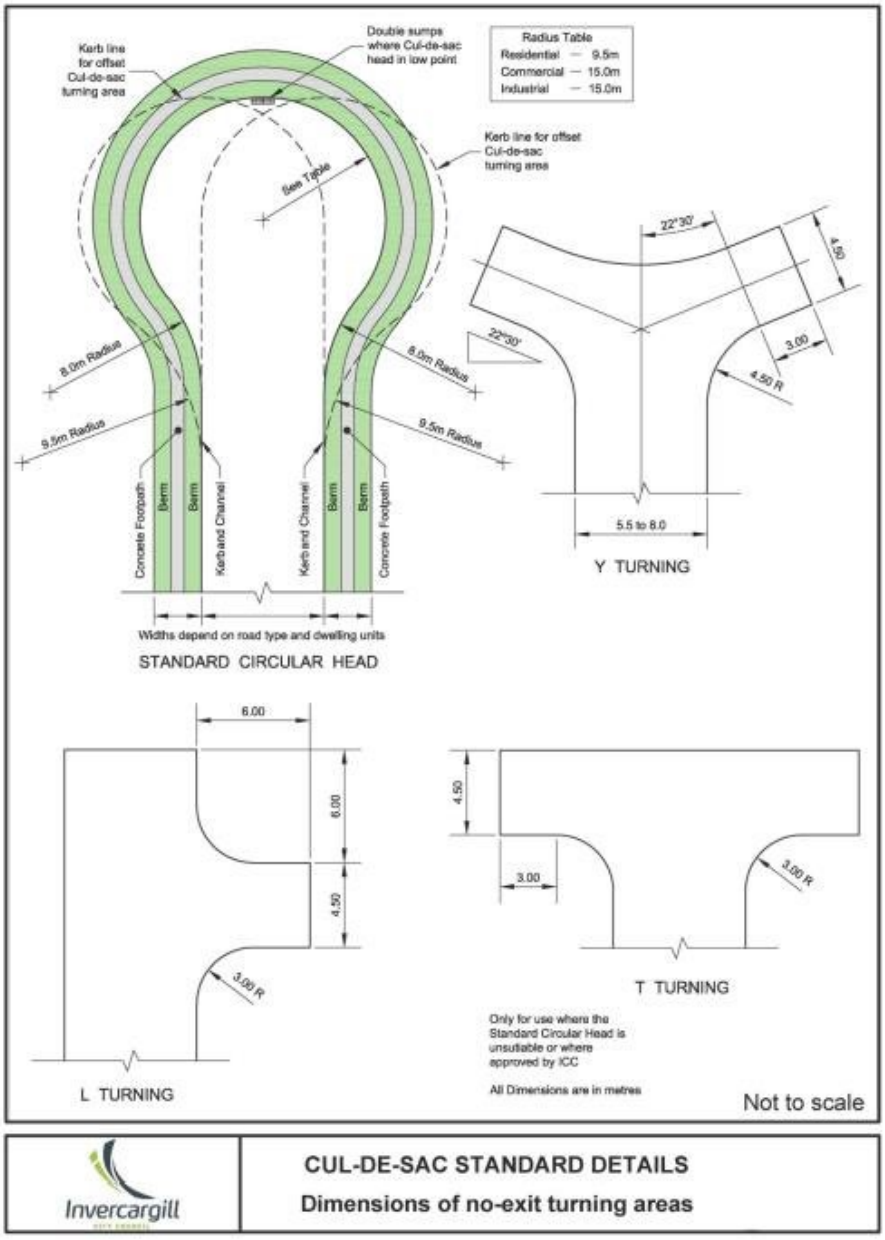
Figure 1 – Passing Bay Detail



Appendix 11-3

- Figure 2 – No change

Figure 2 - No Exit Turning Areas



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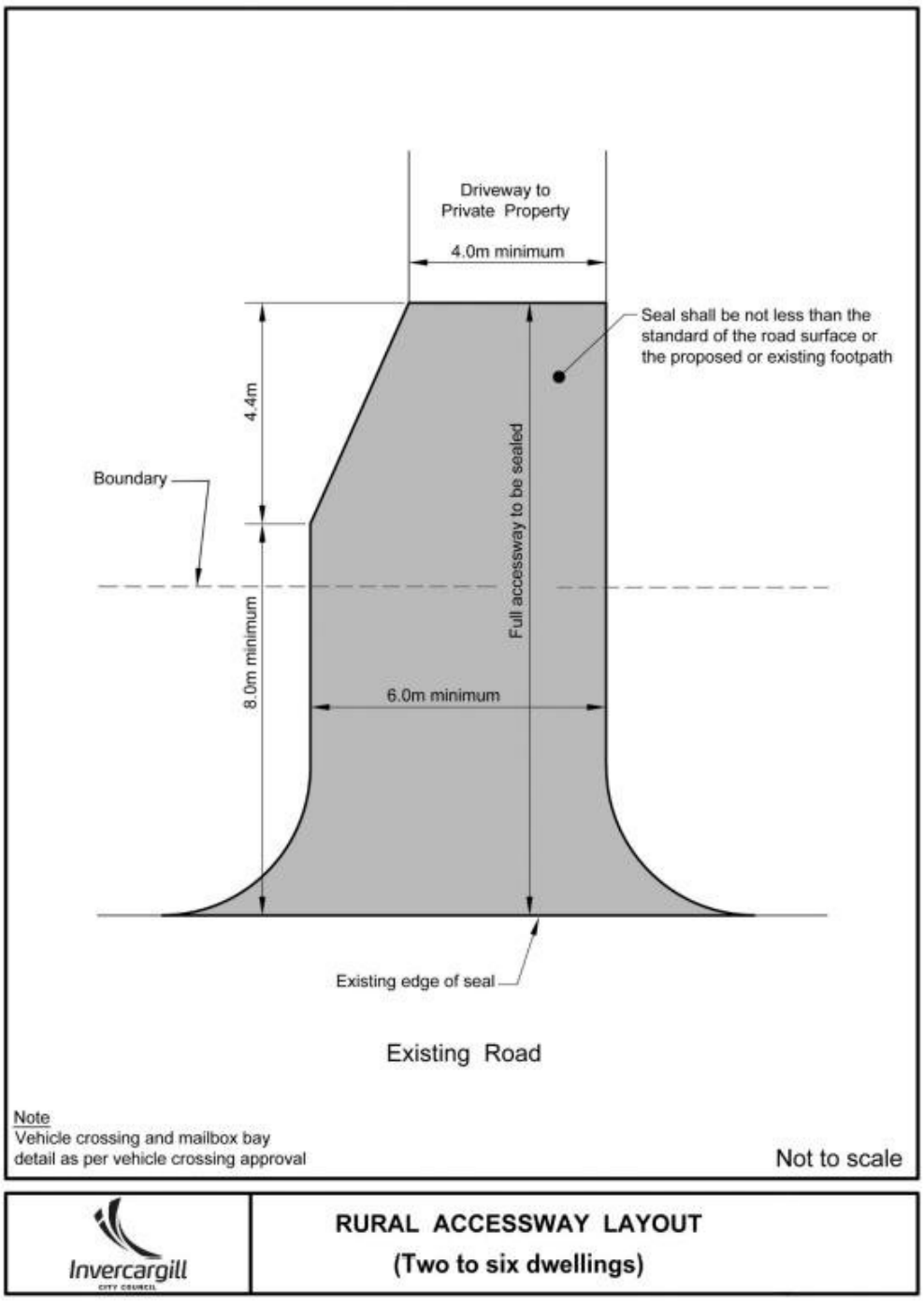
- **Appendix 11-3**

