

**KAPITI COAST DISTRICT COUNCIL**

**SUBDIVISION AND DEVELOPMENT**

**PRINCIPLES AND REQUIREMENTS**

**2005**



**SCHEDULE OF CHANGES**

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# **SUDIVISION DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

## **PART 1**

### **CONTEXT**

This document is intended to provide a guide to subdivision and developments within the Kapiti Coast district. It sets out what the Kapiti Coast District Council needs from developers so that the requirements of the Resource Management Act and the Kapiti Coast District Plan are met.

The Resource Management Act (RMA) is concerned with promoting the sustainable management of natural and physical resources. Emphasis is placed on the integrated management of the effects of activities on the environment. Environmental management under the RMA is intended to be outcome orientated, and this provides challenges for both developers and the Council.

The Act provides for effects-based Regional and District Plans through which the implementation of new and innovative solutions for development can be undertaken. However, the successful adoption of new and innovative designs depends to some degree on certainty in the resource consent process.

Section 11 of the Act requires local authorities to control subdivision. It requires the territorial authority to make specific provision for subdivision in a District Plan. To date, the Council's response has been mainly through rules and standards defined in the District Plan and through a prescriptive Code for Subdivision and Development. Although the Code was only one means of compliance, it tended to become the norm because of the certainty it provided in the resource consent process.

The Council is a signatory to the NZ Urban Design Protocol. As a result the Council is committed to creating quality urban design. By October 2005 the Council will have developed a set of actions to implement the Council's commitment to the Protocol and this will be reported to the Ministry for the Environment. This is likely to include having all of the Council's capital works demonstrating quality urban design and actively encouraging the development community through the Design and Review process to provide for good urban design. The Council will also be encouraging local developers to become signatories.

The Council wishes to promote greater innovation in developments in order to provide for best environmental practice in terms of both design and provision of services. These alternative methods of compliance are being promoted by inclusion in the District Plan and the provision of alternative design guides such as SNZHB44:2001, Subdivision for People and the Environment. The approach is a non-prescriptive method consisting of design guides and minimum engineering requirements, as illustrated in Diagram 1. The approach is interactive with the District Plan provisions, and strategic and community directions of the Council, as illustrated in Diagram 2.

## SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS

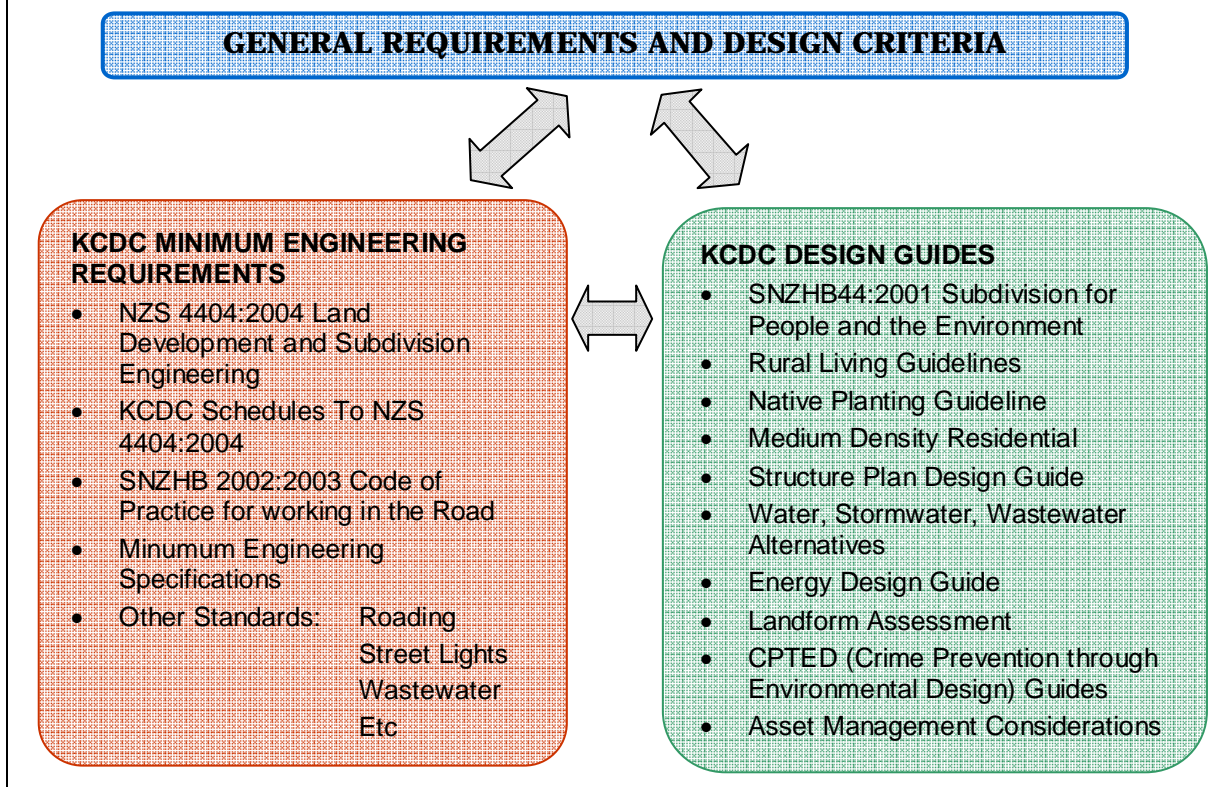


Diagram 1

A major initiative has been to provide landowners and developers with an alternative route which allows for innovative design, but does not penalise them in terms of working through the consent process. Making this shift has involved adjustments to the District Plan and the introduction of Design Guides which can be used instead of the Council's Minimum Engineering Requirements.

Although the Council is looking for an approach that reduces barriers to innovation, it is acknowledged that some developments will be more suited to a more traditional approach. The Council has determined that these will be best provided for by using the New Zealand Standard NZS 4404:2004 as the base document for meeting minimum requirements with Schedules that provide specific design information, and any Council requirements that may differ from those in NZS 4404:2004. Notwithstanding this, the Council prefers that a design approach over a traditional hard engineering approach be pursued by developers, particularly for larger developments and environmentally sensitive sites.

The Council's policies are evolving in response to environmental concerns and service and infrastructure constraints within the District. These include the provision of adequate potable water supplies, treatment and disposal of wastewater, dealing with stormwater issues and design of roads. These are all relevant to development planning and need to be taken into account in development proposals.

The system now in place seeks to support the use of alternative designs and technologies, to be sufficiently flexible to allow innovation, but to also provide a degree of certainty for developers. It provides options for alternatives or innovative designs that a developer may wish to propose. Compliance with minimum standards is still available for those situations where alternatives are not desired.

The system also seeks to integrate across departments within the Council and with national directions and legislative changes. Accordingly, the approach to subdivision and development within the Kapiti Coast has been considered in conjunction with the direction of the Local Government Act 2002 and the implications of community planning on Council activities and subdivision and development in the future. This planning context is illustrated in Diagram 2.

To assess applications a combined interdisciplinary process is used that enables the applicants, developer's representative, Council engineering, resource consents, stormwater, roading, wastewater, parks and recreation, and policy staff to examine proposals in an interactive and integrated manner. This Design and Review team is responsible for assessing applications or early design concepts, recognising that compromises may need to be made in some areas for the benefit of others. This is the essence of sustainable management and the process provides for dialogue between Council staff, applicants and the community to ensure an integrated approach to decision-making. To encourage innovative design, developers should discuss their development concepts with the Council at an early stage. This integrated decision making process is illustrated in Diagram 3.

The use of alternative subdivision design and environmental technologies has not had a long history of use (compared to traditional approaches). This is apparent on a national basis and is not just a local issue. Knowledge regarding the long term operation, maintenance and success of some designs may be limited or not available. This requires, at least initially, that the Council accept some risk and take a trial and error approach to testing these alternative designs to build experience to a level where some degree of certainty in the selection and application of alternatives can be gained.

Conversely it also requires that sufficient information is provided by the applicants on proposals to address ongoing management, maintenance and asset management considerations. Each application will be assessed against specific criteria which also include guidelines on how to deal with issues such as asset management, private versus public ownership of infrastructure, and future maintenance of components in an alternative design approach. Assessment criteria are located within the District Plan as well as in this document.

**Diagram 2: Context & Linkages Of KCDC Framework To Subdivision & Development Within Council Planning Activities**

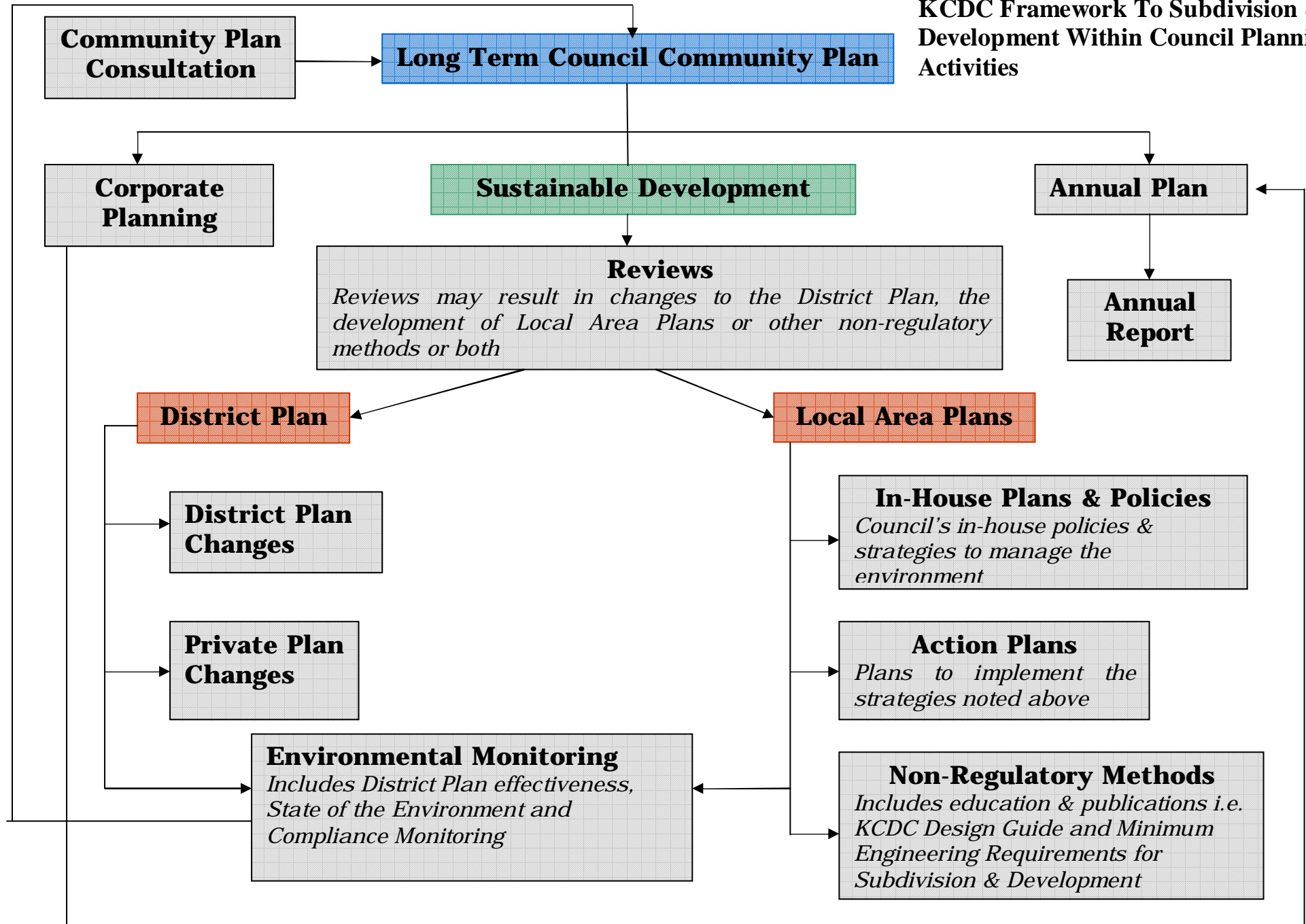
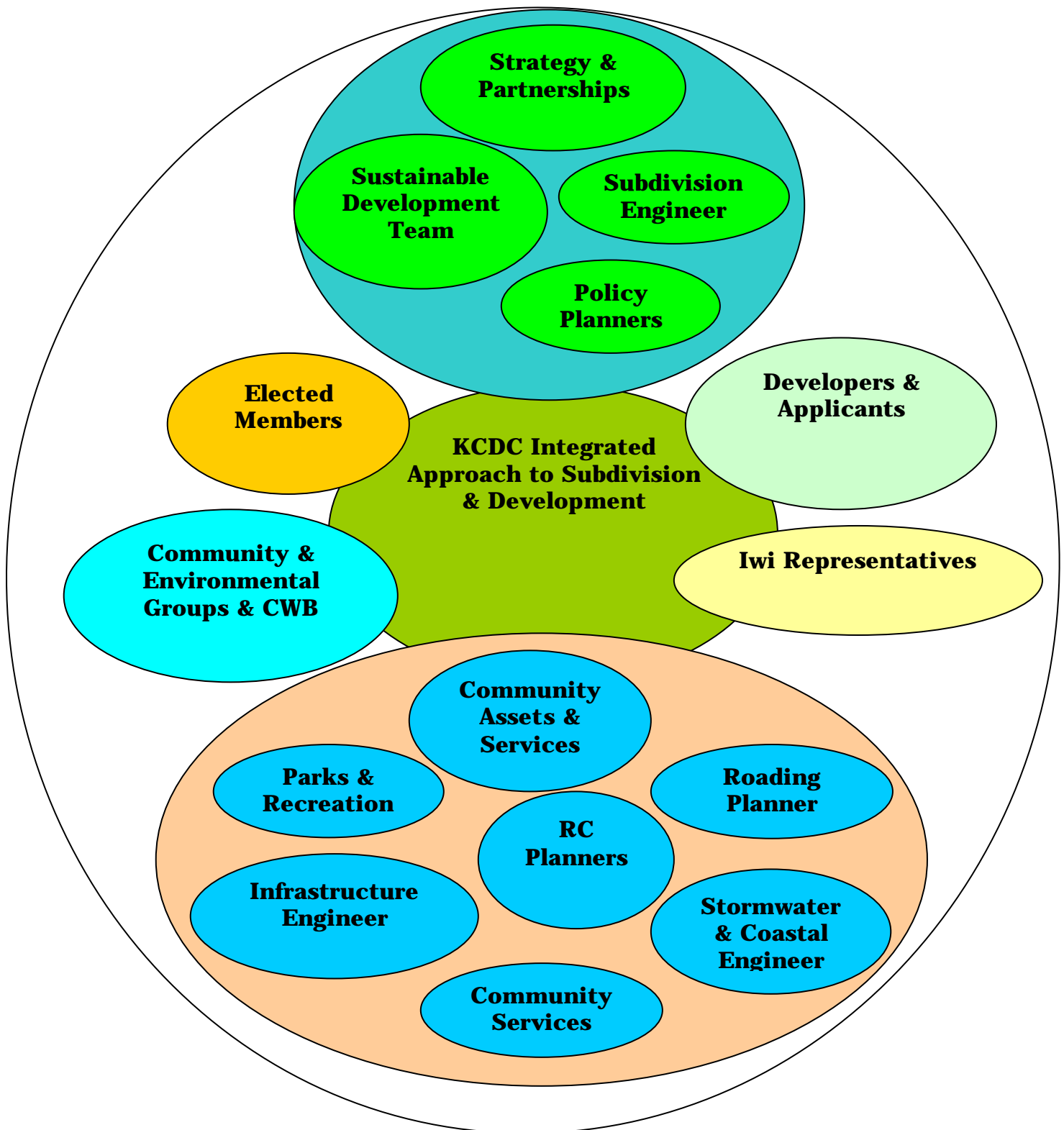


Diagram 3





# **SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

## **PART 2**

### **DEVELOPMENT PROCESS**

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## **SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

### **PART 2**

#### **DEVELOPMENT PROCESS**

##### **A) Preliminary**

- (i) Before any development can commence a resource consent will almost always be required. Developers should consult with the Council at an early stage to ascertain any particular requirements or site limitations for the development proposed.

The Council has constituted a Design Review Group comprising cross sectional staff representation which can meet to work through design issues with developers. Experience has shown that there is a great deal of value in having such meetings at a very early stage, particularly prior to the lodgement of any resource consent application.

- (ii) Applicants need to consider the requirements of the Greater Wellington Regional Council Regional Fresh Water Plan, Regional Discharge to Land Plan, Regional Soil Plan and Regional Air Quality Management Plan. Applicants should consult with the Regional Council to seek their advice on the above plans and to ascertain if resource consents are required from the Regional Council. This is particularly the case where large scale earthworks and/or waterways are involved in the development.

- (iii) Consultation with other persons or organisations may be required, including:

- Local iwi
- Adjoining owners
- Department of Conservation
- Environmental groups
- LINZ
- New Zealand Historic Places Trust
- Network Utility Operators
- Transit New Zealand
- New Zealand Fire Service
- Other interested parties.

##### **B) Concept Plans**

- (i) A concept plan may be required where a large area is proposed to be developed, particularly if to be staged over a number of years. It may also be advantageous to provide concept plans where alternative designs are proposed. Concept plans should look beyond the site to consider any strategic issues within the area.
- (ii) Where the Council requires a concept plan, sufficient copies of the plan and supporting information shall be provided to the Council for evaluation of the

proposal. The plan shall include sufficient details to give a general outline of the nature of the development, either as part of the plan or in the explanatory material accompanying the plan. Information supporting alternative design proposals should be sufficient to enable Council staff to assess the effectiveness of operation and analyse the proposal on a whole of life basis.

**(iii)** The plan should indicate approximate locations of:

Roads;  
Reserves;  
Waterways and flood plains;  
Important natural features;  
Cultural sites;  
Hazards;  
Cycleways, walkways and bridleways;  
Proposed public amenities;  
Other significant features.

It should also extend beyond the site to take account of any adjoining developable land, whether or not owned by the developer, and any effects on existing developed land.

**C) Resource Consents**

- (i)** Subdivisions and other developments require resource consents in accordance with the Resource Management Act. In some cases resource consents will be needed from both the Kapiti Coast District Council and the Greater Wellington Regional Council. In this case the Kapiti Coast District Council will seek to co-ordinate the processing of applications and, where required, to hold joint hearings. Developers are advised to consult with the Council's Consents staff prior to lodging resource consent applications.
- (ii)** Section 88 of the Resource Management Act and the Kapiti Coast District Plan set out the information that must be included with any application to subdivide. A checklist is available which states the information required by the Council's District Plan. Important parts of any application are the Assessment of Environmental Effects, reports covering specific aspects of the proposed development and plans of the development, being scheme plans for subdivisions and development plans for other developments. See below for requirements for these.
- (iii)** The application (particularly for subdivisions) should include reports covering proposed land uses, factors influencing the design of the development, the extent of any earthworks proposed, soils report if required for foundation design and/or as evidence to support any proposal to dispose of sewage effluent on-site, stormwater disposal proposals, potable and fire fighting water supply provisions, road safety audits, current and future effects of traffic, the provision of off-street parking, access for fire fighting appliances, landscaping proposals and any other relevant information which may assist the Council in making an informed assessment of the proposals. Where alternative or non-standard designs are proposed, then the applicant shall provide sufficient evidence to enable Council staff to assess the viability of the proposal, ongoing maintenance requirements and whole of life cost assessments.

- (iv) If a subdivision is likely to fall within the provisions of Section 106 of the Resource Management Act, then the Council may refuse to grant a subdivision consent, or may grant a subdivision consent subject to conditions. In cases where Section 106 provisions may apply, applicants should propose suitable conditions for the purpose of avoiding, remedying or mitigating the material damage effects referred to in subsection (1) of Section 106.
- (v) An applicant is required to assess the floodability of any proposed subdivision through direct liaison with the authority responsible for the administration of watercourses in the area. If the Greater Wellington Regional Council or the Kapiti Coast District Council does not have the necessary information, then the applicant will be responsible for providing it. Applications should include proposals for dealing with stormwater from the development, including, where necessary, assessment of the effects of the proposed development on upstream and downstream stormwater flows and levels. The assessment should also include possible effects the proposed development may have on groundwater levels and, where applicable, what measures are proposed to mitigate any adverse effects arising from possible changes in groundwater levels. Existing stormwater systems shall be able to cope with stormwater runoff from the development without adverse impacts on other properties either upstream or downstream of the development site.

Potential increases in stormwater runoff peak flows shall be mitigated within the development by appropriate measures. Examples of such measures would include on site storage and soakage where soil types enable this. Secondary flow paths required to deal with run off from the 100 year design storm (1% annual exceedance probability event) should be identified. If secondary paths are not available, then the stormwater systems shall be designed to meet the flows arising from the 100 year design storm.

To meet the requirements of Section 106 of the Resource Management Act, the Council needs to consider in any subdivision application the implications of flooding or inundation and any coastal hazards. Building sites within subdivisions are required to be above the flood level of the 1% annual exceedance probability (AEP) storm event plus an approved freeboard. A distinction is made between inundation by ponding and inundation where flood waters are likely to generate scour velocities and consequent erosion.

Applicants must either establish that the land is not subject to material damage, or propose measures that will ensure that material damage under “bank full” conditions does not occur or can be remedied.

Areas of private property may be able to become inundated (usually not exceeding 300mm) provided they are not used as building sites. These areas shall be designed to a 1% AEP storm event and shall be registered as building exclusion zones on the titles of the properties. Approval will not be given where it is considered that erosion is likely to occur.

A report from a suitably qualified person covering stormwater disposal and inundation issues, including a catchment plan and calculations, should be included with the resource consent application.

The Council will require easements or covenants to be recorded on the title if a planned secondary flow path arising from the 1% AEP event intrudes into an allotment within the development to a point where a dwelling site is normally permitted.

- (vi) Once an application is submitted the Council will decide whether to notify it or not. Under the Act it is possible to gain consent for discretionary and non-complying activities without public or limited notification and hearings. However, the Council must consider each application and be satisfied that this is only possible if:
- That the effects on the environment will be minor; and
  - Approval of all potentially affected parties has been obtained (unless the Council considers it unreasonable in the circumstances).

Note: The Resource Management Act allows any application to be notified under special circumstances, even if a relevant plan expressly provides that it need not be notified.

- (vii) If an application is non-notified then resource consent staff may make the decision to grant or refuse consent under delegated authority. Applicants can object to the Council if consent is refused, or if they are not happy with the conditions. The Council is happy to forward draft conditions to applicants and consider any comments they may have prior to issue of the resource consent. Further information can be obtained from the Council regarding non-notified applications and objections.
- (viii) If the Council decides to notify an application, it will first decide if it is to be publicly notified or have limited notification. If it is to be publicly notified, it will be advertised in the Public Notices section of an appropriate local newspaper. A sign is generally erected on the site of the proposed activity and any parties who are considered to be potentially affected are notified in writing. These parties are invited to inspect the application at the Council buildings or the local library, and to make a submission either for or against the proposal. The aim of notification is to ensure that everyone that may be affected by a proposal is given the opportunity to make a submission.

If notification is to be limited, then only those parties who are considered to be directly affected by the application, such as immediate neighbours, will be served notice and invited to participate in the hearing process.

Once the closing date for submissions has passed the Council may arrange a pre-hearing meeting. The applicant and all submitters are invited to discuss the application in an informal way. The aim is to first clarify the concerns and goals of all parties, and to agree on the facts as far as possible. Secondly, the pre-hearing meeting can go on to resolve as many differences as possible. If all differences are resolved a hearing may not be necessary. If some concerns remain unresolved, then the application will go to Hearing. A Hearing Committee of at

least three elected Councillors, or independent commissioners, will hear the case and make a decision to grant or refuse consent. This decision may be appealed to the Environment Court. Further information is available from the Council.

- (ix) Consents may have conditions imposed to ensure that developments are sound in relation to both engineering and environmental aspects, and to protect other landowners and future residents. Resource Consent staff and the Subdivision Engineers will set the conditions using the District Plan and other planning and engineering documentation, including these requirements, as guidance. Applicants may appeal or object to any conditions set on their consent. Further information regarding appeals can be obtained from the Council.
- (x) Once a resource consent has been granted, there is normally a period of five years to submit a land transfer plan for the Council's approval. This plan must be in accordance with the original plan and any conditions of approval. If the land transfer plan satisfies the Council's requirements, approval is granted. The land transfer plan is then lodged with Land Information New Zealand.

A longer period for the survey plan to be submitted may be agreed by the Council at the time consent is granted, and an extension can be granted later by the Council if certain criteria are met.

- (xi) A certificate stating that all the conditions of consent have been satisfied must be provided within three years of the Council's approval of the land transfer plan. This certificate and other documents are then lodged with the District Land Registrar to allow the new certificates of title to be issued. Failure to gain this certificate within the time limit may result in the consent approval lapsing.
- (xii) The Council imposes fees for the processing of resource consent applications and for the later monitoring of resource consent conditions. Fees are split into two components. An application fee is required for the consent planning processes required for decisions on applications and, where applicable, an application fee is required for the engineering considerations required. Where consent monitoring is involved additional fees may be required. The quantum of these will generally be included in the resource consent conditions. Additional charges and costs are required to be fair and reasonable.

Schedules of the fees and charges are available from the Council.

- (xiii) Resource consent procedure and time frames can be obtained from the Council's Resource Consents Section.

#### **D) Financial Contributions**

- (i) Reserves contributions for developments and subdivisions are required in accordance with the requirements of the District Plan.

For example, residential zoned subdivisions require contributions of 7.5% plus GST of the market value (up to a maximum value of \$100,000) for each

additional lot. The contribution may be made in land, money, or works, or a combination of these, in accordance with the Council's Reserves Acquisition Strategy. See Section I of this document for a summary of the relevant parts of this policy.

See section E.1 of the Kapiti Coast District Plan for reserve contributions for contributions required for other developments.

- (ii) Development contributions shall be required from new developments in the form of money or land or both at the Council's discretion for capital expenditure for growth for roading, cycling, walking and bridle ways (CWB), water supply and waste water treatment facilities, community infrastructure and flood mitigation activities in accordance with the Council's Development Contributions Policy. The level of fees (GST inclusive) per new lot as at 1st July 2004 is set out in the table following. These fees may be adjusted from time to time.

The current schedule of fees is available from the Council.

|                            | <b>Roads &amp; CWB</b> | <b>Waste water</b> | <b>Community Facilities</b> | <b>Flood mitigation</b> | <b>Water supply</b> | <b>Total per Lot</b> |
|----------------------------|------------------------|--------------------|-----------------------------|-------------------------|---------------------|----------------------|
| <b>Otaki</b>               | <b>\$1,719</b>         | <b>-</b>           | <b>\$1,021.50</b>           | <b>\$237</b>            | <b>\$341</b>        | <b>\$3,318.50</b>    |
| <b>Waikanae</b>            | <b>\$2,644</b>         | <b>\$2,442</b>     | <b>\$1,827</b>              | <b>-</b>                | <b>\$112.50</b>     | <b>\$7,025.50</b>    |
| <b>Paraparaumu Raumati</b> | <b>\$2,683</b>         | <b>\$2,071</b>     | <b>\$1,856</b>              | <b>-</b>                | <b>\$112.50</b>     | <b>\$6,722.50</b>    |
| <b>Rural North</b>         | <b>\$1,573</b>         | <b>-</b>           | <b>\$949.50</b>             | <b>-</b>                | <b>-</b>            | <b>\$2,522.50</b>    |
| <b>Rural South</b>         | <b>\$2,814</b>         | <b>-</b>           | <b>\$1,611</b>              | <b>-</b>                | <b>-</b>            | <b>\$4,425</b>       |

## **E) Assessment of Environmental Effects**

- (i) For all resource consent applications it is necessary to provide an assessment of any actual or potential effects that may result from the activity for which the consent is sought. An Assessment of Environmental Effects needs to be prepared in accordance with the Fourth Schedule to the Resource Management Act. The Council has a series of brochures which includes Assessments of Environmental Effects reports.
- (ii) An Assessment of Environmental Effects may include such issues as increased traffic (vehicular and pedestrian), effects upon vegetation and the landscape, effects arising from stormwater, wastewater and provision of potable water supply, and effects of additional buildings on amenity values. The amount of detail of an assessment of environmental effects should be proportional to the scale of the potential or actual effects of the activity.
- (iii) The Fourth Schedule to the Resource Management Act requires details of who is affected, any consultation undertaken with the parties (including tangata whenua), the results of this consultation and the views of those consulted. It is best to consult early on in the preparation of an application. Effective consultation can resolve any misunderstandings and concerns that affected parties may have. This in turn can result in the application being simpler and quicker to process. If adequate consultation is not undertaken by the applicant, this will be done by the Council, at the applicant's cost.

