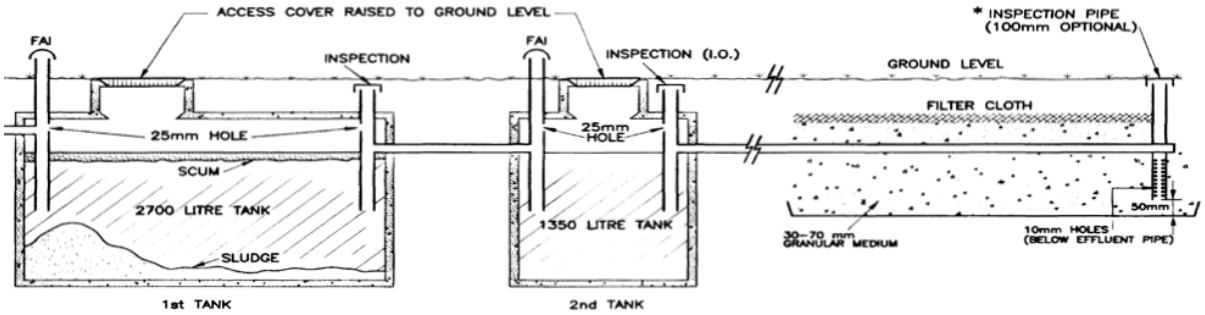
Guidelines for On-site Wastewater Management

August 2012

GISBORNE DISTRICT COUNCIL

Disclaimer

The Gisborne District Council accepts no liability for the performance of the on-site wastewater management systems referred to in this document irrespective of whether consents have been issued in respect of them or not. All information collected during the site assessment and subsoil investigation of the wastewater treatment and design system design, is the liability of the designer.



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Foreword

Environments in the Gisborne District present considerable constraints to successful on-site management of domestic wastewater, including soils of low permeability, thin soils, high groundwater levels, perching water, unstable and sloping land and limited available space on property within the built areas. It is vital that on-site wastewater management systems are designed, installed and managed to reflect the nature of the site conditions and constraints associated with each individual property. If they are not, domestic wastewater will not be treated or contained on-site and the discharge will result in adverse effects off-site. Cumulative environmental effects from these discharges degrade the wider environment contributing to pollution of water systems and soil. Nuisance conditions and heightened public health risk from inadequately managed discharges reduces the overall well-being of the community at risk.

Gisborne District Council Guidelines were first developed in 1998 and reviewed in 2002. These have served to inform regulatory process setting out a method for site evaluation and design for a limited range of on-site wastewater systems. The Council has been approving on-site systems against criteria of these Guidelines, while also identifying other wastewater treatment and land application techniques and operational factors which collectively contribute to sustainable long-term on-site wastewater management.

Best practice has evolved over time in response to new technology and better understanding of the factors that influence on-site management of domestic wastewater. More recently National Standards have been developed which identify performance statements supported with performance objectives, performance requirements and performance criteria that cover the overall design and sustainable management of on-site domestic wastewater systems.

The 2011 Guidelines recognise the relevant National Standards as best practice and for setting out requirements and performance expectations for all processes that contribute to sustainable on-site wastewater management in the district. The Guidelines also allow for alternative system design provided the completed on-site wastewater system meets the performance requirements set out in Standards.

The Operative Regional Plan for Discharges to Land and Water, Waste Management and Hazardous Substances - Unreticulated Sewage Systems, (RPDLW), contains objectives and policies which seek to ensure that environmental contamination from discharges to land is avoided where possible and otherwise remedied or mitigated. In particular, they seek to avoid cumulative effects on water bodies. The 2011 Guidelines give effect to this Plan.

1. Introduction

1.1 General

The Guidelines represent current best practise in the field of on-site management of domestic wastewater taking a performance based approach to the processes of site evaluation and system design, product and system component suitability, system installation and operation, discharge quality and monitoring system performance, maintenance of systems and end of system functional life.

Intended as a technical document, the Guidelines are to inform and assist land development practitioners, system designers, installers, product suppliers and manufacturers, maintenance and service agents and component supplies and service practitioners. As a technical resource they are not generally intended for use to inform homeowners. Other material has been prepared for homeowners to assist them in understanding the function and processes for sustained management of on-site wastewater systems.

Technical and informative material supplementary to the Guidelines is available to practitioners. Design manuals, research and technical papers/reports, equipment manufacturer and product supplier documents and informative websites all contribute to enhancement and increased understanding on specific design of on-site wastewater systems. Some resource material commissioned by the Gisborne District Council is available for specific system design, guidance on design to overcome land instability commonly experienced in the Gisborne District and to overcome limitations of small site areas, waterlogged soils and perched water tables.

1.2 Relationship between the Guidelines and Resource Management Act 1991

The discharge of contaminants into or onto land is regulated by Section 15 of the Resource Management Act 1991. The discharge of contaminants to land cannot be undertaken in a manner that contravenes a rule in a regional plan or proposed regional plan unless the discharge is expressly allowed by a resource consent.

The Operative Regional Plan for Discharges to Land and Water, Waste Management and Hazardous Substances - Unreticulated Sewage Systems, (RPDLW), contains objectives and policies which seek to ensure that environmental contamination from discharges to land is avoided where possible and otherwise remedied or mitigated. In particular, they seek to avoid cumulative effects on water bodies. These objectives and policies place emphasis on careful selection and design of systems, while providing for a variety of systems including new technologies that arise. Systems should be designed, installed and maintained by competent people. The objectives and policies also seek to encourage responsible care and ownership of systems.

The RPDLW sets out Permitted activity rules authorising the discharge of domestic wastewater to land. This means that if the discharge can comply with the conditions of the particular Permitted activity rule, a resource consent is not required for the discharge or activity. Resource consent is required for a discharge from an on-site wastewater system not meeting permitted activity Rules. The rules do not prescribe the design of on-site wastewater management systems that can be used but rather sets out performance standards.

The processes of site evaluation and design of on-site wastewater systems also identifies actual and potential environmental effects from the discharge and ways of mitigating or ensuring effects are no more than minor. This provides information toward an Assessment of Environmental Effects (AEE) required for resource consents when Permitted activity rules are not met.

It is the role of these Guidelines to set out minimum procedures and design requirements used to determine the suitability of proposals for on-site wastewater management systems. Council staff will use the Guidelines when considering an application for a resource consent for a discharge from an on-site wastewater system.

1.3 Relationship between the Guidelines and Building Act 2004

The performance requirements for the construction and operation of on-site domestic wastewater systems are covered in the New Zealand Building Code which is contained in the First Schedule of the Building Regulations 1992.

To be relevant for assessment of Building Consent applications the Gisborne District Guidelines reference to the Joint Australian and New Zealand Standards for on-site domestic wastewater and where suitable, provides adaptations to them to reflect conditions in the Gisborne District and accumulation of local industry and staff experience.

Systems designed to meet the Standards will comply with the requirements of the Building Code making design suitable for acceptance for Building Consent processes in respect of;

Clause B1 Structure

Clause B2 Durability

Clause G1 Personal Hygiene

Clause G13 Foul Water

Clause G14 Industrial Liquid Waste

It is the role of these Guidelines to set out minimum procedures and design requirements used to determine the suitability of proposals for on-site wastewater management systems. Council staff will use the Guidelines when considering an application for a building consent for an on-site wastewater system.

A building consent is required for installation of all on-site wastewater systems. Work under a building consent includes the finishing of any land application system and protection of systems. Where soil cover, planting or fencing is required within the approved design, Code of Compliance Certificate will not be released until this work is completed.

1.4 Purpose of the Guidelines

The Guidelines are not intended as a regulation in its own right but a document that supports regulation by providing performance parameters for on-site wastewater management to achieve the objectives and policies of the RPDLW, and also requirements of the Building Act. The intention is for these Guidelines to be applied in the Gisborne District by Council staff, designers, land development practitioners, installers, service and maintenance people, equipment supplies, component manufacturers, and system owners.

1.5 Scope of the Guidelines

1.5.1 Domestic wastewater

These Guidelines apply to all on-site wastewater systems designed for the purposes of managing domestic wastewater (including greywater, black water and composted waste), where the wastewater originates from single dwellings, a marae, a public hall, a club facility, an institutional, industrial or commercial facility or a public sanitary facility, generally located on the same property as it is disposed on.

Varying from Australian/New Zealand Standards, there is no limit on capacity of an individual system. But the Gisborne District Council reserves the right to seek peer review to examine the appropriateness and completeness of the site and soil evaluation and design analysis supplied with respect to the site and development. Peer review will be at the cost to the applicant and may be required for complex, multiple user systems - cluster, apartment or decentralised - and systems with high flow.

1.5.2 Commercial or trade waste

Systems specifically for management of commercial or trade waste require design consideration beyond the scope of these Guidelines. Design for such systems must be supported by relevant technical material. The Gisborne District Council reserves the right to seek peer review, at the applicant's cost, if site and soil evaluation or design information is inadequate, or where the Council is not satisfied the effects of the discharge will be no more than minor.

1.5.3 Subdivision

The (Part Operative) Combined Regional Land and District Plan contains objectives and policies specific to servicing proposed subdivisions. It requires the subdivider to demonstrate that the proposed method of servicing allotments for wastewater is adequate for the anticipated land use and location. The treatment and disposal of wastewater should be undertaken in a manner than avoids, remedies or mitigates adverse effects on the environment and be consistent with maintaining public health. Under the RMA, the method of discharging contaminants should be the best practicable option for preventing or minimising the adverse effects on the environment.

The site investigation and evaluation requirements, clearances and setbacks set out in these Guidelines also apply for individual allotments proposed through subdivision of land. The information contained in these Guidelines can be used, as well as the relevant sections of AS/NZS 1547:2000, for site and soil evaluation and reporting. For a larger scale subdivision or proposals for rezoning land for residential uses that will rely on on-site wastewater management, the Gisborne District Council also reserves the right to request a broader level of survey and land capability assessment that considers the localised catchment along with the land under the proposal.

1.6 Review of the Guidelines

These Guidelines will be reviewed as technological advancements are made and as the body of knowledge about on-site wastewater systems increases, to ensure that they continue to reflect best practice over time. Council's staff working with the Guidelines will inform and support collaboration with practitioners involved in the investigation, design, installation, management and maintenance of on-site wastewater systems and will encourage participation in the ongoing improvement of the Guidelines.

1.7 Document control

The Gisborne District Council On-site Wastewater Guidelines will be a controlled document. A distribution record will be maintained and updates to the document and additional supplementary material will be forwarded to as completed. A document change record will be maintained for reference.

1.8 Structure of the Guidelines

Part 1	Technical material recognised through the Guidelines
Part 2	Site evaluators/soil assessors and on-site wastewater system designers
Part 3	Site evaluation/soil assessment procedures and reporting
Part 4	Selecting and design on-site wastewater systems
Part 5	Installing and commissioning on-site wastewater systems
Part 6	Maintenance, function, and performance of on-site wastewater systems
Part 7	Continued use and end-of-life of on-site wastewater systems
Part 8	Function of on-site wastewater systems – owner and system user responsibilities
Part 9	Protection of on-site wastewater systems

PART 1: Technical material recognised through the Guidelines

Guideline 1.1: Recognition of the Gisborne District Council Guidelines for On-site Wastewater Management as the primary resource for assessment of applications for building consents and resource consents for discharges of domestic wastewater to land.

Guideline 1.2: Applications for consents will be considered against criteria set out in the Guidelines for site and soil evaluation procedures and associated reporting and for design of on-site wastewater systems and associated reporting.

Guideline 1.3: Recognition of Joint Australian and New Zealand Standards as supporting reference and technical resources for on-site wastewater management.

The Guidelines reference to specific Joint Australian and New Zealand Standards for on-site domestic wastewater and practitioners should refer to appropriate and relevant sections when directed.

The Standards referenced are:

AS/NZS 1547:2000	On-site domestic wastewater management
AS/NZS 1546.1.2008	On-site domestic wastewater treatment units Part 1: Septic tanks
AS/NZS 1546.2.2008	On-site domestic wastewater treatment units Part 2: Waterless composting toilets
AS/NZS 1546.3.2008	On-site domestic wastewater treatment units Part 3: Aerated wastewater treatment systems

Guideline 1.4: Reviews of the Gisborne District Council Guidelines for On-site Wastewater Management are not required when reviews of Joint Australian and New Zealand Standards alter referenced sections.

Periodic review of the Joint Australian and New Zealand Standards for on-site domestic wastewater means the Guidelines references to relevant sections for the same will alter within the revised Standard/s. Reviewed Standards direct the practitioner to the updated corresponding sections in the most current Standard.

Guideline 1.5 Supply of the Joint Australian and New Zealand Standards for on-site domestic wastewater management to practitioners and general public is not the responsibility of the Gisborne District Council.

The Gisborne District Council will not supply copies of the Joint Australian and New Zealand Standards to practitioners or general public who shall purchase the relevant documents from Standards New Zealand.

Guideline 1.6: Supplementary technical and resource material either commissioned by the Gisborne District Council, or with relevance to on-site wastewater management in the Gisborne District, will be distributed, from time to time, to practitioners as appropriate.

1.1 Relationship of the Guidelines to AS/NZ Standards

The Guidelines reference to the suite of AS/NZ Standards dedicated to on-site wastewater systems. This suite of Standards set out performance objectives, performance requirements, performance criteria for on-site wastewater systems and the means of meeting those objectives. This includes procedures for site and soil evaluation, on-site system design, installation commissioning, and the management, maintenance and monitoring of on-site systems.

The Guidelines do not seek to replace the performance objectives and procedures set out in the Standards, but are designed to either complement them or adapt them so that they reflect conditions in the Gisborne District. As such, practitioners should refer in particular to AS/NZS 1547:2000. There are references to appropriate sections of the Standards throughout the Guidelines.

AS/NZS 1547:2000 does not cover all wastewater treatment and land application systems and has scope limited to residential, institutional or commercial facilities systems with a flow limit up to a maximum of 1400 L/week, from a population equivalent of up to 10 people.

The Guidelines do not preclude use of other reputable published material provided the completed design for the on-site wastewater system meets the performance requirements set out in the Standards.

Where neither the Guidelines nor the Standards provide sufficient information on matters, such as design for large capacity systems and de-centralised systems, the practitioner must seek guidance from alternative or complementary technical material. The Auckland Regional Council Technical Publication No. 58 (TP 58) On-site Wastewater Systems: Design and Management Manual Third Edition 2004 is noted as one source of guidance for domestic wastewater management.

Systems for specific non-domestic wastes from commercial and industrial systems are not within the scope of these Guidelines and specialist design and reporting is required, accompanied by a Producer Statement to support the design proposal.

1.2 Supplementary technical resources

Supplementary to the Guidelines are technical reference and guidance material commissioned by the Gisborne District Council including:

- Gisborne District Council – Wastewater Design Guidelines Technical Report: Composting Toilet Systems and Greywater Systems
- Design Guide for Horizontal Flow Wetland Treatment System
- Design Guide for a Peat Treatment Filter

1.3 Recommended websites

www.greymatters.org.nz

A dedicated website for greywater system design.

www.lanfaxlabs.com.au and a specific New Zealand page at www.lanfaxlabs.com.au/new_zealand.htm

Information on laundry detergents and their environmental impact.

- Industry technical documents and specifications can be obtained online from company websites or direct from equipment suppliers.

1.4 Recommended design documents

Auckland Regional Council Technical Publication No.58 (TP58) Third Edition 2004

PART 2: Site evaluators/soil assessors and on-site wastewater system designers

Guideline 2.1 Accreditation criteria for competency of site evaluators/soil assessors and wastewater system designers shall apply for practitioners offering such services in the Gisborne District. Accreditation is either conditional or unconditional.

Guideline 2.2 Accreditation is specific to an individual person rather than the company where they are employed.

Guideline 2.3 Accreditation of an individual is for specific site and soil evaluation purposes and is dependant on their competency.

Specific Site and Soil Evaluation (SSE) purposes:

SSE Level 1	Surveys of land prior to zoning or re-zoning the land use
SSE Level 2	Surveys of land for subdivision – more than two or multiple proposed allotments
SSE Level 3	Surveys of land for subdivision – not more than two proposed allotments
SSE Level 4	Site evaluation for a single on-site wastewater system for one building
SSE Level 5	Site evaluation for a single on-site wastewater system for two or more buildings either on the same allotment or on adjacent allotments

Guideline 2.4 The accredited person, or the company they are employed by, shall maintain public liability and indemnity insurance to a value of not less than $1,000,000. The accredited person or employing company shall accept professional liability for the site evaluation, including soil assessment, and the resultant interpretations, conclusions drawn and recommendations made.

Guideline 2.5 The accredited person shall certify the site evaluation procedures have been completed in general accordance with the Gisborne District Council On-site Wastewater Guidelines, and/or other accepted referenced material. The person shall provide certified reports generally consistent with those described in these Guidelines.

2.1 Accreditation criteria for site/soil evaluators and on-site wastewater system designers

The (Part Operative) Combined Regional Land and District Plan, the Regional Discharges Plan and these Guidelines have requirements for the applicant to demonstrate that the proposed method of servicing allotments for wastewater is adequate for the anticipated land use and location. The site and soil evaluation process must accurately identify any constraints to effective on-site wastewater servicing prior to land being re-zoned or subdivided. Failure of this process contributes to unsustainable on-site waste management particularly for new urban residential developments.

Selection and design of an on-site wastewater system appropriate to the site use and constraints relies on information recorded from the site and soil evaluation processes. Malfunction and premature failure of systems occurs when these evaluations and design considerations are inadequate.

Site and soil evaluation and system design processes is completed by expert people. The Gisborne District Council endorses these people and requires that the site and soil evaluation and system design reports they produce are submitted for a consideration of a building consent or for a relevant resource consent or land re-zoning application.

There is no set qualification or performance standard set for these practitioners in New Zealand. To ensure adequate competency is maintained, the Gisborne District Council has developed a set of minimum performance criteria for 'Accredited Site and Soil Evaluators' and 'Accredited On-site wastewater System Designers'.

2.1.1 Unconditional accreditation criteria

The criteria the council will use to accredit and maintain accreditation for a Site and Soil Evaluator and for an On-site Wastewater System Designer, and for acceptance of their reported work within Gisborne District is the individual person shall have:

- Completed a Centre for Environmental Training (CET) Site and Soil Evaluation Course; or
- Verifiable Previous Experience in site and soil evaluation; and
- Completed and met a 95% or better pass mark in an assessment relevant to the specific site and soil evaluation purposes the person wants accreditation for; and
- Ongoing accuracy and competency in site/soil assessment and system design processes.

2.1.2 Conditional accreditation criteria

Where site/soil evaluation reports and/or wastewater system design reports are submitted for consent applications and the work is from a person that is not accredited by the Gisborne District Council, the person shall fund peer review of their work by an accredited practitioner. The results of any peer review shall be submitted to Council staff. The competency of conditional evaluators /designers will be considered by Council staff against the following criteria:

Before full acceptance as an accredited evaluator/designer will be considered, conditional evaluators /designers shall:

- Have at least their first three site/soil evaluations and associated design reports peer reviewed; and
- Complete and meet a 95% or better pass mark in an assessment which includes site/soil evaluation and system design. The assessment, consistent with the GDC Guidelines, is prepared by Council staff, marked by Council staff and moderated by an independently qualified person. The assessment is open book and is not completed under supervision.

The cost of seeking conditional accreditation will be charged at hourly staff rates set out the Council's annual fees and charges manual, and the fees for a moderator will be charged at their respective hourly rate.

On acceptance, details of Conditional Accredited evaluators and/or designers will be posted on the Council's website and on printed information available for customers.

2.1.3 Competency assessment processes

Competency assessments for specific site and soil evaluation purposes will differ but these assessments will generally include the completion of a site evaluation, soil assessment and reporting, and on-site wastewater system design and reporting. The person may complete SSE Level assessments and design assessments concurrently or individually.

Assessments, will be consistent with the GDC Guidelines and will be prepared by Council staff, marked by Council staff and moderated by an independently qualified person. Assessments are open book and are not completed under supervision. Completion of an assessment by the applicant is restricted to one calendar month from the date the assessment brief is received to the date the assessment documents are submitted to the Gisborne District Council. On written request to the Building Control Manager a maximum extension of two weeks may be agreed for the completion of an assessment.

A minimum of two Council staff, one from Building Control and one from Regulatory Services, will decide who should be accredited and who should maintain accreditation status. This process will be moderated by a practitioner competent with accreditation and quality control processes.

On acceptance, details of accredited evaluators and/or designers will be posted on the Council's website and on printed information available for customers.

The cost of assessments and maintaining accreditation will be charged at hourly staff rates set out the Council's annual fees and charges manual, and the fees for a moderator will be charged at their respective hourly rate.

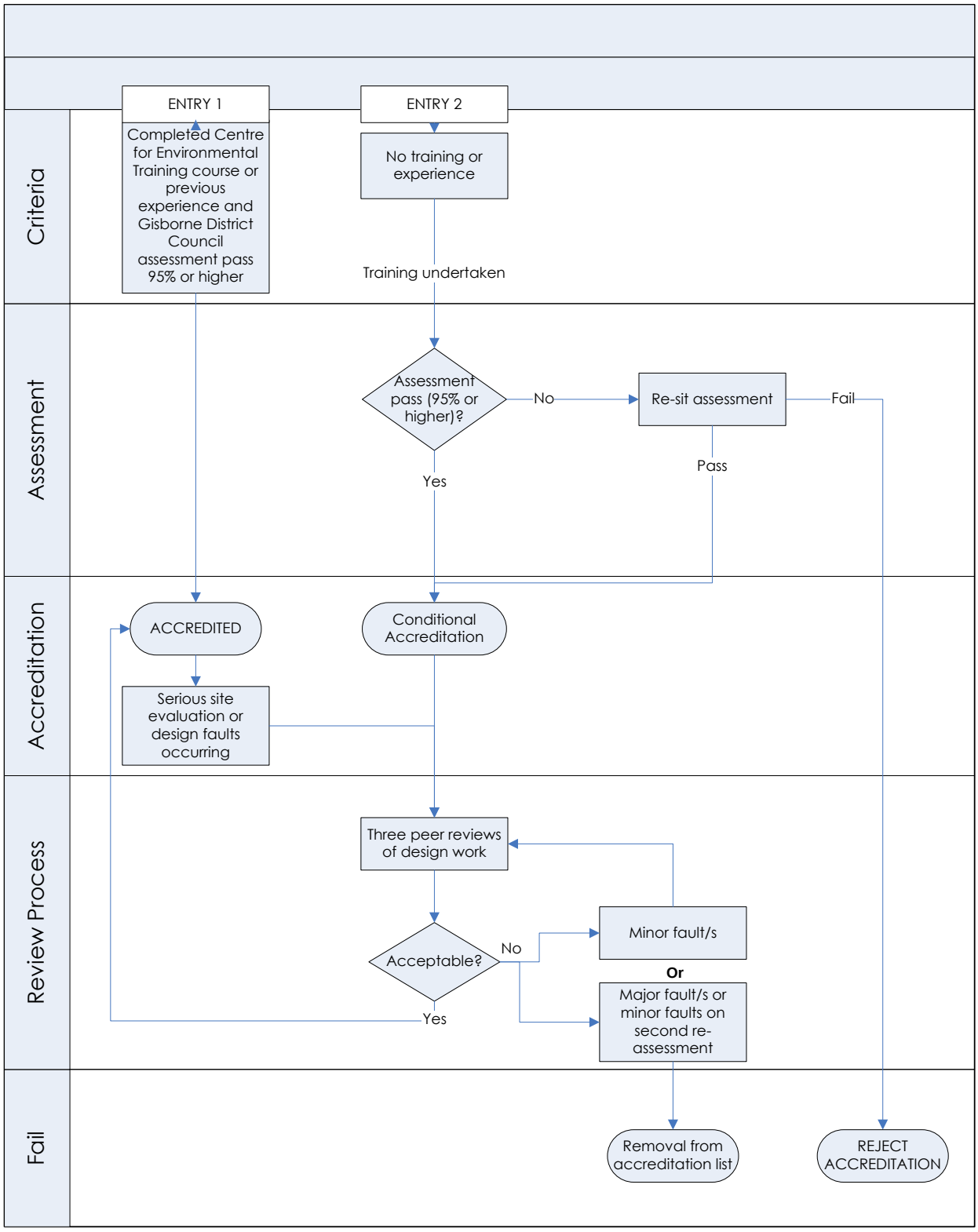
2.1.4 Removal from accreditation list

Removal of an individual from the accredited list to the conditional accreditation list or from being accredited at all may occur as a result of inadequate competency or performance. The removal process will be overseen by Council staff and moderated by a practitioner competent in accreditation and quality control processes. Once a decision is made to remove an individual this decision is final and the person will be notified in writing. The Council will retain the right of refusal for any future readmission of such individuals.