Existing Figure 3

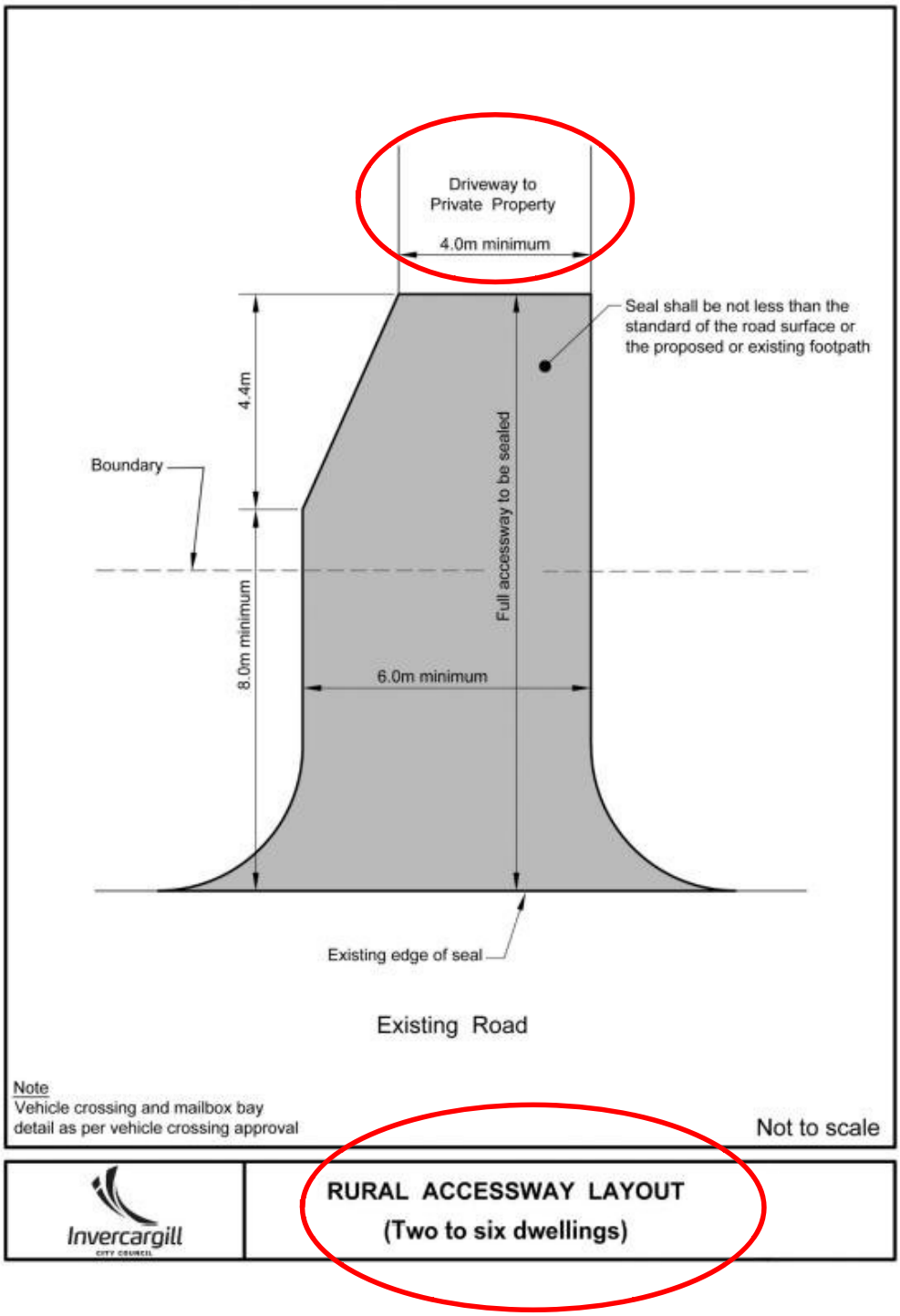
Figure 3 - Rural Accessway Layout



Proposed Figure 3

- Amended to reflect accordance with a change of figure with the Code of Practice Table 5-4, including
  - Change in “Driveway to Private property” from 4.0 / 6.0m to 3.0m
  - Change of description of the title block from (Two to six dwellings) to (One to six dwellings)
  - Alteration of the Rural Access way Layout, subject to finalisation of Code of Practice
  - Note 2, to reference passing bays as per Table 5-4.

Figure 3 - Rural Accessway Layout



AGREEMENT IN RELATION TO JOINT COMMITTEE HEARING PANEL

CODE OF PRACTICE FOR SUBDIVISION, LAND USE, AND DEVELOPMENT

Dated this day of 2023

BETWEEN INVERCARGILL CITY COUNCIL a territorial authority duly constituted pursuant to the Local Government Act 2002;

AND SOUTHLAND DISTRICT COUNCIL a territorial authority duly constituted pursuant to the Local Government Act 2002.

(together referred to as "the Councils")

BACKGROUND

A The Councils have worked together to draft a Code of Practice for Subdivision, Land Use, and Development which would, if adopted, apply across both the Invercargill City and Southland Districts.

B To allow for the hearing of submissions on the proposed creation of the Code of Practice for Subdivision, Land Use, and Development (the "Code of Practice"), the Councils agree to form a hearing panel joint committee, pursuant to the Local Government Act 2002 (the "Act"), to be known as the "Code of Practice for Subdivision, Land Use, and Development Hearing Panel" (the "Hearing Panel").