- (iv) If an Assessment of Environmental Effects is not completed or does not have sufficient information for Consent staff to make a decision, a request will be made for further information. There is the right to formally object to a request for further information. Advice on this is available from the Council.

## **F) Scheme Plans**

- (i) Scheme plans of subdivision shall comply with those requirements of the District Plan that apply to the land being subdivided and be submitted with the resource consent application.
- (ii) Scheme plans shall provide the following information:
  - (a) The position of all existing public utility services and water courses, water catchments and other significant water features.
  - (b) Adequate contour information to illustrate the existence on each allotment of a suitable building platform and to enable the gradients proposed for roads, rights of way and access ways to be assessed. For two or three lot subdivisions spot levels in terms of mean sea level datum (Wellington) may be acceptable where the land is of gentle enough contour to enable road and right of way grades and feasibility to be assessed from such limited information.
  - (c) Sufficient topographical information, including a locality plan if necessary, to accurately identify the site. The position of all buildings and significant stands of trees or bush and any other significant feature of historic, cultural, environmental or other interest shall be shown.
  - (d) Where a scheme plan forms only part of the future potential development of a larger block of land held in the same ownership and zoned residential, and a concept plan has not previously been provided, the scheme plan shall show the total development including roading, drainage, water supply and the number of allotments, so as to ensure that the initial scheme plan application does not prejudice full and future development. The extended development may be shown to a smaller scale as an insert on the initial application.
  - (e) All allotments on the plan shall be numbered, including any land to vest, and shall show metric dimensions for all boundaries as well as the area of each allotment.
  - (f) Indicative roading networks and service layouts shall be shown with typical road cross-sections that provide sufficient information to check that adequate gradients and suitable manhole invert levels can be achieved.
  - (g) The draft conceptual cycleway, walkway and bridleway indicative network.
  - (h) All landscape works proposed, including on road reserves, including the location and species of trees.
  - (i) Details shall be given of any proposed reserve and its proposed development. The applicant shall be responsible for nominating the purpose for which each reserve is to vest and such information shall be shown on the plan. The Council may or may not approve part or any of the proposals.

- (j) Public roads, private ways, service lanes, access ways and cycleway, walkway and bridleway networks shall be laid out to fit in with the general roading requirements of the locality in which they are situated. They shall generally provide for connectivity and any requirements arising from road safety audits that have been undertaken.
- (k) The width of legal road reserves and carriageways and road geometry and gradients shall be in accordance with the requirement of the Kapiti Coast District Council Development Requirements, unless alternative designs are required or approved by the Council.
- (l) Plans shall be drawn to commonly accepted metric scales. The Council's preference is for scales of either 1:500 or 1:1000. However scales of 1:100 or 1:200 are acceptable in appropriate situations. Datum shall have reference to mean sea level (Wellington). A north point must be shown on plans.
- (iii) Due regard shall be given for any road widening or upgrading proposals which the Council may have and any requirements shall be ascertained by consultation at an early stage with appropriate Council staff.
- (iv) In designing any scheme plan, consideration shall be given to the future development of adjoining land and the Council may, as a condition of consent, require the creation of road reserve and/or the formation of roads to or near the boundary of adjoining land.
- (v) In submitting any scheme plan for approval, the applicant shall provide documentary evidence that the general layout is sufficient for reticulation by other utility services authorities and meets New Zealand Fire Service requirements.  
When a scheme plan has been approved adequate provision shall be made for transformer sites, junction boxes and other special needs of these authorities.

## **G) Water Permits**

- (i) The applicant shall make a thorough evaluation of the effects which the proposed works are likely to have on surface run-off and the consequences thereof, both on the land to be developed and also on adjoining lands, or into water.
- (ii) Water permits shall be obtained from the Greater Wellington Regional Council for any restricted activity covered by Section 14 of the Resource Management Act and any requirements arising from the Regional Fresh Water Plan and Regional Discharges to Land Plan.
- (iii) The approval of the Greater Wellington Regional Council shall be obtained for temporary or emergency overflows from sewage pumping stations in order to comply with the requirements of Section 15 of the Resource Management Act "Discharge of Contaminants into the Environment".
- (iv) A water permit may be granted on either a temporary or permanent basis. A permanent permit is required if the obstruction, impounding, diversion or discharge of water, whatever the case may be, is to become a permanent part of the development.



- (v) Any condition imposed by the Regional Council or the Kapiti Coast District Council shall be deemed to be a condition of scheme plan approval for the subdivision or development.
- (vi) Where a water permit requires the Council to assume responsibility for any of the temporary works which will remain in operation subsequent to the sealing of the Land Transfer Plan, the Council will require the applicant to enter into a registrable agreement enabling the Council to recover any costs arising from the operation of such temporary works.
- (vii) The applicant shall be responsible for the payment of all fees to the Greater Wellington Regional Council for the licensing of the permits to discharge stormwater. Application for a permanent water permit will be made by the Council to the Greater Wellington Regional Council where necessary, in the name of the Kapiti Coast District Council.



## **SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

### **PART 3**

### **DEVELOPMENT REQUIREMENTS**

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## **SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

### **PART 3**

## **DEVELOPMENT REQUIREMENTS**

### **A) Alternative Approaches**

- (i) The Council has adopted alternative approaches that allow variation in the ways compliance with District Plan requirements can be achieved.

  - The more prescriptive approach is outlined in the Kapiti Coast District Council Minimum Engineering Requirements section of this document.
  - The less prescriptive approach, which offers more opportunity for innovation, is covered in the Kapiti Coast District Council Design Guides.

The requirements outlined in paragraphs **B** to **J** of this section apply to both approaches.

- (ii) The Council has adopted the New Zealand Standard NZS 4404: 2004 as the base document to meet its minimum engineering requirements. Schedules outlining the Council requirements that are different to, or not covered in the Standard, have been developed and form part of the minimum engineering requirements.
- (iii) The Design Guides includes the Standards New Zealand Handbook, SNZHB 44:2001 Subdivision for People and the Environment, which provides guidance on alternative means of carrying out subdivisions. Other guidelines are also included which can be used in support of applications. Applicants can also submit to the Council other alternative designs based on appropriate Design Guides and with appropriate supporting detail.
- (iv) Applicants can choose for their developments whether to use the Minimum Engineering Requirements section, use the Design Guides or use a combination of the two.



## **B) General Provisions**

### **(i) General requirements**

Developments shall comply with Part 1, General Requirements and Procedures of NZS 4404:2004 whether using the Minimum Engineering Requirements or the Design Guide approaches, except as modified by the schedule titled **Schedule 1, Kapiti Coast District Council Altered Requirements to Part 1 NZS 4404:2004, General Requirements and Procedures.**

### **(ii) Representatives**

The owners of any development projects shall appoint a Developer's or Owner's Representative or Representatives who shall be responsible for the investigation, design and obtaining of approvals of the works, contract administration and supervision of the works, and certification upon completion of the works. The Developer's Representative shall be a person with qualifications and/or experience appropriate to the project with suitable liability and indemnity cover commensurate with the scale of the development.

### **(iii) Suitably Qualified Persons**

Where investigations and reports are required by a suitably qualified person, a person or company should be agreed between the Council and applicant prior to the engagement. The person or company will normally be expected to be professionally recognized in the area of competence claimed and to carry professional indemnity insurance to a level suitable for the purpose but in any case not less than \$250,000.

The Council reserves the right to have any work peer reviewed regardless of their prior approval as to the acceptability of the suitably qualified person.

Without limiting the Council's rights to require the use of suitably qualified persons the following are examples of areas of expertise where such people may be required:

- traffic engineering.
- flood mitigation and assessment of effects of development on flood and runoff issues.
- suitability of land for on site wastewater disposal.
- suitability of rural water supply proposed by the applicant.
- geotechnical engineering prior to development and to manage fill and excavation compliance during construction.
- site investigations and recommendations for foundation design.

### **(iv) Maintenance of Standards**

Developers have the responsibility, both directly and through their appointed representatives, to ensure that all works carried out directly or by contractors or sub-contractors are at all times in accordance with the approved drawings and specifications (including approved variations), and in accordance with sound engineering practice. While Council Officers will be available to offer advice and guidance, it remains the developers' representatives' responsibility to supervise

the construction and ensure standards are maintained. See paragraph 4 of Schedule 1 for maintenance and defects liability period requirements.

**(v) Safety**

Developers, Developer's Representatives and Contractors must meet the requirements of the Health and Safety in Employment Act 1992. Developers and/or contractors working on a development site are responsible for the safety of Council employees and anyone else undertaking work on, or inspections of, the development.

Developers and their representatives shall ensure that contractors have in place effective safety management systems. They shall ensure that contractors have in place suitable plans to carry out the required work in a safe manner and that the contractors comply with the requirements of relevant legislation covering the works.

Where a developer's contractor is to make connections to Council owned existing services or roads then the Developer, the Developer's Representative and the Contractor shall comply with Section 6 of the Council's Health and Safety Manual. For the purposes of the Health and Safety Manual requirements any work on Council owned assets is deemed to be managed by the Developer's Representative on behalf of the Council. The Developer's Representative shall get the contractor's signature to the Contractor Health and Safety Obligation Form as set out in Appendix 2 of Section 6 the Council's Health and Safety Manual, and shall ensure that the contractor complies with their health and safety obligations.

**(vi) Engineering Services**

Engineering services required for a development shall be provided and be in accordance with Council requirements, or as otherwise approved by the Council. Engineering works will generally include the provision of:

Urban developments

- (a) Earthworks.
- (b) Stormwater management, including pipe systems, swales, ponds, lakes, wetlands, attenuation devices, etc.
- (c) Wastewater.
- (d) Water supply, including for fire fighting purposes.
- (e) Underground power, gas and telecommunication services.
- (f) Street lighting.
- (g) Kerbs and/or channels where appropriate.
- (h) Road formation, metalling and sealing.
- (i) Footpaths as required.



- (j) Formation, metalling, sealing, drainage, kerbs and/or channels (where appropriate) and provision of services for private rights-of-way and service lanes.
- (k) Paths and fencing (where appropriate) in public access ways, cycleways, walkways and bridleways.
- (l) Grass areas, planting and other landscaping within road reserve or recreational and drainage reserves to vest.

#### Rural developments

- (a) Earthworks.
- (b) Road surface water drainage and culvert installations.
- (c) Wastewater treatment and disposal.
- (d) On site water supply or restricted water supply reticulation if a public system is available, including for fire fighting services.
- (e) Electric power and telecommunication services.
- (f) Street lighting, if appropriate.
- (g) Formed, metalled and sealed road pavement, safety shoulders and drainage channels.
- (h) Formed, topsoiled and sown road berms.
- (i) Cycleways, walkways and bridleways where appropriate.

#### **(vii) Natural Ecosystems**

Developers will ensure that natural ecosystems are able to continue to function and are not degraded or lost as a result of the subdivision or development. Enhancement of existing natural ecosystems should be considered a priority as a form of mitigation.

As a minimum, developers are required to:

- Provide information about any natural values (including indigenous fauna) that occur within the development site or that will be affected by the development site (i.e. can be off site as well).
- Submit to the Council a plan detailing how any natural values will be protected and enhanced, and appropriate conditions or methods to achieve this.

The natural values/ecosystem assessment and plan will:

- Identify all natural values that will be affected and detail appropriate mitigation.

- Ensure that the impact of buildings, structures, people, domestic animals and increased use of the area and adjacent areas in relation to the impacts on indigenous vegetation communities, landforms (e.g. dunes) and indigenous fauna are effectively avoided, remedied or mitigated.
- Ensure indigenous vegetation communities are not degraded by the introduction of weeds from gardens by either using indigenous species, or prohibiting the use of species that would become weeds in the particular environment in question.
- Ensure that the likely impacts of increased disturbance or predation are properly assessed and measures are put in place which protects indigenous fauna and flora.

Design requirements may include:

- Protection of areas of indigenous vegetation through legal protection, fencing and pest and weed control (see also Reserves section).
- No build areas or planted buffer areas to ensure that ‘edge effects’ and conflicts in use are not caused by building too close to natural areas (including watercourses).
- Conditions placed on the consent which list plants that should not be planted in the subdivision as a measure to control the spread of weeds..
- Interpretation, a very powerful and important tool that can help residents and the public to understand the values of a site and direct how they should be protected.
- The exclusion of domestic predators, such as cats and dogs, from the development in order to protect the values in adjoining areas. This consideration is important for subdivisions adjacent to coastal areas, wetlands and forest tracts, especially where there is no significant existing development in or adjacent to the area.
- The exclusion of goats, as they may not be appropriate to keep adjacent to forested areas or where adjoining the forest park as they are hard to contain. Escaped goats can lead to establishment of wild populations in the forest park.

#### **(viii) Working in Existing Roads**

The Council has adopted Standards New Zealand Handbook SNZ HB 2002:2003 Code of Practice for Working in the Road. The requirements set out in this handbook, except as modified by the schedule titled **Kapiti Coast District Council Schedule of Special Conditions to SNZHB 2002:2003 Code of Practice for Working in the Road**, shall be followed where any work is undertaken in existing roads.

#### **(ix) Design performance criteria**

The purpose of an engineering design is to provide a common terms of reference for defining the physical works (as may be required to meet Council requirements and/or resource consent conditions) and to provide a mechanism to evaluate the proposed works against their performance requirements.

An engineering design shall:

- Define the scope of the works and incorporate all of the components required for the intended project.
- Be legible and understandable and be supported by sufficient drawings, calculations, reports and associated documentation to facilitate appraisal.
- Provide sufficient information for construction purposes.
- Provide for
  - Safety
  - The whole of the catchment
  - Sudden or catastrophic failure
  - Future development
  - Efficiency in operation and maintenance
  - Optimisation of life cycle costs.
- Be prepared and endorsed by suitably qualified persons.
- Demonstrate compliance with resource consent conditions, this document and other regulatory and statutory requirements.
- Be a platform for approvals and acceptance.

**(x) Commuted Sums**

In some situations the Council will require a commuted sum to be paid by the developer based on the net present value of the ongoing operation, maintenance and replacement costs for a facility taken over by the Council. This particularly relates to sewer pumping stations, but may also apply to other non-normal situations. If relevant, applicants should discuss this aspect with the Council at an early stage.



## **C) Earthworks and Geotechnical**

### **(i) General Requirements**

Developments shall comply with Part 2, Land Stability, Foundations and Earthworks, of NZS 4404:2004, whether using the Minimum Engineering Requirements or the Design Guide approaches, except as modified by the schedule titled **Schedule 2, Kapiti Coast District Council Altered Requirements to Part 2 NZS 4404:2004, Land Stability, Foundations and Earthworks.**

Geotechnical appraisal and design may be required:

- (a) prior to detailed planning, which usually involves some form of subsurface investigation;
- (b) during the review of design concepts;
- (c) during construction to ensure the adequacy of bulk filling and the execution of the earthworks design; and
- (d) after construction, to provide certification and/or define limitations of the works.

### **(ii) Performance Criteria**

Earthworks shall:

- Meet the relevant standards and criteria of the District Plan.
- Be safe and stable and geotechnically sound.
- Not unnecessarily alter the natural land form or interfere with natural features.
- Provide adequate foundations for roads and services.
- Provide an accessible building area within each lot of a subdivision appropriate to the zoning of the land.
- Control surface and ground water flows both during and after construction.
- Control sediment generated by the works.
- Not cause undue nuisance from silt, dust, noise or disposal of vegetation.

### **(iii) Iwi Representation**

Where significant earthworks are to be undertaken, either in terms of scope or in areas of cultural significance, a representative of the relevant local iwi may be required to be on site while earthworks are being undertaken.

**(iv) Cultural Sites**

Should a waahi tapu or other cultural site be unearthed during earthworks the contractor and/or owner shall:

- (a) cease operations;
- (b) inform local iwi (Ngati Raukawa, Te Ati Awa ki Whakarongotai, Ngati Toa or Ngati Haumia);
- (c) inform the NZ Historic Places Trust (NZHPT) and apply for an appropriate authority if required; and
- (d) take appropriate action, after discussion with the NZHPT, the Council and iwi to remedy damage and/or restore the site.

**(v) Archaeological Sites**

Where an archaeological site is present (or uncovered), an authority from the NZ Historic Places Trust is required if the site is to be modified in any way, in accordance with the Historic Places Act 1993.

**(vi) District Plan Provisions**

The Kapiti Coast District Plan contains various provisions for the preservation of vegetation and or landform. Developers shall comply with those provisions and should note that this may have an impact on the extent of earthworks which may be permitted.

## **D) Transportation**

### **(i) Objective**

The Council's Transportation and Rooding objective is to plan, provide and maintain an efficient rooding network appropriate to the level of use that will ensure the safe and orderly passage of road users (including cyclists) and pedestrians throughout the Kapiti Coast District. The Council wishes to encourage pleasant, walkable neighbourhoods, with a low speed environment, which provides increased amenity by, for example, enhancing connectivity, decreasing the area of "black top", differentiating parking bays and providing associated landscaping. This will be achieved by:

- Planning and implementing a balanced rooding network with adequate opportunity for future growth.
- Planning and constructing cycleways and footpaths to provide safe access between home, work, shops and schools for cyclists, pedestrians and mobility scooter users.
- Planning and implementing a linked network of accessways using streams, riverbanks and pathways to link reserve areas and open spaces for recreational uses such as cycling, walking and horse riding, in accordance with the Council's Cycleways, Walkways and Bridleways strategy.
- Planning and developing low speed, attractive and connected neighbourhood areas

### **(ii) Performance Criteria**

The layout and structure of a road network and its associated amenities shall:

- Meet the relevant standards and criteria of the District Plan.
- Be appropriate for its position in the road hierarchy.
- Provide safe roads with operating speeds appropriate to the surrounding environment.
- Provide linkages and connectivity.
- Provide for the safe, efficient, and comfortable passage of motor vehicle (including emergency vehicles), cycle and pedestrian traffic, and, where appropriate, horse riding.
- Be of sufficient strength to cope with design loads.
- Be of adequate width and gradient to allow ease of passage, as constrained by land form.
- Provide for stormwater drainage, landscaping and utility services.
- Minimise noise to a level compatible with the character of the neighbourhood.

- Provide all lots with adequate access.

### **(iii) Design Principles**

With regard to Subdivision and Development the Council has reserved control in the District Plan over the design and layout of subdivisions and some aspects of development. The Council will ensure that new developments take into account the need to link with and use public transport networks efficiently, provide for connectivity and promote ease of use by transport modes such as walking and cycling.

Designs of roads, rights of way and other access facilities should be site specific and take into account site constraints and opportunities. They should be designed as part of an integrated development looking to achieve residential amenity, enhance connectivity, safety, access and manoeuvring for fire fighting appliances, traffic calming, stormwater management, minimise earthworks and avoid destruction of natural features. Developments need to meet the roading hierarchy requirements of the Kapiti Coast District Plan and encourage pedestrian and cycle links. New roads within developments should connect with existing roads where possible. As such cul-de-sacs, particularly long cul-de-sacs, are not favoured by the Council. Where cul-de-sacs are used then pedestrian and cycling links to enhance connectivity may be required. Cycleways, walkways and bridleways may be required in accordance with the Council's Cycleways, Walkways and Bridleways strategy and the indicative network.

### **(iv) Road Safety Audits**

All applications for consents or planning approval that have a roading component shall follow the Transfund New Zealand Road Safety Audit Procedures for Projects Guideline dated November 2004. In particular the Guideline requires audits at three stages throughout a project, being:

- a) Feasibility/Concept and Scheme/ Preliminary Design Stages;
- b) Detailed Design Stage; and
- c) Post Construction Stage.

This audit requirement shall apply to all applications that involve subdivision with land to be vested in the Council as road, or any land use resource consent involving a vehicle crossing or entrance that accommodates more than 200 vehicles per day. The Council may require audits in other situations where it considers safety may be an issue.

The applicant should take careful note of the experience and suitability of the persons engaged to carry out the audits. If the independent audit team engaged by the developer considers that any stage of the Road Safety Audit is not required, the lead auditor may complete an "Exemption Declaration" as described in the guideline and submit it as part of the application process. The Council may then either accept or refuse the application.

The applicant shall submit the initial Road Safety Audit report at the feasibility/concept stage (if this stage is required) or with their applications for



consents, submit the second audit report with their construction drawings and shall submit their final post construction audit prior to being granted the 224 certificate for the development. If a report is provided at feasibility/concept stage, then an updated report may be required at the application for consent stage.

**(v) Means of Compliance**

Part 3, Roads, of NZS 4404:2004, except as modified by the schedule titled **Schedule 3, Kapiti Coast District Council Altered Requirements to Part 3 NZS 4404:2004, Roads**, provide a means of compliance with the Council's requirements.

Alternative specifically designed proposals may be submitted with appropriate engineering information that will enable the Council to assess the viability of the proposal.



## **E) Stormwater**

### **(i) Objective**

The Council's stormwater objective is to have a stormwater drainage system that minimises the risk of surface water flooding to acceptable levels and protects public and private property from inundation. The Council seeks to have high standard sustainable stormwater systems that minimise the effects of flooding, erosion and water pollution. Refer also to Section 2 C (v) above concerning stormwater issues for developments.

### **(ii) Stormwater Management**

Stormwater systems shall minimise environmental impacts, which includes pollution of waterways, coastal and marine environments, erosion and habitats. The Council encourages the development of alternative stormwater systems, which will have low impact on the receiving environment. This includes reduced pavement areas, permeable pavements, wetlands, ponds, swales, soak pits and attenuating devices in order to minimise environmental concerns and maintenance expenditure.

Rather than immediately directing stormwater to the kerb or a piped system from developed lots, developments or redevelopments, it shall be attenuated or disposed of on site, unless this is shown to be not feasible. Appropriate site investigations will be required to ascertain the acceptability of on site disposal.

Watercourses shall remain in a natural state wherever possible. Channel lining shall only be considered where planned maintenance is not considered appropriate or there is a threat to life and property. Any lining shall be carried out in a manner and by a method that is sensitive to the surrounding environment. Piping or closing in of natural waterways is not recommended and will only be approved in exceptional circumstances. A consent for such work may be required from the Regional Council.

### **(iii) Performance Criteria**

A stormwater system proposed for a development shall:

- Meet the relevant standards and criteria of the District Plan, the Regional Freshwater Plan and the Regional Plan for Discharges to Land.
- Provide for the collection and/or control of stormwater, allowing for ultimate future development within the catchment or adjoining catchments.
- Meet the requirements of any stormwater management plans.
- Create a multifunctional landscape where the design integrates with other aspects of site planning and provides multiple benefits.
- Make use of available natural features and processes on site wherever possible.
- Result in minimal disturbance to the site and natural water systems.

- Result in no increase of runoff into the receiving body up to the 1 in 10 year event wherever possible, or, if not possible, result in minimal increase which have adverse effects that are no more than minor.
- Preserve and/or recreate natural landscape features.
- Reduce impervious cover as far as practical.
- Facilitate detention and infiltration opportunities.
- Address flood events and preserve treatment systems through offline storage and by-passes.
- Meet Regional and District stormwater discharge quality requirements.
- Have those stormwater treatment systems based on created natural systems (e.g. wetlands, lakes and detention ponds) able to function as entire ecosystems.
- Comprise simple, non-structural, low-tech and low cost methods.

#### **(iv) Design Principles**

The following paragraphs set out a number of principles and requirements to be applied in developing stormwater systems.

##### **(a) Design for Integration**

The Council seeks to promote the utilisation and enhancement of natural systems for stormwater treatment and integration into the environment through subdivision and development design. When assessing proposals for subdivision and development the Council will look to:

- Encourage development styles and stormwater management methods that mimic natural runoff patterns.
- Promote protection and enhancement of riparian vegetation.
- Minimise vegetation loss in riparian areas associated with development.
- Ensure sufficient water flows are maintained to support healthy aquatic life.
- Promote the restoration of degraded or piped channelled streams.
- Promote the remediation of existing barriers to migration of weak-climbing native aquatic species.
- Encourage the use of swales within road reserves.
- Promote the use of low impact design for development.
- Promote on site disposal where practicable.

- Encourage the fencing off of stock from water bodies and their margins.
- Promote the use of soft engineering or bioengineering solutions.
- Avoid straightening of streams and for streams already in a forced alignment encourage the realignment into a natural pattern.

#### **(b) Efficient Use of Water Resources**

Encourage the efficient use of water resources within subdivision and development through the use of stormwater as a water resource for non-potable uses. When assessing proposals for subdivision and development the Council will look to:

- Promote the use of stormwater methods that minimise, retain, treat and reuse stormwater runoff within the development for non-potable uses such as irrigation, fire fighting, etc.
- Ensure that treated stormwater water quality is of a standard suitable for the proposed use, where it will be used in contact with people.
- Ensure that specifications for stormwater treatment devices take into account habitat requirements.

#### **(c) Minimise Effects of Development**

Ensure that new subdivision and developments are compatible with existing natural (ecologically intact) water systems as far as practically possible, or replicate natural systems, and minimise the increase of stormwater runoff from those sites. When assessing proposals for subdivision and development the Council will look to:

- Minimise the adverse effects of activities on habitat quality and promote sustainable solutions.
- Avoid the creation of barriers to upstream movement of weak climbing native aquatic species.
- In addressing flooding issues, give priority to solutions that also address water quality and habitat values by ensuring a practical balance is achieved to address both flooding and ecological considerations.
- As far as practical ensure secondary flow paths are located in public land or in areas where they will not be obstructed by fences or planting.
- In areas subject to flooding ensure the type of planting are not species known to exacerbate flooding.
- Consider effects on groundwater quality and levels.

#### **(d) Compatibility of Treatment and Disposal Systems**

Ensure any stormwater treatment and disposal/use systems proposed in a subdivision or development are able to maintain and enhance the condition of natural systems, ecological values, landscape, recreation, cultural and safety values of that system. When assessing proposals for subdivision and development the Council will look to:

- Promote the use of stormwater management devices that are designed to increase habitat opportunities.
- Avoid the piping and channelling of streams.
- Encourage the treatment of road runoff within a development, prior to discharge to natural systems.
- Ensure that groundwater quality and levels are not adversely affected.
- Ensure stormwater infrastructure (including manmade natural systems) is designed to minimise long-term maintenance costs.
- Ensure stormwater systems do not conflict with the operation of other utilities
- Ensure safety of public in terms of the management of stormwater and provide adequate signage for areas known to have changing water levels and contaminants.