2.1.5 Records

All information on or in connection with this procedure will be retained by Gisborne District Council as a matter of record. As a general rule, this information will not be made available to the general public.

2.2 Diagram of the accreditation process for site/soil evaluators and on-site wastewater system designers



PART 3: Site evaluation/soil assessment procedures and reporting

Guideline 3.1 Site evaluation and soil assessment procedures shall be completed

a) in general accordance with methods set out in AS/NZS 1547:2000 Part 4: Means of Compliance and associated normative appendices 4.1A, 4.1B, 4.1C, 4.1D, 4.1E, 4.1F and AS/NZS 1547:2000 Figure 4.1B2 and Table 4.1C1;

AND

b) in general accordance with adaptations as set out in the Guidelines and associated appendices – 2 Assessment of Slope; 3 Assessment of Site Stability; 4 Criteria for On-site Wastewater Systems on Sloping and/or Erosion Affected Ground; 5 Summary of Clearances, Setbacks and Maximum Slope Gradients for Discharges

Guideline 3.2 Evidence shall be provided to confirm that the site proposed for the effluent treatment and disposal system is unlikely to be subject to natural hazards; these hazards being:

1. erosion (including coastal erosion, bank erosion, and sheet erosion)
2. falling debris (including soil and rock)
3. subsidence
4. inundation (including flooding, overland flow, storm surge, tidal effects, and ponding)
5. slippage.

Guideline 3.3 An on-site wastewater Site and Soil Evaluation Report must be supplied with any application for consent. The suitability of this report will be ascended against:

- The content, completeness and accuracy of the report and associate field analysis and measurement
- The soil assessment procedures and interpretation to determine soil type/s
- The processes used and accuracy of the site evaluation to identify and describe site limitations

Guideline 3.4 Building consent applications for on-site wastewater systems will not be accepted without a Site and Soil Evaluation Report. Guidelines Appendix 1 Form 1B, 1C

Guideline 3.5 The Site and Soil Evaluation Report will be used to assess the status of the proposed discharge against rules in the Regional Discharges Plan. Assessment will consider if the wastewater system selection, design, construction and installation has followed best practice, informed by standard(s) recognised by Council.

Guideline 3.6 A subdivision specific, Site and Soil Evaluation Report will be used to assess subdivision applications against rules in the (Part Operative) Regional Land & District Plan. The subdivider must demonstrate the proposed method of servicing allotments for wastewater is adequate for the anticipated land use and location.

3.1 References

AS/NZS 1547:2000 Part 4: Means of Compliance

AS/NZS 1547:2000 Appendix 4.1A Site and Soil Evaluation: Procedures

AS/NZS 1547:2000 Appendix 4.1B Site and Soil Evaluation for planning, re-zoning and subdivision of land

AS/NZS 1547:2000 Appendix 4.1C Site and Soil Evaluation for individual lots

AS/NZS 1547:2000 Appendix 4.1D Site and soil properties

AS/NZS 1547:2000 Appendix 4.1E Dispersive soils and sodicity

AS/NZS 1547:2000 Appendix 4.1F Soil-permeability measurement – constant-head test

AS/NZS 1547:2000 Appendix 4.2C Water Balance and Land Application Systems

AS/NZS 1547:2000 Figure 4.1B2 and Table 4.1C1

Guidelines Appendix 1 Site Assessment and Design Criteria

Guidelines Appendix 2 Assessment of Slope

Guidelines Appendix 3 Assessment of Site Stability

Guidelines Appendix 4 Criteria for On-site Wastewater Systems on Sloping and/or Erosion Affected Ground

Guidelines Appendix 5 Summary of Clearances, Setbacks and Maximum Slope Gradients for Discharges

3.2 Site and soil evaluation - individual lots

3.2.1 Site evaluation must be completed

AS/NZS 1547:2000 Appendix 4.1A Site and Soil Evaluation Procedures; Appendix 4.1C Site and Soil Evaluation for Individual Lots, shall be used as the basis for site evaluation.

3.2.2 Land stability, land slope, clearances and setbacks

Guidance and criteria set out in the Guidelines Appendix 2: Assessment of Slope, Guidelines Appendix 3: Assessment of Site Stability and in the Guidelines Appendix 5: Clearances, Setbacks and Maximum Slope Gradients for Discharges, shall be consulted and applied for the site evaluation process.

3.2.3 Soil assessment must be completed.

The soil evaluation process is an evaluation of soil properties particularly soil texture and structure. Two stages are required, as follows:

(a) An inspection of the nature of the soil and its layers; and then

(b) An examination of the soil properties within individual soil layers.

A preferred Land Application Area (LAA) shall be selected and soil assessments shall be within this area. A reserve area identified shall have a minimum of one soil assessment point.

Either the Guidelines soil assessment method or AS/NZS 1547:2000 'standard procedure' /'modified procedure' for soil assessment can be used. In either case the use of powered augers for soil bores is not accepted.

1547:2000 Appendix 4.1D Site and Soil Properties; Appendix 4.2E Dispersive Soils and Sodicity; AS/NZS Table 4.1A2 shall be applied for soil assessment and AS/NZS 1547:2000 Table 4.1.1 shall be applied for soil descriptions and determination of soil category.

The results of the soil assessment shall be recorded on the prescribed reporting form or an equivalent form. A reporting form shall be completed for each soil pit or borehole. The completed records shall be submitted with the Site and Soil Evaluation Report.

- AS/NZS 1547:2000 Figure 4.1A1 Soil Profile Information and Data Sheet
- Guidelines Appendix 1, Form 1G

If unfavourable soil characteristics are found within the LAA, alternative land application areas should be investigated.

For review of any Site and Soil Evaluation Report submitted for building or resource consent, the Council reserves the right to request that additional soil pits and/or boreholes be used to confirm soil properties within the LAA.

3.2.4 Soil-permeability measurement

AS/NZS 547:2000 Appendix 4.1A7: Soil permeability measurement

AS/NZS 547:2000 Appendix 4.1F: Soil-permeability measurement – Constant head test

Guidelines Appendix 1, Form 1H

Soil permeability measurement is not specifically required as part of a site and soil evaluation but can be used to assist the process of confirming a soil category. Soil permeability measurement cannot be used as a substitute for an assessment of soil properties.

The indicative permeability (K_{sat}) shall be calculated from field data and result of each measurement shall be reported. Averaging the results from multiple measurements or averaging multiple indicative permeability(K_{sat}) calculations to obtain one result is not accepted.

The positions of soil permeability measurements shall be shown on the site plan and soil permeability measurement data shall be appended to the Site and Soil Evaluation Report.

3.2.5 Site and soil evaluation report

The Site and Soil Evaluation Report shall be supported by scale site plan and photographs if appropriate, with Land Application Area clearly identified. The location of all boreholes and soil pits must be identified on the plan. Site geographical features, contours, large trees, waterways, drains, buildings, access ways and any other relevant features must be accurately identified on the site plan.

The report must describe any limitations for application of wastewater to land, particular requirements to make the land suitable for wastewater discharges, or particular requirements to make the discharge suitable for land application (ie minimum treatment prior to discharge, preparation of land for disposal areas).

The Site and Soil Evaluation Report should clearly identify, with reasons, an estimated soil category and DLR/DIR. When soil conditions vary across the survey area, the soil category and associated DLR/DIR must not be derived by 'averaging' the results from the soil assessment points. The 'worst-case' soil category shall be applied.

Soil types and loading rates are detailed in AS/NZS 1547:2000 Appendix 4.2A for various land application methods. This information can then be used to determine the potential type, land area requirement and position the land application system.

The practitioner must discuss findings with the client and inform about possible on-site wastewater system options. The client should be informed before proceeding with design and obtaining consents, and they must be made aware of the limitation of the land and how this may limit the choice of suitable systems. They should be informed about any land improvements needed to install a system, land drainage requirements, limitations on use of land on-top of a land application area and protection requirements for a land application area.

3.3 Site and soil evaluation - rezoning and subdivision of land

3.3.1 Site evaluation must be completed

AS/NZS 1547:2000 Appendix 4.1B Site and Soil Evaluation for planning, re-zoning and subdivision of land, shall be applied as well as:

- Slopes upward and below potential discharge land application areas must be measured.
- Surface and shallow subsurface water flow paths and their direction must be determined.
- Land drainage requirements and/or land reconfiguration requirements to make land suitable for on-site wastewater management must be identified.
- Where any proposed land parcel is less than 2500 square meters, possible land application methods must be determined from the site evaluation and soil assessments. The anticipate land area required for potential land application system types and any additional land area required for in-ground seepage and assimilation of the discharge beyond the land application system must be identified. Site geographical features, large trees, waterways, drains, buildings, access ways and any other relevant features must be identified in scale on the site plan.

3.2.2 Land stability, land slope, clearances and setbacks

Guidance and criteria set out in the Guidelines Appendix 2 Assessment of slope; Appendix 3: Assessment of Site Stability; Appendix 5: Clearances, Setbacks and Maximum Slope Gradients for Discharges shall be consulted and applied for the site evaluation process.

3.3.3 Soil assessment must be completed

Areas identified from the site evaluation as appearing favourable for wastewater disposal shall have the soils assessed. The number of soil assessment points will be determined by the scale of the land area, proposed layout and density of lots, and the limitations identified within the land area being evaluated and from the surrounding catchment.

The soil evaluation process is an evaluation of soil properties particularly soil texture and structure. Two stages are required, as follows:

(a) An inspection of the nature of the soil and its layers; and then

(b) An examination of the soil properties within individual soil layers.

A combination of soil pits or trenches and soil bores and cores shall be completed to get a reliable representation of the soil properties, soil types, and limiting factors associated with the land.

AS/NZS 1547:2000 Appendix 4.1D Site and Soil Properties; Appendix 4.1E Dispersive Soils and Sodicity; Table 4.1A2 shall be applied for soil assessment and the soils shall be described as set out in AS/NZS 1547:2000 Table 4.1.1.

The results of the soil assessment shall be recorded on the prescribed reporting form or an equivalent form. A reporting form shall be completed for each soil pit or borehole. The completed records shall be submitted with the Site and Soil Evaluation Report.

- AS/NZS 1547:2000 Figure 4.1A1 Soil Profile Information and Data Sheet
- GDC Guideline Appendix 1: Form 1G Soil Assessment Reporting Sheet and Form 1H Soil Permeability Record Sheet

If unfavourable soil characteristics are found within the LAA, alternative land application areas should be investigated.

3.3.4 Soil-permeability measurement

AS/NZS 547:2000 Appendix 4.1A7: Soil-permeability measurement

AS/NZS 547:2000 Appendix 4.1F: Soil-permeability measurement – Constant head test
Soil permeability measurements must be completed as part of a site and soil evaluation to assist the process of confirming a soil category. Soil permeability measurements cannot be used as a substitute for an assessment of soil properties.

The number of Soil permeability measurements will be determined by the scale of the land area being surveyed and the variation or complexity factors found from site and soil assessment.

The indicative permeability (K_{sat}) shall be calculated from field data and result of each measurement shall be reported. Averaging the results from multiple measurements or averaging multiple indicative permeability(K_{sat}) calculations to obtain one result is not accepted.

The positions of soil permeability measurements shall be shown on the site plan and soil permeability measurement data shall be appended to the Site and Soil Evaluation Report.

3.3.5 Determination of soil category

The soil assessment information shall be used to determine the soil category and the soil structure. An estimate should be made of DLR/DIR values appropriate to the potential treatment and land application systems suitable for the site soils.

Soil types and loading rates are detailed in AS/NZS 1547:2000 Appendix 4.2A for various land application methods. This information can then be used to determine the potential type of systems suitable for the land, the minimum land area requirements for such systems and overall if on-site wastewater management can be sustained within the proposed land use.

3.3.6 Site and soil evaluation report

The Site and Soil Evaluation Report shall be supported by scale site or proposed survey plan and aerial photographs with areas identified as being suitable for land application of wastewater. The location of all boreholes and soil pits must be identified on the plan.

The report must describe any limitations for application of wastewater to land, particular requirements to make the land suitable for wastewater discharges, or particular requirements to make the discharge suitable for land application (ie minimum treatment prior to discharge, preparation of land for disposal areas).

The minimum land area required for on-site wastewater management per lot must be reported as well as reserve land allocations. Additional land area for down-flow seepage/absorption of wastewater from a land application area may be required on sites with slope and/or permeability-limiting soils.

The Site and Soil Evaluation Report should clearly identify, with reasons, estimated soil category/s and DLR/DIR across the site. When soil conditions vary across the survey area, the soil category and associated DLR/DIR must not be derived by 'averaging' the results from the soil assessment points.

3.4 Soil assessment methods

Gisborne District Council Guidelines method

Soil Pits Required	At least two within the area selected for the land application area. A minimum of three pits are necessary for a land application system requiring 250 square meters of land or more.
Location of Soil Pits	Near each end of the proposed land application area and, if three pits are dug, at least one from the middle of the land application area.
Bore holes required	Not essential if two or more pits are dug.

Where soils pits cannot be dug the AS/NZS 1547:2000 methods shall be used. The Guidelines Table 3A: Adapted soil data collection procedures for soil pit and boreholes, shall apply.

AS/NZS 1547:2000 standard procedure for soil assessment

The standard procedure is used if site factors indicate that the greater DLR/DIR (least conservative) rates may be appropriate. A soil pit investigation is needed.

Soil Pits Required	At least one within the area selected for the land application area
Location of Soil Pits	Near the centre of the proposed land application area
Bore holes required	At least three within the area selected for the land application area
Location of boreholes	One near where the wastewater enters the proposed land application area and one at the far end of the proposed land application area.

AS/NZS 1547:2000 modified procedure for soil assessment

The modified procedure should be used if site factors indicate the need to use a conservative DLR/DIR for system design.

Soil Pits Required	Nil
Location of Soil Pits	Not Applicable
Bore holes required	At least three within the area selected for the land application area
Location of boreholes	One near where the wastewater enters the proposed land application area, and one near the centre of the proposed land application area, and one near the point most distant from the point of entry into the proposed land application area.

Table 3A: Adapted soil data collection procedures for soil pit and boreholes

Soil Pits	• Pits are dug by hand or excavator. • Pits are dug to get light on exposed surface. • A clean face is exposed for assessment. • The pit should be big enough to allow access to observe and measure the soil profile . • The side of another exposed soil face of pit can be cleaned with a spade and examined. • Soil cores are suitable as an alternative to a pit if the core is greater than 50 mm diameter, is stable and relatively undisturbed. • Soil properties are described as per AS/NZS 1547:2000 Table 4.1A2 for each layer. • The depth of the pit or core must be; - a minimum of 1.5 meters or to depth of unfavourable layer, equipment refusal, or to permanent water table; or - at least 1 meter below effluent disposal depth for a specified land application system; and - at least 1.2 metres below effluent disposal depth if soils are Category 1. • For safety - all pits to be refilled immediately.
Soil Boreholes	• Soil Boreholes must be made without causing blending of the soils through the profile. • Upper soil section removed by spade. • Lower sections are usually removed by auger or a core sampler can be used. • Soil properties are described from the topsoil down through the subsoils as per AS/NZS 1547:2000 Table 4.1A2 omitting structure, fabric, and large coarse fragments. • The depth of the borehole must be: - a minimum of 1.5 meters or to depth of unfavourable layer, equipment refusal, or to permanent water table; or - at least 1 meter below effluent disposal depth for a specified land application system; and - at least 1.2 metres below effluent disposal depth if soils are Category 1. • For safety - all boreholes to be backfilled after inspection.

PART 4 Selecting & designing on-site wastewater systems

Guideline 4.1 Design flows used for wastewater system design shall be consistent with the Guidelines Table 4A: Wastewater Flow Design Allowances and Design Occupancy Allowances.

Guideline 4.2 Septic tank capacities shall be consistent with the Guidelines being calculated from Table 4A: Wastewater Flow Design Allowances and Design Occupancy Allowances, Table 4B: Solids Accumulation Rates, specified minimum time for flow retention dependant on the wastewater source, and a 5-year sludge accumulation period.

Guideline 4.3 Criteria set out in the Guidelines for siting septic tanks, holding tanks and pump wells, and their capacity applies. AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 1: Septic tanks, applies in all other aspects for septic tanks, greywater tanks, holding tanks and pump wells.

Guideline 4.4 AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 2: Waterless composting toilets, applies in general for composting toilets.

Guideline 4.5 AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 3: Aerated wastewater treatment systems, applies in general for Aerated Wastewater Treatment Systems (proprietary Advanced Treatment Systems).

Guideline 4.6 Criteria set out in the Guidelines for greywater systems applies for greywater-general systems, greywater-reuse and recycling-systems, and greywater-diversion systems.

Guideline 4.7 Performance Evaluation - A brand/model specific test certificate from the New Zealand On-site Wastewater Test Facility OSWTF is accepted. Or, field trials may be considered on the merits of the reliability and duration of the trials and parameters tested and monitored for a performance evaluation. A performance evaluation report or certificate will be used to assess rules in the Regional Discharges Plan for advanced treatment systems.

Guideline 4.8 A Design Report must be prepared, be consistent with recommendations for wastewater treatment quality requirements, DLR/DIR and site limitations detailed from the Site and Soil Evaluation Report and any recommendations from associated geotechnical survey. The Design Report shall be supported with system specifications, drawings and a scale site plan or benchmarked and measured site plan showing the positions of each component of the proposed system.

Guideline 4.9 Where the proposal for a proprietary advanced treatment system, other alternative on-site systems solutions shall identified within the Design Report and a statement provided why the proposed option is the Best Practicable Option for the site.

Guideline 4.10 The client shall be a signatory to the Design Report in-so-far that the client accepts the design proposal or has nominated the preferred design proposal if more than one is promoted in the Design Report. When the accepted design solution is a 'proprietary advanced treatment system', the Brand of system must be stated and system specifications, installations requirements and maintenance requirements shall be submitted with the Design Report for a Building Consent or Resource Consent application.

Guideline 4.11 The suitability of an on-site wastewater system promoted in a Design Report will be assessed against:

a) For any septic tank or pump well, siphon dosing device, irrigation system, pump, proprietary treatment system, composting toilet system, greywater system as relevant:
   - The product or system Test Certificates, Producer Statements, Certified Approvals; and
   - The manufacturer specifications for installation, operational range or capacity and maintenance requirements.

b) For any proprietary advanced on-site wastewater-treatment unit:
   - A Producer Statement relating to Building Code and relevant AS/NZS performance requirements and performance criteria; and
   - A Secondary-effluent Producer Statement; and
   - The manufacturer design and operational specifications for installation, functional performance range and maintenance requirements; and
   - The availability of people with sufficient expertise for maintenance servicing.

c) The limitations and restrains of a site identified in a Site and Soil Evaluation report; and

d) The proposed wastewater system design specifications - including the treatment system, land application system, hydraulic design for the proposed design flow rate and occupancy allowances; and

e) The system performance, operational and maintenance requirements and the ability of these to be reliably met by the user; and

f) Evidence provided and confirmation given that the proposed effluent treatment and land application system is unlikely to induce natural hazards during or following the installation, construction or functioning of the effluent system; and

g) The identification and detail of land improvements to protect the function of on-site wastewater system such as land drainage systems, embankments, raising or flattening land areas; and

h) The identification and specifications or detail for protection of a wastewater system from damage - such as traffic protection, tree/growth root intrusion protection, protection from stock, hydrostatic uplift - anchorage to overcome buoyancy.

Guideline 4.12 Evidence shall be provided to demonstrate the structural and functional integrity of existing system components prior to re-use within a design for an upgrade or a replacement on-site wastewater system.

Guideline 4.13 Dosing systems shall be designed to ensure even distribution of wastewater over the land application area.

Guideline 4.14 The Design Report will be used to assess if rules in the Regional Discharges Plan for wastewater system selection, design, construction and installation has follow best practice, informed by standard(s) recognised by Council.

4.1 References

AS/NZS 1547:2000 Appendix 4.2A Land-application systems – system selection and sizing

AS/NZS 1547:2000 Appendix 4.2B Land-application systems – guidance on selection

AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 1: Septic tanks

AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 2: Waterless composting toilets

AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 3: Aerated wastewater treatment systems

Regional Plan for Discharges to Land and Water Waste Management and Hazardous Substances: Rules

Auckland Regional Council Technical Publication No.58 (TP58) Third Edition 2004 –Section 7.4 Advanced Secondary Treatment– Packed Bed Reactors; Section 7.8.5 Constructed Wetland Treatment; Section 9 Shallow Irrigation Systems; Section 10.7 Deep Bores

Gisborne District Council Wastewater Design Guidelines Technical Report 2010 – Composting Toilet Systems and Greywater Systems

4.2 System design

The designer must use the information contained in the Site and Soil Evaluation Report and, in association with the clients brief, determine an appropriate on-site wastewater management system, given the site conditions and constraints. Clearances, setbacks and maximum slope gradients for discharges listed in Appendix 5 apply.

4.2.1 Design report

A Design Report must describe the design of both the land application system and the treatment unit. The report must justify why the proposed on-site system in the "best practicable option" for the servicing of the site. The client, or their nominated agent, must be a signatory to the Design Report to show acceptance and understanding of the design proposal.

General criteria

The Design Report must include a site plan, to scale, or a site plan annotated with multiple measurements from permanent benchmarks to the wastewater system components and any protecting land drains required. The soil test sites must be shown and any contour levels or terraced land height variations and benchmark positions shown.

A reserve area of land suitable for replacement or extending of the land application system must be identified on-plan and must be kept for a future installation.

The plan must show the layout of the on-site wastewater system on the site and any reserve area and the proximity to:

- legal boundaries and easements; and
- waterbodies, streams, rivers, the coast, stormwater drains, land drains, drinking water bores or springs; and
- buildings – existing or proposed, structures, driveways, water tanks – in-ground or above ground, existing septic tanks, pools, structural and retaining walls, large trees, and any other feature; and
- slopes, building set-back lines and areas of unstable land or erosion.

Annotated drawings are required so there is sufficient information for the installer, such as;

- cross sections of components
- construction drawings
- pump chamber set-up detail
- irrigation and other land application field layouts
- land drains or cut-off drains.

The reduced levels between the building foul water drain, the treatment system/tanks and dosing chambers must be shown.

The reduced levels between the treatment system/tanks and gravity land application trenches must be shown.

On sloping land, the installed reduced levels of each land application trench or bed on the slope contour must be shown.