C Clause 30A of Schedule 7 of the Act requires that an agreement must be entered into by the Councils specifying membership of its joint committee, the delegated responsibilities and the means of varying the agreement relating to the joint committee. This Agreement sets out each of these matters as required by the Act.

IT IS HEREBY AGREED:

1. The Councils shall appoint a joint committee to be known as the Code of Practice for Subdivision, Land Use, and Development Hearing Panel.

2. Membership of the Hearing Panel shall consist of three members appointed by each of the Councils (making a total of six members). The Councils will nominate three members each, plus a fourth person as an alternate member who may attend on behalf of any of the other three if and when required.

3. Councils may appoint current Councillors or Mana Whenua representatives as members of the Hearing Panel, and all Hearing Panel members shall have equal speaking and voting rights.

4. The Hearing Panel shall at its first meeting appoint its chairperson and deputy chairperson by simply majority vote. The term of these appointments is until the end of the current Council term.

5. The Terms of Reference for the Hearing Panel are set out in Schedule 1 hereto. The Councils acknowledge they are bound by the Terms of Reference and will comply with them.

6. The Hearing Panel will be delegated responsibility:

    a. To consider and hear submissions on the draft Code of Practice for Subdivision, Land Use, and Development;
    b. To recommend a final Code of Practice for Subdivision, Land Use, and Development to the Councils for adoption.

7. This Agreement (including the Terms of Reference) may be varied by mutual agreement of the Councils at any time with any such mutually agreed variation to be recorded in writing, signed by the Councils and attached to a copy of this Agreement.

[SIGNING BLOCKS]

Schedule 1

TERMS OF REFERENCE

The Code of Practice for Subdivision, Land Use, and Development Hearing Panel ("the Hearing Panel") is a joint committee of the Invercargill City Council and Southland District Council (together referred to as "the Councils") established pursuant to the provisions of the Local Government Act 2002 ("the Act").

PURPOSE:

- To consider and hear submissions on the draft Code of Practice for Subdivision, Land Use, and Development ("the Code of Practice");
- To recommend a final Code of Practice to the Councils for adoption.

To give effect to the purpose of these Terms of Reference the Councils agree:

1. The formation of the Hearing Panel and the means of appointing its members and office holders are set out in clause 1 and 2 of the Agreement in Relation to Joint Committee Hearing Panel executed by the Councils.

2. The members of the Hearing Panel may meet together for the despatch of business, adjourn or otherwise regulate their meetings as they think appropriate.

3. The Hearing Panel shall supply agendas to their members detailing the business to be brought before that meeting together with relevant attachments which must be sent to every member not less than two clear working days before the day appointed for the meeting.

4. Questions arising at any meeting of the Hearing Panel shall be decided by a majority of votes of those present, each member having only one vote. In the case of an equality of votes, the chairperson shall have a casting vote. If the standing orders of either of the Councils do not provide for the Hearing Panel Chairperson to have a casting vote, each Council shall amend its standing orders accordingly.

5. The quorum necessary for the transaction of business of the Hearing Panel shall consist of three members, with both of the Councils represented.

6. The Hearing Panel shall keep minutes recording

    a. The names of the members present at each meeting; and
    b. All resolutions and proceedings from each meeting.

7. The Hearing Panel may provide any advice and develop and recommend any strategies, policies and procedures necessary.

8. All members of the Hearing Panel shall be remunerated by their respective appointing Council, should this be necessary.

9. The Hearing Panel will cease to exist on the appointment of the new Code of Practice or at the end of the current Council term, whichever is earliest.

WASTENET RESERVES, EDUCATION, AND ENFORCEMENT

To:	Infrastructure Committee
Meeting Date:	Tuesday 2 May 2023
From:	Erin Moogan – Group Manager Infrastructure
Approved:	Michael Day - Chief Executive
Approved Date:	Thursday 27 April 2023
Open Agenda:	Yes

Purpose and Summary

The purpose of this report is to provide an update to the Committee on the reserves held by WasteNet and potential availability to Invercargill City Council (ICC). The Committee Chair has also requested advice on WasteNet's education and enforcement programme.

A copy of a summary report that has been prepared for the WasteNet meeting on 15 May 2023 is attached.

Recommendations

That the Committee:

1. Receive the report 'WasteNet Reserves, Education, and Enforcement'.

2. Note the potential ICC share of WasteNet reserves of $1.33M and the requirement for a resolution of the WasteNet Governance Group for funds to be released.

3. Note the attached Education and Enforcement summary prepared for the 15 May 2023 WasteNet Governance Group meeting.

Background

WasteNet is an agreement between the three Southland councils -Invercargill City Council (ICC), Southland District Council (SDC) and Gore District Council (GDC) – to collaborate in the spirit of the Local Government Act (LGA) so that solid waste resources may be used efficiently and effectively. Most notable are the efficiencies gained from economies of scale for the waste collection, transportation and transfer station management contract and the landfill contract.

Currently, the scope of WasteNet activities does not include recycle processing. Recycle processing is managed through a direct arrangement between ICC and Recycle South.

Currently a separate back-to-back agreement between with ICC and SDC for processing of their recyclables through this contract is in place.

Issues

WasteNet Reserves

The Agreement between the councils for the governance and management of WasteNet is provided for via the WasteNet Southland - Joint Waste Management Agreement, known as the WasteNet Agreement. The agreement was signed in October 2011. The current structure defined in the agreement is:

- Waste Advisory Group (WAG) made up of 2 elected members of each council. This group, through governance, provides guidance to the officers.
- Waste Management Group (WMG) made up of senior officers. This group, following guidance from the WAG, gives direction to the supporting services.
- Support Services. This is the administration of WasteNet on behalf of the three councils. It follows direction from the WMG to execute the operational activities of WasteNet.

An annual budget for WasteNet is prepared each year and funded by the 3 Councils. WasteNet's total annual revenue budget is approximately $750,000 per annum.

Pursuant to clause 6.38 of the joint agreement all operational surpluses for any year shall, unless the parties agree otherwise, be retained by WasteNet as WasteNet reserve to be carried forward to subsequent years operational requirements.

WasteNet currently holds $2,088,786.84 in the operational reserve.

Pursuant to clause 6.40 any surpluses that the WasteNet Councils resolve to distribute shall be allocated in such proportions as the WAG shall agree and failing agreement in accordance with the proportions determined in accordance with Clause 6.9 [pro rata on the basis of the population of each WasteNet Council].

ICC holds 55% of the total population serviced by WasteNet.