#### **(e) Design Requirements**

The design of a stormwater system shall include the following:

- Stormwater drainage systems shall consist of both a primary system to cater for the more frequent rainfall events and a system of secondary flow paths to cater for higher intensity rainfall events and occasions when there are blockages in the primary drainage system.
- The primary stormwater drainage system shall be designed to adequately cater for the following rainfall events:
  - (a) 10% Annual Exceedance Probability (AEP) (10 year) rainfall event for industrial/commercial areas and residential areas
  - (b) 10% Annual Exceedance Probability (AEP) (10 year) rainfall event for culverts. However culverts may need to be designed up to 1% AEP depending on circumstances. This will be determined on a case by case basis.
  - (c) 1% Annual Exceedance Probability (AEP) (100 year) rainfall event for all situations where secondary overflow paths are not available or where these are through private property.
- Secondary flow paths shall be designed to adequately cater for the full 1% AEP (100 year) flow less an appropriate contribution from the primary

drainage system. The contribution from the primary drainage system shall take account of the risk and likely degree of blockage as well as the capacity of the inlets to the system. Allowance for 100% blockage may be necessary in certain situations. Provision of additional capacity in the primary drainage system does not eliminate the need to provide a secondary flow path.

- Detention and/or storage devices may be required as part of a development to mitigate stormwater effects on downstream catchments. Such devices shall make provision for grit and debris entrapment and be designed for ease of maintenance.
- The proposed stormwater system shall be compatible with the existing drainage network and comply with current requirements as identified by the Council.
- The system design shall identify and incorporate downstream improvements required as a result of the proposed works.
- Design methods shall be in accordance with NZS 4404:2004 Part 4, Stormwater Drainage as modified by the schedule titled **Schedule 4, Kapiti Coast District Council Altered Requirements to Part 4 NZS 4404:2004, Stormwater Drainage** or as otherwise specifically approved by the Council.
- Design of stormwater systems shall be based on the isohyet charts produced by the Council for the Kapiti District. These charts and guidelines for their use are included in Schedule 4.

**(v) Greater Wellington Regional Council Requirements**

Activities such as the discharge of stormwater, damming and diversion of water courses, establishment of structures and works in the beds of rivers or in the coastal marine area are governed by rules in the Regional Coastal Plan, Regional Freshwater Plan and Regional Plan for Discharges to Land.

Applicants should consult with the Greater Wellington Regional Council to determine:

- Whether or not resource consents are required from Greater Wellington for the activities they intend to undertake; and
- What conditions must be met to comply with permitted activity rules.

Any Greater Wellington requirements shall be noted in resource consent applications to KCDC.

**(vi) Stormwater Quality**

Stormwater quality issues shall be addressed during planning, construction and for final intended uses.

Water quality ponds (wet ponds), wetlands, or other effective treatment facilities shall be constructed for new development where practical.

Pre-treatment devices may be constructed to prevent floating contaminants and debris entering into the wet ponds or other treatment systems.

The design and construction of any treatment facilities shall be undertaken in such a way that future maintenance can be carried out easily.

Applicants are referred to Auckland Regional Council publications, such as their "*Low Impact Design Manual*" and "*Stormwater Management Devices: Design Guideline Manual*". Other references include Metrowater's "*On-site Stormwater Management Manual*" and "*Stormwater Soakage Manual*"; and Sustainable Urban Drainage Systems design manuals for countries within the United Kingdom. Other appropriate design manuals may also be used. The New Zealand Water Environment Research Foundation (NZWERF) has compiled a stormwater directory, which can be accessed through the internet.

**(vii) Relevant Information**

The Council holds significant information concerning catchments, flood plains, flood levels, waterways and existing systems. Developers should approach the Council and obtain any relevant information held that may be relevant to their proposed development.

**(viii) Construction**

Construction of stormwater systems shall be undertaken in accordance with the requirements of Part 4, Stormwater Drainage of NZS 4404:2004, except as modified by the schedule titled **Schedule 4, Kapiti Coast District Council Altered Requirements to Part 4 NZS 4404:2004, Stormwater Drainage**, unless otherwise approved by the Council.

Low impact designs and other alternative specific proposals shall have construction details referenced to an appropriate design guide and/or have full construction details provided, with appropriate supporting engineering information.



## **F) Wastewater**

### **(i) Objective**

The Council is seeking to have reliable, affordable and environmentally acceptable wastewater collection and disposal systems that protect the public health and safety, and the environment and which are adequate to meet present and future needs.

Wastewater systems shall minimise environmental impacts, including erosion, pollution of waterways, coastal and marine environments, and habitats. Development of alternative wastewater systems that minimise environmental concerns and/or maintenance expenditure will be encouraged.

Where the Council's wastewater network is available to service developments then each lot shall be provided with a connection and each development shall be provided a piped wastewater system connecting to the Council's system, unless alternatives are approved by the Council.

### **(ii) Performance Criteria**

The design of a wastewater system shall include the following:

- Meet the relevant standards and criteria of the District Plan and the Greater Wellington Regional Council Regional Plan.
- Provide for the collection of wastewater, allowing for ultimate future development within the catchment or adjoining catchments.
- Minimise health and safety related risks.
- Be compatible with the existing wastewater system.
- Prevent stormwater ingress (inflow and infiltration) into the system and prevent sewage egress out of the system.
- Where the Council wastewater system is available, provide a connection for each lot.
- On-site systems (where required) are compatible with daily flow, waste water characteristics and soil/site conditions so that effective assimilation of pollutants without exceeding the carrying capacity of the receiving environment is achieved.

### **(iii) Greater Wellington Regional Council Requirements**

The discharge of wastewater is governed by rules in the Regional Coastal Plan, Regional Freshwater Plan and Regional Plan for Discharges to Land.

Applicants should consult with the Greater Wellington Regional Council to determine:

- Whether or not resource consents are required from Greater Wellington for the activities they intend to undertake, and
- What conditions must be met to comply with permitted activity rules.

Any Greater Wellington requirements shall be noted in resource consent applications to KCDC.

#### (iv) **Design Principles**

The design of a wastewater system shall include the following:

- Design methods shall be in accordance with NZS 4404:2004 Part 5, Wastewater as modified by the schedule titled **Schedule 5, Kapiti Coast District Council Altered Requirements to Part 5 NZS 4404:2004, Wastewater**, or as otherwise specifically approved by the Council.
- Pipe sizes shall be based on the design flow without surcharging but those mains to pass into Council ownership shall be a minimum of 150mm diameter, except as detailed in paragraph (v) below.
- The design flows shall be calculated using the flow parameters detailed in Schedule 5.
- The proposed wastewater system shall be compatible with the existing network and comply with current requirements as identified by the Council. If demand on the system requires use of the Council's wastewater reticulation model to ascertain effects, then this will be at the cost of the applicant.
- The system design shall identify and incorporate downstream improvements required as a result of the proposed works.
- Where a proposed development cannot be adequately serviced by a gravity system, a public wastewater pumping station may be proposed for consideration by the Council, provided it is located and designed to service the entire area of potential catchment beyond the reach of the gravity system and that the design provides the minimum whole of life cost. The land area to be served shall be demarcated on the basis of sound engineering practice. A financial contribution towards future operation, maintenance and replacement will be required.
- On-site wastewater disposal systems shall be specifically designed taking into account the daily flow, the wastewater characteristics and the site/soil conditions and meet the requirements of Rule 7 of the Regional Discharges to Land Plan. (See also the Regional Council publication "*Guidelines for on-site Sewage Systems in the Wellington Region*".)

#### (v) **Private and Public Drains**

A private drain (generally 100mm diameter) is a drain which serves one lot, regardless of the number of dwellings on that lot and regardless of whether it traverses adjacent lots. In some cases drains with appropriate easements serving more than one lot will be considered common private drains.

Public drains include:

- Any drain or pipeline which serves more than one lot, except where a common private drain situation applies.
- The section of 100mm diameter drain within the road reserve between the lot served by it and the pipeline to which it connects.
- Any drain over which the Council has exercised control for a period of not less than 20 years.
- Drains for the general interest of the district as opposed to the particular or personal benefit of one or two individuals or households are generally public drains.
- Any drain so declared under Section 462 of the Local Government Act.

**(vi) Alternative Wastewater Systems**

- The following principles are applicable in providing alternative wastewater systems.

**(a) Compatibility of Treatment and Disposal Systems**

Ensure any wastewater treatment and disposal/use systems proposed in a subdivision or development are able to maintain and enhance the condition of natural systems, ecological values, landscape, recreation, cultural and safety values of that system. When assessing proposals for subdivision and development the Council will look to:

- Require the provision of monitoring and maintenance of alternative systems as part of the supplier's contract for a reasonable post installation period depending upon the specific system installed.
- Encourage the use of the latest technology in monitoring through the provision of a 24 hour monitored system.
- Ensure that sites where on-site wastewater systems are used in a community capacity that the design and maintenance of the system avoids the direct discharge of inadequately treated contaminants into natural water bodies.

**(b) Reuse of Wastewater**

Encourage the safe and efficient use of water resources within subdivision and development through the use of treated wastewater (greywater only) from community/neighbourhood systems as a water resource for non-potable uses. When assessing proposals for subdivision and development the Council will look to:

- Ensure that public are aware of areas where non-potable supplies exist as well as the precautions necessary for its use.

- Require the plumbing of new dwellings in communities where non-potable water is used is such that it will prevent any cross contamination of potable water supplies and so that it will allow grey and black water to be separated for treatment on site.

### **(c) On Site Wastewater Systems**

Promote where appropriate the utilisation of ecosystem services for wastewater treatment and assimilation into the environment as neighbourhood systems in areas not connected to the reticulated wastewater system or where it is inefficient to connect to the reticulation system. When assessing proposals for subdivision and development the Council will look to:

- Ensure that suitably qualified and experienced on-site wastewater treatment suppliers are used by developers, and that these suppliers are involved with ongoing monitoring and maintenance of the systems throughout their lives.
- Ensure that approved systems provide an acceptable level of risk that is balanced between environmental, efficiency and public health concerns.
- Ensure appropriate involvement of Greater Wellington Regional Council, Regional Public Health and iwi in the assessment procedure.
- On-site wastewater systems will only be approved where:
  - The public reticulated system is not available or is at capacity; or
  - connection to the public reticulated wastewater system is not desirable due to site, environment, integrated subdivision design or cost constraints which would result in such connection being inefficient and lead to a lower environmental result; and
  - the system results in a reasonable level of maintenance and responsibility for the future owner.

If a subdivision and development proposes the use of an on-site wastewater system the developer shall obtain the Council's approval for the on-site systems (whether community or individual household based) prior to the approval of the subdivision. Where a community based system is proposed the developer shall be responsible for the installation of any common on-site treatment facility (secondary treatment and disposal). This shall be installed either prior to the 224c approval or bonded until such time as the first future lot owner applies for a building consent. A Regional Council consent may also be required for community based systems.

- To enable the Council to evaluate an on-site system the applicant needs to provide the following information:
  - A comprehensive soil and site evaluation – constraints include mineralogy, water table and available space.

- An evaluation of the site on which the system is to be constructed. The site evaluation needs to provide sufficient information to determine if the site can support an onsite wastewater treatment and disposal system, what system design concept to use, and what design parameters to follow. The components of a soil/site evaluation are:
  - Topography and landscape position.
  - Soil characteristics: soil texture, structure, clay mineralogy and organic soils.
  - Soil wetness conditions in all seasons.
  - Soil depth.
  - Soil permeability.
  - Groundwater level.
  - Restrictive horizons.
  - Available space (the area of suitable soil, the required setbacks, other site layout factors relevant to the development).
- The system design, including:
  - The design wastewater flow and characteristics.
  - The type of pre-treatment.
  - The type of nitrification field.
  - The type of distribution.
  - The proposed wastewater system and its location.
  - The conditions for any site modification.
- Compliance with Rule 7 of the Regional Plan for Discharges to Land, Greater Wellington Regional Council.
- For community based systems a compliance certificate will be required once the system is properly installed. This shall contain: system type, system performance, operation and maintenance requirements, as built drawings, operating manuals, asset management plans, a life cycle analysis, system monitoring and reporting requirements, and a copy of the section 221 notice.

#### **(vii) Pumping Mains and Pump Stations**

Pumping stations will be only considered and approved by the Council when all other options are impracticable. Where required pumping stations shall be provided at the entire expense of the developer and be located in publicly owned property. If properly designed and constructed to the Council's approval, the

Council will take over their future operation and maintenance after they have been commissioned.

A financial contribution will be required. This contribution will be based on the net present value of the ongoing operation, maintenance and replacement costs.

Design of pumping stations shall be carried out by suitably qualified persons. Schedule 5 covers the Council's general requirements, however designers will need to consult Council staff at an early stage.

**(viii) Construction**

Construction of wastewater systems shall be undertaken in accordance with the requirements of Part 5, Wastewater of NZS 4404:2004, except as modified by the schedule titled **Schedule 5, Kapiti Coast District Council Altered Requirements to Part 5 NZS 4404:2004, Wastewater.**

Alternative specific proposals may be submitted with appropriate engineering information that will enable the Council to assess the proposal.

## **G) Water**

### **(i) Water Supply Management**

The Council seeks to have a reliable potable water supply to acceptable quality and reasonable quantity standards that will meet the present and future water supply needs of the community in order to protect public health and meet fire fighting requirements, while promoting water conservation.

The Council is looking to reduce peak consumption to reasonable, sustainable levels using a range of conservation and demand management measures. This is set out in the Council's publication "*Water Matters, Kapiti Coast District Sustainable Water Use Strategy*".

To aid this process Developers are encouraged to look to make efficient use of available water sources within a site through providing for sustainable systems of collection and use of rainwater, bore water and grey water (see paragraph (vi) (b) of the previous section).

Where the Council's potable water supply network is available to service developments then each lot shall be provided with a connection and each development shall be provided a piped water supply system connecting to the Council's system, unless alternatives are approved by the Council.

For land rezoned to residential since July 2002, the Council requires the installation of water saving devices, for example, restricted water supply, rainwater tanks, bore water supply and use of grey water.

### **(ii) Performance Criteria**

The design of a water supply system shall include the following:

- Meet the relevant standards and criteria of the District Plan.
- Be appropriate for its position in the water supply hierarchy.
- Be compatible with the existing water supply system.
- Provide for an adequate water supply that will meet fire fighting and domestic needs, commercial and industrial requirements, allowing for ultimate future development within the catchment or adjoining catchments.
- Minimise health and safety related risks.
- Prevent contamination of the water supply system.
- Where the Council water supply system is available, provide a connection for each lot.

### **(iii) Design Principles**

The design of a water supply system shall include the following:

- Design methods shall be in accordance with NZS 4404:2004 Part 6, Water Supply as modified by the schedule titled **Schedule 6, Kapiti Coast District Council Altered Requirements to Part 6 NZS 4404:2004, Water Supply**, or as otherwise specifically approved by the Council.
- Pipe sizes shall be based on the design flows required to meet fire fighting and supply requirements.
- The design flows shall be calculated using the design information detailed in Schedule 6.
- The system design shall identify and incorporate improvements required to the existing network as a result of the proposed works. If demand on the system requires use of the Council's water reticulation model to ascertain effects, then this will be at the cost of the applicant.
- On-site water supply systems shall be specifically designed. The focus of the design shall be on the efficient and safe use of water resources within a site. The water system proposed shall result in minimal disturbance to the site and natural water systems.

Applicants are referred to the Ministry of Health's "*Household Water Supplies*" (1995) which provides guidelines on the selection, operation and maintenance requirements of individual household water supplies.

- Where on-site storage is required this shall be a minimum of 25,000 litres, unless otherwise approved by the Council, but 50,000 litres is recommended. The Council may require minimum storage of a greater volume.

### **(iv) Relevant Information**

The Council holds significant information concerning the existing systems. Developers should approach the Council and obtain any relevant information held that may be relevant to their proposed development.

### **(v) Pumping Stations and Reservoirs**

A development may require the construction of booster pumping stations and/or storage in order to comply with requirements. Where these are required, the Council's Infrastructure Engineer shall be consulted on the specific requirements and they shall be provided at the entire expense of the developer. If properly designed and constructed to the Council's approval, the Council may take over their future operation and maintenance after they have been commissioned. In some situations a financial contribution to cover future operation, maintenance and replacement costs may be required. Design shall be carried out by suitably qualified persons.



**(vi) Construction**

Construction of water supply systems shall be undertaken in accordance with the requirements of Part 6, Water Supply of NZS 4404:2004, except as modified by the schedule titled **Schedule 6, Kapiti Coast District Council Altered Requirements to Part 6 NZS 4404:2004, Water Supply.**

Alternative specific proposals may be submitted with appropriate engineering information that will enable the Council to assess the proposal.



## H) Landscape Design and Practice

### (i) General Requirements

Developers are encouraged to undertake landscaping within their developments that will provide an interesting and varied living environment which is attractive to residents and visitors. As a minimum, developers are required to:

- Meet the relevant standards and criteria of the District Plan.
- Meet the requirements of the *Kapiti Coast District Council Native Planting Guideline* and, where applicable, the *Kapiti Horowhenua Environmental Guidelines for Rural Living*.
- Submit to the Council for approval a comprehensive landscape plan where new roads are created or existing roads extended, and, where required, for other reserves. The plan shall consider any existing amenity and ambiance of adjacent street scape.
- Complete the landscaping work in accordance with the approved landscape design and provide temporary screening as protection during building construction.

Other landscaping and plantings may be required for specific locations e.g. riparian planting in drainage situations, coastal areas and adjacent to open space.

### (ii) Design and Implementation

Landscape Design and implementation shall be in accordance with NZS 4404:2004 Part 7, Landscaping Design and Practice as modified by the schedule titled **Schedule 7, Kapiti Coast District Council Altered Requirements to Part 7 NZS 4404:2004, Landscaping Design and Practice**, or as otherwise specifically approved by the Council.

Alternative specific proposals may be submitted with appropriate information that will enable the Council to assess the proposal.



## **I) Reserves**

### **(i) Council Policies**

Reserves contributions shall be in accordance with the District Plan requirements and the Council's Reserves Acquisition Strategy, adopted on 13 February 2003. The following policies from the Acquisition Strategy are the most relevant for developments and subdivisions.

#### **Policy 9 – Maximum Value**

The maximum value for determining market value of each lot when calculating reserves contributions, except in the rural zone, is \$100,000.

#### **Policy 10 – Criteria for accepting Land in Lieu of Cash**

The following are minimum criteria, which should be met, where land is being considered instead of cash:

##### Active and Passive Reserves

- There is no local reserve within 800m of subdivision.
- The land is capable of being utilised for a variety of informal and formal recreation activities including commuter and recreational walking and cycle routes.
- Cost of maintenance is manageable - size, shape, nature and topography of land.
- The land has adequate road frontage for its purpose.
- It is accessible to the community, including people with special needs where appropriate.
- There are links to public open space network.
- The land totals at least 2,000 square metres.

##### Other non-traditional reserves – significant natural/cultural heritage sites

- Contains ecosystems that have species that are endemic to the district or are threatened.
- The site is largely in its natural state or is restorable.
- Provides, or has potential to provide, corridor/buffer zone to an existing area.
- Contains sites of significance to Maori.
- It is easily managed.

If any of these criteria are not met, this will provide the Council with grounds to accept cash as reserves contribution.

Note: The reserve contribution can include a mix of cash, land and improvements such as play equipment and recreational facilities.

#### **Policy 11 – Existing Reserve Credits**

The transfer of existing reserve credits is limited to within 2 kilometres of the original site.

#### **Policy 12 – New Reserve Credits**

There will be no new reserve credits created outside of the subdivision area.

#### **Policy 13 – Gifting of Land**

Where land is given which is in excess of the reserves contribution requirement then this will be recognised as a gift and not as a reserves contribution. This must be agreed to in writing.

### **(ii) Design and Construction**

Reserves design and construction shall generally be in accordance with NZS 4404:2004 Part 8, Reserves as modified by the schedule titled **Schedule 8, Kapiti Coast District Council Altered Requirements to Part 8 NZS 4404:2004, Reserves**, or as otherwise specifically approved by the Council. The Council's Parks and Recreation Manager may have specific requirements for individual reserves that are being formed as part of a development or subdivision.

## **J) Power, Telecommunications, Gas**

### **(i) General Requirements**

- Subdivisions and developments are required to be serviced with electric power, telecommunications and, where applicable, gas reticulation. These services are generally to be provided by an appropriate network utility operator.
- All urban services shall be underground unless otherwise authorised by the Council. In rural areas the Council may require services to be underground (for example in a hamlet situation). Otherwise overhead reticulation is acceptable.
- The Council may consider proposals for alternative means of providing electrical and telecommunication services, particularly in rural areas. The Council's approval for any alternative proposals should be sought prior to seeking resource consent approval. A section 221 notice will be required advising the alternative means of providing the service, and that the Council will not be liable to provide the service in the future.
- Where a community based system is used, a compliance certificate shall be provided once the system is properly installed. This shall contain: system type, system performance, operation and maintenance requirements, as built drawings, operating manuals, asset management plans, a life cycle analysis, system monitoring and reporting requirements, and a copy of the section 221 notice.
- In some very isolated areas where it is unlikely that electric power and/or telecommunication services will be required, the Council may agree that these services need not be provided. In this situation a section 221 notice will be required advising that electric power and/or telecommunication services are not available and that the Council will not be liable to provide the services in the future.

### **(ii) Design and Construction**

Design and construction shall be in accordance with NZS 4404:2004 Part 9, Power, Telecommunication, Gas as modified by the schedule titled **Schedule 9, Kapiti Coast District Council Altered Requirements to Part 9 NZS 4404:2004, Power, Telecommunication, Gas**, or as otherwise specifically approved by the Council.





## **SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

### **PART 4**

#### **MINIMUM ENGINEERING REQUIREMENTS**

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# **SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

## **PART 4**

### **MINIMUM ENGINEERING REQUIREMENTS**

#### **Introduction**

The Minimum Engineering Requirements are made up of:

- **Schedules 1 to 9 containing Council's amendments and additions to NZS 4404:2004.**
- **NZS 4404:2004, Land Development and Subdivision Engineering.**
- **Schedule 10 containing Council's amendments and additions to SNZHB 2002:2003**
- **SNZHB 2002:2003 Code of Practice for working in the Road.**
- **Council's Engineering Specifications**  
(Note: The current specifications are to be updated).
- **Other Standards are as listed in NZS 4404:2004.**



**SCHEDULE 1**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 1 NZS 4404:2004 GENERAL REQUIREMENTS AND PROCEDURES**

The Kapiti Coast District Council has adopted Part 1 of NZS 4404:2004 with the following additions and/or alterations:

**1. Clause 1.5.1** *Documents to be submitted for design approval*

- The Council requires the documents listed in paragraphs 1.5.1.1 (a) to (d) inclusive to be submitted.
- Two copies of preliminary drawings, specifications and calculations shall be supplied to the Council. One set will be returned to the applicant when these have been checked by Council staff with any required amendments endorsed on the plans and specifications. These check prints shall be preserved intact and returned to the Council when the required amendments have been completed, along with two copies of the amended set of plans and specifications. Drawings may be provided in electronic format.

**2. Clause 1.5.4** *Approval of design*

- Add to the existing paragraph 1.5.4.1

In order to expedite the commencement of works, design approval in principle may be applied for prior to the granting of a resource consent. However design approval will not be given until after a resource consent is granted.

**3. Clause 1.5.6** *Supervision of work*

- The Council requires completion certificates in the form given in schedules 1B and 1C.

**4. Clause 1.5.9** *Maintenance*

- Replace the existing clause with the following.

The developer shall maintain the works until they are formally taken over by the Council. Formal takeover is the date when the Council issues the Section 224(c) certificates, or such other earlier date as may be agreed by the Council. For uncompleted works covered by a bond the developer shall maintain the works until a date specified in the bond or, if earlier than such date, the works are completed to the satisfaction of the Council.

Unless stated otherwise in the engineering approval, a defects liability period of six months from formal takeover by the Council shall apply. However the developer shall not be responsible for damage caused by other activities, such as building construction on completed sections, or for fair wear and tear caused by public use.

## **5. Clause 1.6.1 *Uncompleted works bonds***

- The amount of any bond under paragraph 1.6.1.3 is 150% of the estimated value of the uncompleted work.

## **6. Schedule 1D *As built plans***

The Council requires the detail outlined in the schedule. A DXF file of the linework contained in each as built in terms of either the local Cadastral Circuit or New Zealand Map Grid Coordinate system shall be supplied. The Linework shall be contained within the minimum number of logically named layers in the DXF file.

## **7. Additional Requirements**

### **• Emergency Works**

If during the course of the development, any situation arises associated with the development whereby, in the opinion of the Council, public safety, the security of public or private property, or the operation of any public facility or ecological site is endangered, the developer shall immediately carry out such remedial measures as the Council requires to remove the danger. Any work so required shall be at the expense of the developer.

If such emergency works are not immediately carried out, the Council may arrange for the necessary remedial work to be carried out and charge the developer the cost for carrying out the works.

### **• Damage To Existing Roads, Services And Property**

All damage to existing roads, services or private property, or any disturbance of survey boundary marks due to or caused by any new works, shall be the liability of the developer. All damage must be repaired by the developer immediately following instructions from the Council. If such remedial works are not commenced within twenty four hours, the Council may arrange for the necessary work to be carried out and charged to the developer. This provision includes the removal of mud and debris from existing roads in the vicinity of the development. A daily removal of such debris may be necessary in the interests of traffic safety.

In any situation where the Council considers that damage to existing roads, services or private property constitutes a risk or potential risk to the safety, of road users, pedestrians or other persons, the developer shall immediately repair the damage or otherwise abate the hazard or potential hazard.

### **• Safety**

Temporary fencing and warning signs shall be erected in accordance with the Health and Safety Plan to protect site personnel and the general public, particularly children, from all hazards associated with the development. All fences and warning signs shall comply with Occupational, Health and Safety requirements.

- **Final Valuations for the Council’s Asset Register**

An itemised schedule of quantities and costs shall be provided for those services and assets which are to vest in the Council.

Where the work has been built by an “arms length” contractor the work Schedule of Prices, modified to represent the work as built and complete with the market unit rates, will be considered a current market valuation.

Where the work has not been undertaken by an arms length contractor (i.e. by own staff) the valuation shall be provided by a suitably qualified person in the form of a Schedule of Works as built, priced at current commercial market rates as assessed by the suitably qualified person.

The Schedule shall take the following form:

| <b>Item description</b> | <b>Unit</b> | <b>Quantity</b> | <b>Rate<br/>\$/Unit</b> | <b>Amount<br/>\$</b> |
|-------------------------|-------------|-----------------|-------------------------|----------------------|
|                         |             |                 |                         |                      |

- **Easements**

Easements are required over any rights of way and communal services where these pass through lots in subdivisions. The Council may also require other easements.

Easements shall be shown on the land transfer title plan and documentation shall be prepared by solicitors at the Developer’s expense. Draft easement documentation will require Council approval.





**SCHEDULE 2**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 2 NZS 4404:2004 LAND STABILITY, FOUNDATIONS AND EARTHWORKS**

The Kapiti Coast District Council has adopted Part 2 of NZS 4404:2004 with the following additions and/or alterations:

1. **Clause 2.8** *Erosion, sediment and dust control*

- Add further clause  
**2.8.3** *Erosion and sediment control*  
Developers shall apply the appropriate recommended treatments outlined in the Erosion and Sediment Control Guidelines for the Wellington Region (available from the Greater Wellington Regional Council).
- Add further clause  
**2.8.4** *Dust control*  
Should there be potential for wind-blown sand, soil or other material to be transported onto other properties the developer shall erect suitable fabric fencing (sarlou cloth or similar) or take other acceptable mitigation measures, such as frequent watering, to control any dust nuisance. Water for dust control shall not be sourced from the Council's potable water supply without the agreement of the Council. A fee is likely to be charged for water used for this purpose.

2. **Clause 2.11.2** *As built drawings for earthworks and drainage*

- This clause applies for all earthworks situations.