The following specifications and verifications must be appended to The Design Report as appropriate to the system:

- Manufacturer specifications for system components and for installation of components,
- Performance test certificates,
- Producer Statements,
- Certified Approvals,
- Secondary-effluent Producer Statement,
- Hydraulic design report for any dosing system,

4.3 Positioning of treatment systems

All treatment systems should be located so as to facilitate the removal of sludge from the system and to allow other servicing requirements. Where vehicular access to the property is available, then the treatment system should be located so as to facilitate desludging by septage removal truck. Where vehicular access to the property is not available, the operation and maintenance guidelines should specify the manner in which the treatment system is to be desludged.

The treatment system and land application system shall not be subject to any vehicular traffic loading unless adequate protection can be demonstrated.

Tanks must be placed on firm, stable, level ground or a minimum 100mm thick granular material, sand or a concrete base provided.

Septic tanks and effluent disposal systems to be located as high in the ground as possible to ensure that the effluent pipes are as shallow as possible. Notwithstanding the above the tanks must be deep enough to achieve the drainage gradient required by the New Zealand Building Code.

4.3.1 Minimum set back distances

The effluent treatment shall be located a minimum distance away from embankments, escarpments, top/base/toe of slope, retaining structures and buildings unless a specific engineering assessment has been undertaken by a suitably qualified professional confirming that the proposal is unlikely to affect that feature. The minimum set back distance shall be;

- 1.5 x the height of any embankment
- 1.5 x the height of any slope
- 2 x the height of a retaining wall

- 1.5 x the depth of the foundations of any building with a minimum distance of 1.5m
- base of the septic tank shall be outside a 45° line drawn from the base of any building foundation or allotment boundary

4.3.2 Siting tanks on or within slopes

A specific geotechnical investigation of the site proposed for any tank located on or within a slope greater than 6° (1v:10h) that displays evidence of any undulations, hummocks, tension cracks, scarps, terracettes, soil creep, land slippage, surface erosion, subsurface erosion ("under-runners") or any other form of land movement, land deformation, settlement, subsidence or erosion shall be carried out by a suitably qualified professional. Appropriate evidence shall show that the site proposed for the tank is unlikely to be subject to slope instability or that the tank will not induce slope instability.

4.4 Calculation of design flows

Design flows are critical in the sizing of treatment units and land application areas. An estimate of the design flow can be made by multiplying the number of people the dwelling can accommodate (design occupancy) by the per person wastewater production figures.

Design flows for other buildings should be calculated from the number of people occupying the premises to be served, and a per capita wastewater flow allowance according to the nature of that occupancy.

Design Flow = Design Occupancy x Wastewater Production per Person

The design flows are minimum rates unless actual flows from past experience can be demonstrated. A precautionary approach should be taken with allowance for the potential maximum occupancy when designing on-site wastewater management systems.

Unrestricted flows, such as, continuously flowing streams, bores, artesian water or reticulated community supply, must be designed conservatively and appropriately to the specific use.

Table 4A: Wastewater flow design allowances in litres/person/day and design occupancy allowances

Design Flow Allowances – Dwellings			
Source	**On-site roof water tank supply**	**Bore, spring or restricted supplementary supply to rain water tank**	**Unrestricted supply**
Households - All waste	180	200	Note (1)
Households – Blackwater (2)	50	60	Note (1)
Households – Greywater Greywater-general (3) Greywater-heavy (4) Greywater-lite (5)	 130 Note (4) Note (5)	 140 Note (4) Note (5)	Note (1)

(1) Site specific flow rates shall be determined by the designer.

(2) Source - Toilet only

(3) Source – Greywater-general - Shower, bath, handbasin, laundry tub, washing machine, kitchen

(4) Source – Greywater- heavy - Laundry tub and kitchen. Calculate as 10% to 20% of Greywater-general flow

(5) Source – Greywater-lite - Shower, bath and washing machine. Calculate as 80% to 90% of Greywater-general flow

Design Occupancy Allowances – Dwellings	
Number of Bedrooms	Occupancy for design purposes
1	2
2	4
3	5
4	6
5	7
More than 5 bedrooms within the dwelling	Add 1 for each additional room
Additional rooms where the room is able to be closed off for privacy such as "games", "family" "recreation", "study", "office", "work" rooms, and which could potentially be used as bedrooms.	Add 1 for each additional room
Room or unit ancillary to the main dwelling that is built to habitable standard and has with ablution facilities attached.	Apply occupancy allowances for dwellings.
Room or unit ancillary to the main dwelling that is built to habitable standard but without ablution facilities attached.	Apply 1 for each additional room
Design occupancy shall allow for peak occupancy. Holiday homes tend to have intermittent but greater occupancy than a continuously occupied dwelling. Design allowances must allow for the peak occupancy.	
Design Flow and Design Occupancy Allowances **Commercial, Accommodation and Institutional Buildings**	
Motels/Hotels	
- Guests/resident staff with on site laundary	180
- Guests/resident staff with off site laundary	150
- Non-resident staff	40
- Reception room	30
- Bar trade (per customer)	10 - 20
- Restaurant (per customer)	30
Guests	Maximum Occupancy/Number of beds
Customers	Highest daily number over 7 day period - peak season
Staff	Maximum number of staff
Restaurants/Bar/Café with restroom facilities	
- dinner	30
- lunch	25
- bar trade	10 - 20
- staff	40
Café/food premises without restroom facilities	
Customers	15
Staff	40
Customer	Highest daily number over 7 day period - peak season
Staff	Maximum number of staff

Marae		
- Day users	15	
- Day users and day visitors	40	
- Day plus overnight visitors	150	
Maximum number of day users, day visitors and overnight visitors. *Assumes that day users have no meals provided; day visitors and overnight visitors have lunches and dinners provided; and that overnight visitors have access to showers but not laundry facilities.*		
Community Halls and Churches		
- banqueting	30	
- meetings or gatherings	15	
Highest daily number over 7 day period		
Work Places non-resident		
Standard fixtures and showers	60	
Standard fixtures excluding showers	40	
Maximum number of staff per shift		
Child Care Centres & Te Kohanga Reo		
With in-house laundry service per child	60	
With external laundry service per child	40	
Staff	40	
Maximum number of staff and children		
Camping Grounds and Campervan Parks	Fully serviced	Recreation areas
On-site roof water tank supply	100	50
Bore, spring or restricted supplementary supply	130	65
Reticulated unrestricted community supply	140	65
Maximum number of campers or occupants allowing 3.5 campers per camp-site Recreation areas with no showers or communal cooking facilities		
Schools		
On-site roof water tank supply	30	
Bore, spring or restricted supplementary supply	40	
Reticulated unrestricted community supply	50	
Maximum number of staff and children		
Hospitals/Rest Homes		
On-site roof water tank supply	220	
Bore, spring or restricted supplementary supply	250	
Reticulated unrestricted community supply	250	
Staff non-resident	40	
Staff resident	180	
Maximum Occupancy/Number of beds Maximum number of staff		

Public Toilets	
With water control features	10 - 20
Without water control features	15 - 25
Highest daily number of users over 7 day period - peak season	
Construction Camps/Holiday Camps/Training Accommodation facilities/Lodging Facilities	
On-site roof water tank supply	140
Bore, spring or restricted supplementary supply	150
Reticulated unrestricted community supply	150
Maximum Occupancy/Number of beds	

4.4.1 Use of water reduction fixtures to reduce design flow allowances

While water saving devices are encouraged, the Guidelines don't utilise water reducing fixtures for design flow allowances. Rather, designers are encouraged to design systems that can reliably manage flows over the lifetime of the system by proofing systems as much as possible. The design flow and occupancy allowances in Table 4A are the minimum accepted for meeting Permitted activity rules in the discharges plan.

AS/NZS 1547:2000 allows design flows to be reduced where water reduction fixtures are installed. Lower volumes of wastewater generated allows for a smaller land application system and reduced land area to accommodate the system.

A discharge to land consent is required for a discharge from a system designed on reduced flows than set in Table 4A. The wastewater system design report must clearly state the flow limits for the scale of the land application system, and the flow reduction fixtures in the building and the associated water usage of each fixture. Fixture maintenance and any monitoring must be detailed as appropriate to the components. Specifications of fixtures must be detailed within the construction plans submitted for building consent.

A 'Operation and Maintenance Guideline' must be provided to the property owner identifying the installed water reduction fixtures and how the correct use of these is essential to the on-site wastewater system function.

Reduced treatment system capacities, the septic tanks or treatment system, for designs using water reduction fixtures will not be accepted for consent. The capacity of treatment systems shall be consistent for design flows set out in Table 4A.

4.4.2 Water saving devices

Water saving devices are becoming more common, with many 'water saving' alternatives not costing much more than the equivalent 'non-water saving' option. Always refer to the manufacturer's specifications to ensure devices are suitable. As guidance, typical water saving devices include:

- Dual flush (3/6 litres) toilets
- Front loading or equivalent AAAA washing machine
- Laundry taps maximum flows of 10 L/m
- Kitchen taps maximum flows of 9 L/m
- Bathroom taps maximum flows of 6 L/m
- Showers maximum flows of 9 L/m

Examples of water reduction fixtures

- Standard water-reduction fixtures include dual flush 11/5.5 litre water closets, shower flow restrictors, aerator faucets (taps) and water-conserving automatic washing machines.
- Full water reduction fixtures include the combined use of reduced flush 3/6 litre toilet cisterns, shower flow restrictors, aerator facets, front-loading washing machines and flow/pressure control valves on all water use outlets.
- Water reduction may be achieved by advanced treatment of greywater and recycling for toilet flushing.

4.4.3 Non Standard fixtures and prohibited discharges into on-site wastewater systems

Unless the design of a system specifically identifies the capacity of a system to manage increased volumes of solid waste or very high peak flows, non-standard fixtures discharging into the system should not be installed.

Examples of non-standard fixtures

- **Food waste disposal units** - An increase of capacity must be provided for when designing the septic tank to accommodate increased flows, solids accumulation and biological digestion. The dispersal area will also need to be expanded to handle the increased effluent discharge flow.
- **Spa baths -** A spa bath is a fixture, having a capacity of less than 680 litres which incorporates facilities for injecting air bubbles or jets of turbulent water and connects to the waste system in the same manner as a standard bath.

  A spa bath with a capacity of less than 120 litres (standard 1.5 metre bath size) may be connected to a standard septic tank system. Spa baths installed with a capacity 120 litres or greater will require an increase in the capacity of the septic tank system to accommodate the peak flow volume.

Commercial and communal kitchens - The discharge from any kitchen sink and/or dishwashing machine in a commercial kitchen shall discharge to an approved grease arrester (grease-trap) located as near as practicable to the kitchen sink and/or dishwasher and where possible be located outside the building.

An approved grease arrester shall be installed when new or upgraded systems are designed for kitchen facilities at marae, camping grounds, exhibition and event facilities and any other facility where wastewater from food preparation is a significant contributing discharge to the on-site wastewater system,

4.4.4 Prohibited discharges

Unless otherwise approved through design for which building and resource consent has been granted, the following discharges into an on-site wastewater system are not permitted:

- Stormwater, including roof and rainwater tank overflow, and surface drainage waters
- Back-flush waters from a swimming pool or spa pool or water softener unit
- Discharge or back-flush from a spa bath in excess of 120 litres capacity
- Disposable napkin, clothing or similar materials
- Animal carcass or offal
- Animal effluent or kennel/cattery washdown flows

- Trade waste
- Wastewater from a commercial bakery, food production kitchen, or food processing facility
- Petrol or other flammable or explosive substance whether solid, liquid or gaseous.
- Commercial disinfectant or deodorant or sewage mixed with the same, or any antiseptic or germicide powder or fluid, unless specifically stated to be suitable for use in a septic tank or treatment system
- Commercial laundry flows
- Commercial or industrial waste flows other than flows generated from facilities serving employees, residents, students, or guests.

4.5 Sizing and design of treatment systems

4.5.1 Treatment systems

The choice of treatment unit must be determined appropriate for the level of treatment required for the recommended land application system. The circumstances in which the wastewater is to be generated may also influence the choice of treatment unit (eg, the availability of a power supply or the nature of the building's occupancy). The factors that influence the final selection of treatment unit should be clearly set out in the Design Report.

Level of Treatment	Treatment Unit
Primary	Traditional septic tank or greywater tank
Advanced Primary Removal of material greater than 3mm and suspended solids at 100ppm.	Septic tank or greywater tank and outlet filter
Secondary 20g/m^3 BOD_5 and 30g/m^3 total Suspended Solids.	Advanced wastewater treatment systems Aerated wastewater treatment systems (AWTS) Septic tank with textile filter Septic tank with sand filter (recirculating or single pass) Horizontal flow wetland treatment units Some organic material filters (e.g. peat filters)
Tertiary	Secondary treatment followed by a disinfection unit
Grease removal	Grease arrester or convertor
Composting & Vermi-composting	Composting toilet Note 1 Vermi-culture filters (Solids only) Note 2
Notes	1. Leachate from composting toilets is considered as primary quality effluent unless the treatment process is shown to produce another specified effluent quality. 2. Liquid effluent from vermi-culture filter systems is considered as advanced primary quality effluent unless the treatment process is shown to produce another specified effluent quality.

4.5.2 Septic tanks

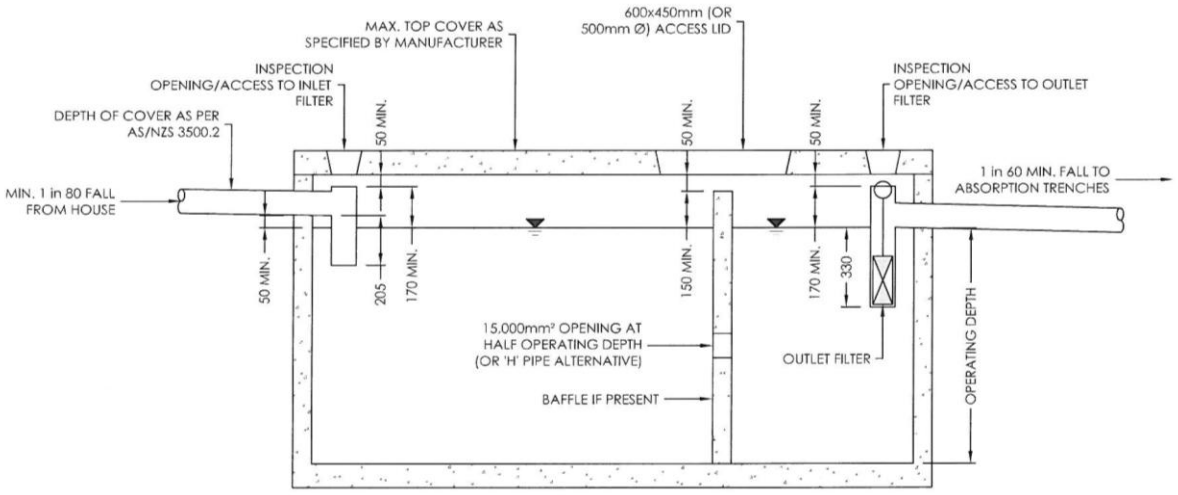
AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 1: Septic tanks, applies for:

> Performance requirements 2.3.1 General, 2.3.3 Holding tanks and pump wells, 2.3.4 Serviceable life, Performance criteria 2.4.3 Inlet and outlet fittings, 2.4.5 Joints, 2.4.7 Access and inspection openings and covers, 2.4.8 Extensions

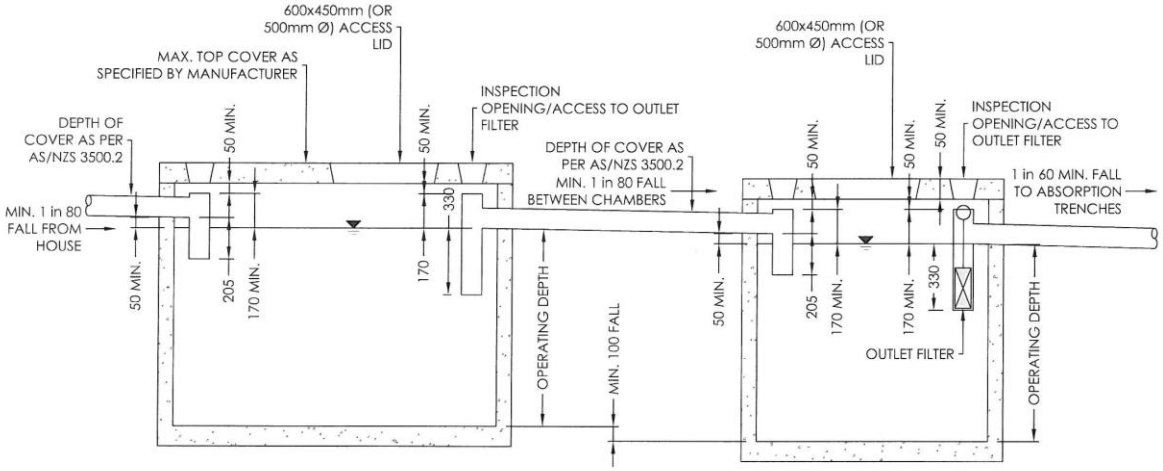
Tanks meeting these Standards meet the requirements of the New Zealand Building Code Clause B1, Clause B2 and Clause G14.

A Producer Statement shall be supplied by the tank manufacturer detailing how the tank and its components meet the Standards.

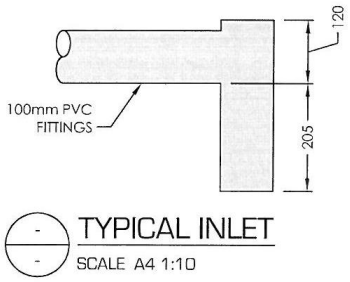
Repairs and improvements to septic tanks shall be done so the tank component meets the Standards.



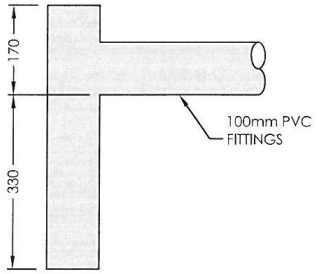
TYPICAL DUAL CHAMBER SEPTIC TANK ARRANGEMENT
SCALE A4 1:20



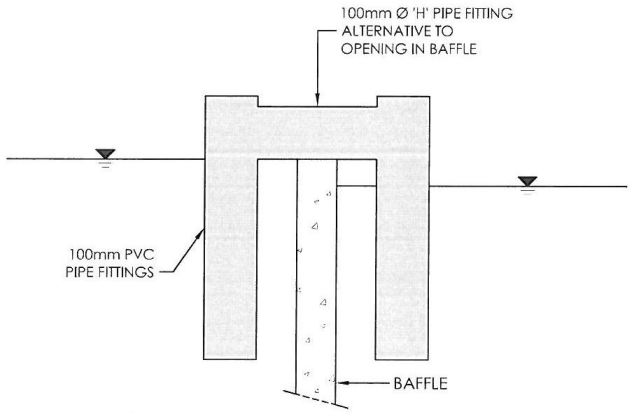
TYPICAL TWO CHAMBER SEPTIC TANK ARRANGEMENT
SCALE A4 1:25



TYPICAL INLET
SCALE A4 1:10



TYPICAL OUTLET
SCALE A4 1:10



ALTERNATIVE BAFFLE OPENING
SCALE A4 1:10

General criteria

- The treatment tank(s) or chamber(s) shall have access points above ground level for inspecting and maintaining the effluent outlet filter, monitoring the sludge accumulation and desludging the tank(s) or chamber(s). The access points shall be accessible for these purposes at all times.
- The installation of an outlet filter in the last septic tank is required. The filter must be capable of preventing particles greater than 3mm passing through.
- Septic tanks should not be vented; venting is to be achieved through the house drainage system as per the requirements of AS/NZS 3500.2:2003/Amdt 3:2010. I.e. the installation of terminal vents.
- All tank pipe fittings are to be capable of passing a 90mm diameter sphere.
- All septic tanks are to be manufactured to be to the requirements of AS/NZS 1546.1 2008.
- Tanks subject to vehicular loads are to be specifically engineer designed and provided with load carrying certification.
- Access opening(s) are to be located over baffle if present and shall allow for the desludging of all chambers.
- When tank dead weight + soil loads < 1.5 times hydrostatic uplift force then holding down anchorage is to be designed.
- The gravity feed pipeline from the dwelling to the primary septic tank/chamber is to be at a gradient of no less than 1 in 80. Where separate primary and secondary tanks are used then the pipe gradient between the two tanks is to be no less than 1 in 80 with a minimum fall of 100mm.

- The invert of tank outlet to the invert of the distribution trench to be at a grade of no less than 1 in 60.
- Distribution trenches to be laid at a grade of 1 in 200 and are to be inter linked at the downstream end.
- Fall between tanks and the disposal field must be considered and designed in line with best industry practise.
- The setback and clearance distances listed in the Guidelines Appendix 5 apply.

Capacity of septic tanks

Capacity of a septic tank is the volume of the tank below the invert of the outlet.

Tank capacities must provide room to store both the consolidating sludge and the floating scum, and enable a minimum 24-hour settling volume within the central liquid zone at sludge/scum "full" condition. A longer time in the detention zone the more suspended solids and Biological Oxygen Demand (BOD) are reduced, improving the quality of the effluent.

In the Gisborne District a precedent is set for installation of dual septic tanks for residential buildings. The first tank capacity provides for the 24-hour settling volume and 5 year sludge accumulation. The second tank has half the capacity of the first. The additional capacity provides for surge flows and short-term high flows. In conjunction with a longer retention period, dual chambers assist to reduce the suspended solids in the septic tank effluent improving the effluent quality. The installation of an outlet filter in the last septic tank assists further reduce carryover of solids being forwarded to the land application system, so that the system is more sustainable.

Septic tank design criteria – residential

- Sludge/scum accumulation rates
    - All-waste 80 litres/person/year
    - Greywater 40 litres/person/year
    - Blackwater 50 litres/person/year
- Minimum settling volume
    - Black water 48 hours
    - All other tanks 24 hours single tank
- Maximum retention period Greywater diversion 24 hours
- Minimum daily inflow is calculated on two people
- Five year sludge accumulation (pump-out frequency)
- Dual septic tank systems – The first chamber must be designed on the calculation below with a sludge accumulation period of 5 years and a minimum of a 24-hour settling volume. The second tank must be at least half the volume of the first tank.
- Single septic tanks must have a capacity of the combined volume of a dual tank system.
- To accommodate available tank sizes, septic tank capacities shall be not less than 98% of the volume than the recommended tank volumes in the tables below. Dual tanks shall be not less than 95% of the recommended tank volumes, provided that the total capacity is no less than 98% of the recommended tank volumes.
- Septic tanks shall be fitted with an approved outlet filter installed on the outlet of the final tank.

- Tank capacities shall be in general accordance with:
    - Table 4A - design flow rates and occupancy rates applied for calculating septic tank capacities.
    - Table 4B - sludge accumulation rates applied for calculating septic tank capacities.
    - Tables 4C - All-waste Tanks, Table 4D – Greywater Tanks and 4E - Blackwater Tanks, calculated tank capacities.