Education and Enforcement

Education

One of the key component of the WMMP's waste minimisation goals is to identify and address the region's waste issues through educational activities. To deliver successful education initiatives that ultimately reduce waste to landfill by enabling voluntary behaviour change, an innovative and more comprehensive approach must be taken. The preferred approach outlined in this strategy is called the WasteNet Waste Minimisation Education and Communication Strategy (WWMECS). The WWMECS identifies what the Southland region needs in order to make voluntary behaviour changes that minimise waste. This logical approach requires greater effort in the development of regional initiatives. It incorporates enhanced risk management capability and enhances the region's ability to achieve the outcomes of behavioural changes that will result in waste minimisation.

A copy of the summary report that has been prepared for the WasteNet meeting on 15 May 2023 is attached.

Enforcement

It is intended that enforcement will be limited to stickering bins that contain non-recyclables/contaminated recyclables in the coming financial year. This will allow the education activities to be fully rolled out and an appropriate amount of time for the education to embed into the community. A bylaw update is proposed in the coming financial year to reflect the Governments changes in the waste space and support further enforcement should this be required following the education process.

Attachments

Attachment 1 - WasteNet Waste Minimisation, Education, and Communication Strategy. (A4505421)

Draft WasteNet Waste Minimisation Education and Communication Strategy (WWMECS)

Introduction:

This paper advises the path staff propose to reduce waste to landfill and ensure that Wastenet is doing its part towards its waste related social, economic, cultural and environmental responsibilities.

One of the key components of the WMMP's waste minimisation goals is to identify and address the region's waste issues through educational activities. To deliver successful education initiatives that ultimately reduce waste to landfill by enabling voluntary behaviour change, an innovative and more comprehensive approach must be taken. The preferred approach outlined in this strategy is called *the Wastenet Waste Minimisation Education and Communication Strategy (*WWMECS*)*. The WWMECS identifies what the Southland region needs in order to make voluntary behaviour changes that minimise waste. This logical approach requires greater effort in the development of regional initiatives. It incorporates enhanced risk management capability and enhances the region's ability to achieve the outcomes of behavioural changes that will result in waste minimisation.

In the Year 1 July 2021 to June 2022, a total of 55512 tonnes of waste was generated, collected, transported and dumped into the Southland Regional Landfill and equated to a waste per capita of 650 kg. With the successful implementation of this strategy, we hope to see a transformation in the coming years. The aim is that all residents and businesses in the Southland region will have a better understanding of waste minimisation, take voluntary actions to minimise waste and progressively transition to a circular economy.

WASTENET WASTE MINIMISATION EDUCATION AND COMMUNICATION STRATEGY (WWMECS) FRAMEWORK

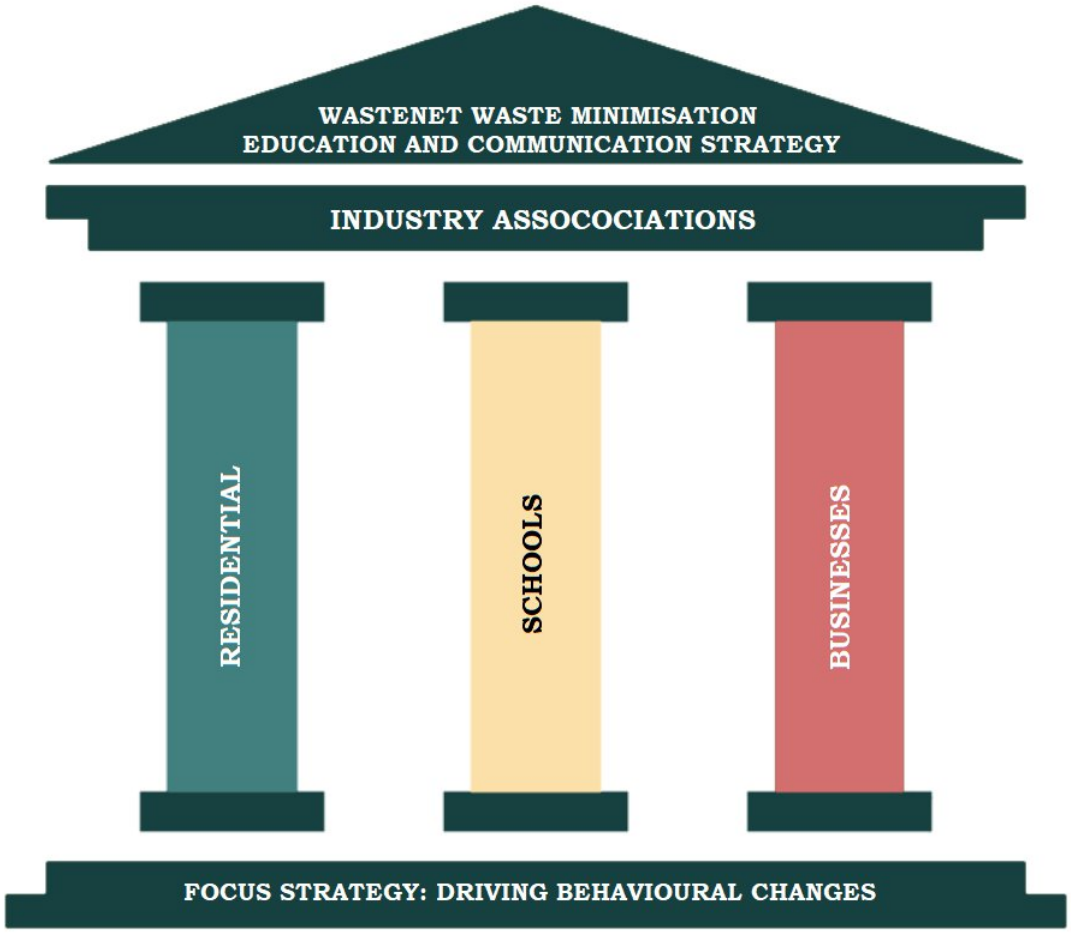
Purpose: The Wastenet Waste Minimisation Education and Communication Strategy (WWMECS) provides a framework for delivering collaborative education initiatives and communications activities across the Southland region to change behaviour, minimise waste and increase efficiency.

Delivery Framework Model: The WWMECS delivery framework engages it's identified target groups in a cohesive and constructive way, helping these groups to better understand the benefits of adopting a waste minimisation culture.

The three primary target groups, identified through the analysis of the landfill data, to facilitate behaviour change outcomes are:

i. Residential
ii. Schools
iii. Businesses

The fourth target "industry associations", identified through secondary analysis, will work to influence regulation, government policy and public opinion on behalf of the collective needs and objectives of their members.