3. **Additional Requirements**

- An Earthworks Management Plan (EMP) that addresses all potential adverse effects of the proposed earthworks shall be submitted with any consent application covering earthworks. As a minimum, the EMP will need to address at least the following matters:
  1. Windblown soil.
  2. Sediment control and stormwater run-off.
  3. Maintenance of local drainage paths from adjoining properties.
  4. Progressive top soiling and re-vegetation immediately following completion of each stage of the works.
  5. The control of noise and other construction related effects.
  6. A monitoring program for effects of the earthworks on and off site.
  7. The discovery of an unrecorded archaeological site.



**SCHEDULE 3**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 3 NZS 4404:2004 ROADS**

The Kapiti Coast District Council has adopted Part 3 of NZS 4404:2004 with the following additions and/or alterations:

1. **Clause 3.3.1** *Minimum requirements*

- Note that figure 3.1 on page 48 of Part 3 is amended and retitled. The amended version is noted as figure 3.1R, titled *Kapiti Coast District Roading Guidelines*, and is attached to this Schedule as Appendix 1.
- Subsoil drains are generally not required where development is being undertaken in sand or other permeable materials.
- Pedestrian accessways and cycleways may also be required for connectivity purposes and in accordance with the Council's policy on Cycleways, Walkways and Bridlepaths.
- Specifically designed swales may be an acceptable form of side drain for rural roads.

2. **Clause 3.3.2.1** *Design parameters*

- Amend references to figure 3.1 to figure 3.1R.

3. **Clause 3.3.3** *Pavement structural design*

- Pavement depths shall be as established through use of the design documents, but the minimum pavement thickness shall be 200mm, unless otherwise approved by the Council.

4. **Clause 3.3.3.2** *CBR tests*

- Use of scala penetrometer tests to establish subgrade CBR values requires the specific approval of the Council. Correlation of scala penetrometer results to actual soaked CBR tests may be required.

5. **Clause 3.3.12.1** *Urban (pedestrian accessways)*

- Pedestrian accessways shall generally have a legal width of 6 metres, with a specifically designed formation width and boundary fences being no higher than 1.5 metres.

6. **Clause 3.3.12.3** *Cycleways*

- A New Zealand cycle design supplement is available and is the official guide to the application of Austroads Part 14 in New Zealand.

7. **Clause 3.3.18** *Multi-unit non public accesses (urban and rural)*

- Amend references to figure 3.1 to figure 3.1R.

8. **Clause 3.3.21.5** *Sumps*

- Standard Wellington City Council trap sumps, or other Council approved trap sump arrangements, shall be used.

9. **Clause 3.4.2.3** *Basecourse*

- TNZ Approved Regional Basecourse shall be used for both collector and local roads. This is as specified in TNZ M/4: 2003 "Specification for Basecourse Aggregate" - Wellington 1 Greywacke.

**10. Additional Requirements**

- Work undertaken on Council owned roads shall be undertaken in accordance with Standards New Zealand Handbook SNZ HB 2002:2003 Code of Practice for Working in the Road, except as modified by the schedule titled **Kapiti Coast District Council Schedule of Special Conditions to SNZHB 2002:2003 Code of Practice for Working in the Road**.
- See Kapiti Coast District Council drawing TYPICAL CROSS SECTION-SERVICES for recommended position of services within the road reserve. See attached Appendix 2.

Alternative positions may be acceptable if approved by the Council and Utility Companies.

Figure 3.1R

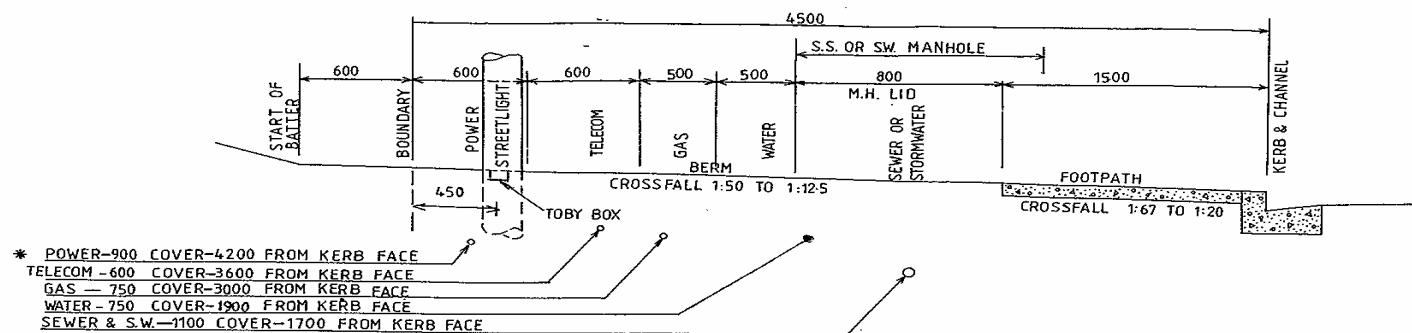
## Kapiti Coast District Council Urban Roading Guidelines

## Appendix 1

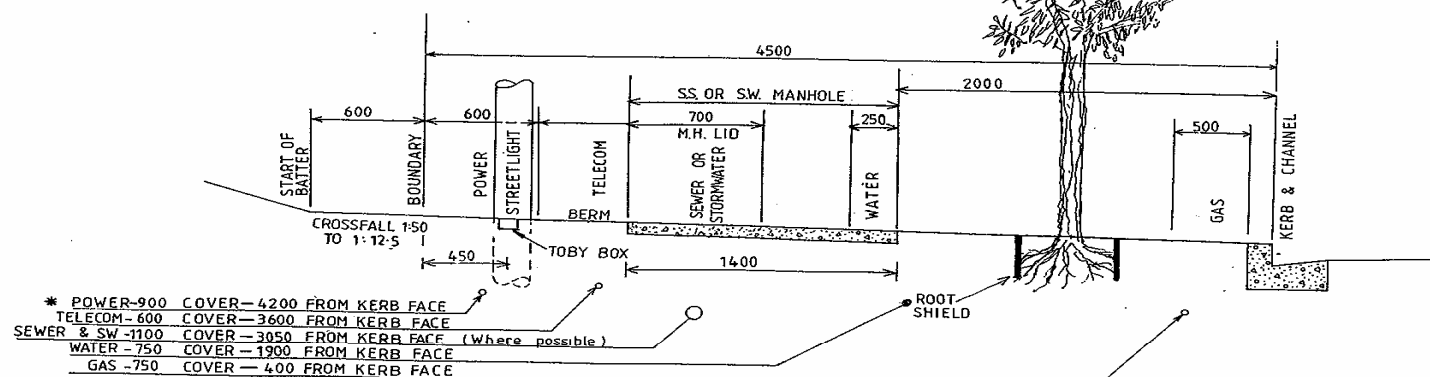
| Class                   | Type                                    | Area Served    | Traffic Vols. vpd | Recommended Requirements         |                                  |                   |                 |                                |                    | Notes  |
|-------------------------|---|----------------|-------------------|----------------------------------|----------------------------------|-------------------|-----------------|--------------------------------|--------------------|--|
|                         |   |                |                   | Rd Reserve Width                 | Parking                          | Traffic Lanes     | Footpath        | Kerb to Boundary               | Max/Min Grade*     | Specific designs may be proposed or may be required to meet site conditions.   |
| LOCAL ROADS             | Private Way                             | 1 to 3 lots    | N/A               | 4.0m                             |                                  | 3.0m              |                 | Total 1.0m                     | 16% max 0.4% min   | Not public street. Long private ways may require passing bays no more than every 60metres, & turning heads.                                      |
|                         | Private Way                             | 4 to 6 lots    | N/A               | 6.0m                             |                                  | 3.5m              |                 | Total 2.5m                     | 16% max 0.4% min   |  |
|                         | Residential Lane                        | ≤ 10 du        | <50               | 10.0m to 12.0m                   | 1 by 3.0m or 1 by 2.5m           | 1 by 3.0          | Nil or 1 by 1.4 | Total 4.0m to 6.0m             | 12.5% max 0.4% min | No stopping one side. May possibly be one-way.   |
|                         | Minor residential road (Inc Cul-de-sac) | < 20du         | <100              | 12.0m to 15.0m                   | 1 by 2.5m                        | 1 by 3.0m         | 1 by 1.4m       | 4.5m and 2.0m min. other side. | 12.5%max 0.4% min  | No stopping one side. Alternative parking arrangements may be acceptable e.g. parking bays in cul-de-sac heads. Long cul-de-sacs not acceptable. |
|                         | Residential road                        | 20 to 100du    | <500              | 17.5m                            | 1 by 2.5m or 1 to 2 bays per lot | 2 by 2.75 to 3.0m | 2 by 1.4m       | 2 by 4.5m                      | 12.5%max 0.4% min  |  |
|                         | Industrial/Com. Service Lane            |                |                   | 8.0m                             | -                                | 2 by 3.5m         | -               | Total 1.0m                     | 10% max 0.4% min   | Parking provided elsewhere.  |
|                         | Industrial Street                       | <20 units      | <300              | 17.0m                            | 1 by 2.5m                        | 2 by 3.5m         | 2 by 3.0m       | 2 by 3.0m to 5.0m              | 10% max 0.4% min   | Possible parking restrictions. May require specific design   |
| LOCAL DISTRIBUTOR ROUTE | Residential road                        | <150du         | <1000             | 17.5m to 18.5m                   | 1 by 2.5m or 1 to 2 bays per lot | 2 by 3.0m to 3.5m | 2 by 1.4m       | 2 by 4.5m                      | 12.5%max 0.4% min  | Alternative parking arrangements may be acceptable.  |
|                         | Industrial/Commercial                   | 20 to 40 units | 300 to 1000       | 18m or specific design           | 2 by 2.5m or specific design     | 2 by 3.5m         | 2 by 3.0m       | Specific design                | 10.0%max 0.4% min  | May require flush median. May require specific design.   |
|                         | Commercial (Park precinct)              |                | <2000             | See Notes                        | See Notes                        | 2 by 3.5m         | 2 by 3.0m       | See notes                      | 10% max 0.4% min   | Specific design for parking and road reserve width, including berms.   |
| COLLECTOR ROUTE         | Residential road                        | 150 to 450du   | 1000 to 3000      | 21.0m to 23.0m (with cycle ways) | 2 by 2.5m                        | 2 by 3.5m         | 2 by 1.4m       | 2 by 4.5m                      | 10%max 0.4% min    | Alternative parking arrangements may be acceptable. Provision is likely to be needed for cycle ways.   |
|                         | Industrial/Commercial                   | >40units       | >1000             | 18m or specific design           | 2 by 2.5m or specific design     | 2 by 3.5m         | 2 by 3.0m       | Specific design                | 10.0%max 0.4% min  | May require specific design.   |
| ARTERIAL ROADS          |   |                | >3000             | Specific Design                  |                                  |                   |                 |                                |                    |  |

\*Steeper gradients for short lengths may be acceptable to minimise earthworks.

## TYPICAL CROSS SECTION – SERVICES



FOOTPATH ADJACENT KERB – ONLY WHERE APPROVED



FOOTPATH AWAY FROM KERB – STANDARD REQUIREMENT

\* ALTERNATIVELY, POWER CABLES MAY BE LOCATED WITHIN 600mm OF THE ROAD FRONTAGE BOUNDARIES

NOTE: DRAWING AMENDED  
 JANUARY 1998  
 APRIL 2005

## TYPICAL CROSS SECTION—SERVICES

KAPITI COAST DISTRICT COUNCIL

SHEET  
4

|             |              |        |           |
|-------------|--------------|--------|-----------|
| DRAWN       | CHECKED      | SCALES | SERIES OF |
| TRACED SvdB | DATE JULY 88 |        | REF       |

**SCHEDULE 4**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 4 NZS 4404:2004 STORMWATER DRAINAGE**

The Kapiti Coast District Council has adopted Part 4 of NZS 4404:2004 with the following additions and/or alterations:

**1. Clause 4.3.1.2 *Information to be Provided***

- The information requirements outlined in the first set of sub-paragraphs (a) to (e) and subparagraphs (a), (c) and (d) from the second set are to accompany resource consent applications. The other information requirements are generally required for plan and specification approvals, but may be required for assessment of resource consent applications.
- The information is additional to any that is required under Parts 2 and 3 of this document.

**2. Clause 4.3.2 *System Design***

- See Part 3, Section E (iv), Design Principles, of this document for design requirements.
- Replace the table in clause 4.3.2.5.1 with the following table.

| <b>Function</b>  | <b>AEP<br/>(%)</b> | <b>Return Period<br/>(years)</b> |
|--|--------------------|----------------------------------|
| Primary protection   | 10                 | 10                               |
| Secondary flow paths not available or are through private property | 1                  | 100                              |
| Secondary protection   | 1                  | 100                              |

**3. Clause 4.3.3.1 *Location and Alignment of Stormwater Mains***

- In general curved pipelines are not acceptable. However the Council may accept curved alignments for large pipelines and culverts which are able to be traversed by people.

**4. Clause 4.3.3.2 *Pipe Materials***

- The following pipe materials are not acceptable:

Corrugated aluminium pipe.  
Corrugated steel pipe.

**5. Clause 4.3.3.3 *Building Over Pipelines***

- Only in exceptional circumstances will building over pipelines be permitted.

**6. Clause 4.3.3.5 *Minimum pipe sizes***

- Replace the existing clause with the following.

Minimum pipe sizes, unless otherwise specified, shall be as set out in the following table. A pipe size shall be not less than the size of an incoming pipe.

| <b>Size<br/>(internal<br/>Diameter)</b> | <b>Function</b>   |
|---|---|
| 150mm                                   | Serving a small number of properties, but not including sumps of any type.                      |
| 200mm                                   | Stormwater mains serving one sump.<br>Single sump outlets.                                      |
| 300mm                                   | Stormwater mains serving two or more sumps.<br>Double sump outlets.<br>Under-driveway culverts. |

**7. Clause 4.3.3.6 *Minimum Cover***

- Minimum cover shall be in accordance with manufacturer's recommendations, but no less than 500mm.

**8. Clause 4.3.7.1 *Individual Lots and Developments***

- Replace the first sentence with the following:

The connection of individual lots and developments to a stormwater system shall meet the following requirements, unless otherwise approved by the Council:

- Replace paragraph (h) with the following:

Connection to an alternative stormwater disposal system (such as vegetated swales, soakpits, soakage basins) may be acceptable, provided that the system meets the Council's requirements and any Wellington Regional Council requirements.

**9. Clause 4.3.8.2 *Soak Pits***

- In areas with satisfactory soakage the Council may require on-site disposal through soakpits.



#### **10. Clause 4.3.9.1 *Easements***

- Easements are required for protection of public stormwater pipelines, subsoil drains, waterways and secondary flow paths, when these are located in private property.

Pipeline easements shall be a minimum of 3 metres wide and provide unlimited and unrestricted access for the Council to undertake maintenance work. Where pipes are laid to depths of 2 metres or more, greater easement widths may be required to facilitate maintenance.

#### **11. Clause 4.3.12 *Means of Compliance***

- The primary method for the design of stormwater systems shall be based on the isohyet (rainfall depths) charts produced by the Council for the Kapiti District. These charts, and guidelines for their use, are attached as Appendix 1 to this Schedule. The methods outlined in NZS 4404:2004 may be used, at the Council's discretion, for small scale situations. In these cases rainfall intensities shall be derived from the rainfall depth charts and the 24 hour distribution table in the guidelines.

Note: Larger size copies of the charts are available for purchase from the Council. Alternatively copies may be available electronically.

#### **12. Additional Requirements**

- Work undertaken on Council owned roads shall be undertaken in accordance with Standards New Zealand Handbook SNZ HB 2002:2003 Code of Practice for Working in the Road, except as modified by the schedule titled **Kapiti Coast District Council Schedule of Special Conditions to SNZHB 2002:2003 Code of Practice for Working in the Road.**



# **Isohyet Based Calculation of Design Peakflows**

## **ISOHYET GUIDELINES AND CHARTS**

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## **1. Introduction**

As part of Kapiti Coast District Council's new subdivisional and development requirements, Sinclair Knight Merz have been engaged by the Council to prepare a standard for the calculation of stormwater design flows. The purpose of this standard is to provide a unit hydrograph based approach to the development of peak flows.

The results of such an analysis will allow assessment of storage requirements for the plethora of modern stormwater retention and treatment devices that are being embraced by the Council requirements.

The unit hydrograph based approach is modelled on the US Soil Conservation Service software HEC-1. This approach has been internationally recognised and is widely used throughout the world. It has the advantage of having a unsupported 'freeware' version, 'HEC-HMS', as well as more mainstream versions of the software such as 'Graphical Hec' which is sold as part of Heastad Methods 'Pondpack'.

These guidelines will provide details on how to produce design hydrographs using both of the aforementioned versions of the software.

Unit hydrograph modelling is widely used for the development of floodplain management plans, and has been used for this purpose in Kapiti since the early 1990's. This method of developing runoff design flows is also being widely used throughout New Zealand and is the basis of the Auckland Regional Councils rainfall-runoff guidelines 'TP-108'.



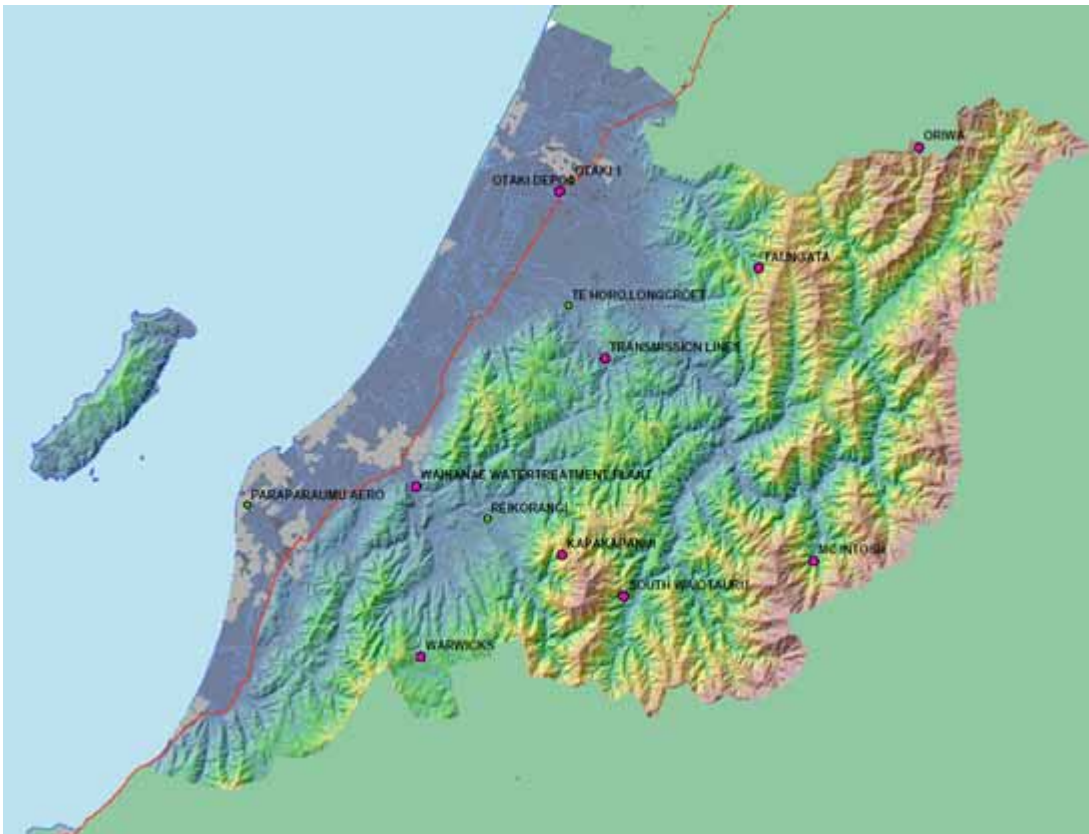
## 2. Background

### 2.1 24 Hour Rainfall Isohyet Plans

The intention of this report is to provide a system of assessing design storm runoff for peak flows and storage volumes to allow for consistent design of low impact structures. Design storm isohyets have been developed for the 2, 5, 10, 20, 50 and 100 year annual recurrence interval events.

Annual maxima daily rainfall totals were extracted for 13 stations in the Kapiti Coast region. The stations that were used in the analysis are shown in Figure 2-1 below. Of these 13 sites the South Waiotauru site was excluded from the study due to consistently lower rainfall depths than other surrounding sites. Further investigation would have to be undertaken on this site before it was to be included within the study.

#### ■ Figure 0-1 : Annual Maxima Rainfall Station



The methodology employed in this study for determining the frequency distribution of annual maximum storm rainfalls for the Kapiti region involves a regional frequency analysis technique using the method of L-Moments. The approach involves identification of the most appropriate distribution for the region, followed by estimation of the regional parameters for that distribution. The parameter estimates are used to calculate the rainfall quantiles for each locality (station) within the region.

Further discussion of this analysis is covered by the document “*Regional Analysis of Kapiti Coast Daily Rainfalls, 2003*”. A generalised logistic distribution was adopted for the Regional Analysis.

Rainfall recurrence isohyet maps have been generated for the 2, 5, 10, 20, 50 and 100 year ARI rainfall depths using kriging geostatistical techniques. The respective maps are appended at the rear of this report as Appendix A.

## **2.2 Clark Unit Hydrograph using the SCS Curve Numbers**

The unit hydrograph method of flood estimation was first proposed by Sherman and has since found wide application for both design and estimation of actual floods where a hydrograph and reasonable accuracy are required (*Maidment, 1992*).

Unit Hydrographs are defined by the runoff resulting from uniform units of rainfall depth over an entire catchment. The difference between rainfall volumes and runoff volumes in the unit hydrograph model are expressed as losses to the system, which can relate to a variety of forms such as evapo-transpiration, and storage within vegetation, the soil, and undrained depressions.

The key components for the development of a unit hydrograph model are therefore rainfall depth relationships, rainfall losses, and catchment characteristics. Each of these items have been separately discussed through the remainder of this chapter, and are covered considerably more comprehensively in Hoggan (1996).

### **2.2.1 Rainfall Depth Relationships**

A 24 hour balanced storm has been proposed for general use. A long balanced storm of this nature is commonly used for floodplain management based work and allows for storage volumes to be more accurately assessed for low impact design storage based solutions.

The balanced storm approach ‘nests’ high intensity rainfall events within the 24 hour storm profile. This allows for peak estimates of flow to be accurate for small catchments while also providing an appropriate assessment of larger storage volume issues.

A symmetrical distribution has been applied in this case so that the peak rainfall intensities will fall across the midpoint of the storm.

24 hour rainfall depths for any catchment can be estimated for the 2,5,10,20,50 and 100 year annual recurrence interval (ARI) events using the 24 hour isohyet maps attached as Appendix A. For larger catchments weighted averages can be calculated, or the catchment can be split up and modelled as a series of sub-catchments.



Once 24 hour rainfall depths have been defined, these have to be converted into some form that allows a balanced storm to be developed in Graphical Hec, or HEC-HMS. For both of these software packages a normalised depth-duration-frequency relationship can be multiplied by the 24 hour total depths to provide duration-depth data. The normalised rainfall depth-duration relationship is shown in table 2-1.

■ **Table 0-1 : Normalised Depth-Duration Relationship for 24-hour Rainfall**

| <b>Duration</b> | <b>Normalised Rainfall<br/>Depth (<math>I/I_{24}</math>)</b> |
|-----------------|--|
| 5 Mins          | 0.08   |
| 10 Mins         | 0.11   |
| 15 Mins         | 0.14   |
| 30 Mins         | 0.19   |
| 1 Hour          | 0.26   |
| 2 Hour          | 0.35   |
| 3 Hour          | 0.46   |
| 6 Hour          | 0.60   |
| 12 Hour         | 0.81   |
| 24 Hour         | 1  |

Computed duration depths can be entered directly into Graphical Hec or HEC-HMS as a balanced storm as will be explained in chapter 3 and 4.

The normalised rainfall depth relationship has been developed using the Paraparaumu Aerodrome rainfall record. This provides the longest record of continuous (as opposed to daily read) data in the region with 48 years record.

### **2.2.2 Rainfall-Runoff Losses**

One of the advantages of the SCS method of unit hydrograph modelling is that it provides a system for the delineation of rainfall losses over the period of the storm based on a catchments soil, and land-use characteristics. These curves, unlike linear losses across a storm, allow for antecedent storage to impact the shape of the storm profile. This reflects reality where greater rainfall losses would be expected through the earlier portions of the storm.

The SCS loss method is defined by the following equations; (Hoggan, 1996).

$$Q = \frac{(P - I_a)^2}{P - I_a + S}$$

$$S = \left( \frac{1000}{CN} - 10 \right) 25.4$$

Where<sup>1</sup>;

Q = accumulated Runoff (mm)

P = accumulated Rainfall (mm)

I<sub>a</sub> = initial Abstraction

S = potential maximum retention after runoff begins (mm)

CN = curve number, percent of runoff

### 2.2.2.1 Initial Abstraction

Initial abstraction is approximated by the empirical equation  $I_a = 0.2S$  as the default parameter of the SCS model. Initial abstraction has been found to be less than this in studies completed within the Kapiti Coast however. Work recently completed for a Masters thesis confirmed that for storms in the order of an annual flood, I<sub>a</sub> values fluctuated between 0 and 4mm (Watts, 2002). This corroborates the results of TP108 (Beca Carter, 1999), which suggests initial abstraction values of 5mm for pervious areas and 0mm for impervious.

Our suggestion is that for fully urbanised catchments I<sub>a</sub> values of 0mm be used, and small rural catchments 5mm is used. No data is available for larger catchments, but this is one area where further work could be done with available data.

### 2.2.2.2 Delineation of Curve Numbers

Curve numbers (CN's) define the volume of storage losses for any modelled rainfall event. These values can be delineated from a standard set of runoff curve tables that were developed by the US Soil Conservation Service. These tables, (Appendix B), allow for a variety of differing land uses, including urban land, for a range of differing soil types.

As these tables allow for the analysis of a wide variety of land uses and soil types previous work completed in the Kapiti Coast District has identified base CN values that encompass most of the soil types typically found in the region. A summary table of typical CN values (based on Connell Wagner, 2001) is as follows;

---

1) <sup>1</sup> TP-108, ARC 1999

| Soil Type |   | Curve Number       |
|-----------|---|--------------------|
| 1.        | <b>Loose Dune Sands</b><br>Assumed soil type A.   | 45                 |
| 2.        | <b>Gravel Silt Loams</b><br><br><b>Pasture</b><br><b>Urban Gardens*</b><br><b>Bush</b><br><br>Assumes soil type B. In some cases testing will show gravel soils to have higher infiltration capacities than this in which case soil type A should be assumed. | 69<br><br>61<br>48 |
| 3.        | <b>Residential Inland Dune sands</b><br>Assumes soil type B and accounts for construction compactions.  | 61                 |
| 4.        | <b>Greywacke Argillite Steepland Soils</b><br><br><b>Pasture</b><br><b>Urban*</b><br><b>Bush</b>  | 79<br>74<br>65     |

\* Excludes connected impervious areas as covered in section 2.2.3.

This table is intended as guidance and should not substitute formal ground investigation in cases of uncertain soil conditions.

### 2.2.3 Catchment Characteristics

A variety of catchment characteristics need to be defined for the development of the Clarke's unit hydrograph. These include

- An assessment of soils for development of the Curve Numbers covered above.
- An assessment of Connected Impervious Areas.
- The nature of catchment Storage.
- Calculating the Time of Concentration

#### 2.2.3.1 Soils Categories

CN tables, as covered in appendix B, identify the substantial impact of soils properties on total runoff volumes. Soils are assessed under four categories (TP108, 1999) as follows:

**Group A** soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (greater than 8mm/h).

Loose dune sands would typically fall within the Group A soil category, and well drained gravels would also fall within this category.