Septic tank design criteria – commercial and residential

Septic tank systems for commercial and institutional buildings shall be designed on a sludge accumulation period of 5 years and a minimum of 24-hour settling volume:

Septic Tank Capacity = [(S x P x Y) + (P x DF x SV)]

Where:

S = Rate of sludge/scum accumulation per person per year (litres)
P = Number of People as specified in Table 4A
Y = Desludging Frequency
DF = Daily Inflow Rate from Table 4A
SV = Settling Volume – 1 = 24 hours, 2 = 48 hours

Table 4B: Solids accumulation rates

Rate of sludge/scum accumulation litres/person/year for domestic wastewater with allowances for food preparation and beverage service	
Motels/Hotels	
-Guests/resident staff	65
- Non-resident staff	45
- Reception room	5 -10
- Bar trade (per customer)	5 -10
- Restaurant (per customer)	45
Guests Customers Staff	Maximum Occupancy/Number of beds Highest daily number over 7 day period - peak season Maximum number of staff per shift x number of shifts
Restaurants/Bar/Café with restroom facilities	
- Bar trade (per customer)	5-10
- Restaurant (per customer)	45
- staff	45
Café/food premises without restroom facilities	
Customers	40
Staff	45
Customer Staff	Highest daily number over 7 day period - peak season Maximum number of staff per shift x number of shifts
Marae	
- Day users	10
- Day users and day visitors	45
- Day plus overnight visitors	80

Maximum number of day users, day visitors and overnight visitors. *Assumes that day users have no meals provided; day visitors and overnight visitors have lunches and dinners provided; and that overnight visitors have access to showers.*		
Community Halls and Churches - banqueting - meetings or gatherings	 45 30	
Highest daily number people over 7 day period x average number of times used per week		
Work Places non-resident Standard fixtures	 45	
Maximum number of staff per shift x number of shifts		
Child Care Centres & Te Kohanga Reo With in-house laundry service per child With external laundry service per child Staff	 60 45 45	
Maximum number of staff and children		
Camping Grounds and Campervan Parks Permanent Occupation Casual Occupation	Fully serviced 80 65	Recreation areas 10-20
Maximum number of campers or occupants allowing 3.5 campers per camp-site Recreation areas with no showers or communal cooking facilities		
Schools	45	
Maximum number of staff and children x portion of the year facility is used		
Hospitals/Rest Homes Staff non-resident Staff and residents	 45 80	
Maximum Occupancy/Number of beds and Maximum number of staff		
Public Toilets	5	
Highest daily number of users over 7 day period - peak season		
Construction Camps/Holiday Camps/Training Accommodation facilities/Lodging Facilities	Permanent Occupation 80 Casual Occupation 65	
Maximum Occupancy/Number of beds		

Table 4C: Tank capacity residential - all waste flows

Dual or Single Tank - Capacity in Litres									
	On-site roof water tank supply			**Bore, spring or restricted supplementary supply to rain water tank**			**Unrestricted supply (1)**		
Occupancy	**1st tank**	**2nd tank**	**Single tank**	**1st tank**	**2nd tank**	**Single tank**	**1st tank**	**2nd tank**	**Single tank**
2	**1160**	**580**	**1740**	**1200**	**600**	**1800**	**(1)**	**(1)**	**(1)**
4	**2320**	**1160**	**3480**	**2400**	**1200**	**3600**	**(1)**	**(1)**	**(1)**
5	**2900**	**1450**	**4350**	**3000**	**1500**	**4500**	**(1)**	**(1)**	**(1)**
6	**3480**	**1740**	**5220**	**3600**	**1800**	**5400**	**(1)**	**(1)**	**(1)**

Dual or Single Tank - Capacity in Litres									
	On-site roof water tank supply			Bore, spring or restricted supplementary supply to rain water tank			Unrestricted supply (1)		
7	4060	2030	6090	4200	2100	6300	(1)	(1)	(1)
8	4640	2320	6960	4800	2400	7200	(1)	(1)	(1)
9	5220	2610	7830	5400	2700	8100	(1)	(1)	(1)
10	5800	2900	8700	6000	3000	9000	(1)	(1)	(1)

Table 4D Tank Capacity Residential – Greywater–general Flows

Dual or Single Tank - Capacity in Litres									
	On-site roof water tank supply 130L/p/day			Bore, spring or restricted supplementary supply to rain water tank 140L/p/day			unrestricted supply		
Occupancy	1st tank	2nd tank	Single tank	1st tank	2nd tank	Single tank	1st tank	2nd tank	Single tank
4	1320	650	1970	1360	680	2040	(1)	(1)	(1)
5	1650	825	2475	1700	850	2550	(1)	(1)	(1)
6	1980	990	2970	2040	1020	3060	(1)	(1)	(1)
7	2310	1155	3465	2380	1190	3570	(1)	(1)	(1)
8	2640	1320	3960	2720	1360	4080	(1)	(1)	(1)
9	2970	1485	4455	3060	1530	4590	(1)	(1)	(1)
10	3300	1650	4950	3400	1700	5100	(1)	(1)	(1)

Table 4E Tank capacity residential – blackwater flows

Single Tank - Capacity in Litres			
	On-site roof water tank supply 50L/p/day	Bore, spring or restricted supplementary supply to rain water tank 60L/p/day	unrestricted supply
Occupancy	Single tank	Single tank	Single tank
4	1400	1480	(1)
5	1750	1850	(1)
6	2100	2220	(1)
7	2450	2590	(1)
8	2800	2960	(1)
9	3150	3330	(1)
10	3500	3700	(1)

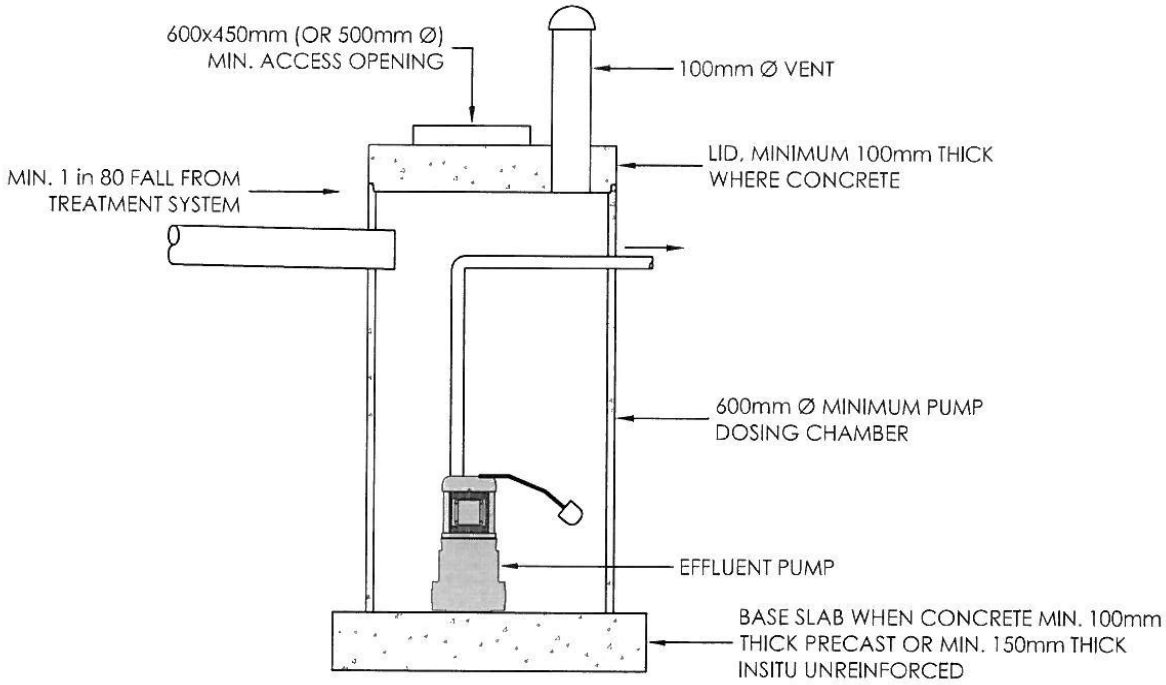
Note (1) Must be confirmed through site specific and conservative design.

4.6 Dosing chambers

Dosing chambers are to be sized to ensure that a single dose delivers at least 5 -10 times the volume of the distribution field pipe work, or the minimum chamber sizes as noted below, whichever is the larger. A sequencing valve may be specified to split the field and reduce the dose volume and the required chamber size.

General criteria

- Minimum chamber capacity to be 50% of the daily design flow ie. (0.5 times DF).
- Maximum chamber capacity to be 150% of the daily design flow ie. (1.5 times DF).
- Pump and siphon chamber bases are to be precast and integral with the chamber or minimum 150mm thick reinforced concrete where ground bearing is at least 50kPa. Where ground bearing is less than 50kPa the base shall be specifically engineer designed.
- Chambers are to be manufactured from sulphate resistant concrete or other approved water and corrosion resistant material. Chambers are to be manufactured to the requirements of AS/NZS 1546.1 2008.
- Tanks subject to vehicular loads to be subject to specific engineering design and be supplied with load carrying certification.
- All dosing chambers are to be fitted with a high level visual alarm wired to a separate electrical circuit to the pump.
- All pump chambers are to be fitted with quick release pump fittings which are easily accessible to allow for the removal of the pump.
- As required by the Gisborne District Council Engineering Code of Practice pump chambers are to be vented to limit the build up of odours. A 100mm nominal bore induct vent is to be fitted to the chamber inlet or cover.
- All fittings are to be made using collars cast into the walls or lid and shall be made water proof.

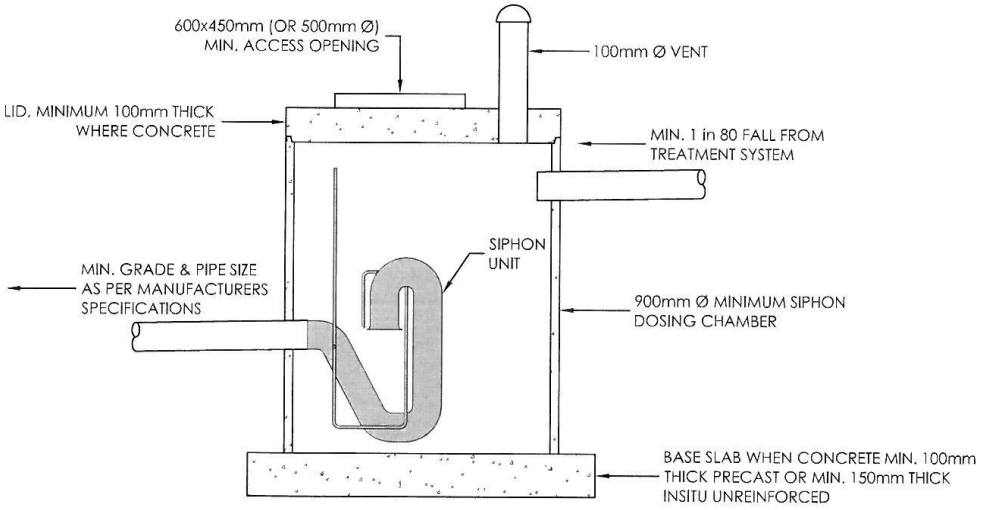


TYPICAL PUMP CHAMBER

SCALE A4 1:20

NOTES:

1. ENSURE SIDEWALL CLEARANCE ALLOWS FOR UNIMPEDED OPERATION OF FLOATS.
2. CLEARANCES SHOWN ARE MINIMUMS, ACTUAL CLEARANCES FOR SPECIFIC PUMPS AND SIPHONS WILL NEED TO BE CHECKED WITH THE MANUFACTURER.
3. WHERE GROUND BEARING IS LESS THAN 50kPa THEN THE CHAMBER BASE SLAB SHALL BE SPICIFICALLY ENGINEER DESIGNED.

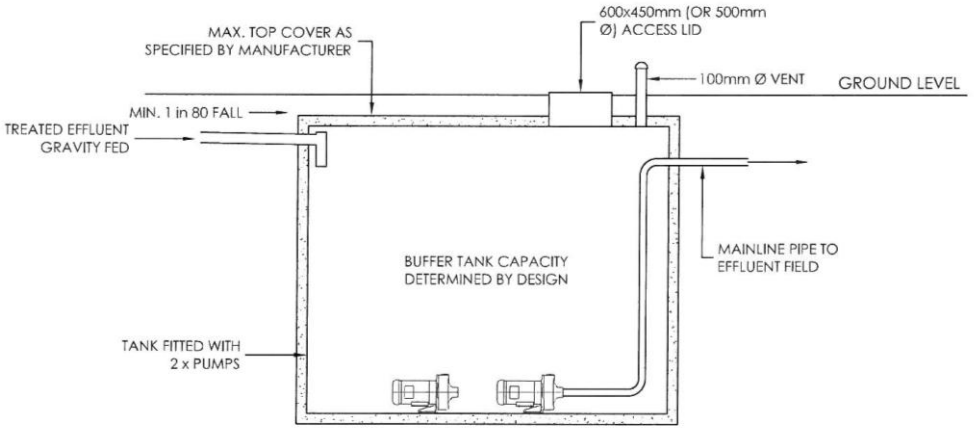


TYPICAL SIPHON CHAMBER

SCALE A4 1:20

4.7 Buffer tanks

Buffer tanks may be incorporated into large scale treatment systems for short-term storage of effluent before it is released, in controlled doses, into the land application system during period of low inflow when the buildings are not in use. Buffer tanks can be suited to design for marae and institutional or commercial buildings where there is intermittent flow or occasional extra high flows but also times during the week when inflow is negligible. Use of buffer tanks can reduce the scale of a land application system, which if designed full scale for peak demand, would be under utilised.



CROSS-SECTION
TYPICAL BUFFER TANK SET UP
SCALE A4 1:50

General criteria

- The capacity of any buffer tank specified within a design is to be determined by specific design.
- Tanks are to be manufactured from sulphate resistant concrete or other approved water and corrosion resistant material. Chambers shall be manufactured to the requirements of AS/NZS 1546.1 2008.
- Tanks subject to vehicular loads to be subject to specific engineering design and be supplied with load carrying certification.
- All buffer tanks are to be fitted with a high level visual alarm wired to a separate electrical circuit to the pump.
- Two pumps are to be fitted within the buffer tank. The pumps should be controlled to alternate duty between doses. If one pump should fail then the alarm should activate and the other pump will become the full time duty pump.
- All buffer tanks are to be fitted with quick release pump fittings which are easily accessible to allow for the removal of the pump.
- Buffer tanks are to be vented to limit the build up of odours. A 100mm nominal bore induct vent is to be fitted to the chamber inlet or cover.
- All fittings are to be made using collars cast into the walls or lid and shall be made water proof.

4.8 Holding tanks

Permanently established holding tanks may be used in situations like holiday homes or temporary accommodation units. They can be used for either:

- a permanently established building or public sanitary facility connected to the holding tank(s) which are on the same property or land as the building or sanitary facility; or
- collecting and storing the contents of campervans and mobile homes foul water tanks.

There is no discharge to the land at the site of the tank. The contents of the tank must be emptied to a septic tank servicing vehicle for off-site disposal. Holding tanks can be suitable for occasional use holiday batches but are not suitable for frequently occupied dwellings.

Use of holding tanks is considered on a case-by case basis. Control is maintained over time through conditions of resource consent to ensure pumping out and removal of wastewater by an approved person to an authorised discharge point occurs and sewage spills or overflows on the property are prevented.

Change in building usage to permanent occupancy generates increased volumes of wastewater for off-site disposal and can become unaffordable to service. Control is maintained through resource consent conditions to ensure non-authorised discharges do not establish over time.

Applications for resource consent will consider if:

- The holding tank(s) are permanently established in or on the ground.
- The discharge is human wastewater and contains no other hazardous substances.
- The building or activity serviced by a holding tank(s) is used intermittently and for short duration.
- The holding tank can be emptied at a frequency that avoids nuisance and adverse environmental effects.
- The land containing the holding tank is not likely to be subject to inundation, slippage, subsidence or erosion.
- The holding tank is not likely to induce inundation, slippage, subsidence or erosion.

General criteria

- The tank/s must meet the requirements set out in AS/NZS 1546.1:2008 – On-site domestic wastewater treatment units Part1: Septic Tanks, as relevant to holding tanks.
- Extensions and lids must finish above ground level.
- Lids must be constructed to prevent access of unauthorised people.
- Tanks must be vented.
- Tanks must be installed to overcome hydrostatic up-lift when emptied.
- The tank outlet must be sealed and water-tight. Dual tanks with a joiner – the second tank's outlet must be sealed.
- The tank/s capacity must have adequate capacity for the specified flow (all-waste, blackwater or greywater).
- Permanently established systems must be capable of holding a minimum of 14 days wastewater flow and an additional two days minimum emergency storage capacity.

Calculated volumes of wastewater flows shall be no less than the flows listed in Table 4A Wastewater Flow Design Allowances.

- Capacity of a holding tank system is the volume of the tank/s below the invert of the inlet/s.
- The tank/s must be positioned where they can be safely accessed in a reasonably unimpeded manner for the removal of accumulated sludge using pump-out equipment.
- Permanently established tank/s must have high water visual indicator or alarm to activate when the tank has two days (48 hours) storage capacity remaining. Acceptable visual indicator and alarm systems include:
    - A floating flag or indicator clearly marked to show tank fill levels; or
    - Electric alarm with both visual and auditable warning system to activate at set tank fill levels.

4.9 Outlet filters

Outlet filters control the discharge of suspended solids in the effluent leaving the septic tank by preventing carryover of gross solids and scum. They are of particular benefit during peak hydraulic and/or organic flows, but filters also provide a positive effect under all flow conditions.

General criteria

Specifications for outlet filters shall meet: AS/NZS 1546.1:2008 On-site domestic wastewater treatment units Part 1: Septic tanks clause 3.4.2 and Appendix D

The outlet filter should have capacity to prevent the discharge of suspended particles of greater than 3 mm, and ensure Total Suspended Solids (TSS) of less than 100g/m³.

Outlet filters should be capable of performing with minimal maintenance.

Outlet filters should be easily accessible and removable for maintenance and replacement purposes.

4.10 Pumps, siphons and dosing devices

An effluent pump, siphon or another flood-losing device is required for disposal of effluent to land application systems that are distant or elevated in relation to the septic tank.

It is critical that the pumping or dosing device is largely maintenance free and that it provides the required duties to satisfy design loadings and system performance.

General Criteria

- Pumps, siphons and other flood-loading dosing systems must be constructed from materials suitable for septic tank effluent.
- A device or pump must have a capacity to discharge the design dose against any physical or imposed head.
- Must be statically mounted and protected from the elements.
- Pumps shall be wired to operate automatically and have an outdoor switch for isolation of the pump for servicing.
- Quick release pump fittings should be installed which are easily accessible to allow for the removal of the pump.
- Pumps shall be provided with a visible high level alarm to indicate pump failure.

- Design calculations for a specified pump or dosing system must be presented within the system Design Report.
- The pump performance specifications must be matched to the appropriate hydraulic requirements of the system. This must take into account the flow, head loss, and pressure requirements of the system.
- A dosing pump must be housed in a pump chamber that has storage capacity to match the electrical starting requirements of the pump motor and to cope with the design flow.

4.11 Grease traps

Inclusion of a suitably sized grease trap or grease arrestor is required on commercial institutional buildings with kitchens. Under bench 'grease converter' units may also be suitable for small scale, low flow kitchen uses. These systems require regular addition of a chemical to aid the process and for small scale commercial kitchens should be managed within a premise Food Control Plan. Manufactures specifications for these systems must be consulted to determine their suitability to the proposed use.

The size and depth of a grease trap or grease arrestor must be based on the peak outflow from the kitchen and be sufficient to allow the cooling of the wastewater and separation of the fats and grease and excessive solids from the main flow.

Grease traps require regular cleaning to prevent the collected material being washed to the treatment system tanks during high flows.

4.12 Advanced treatment systems

Advanced treatment systems or aerated treatment systems include septic tank/intermittent sand filter systems, recirculating sand filter systems and proprietary aerated systems - AS-AWTS (activated sludge aerated wastewater treatment system) and BF-AWTS (bio-filter-aerated wastewater treatment system).

Intermittent (single pass) and recirculating sand filters can be built on-site and are used for the treatment of advanced primary septic tank wastewater to secondary, or for some recirculating filters, advanced secondary effluent quality standards. The treated effluent is collected from the system for distribution into an appropriate land application system.

Specification filter media used in mound systems is used within the filters. The filters are intermittently, and preferably timer dose loaded with controlled volumes of effluent to achieve a small even dose across the filter surface and to avoid development of anaerobic conditions and premature clogging of the filter. The quality of effluent from the septic tank is also an important factor in long-term performance of sand filters.

Intermittent and recirculating sand filters and the associated design criteria are fully described in Auckland Regional Council Technical Publication No.58 (TP58) Third Edition 2004 – Section 7.4 On-site Wastewater Treatment Options. Sand filter design consistent with criteria set out in TP58 is accepted for design of sand filters in the Gisborne District with exception of a 35mm maximum loading rate being applied for advanced primary effluent.

Intermittent and recirculating sand filters have generally been superseded by the development and marketing of proprietary systems designed to achieve similar effluent treatment standards.

General criteria – proprietary systems

- The advanced wastewater-treatment system has sufficient collection capacity to receive peak influent from buildings or sanitary facilities connected to it and treatment capability for that influent. Design flow allowances shall comply with Table 4A.
- Advanced wastewater treatment unit must be capable of producing an effluent that has a quality equal to or better than 20g/m³BOD5 and 30g/m³ SS.
- Proprietary advanced wastewater-treatment systems must have a Producer Statement and a Secondary-effluent Producer Statement accepted by the Gisborne District Council.
- A proprietary advanced wastewater-treatment system shall be installed, operated and maintained in accordance with manufacturer's design specifications, including regular maintenance servicing by a person with sufficient expertise, and desludging by a registered offensive trade operator.

4.13 Greywater systems

Supplementary document

Gisborne District Council Wastewater Design Guidelines Technical Report 2010 – Composting Toilet Systems and Greywater Systems, provides information and additional context for the Guidelines below.

The Guidelines refer to four generalised types of greywater systems, each with a number of possible pre-treatment devices, and discharge/distribution methods. The four generalised types of greywater systems are numbered Type 1 to Type 4, summarised in Table 4F.

Table 4F: Summary of four generalised types of greywater systems

Type of Greywater System	Source	Pre-Treatment	Discharge
Type 1: Greywater Treatment for Land Application	Greywater–general (all greywater sources)	Primary (septic), bioreactor or secondary treatment	To conventional systems and subsurface irrigation.
Type 2: Greywater Treatment for Land Application and Recycle Toilet Flushing	Greywater–general (all greywater sources)	Advanced secondary treatment plus automatic disinfection.	To conventional systems, irrigation systems and toilet flushing.
Type 3: Greywater Flow Filtration and Recycle for Irrigation and Toilet Flushing(1).	Greywater – lite, (bath, shower and washing machine)	Soap and lint filters and chlorine disinfection.	To subsurface irrigation and toilet flushing (1).
Type 4: Greywater Diversion and Recycle for Irrigation	Greywater – lite, (bath, shower and washing machine)	Coarse screen and surge tank with no storage of greywater longer than 24 hours.	To subsurface irrigation.
Note (1): Filtering and chlorine disinfection of greywater for toilet flushing is achievable but is not a permitted activity in the Gisborne District. This is because of high health risk from partly treated greywater with fluctuating management of manual chlorination. Also because of chloramines production in the recycled toilet water and subsequent release of the same within the dwelling. Chloramines can cause adverse health reactions for some people.			

Unless greywater recycling for irrigation and/or toilet flushing is proposed, when considering two treatment systems - a black water system and a greywater treatment system - it is recommended, and likely to be more efficient, to have one 'all-waste' system to handle both black water and greywater. Greywater recycling only uses flows from the bath, shower and washing machine and another treatment system is required for laundry tub and kitchen greywater. A third system for toilet wastewater is needed if this blackwater is not combined with laundry tub and kitchen greywater.