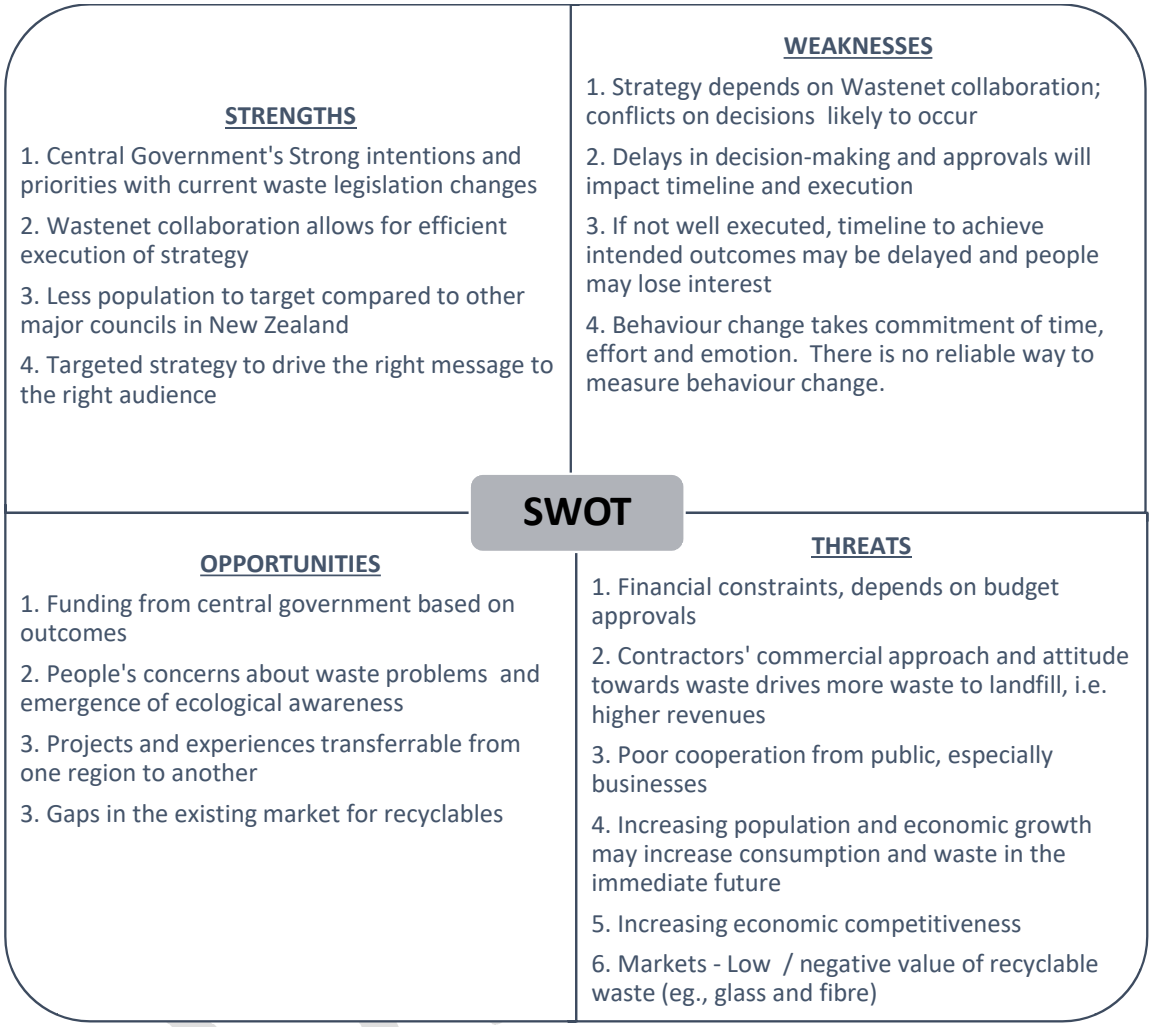


Delivery Framework Table:

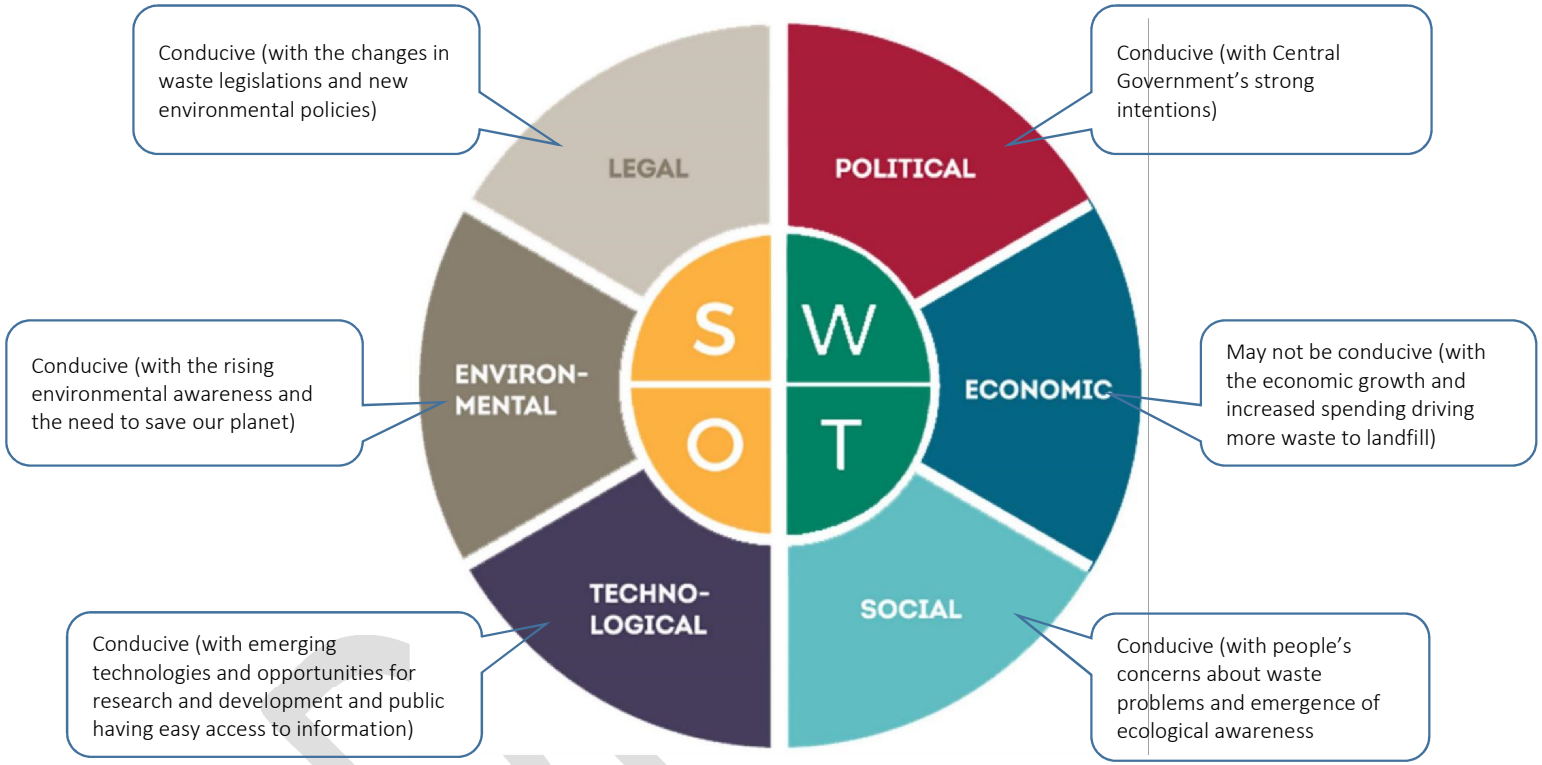
Wastenet Waste Minimisation Education and Communication Strategy				
Vision	By 2035, all residents and businesses in the Southland region to have a better understanding of waste minimisation and take voluntary actions towards minimising waste and progressively transitioning to a circular economy.			
Aim	Promote waste minimisation and resource recovery through targeted and effective tools for education and communication that promote behavioural change.			
Objectives	1. Retain and recover as much as possible through reusing, repairing, refurbishing, remanufacturing, repurposing or recycling products and materials 2. Protection of human health 3. Protection of the environment 4. Improve business efficiency 5. Minimise the costs and impacts associated with Southland region's waste generation 6. Be an advocate for more sustainable waste management legislation, policy and practice			
Initiatives	School Waste Education	Business Programmes	Residential and Community Education and Development	Industry Associations
Targeted Objectives	Educating school children, teachers and parents to reduce, reuse, recycle and rethink. Educating teachers to incorporate waste management in their schools' daily operational activities	Educating local businesses to incorporate waste management and environmental sustainability into their everyday business practices (operational change and influencing customer behaviour)	Educating general public, raising awareness and monitoring waste production - Reduce, reuse, recycle and rethink	Influence regulation, government policy and public opinion on behalf of the collective needs and objectives of their members
Targets	Schools	Local Businesses	Residential	Industry and Trade Groups
Tools	1. Koha Kai 2. Para Kore 3. Waste Free Wanda (Anna Van Riel) 4. Zero waste Education 5. Enviro Schools 6. The Sustainability Trust (YSSN) Refer to Appendix	1. Business Self Audit Template 2. Information pack on waste reduction and packaging options 3. Stands in Trade Shows 4. Direct Engagement with local business groups through Chamber of Commerce 5. Reusable Coffee Cup Initiative - piloting with Batch Café 6. Battery Disposal Initiative	1. Residential Bin Audits 2. General Media, Advertising 3. Website/app 4. Love Food Hate Waste 5. Kate Meads (3-year contract) 6. Plastic Free July 7. Love Southland 8. Orange Pages - collateral 9. Trash Talk 10. Flytipping Flyers 11. GIS Mapping Software	Memberships

SWOT AND PESTLE ANALYSES:

SWOT and PESTEL analyses were carried out to help drive the strategy. This ensures alignment between the broader national context and Council's ability to deliver.



The SWOT-PESTLE integration analysis gives us an insight into the WWMECS strategy's internal and external dimension that serves as the sustainability indicator.


Conducive (with the changes in waste legislations and new environmental policies)
Conducive (with Central Government's strong intentions)
LEGAL
POLITICAL
S
W
O
T
ENVIRON-MENTAL
ECONOMIC
Conducive (with the rising environmental awareness and the need to save our planet)
May not be conducive (with the economic growth and increased spending driving more waste to landfill)
TECHNO-LOGICAL
SOCIAL
Conducive (with emerging technologies and opportunities for research and development and public having easy access to information)
Conducive (with people's concerns about waste problems and emergence of ecological awareness

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Appendices

School Waste Education Programmes

KOHA KAI:

Koha Kai is a school holiday food waste reduction programme that raises awareness of the food waste issue in NZ. Koha Kai uses 2 or more of the top 10 wasted foods on the course; a meal to go home to the family; learn the full life-cycle of food (from growing to harvest to plate). The aim is to sample 100 students (piloting project) to complete the Koha Kai food waste reduction school holiday 1-day course. Each student pledges to make one behaviour change that they will implement in their everyday life.

WASTE FREE WANDA (Anna Van Riel):

Waste free Wanda, written and composed by award-winning singer/songwriter Anna van Riel, who performs interactive stage shows to primary aged children. It helps school children learn how to reduce waste and discover tools that prevent us from counting solely on recycling to reduce our waste.

Website: https://www.wastefreewanda.com/
Duration: 4 days
Measure / Deliverables: Feedback from Schools

ZERO WASTE EDUCATION:

The waste minimisation education is an award-winning programme and is offered to over 500 schools and pre-schools nationwide.
This option is based in Hamilton and does not have a presence in Southland. We could, however, seek and external party to train up with this education provider and deliver the training on our behalf. Funding for this initiative would be via the waste minimisation levy, which council receives on a quarterly basis from MfE. Subject to performance, MfE are able to provide additional funding at their sole discretion.

Unit plans are provided prior to the visit to assist teachers in undertaking curriculum planning. These unit plans also contain suggested hands-on extension activities, writing tasks and links to resources.

Website: https://zerowasteeducation.co.nz/
Duration: A total of 10 Waste Minimisation Education Units from Pre School to Year 8, funded by local councils.

Preschools: One 45-minute lesson The No Rubbish Hero
Year 1&2: Two x 45-minute lessons Is that really rubbish? The Litterless Lunch Box

The Year 3-8 units each comprise four 45-minute lessons
Year 3&4: Reducing & Reusing
Year 5&6: Recycling & Composting
Year 7&8: Resource Sustainability & Water
Year 5 to 8: Rural Waste Unit

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Teachers can opt for one 45-minute lesson per day, or 90-minute sessions comprising of two lessons (with a 10 minute break mid-session).
Risk – Low (well-planned action)

Measure / Deliverables: Facilitator to report back progress; reportable to MfE.

PARA KORE: (Currently in action)

Para Kore is similar to Zero Waste Education programme but delivers waste minimisation education from a Māori perspective. They use tikanga and te reo Māori to think about resource extraction and disposal and how it impacts our natural world. Para Kore delivers its education to Māori and non- Māori organisations, and responds to all invitations. They are currently working with three different schools (Te Kura, Te Kohanga REO Nga Hau E Wha and the Aurora College) in Invercargill to reduce food waste generated from the schools' free lunch programme.