**Group B** soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well drained to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (4-8mm/h).

Inland compacted sands, less well drained gravel loams and valley based gravel loams would typically fall within this soil group.

**Group C** soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (1-4mm/h).

Most of the steepland argillite, greywacke and loess based soils would fall into this category.

**Group D** soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils and a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-1mm/h). Existing peat bogs may fall into this category.

#### **2.2.3.2 Connected Impervious Areas**

Connected impervious areas are recorded as a percentage of the residential zone that is impervious, and directly connected via formal drainage systems to the receiving waterway. A previous assessment of current land-use (*Connell Wagner, 2001*), gave Connected impervious values of:

|  |         |
|--|---------|
| Residential A – older lots 800m2 average | 38% CIA |
| Residential B – newer lots 600m2 average | 55% CIA |
| Residential C – retirement villages      | 65% CIA |
| Industrial                               | 72% CIA |
| Commercial                               | 85% CIA |
| Road Designation                         | 36% CIA |
| Town Centre (Paraparaumu)                | 50% CIA |
| Educational                              | 72% CIA |
| Hospital                                 | 72% CIA |
| Open Space/Rural Zone                    | 0% CIA  |

### 2.2.3.3 Storage Values

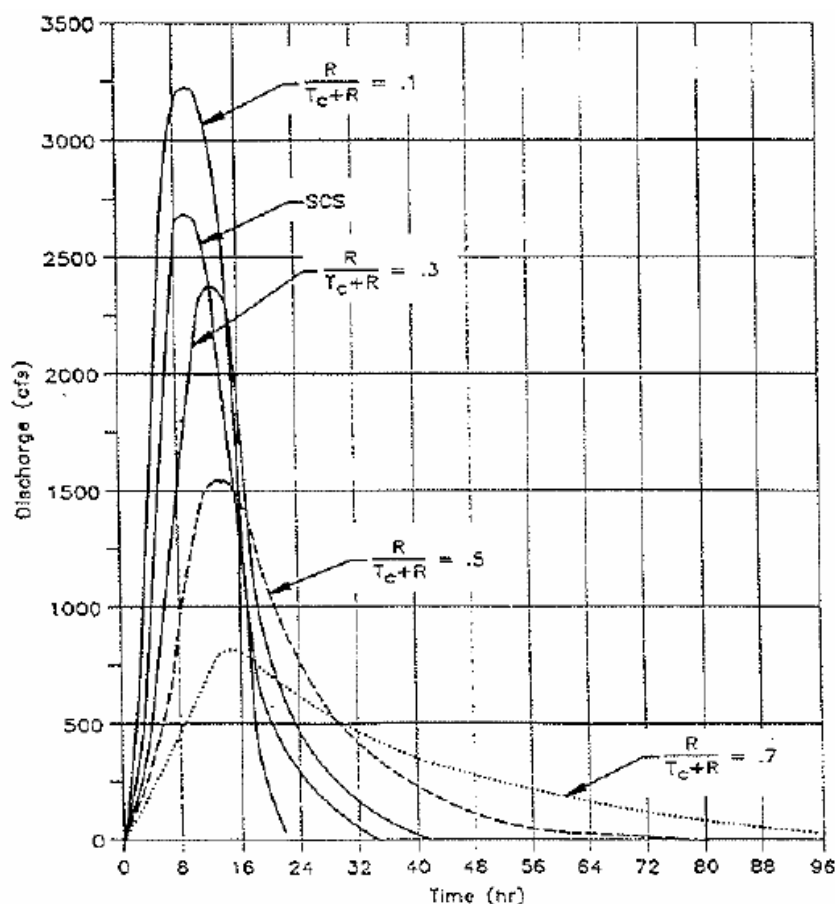
Storage volumes for any one event are defined by the given CN. The shape of the volume outflow in the Clarke's unit hydrograph is determined by the storage coefficient R. The value R is interdependent of the concentration time and can be given as;

$R = T_c \cdot \text{Ratio} / (1 - \text{Ratio})$  Where the ratio represents the shape of a given hydrograph as shown in figure 2-2.

In this situation the concentration time becomes the control of R given a set ratio of runoff. This is seen as a distinct advantage as although some work has been undertaken in an attempt to quantify R in the Kapiti Region, (Watts, 2001, Connell Wagner, 1999), this work has not been conclusive, and has provided a wide variety of results.

Using the runoff ratio approach, ratios can be set for differing landuse types to control the runoff hydrograph shape. These can be applied for any given time of concentration to provide a value for R that can be entered into the hydrograph equation.

**Figure 0-2 : Storage/Concentration Time Ratio Curves (Hoggan, 1996)**



From previous work undertaken by Connell Wagner, (2001), appropriate ratios for R have been defined as;

- 0.25 for highly developed industrial commercial catchments;
- 0.30 for most residential catchments;
- 0.35 for high storage residential catchments;
- 0.45 for rural steepeland catchments.
- 0.60 for rural flatland catchments.

A more detailed discussion of the calculation of storage coefficients, and indeed all of the above SCS parameters, is covered in Hoggan, 1996. This is an excellent background text for the engineering hydrologist.

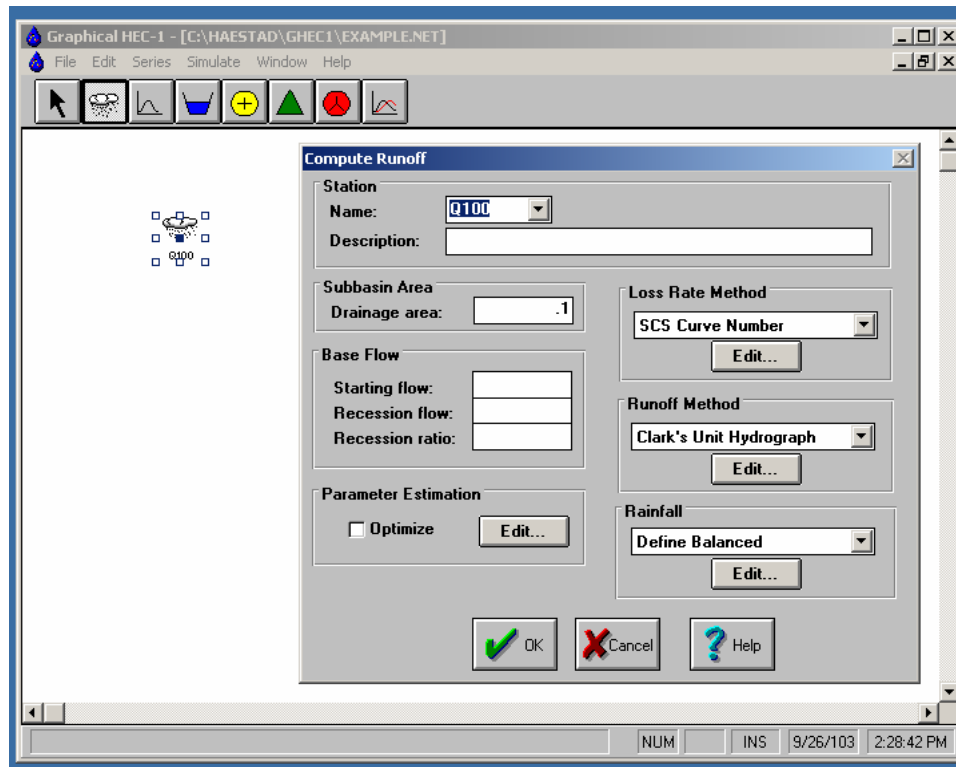
#### **2.2.3.4 Concentration Times**

Times of concentration should be calculated in accordance with the requirements for subdivision and development. An example calculation of concentration times is covered in section 6.4 of this report.

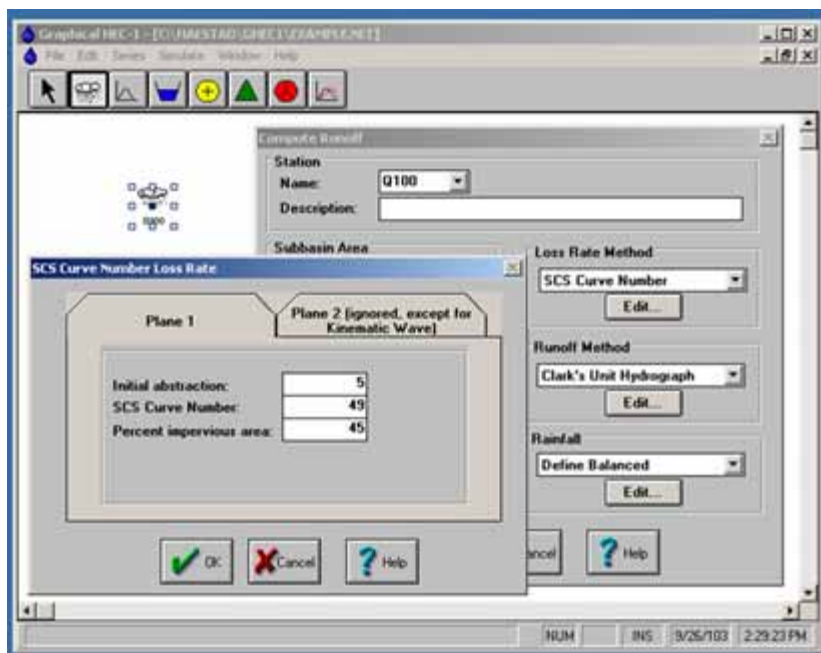
### 3. Haestad's Graphical Hec-1

Haestad's are an American software company that have taken the proprietary Hec 'freeware' and developed a windows front end that is both easy to use, and backed up by full software support.

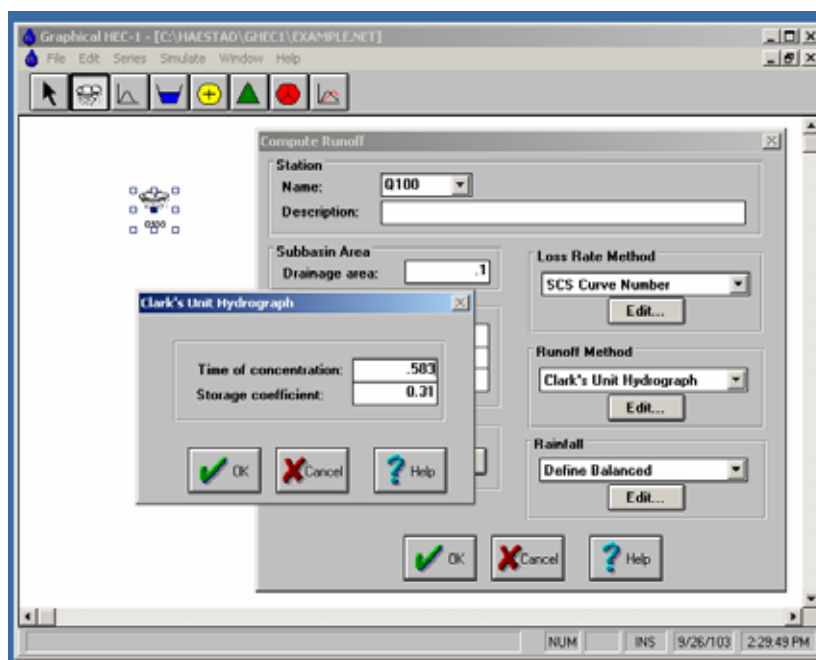
To develop an SCS hydrograph using the information from the previous chapter, the design engineer or hydrologist will need to follow the following steps.



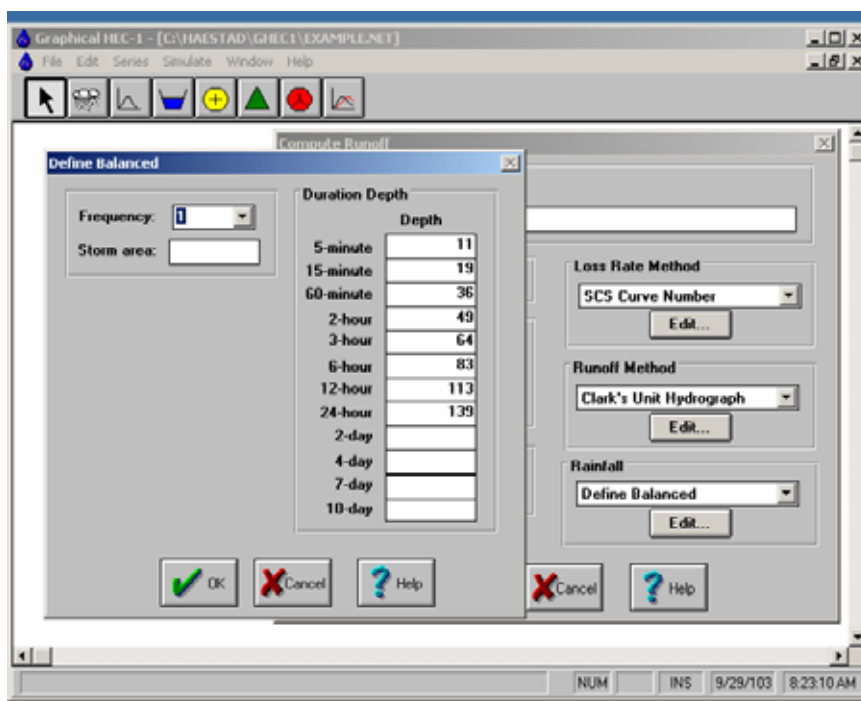
**Step 1** – Select the storm item to open a new basin model and enter catchment size under drainage area.



**Step 2** – Select the SCS curve number item under the loss rate method and enter the initial abstraction, Curve Number (CN), and Percent impervious area (CIA) in the boxes as shown. These items should be worked through as discussed in the previous chapter.



**Step 3** – Calculate the time of concentration and enter the time, (in hours), and the assessed storage coefficient under the Clarkes Unit Hydrograph runoff method.

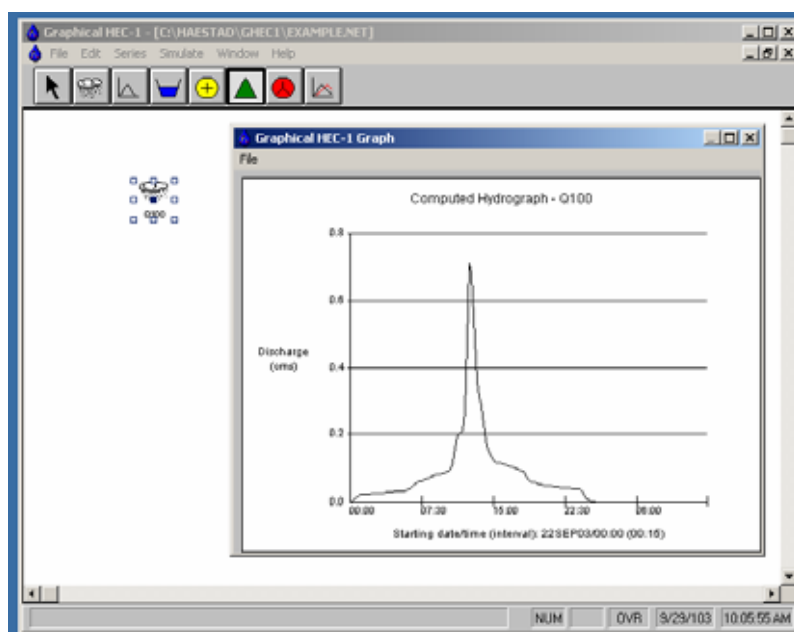




**Step 4** – Add in the balanced rain event under ‘Define Balanced’ in the rainfall portion of the model. These values would be calculated as per sections 2.2.1.

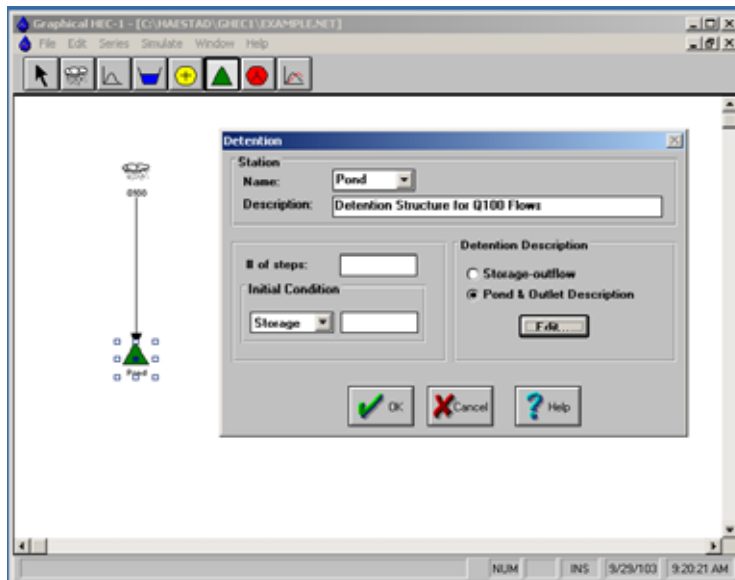
This is all the data that is required to run the model. Typically the model would be run for the full 24 hour storm but in some special circumstances it could be run for shorter periods of time. The hydrograph can be reduced to a twelve hour storm simply by leaving the 24 hour rainfall depth out of the rainfall duration depth series. The model will automatically adjust to a twelve hour storm.

**Step 5** – From the *simulation* menu the model parameters need to be entered to allow the programme to be run. Typically for a 24 hour storm the model is run for 36 hours as shown above to allow for the full hydrograph to be represented. In situations where detention is being modelled this may need to be further extended to allow for slow drawdown from detention structures. The final results of the analysis can be represented in tabular form or graphically as shown below.



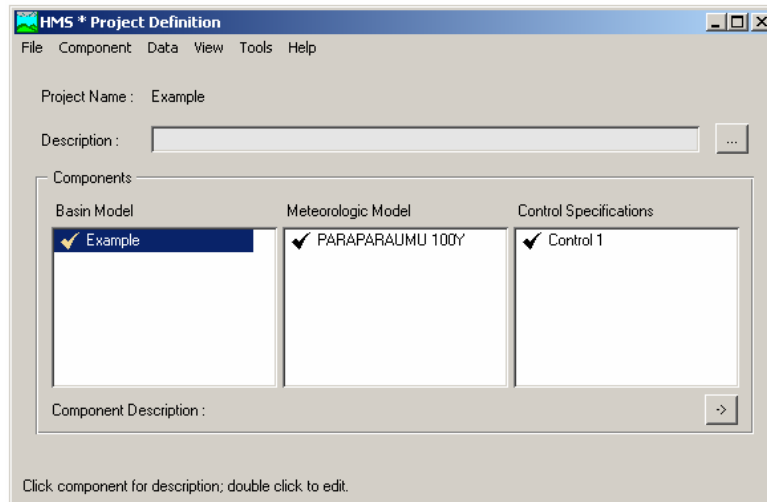
### 3.1 Storage Structures

Storage ponds and other structures can be easily modelled within the HEC system by running the newly calculated unit hydrograph through a stage-storage-discharge relationship. Pond and outlet relationships are defined from first principles and entered into the detention basin. The hydrograph is attached to the basin, and the model run as before.



#### 4. US Army Corps of Engineers HEC-HMS.

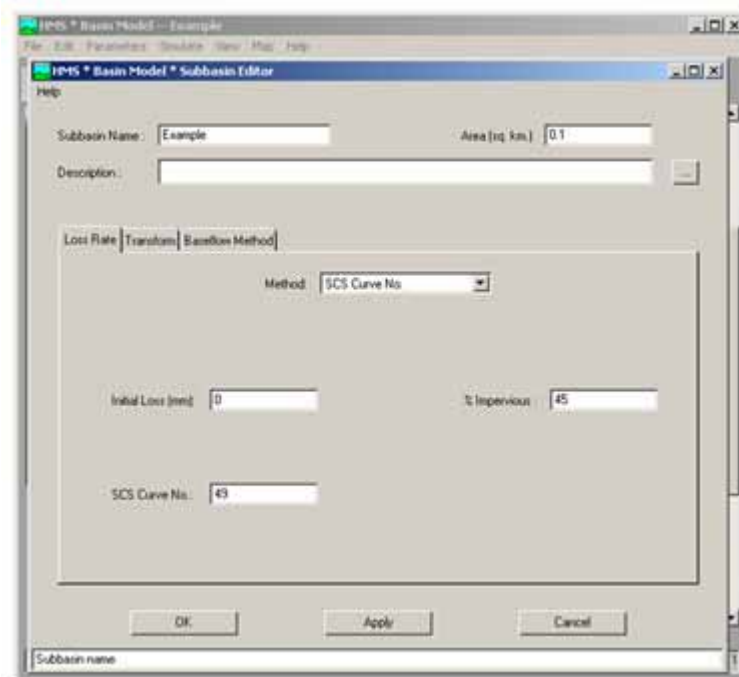
The freeware version of the unit hydrograph modelling software is available off the internet as HEC-HMS. Also available for download with this software are full software user manuals. The basic components of the software are generally the same as the Haestad's version, but are set out in a slightly different format. To compute a unit hydrograph the following steps need to be completed.



For each hydrological 'project' there are three separate 'model' components. These are the basin model, the meteorological model, and the control specifications. Each of these components can be created under the *component* menu in the project screen as seen above.

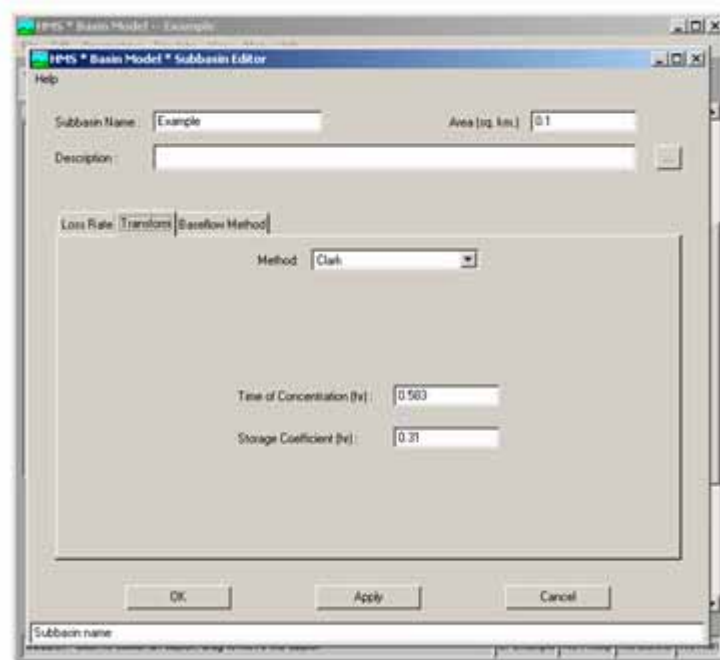


**Step 1** – Create a new basin model and open a sub-basin element. This is essentially the same as the catchment element in Graphical Hec. Once this element has been created the catchment characteristics can be entered into the model.



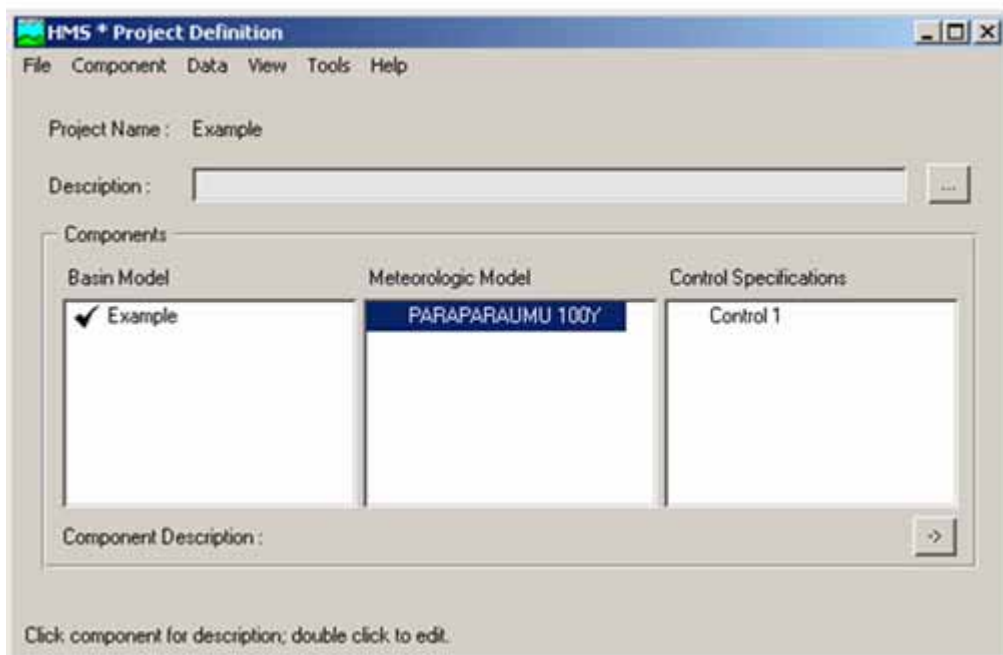
The screenshot shows the 'HEC-MS \* Basin Model \* Subbasin Editor' dialog box. The 'Loss Rate' tab is selected. The 'Subbasin Name' is 'Example' and the 'Area (sq. km)' is '0.1'. The 'Description' field is empty. The 'Method' dropdown is set to 'SCS Curve No'. The 'Initial Loss (mm)' is '0' and the '% Impervious' is '45'. The 'SCS Curve No.' is '49'. The 'OK', 'Apply', and 'Cancel' buttons are at the bottom.

**Step 2** – Select the loss rate method as the SCS curve Number, and enter the loss rate, and connected impervious area data into the model as outlined in chapter 2.

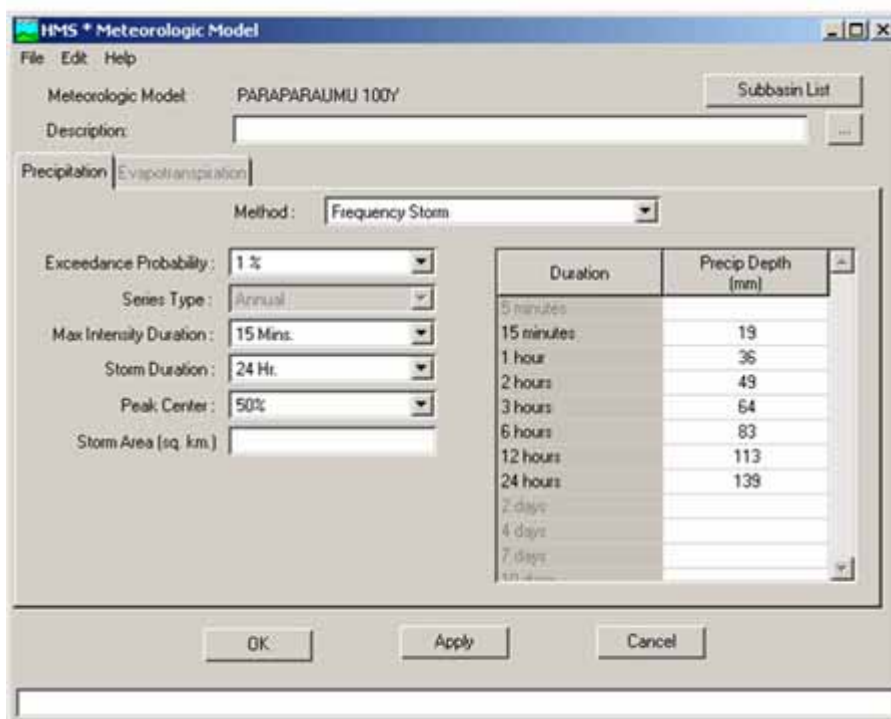


The screenshot shows the 'HEC-MS \* Basin Model \* Subbasin Editor' dialog box. The 'Transform' tab is selected. The 'Subbasin Name' is 'Example' and the 'Area (sq. km)' is '0.1'. The 'Description' field is empty. The 'Method' dropdown is set to 'Clark'. The 'Time of Concentration (hr)' is '0.503' and the 'Storage Coefficient (hr)' is '0.31'. The 'OK', 'Apply', and 'Cancel' buttons are at the bottom.