General criteria

- The greywater discharge shall not contain any:
    - human waste flows from toilets, water closets or urinals, or
    - prohibited discharge unless the system is specifically designed for the waste
- The greywater shall pass through a treatment unit which includes a filtration system before being discharged into land.
- Septic tanks and tank outlet filters used for gerywater systems shall meet the same requires as all-waste septic tanks.
- The treatment system shall have sufficient capacity to receive peak influent from sanitary facilities connected to it and treatment capability for that influent and specific use. Design flow allowances shall comply with Table 4A and sludge accumulation rates with Table 4B.
- The setback and clearance distances listed in Appendix 5 shall be met.
- Any greywater diversion system shall be able to automatically divert to either a sanitary sewer or a wastewater treatment-unit if blockages occur that result in malfunction.
- The greywater system shall be operated, maintained and serviced in accordance with manufacturer's specifications by a person with sufficient expertise.

Design flow volumes residential

Design flows should be based on a minimum of two people and the number of bedrooms set out in Table 4A.

The design greywater discharge volumes for the three types of greywater are:

- Greywater-general - Shower, bath, handbasin, laundry tub, washing machine, kitchen. Based on 130, 140 and 160 litres person/day dependant on water supply.
- Greywater- heavy - Laundry tub and kitchen. Calculate as 10% to 20% of Greywater-general flow
- Greywater-lite - Shower, bath and washing machine. Calculate as 80% to 90% of Greywater-general

Design flow volumes commercial and institutional

For non-residential situations, greywater flow volumes should be based on the types of fixtures and design all-waste flows from Table 4A.

Greywater pre-treatment options

The pre-treatment component of the four types of greywater systems are described in the following sections.

Type 1: Greywater treatment for land application

This system generally comprises a pre-treatment of either:

(a) Primary treatment septic tank, similar to a traditional all-waste on-site septic tank,

(b) (b) Proprietary "bioreactor" tank filled with bark and gravel through which the incoming flow drains freely to encourage worms, slaters and aerobic bacteria to feed on the solids (organic matter, soap, lint etc.). Note: Can be regarded as secondary treatment if can meet treated effluent quality as in (c), or

(c) Secondary treatment effluent with a quality equal to or better than 20g/m^3 BOD_5 and 30g/m^3 SS for 90% of samples and not exceeding 30g/m^3 BOD_5 and 45g/m^3 SS. It typically is the effluent discharged from processes such as 'aerated' waste treatment systems, sand filters, or wetlands.

The minimum pre-treatment septic tank sizing is based on the sludge/scum accumulation rate, the desludging frequency and daily inflow, or 1,800 litres, which ever is the larger. The proprietary "bioreactor" tank sizes are as per manufacturer's specifications.

The tank may be a single or multiple chamber tank. Desludging frequency should be based on the primary chamber. That is, tanks with compartments must be desludged more frequently than those of equal size without compartments as the bulk of sludge settles in the first compartment. The final outlet from the tank should be fitted with an effluent outlet filter.

For "bioreactor" tanks, these are provided off-the-shelf by the manufacturer with full instructions as to installation and the requirements for suitable bark and gravel fill.

Type 2: Greywater treatment for land application and toilet flushing

This system comprises 'advanced secondary treatment' and automatic disinfection. This high level of treatment for the Type 2 greywater system has been chosen as it can treat all sources of greywater (including the laundry tub and kitchen) and can consistently achieve a high effluent quality, and hence has the least risk to human health when recycled to flush the toilet or for irrigation.

Advanced secondary treatment involves an aerobic biological treatment process with pre-treatment via a septic tank compartment, aeration of suspended and fixed film bacteria, final settlement and disinfection to remove harmful microorganisms. Typical effluent quality from such systems is a biochemical oxygen demand (BOD) level of better than 15g/m^3 and a suspended solids (SS) level of better than 15g/m^3.

Disinfection refers to the selective reduction of disease causing bacteria, parasites and viruses remaining within secondary treated wastewater and is typically achieved by chlorination, ultraviolet (UV) or ozone disinfection. Disinfection does not kill all microorganisms from the wastewater, and this is what differentiates disinfection from sterilisation, but it should limit their ability to reproduce, decreasing their effectiveness. The preferred method is chlorination using automated flow proportionate chlorine dosing with continual online monitoring by redox probe to ensure chlorine doses are sufficient and that the required 0.5ppm chlorine residual is maintained. UV and ozone disinfection are not recommended as their effectiveness requires certainty that the treated wastewater will be consistently high quality.

Type 3: Greywater flow filtration and recycle for irrigation and toilet flushing

This treatment system comprises a number of filters and settling tanks and chlorine dosing tablets. Manual addition of chlorine tablets are used as per manufacturer's recommendations to keep the level of chlorine in the outlet water between 0.5 and 2 ppm.

Only the greywater-lite from the bath, shower and washing machine can be used. The discharge water can be used for irrigation. Use for toilet flushing is possible but due to potential health risk use for toilet flushing indoors is not a permitted activity in the Gisborne District.

Type 4: Greywater diversion and recycle for irrigation

These systems only have one or several relatively coarse screens to remove materials that may clog pumps, block pipes or irrigation systems and hence are called diversion systems rather than 'pre-treatment' systems.

Only the greywater-lite from the bath, shower and washing machine can be used. The discharge water can only be used for irrigation and NOT for toilet flushing.

To minimise the potential health risk from irrigating with untreated greywater the system must meet the following criteria:

- The greywater must not be stored for longer than 24 hours. Therefore it must have a system to drain the tank at least every 24 hours if not irrigating or it has not used up all of the temporarily stored greywater – greywater can generate odours if stored greater than 24 hours.
- Only subsurface irrigation (to a minimum depth of 100mm below ground surface) is permitted. Not permitted for surface spray of 'covered surface' irrigation systems due to likely contact with humans.
- Contains a manual and automatic overflow system where if the surge tanks are full, or in the event of a failure or blockage, the water overflows to the household conventional wastewater treatment system.
- Regular cleaning of screens and flushing of the surge tank as per manufacturer's recommendations.
- These systems can also be connected to a soil moisture probe in the irrigation area so the flows are diverted to the conventional wastewater treatment system when the soil is saturated. This can be used as a safety precaution if the irrigation area becomes waterlogged. However, for the system to work year round, and gain credit against the area required for the total wastewater system, the irrigation area should be designed to operate through summer and winter.

Reducing greywater volumes and toilet flushing

The most effective way of reducing the area required for land application of greywater is to reduce the volumes of greywater generated in the first place. Greywater volumes can be reduced through two ways:

- Using water saving devices – reduces volumes of water used, and hence discharge volumes are reduced. Water saving devices can reduce water use by up to 20%.
- Recycling treated greywater to flush the toilet – reusing some of the discharged greywater to flush the toilet, so the discharged greywater volumes to the environment are reduced. (Note: this recycled greywater then becomes blackwater to join the system that treats the toilet wastes. The blackwater discharged volumes remain the same, but reduced greywater discharge volumes mean the total wastewater volumes discharged are reduced). Recycling treated greywater to flush the toilet can reduce greywater volumes discharged to the environment by up to 20%.

Of the two methods, the use of water saving devices is the preferred method, as there are no potential health risks, compared to recycling inadequately treated greywater to flush the toilet.

The potential risks from using greywater as a source of recycled water for toilet flushing can be adequately managed by appropriate disinfection of the recycle flow.

Recycling treated greywater to flush the toilet

These Guidelines refer to two treatment methods to recycle treated greywater to flush the toilet:

- Advanced secondary treatment plus automatic disinfection.
- Separate soap and lint filter and chlorine disinfection.

Of these two methods, the advanced secondary treatment and automatic disinfection provides the best public health protection due to the high quality treated effluent. However, it comes at a significant cost for proprietary systems. Advanced secondary wastewater systems need to be designed and installed by specialist wastewater engineers and contractors. Refer to individual manufacturer's specifications for details. In general, advanced secondary treatment is expected to be equal to or better than 15g/m^3 BOD_5 (5-day biochemical oxygen demand) and 15g/m^3 SS (suspended solids), and is often as good as 10/10 BOD/SS. Systems that can provide advanced secondary treatment are predominantly sand filters, advanced textile filters and packed bed reactors.

The significantly lower cost 'separate soap and lint filter and chlorine disinfection' has higher potential health risks and can reduce indoor air quality from the release of chlorine by-products generated from chlorination. The 'separate soap and lint filter and chlorine disinfection' system is highly dependent on regular (weekly) attention from the owner/occupier and therefore has a high likelihood of being inadequately managed over time. For these reasons this type of system is not generally accepted in New Zealand and is not a permitted activity in the Gisborne District. The Guidelines include information to allow comparison of the risks.

Table 4G.1: Design requirements for recycling treated greywater for toilet flushing

Feature	Type 2: Greywater Treatment System -Advanced secondary treatment plus automatic disinfection	Type 3: Greywater Treatment System - Separate soap and lint filter and chlorine disinfection Not permitted activity in the Gisborne District
Greywater Source	Greywater – regular (all greywater sources from kitchen, laundry tub, bath, shower and washing machine)	ONLY Greywater – lite (bath, shower and washing machine, excluding laundry tub and kitchen)
Disinfection	Automatic disinfection by chlorination, ultraviolet or ozone disinfection.	Only chlorine disinfection due to the presence of suspended solids. Manual addition of chlorine tablets permitted.
Treated Greywater Use	Recommend for toilet flushing only. NOT to be used where in direct contact with people.	Mandated for toilet flushing ONLY and CANNOT be used for any other non-drinking water use (such as outdoor taps for washing the car of garden watering)
Building Use	For public and private dwellings	Only for single family private residential dwellings.
Owner Responsibilities	These advanced treatment systems usually come with a scheduled maintenance agreement with a certified maintenance company, on a 6 to 12 month frequency.	This system relies on weekly addition of chlorine tablets by the owner/operator as well as long term general maintenance that can be carried out by the owner/operator or a certified maintenance company.

Greywater land application systems

There is not a significant difference in the land application systems for blackwater and greywater, except the highest - least conservative - design loading rates into soils can be used for greywater systems if site conditions are suitable. The types of land application systems are the same due to the highly variable contamination levels in greywater, depending on the greywater source. Irrigation of greywater is dependant on the level of treatment ad subsequent quality of the greywater.

Table 4G.2 Greywater application to different irrigation systems

Type of Greywater System	Source	Pre-Treatment	Irrigation System		
			Shallow subsurface	Covered surface	Spray
Type 1: Greywater Treatment for Land Application	Greywater– general (all greywater sources)	Primary (septic) treatment tank.	Not suitable for fine-drip OK for coarse-drip and LPED (See Note 1)	Not suitable (See Note 1)	Not suitable (See Note 1)
Type 2: Greywater Treatment for Land Application and Recycle Toilet Flushing	Greywater– general (all greywater sources)	Advanced secondary treatment plus automatic disinfection.	Yes (fine drip)	Yes (fine drip)	Yes
Type 3: Greywater Flow Filtration and Recycle for Irrigation and Toilet Flushing	Greywater – lite, (bath, shower and washing machine)	Soap and lint filters and chlorine disinfection.	Yes (coarse drip and LPED)	Not suitable (See Note 2)	Not suitable (See Note 2)
Type 4: Greywater Diversion and Recycle for Irrigation	Greywater – lite, (bath, shower and washing machine)	Coarse screen and surge tank with no storage of greywater longer than 24 hours.	Yes (coarse drip and LPED)	Not suitable (See Note 2)	Not suitable (See Note 2)

(1) Type 1 Greywater Systems are not suitable for drip emitter, covered surface or spray systems due to first the primary effluent quality is not suitable for 'fine-drip' emitter distribution, and second, the potential health risk of the primary treatment level of the 'greywater-regular', which includes the laundry tub and kitchen greywater. However, 'coarse-drip' and LPED irrigation is suitable for soil categories 2 to 5 as it is designed for effective subsurface land application of primary treated greywater.

(2) Type 3 and 4 Greywater Systems are not permitted as surface irrigation systems (covered surface and spray) due to the potential health risks. Although Type 3 and 4 Greywater Systems do not contain the laundry tub and kitchen greywater, their lower degree of pre-treatment means that only shallow sub-surface irrigation systems with a minimum depth of 100mm are permitted.

4.14 Composting toilet systems

Supplementary document

Gisborne District Council Wastewater Design Guidelines Technical Report 2010 – Composting Toilet Systems and Greywater Systems, provides information and additional context for the Guidelines. The designer and client should read this information is conjunction with the Guidelines.

4.14.1 Compost toilet systems

Compost toilets are perceived as an environmental alternative to the flush toilet in managing human waste matter in a domestic situation. The original waterless compost toilet systems were seen as reducing water use and wastewater output from household activities while at the same time producing a useful by-product in converting human waste into nutrient rich humus. Subsequently, compost toilet alternatives incorporating low-flush pedestals and liquid separation systems have enabled the convenience of a conventional flush toilet while minimising water use and providing a mature compost output.

However, the perceived advantages of this method of handling human waste in a domestic situation is offset by the level of commitment required by the homeowner and/or occupier in supervising and maintaining the composting operation and ensuring that potential environmental and public health effects are minimised while managing a decomposing excreta pile within the confines of a dwelling. These effects relate to odour and vector control, and management of the compost end product in a hygienic and risk free manner. In addition, the value of the humus output as a soil conditioner and nutrient is limited by the low annual volume of end product from a typical family, and the fact that health authorities recommend a minimum of 12 months storage or burial prior to use for this purpose.

4.14.2 Building code requirements

The NZ Building Code Compliance Document for Clause G1 indicates that composting toilets (which come within the definition of a "privy") are to be located at least 3 metres from a dwelling (see Acceptable Solution G1/AS1, section 5.02). In addition, for dwellings in urban areas serviced by mains sewerage, the Building Code requires the toilet system to be connected to the sewerage system (Clause G13.3.3).

However the Building Act 2004 (Part 2, section 67) enables the building consent authority to grant a waiver or modification of the building code subject to appropriate conditions. Most modern commercial composting toilet systems, when used and operated within these Guidelines, can readily achieve the personal hygiene requirements envisaged under Clause G1, and hence can be consented for installation and use within a dwelling.

Care must be given to ensure the composting toilet unit can be accommodated within the design of the building. Sufficient height between the toilet and the composting chamber is required and unimpeded access to the chamber for removal of the end product. Leachate and liquids from the composting unit must be managed through an approved system, usually a septic tank and land application trench suited to the quality of the discharge.

4.14.3 AS/NZS 1546.2 requirements

Waterless composting toilets are covered by the joint Australian/New Zealand Standard AS/NZS 1546.2:2008 [Ref. 1]. The Standard contains provisions dealing with the following matters:

- performance requirements;
- design factors (public health, 3.3; construction, 3.4; composting requirements 3.5);

- end product quality (Appendix A);
- sampling end product (Appendix C);
- operation & maintenance (Appendix H); and
- safe handling of solid/liquid end products (Appendix K).

4.14.4 General criteria

Council will consider consent applications for composting toilets which address the following issues:

- The compost discharge shall only contain human waste flows from toilets or urinals.
- The material is subject to aerobic decomposition for a minimum of 12 months from the last addition of raw sewage.
- The discharge shall be worked into or buried under a minimum soil cover of 200mm.
- The setback and clearance distances listed in Appendix 5 are met.
- The disposal area used for the discharge of compost material shall be used only once in any 12 month period
- The property site area must be suitable to accommodate an alternative waterborne on-site wastewater management system in the event that the compost toilet malfunctions or that future owner preferences require replacement of the system with a flush toilet.
- Any proposed commercial toilet system must meet the performance requirements of clauses in the Building Code in respect of durability (B2), personal hygiene (G1), ventilation (G4) and foul water (G14).
- The application must be accompanied by a BRANZ Appraisal Certificate or a manufacturer Producer Statement in respect of the system meeting the Building Code requirements and AS/NZS 1546.2:2008.
- In the absence of a BRANZ Appraisal Certificate or manufacturer Producer Statement the application should be accompanied by evidence regarding the system meeting the Building Code requirements and AS/NZS 1546.2:2008, the evidence prepared by people recognised as having authority in such matters.
- For on-site built units, certification is required by a suitably qualified person as to design and construction methods being satisfactory, and that the system meets the Building Code and AS/NZS 1546.2:2008 performance requirements.

Council requirements for managing compost end products

Method	Requirement	Notes
Collection for off-site management	Registered Contractor	Signed contract required
Safe Burial on the Site	Define the area for compost disposal including the size of the area	Must be adequate for the proposed disposal frequency per annum
	Distance to the dwelling, other buildings, and boundaries	Minimum distances 1.5m to building foundations and boundaries.
	Other uses of area	Disposal site must be a reasonable distance from food crops (burial around fruit trees is OK.)
	Soil structure	To determine suitability of the disposal site (information can be obtained during the site assessment for the greywater system)
	Distance to waterways	Minimum of 30m to a bore or waterway.
	Distance to groundwater	Base of disposal area to be 600mm minimum above seasonally high groundwater
	Slope and contour of disposal area	Recommended slope not greater than 20 degrees (or 1 in 3)
	Depth of soil cover	Recommended minimum cover over compost end product of 200mm of good quality topsoil.

4.14.5 Types of composting systems

Low capacity continuous

These units consist of a compost chamber and toilet seat sized to fit in a normal toilet compartment in a dwelling. They were initially developed for intermittent use in recreational dwellings (such as baches and cribs in the NZ context) where weekend or short term holiday use gave the contents time to decompose and mature between occupancy periods. Addition of mixing and fan ventilation technology has enabled their permanent use for low level occupancy. Relatively frequent servicing for removal of the end product is tailored to occupancy level and duration of use.

High capacity continuous

These units consist of an inclined compost chamber installed below floor level in a basement or outdoor chamber with the toilet seat and pedestal fitted within the normal toilet compartment in a dwelling. They are suitable for permanent use for both low and high level occupancy, with annual removal of the compost end product required. These systems may be naturally ventilated or provided with fan assisted ventilation.

Low capacity batch

These units consist of a human waste container and toilet seat sized to fit within a normal toilet compartment. When the waste container is full it is replaced with an empty container and removed to a secure location to allow the contents to decompose and mature over several months.

High capacity batch

These units consist of a either a large capacity human waste replaceable container within the toilet compartment in a dwelling, or alternatively with the replaceable container or containers located in a basement or outdoor area under the floor below a toilet seat and pedestal located within the normal toilet compartment. One system uses multiple container units rotated sequentially on a turntable (carousel) with eventual emptying to a compost maturing container or to soil burial. These systems are usually fan ventilated.

Rotating drum composters

These units are installed within a larger than normal toilet compartment due to the size of the rotating drum mechanism. Human waste is received into the horizontal drum which is vented to assist moisture evaporation, and turned regularly (at 4 to 6 revolutions every 3 days or so) by a handle mechanism to enable mixing of bulking agent and solid waste matter.

Bin maturing

Batch and drum units provide less mature compost output than continuous composters thus requiring further processing via maturing bins or subsoil burial prior to being used as a soil conditioner supplement. Hence the need to provide an area for container storage over 6-months or more, or to provide a separate compost storage and maturing bin. Some batch units use a degradable liner bag in the toilet container to enable clean transfer of waste material direct to the compost bin. Degradable liner bags can last up to 3 months before beginning to deteriorate.

Optional extras

These include:

- urine separation as a means of reducing moisture content – the urine is ether transferred to treatment in the greywater system or separately conveyed to a subsoil soakage system;
- fan ventilation options in either 12 volt or 240 volt; and
- solar assist ventilation systems.

Mini-flush systems

A low flush toilet unit is sited above a separator unit which uses centrifugal force to spin out the urine and flushing water to a holding tank, or to the greywater treatment unit. Faecal solids drop direct into the composting chamber. These systems can be attached to a low capacity batch/continuous system or a high capacity continuous system.

DIY systems

Numerous references within the environmental literature provide details for DIY units. These include variations on batch toilet systems and continuous high capacity units. BRANZ does not recommend self-designed composting toilets for use in NZ due to the considerable range of manufactured systems available in this country.

Low-flush (worm based) systems

Conventional dual flush toilet units transfer all urine and faecal solids into a decomposition chamber in which worms assist the biological decomposition and processing of the waste. In one system a dual chamber provides alternating load and maturing cycles. The liquid drainage passes to the greywater treatment unit or to a separate treatment and subsoil soakage or evaporator disposal system.

Portable toilet units

In situations where a short term or temporary use is required portable and/or prefabricated compost toilet systems may be preferred to portable chemical toilet units.

Low-flush (worm based) hybrid systems

These units are referred to as "vermicomposter" units. They utilise a single tank with an organic material base filter layer for receiving and treating flush toilet and kitchen wastewater flows. Whereas other waterless and mini-flush compost toilet systems considered above require separate treatment of greywater comprising kitchen, bathroom and laundry flows the hybrid system accepts the kitchen flow leaving greywater comprising bathroom and laundry flows for separate treatment.

4.15 Vermi-culture systems

There are two types of Vermi-culture systems.

Type 1: In the first type of system the waste from the toilet, and water from your kitchen is directed into the tank with worms in it (the vermi tank), while the greywater from the bathroom and laundry is directed to a different tank, or a different part of the tank, which treats that part of the waste. The effluent from the systems can be combined into a batch reactor tank using wood chips and gravel for more filtration treatment. A full description is incorporated with composting systems described in 4.15.5.

Type 2: In the second type of system all waste from toilet, kitchen, bathroom and laundry flows into a single tank and drains through layers of coarse fibre material containing worms which capture and treat the waste matter. The function is essentially a filter for treating liquid waste with worm composting to reduce solids.

4.16 Wetland systems

Supplementary documents

Guidance for design and additional context for design of wetland systems can be taken from the documents:

1) Gisborne District Council, Guideline for the use of horizontal subsurface-flow constructed wetlands in on-site treatment of household wastewaters.
2) Constructed wetland treatment and associated design is described in Auckland Regional Council Technical Publication No.58 (TP58) Third Edition 2004 – Section 7.8.5 Constructed Wetland Treatment.

Small wetlands can be used to further treat effluent from septic tanks to secondary quality. Wetlands are usually built in place in the ground and careful design is needed to make sure the wetland is in the right position where it won't get flooded, is big enough and has enough retention space and flow direction for treating the volume of liquid effluent.

Wetland plants play vital roles in the treatment process and using the right types and enough plants is important. Maintaining the planting and stopping weeds getting established, keeping the right water levels in the wetland and looking after the system over time is necessary to get the best treatment of liquid effluent.

The treated effluent from a wetland is usually gravity fed into a chamber for distribution in to the land application system.

4.17 Bottomless sand filters

The bottomless sand filter is designed similar to an intermittent (single-pass) sand filter and is used for treating wastewater but also allows for infiltration into the underlying soils and doubles as the land application system. Filters can be built above ground but more usually, in-ground. Bottomless sand filters are only suited to soil Category 1 – gravel and sands and Category 2 – sandy loams, and where sufficient clearance to groundwater can be maintained.

Specification filter media used in mound systems is used within the filter. The filter must be intermittently, and preferably timer dose loaded with controlled volumes of effluent to achieve a small even dose across the filter surface and to avoid development of anaerobic conditions and premature clogging of the filter.

The quality of effluent from the septic tank is also an important factor in long-term performance of sand filters and the design criteria below is applicable only to domestic strength wastewater discharged from a septic tank including an outlet filter.

Other wastewater flows - greywater, blackwater or commercial sourced wastewater -requires testing to determine effluent strength. Testing for BOD g/m^3, suspended solids g/m^3 and total fats and grease are required. Comparison of effluent strength against domestic strength wastewater must be done to determine the suitability of the wastewater for sand filtration. Improvement in the primary effluent quality may be required before sand filtration to avoid the clogging of the filter media.