Para Kore is majorly funded through the waste minimisation fund and supplemented from additional funding from Council.

Para Kore is currently collecting waste data and hopes to see a reduction in waste from April 2023.
We anticipate to see this in the next quarterly report.

Duration: Based on the type of programme signed up for and can be for a full school term
Risk: Low (well-planned action)
Measure / Deliverables: Para Kore Quarterly reports

ENVIRO SCHOOLS:

Enviroschools is an environmental action-based programme delivered by Environment Southland where young people are empowered to design and lead sustainability projects in their schools, neighbourhoods and country. Children from different schools in Southland can learn about kaitiakitanga. Enviroschools facilitators support the whole school/centre journey, assisting teachers, caretakers, school management and community members to integrate sustainability and Environmental Education into their roles including classroom learning, planning, policies and Enviroschools projects.

Duration: Learning sessions, events and workshops planned out yearly
Risk: Low (well-planned action)
Measure / Deliverables: Environment Southland Enviro School Reports

THE SUSTAINABILITY TRUST'S YOUR SUSTAINABLE SCHOOL NATIONAL (YSSN):

Your Sustainable Schools programme is fully funded by the Ministry for the Environment and delivered by the Sustainability Trust on their behalf. YSSN "Train the Trainer" workshop is free for teachers, early childhood educators, caretakers, interested parents and other school staff. The programme is fully funded by the Ministry for the Environment and delivered by the Sustainability Trust on their behalf.

The workshop focuses on waste minimisation as climate action and giving educators the tools they need to establish and maintain a successful waste minimisation programmes at their kura/school or kōhanga/early childhood centres.

A large focus is placed on developing and strengthening local connections between schools, local council, and groups/organisations working in waste minimisation.

Topics covered – Waste minimisation in actual practice of generating as little waste as possible, circular economy versus linear economy (take-make-dispose), positive and responsible actions, develop and lead climate action projects of their own making for students, connecting more deeply with cultural roots.

After the workshop, participants are provided with access to a number of online resources.

Website: https://sustaintrust.org.nz/our-events/

Duration: 1 day workshop (9 am to 4 pm)
Risk – Low (well-planned action)

Measure / Deliverables: Logins for schools to report progress and Wastenet can access these reports with own login

Delivery Related Activities:

1. Liaising with WasteNet Councils and the Respective Programme Coordinator.
2. Liaising with schools and relevant community groups where needed.
3. MOUs and bookings for the programmes.
4. Providing additional support as needed during the delivery
5. Being the first point of contact for all general waste enquires including waste minimisation and cleaner production.
6. When appropriate, advocating to central government for a nationwide education programme and certain matters (e.g. energy efficiency).

ACTIVITIES REPORT

To:	Infrastructure Committee
Meeting Date:	Tuesday 2 May 2023
From:	Infrastructure Services Managers
Approved:	Erin Moogan - Group Manager - Infrastructure Services
Approved Date:	Thursday 27 April 2023
Open Agenda:	Yes
Public Excluded Agenda:	No

Purpose and Summary

This report provides an update on a wide range of activities across Council.

Recommendations

That the Infrastructure Committee:

1. Receives the report "Activities Report".
2. Notes that the tender for Councils Road Corridor Maintenance Contract will be live on 8 May 2023.

City Streets - Esk and Don Opening

Mana whenua were joined by Mayor Nobby Clark, Councillors, Council staff, contractors, retailers and guests for a whakawātea and blessing on Friday 14 April to settle the streets and mark the end of over two years of work.

Mana whenua and Waihōpai Runaka deputy chair Joe Wakefield led a walking whakawātea around the Esk, Dee, Don and Kelvin block to undertake a karakia blessing of the space, while discussing the cultural elements and stories behind the artwork that had been added to the street.

The ribbon was then cut and Esk and Don Streets reopened to the public.

New Road Corridor Maintenance Contract

Invercargill City Council's local roading network consists of 598 km of roads, of which 474 km are sealed and 123 km are unsealed. The urban network is 321 km in length (57%) with the remaining 247 (43%) rural roads. There are 500 km of footpaths, 55 bridges and more than 7,000 streetlights across the district.

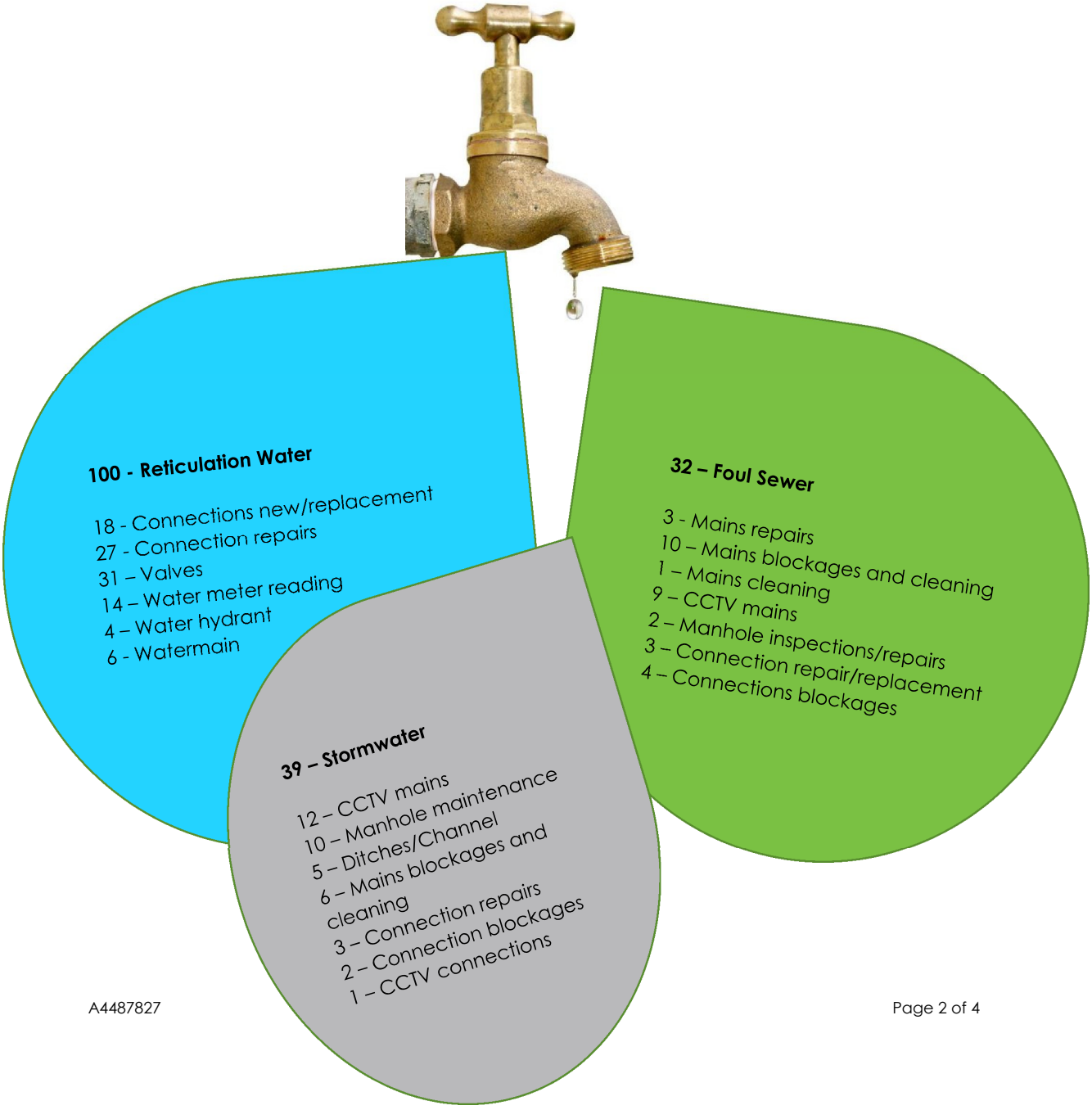
The road corridor maintenance contract is due to expire. The new contract is proposed to commence on 1 October 2023. It is proposed an initial 5-year term with the right to renew for a further 2-year period making a maximum total of 7 years. This contract is the ICC's largest maintenance contract.