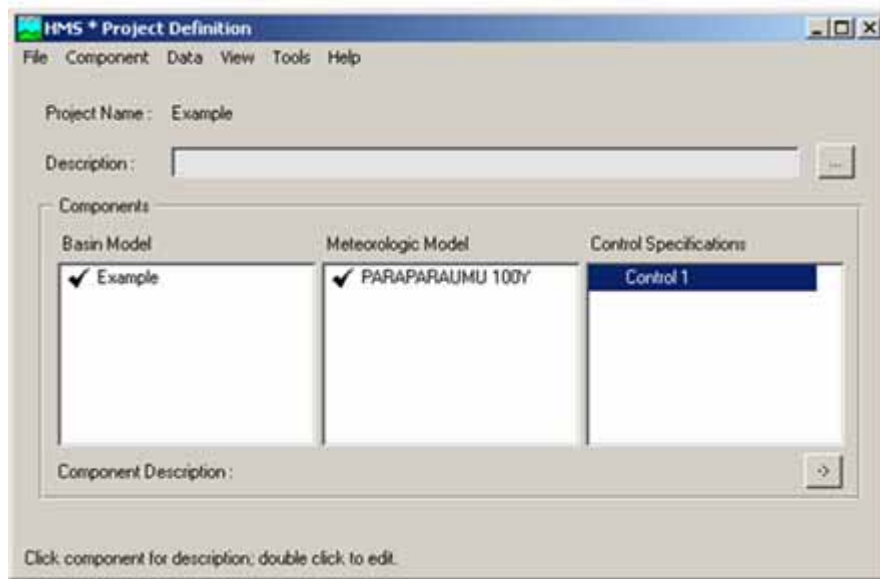
**Step 3** – Select the unit hydrograph method under the transform menu as the ‘Clark’ unit hydrograph and enter Tc and R into the model. Baseflow should be set to ‘none’ unless some good data is available and the baseflow is going to be significant comparative to the peakflow and total storage volumes.



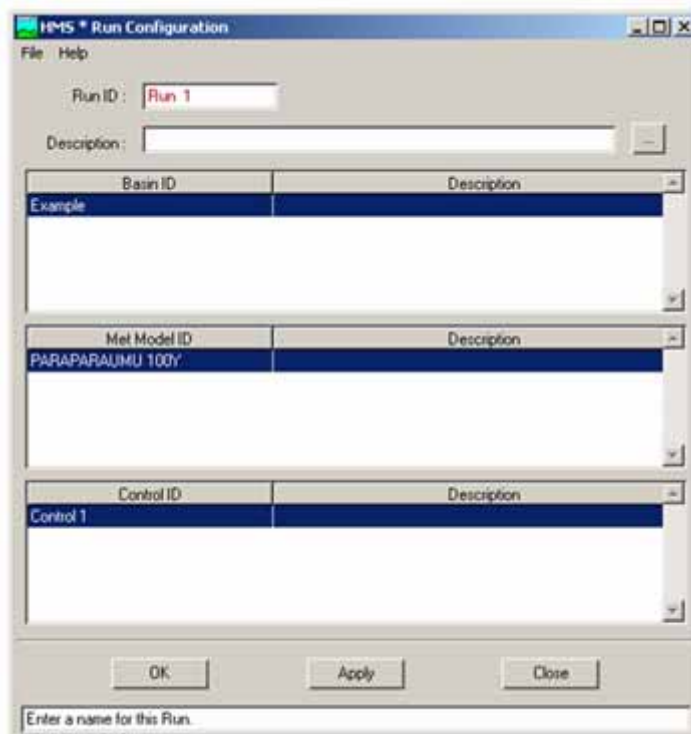
**Step 4** – A Meteorological model needs to be created under the *component* menu of the project. Once this is defined it can be opened to allow entry of design rainfall information as shown below.



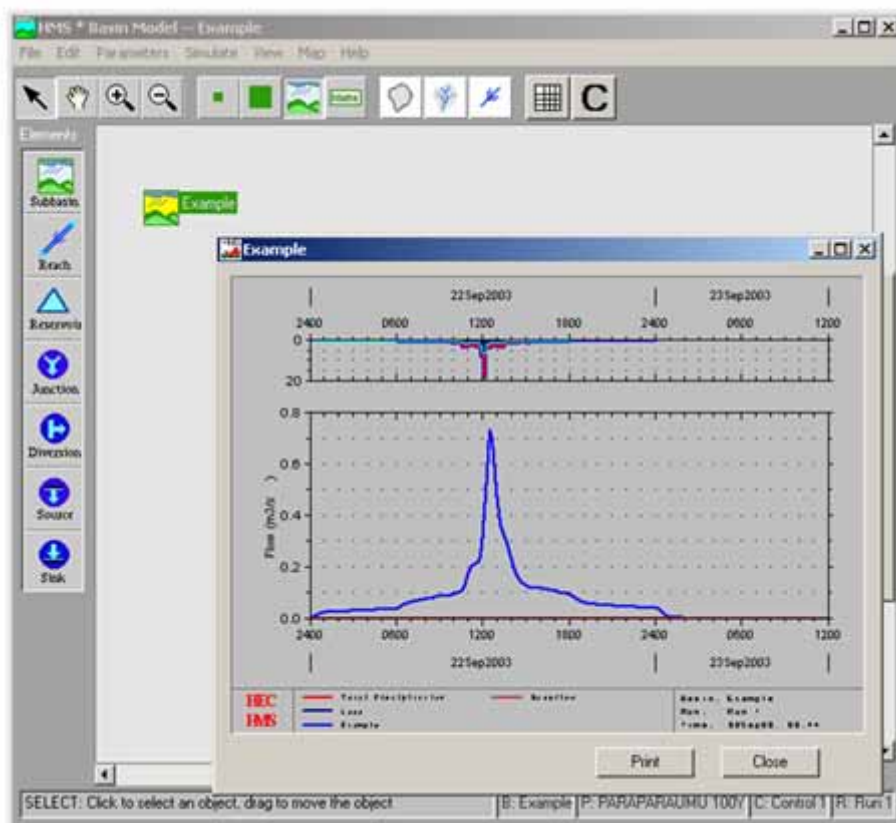
**Step 5** – Selecting the ‘frequency storm’ method from the menu the balanced rainfall data can be entered into the meteorological model. The sub-basin model ‘example’ needs to be selected from the given list to connect the sub-basin to the rainfall series.



**Step 6** – The control specifications are essentially the project time and date running parameters. Again the models should be run for 36 hours as in the previous chapter. Once the control specifications have been set the project model run is set up by selecting *run configuration* under the *tools* menu.



**Step 7** – Under *run configuration* each part of the model needs to be selected and then the model can be computed under the *run manager* also selected from the *tools* menu in the project toolbar



Results can be viewed by returning to the basin menu and right clicking on the basin item. By selecting 'view' there is an option to review the graph as well as time series and general tabular data.

#### 4.1 Storage Structures

Storage structures in Hec-HMS are developed as a detention structure within the basin model. Again, pond and outlet relationships are defined from first principles and entered into the detention basin. The stage storage and discharge relationship will be based on specific outlet conditions that would be engineered for each specific situation.





## **5. Model Limitations**

### **5.1 Rainfall Isohyet Plans**

Statistically the frequency analysis undertaken on the available rain gauge sites is sound. Development of the regional isohyets brings these records together in a broad way however, and will tend to ignore small local differences. It should also be noted that most of the upper catchment gauges (Taungata, Oriwa, McIntosh and Kapakapanui) have the shortest rainfall records and may therefore be subject to change in the longer term when a more substantial record is available.

### **5.2 Calibration of Empirical Assumptions**

Calibration of empirical assumptions for the development of extreme event storms, covered in this report, is limited. Previous work undertaken by Watts (2002), while providing good data on Initial Abstraction, lacked the large storm events required to meaningfully assess general losses (CN's) and storage functions (R). Some work optimising Hec-1 for the large event storms was undertaken following the storms of October 1998, which were recorded at the Coastlands weir, but a lack of other large events at this gauging station is again a limitation to these results.

The data that has been analysed has typically been from catchments of less than 7 km<sup>2</sup>. The isohyet based approach to analysing catchment runoff should not typically be applied to catchments with a greater area than this prior to further calibration work being completed.

For the designer it is important to recognise that due to this a lack of existing hydrometric data the approach encompassed in this report is essentially an uncalibrated empirical process and should be treated as such.

### **5.3 Further Work**

- Some additional local rain gauges through urbanising areas may, in the long term, add useful detail to the rainfall isohyet plans.
- Further analysis of  $I_a$  could be developed from the data for the Waikanae and Otaki Rivers. This would give some feel for large catchment initial abstraction values.
- New data collected at the Wharemauku, Mazengarb, Mangaone and Waitahu flow gauges could be analysed for frequency, and then used to calibrate for storage runoff ratios and general catchment losses.
- Gauging of additional smaller urban streams, such as the Muaupoko and Wainui, would add to the existing knowledge base and allow for more conclusive analysis in the long term.



## 6. Worked Example

### 6.1 Introduction

The following example has been developed to assist the engineer in applying this standard. The example is based on a small residential/commercial catchment in Waikanae that discharges via an open channel to the Waikanae River. The area was defined as being 11.73 hectares and is drained via a formal stormwater piped network as shown below in Figure 6-1.

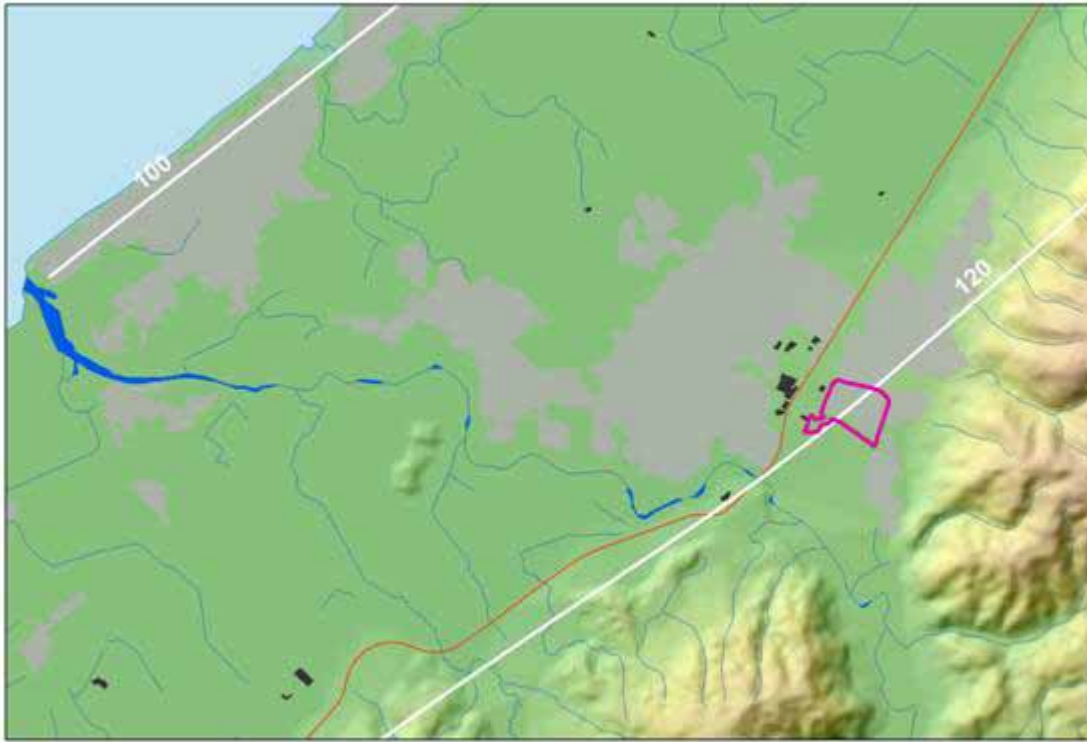
#### ■ Figure 6-1. Site Plan of Example Catchment.



### 6.2 Rainfall

Rainfall depths are taken from the 10 year isohyet plan for the catchment area identified. Figure 6-2 locates the catchment on the isohyet plan.

■ **Figure 6-2. Catchment Location on the 10 Year Isohyet Plan.**



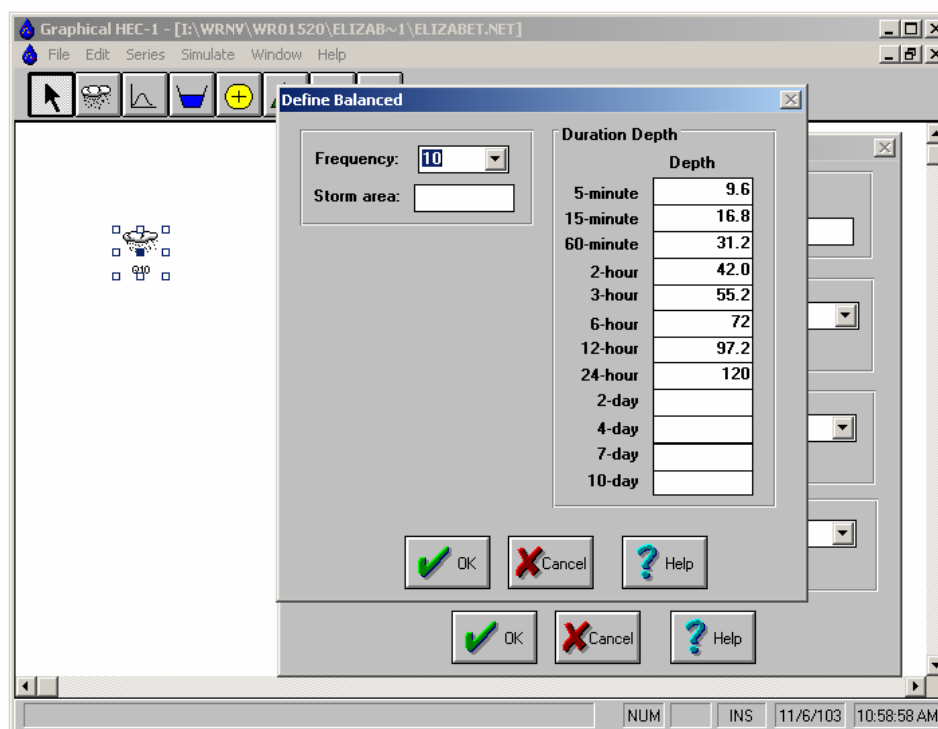
Average rainfall depths for this catchment are estimated at 120mm off the plan. This total depth is then applied to the normalised depth-duration relationship, (section 2.2.1), as shown in table 6-1.

■ **Table 6-1: Normalised Depth-Duration Relationship for 24-hour Rainfall**

| Duration | Normalised Rainfall Depth ( $I/I_{24}$ ) | Normalised 10Y Rainfall |
|----------|--|-------------------------|
| 5 Mins   | 0.08                                     | <b>9.6</b>              |
| 15 Mins  | 0.14                                     | <b>16.8</b>             |
| 1 Hour   | 0.26                                     | <b>31.2</b>             |
| 2 Hour   | 0.35                                     | <b>42</b>               |
| 3 Hour   | 0.46                                     | <b>55.2</b>             |
| 6 Hour   | 0.60                                     | <b>72</b>               |
| 12 Hour  | 0.81                                     | <b>97.2</b>             |
| 24 Hour  | 1  | <b>120</b>              |

These normalised 10Y rainfall depths can then be entered, with the catchment area, into the Hydrological model as outlined in chapter 3 and 4 and shown in Figure 6-3 using Graphical Hec.

**Figure 6-3. Rainfall depths applied for the 10 Year Example**



## 6.3 Catchment Characteristics

### 6.3.1 Initial Abstraction

Initial abstraction in a fully urbanised catchment would be set at **0mm** as outlined in section 2.2.2.1.

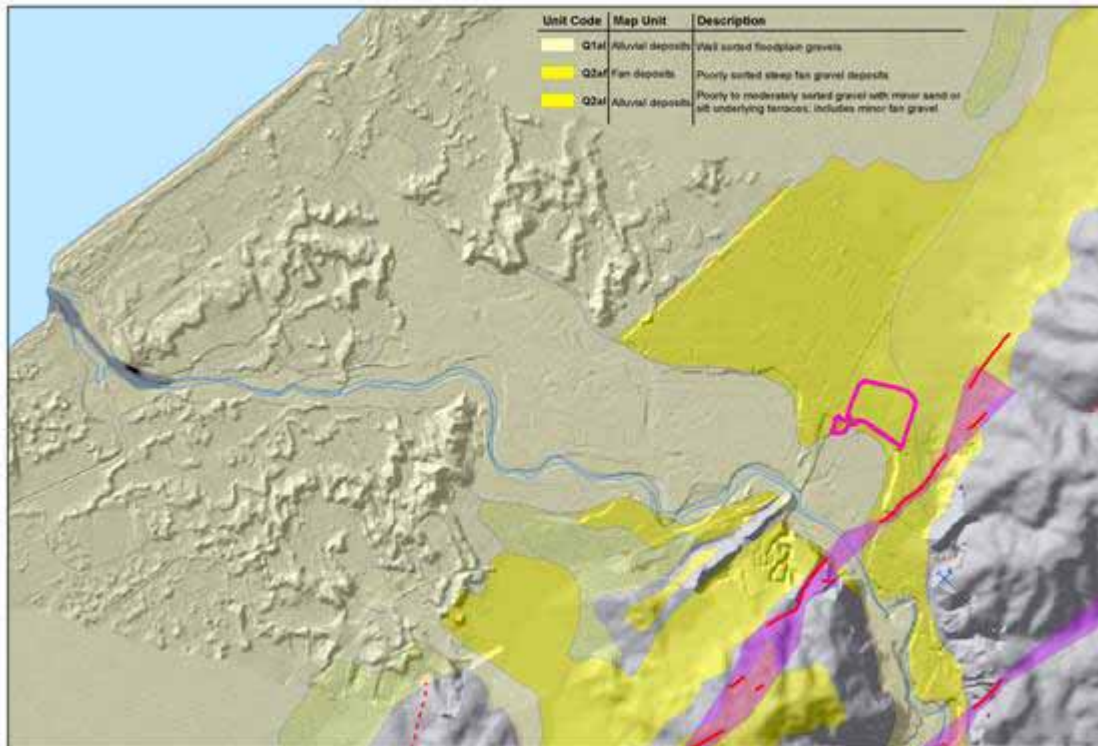
### 6.3.2 Curve Numbers (CN) and Connected Impervious area.

Defining soils parameters can be taken from Soil Bureau Land-Use Inventory Maps in all but urban areas. These maps are difficult to source however and may need to be supplemented by larger geological plans which also cover urban areas.

In either case site an initial site walkover should confirm the nature of the soils with ground investigation if necessary.

For the example case we have used the larger geology maps for the urban based area (figure 6-4). The geology shows a mixture of alluvial and outwash gravels that are well to moderately well drained.

**Figure 6-4. Geology of the Given Catchment Area**



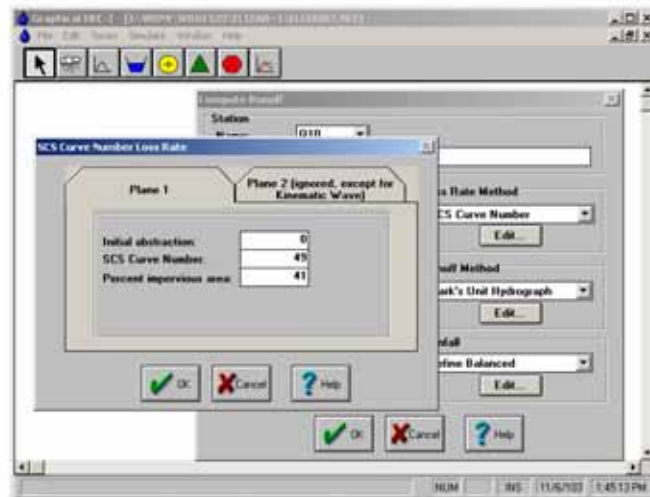
These alluvial soils are well drained and there is no record of flooding in this catchment on Councils flood incidence records. In addition previous soakage testing in this area have shown high soakage rates. From appendix B it has been assumed that these soils would fall into category A, and that the general ground cover (lawns gardens etc) would be in fair (average) condition. This gives a **CN of 49**.

To this value the impervious portion of the catchment needs to be added. This has been estimated as 38% under section 2.2.3.2 for the Residential portion of the catchment (92%), and 72% for the remaining industrial area. This gives a weighted connected impervious area of;

|  |                   |
|--|-------------------|
| Industrial @ 72%*.08                   | 5.8               |
| Residential @ 38%*.92                  | 35.0              |
| <b>Estimated Total Impervious Area</b> | <b><u>41%</u></b> |

These loss rate characteristics are entered into the model under the loss rate method as discussed in chapter 3 and shown below in figure 6-5.

- **Figure 6-5. Loss Rate Factors Applied for the 10 Year Example.**



#### 6.4 Time of Concentration

Calculation of the time of concentration under Kapiti District Councils new subdivisional and development requirements is as follows.

The first step in the calculation of rainfall intensity is to determine the “time of concentration” for the catchment, or the time taken for water to travel from the remotest part of the catchment to the head of the section of the drain or culvert in question.

$T_c$  = time of flow to design point = (overland flow + open channel flow + kerb and channel flow + pipe flow), where:

- Time of overland flow for most urban drainage systems can be obtained from “Chart for Overland Flow” Fig 4.2.a

If the natural surface is longer than 1000 metres the Empirical Bransby-Williams formula shall be used:

$$t_c = \frac{FL}{A^{0.1} S^{0.2}}$$

where

- $t_c$  = time of concentration in minutes
- $F$  = 59.5 when area in square metres  
= 92.7 when area in hectares
- $L$  = main channel length (km)
- $A$  = catchment area
- $S$  = main channel slope (m/km)

- Time of channel flow can be obtained using Mannings formula.



- c) Time of kerb and channel flow can be obtained using Mannings formula for n 0.018 as an average value.
- d) Time of pipe flow can be obtained by using the chart Fig E.5.

Time of concentration shall not be taken less than 10 minutes in all areas:  
The figures referred to are included for this example in appendix C.

The outcome for the Time of Concentration calculations for the example catchment would therefore be;

Overland Flow is 20m @ 3% (From Figure E.4.2) 10.5min

Gutter Flow is 150m @ 4.8% (From figure E.4.2) 2 0min

Pipe Flow is 600m @ 2% @ 1.8m/s (from figure E.5.1) 5.5min

Concentration time in Minutes. **Say 20min.**

#### 6.4.1 Storage Value (R)

From section 2.2.2.3 the ratio for R has been defined as 0.30 for standard residential catchments. To determine R from this ratio the function  $R = T_c \cdot \text{Ratio} / (1 - \text{Ratio})$  is applied.

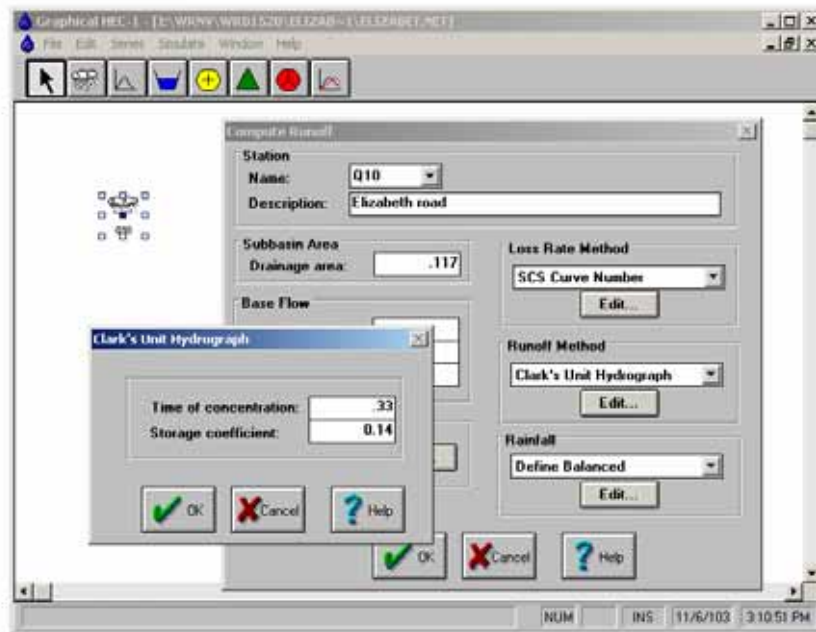
In this case this would give an R value of

$$R = 0.33 \cdot .30 / (1 - .30) = \mathbf{0.14}$$

The time of concentration and R values are the final parameters to be entered into the hydraulic model as given in figure 6-6.

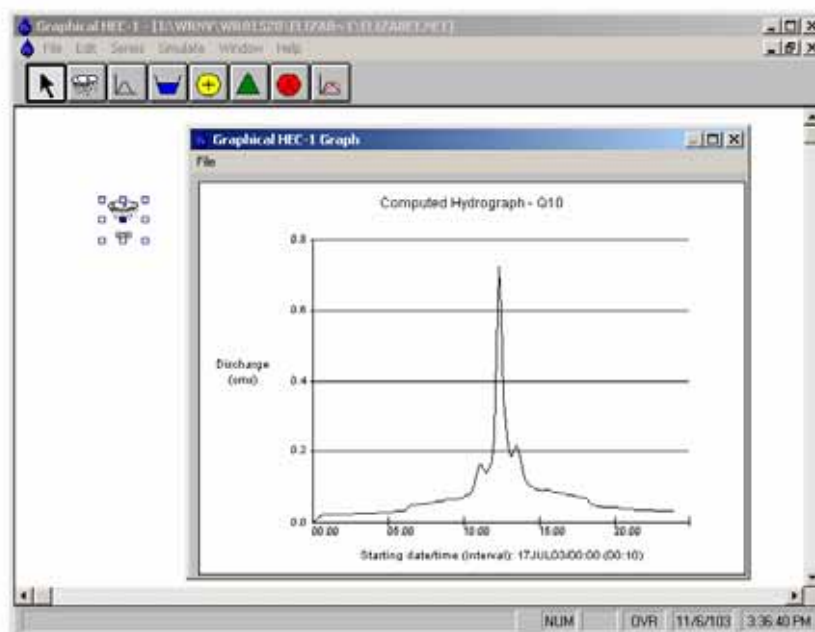


- **Figure 6-6. Concentration Times and Storage Values Applied for the 10 Year Example**



This is the last of the parameters required for the calculation of the unit hydrograph which can now be computed to provide the output hydrograph. This output is given below as figure 6-7.