General criteria

- Use only in Category 1 – gravel and sands and Category 2 – sandy loams
- The maximum sand filter loading rate is 35mm/day for domestic strength wastewater. Wastewater discharged from a proprietary advanced treatment system may be applied at a maximum rate of 50mm/day.
- Dual septic tanks fitted with an outlet filter, is required pre the filter, or a proprietary advanced treatment system.
- A precautionary approach must be taken to sizing the septic tanks and large tank capacity is essential.
- A distribution bed must be constructed on top of the filter sand. The distribution bed shall be constructed of drainage aggregated (20 – 60 mm, non-crushed, rounded) and levelled at a minimum depth of 150mm.
- The sand-fill media shall be medium sand free of clay, limestone or organic material - with a grain size of 0.3 to 1.0mm with a uniformity coefficient of 4.
- The sand-fill media shall be:

  Category 1 soils 900mm minimum filter depth

  Category 2 soils 600mm minimum filter depth
- A 50mm thick gravel layer at the base of the filter between the natural sand and the sand-fill is required.
- Preference is for the walls to be plastic lined to ensure that a vertical flow of effluent is achieved through the filter. If the filter is constructed to extend to interface with sand below a layer of imperfectly or poorly drained soils with strong structure, then the walls need not be lined.

- The distribution bed shall be pressure-pump LPED loaded. Sufficient laterals shall be provided to ensure even loading of the distribution bed surface. Laterals shall be spaced a maximum of 600mm apart and a maximum of 300mm from the side walls of the filter.
- Preference is given to timer dose loading over float arm pump activation.
- Dosing frequency across the distribution bed shall be not less than 12 times per day.
- Dosing laterals shall be vented and have flushing points.

4.18 Peat filters

The use of peat as a filter material can be used in systems built in similar way to intermittent sand filters and a peat filter is an option or treating liquid effluent to a secondary quality standard suitable for irrigation. Advanced primary septic tank effluent quality is required. Effluent is dosed intermittently in small amounts over the filter, captured in a bottom slotted pipe, and gravity drained to a dosing dose loaded for land application. Intermittent timer dosing is preferential to ensure the filter is not overloaded during period of high flow. The size and design of the filter and the type of peat used need careful consideration for sufficient treatment. Design loading rates across a peat filter should be 35 – 50mm/d, dependant on the quality of the peat material.

There is no suitable peat source in the Gisborne District, and with suitable product needing to be transported in, it is not cost effective to use peat as a filter media in comparison to using locally sourced specification sand filter media.

4.19 Loading and distribution methods

Loading land application systems can be done several ways. Low pressure effluent distribution LPED loading via pump or siphon, trickle loading via gravity and flood dose loading via pump or siphon. The purpose of dosed loading is to ensure that effluent is spread uniformly and regularly over the design surface area. Trickle and flood loading tend to overload the front sections of the trenches and do not provide for even distribution along the length of the disposal system.

Low Pressure Effluent Distribution (LPED) is the preferred loading method for trenches and beds.

To ensure even distribution of effluent a pump-pressure loaded LPED system must be used for all effluent trench and bed distribution systems and LPED irrigation installed in Category 1 soils and Category 2 soils with a K sat >3.0m/day. Either flood dose loading or LPED loading must be used for systems in Category 4, 5 and 6 soils with design loading rates less than 10mm/day.

Where the entire lateral pipework is dose loaded it is important that each lateral is loaded equally and the discharge is not concentrated into the lowest trenches. This can be achieved by placing a flow control plate at the start of each lateral. The orifice size in each flow plate can only be calculated when the height of each lateral, length and number of outlet orifices are known. Use of flow plates ensures even loading although individual trenches may be of variable length and elevation. Computer software programmes are available for such calculations. A non-return valve at the start of each line ensures the higher elevation laterals do not drain to the lowest laterals between doses and overload the lower trenches.

4.19.1 LPED (low pressure effluent distribution)

The LPED system utilises pump or siphon dose loading from a perforated small diameter pipe insert within standard drain-coil distribution lines in trenches, allowing the jetted flow from the perforations to spread uniformly along the length of the distribution line, and thereby uniformly infiltrating into the subsoil.

All distribution lines should be capped or screw plugged with removable end pieces to enable maintenance for line blockage. Any growths which tend to clog perforations can be dislodged by flooding the line with dilute bleach solution and then flushing to discharge through the uncapped end, disposing of the spent cleaning mixture via temporary soak hole.

4.19.2 Flood loading

This comprises dosing by siphon or pump discharge to a distribution chamber for gravity flow to individual sections of the disposal area. A separate manifold from the distribution chamber to each trench/bed lateral provides a relatively equal loading to each trench. The manifolds are positioned at the same height in the distribution chamber so no one manifold drains at a greater rate that the others. The siphon chamber or pump sump should be sized to provide two to three doses per day rather than one large dose. The distribution lines in the disposal area should not be too long otherwise overloading of the front sections of the system and under loading of the end section will occur. A maximum of 20 meters dosing lengths for flood loading is recommended to provide reasonable distribution where 100mm perforated distribution lines are used.

4.19.3 Drop-box loading

Drop–box loading has historically been used but is inferior to LPED and flood loading systems because of uneven loading, potential overloading and destabilising soils in of the land application area. This system is not frequently used and is no longer considered best practice.

This system only works on sloping sites as it operates on the basis of incremental loading of a series of parallel trenches via gravity flow down-slope. The top drop-box can be either gravity fed direct from the pre-treatment unit, or pump loaded when the disposal area is located up-slope of the pre-treatment unit. The objective of drop-box loading is to operate each section of the disposal area (either trench or bed) by keeping it flooded at a predetermined level set by the design of each drop-box. In relatively free-draining soils this means the top section of the disposal area can be maintained under continuous load for long periods - other sections downhill do not come into operation until overflow takes place from the uphill section.

4.19.4 Alternation of loading

The use of diversion boxes or valves in either gravity or flood dosed loading systems and LPED systems with manifolds or automatic sequencing valves, provides opportunities to rest sections of the land application system.

In gravity loaded systems, temporary overloading the one section of the land application in use is likely due to manual switching between loading and resting phases of the field areas and because an unmeasured volume is dosed over an variable time. For this reason alternating loading is not recommended for gravity loaded systems.

In flood dose loaded and LPED systems the dose must be calculated so the loaded section area receives only the proportional daily flow to that section. The manifold feeding each LPED line of flood loaded trench/bed can be replaced by an automatic sequencing valve that doses each trench/bed in sequence. This means that following a measured dose equivalent to the daily load for an individual trench delivered over several minutes, the trench then "rests" for the remainder of the 24-hour period until its turn comes round again.

Resting of sections of a land application area designed for subsoil soakage will only benefit its long term performance if during the rest period the system fully drains and dries out. Resting has no value in non-free draining soils which remain waterlogged or only slowly drain during the rest period.

The rest period in a free draining system will enable rejuvenation of the infiltrative surfaces by aerobic action and drying. Restoration of loading will then operate at higher infiltration rates which progressively but slowly decrease over the next operational period.

4.20 Sizing and design of land application areas and systems

A land application area should be of sufficient size to assimilate the volume and character of wastewater effluent discharged to it from the treatment unit. The wastewater flow should be distributed evenly over the land application area.

4.20.1 Sizing land application areas

Trench and Bed Length are calculated using **L = Q / (DLR * W)** where:

- L is the trench or bed length in metres
- Q is the wastewater loading in litres/day /millimetres/day/cubic metres, and is determined in accordance with Table 4A.
- DLR is the design loading rate in millimetres/day (litres/square metres/day) DIR is determined in accordance with Table 4H.
- W is the width of the trench or bed in metres. The maximum width of trenches is 0.6metres. The horizontal bottom area must be used to determine the length of trench or bed required. W does not include sidewall area.

Irrigation area is calculated using **A = Q / DIR** where**:**

- A is the area in square metres into which drip lines or LPED lines are to be configured and installed.
- Q is the wastewater loading in litres/day and it determined in accordance with Section 4.1 above.
- DIR is expressed in Table 4H
- The DIR is an areal loading rate over the entire land application area. The actual loading rate at the individual points of discharge (drip emitters or LPED lines) will be considerably higher than the DIR.

4.20.2 Design of land application

Design of the land application system is set out in AS/NZS 1547:2000, as follows:

- Trenches — Appendix 4.5A
- Beds — Appendix 4.5A
- ETA beds/trenches — Appendix 4.5A
- Mounds — Appendix 4.5B
- Irrigation areas — Appendix 4.5C or 4.5D

These design specifications should be read and applied in conjunction with additional information in the Guidelines - Table 4H and associated design criteria notes. Intermittent sand filter or bottomless sand filters are described in the Guidelines at 4.18.

4.20.3 Irrigation systems

There are two irrigation systems included within the Guidelines which are considered best practise for irrigation of domestic wastewater and these will be considered as permitted activities within the RPDLW - Discharges Plan if installed 'in-ground'.

These are:

- Pressure compensation dripper irrigation systems (PCDI) for irrigation of secondary treated effluent.
- LPED subsurface irrigation systems for irrigation of advanced primary treated effluent.

PDCI installed directly to the surface of the soil under a cover of mulch of bark is not a permitted activity within the RPDLW - Discharges Plan and a resource consent is required to ensure appropriate function and maintenance of the irrigation system.

Other irrigation systems include:

- Low Pressure Pipe (LPP) Surface Irrigation
- Low Pressure Pipe (LPP) Subsurface Irrigation
- Spray irrigation – use sprinklers to disperse disinfected secondary treated effluent over the soil or vegetated area.

LPP irrigation systems have generally been replaced by used of LPED systems and PCDI systems. Layout of irrigation systems on the land surface is not a permitted activity within the RPDLW - Discharges Plan and a resource consent is required. Spray irrigation is not recommended in New Zealand practice and is not a permitted activity within the RPDLW - Discharges Plan.

Descriptions of the function and limitations of these alternative irrigation systems are set out in the Auckland Regional Council Technical Publication No.58 (TP58) Third Edition 2004 – Section 9. The designer must provide sufficient assessment about function and performance of these other irrigation systems before their use will be accepted and a resource consent will be required.

4.20.4 Pressure compensation dripper irrigation systems (PCDI)

Effluent meeting a minimum of Secondary Treated Effluent standard is required for PCDL unless the irrigation system is specifically designed for a lesser quality effluent.

PCDL systems comprise specially configured small diameter plastic lines within which are welded pressure compensating drip emitters. Usually, high quality secondary effluent (and fine filtration, such as 120micron disc filters prior to the irrigation field) is required to feed the small drip emitters to prevent blockages (referred to as 'fine-drip').

A number of dripper line products are available specifically designed to handle more contaminated water, such as less treated greywater, and operate with a coarser filter such as a 40 mesh (referred to as 'coarse-drip').

Commercial companies who market specific types of dripper irrigation lines generally provide guidance on system design, layout and operation. All drip irrigation lines must be installed according to the manufacturer's specifications including wastewater quality requirements. The suitability of the different irrigation systems for the different types of greywater systems depends on the greywater source and type of pre-treatment.

In the Gisborne District, drip lines for secondary effluent have traditionally been installed with 1 metre emitter and line spacing. Research has shown that a more even rate of application can be achieved by reducing emitter and line spacing. Drip line is available with preset 600 millimetre and 300 millimetre emitter spacing's. Use of such drip line is encouraged, along with reduced line spacing, particularly if the drip line is to be installed in heavy soils or in porous soils with shallow groundwater.

To provide an effective even distribution of effluent over the whole design area at rates not exceeding the maximum soil loading rates in Table 4H.

4.20.5 LPED irrigation systems

LPED Irrigation allows for the irrigation of advanced Primary Treated Effluent.

LPED irrigation systems: The LPED lines (perforated dose lines nested within drain coil distribution pipe) are embedded into a shallow and narrow pebble/aggregate filled trench (200mm by 200mm) constructed within a 250mm to 300mm topsoil layer. Closely spaced (1.0m to 1.5m centres) lines ensure that effluent is blotted up into the topsoil along the full length of the line.

The very active biological action within the rich bacteria laden topsoil provides more effective treatment of the septic tank effluent than conventional trenches, while ensuring high transpiration assist due to the carriage water being discharged within the root zone of grass and/or other plantings. Design sizing is based on areal loading, which is the total area within which the LPED lines are installed.

Figure: Improved septic tank and LPED irrigation system

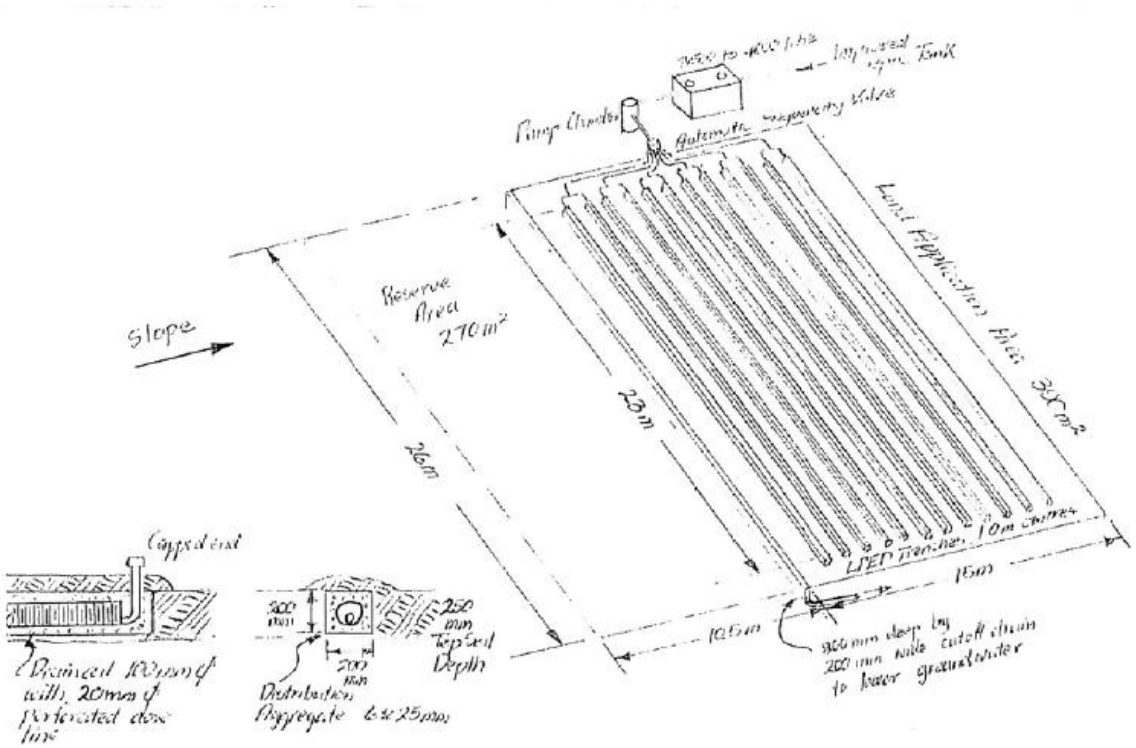


Table 4H Recommended soil loading rates for land application systems

Soil	Soil texture	Indicative Drainage Class	Structure	Indicative permeability (Ksat) (m/d)	Conventional Trenches/Beds			ETS	Mounds (basal area) (Note 1)	Irrigation	
					Primary treatment (septic tank) effluent		Secondary treated effluent			Drip line (mm/d)	LPED (mm/d)
					Conservative rate (mm/d)	Maximum rate (mm/d)	(mm/d)	(mm/d)	(mm/d)	(mm/d)	
1	Gravels and sands	Rapidly drained	Massive	>3.0	20	35	50	-	32	5	-
2	Sandy loams	Well drained	Weak Massive	> 3.0 1.4 – 3.0	20 15	35 25	50 50	-	24 24	5 5	4 4
3	Loams	Moderately well drained	High/moderate Weak/massive	1.5 – 3.0 0.5 – 1.5	15 10	25 15	50 30	- -	24 16	4 4	3.5 3.5
4	Clay loams	Imperfectly drained	High/moderate Weak Massive	0.5 – 1.5 0.12 – 0.5 0.06 – 0.12	10 6 4	15 10 5	30 20 10	12 8 5	16 8 -	3.5 3.5 3.5	3 3 3
5	Light clays	Poorly drained	Strong Moderate Weak/massive	0.12 – 0.5 0.06 – 0.12 < 0.06	5 - -	8 5 -	12 10 8	8 5 5	8 - -	3 3 3	2.5 2.5 2.5
6	Medium to heavy clays	Very poorly drained	Strong Moderate Weak/massive	0.06 – 0.5 < 0.06 < 0.06	- - -	- - -	- - -	5 5 5	- - -	2 2 2	- - -

General Criteria and notes applying to table 4H and design of land application systems

- The Design Loading Rates are based upon the best available information at the time of preparation of the Guidelines.
- Primary-treated effluent from septic tanks will have an effluent quality which has suspended solids content greater than 30g/m3 and a BOD5 greater than 20 g/m3. It includes all waste, grey water and black water effluents.
- Secondary-treated effluent has a quality equal to or better than 20g/m³ BOD5 and 30g/m³ SS. The design loading rates for secondary treated effluent can be used assuming there are no site constraints.
- The values of indicative permeability as K_{sat} are based on the movement of water, and not effluent, through the soil. They are estimates only and shall be used with caution in the determination of soil category and DLR.
- If K_{sat} <0.06 m/d, a full water balance for the disposal area (including effective rainfall, run-off, evapo-transpiration), can be used to calculate disposal area size.
- Indicative drainage classes listed are based on the assumption that drainage of water out of the soil is governed only by the indicative permeability and that external factors play no role.
- The treatment capacity of the soil governs the effluent loading rate in Category 1 soil. Category 1 soils require special design and distribution techniques to help achieve even distribution of effluent over the full design surface for recommended discharge method.
- Distribution line length shall be limited to a maximum length of 20m when distribution lines are gravity trickle loaded.
- Gravity feed pipeline from the dwelling to the primary septic tank/chamber is to be at a gradient of no less than 1 in 80. Where separate primary and secondary tanks are used then the pipe gradient between the two tanks is to be no less than 1 in 80. The invert of tank outlet to the invert of the distribution trench to be at a grade of no less than 1 in 60. Distribution trenches to be laid at a grade of no greater than 1 in 200 and can be inter-linked at the downstream end. Fall between tanks and the disposal field must be considered and designed in line with best industry practise.
- In areas where there is insufficient natural soil depth or separation distance between the disposal zone and groundwater, the ground level should be built up with topsoil. Beach sand is not an appropriate media for building up a site due to capillary action of the sand.
- Imported topsoil for raising land must be free of non-topsoil material and be sourced from a location approved by the regulating authority.
- Setback and clearance distances must be designed on the Guidelines setback criteria in Appendix 5.
- Wastewater disposal on slopes must be designed on the Guidelines slope criteria in Appendix 2.

Trenches and beds

- The DLR in mm/day is to be used to size the horizontal bottom area of conventional trench and bed systems.
- Where loading rates of 10mm/day or lower are required, it is critical that there is an even effluent loading over the design area.
- Conservative Design Loading Rates must be used for beds for systems to be installed on steep sites and where other site and soil limitations are present such as
    - (i) Soil structure is likely to restrict drainage away from the land application systems;
    - (ii) Soil and site conditions are investigated at a level that is unable to support adoption of increased loading rates;
    - (iii) Ground water <600mm from trench bottom and ground water quality is an issue.
- Conservative Design Loading Rates must always be used for primary-treated blackwater effluent and beds
- Maximum Design Loading Rates may only be used where site and soil limitations are absent and where there is evidence that these rates can be effectively maintained without harm to the environment or without potential for failure of the system. Maximum Design Loading Rates could be considered are when
    - (i) Site and soil conditions are highly favourable (such as absence of potential surface water influences good quality and depth of topsoil, site well exposed to wind and sun, availability of evapo-transpiration assistance from nearby plantings);
    - (ii) Trenches of width 300mm or less are adopted;
    - (iii) Sequential dosed loading of individual trenches/beds is utilised for soil in Categories 2 and 3.
- Specialist soils advice and special design techniques will be required for clay dominated soils having dispersive, (sodic), or shrink/swell behaviour. Such soils shall be treated as Category 6 soils. In some situations, these soils will preclude the use of an absorption only system design.
- Trenches and beds can be installed shallow and mounded in well draining soils where insufficient groundwater clearance may otherwise impede installation as long as the distribution zone into the trench or bed is below natural ground level.

Irrigation general

- The irrigation area should be set aside solely for effluent management. Contact, living, play or high foot traffic areas should not be used.
- Irrigation area must be protected from access and damage by stock, horses and vehicles.
- The type of planting must be specified and must have high evapo-transpiration properties.

- Irrigated wastewater (including greywater) must not come in contact with people, domestic or farm animals or any crops intended for human consumption. In open areas potentially accessed by the public it is also recommended that signage be erected to advise that the garden area is used for wastewater irrigation and that extreme care is required when digging so as to avoid cutting the lines.
- Irrigation lines are generally installed parallel at 0.3, 0.5 to 1m centres, however this can be varied according to the site conditions and manufacturer's recommendations. Closer line spacing is appropriate where wastewater (including greywater) is applied within slowly draining Category 3, 4 and 5 soils, whereas wider spacing is appropriate on steeper slopes.
- Design irrigation loading rates are given in Table 4H, based on a per square metre rate. Irrigation loading rates must be designed on aerial loading rates not exceeding soil loading rates.
- If the land application area is to be installed on a slope greater than 20 degrees, then a conservative DIR not exceeding 2 millimetres per day should be used and line spacing should be increased.
- Irrigation installed on a slope must be along the contour and not down the slope.
- The minimum depth of unsaturated soil below irrigation through which the wastewater must be able to infiltrate is 400mm. For category 1 and 2 soils, the Design Report must demonstrate clearance to groundwater is 600 millimetres or will not result in any adverse effects.
- A back flow preventer must be installed where the effluent field is down slope of the pump chamber to prevent siphoning.
- The minimum topsoil required in category 1, 2, 5 and 6 soils and any LPED irrigation lines is 250 mm. For category 3 and 4 soils a minimum of 200 mm cover is required.
- If any part of the irrigation is to be laid in high foot traffic areas a more conservative loading rate must be used. Other options must be explored and discussed in the design.
- All irrigation areas must be permanently marked.
- The position of the land application area must be clearly shown on the as-built site plan.
- Any filters in the system must be serviced and flushed as per the manufacture's specifications.
- The construction should be undertaken in a manner that is consistent with the Design Report manufacturer's directions and the relevant appendix of AS/NZS 1547:2000 Irrigation areas Appendix 4.5C or 4.5D
- The system must not have infiltration rates that vary over the whole of the system by more than 10% when installed on sloping ground.
- For sloping ground the DIR shall be decreased to ensure that effluent migration down slope is taken up adequately within the topsoil and plant root system. Recommended reductions are as follows.
    (i) flat to 3° slope = no reduction

(ii) 3° to 6° slope = reduction in DIR of 10%
(iii) 6° to 9° slope = reduction in DIR of 20%
(iv) 9° to 11° slope = reduction in DIR of 30%
(v) 11° to 17° slope = reduction in DIR of 50%
(vi) >17° slope = specialist design required.