An Open Request for Tender will be undertaken via New Zealand Government GETS.GOVT.NZ. The request for tender will be live in the week commencing 8 May 2023.

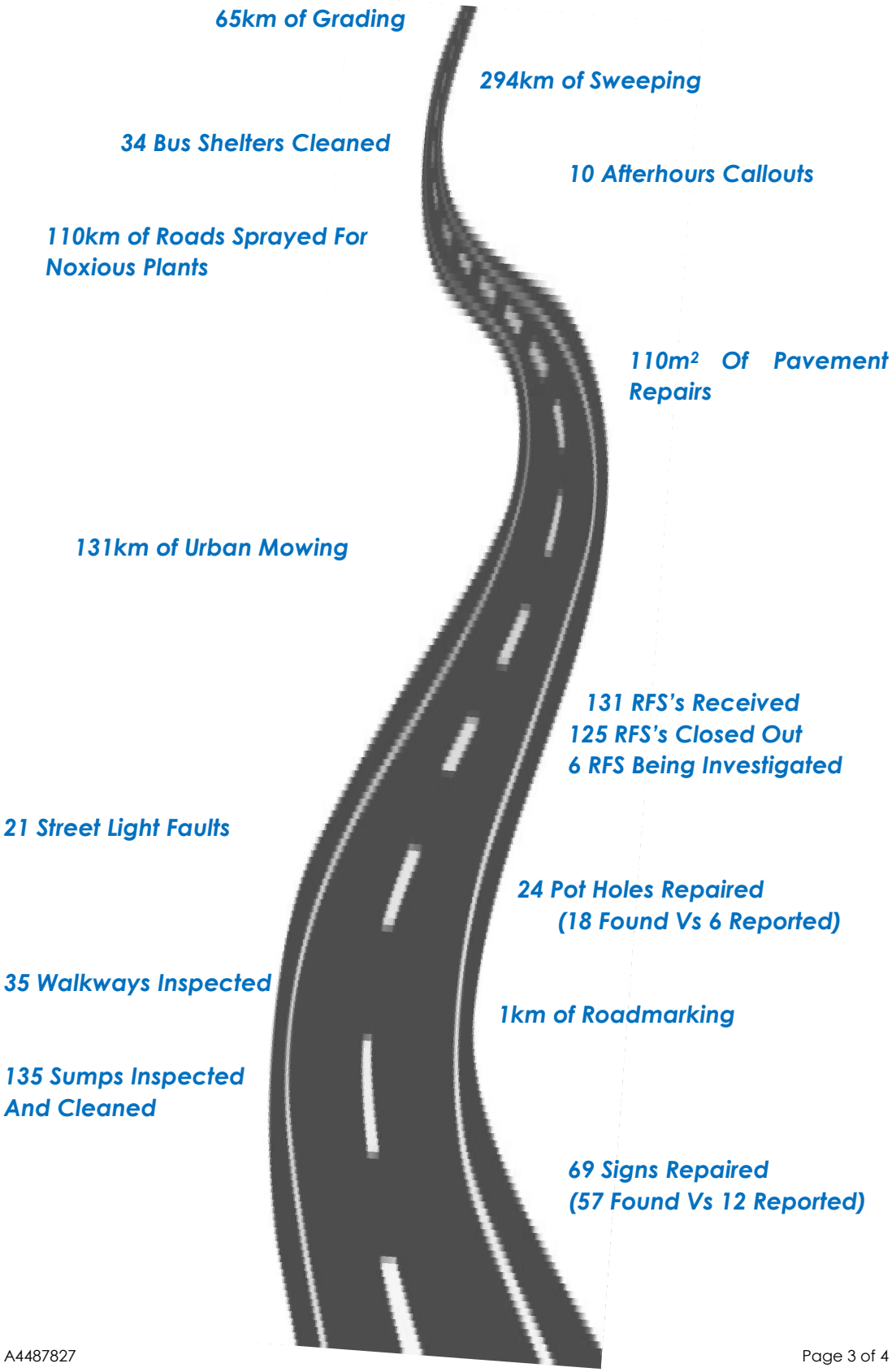
Pothole Statistics From April Infrastructure Committee

At the April Committee meeting clarification was sought on why there was a jump to 30 potholes from 7 the previous month. Staff have advised this is consistent with the trend of lower reporting during the school holiday period with numbers returning to normal in February. March figures are consistent with the higher numbers reported for February.

Three Waters Maintenance Contract Snapshot



Road Corridor Maintenance Contract Snapshot



Aged Care Housing Snapshot

1 Housing Applications Received
7 Housing Enquiries Received
2 Housing Tenancies Vacated
1 Housing New Tenancies
80 Current Housing Waiting List (Priority and Secondary Combined)

The overall waiting list has dropped over the past month due to a significant number of applicants who had been on the list no longer requiring accommodation.