- **Figure 6-7. Output Hydrograph from 10 Year Example.**

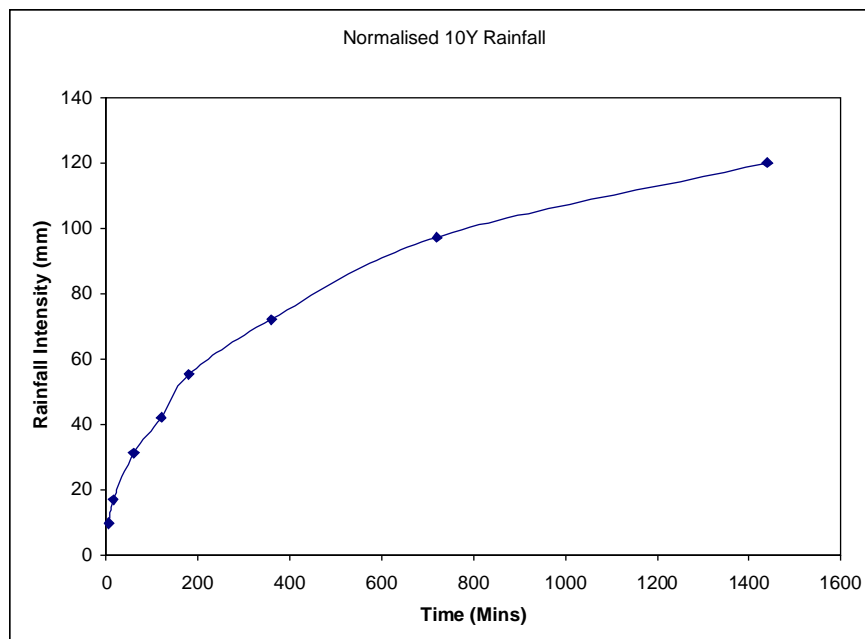


## 6.5 Rational Formula

The Rational Formula has been traditionally used to estimate catchment peak flows in urban areas. It is not the intention of the updated subdivisional and development requirements to exclude the use of the rational formula for this purpose. It will typically not be useful for calculating volume based solutions however and will not be encouraged for use in this area of design.

The isohyet plans that have been developed can be used to provide all the rainfall intensity data required under this method. This can be achieved by plotting the normalised rainfall results from table 6-1 against time as shown below in figure 6-8.

■ **Figure 6-8. 10 Year Rainfall Intensity Curve for the Example Catchment**

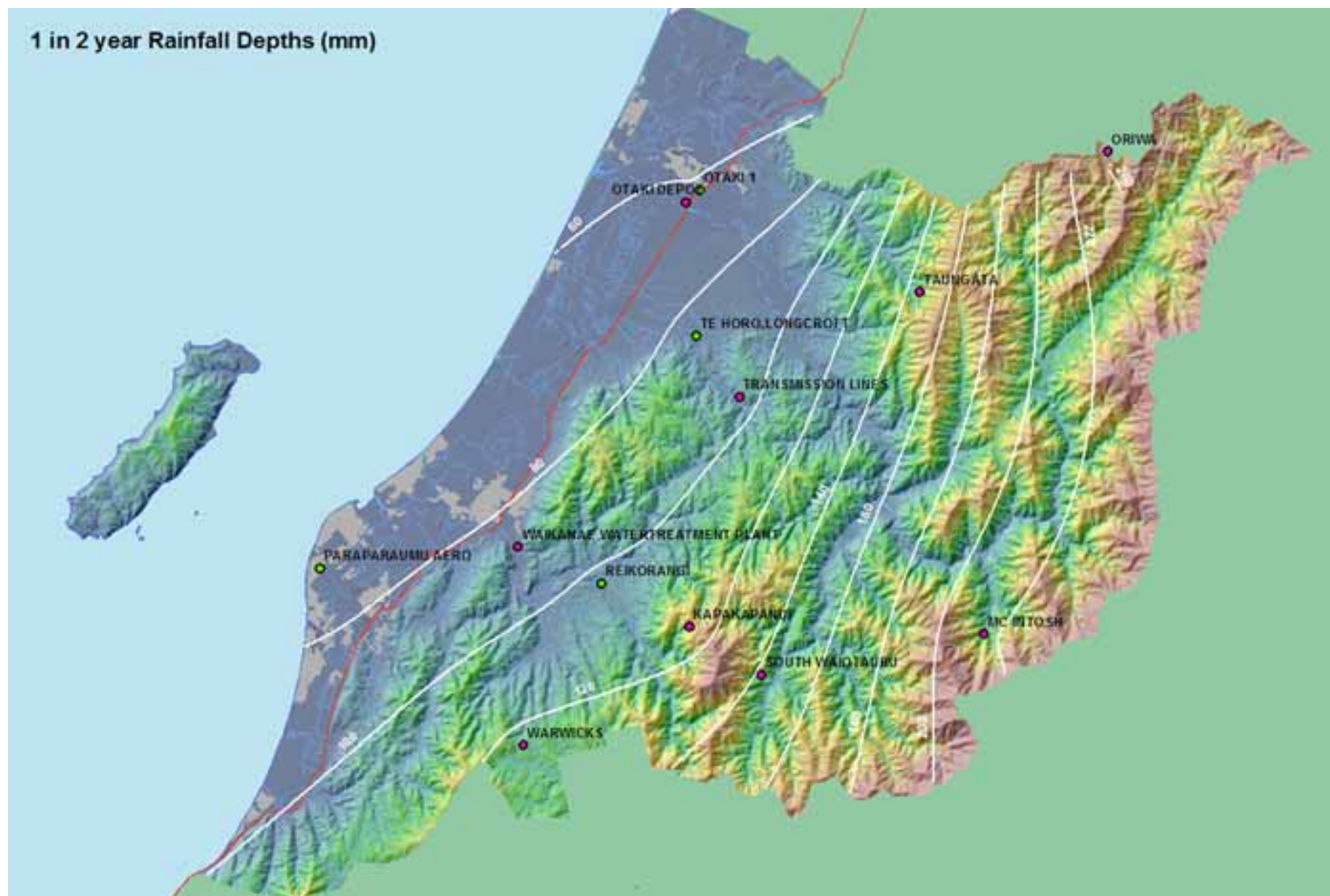


Importantly it should be remembered that intensity under the rational formula is measured in hours so ensure that intensities for shorter or longer periods are factored up or down respectively.

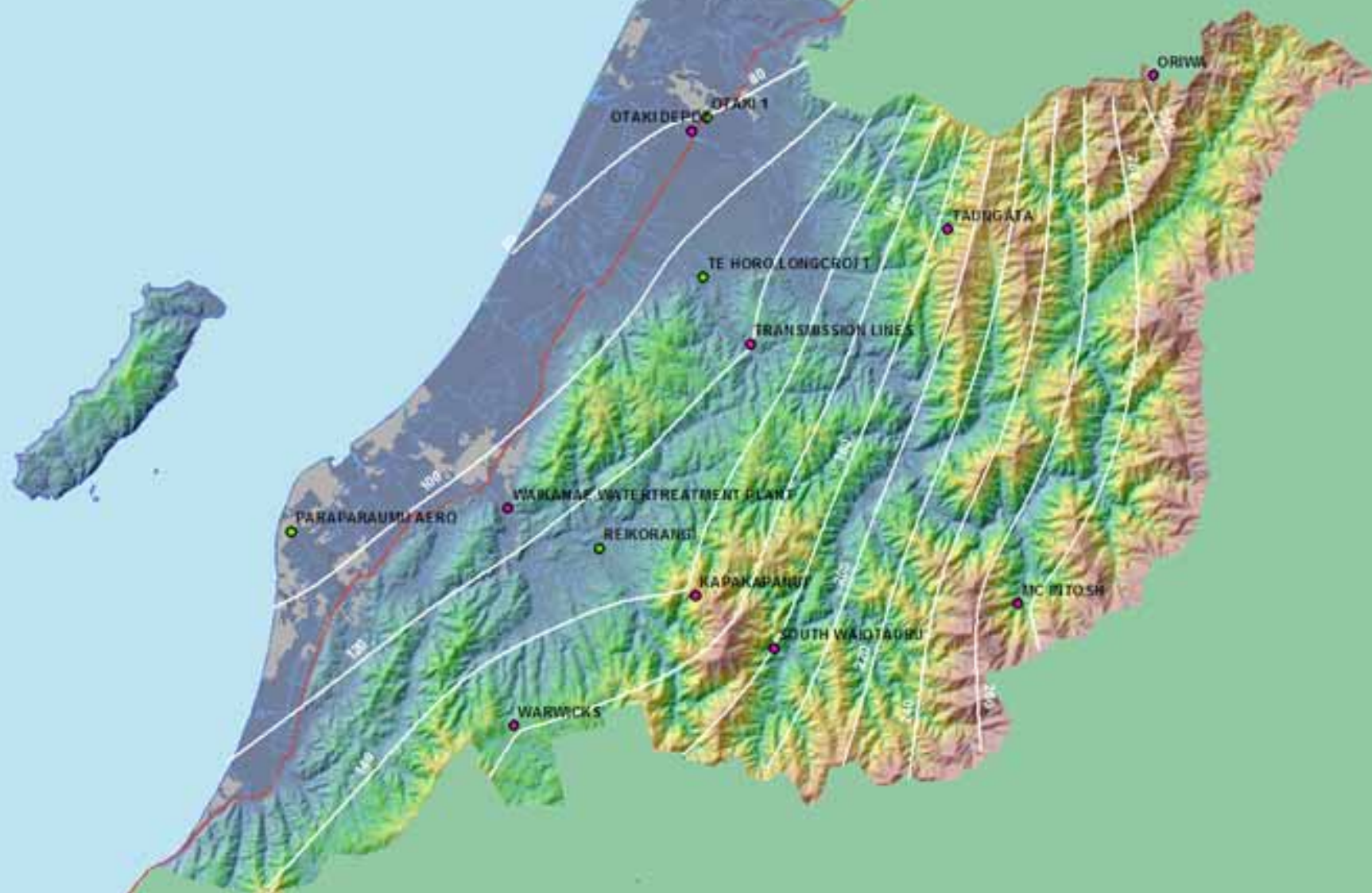
## 7. References

- |                                 |   |
|---------------------------------|---|
| Maidment, D (ed.), 1992         | Handbook of Hydrology, McGraw Hill.   |
| Watts, L, 2002                  | Hydrologic Response and Runoff Model Parameters in the New Zealand Coastal Zone. Unpublished Masters Thesis, Victoria University of Wellington                |
| Auckland Regional Council, 1999 | Guidelines for Stormwater Runoff Modelling in the Auckland Region. Technical Publication N° 108, Auckland Regional Council                                    |
| Hoggan, D, 1996                 | Computer Assisted Floodplain Hydrology and Hydraulics, Second Edition. Department of Civil and Environmental Engineering, Utah State University, McGraw-Hill. |
| Connell Wagner, 1999            | Wharemauku Stream Hydrometric Analysis of October 20-21 <sup>st</sup> Storm, Connell Wagner Ltd   |
| Connell Wagner, 2001            | Wharemauku Stream Stormwater Runoff and Floodplain Assessment.  |
| USACE, 2000                     | Hydrologic Modelling System HEC-HMC Technical Reference Manual – US Army Corps of Engineers, Hydrologic Engineering Centre                                    |

## Appendix A Rainfall Recurrence Isohyet Maps

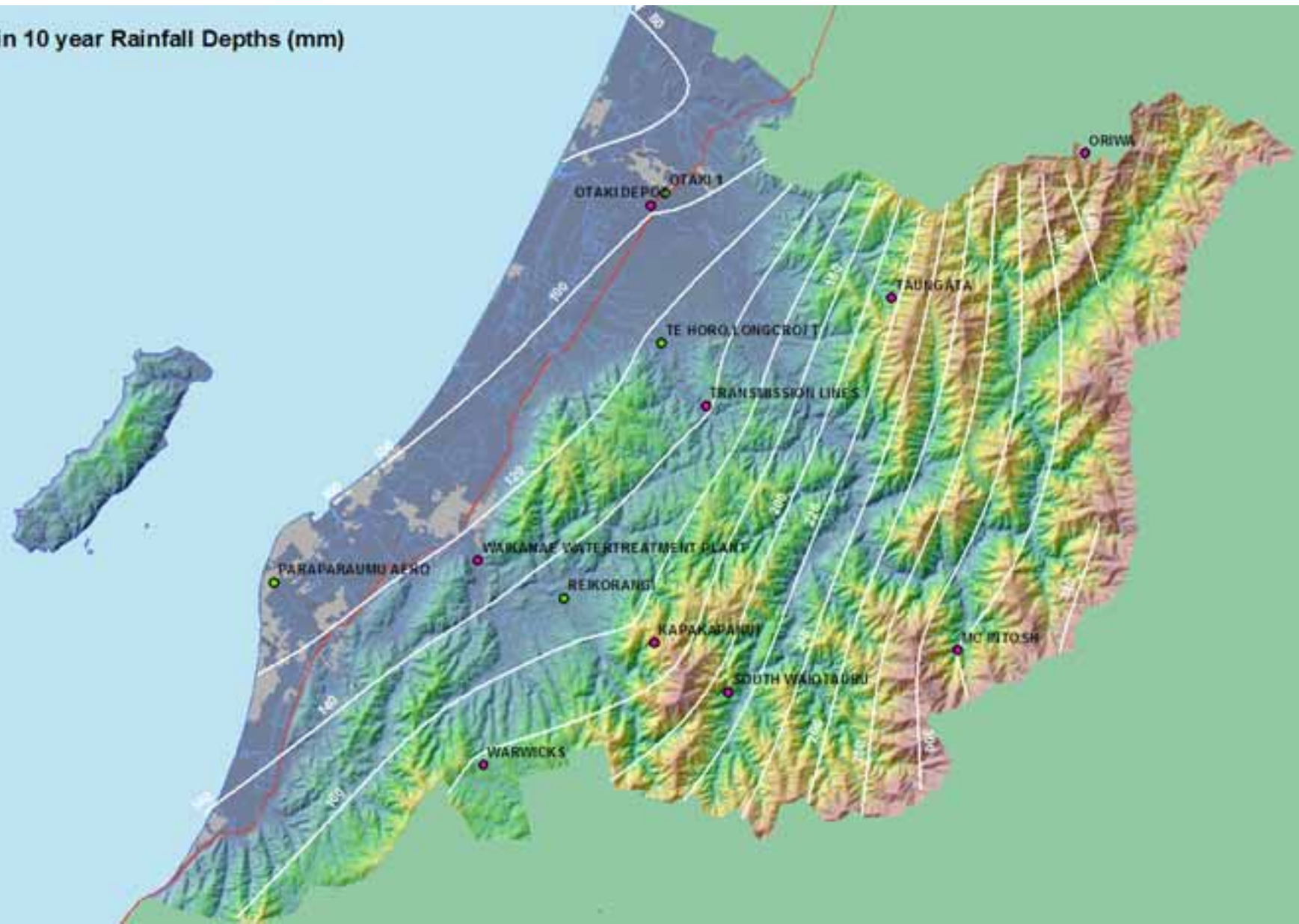


# 1 in 5 year Rainfall Depths (mm)

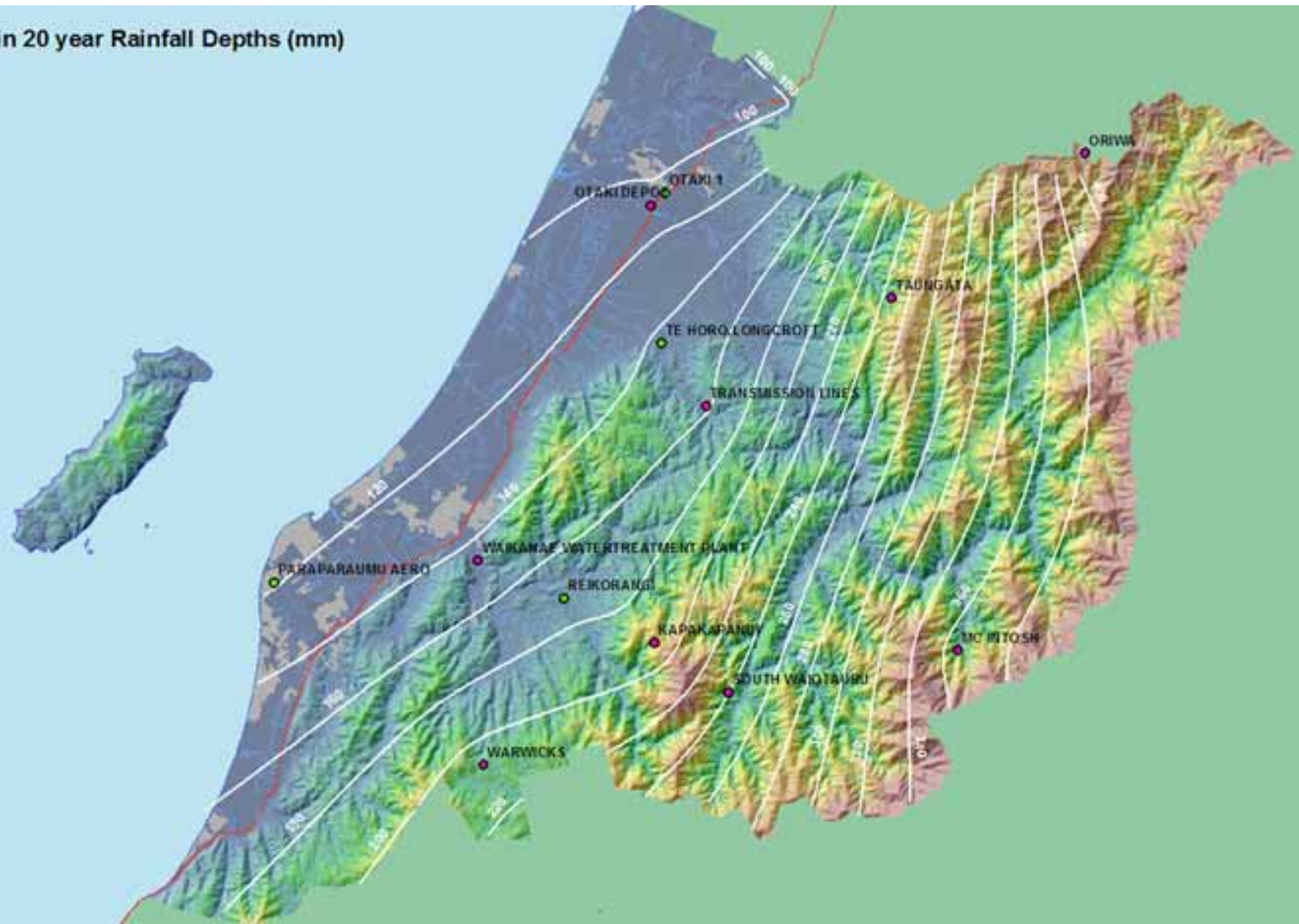




1 in 10 year Rainfall Depths (mm)



1 in 20 year Rainfall Depths (mm)

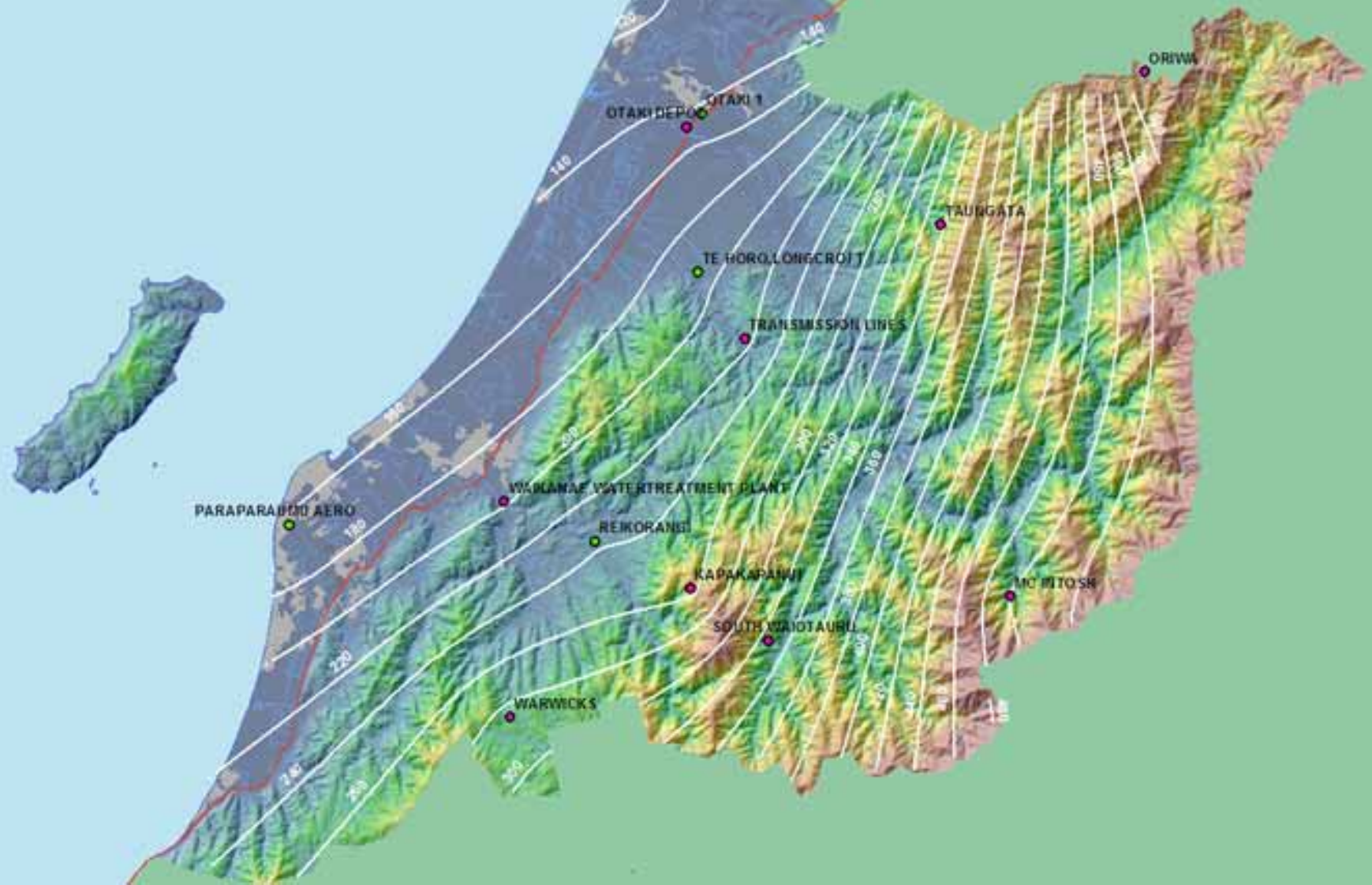








1 in 100 year Rainfall Depths (mm)





## Appendix B

### Curve Number Delineation Tables

(Sourced from USACE, 2000)

Table 2-2a – Runoff curve numbers for urban areas<sup>1</sup> (SCS, 1986)

| Cover Description  |  | Curve numbers for hydrologic soil group |    |    |    |
|--|--|---|----|----|----|
| Cover type and hydrologic condition  | Average percent impervious area <sup>2</sup> | A                                       | B  | C  | D  |
| <b>Fully developed urban areas (vegetation established)</b>  |  |   |    |    |    |
| Open space (lawns, parks, golf courses, cemeteries etc) <sup>3</sup>   |  |   |    |    |    |
| Poor condition (Grass cover <50%).....   |  | 68                                      | 79 | 86 | 89 |
| Fair condition (grass cover 50% to 75%).....   |  | 49                                      | 69 | 79 | 84 |
| Good condition (grass cover >75%).....   |  | 39                                      | 61 | 74 | 80 |
| 1).....  |  |   |    |    |    |
| Impervious areas:  |  |   |    |    |    |
| Paved parking lots, roofs, driveways, etc. (excluding right-of-way) .....  |  | 98                                      | 98 | 98 | 98 |
| 2).....  |  |   |    |    |    |
| Streets and roads:   |  |   |    |    |    |
| Paved; curbs and storm sewers (excluding right-of-way).....  |  | 98                                      | 98 | 98 | 98 |
| Paved; open ditches (including right-of-way) .....   |  | 83                                      | 89 | 92 | 93 |
| Gravel (including right-of-way).....   |  | 76                                      | 85 | 89 | 91 |
| Dirt (including right-of-way).....   |  | 72                                      | 82 | 87 | 89 |
| 3).....  |  |   |    |    |    |
| Western desert urban areas:  |  |   |    |    |    |
| Natural desert landscaping (pervious areas only) <sup>4</sup> .....  |  | 63                                      | 77 | 85 | 88 |
| Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders) ..... |  | 96                                      | 96 | 96 | 96 |
| 4).....  |  |   |    |    |    |
| Urban districts:   |  |   |    |    |    |
| Commercial and business .....  | 85   | 89                                      | 92 | 94 | 95 |
| Industrial.....  | 72   | 81                                      | 88 | 91 | 93 |
| 5).....  |  |   |    |    |    |
| Residential districts by average lot size:   |  |   |    |    |    |
| 1/8 acre or less (town houses).....  | 65   | 77                                      | 85 | 90 | 92 |
| 1/4 acre.....  | 38   | 61                                      | 75 | 83 | 87 |
| 1/3 acre.....  | 30   | 57                                      | 72 | 81 | 86 |
| 1/2 acre.....  | 25   | 54                                      | 70 | 80 | 85 |
| 1 acre.....  | 20   | 51                                      | 68 | 79 | 84 |
| 2 acres .....  | 12   | 46                                      | 65 | 77 | 82 |
| <b>Developing urban areas</b>  |  |   |    |    |    |
| 6).....  |  |   |    |    |    |
| Newly graded areas (pervious areas only, no vegetation) <sup>1</sup> .....   |  | 77                                      | 86 | 91 | 94 |

2)<sup>1</sup> Average runoff condition, and Ia = 0.2S.

3)<sup>2</sup> The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: Impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

4)<sup>3</sup> CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

5)<sup>4</sup> Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

7).....  
Idle lands (CN's are determined using cover types similar to those in table 2-2c)

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6) <sup>1</sup> Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 and 2-4, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

**Table 2-2b – Runoff curve numbers cultivated agricultural lands<sup>7</sup> (SCS, 1986)**

| Cover Description  |                            |                                   | Curve numbers for hydrologic soil group |    |    |    |
|--|----------------------------|-----------------------------------|---|----|----|----|
| Cover type   | Treatment <sup>8</sup>     | Hydrologic condition <sup>9</sup> | A                                       | B  | C  | D  |
| Fallow   | Bare soil                  |                                   | 77                                      | 86 | 91 | 94 |
|  | Crop residue cover (CR)    | Poor.....                         | 76                                      | 85 | 90 | 93 |
| Row crops  | Straight row (SR)          | Good.....                         | 74                                      | 83 | 88 | 90 |
|  |                            | Poor.....                         | 72                                      | 81 | 88 | 91 |
|  | SR + CR                    | Good.....                         | 67                                      | 78 | 85 | 89 |
|  |                            | Poor.....                         | 71                                      | 80 | 87 | 90 |
|  | Contoured (C)              | Good.....                         | 64                                      | 75 | 82 | 85 |
|  |                            | Poor.....                         | 70                                      | 79 | 84 | 88 |
|  | C + CR                     | Good.....                         | 65                                      | 75 | 82 | 86 |
|  |                            | Poor.....                         | 69                                      | 78 | 83 | 87 |
|  | Contoured & terraced (C&T) | Good.....                         | 64                                      | 74 | 81 | 85 |
|  |                            | Poor.....                         | 66                                      | 74 | 80 | 82 |
|  | C&T + CR                   | Good.....                         | 62                                      | 71 | 78 | 81 |
|  |                            | Poor.....                         | 65                                      | 73 | 79 | 81 |
|  | Small grain                | Good.....                         | 61                                      | 70 | 77 | 80 |
|  |                            | Poor.....                         | 65                                      | 76 | 84 | 88 |
|  | SR + CR                    | Good.....                         | 63                                      | 75 | 83 | 87 |
|  |                            | Poor.....                         | 64                                      | 75 | 83 | 86 |
| Close-seeded or Broadcast<br>Legumes or Rotation<br>Meadow | SR                         | Good.....                         | 60                                      | 72 | 80 | 84 |
|  |                            | Poor.....                         | 63                                      | 74 | 82 | 85 |
|  | C                          | Good.....                         | 61                                      | 73 | 81 | 84 |
|  |                            | Poor.....                         | 62                                      | 73 | 81 | 84 |
|  | C + CR                     | Good.....                         | 60                                      | 72 | 80 | 83 |
|  |                            | Poor.....                         | 62                                      | 73 | 81 | 84 |
|  | C&T                        | Good.....                         | 61                                      | 72 | 79 | 82 |
|  |                            | Poor.....                         | 59                                      | 70 | 78 | 81 |
|  | C&T + CR                   | Good.....                         | 58                                      | 69 | 77 | 80 |
|  |                            | Poor.....                         | 60                                      | 71 | 78 | 81 |
|  | SR                         | Good.....                         | 58                                      | 72 | 81 | 85 |
|  |                            | Poor.....                         | 64                                      | 75 | 83 | 85 |
|  | C                          | Good.....                         | 55                                      | 69 | 78 | 83 |
|  |                            | Poor.....                         | 63                                      | 73 | 80 | 83 |
|  | C&T                        | Good.....                         | 51                                      | 67 | 76 | 80 |
|  |                            | Poor.....                         | 63                                      | 73 | 80 | 83 |

7) <sup>7</sup> Average runoff condition, and Ia = 0.2S.