Drip line irrigation

- Drip line irrigation must be a minimum of secondary quality effluent.
- The drip irrigation line used must be pressure compensating dripper irrigation line for subsurface or surface irrigation.
- Emitter and line spacing and emitter flow rates must be designed to ensure even distribution of effluent. (These are usually spaced between 300 mm to 1 metre spacing's. Emitter flow rates are typically from 1.2 to 4.0 litres per hour). Drip line and emitter spacing for Category 1 soils must be 300 millimetres.
- Dripper line spacing, emitter spacing and flow rate must be stated in the design.
- Irrigation lines must have a flush system. In residential areas this must return to the primary chamber. Flushing valves must be protected from damage.
- Irrigation lines must have air release valves in the system to prevent air locks.
- The irrigation lines must be accessible so they can be maintained.
- Drip line irrigation must be 50 to 250 mm below the ground surface, or into imported topsoil, but within the root zone of the proposed planting.
- If any weed matting is to be laid it must be over the top of the dripper lines and laid in a way that will not damage or impair the function of the dripper line.
- Any surface irrigation must be pinned to ground and covered with a minimum of 100 mm of mulch or similar inert product to be defined in the design. The containment of the cover provided must be defined.
- Any surface irrigation on sloping ground must be covered with a durable net mesh and pinned to the ground to keep mulch in place.
- Surface irrigation is not suitable in residential or in-built areas.
- On slopes greater than 20 degrees, line spacing should be increased to allow potential of down slope seepage.
- Maximum run lengths of dripper irrigation line should not exceed the manufacturer's specifications and must be provided with the design.
- Any filters in the system must be serviced and flushed as per the manufacture's specifications at the same time as the irrigation lines.
- The irrigation lines must be serviced and flushed as per the manufacturer's specifications but as a minimum of annually by an appropriately trained person.
- A minimum volume of 200 litres is recommended for each dose to the effluent field.

LPED irrigation

- LPED irrigation must be advanced primary quality.
- A 3mm tank outlet filter must be installed prior to the pump chamber.
- The construction of LPED irrigation shall be using drain coil with appropriately perforated pipe, such as, pressure pipe with drilled squirt holes inside, bedded into 20-40 mm drainage aggregate.
- It is not recommended that LPED irrigation is laid into slopes greater than 15 degrees.

4.21 Long-drop toilets – pit latrine

Although not a treatment system the discharge of human waste into land through a pit latrine in rural and remote locations is permitted providing the activity can meet certain conditions. These conditions are to avoid, remedy or mitigate adverse effects on the environment. The activity involves the direct disposal of limited amounts of untreated human waste to land and is an unsuitable activity for more densely populated areas.

General criteria

- The discharge shall only contain human waste.
- The building or activity serviced by the pit privy is used intermittently and for short duration.
- The discharge of pit latrine effluent shall not occur within any property zoned Residential, Commercial or Industrial in the Gisborne District Council Combined Regional Land and District Plan.
- The setback and clearance distances listed in Appendix 5 are met.
- The pit latrine shall not be located on land where the soil comprises gravels, coarse sands, beach sands or fissured rock that allow the rapid migration of effluent liquids from the pit.
- When the pit is filled to within 1 metre of the land surface, or is no longer used, the contents shall be covered to ground level with a minimum of 1 metre of soil.

4.22 Deep bores

The discharge of human waste into land through a deep bore in rural and remote locations is a permitted activity providing the activity can meet certain conditions. These conditions are to avoid, remedy or mitigate adverse effects on the environment. The activity involves the direct disposal of primary treated effluent into land without treatment through soils. The activity is unsuitable for more densely populated areas, areas in proximity to water bodies, artificial water body or coastal water, steeply sloping sites and sites in proximity to the edges of cliffs and embankments.

Bores are 600mm diameter and generally extend no deeper than 6 metres or to within 1500mm of the groundwater level. Bores have one solid stand pipe, 100mm in diameter, with the stand pipe outlet 300mm above the base of the bore hole. The top of the stand pipe extends above the natural ground level and is vented with an inspection cap. One feed line from the septic tank gravity loads the bore. The bore cavity is backfilled with 30 to 50mm gravel or stone chip. The land surface of the bore is capped with impervious soil and mounded to stop land surface inflow.

Two sets of deep bores may be installed and operated under alternating weeks or months to prolong the life of the bores.

To size a deep bore system the following procedure is required: (Procedure referenced to TP58 Clause 10.7 Deep Bores).

1) Auger 50mm holes to identify suitable permeable soil layers at depth.
2) Prepare two 600mm diameter teat holes (machine dug) to a depth of approximately 6 meters or within 1500mm of the groundwater level.
3) Test load each hole with clean water over a 4 hour period and measure the head loss at 15 minute intervals.
4) From a plot of soakage rate verses time, take the minimum soakage rate from the curve for design purposes in terms of the tangent at the 4 hour.
5) From the rate of fall in the fourth hour calculate the volume rate of soakage per hour, halve the figure obtained, then calculate the number of 600mm diameter deep bores to soak away the daily design flow volume over an 8 hour period at this rate.

This then becomes the requirement for the installed design.

General criteria

- The discharge of wastewater through a deep bore shall not occur within any property zoned Residential, Commercial or Industrial in the Gisborne District Council Combined Regional Land and District Plan.
- A septic tank fitted with an outlet filter, is required
- The discharge shall only comprise domestic wastewater from an individual on-site wastewater-treatment unit servicing a habitable building.
- The deep bore discharge shall not be into land where the soil comprises gravels or fissured rock that allow the rapid migration of effluent from the bore.
- The deep bore discharge shall not be into land where the soil comprises clay loams, light clays or medium to heavy clays with poor drainage characteristics.
- The setback and clearance distances listed in Appendix 5 are met.
- The design sizing for infiltration of primary effluent shall be based on a soakage rate per deep bore of one sixth (1/6th) that indicated by the clean water 4 hour test result.

PART 5: Installing and commissioning on-site wastewater systems

Guidelines 5.1 A building consent must be approved prior to installation of a system, or, pre-approval gained for emergency work. Pre-approval is only considered against a Site and Soils Assessment Report and a Design Report.

Guideline 5.2 The construction should be undertaken in a manner that is consistent with the Design Report, manufacturer's instructions and the relevant appendix of AS/NZS 1547:2000, as follows:

- Trenches — Appendix 4.5A
- Beds — Appendix 4.5A
- ETA beds/trenches — Appendix 4.5A
- Mounds — Appendix 4.5B
- Irrigation areas — Appendix 4.5C or 4.5D

Guideline 5.3 The installation must be consistent with the performance requirements set out in AS/NZS 1547:2000 Clause 2.5.

5.1 Installation

Correct installation of systems is essential to the long-term function and performance of an on-site wastewater system.

The construction of any on-site wastewater management system approved by way of resource consent and/or building consent should only be undertaken by a registered drain layer or, in case of a proprietary treatment unit, an experienced, registered installer.

System installers are expected to meet Building Act 2004 and Building Code requirements, ensuring building inspections are requested as specified within a building consent for a system. Any significant changes in the design of a system must be approved by the Gisborne District Council through the building consent process before installation.

Installation instructions

The Design Report contains sufficient installation instructions and/or be appended with manufactures installation instructions. These should be sufficiently clear for a suitably qualified person to follow. If uncertainty about a design occurs, the designer should be contacted first for confirmation.

5.2 Construction

System construction practices are critical to the performance of on-site systems. Good construction practices require that careful consideration be given to protecting the site, especially the porous nature of the soils in the land application area, that depend on a certain infiltration rate to be effective. Therefore the on-site treatment land application area should be staked before construction begins to ensure all parties involved in any construction activities around the site are aware of the need to protect the area.

Excavation activities can cause significant reduction in soils' porosity and permeability. Before any distribution media is installed, any smeared areas should be scarified and the surface gently raked. Any fill material should be kept clean and uncontaminated from other unsuitable soil around the site.

All parts of the treatment and land application system must be carefully installed, including the fitting of pipes and tanks (pipe to pipe and pipe to tank and other tank fittings) to be watertight. All electrical connections are safe and in compliance with current codes (AS/NZS 3000:2007) and operate correctly. Any dosing system should be fully tested with clean water before covering over the distribution lines so that the effectiveness of the system can be observed.

Before completion of installation, the area around the site should be graded and any upslope surface and/or subsurface water cut-off drainage installed. The backfill over the infiltration area should be mounded slightly to account for settling and eliminate depressions over the system that result in ponding of water.

5.3 Certification

The installer must certify the installation of the on-site wastewater management system to confirm that the system has been installed according to design. This certification should be forwarded to the Council prior to the discharge commencing for the first time. This should include confirmation of any land drains, vehicle protection, tree root protection and other measures completed or installed to protect the wastewater treatment system and the land application system. As-built plans must be provided to at least cover:

- Location of all treatment system components.
- Location of all land application system components including the primary and reserve land disposal areas.
- The critical components of the land application system including any flush points, separation distances, air relief valves and non return valves or other critical components.
- Location of all electrical cables installed as part of the system.
- Location of all sewer pipes discharging to the treatment plant.
- Location of all rising mains to land application areas.
- Location of alarm controls and alarm panels, recirculating valves, splitter valves, monitoring ports, shutoff valves.
- Identification of all critical separation distances from buildings, property boundaries and surface water.
- Location of any land drains installed to protect the systems.

PART 6 Maintenance, function and performance of on-site wastewater systems

Guideline 6.1 On-site wastewater systems must be inspected, cleaned and maintained to minimise the likelihood of system malfunction and failure.

Guideline 6.2 System servicing and maintenance must be completed on regular basis by suitably qualified or experienced people.

6.1 References

AS/NZS 1547:2000 On-site Domestic Wastewater Management

6.2 Management plans

A key of requirement for all proprietary advanced treatment systems, greywater treatment systems, composting systems, vermi-culture systems and associated land application systems is that a Management Plan is provided by the system designer/installer/supplier prior to the system commissioning so that the system owner has a clear understanding from day one of the key maintenance requirements. Key requirements, in plain language so the householder can understand, are:

- Contact Details of System Designer, Supplier, Installer and recommended Maintenance Contractor(s), including 24 hour emergency contacts.
- Design Discharge Volume, including peak occupancy/usage.
- The Process Flow Diagram, of all the different parts of the system.
- The Process Description, how the system works
- As-built site plans,
- System Maintenance, key maintenance requirements and frequencies, from the householder's daily/weekly inspections up to specialised contractor's 1 to 3-yearly inspections.
- A Contingency Plan/Trouble Shooting Guide, to diagnose problems and potential causes and determining appropriate response actions.
- Educational Material of Routine Precautions, of actions that may affect the performance of the system.
- Copies of relevant Regulatory Documentation, such as the initial site investigation and evaluation and the building consent.

6.3 Service agents

Agents and personal offering servicing, desludging, cleaning or maintenance of on-site wastewater systems must be people recognised as having suitable experience and training or qualifications appropriate to the work.

Removal of sludge, scum or effluent from septic tanks, greywater systems and tanks within advanced treatment systems must be done by a company or person holding registration for an Offensive Trade Activity.

Service agents maintaining proprietary advanced treatment systems should be trained professionals who are familiar with the system design. They should be endorsed by the New Zealand distributor or manufacture of the specific brand of system. They need to regularly check the systems performance in accordance with the manufacturer's instructions.

Property owners with proprietary advanced treatment systems are encouraged to have a signed maintenance and servicing contract, and maintain this contract, preferably with the agent endorsed by the system supplier/manufacturer, although other agents may be familiar and suitably experienced to complete servicing. This is particularly important for tenanted dwellings and any commercial or institutional buildings.

Some property owners can gain sufficient knowledge to service parts of a proprietary advanced treatment system, greywater system or management of a composting system. Manufacturers of proprietary systems which are reliant on the home owner to do regular maintenance for the system to function correctly must provide clear operating instructions.

For composting toilet systems and some greywater systems an on-site system management plan suited to use by the home owner is best prepared by the system supplier and installer, prior to system commissioning.

6.4 Home owners and occupiers

Home owners can help by look out for any advanced warning signs that the disposal area is not functioning properly. These may include; zones of soil saturation/wet patches or signs of greywater/sludge on the ground surface; check on uneven plant growth; any public or vehicle access paths.

Any damage, faults or malfunction of a system should be addressed early and not left until a more significant failure occurs. The owner or occupier should act on the triggering of high water alarms in a system, calling the service agent or a drainlayer.

Water usage affects the performance of systems and for greywater and advanced treatment systems, the function is highly dependent on the water usage. High daily wastewater flows can easily overload the system. For example, spreading the clothes washing over several days, rather than all on the one day, can help significantly.

The types of chemical uses in the cleaning and laundry processes can have a significant impact on the performance of some systems. Avoidance of using cleaners and chemicals that destroy bacteria and limiting use of cleaning detergents high sodium and phosphorus levels can assist to maintain good function within treatment and land application systems.

6.5 Records of treatment system servicing, inspection and desludging

Records of servicing should be provided by the service agent and should be safely kept to provide a servicing history for a system.

Septic tank servicing

Information to be recorded at each inspection and/or pump out of a conventional on-site wastewater system shall include but not be limited to the following:

Property identifiers **Date of clean out or inspection** **Clean out records:** Number of tanks/chambers Lids removed on each chamber for cleaning Sludge and scum depth in each tank/chamber Number of tanks/chambers emptied to the floor Lids replaced on each chamber following cleaning Outlet filter cleaned **Overall rating of tank(s) condition and function, including** Good order condition Problems with tank function Repairs needed	**Company and operator identifiers** **Condition of tank(s) including:** Condition and Placement of: • lids into each tank/chamber, lids above ground, lids below ground • vents • effluent outlet filter • inlets and outlets Evidence of cracks Evidence of overflow **Function of tank(s):** Evidence of groundwater inflow backflow into tank(s) Evidence of flow restrictions into/out of tank(s) **Required actions, including:** Minor repair Contact drainlayer Contact Council Contact electrician

Advanced treatment system servicing

Service reports, complied by a proprietary system manufacture or supplier, are specific to a brand of system. In general these reports should identify performance and functional conditions of the advanced treatment system including but not exclusive to:

- Property identifiers,
- date of clean out or inspection,
- company and operator identifiers,
- malfunction, damage or inadequate performance of a component in the system,
- repair or service work required and the completion of this work; and
- sludge and scum pump out requirements and the completion of this work.

An irrigation field must be flushed at each service and any breaks or cuts in lines, any leaking valves or similar minor repairs made.

Required actions for repair or further servicing should be clearly described and discussed between the client and the service agent. Repairs should be done in a timely manner.

Greywater systems

Routine system maintenance is critical for optimising the performance of greywater treatment and land application systems. This will extend their effective life and minimise potential for adverse effects on the receiving environment and public health risks.

- Where septic tanks are installed, regular pump outs to prevent sludge and scum build up are required. The frequency depends on the size of the tank, the influent flow volume and wastewater characteristics. At least once every 3-years is recommended for older style tanks without outlet filters. 3 to 5 years is suitable for newer tanks with outlet filters. All tanks need to be pumped out once the sludge and scum levels occupy half the tank volume.
- Advanced treatment systems (such as the advanced secondary treatment system and automatic disinfection) involve a high level of technology and expertise. Trained professionals who are familiar with the system design need to regularly check the systems performance in accordance with the manufacturer's instructions, generally 6-monthly, or at least once per year.
- Other parts of specialised equipment, such as treated greywater recycle for irrigation and toilet flushing will all have their own maintenance regimes which need to be carefully followed.
- It is desirable to have a regular maintenance contract for the inspection of the land application system and undertake any routine maintenance with the distribution lines. This may include flushing the lines, replacing any blocked or ineffective emitters and making recommendations to the system owner to arrange any other maintenance requirements.

Composting toilets

Product quality AS/NZS 1546.2:2008 recommends that compost end product achieves the following quality characteristics prior to removal and disposal (Table A1 in the Standard):

- monitoring samples should contain no recognisable faecal material;
- moisture should not exceed 75% by weight;
- *E-coli* level should not exceed 200 MPN/gram dry weight; and
- salmonella organisms should not be detectable in 4 gram dry weight.

The Standard sets out a sampling regime relating to monitoring end product and performance assessment against the above quality requirements. This sampling regime and quality characteristics apply to systems being tested under the performance evaluation process set out in Appendix D in the Standard for those systems undergoing certification. The monitoring and testing procedures are not field testing requirements, but may be used to assess field performance.

Operation and maintenance composting toilets

The manufacturer/supplier for a proprietary system will supply a set of operating and maintenance (O&M) instructions. The owner/occupier of the dwelling will be responsible for O&M, and where the property is rented, it will be important that the owner ensures the occupier is fully aware of their responsibilities for complying with the user instructions, and for undertaking such routine maintenance as is required by the O&M instructions.

Key maintenance elements will include details re frequency of service checks as well as:

- information on appropriate cleaning methods for the toilet pedestal (including use of cleaning fluids);
- checking bulking material supply and storage capacity top-up;
- procedures to check compost condition and progress with maturing;

- removal of batch containers and replacement of container units and/or liner bags;
- storing batch containers and pre-treatment (by adding soil cover) to assist decomposition process during the storage period;
- removing compost from continuous composters;
- checking the health and activity of worms in vermiculture systems;
- dealing with excess moisture levels (including use of bulking materials and checking that drainage outlets are clear);
- removing 'salt' accumulations from evaporation trays;
- dealing with cold weather conditions;
- requirements for placing system on stand-by prior to periods of non-use; and
- measures for start-up following periods of non-use.

PART 7: Continued use and end of usable life for on-site wastewater systems

Guideline 7.1 Decommissioning or systems is required for public safety and to prevent nuisance conditions.

Guideline 7.2 Evidence on system function is required prior to continued use under actual or potential increased use.

Guideline 7.3 Systems that have inadequate function for the use must be upgraded.

7.1 Decommissioning wastewater systems

The decommissioning of on-site wastewater treatment systems is required to ensure public safety and to ensure nuisance is prevented from tanks filling and overflowing.

If wastewater effluent is left in tanks or tanks are emptied but still able to accumulate stormwater, nuisance effects can result from wastewater contaminated overflows. Tanks should be completely removed or collapsed with the bottom broken and then backfilled so there is no cavity that is a safety hazard to future users of the property.

7.1.1 Criteria for decommissioning:

1. Unused tanks are emptied of wastewater and sludge; and
   a) Fully removed with the hole backfilled; or
   b) The bottom of the tank is fractured and the tank is backfilled to land surface with material not likely to compress and slump or provide voids and cavities which would present a safety hazard to people or animals.
2. Written notification to the Gisborne District Council is provided within 60 days of decommissioning the system. Written notification shall include the following information:
   a) the address and legal description of the property; and
   b) a description of what decommissioning work was completed; and
   c) a site sketch indicating the location of the decommissioning work.

7.2 Malfunction verses failure of an on-site wastewater system

Malfunction of on-site wastewater systems can occur due to seasonal ground and climate conditions, inappropriate use, power outages, pump failure, lack of maintenance or servicing and accidental damage to components. A system has failed when normal tank desludging, filter cleaning, advanced system servicing and minor repairs, unblocking of foul water drains, repair of a pumping system or similar types of general maintenance does not permanently resolve the malfunction of the system. If prolonged malfunction occurs in winter due to influence from ground water or from overland flooding into the system, the system is considered inappropriate because of the repeated failings.

7.3 Repair and improvements of an on-site wastewater system

Some faults with a wastewater system can be repaired and improvements made keeping a system in use, provided that repairs and improvements meet appropriate Standards.

These are limited to:

- Replacing pipework between the building and the treatment system – like for like.
- Replacement of pipework between the treatment system and the land application system – like for like.
- Replacement of pumps – a pump with the same head and flow specifications is required.
- Cuts in an irrigation system – repaired with specification joiners.
- Inlets and outlets on septic tanks.
- Lids and extensions installed on tank openings.
- Replacement of components within proprietary advanced treatment systems.
- Installation of tank outlet filters.

All work on foul water systems must be completed by a registered drainlayer. In some cases replacement of components within a proprietary advanced treatment system can be completed by the service agent nominated by the manufacturer or supplier of the system.

Other faults affecting the function or performance of a system will require a new system designed consistent with the GDC Guidelines.

7.4 Continued use of existing systems or reuse of components

7.4.1 Continued use of systems

Consideration of the suitability and performance capability of the system to function under actual or potential future use is required for any proposal to continue to use an existing on-site wastewater system. This applies when a building is proposed to be:

- expanded or altered; or
- have its use changed,

AND

- from the building there is an actual or potential change in the:
  - design occupancy;
  - design flow;
  - source of the wastewater; or
  - quality of the wastewater;

When there is a change to the design flow or to the origin, quality or volume of the discharge, or any modification to the system, as a result of:

a) alteration of the building connected to the system; or

b) the connection to the system of a new or relocated building or a replacement building; or

c) any alteration to the existing system, excluding routine maintenance of the system or fitting an effluent outlet filter or access to land surface from the treatment system;

the discharge flow shall be recalculated and discharge reassessed against criteria set out in the Guidelines.

7.4.2 Assessing and reporting

A Design Report describing the condition of the existing components and anticipated function under the proposed changes in wastewater origin or flow must be completed.

There must be surety that tanks or other components from an existing system are sound and in good condition before being incorporated within the design of a new system or being approved for continued use. Checks on the component must be done and reported against criteria set out in AS/NZS 1547:2000 and AS/NZS: 1546.1:2008 Part 1 Septic tanks.

Before a tank or dosing chamber can be reused the following must be documented:

- The depth of the tank/chamber below ground to the lid, and to the tank inlet and the tank outlet.
- The condition of the inlet and outlet fixtures and water tightness of these through the tank/chamber walls.
- The internal condition of the tank/chamber, any extension on the opening, and the condition of the tank lid.
- The type and condition of any tank outlet filter and associated housing.

Before an Advanced Treatment System can be reused the design and functional performance capacity of the treatment system and the scale of the land application system must be confirmed. An assessment of the function of the system must be done and any repairs or improvements that are required must be documented.

PART 8 Function of on-site wastewater - owners and system user responsibilities

Guideline 8.1 Council will maintain and distribute relevant information resources for owners and users of systems to encourage system servicing and maintenance, repair of faults and damage, and to encourage use of a system within its design capacity.

Guideline 8.2 Council will provide information, if known, about the type, function and performance of systems for LIM applications.

8.1 References

On-site Wastewater Systems – What you need to know GDC Publication 2011
AS/NZS 1547:2000 On-site Domestic Wastewater Management

8.2 Owners and system user responsibilities

Once designed and installed and certified by the installer, the ongoing function and performance of a system is the responsibility of the property owner.

Owners should fully inform themselves about the on-site wastewater system on their property and its operation and maintenance and limits on how it can be used. If the property is rented, owners should inform any property agent or the tenant, as appropriate, about the system, its use and operation and maintenance requirements.

A manual provided by the system manufacture or one put together by the system designer, installer or owner is important to assist with keeping the on-site wastewater system working in good order. Keeping a copy of the 'as-built' site plan showing the position of the treatment system and the land application area is important to prevent damage. This is especially important for irrigation areas, disposal mounds and ET systems. Parts of these systems are either very shallow or have soil cover or plantings that must be maintained for the correct function of the system.

Other responsibilities are:

- When selling a property the owner must disclose if there are system malfunctions they are aware of. These may be evident in winter with elevated water tables or water logged land.
- Owners must not build over septic tanks or allow structures, water tanks, and concreted areas to cover or encroach onto land applications areas. Vehicles must not access or park over treatment tanks or land applications areas unless the system has been designed and constructed for this purpose.
- Farm animals must be kept off land application areas.
- Large trees and deep rooting plants must not be planted in proximity to treatment tanks and land application areas.
- Maintaining plantings and soil or mulch cover over land application areas.

- Malfunction or damage to parts of a system must be managed and fixed using qualified people for advice and repair work.
- Serving and desludging septic tanks every 3-5 years and maintaining records of servicing. Registered people must be used for cleaning tanks and managing septage.
- Servicing of advanced treatment systems by qualified and experienced people and maintain records of servicing.
- Operating the system within the design capacity and not allowing excessive flows. Fixing leaking taps, limiting house occupancy and ensuring replacement water fixtures and water use appliances are low flow and low volume fixtures/appliances.
- Stopping stormwater from getting into treatment tanks or stopping overflows from rain water collection tanks or downpipes over-saturation the land application area.
- Ensuring no prohibited substance or discharge is disposed into the treatment system.
- Compliance with Permitted Activity Rules in the Operative Regional Plan for Discharges to Land and Water, Waste Management and Hazardous Substances - Unreticulated Sewage Systems, (RPDLW) and/or compliance with conditions of a resource consent for the discharge from a system.