8) <sup>8</sup> Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

9) <sup>9</sup> Hydrologic condition is based on combination of factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes in rotations, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

10) Poor: Factors impair infiltration and tend to increase runoff.

11) Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

**Table 2-2c – Runoff curve numbers for other agricultural lands<sup>10</sup> (SCS, 1986)**

| Cover Description  |                      | Curve numbers for hydrologic soil group |    |    |    |
|--|----------------------|---|----|----|----|
| Cover Type   | Hydrologic Condition | A                                       | B  | C  | D  |
| Pasture, grassland, or range-continuous forage for Grazing. <sup>11</sup>      | Poor                 | 68                                      | 79 | 86 | 89 |
|  | Fair                 | 49                                      | 69 | 79 | 84 |
|  | Good                 | 39                                      | 61 | 74 | 80 |
| 8) Meadow-continuous grass, protected from grazing and generally mowed for hay |                      | 30                                      | 58 | 71 | 78 |
| Brush-brush-weed-grass mixture with brush the major element <sup>12</sup>      | Poor                 | 48                                      | 67 | 77 | 83 |
|  | Fair                 | 35                                      | 56 | 70 | 77 |
|  | Good                 | <sup>13</sup> 30                        | 48 | 65 | 73 |
| Woods-grass combination (orchard or tree farm) <sup>14</sup>                   | Poor                 | 57                                      | 73 | 82 | 86 |
|  | Fair                 | 43                                      | 65 | 76 | 82 |
|  | Good                 | 32                                      | 58 | 72 | 79 |
| Woods. <sup>15</sup>   | Poor                 | 45                                      | 66 | 77 | 83 |
|  | Fair                 | 36                                      | 60 | 73 | 79 |
|  | Good                 | <sup>4</sup> 30                         | 55 | 70 | 77 |
| Farmsteads-buildings, lanes, driveways, and surrounding lot.                   | .....                | 59                                      | 74 | 82 | 86 |

12) <sup>10</sup> Average runoff condition, and Ia = 0.2S.

13) <sup>11</sup> *Poor*: 5 0% ground cover or heavily grazed with no mulch

14) *Fair*: 50 to 75% ground cover and not heavily grazed.

15) *Good*: >75% ground cover and lightly or only occasionally grazed.

16) <sup>12</sup> *Poor*: 50% ground cover.

17) *Fair*: 50 to 75% ground cover.

18) *Good*: >75% ground cover.

19) <sup>13</sup> Actual curve number is less than 30; use CN = 30 for runoff computations.

20) <sup>14</sup> CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture

21) <sup>15</sup> *Poor*: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.

22) *Fair*: Woods are grazed but not burned, and some forest litter covers the soil.

23) *Good*: Woods are protected from grazing, and litter and brush adequately cover the soil

SCS TR-55 Table 2-2d – Runoff curve numbers for arid and semi-arid rangelands<sup>16</sup>

| Cover Description  |                                    | Curve numbers for hydrologic soil group |    |    |    |
|--|------------------------------------|---|----|----|----|
| Cover Type   | Hydrologic Condition <sup>17</sup> | A <sup>18</sup>                         | B  | C  | D  |
| Herbaceous – mixture of grass, weeds and low-growing brush, with brush the minor element                                       | Poor                               |   | 80 | 87 | 93 |
|  | Fair                               |   | 71 | 81 | 89 |
|  | Good                               |   | 62 | 74 | 85 |
| Oak-aspen – mountain brush mixture of oak brush, 9) aspen, mountain mahogany, bitter brush, maple, and other brush             | Poor                               |   | 66 | 74 | 79 |
|  | Fair                               |   | 48 | 57 | 63 |
|  | Good                               |   | 30 | 41 | 48 |
| Pinyon-juniper – pinyon, juniper or both; grass understorey  | Poor                               |   | 75 | 85 | 89 |
|  | Fair                               |   | 58 | 73 | 80 |
|  | Good                               |   | 41 | 61 | 71 |
| Sagebrush with grass understory  | Poor                               |   | 67 | 80 | 85 |
|  | Fair                               |   | 51 | 63 | 70 |
|  | Good                               |   | 35 | 47 | 55 |
| Desert shrub – major plants include saltbrush, Greasewood, creosotebush, black brush, bursage, Palo verde, mesquite and cactus | Poor                               | 63                                      | 77 | 85 | 88 |
|  | Fair                               | 55                                      | 72 | 81 | 86 |
|  | Good                               | 49                                      | 68 | 79 | 84 |

24) <sup>16</sup> Average runoff condition, and  $I_a = 0.2S$ .

25) <sup>17</sup> *Poor* : <30% ground cover (litter, grass and brush overstorey).

26) *Fair*: 30 to 70% ground cover

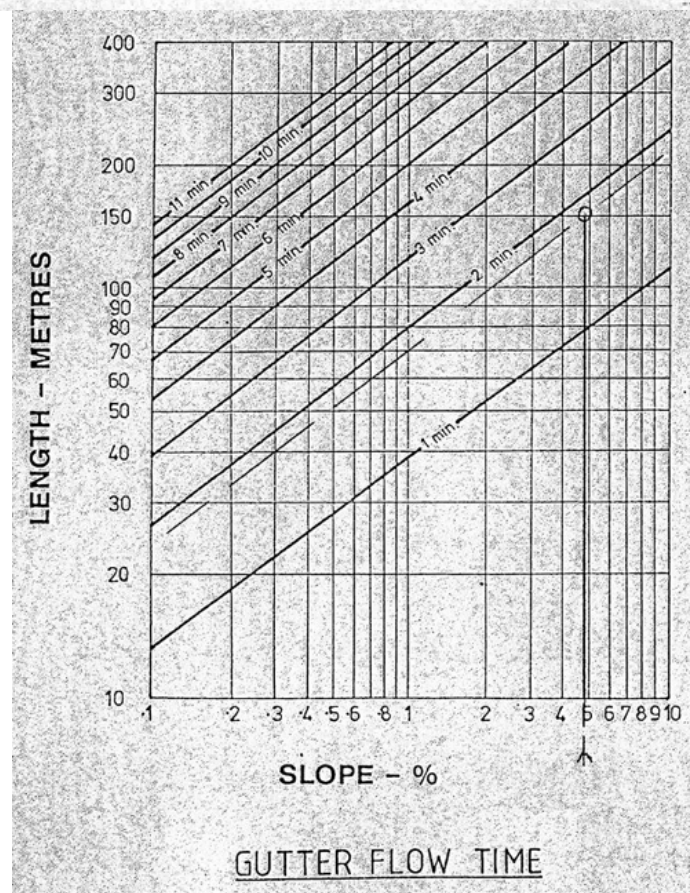
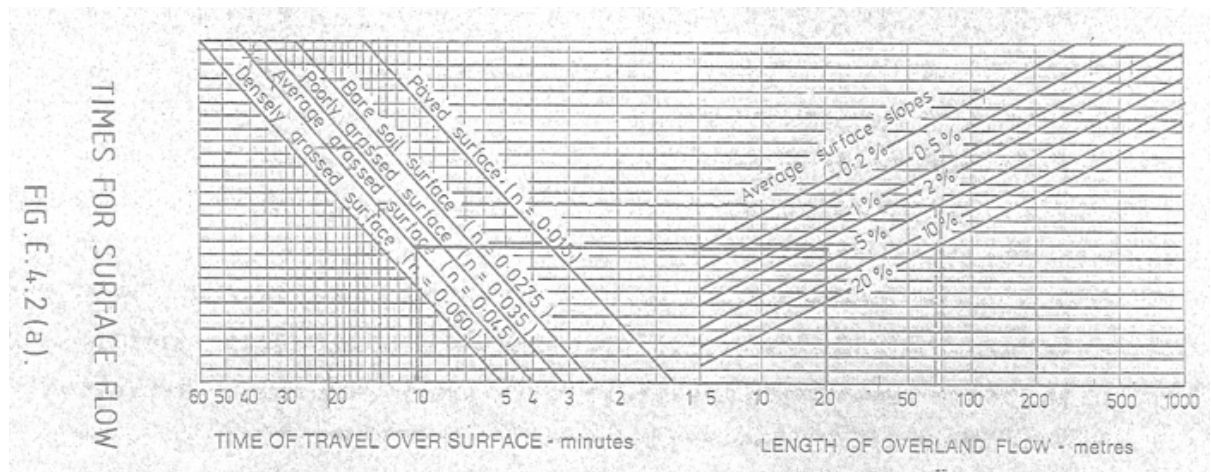
27) *Good*: >70% ground cover

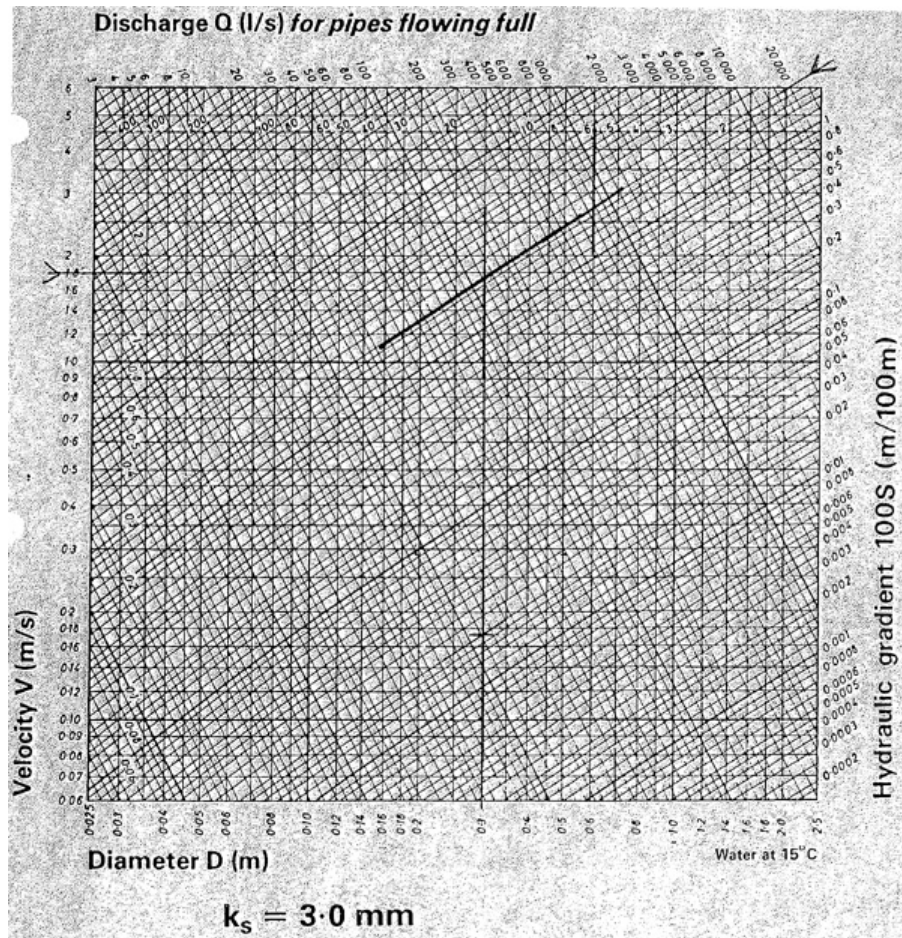
28) <sup>18</sup> Curve numbers for group A have been developed only for desert shrub





## Appendix C Time of Concentration Calculations





**SCHEDULE 5**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 5 NZS 4404:2004 WASTEWATER**

The Kapiti Coast District Council has adopted Part 5 of NZS 4404:2004 with the following additions and/or alterations:

**1. Clause 5.3.2.2 *Scheme layout***

- The Council's requirements for pipe locations are that they should be kept within the road reserve or other public open space, except where topography does not practically permit this.

**2. Clause 5.3.2.5 *Horizontal curves***

- In general horizontal curves are not acceptable. However the Council may consider special case situations where normal straight alignments are impractical. In these cases specific designs, supported by appropriate information shall be provided to enable the Council to evaluate the proposals.

**3. Clause 5.3.2.6 *Vertical curves***

- In general vertical curves are not acceptable. However the Council may consider special case situations where normal straight grades are impractical. In these cases specific designs, supported by appropriate information shall be provided to enable the Council to evaluate the proposals.

**4. Clause 5.3.4 *Easements***

- Add the following clause:

Easements are required for protection of public wastewater pipelines that are located in private property and shall be centred on the as built position of the pipeline. The easement shall be a minimum of 3 metres wide and provide unlimited and unrestricted access for the Council to undertake maintenance work. Where pipes are laid to depths of 2 metres or more, greater easement widths may be required to facilitate maintenance.

**5. Clause 5.3.5.1 *Design Flow***

- (a) Residential flows
  - (i) Allow for dry weather flow of 250 litres per day per person, unless otherwise approved by the Council.

## 6. **Clause 5.3.5.7** *Minimum Cover*

- Minimum cover requirements shall be in accordance with manufacturer's requirements but shall be no less than:

750mm where subject to vehicle loading (including construction equipment).  
500mm in other situations, or as otherwise required by the Council.

## 7. **Clause 5.3.10** *Pumping Stations and Pressure Main*

- In general Pumping Stations are to be constructed in accordance with WSA 04 Sewage Pumping Station Code of Australia. However applicants should discuss requirements with the Council for particular proposals prior to final design. In general the Council will require:
- Stations to have not less than two pumps.
- Above ground control system protected from the weather.
- Automatic operation.
- SCADA installed.
- Soft step start or VSD.
- Pumping stations to be located in publicly owned land.

## 8. **Additional Requirements**

- **Testing**

All gravity sewer mains and laterals shall be tested, either with a water test or an air test. The Council may also require testing of manholes if it considers infiltration may be a problem.

The water test shall be maximum test height of 6.0 metres above the invert of the low manhole of the line being tested and a minimum of 1.8 metres above the invert of the high manhole. The pressure head shall be maintained for a minimum of 15 minutes and no loss is permitted. Testing shall only be carried out between adjacent manholes.

The air test shall be to a pressure of 20 kilopascals. No pressure loss is allowed over a one minute period from the application of pressure.

Manholes shall be tested, after a 24-hour period of soaking to allow for absorption, by completely filling with water to the top surface of the root slab. The rate of water loss shall not exceed 5 litres per hour.

All pumping mains shall be tested to a pressure of 600 kilopascals for domestic pressure pipes and 900 kilopascals for public drains, or 1.5 times the working pressure, whichever is the greater.

- Work undertaken on Council owned roads shall be undertaken in accordance with Standards New Zealand Handbook SNZ HB 2002:2003 Code of Practice for Working in the Road, except as modified by the schedule titled **Kapiti Coast District Council Schedule of Special Conditions to SNZHB 2002:2003 Code of Practice for Working in the Road.**

**SCHEDULE 6**

**KAPITI COAST DISTRICT COUNCIL**

**ALTERED REQUIREMENTS TO**

**PART 6 NZS 4404:2004 WATER SUPPLY**

The Kapiti Coast District Council has adopted Part 6 of NZS 4404:2004 with the following additions and/or alterations:

**1. Clause 6.3.7.1 *Sizing of Mains***

- Residual pressures due to peak demand shall be a minimum of 250 kpa.

**2. Clause 6.3.7.2 *Pipe Class***

- Add to the clause

Minimum pipe classes shall be PN12 in Waikanae and PN9 in all other areas.

**3. Clause 6.3.9.5 *Pressure Zones***

- Pressure zones are set out in the following table.

| AREA        | RESERVOIR                                  | CAPACITY | FLOOR LEVEL | T. W. L. |
|-------------|--|----------|-------------|----------|
| Paraparaumu | Riwai Street (high level)                  | 0.4ML    | 110.50      | 113.30   |
| Paraparaumu | Riwai Street (main res.)                   | 11.25ML  | 62.20       | 68.40    |
| Paekakariki | Main Road                                  | 1.125ML  | 69.13       | 73.77    |
| Waikanae    | Kakariki Grove                             | 5.7ML    | 92.96       | 100.30   |
| Waikanae    | Tui Crescent                               | 1.4ML    | 92.96       | 99.18    |
| Otaki       | Waitohu Valley                             | 0.675ML  | 100.00      | -        |
| Otaki       | Tasman Road Bore operating pressure 670Kpa |          |             |          |

**4. Clause 6.3.9.6.1 *Design Pressures***

- The maximum static pressure should generally not exceed 800Kpa (80 metres head)

Minimum requirements are that in any road no watermain shall be laid above a hydraulic gradient line falling at the head loss defined in paragraph 6.3.9.4, starting at a point 9 metres below the floor of the supply reservoir.

Minimum pressures may be set by fire fighting requirements.

**5. Clause 6.3.10.6 *Shared Trenching***

- The Council allows shared trenching.

**6. Clause 6.3.12 *Reservoirs and Pumping Stations***

- If reservoirs and/or pump stations are proposed then these should be discussed with the Council at an early stage. Reservoirs will require specific design by a suitably qualified person. Pumping stations will require to meet the design criteria in WSA 03, Water Reticulation Code of Australia, and in general the Council will require:
  - Stations to have not less than two pumps.
  - Above ground control system protected from the weather.
  - Automatic operation.
  - SCADA installed.
  - Soft step start or VSD.
  - Pumping stations to be located in publicly owned land.

**7. Clause 6.4.2.2 *Butterfly Valves***

- Butterfly valves are generally not acceptable.

**8. Clause 6.6.2 *Property Service Connections***

- The Council requirements are as follows:

The minimum size of any connection shall be 20mm. An increased connection size may be required for sprinkler installations to achieve design flows. A separate service with a water manifold in a toby box shall be installed for each lot. Generally the water manifold should be located 300 to 400 mm from the front boundary and 4 metres clear of side boundaries and where any drive is to be located. The toby box shall have a base plate and a blue lid.

**9. Clause 6.11.5 *Minimum Water Demand***

- Amend daily consumption from 250l/p/day to 400l/p/day.

**10. Additional Requirements**

- Work undertaken on Council owned roads shall be undertaken in accordance with Standards New Zealand Handbook SNZ HB 2002:2003 Code of Practice for Working in the Road, except as modified by the schedule titled **Kapiti Coast District Council Schedule of Special Conditions to SNZHB 2002:2003 Code of Practice for Working in the Road.**

**SCHEDULE 7**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 7 NZS 4404:2004 LANDSCAPE DESIGN AND PRACTICE**

The Kapiti Coast District Council has adopted Part 7 of NZS 4404:2004 with the following additions and/or alterations:

**1. Clause 7.4 *Construction***

- Add to Clause 7.4.1.1

They shall put in place a monitoring system to ensure that appropriate maintenance and replacement is undertaken and shall be responsible for arranging a final inspection by the Council's Parks and Recreation Manager at the end of the maintenance period, to get sign-off of practical completion.

- Amend clause 7.4.1.2 by deleting "18 months" and replacing with "12 months".
- Amend clause 7.4.5.4 (b) to read:

Ground shall be cultivated to a minimum depth of 2.5 times the size of the plant container width to break up any compaction and fracture subsoil and afford drainage to hard rock areas.

- Note that 15g of slow release fertilizer is the minimum requirement.
- Amend clause 7.4.5.5. by deleting "18 months" and replacing with "12 months".

**2. Clause 7.4.8 *Restoration and Tidy Up***

- Amend clause 7.4.8.2 to read:

The developer shall clean all paths and surrounding areas. Channels shall be cleared and all damage made good to the satisfaction of the Council.

- Delete clauses 7.4.8.3.





**SCHEDULE 8**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 8 NZS 4404:2004 RESERVES**

The Kapiti Coast District Council has adopted Part 8 of NZS 4404: 2004 with the following additions and/or alterations:

**1. Clause 8.3.6 *Pedestrian accessways***

- Replace the existing paragraph with the following:

Pedestrian accessways shall generally have a minimum legal width of 6 metres and shall be formed to a specific design to be approved by the Council. The design shall include fencing that does not exceed 1.5 metres in height.

**2. Clause 8.3.8 *Fencing of reserves***

- Add the following to paragraph (a).

The covenant will also specify that fencing on and within 3 metres of the boundary with the reserve shall be in accordance with the following table:

|                        | <b>Close Boarded</b> | <b>Visually Permeable*</b> |
|------------------------|----------------------|----------------------------|
| <b>Passive Reserve</b> | <b>700mm</b>         | <b>1200mm</b>              |
| <b>Active Reserve</b>  | <b>1200mm</b>        | <b>1500mm</b>              |

\* Visually Permeable means that more than 50% of the fence area is not obstructed by materials making up the fence.

- Replace paragraph (b) with:

A fence be erected in accordance with the above table for urban areas, or in the case of reserves in a rural area, in accordance with figure 8.2. A fencing covenant in accordance with the criteria outlined in paragraph (a) will also be required.



**SCHEDULE 9**  
**KAPITI COAST DISTRICT COUNCIL**  
**ALTERED REQUIREMENTS TO**  
**PART 9 NZS 4404:2004 POWER, TELECOMMUNICATION, GAS**

The Kapiti Coast District Council has adopted Part 9 of NZS 4404:2004 with the following additions and/or alterations:

**1. Clause 9.3.2 *Utilities above ground***

- Delete the existing paragraph and substitute the following:

Sites for above ground utilities shall be specifically provided for by recessing the front boundary of lots and including the area within road reserve, unless alternatives are approved by the Council.

**2. Clause 9.4.5.1 *Position in the Street***

- See Kapiti Coast District Council drawing TYPICAL CROSS SECTION-SERVICES for recommended position of services within the road reserve, attached to Schedule 4 as Appendix 2. Alternative positions may be acceptable if approved by the Council and Utility Companies.



## **SCHEDULE 10**

### **KAPITI COAST DISTRICT COUNCIL**

#### **Schedule of Special Conditions to SNZHB 2002:2003 Code of Practice for Working in the Road**

Where there are any discrepancies, the following conditions shall take precedence.

##### ***Clause 3.1.4 Road Opening Notice (RON)***

For the purposes of clarity, it is noted that excavation includes any method that could potentially disturb the subbase and basecourse of the road and includes but is not limited to directional drilling and tunnelling.

Sub-clause (b) is amended to three working days before work starts.

##### ***Clause 3.2.6.4***

The Kapiti Coast District Council uses the procedures under Transport (Vehicular Traffic Road Closure) Regulations 1965 which requires a minimum of 42 days public notice before a road is closed to traffic.

##### ***Clause 3.2.9***

The principal provider, and any contractor shall hold a current public liability insurance policy to the value of \$1,000,000. This policy shall allow for sufficient cover to mitigate risk, and shall indemnify the road controlling authority against any claims of loss, damage or injury to persons or property that may arise out of, or in consequence of, the construction or maintenance (or lack thereof) of the work. The period of cover shall be for a minimum period of one year from the date of the completion of the works.

The policy shall be extended to cover all insurable risks normally applicable to road work including vibration and removal of support to the value of \$250,000.

##### ***Clause 4.2***

Consideration shall be given to using trenchless technology or rerouting the service to avoid constructing trenches through geotextiles or other stabilised layers or where there are open graded porous asphaltic surfaces because of the difficulty of adequately reinstating these roads.

##### ***Clause 4.7.1.1***

(c) The RCA may waive this requirement for nominated sources of material.

#### **Clause 4.7.2.3**

Approved methods for reinstating asphaltic concrete surfaces are:

- (a) chip seal then 30mm of Mix 10 AC
- (b) tack coat then 60mm of Mix 20 AC (light traffic)
- (c)  $\geq$  100mm of Mix 20 AC (heavy traffic).

#### **Clause 4.7.2.4**

- (f) A specific design is required for reinstatement.

#### **Clause 4.7.2.6 Trenches in chip seal carriageways**

- (a) Reinstatement of chip sealed carriageways shall be accomplished using asphalt flush with the existing carriageway surface in accordance with 4.7.2.3 with no overlap onto existing seal. All joints shall be sand sealed.

#### **Clause 4.7.2.12**

Concrete Vehicle Crossings are to be fully replaced to the standard design if they are cut for trenching.

#### **Clause 4.8.1**

All road markings shall be reinstated with two coats of fully beaded acrylic paint.

#### **Clause 5.2**

GAP 150, GAP 100 and GAP 20 are not acceptable backfill materials.

#### **Appendix L**

Approved methods for reinstating asphaltic concrete surfaces are:

- (a) chip seal then 30mm of Mix 10 AC
- (b) tack coat then 60mm of Mix 20 AC (light traffic)
- (c)  $\geq$  100mm of Mix 20 AC (heavy traffic)

GAP 150, GAP 100 and GAP 20 are not acceptable backfill materials. *In situ* materials may be accepted provided they are compacted to 98% MDD

#### **Quality Assurance**

The Contractor shall be certified as meeting the requirements of TQS2 for minor works and TQS1 for major or project works.

## **Main Roads**

For the purposes of Preliminary Notification of Work in the Road, the Main Roads are:

- Kapiti Road, Paraparaumu
- Rimu Road, Paraparaumu
- Raumati Road, Raumati
- Marae Lane, Waikanae
- Mill/Main/Tasman Road, Otaki
- Te Moana Road, Waikanae
- Mazengarb Road, Paraparaumu
- Arawhata Road, Paraparaumu
- Te Roto Drive, Paraparaumu
- Poplar Avenue, Raumati
- Ngaio Road, Waikanae

## **Grass Reinstatement**

First class quality topsoil shall be spread and compacted to a depth of 100mm. The topsoil shall be graded evenly from the edge of footpath to the kerb, existing berm, or boundary. The crossfall on the berm shall not be less than 2%. After topsoiling the new berm areas shall be sown with a seed mixture containing 10 parts by weight of Ellet/Nui Rye grass and one part of white clover, or another approved mixture. The mixture shall be sown at a rate of 1 kilogram to 30 square metres area, and the soil top dressed with recommended fertiliser rates before and after planting.

## **Hours of Work**

Hours of work will normally be 7am to 6pm except for emergencies.

Lane closures or disruptions are not permitted on the following roads between 7.30am and 9am and 4pm and 5.30pm:

- Kapiti Road, east of Langdale Ave
- Rimu Road
- Marae Lane
- Raumati Road, east of Matai Road





## **SUBDIVISION AND DEVELOPMENT PRINCIPLES AND REQUIREMENTS**

### **PART 5**

#### **DESIGN GUIDES**

The following are included in the Design Guide section.

- SNZHB 44:2001 Subdivision for People and the Environment.
- Kapiti & Horowhenua Environmental Guidelines for Rural Living.
- Kapiti Coast District Council Growing Native Plants in Kapiti.
- Medium Density Residential Guidelines. (to be completed)
- Structure Plan Design Guide. (to be completed)
- Energy Design Guide. (to be completed)
- Landform Strategy. (to be completed)
- Water, Stormwater, Wastewater Alternatives.
- Crime Prevention Through Environmental Design (CPTED) Guides.

Other alternative designs based on appropriate Design Guides and with appropriate supporting detail may be acceptable.