PART 9 Protection of on-site wastewater systems

Guideline 9.1 On-site wastewater systems must be protected from damage, flooding and oversaturation of the land where the land application system is positioned.

9.1 Protection of on-site wastewater systems

On-site wastewater systems must be protected from:

- being saturated from other discharges on a property including pool overflow/emptying or filter backwash water and overflows from rainwater tanks, downpipes and stormwater retention systems
- ground seepage or overland flows of stormwater
- intrusion from tree roots and deep rooting plants
- damage from vehicles, heavy loads and stock

9.2 Pool backwash land disposal system in a non-reticulated area

The backwash and overflows from a swimming pool must be managed to ensure no health nuisance or localised flooding occurs. A drainlayer and the pool pump supplier and site designer should be consulted for the relevant information.

- Pool backwash water must not be discharged into an on-site wastewater system (septic system). Discharge of pool backwash water to any stormwater system is not permitted.
- Pool backwash water discharges must be contained within the property boundaries
- Pool backwash water discharges must be into the ground.
- The infiltration rate into the soils must not be higher than the primary effluent rates into the soil given in the GDC Guidelines for wastewater disposal for each soil category.
- The airspace volume in any fill media must be large enough to hold at least one backwash cycle or 24 hour holding volume whichever is the greater.
- There must be a minimum separation distance to highest groundwater or perched groundwater of 600mm.
- The filter outlet must have a suitable washable 3mm filter fitted to prevent solids from entering the backwash disposal system.
- The placement of the backwash disposal system should be located a suitable distance from any building or on-site wastewater system component serving a building to prevent flooding or oversaturation of land. This separation distance will depend on the size and slope of the property. As a guide;
    - a minimum of 5 metres horizontal distance from any building or on-site wastewater system component; **or**
    - 500mm vertical distance below any building or on-site wastewater system

  should be maintained.

- The hydraulic performance of the pool backwash pump must have capacity to ensure that the pool backwash water is properly dosed to the backwash disposal system.
- The backwash disposal system should be designed to the site specific limitations. Some examples of potential backwash disposal systems include standard trenches, bore holes, infiltration pits, raised beds or mounds.

Information that must be provided for building consent includes:

1) The volume of water discarded in each pool backwash cycle and the likely frequency of the backwash.
2) The dimensions and construction details of the disposal system for the pool backwash water. Include height, width, depth, fill material and distance to winter high groundwater or perched water tables.
3) The grading size and percentage airspace volume in the fill media used in a disposal system.
4) A hydraulic design and specifications of the pool backwash pump demonstrating the pump has capacity to dose load the disposal mechanism.
5) A site scale diagram must be provided showing;
    a) The location and layout of the pool and pool backwash water disposal area including distances to boundaries from the same. A replacement option/area for a replacement backwash disposal system should be identified on the property.
    b) Other relevant structures including the house, sheds, driveway and parking areas.
    c) The position of any on-site wastewater system (septic system) including the septic tanks and effluent disposal field. If this is system is more than 10 years old, sufficient information must be provided to demonstrate there is adequate land remaining on the property for a replacement on-site wastewater system.
    d) The pool overflow outlet point for high rainfall events or pool emptying. Water released to an outlet point must not compromise the function of any on-site wastewater system or cause or increase any localised flooding.
    e) Information regarding the soils.

9.3 Rainwater tank overflows and stormwater retention systems

Overflow pipes from rainwater tanks and any outlets from stormwater retention systems on a property must be piped to an approved discharge point where the discharge will not influence the function or flood any treatment tank or pump well, or infiltrate or cause oversaturation of any land application system.

Open ponds used for stormwater retention must not be the cause of seepage and subsequent saturation of ground adjacent to or within a land application area.

9.4 Stormwater and land drains

Cut off drains

Unless qualified otherwise, a surface cut-off drain shall be constructed 3m upslope of the effluent disposal field for all sites which are 1v:20h (3°) or steeper. Unless a specific engineering assessment is undertaken by a suitably qualified professional, the surface drain shall;

- be located in stable ground;
- have a maximum depth of 0.3m for slope gradients over 1v to 4h with a maximum slope gradient of 1v to 2.5h
- have side slopes no steeper than 1v:1h to minimise the potential for local instability;
- have a minimum longitudinal gradient of 1v to 50h to promote water flow and to minimise ponding;
- be grassed, or lined with erosion protection material or geotextile should the base gradient exceed 1v:20h.

Cut off trenches

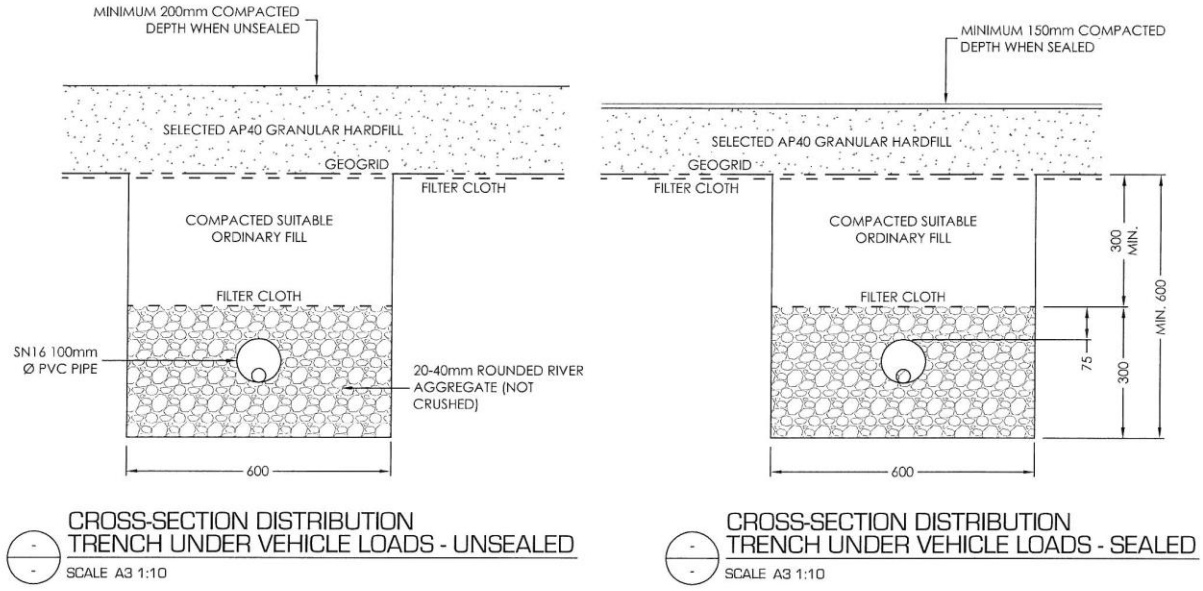
A subsurface cut-off trench shall be installed on the upslope of the effluent disposal field for all sites which are 1v:20h (3°) or steeper and where the depth to the groundwater table is equal to or less than the depth of the drainage unit plus 0.6m. Unless a specific engineering assessment is undertaken by a suitably qualified professional, the subsurface cut-off drain shall;

- be located in stable ground;
- be limited to ground with a maximum slope of 19° (1v to 3h) for trenches up to 1.0m deep or less;
- have a minimum longitudinal gradient of 1v to 50h to promote water flow;
- be installed with perforated drainage coil surrounded by clean no-fines angular drainage metal graded between 7mm and 25mm enclosed in filter geotextile fabric;
- be capped with 0.3m of well compacted cohesive soil

9.5 Vehicle protection

Treatment systems must not be subjected to vehicles loadings unless engineered design to protection is installed.

Distribution trenches under vehicle loads



- The acceptable solution shown on the drawings is for light vehicular (gross vehicle mass of no more than 2.5 tonnes), loads only.
- Where the pavement is to be sealed the minimum pavement depth is to be 150mm and where the pavement is to be unsealed then the minimum pavement depth is to be 200mm.
- Ordinary backfill is to be placed in layers not exceeding 200mm loose depth and is to achieve at least 2 blows per 100mm penetration with a scala penetrometer.
- Filter cloth to meet TNZ F/7: 2003 filtration class 1-4 and strength class B.
- The 100mm diameter external distribution pipe is to be SN16.
- The 32mm diameter distribution pipe is to be SN8, PN9.
- Granular hardfill for the pavement construction is to have a weathering quality index of AA, AB, AC, BA, BB, CA or CB when tested according to NZS 4407:1991 test 3.11 and a crushing resistance of at least 100kN when tested in accordance with NZS 4407:1991 test 3.10. The grading curve is to fit the envelope as shown in table 2.

Table 9A: Granular Hardfill Grading Curve	
Test Sieve Aperture	**Percent Passing**
37	100
19	63-81
9.5	40-60
4.75	25-45
2.36	16-35
1.18	9-27
600 micron	5-20
300 micron	1-15

Table 9A: Granular Hardfill Grading Curve	
Test Sieve Aperture	**Percent Passing**
150 micron	10 max
75 micron	7 max

9.6 Protection from tree roots and deep rooting plants

Tree roots and deep rooting plants can damage and block pipework and tanks, reducing the function and performance of the on-site wastewater system. Land application systems in close proximity to established trees must be protected from root intrusion. Generally, if the land application system is within the tree drip zone, protection may be necessary or the tree removed. Systems must be positioned away from shelter belts of trees. To using hedging or plantings for fencing barriers in close proximity to the land application system, the species used must not have rooting systems likely to encroach into the soakage area.

Protection methods from root intrusion must not impede the infiltration of effluent from the land application system but must resist penetration by roots. Some geotextile products meet this performance criteria and advice should be sought from product manufacturers.

Plantings for systems reliant on evapo-transpiration must be suitable species for the local environment and for the proposed use.

Plantings for wetland treatment filters are specific and important for function of the system.

Specialist advice should be sought from qualified people about suitable plantings in close proximity to treatment systems and plantings for particular land application systems.

Table 9B may be used for guidance but is not a definitive list of plantings for soakage areas.

Table 9B: Plants for Soakage Areas	
Suitable plants	***Unsuitable Plants***
Astelias	Large trees
Ground ferns (e.g. Blechnum, kiokio)	Pine trees
Carex grasses	Gum trees
Toetoe (but not pampas)	Poplars
Sedges	Willows
Tree ferns e.g. wheki	Macrocarpa
Rengarenga lily	Palm Trees –particularly Phoenix and Date Palms
Fuchsia	Oaks (especially Swamp Oak and Silky Oak)
Rhododendrons	Wisteria
Flax	Bougainvilleas
Begonias	Hollies
Azaleas	Privets
Geraniums	Bamboo
Most native shrubs but especially Fivefinger, Kaka beak and Poroporo	Figs and Rubber Plants
Kikuyu and paspalum lawns	Elms
	Karaka
	Pohutakawa

9.7 Fencing

Appropriate fencing or barriers to prevent stock and vehicle access and to provide separation between irrigation land application systems and outdoor living areas must be identified and described in the Design Report. The responsibility of the fencing or barriers

Glossary

Advanced on-site wastewater-treatment unit means septic tank(s) and/or secondary treatment process comprising aerobic biological processes and solids control. Secondary treatment may comprise aeration/clarification units, bio filter/clarification units, or sand filter units.

All waste means the combined blackwater and greywater from a dwelling unit or premise that is generating wastewater.

Authorised discharge point means a discharge point or "campervan dump station" connected to the sewer network or to a specifically designed system, or to a septage facility designed for the discharge of foul water and sewage.

Best practicable option (for management of domestic wastewater)

The best method for preventing or minimising the adverse effects on the environment having regard, among other things, to:

(a) The nature of the domestic wastewater discharge and the sensitivity of the receiving environment to adverse effects

(b) The financial implications and the effects on the environment of that option when compared with other options; and

(c) The current state of technical knowledge and the likelihood that the option can be successfully applied.

$BOD_{(5)}$ Biochemical Oxygen Demand (five day) is a measure of the oxygen consumed by aerobic bacteria in degrading organic material at 20 degrees Celsius over a five day period. $BOD_{(5)}$ values represent the organic strength of wastewater.

Blackwater means wastes discharged from the human body either direct to a dry-vault toilet or through a flush toilet and/or urinal.

***Coastal water** means seawater within the outer limits of the territorial sea and includes—

(a) seawater with a substantial fresh water component; and

(b) seawater in estuaries, fiords, inlets, harbours, or embankments.

Conventional on-site wastewater system means an on-site wastewater system consisting of a septic tank and a land application system. The wastewater moves from the septic tank to the land application area by way of gravity or by a dose loading mechanism.

Community drinking-water supply means a reticulated publicly or privately owned drinking water supply connecting at least two buildings on separate Certificates of title and serving at least 1500 person days per year (for example, serving 25 people at least 60 days per year).

Design loading rate means the long term acceptance rate (LTAR), reduced by a factor of safety, expressed in $L/m^2/day$ or mm/day as applied to the horizontal design area of a land-application system.

Design irrigation rate means the loading rate that applies to the irrigation of a land application area with effluent of a secondary quality. It is expressed in $L/m^2/day$ or mm/day.

Deep bore means a form of effluent disposal system, typically around 6 meters deep, used on sites where low permeability surface soils, such as poorly draining clays, are underlain by more permeable subsoil layers at depth.

Diffuse Discharges means difuse discharges of contamination to air, water and land which may not attribute to an individual site or activity. The contamination from diffuse discharges is related to land management, geologic and hydrological variables which may change from day to day or year to years. Only land management factors may be controlled by society. Pastoral and cropping agriculture, silviculture and development of residential subdivisions (e.g. construction of infrastructure, septic tanks) are common activities which generate non-point source pollution.

Discharge Permit means a permit required under section 15 of the Resource Management Act 1991 where a contaminant will be discharged in the environment, either to water or air.

Dose Loading means a method of discharging a controlled dose volume (by pump, siphon or other dosing device) across an infiltrative area.

Effluent means the liquid discharged from a wastewater-treatment unit.

Effluent outlet filter means a device, other than a pump screen, fitted at the outlet of a septic tank and designed to prevent solids 3 millimetres or greater in size passing from the tank to the land application area.

Erosion means the processes of the wearing away of the land surface (including soil or bedrock) by natural agents and the transport of the derived material. Erosion includes erosion from natural causes, and erosion induced or accelerated by human activity.

Greywater means the wastewater flow from kitchen, bathroom and laundry facilities. It excludes wastes defined as blackwater.

Greywater diversion system means a system that diverts only greywater sources from the bath, shower and washing machine (but not the kitchen and laundry tub) for subsurface irrigation.

Impermeable layer means a soil layer with less than 10% permeability than the overlaying soil layer.

Inundation includes flooding, overland flow, storm surge, tidal effects and ponding.

Land application area means an area of land which is set aside to allow domestic wastewater from the treatment unit to be applied into or onto the soil for further in-soil treatment and absorption. The method of distribution and nature of the land application area can vary, and includes trenches, beds, moulds and drip lines, but does not include soak pits.

Land application system means the system used to apply effluent from a wastewater–treatment unit into or onto the soil for further in-soil treatment and absorption.

Lawfully established in respect of Chapter 7 means a system installed in accordance with a Building Consent under the Building Act 2004 or, for systems installed before 2004, the Building Act 1991, or for systems installed before 1991, the Drainage and Plumbing Regulations 1978.

Permanently established in relation to an on-site wastewater system means a system fixed onto or into the ground.

Point source discharge in relation to discharges to water means a discharge via a pipe, drain or any other confined channel which enables contaminants to discharge to water at a specific location.

Primary treatment The separation of suspended material from wastewater by settling and/or floatation in septic tanks or primary settling chambers, prior to effluent discharge to a secondary treatment process or to a land application system.

Producer Statement means a written declaration by a person responsible for an activity/product/process, setting out the performance requirements, how these are to be met and the measures required to assess their effectiveness. In respect of Chapter 7, the Producer Statement shall be lodged by the system manufacturer or system provider.

The Producer Statements shall confirm:

a) Test/trial results demonstrating that the specific brand and model or specific design of the advanced on-site wastewater treatment unit, if correctly installed and maintained, will meet or exceed the functional and treated effluent quality parameters set out in this Rule.

b) The minimum maintenance, frequency of maintenance, expertise for maintenance and availability of expertise for maintenance required for the advanced on-site wastewater-treatment unit to meet or exceed the functional and treated effluent quality parameters set out in this Rule.

c) The minimum influent quality and any limitations on influent quality, and the minimum and maximum inflow design parameters that the advanced on-site wastewater-treatment unit is designed for, to meet or exceed the functional and treated effluent quality parameters set out in this Rule.

d) The power or energy requirements for the advanced on-site wastewater-treatment unit to meet or exceed the functional and treated effluent quality parameters set out in this Rule.

Property means any area of land comprised wholly of one Certificate of Title or any allotment as defined by the Act. Property may also include two or more allotments that are subject to Section 75 of the building Act 2004.

Proprietary advanced on-site wastewater-treatment unit means a prefabricated on-site wastewater-treatment unit designed to treat wastewater to secondary quality or better before it is discharged into or onto land within the land application area.

Registered operator means an operator registered as an 'Offensive Trade' operator pursuant to the Health Act 1956.

Runoff means surface water moving across the ground and into a waterway that may be contaminated with effluent.

Scum means a floating mass of wastewater solids buoyed up by entrained gas, grease or other substances which form an accumulating layer on the liquid surface inside the treatment tank.

Secondary-effluent Producer Statement means a written declaration by the system designer or manufacturer confirming how the wastewater-treatment unit achieves the effluent quality for which it is designed. The statement must describe the effluent quality in terms of Biochemical Oxygen Demand (BOD_5) and Suspended Solids (SS).

Secondary treatment means aerobic biological processing and settling or filtering or effluent received from a primary treatment unit. Effluent quality following secondary treatment is expected to be equal to or better than 20g/m³ BOD_5 and 30g/m³ suspended solids.

Septage means the pump out contents from a septic tank (or primary compartment of an advanced treatment system) removed during desludging operations, which includes scum, sludge and tank liquid.

Septic tank means a watertight sedimentation tank for organic wastes in which the sludge settling on the bottom is allowed to digest and liquefy by anaerobic bacterial action.

Setback means the distance that a wastewater system must be situated from a building, boundary, body of water or land stability feature.

Sewage carrier means a person or company registered to carry out the 'Offensive Trade' of collecting and carting sewage.

Sewer network means the network of collection drains carrying wastewater or effluent away from properties for off-site treatment and sometimes referred to as sewerage.

Shear plane A zone of different permeability in soil or rock which water preferentially travels along and which the rock or soil will preferentially fracture along. This can be a problem if soils on slopes become unstable as a result of saturation due to on-site wastewater discharges.

Sludge means the semi-liquid solids settled from wastewater.

Sufficient capacity in respect of Chapter 7 means a treatment system has sufficient capacity if it has been designed to accommodate and treat the peak potential discharge from a building or facility. Sufficient capacity is calculated from the number of permanent or intermittent users of a building or facility and multiplied by the peak discharge flow for the type of building connected to the on-site sewage treatment system. Wastewater Flow Design Allowances listed in Appendix 5 Schedule 4 Table 1 set out typical flow design allowances.

Treated wastewater - means wastewater which has been subject to:

i. Primary treatment, which means physical processes including; screening, filtering, primary sedimentation or flocculation; and

ii. Secondary treatment, which means aerobic or anaerobic biological treatment processes; and

iii. Tertiary treatment processes, which means advanced treatment or disinfection of effluent following secondary treatment.

Untreated wastewater in relation to Chapter 6 and 7 means wastewater that has not passed through a wastewater-treatment unit.

Wastewater-treatment unit means a primary or secondary treatment system.

Wastewater holding tank means a tank used for holding wastewater prior to pumping out.

Wastewater In relation to Chapter 7 means wastewater originating from household or personal activities, including toilets, urinals, kitchens, bathrooms (including shower, washbasins, bath, spa bath (but not spa)) and laundries. It includes wastewater flows generated from facilities serving employees, residents, students, or guests within institutional, commercial and industrial establishments. It excludes commercial and industrial wastes, large-scale laundry activities and any stormwater flows.

Wastewater System means an on-site wastewater system that receives, treats and absorbs wastewater within the property boundaries of the site of generation. The system consists of a treatment unit and land application area.

***Water body** means fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.

Water closet means a flush toilet.

Water table in relation to Chapter 7 means the upper surface of groundwater below which the soil is permanently saturated with water.

Wetland treatment in relation to Chapter 7 means a system for treatment of effluent consisting of aggregate or other similar material in which wetland plants are grown.

Appendices

Appendix 1 Site Assessment and Design Criteria

- Form 1A Assessment checklist
- Form 1B Desk top evaluation for Site and Soil Evaluation Report
- Form 1C On-site Evaluation for Site and Soil Evaluation Report
- Form 1D Design Report
- Form 1E Site Plan for Design Report
- Form 1F Hydraulic Assessment for Design report
- Form 1G Soil Assessment Reporting Sheet for Soil Evaluation
- Form 1H Soil Permeability Field Record Sheet for Soil Evaluation

Appendix 2 Assessment of Slope

Appendix 3 Assessment of Site Stability

Appendix 4 Criteria for On-site Wastewater Systems on Sloping and/or Erosion Affected Ground

Appendix 5 Summary of Clearances, Setbacks and Maximum Slope Gradients for Discharges

Appendix 6 Guidance for Resource Consent Applications

Appendix 1 Site Assessment and Design Criteria

Form 1A

Assessment Checklist

Have you attached;

- Desktop Study
- On site evaluation
- Design
- Hydraulic assessment
- Site stability report (if required)
- Site plan
- Soil Assessment Reporting Sheets
- Soil Permeability Assessment Sheet (if done)
- Photographs (if taken)
- Aerial photographs (if used)
- Consultation records (if required)
- Any other information needed
- Signature of client for agreement with proposed design
- Statement from the owner authorising agent to act on their behalf (if required)

Form 1B

	Desktop Evaluation					
1	**Details**					
	Owner					
	Location address					
	Legal description					
	Other site details					
	Postal Address					
	Phone					
	Email					
	Intended water supply source (Tick one)					
	Public supply		Rainwater (roof collection)		Bore/well/dam/spring	
3	**Building type and proposed use**					
4	**Occupancy**					
	Number of people who will occupy the building					
	Number of bedrooms in dwelling					
	Number of habitable rooms in the dwelling					
	Number of bedrooms in secondary dwelling					
	Number of bedrooms in secondary dwelling with bathroom or					

	Desktop Evaluation	
	kitchen facilities	
	Number of habitable rooms in a secondary dwelling	
5	**Site Evaluator(s)**	
	Name (principal evaluator):	
	Company/agency:	
	Address:	
	Phone	
	Email	

	Additional staff involved:		
	Name(s)	Designation	Involvement
	Signature of Principal Evaluator		
	Date		

Form 1C

	On-site Evaluation	
1	**Date work undertaken**	
	Date:	
2	**Weather (on day and preceding week):**	
	Weather:	
3	**Site History**	
	Any fill on site	
	Previous use of land	
	Current use of land	
	Any future or conflicting proposed use of land	
	Any remediation required?	
	Any local issues?	
4	**Land suitability evaluation**	
	Slope across distribution area	
	Slope along distribution area	
	Slope adjacent to distribution area	
	How was slope measured?	
	Ground cover over distribution area	
	Land Form across land application area	
	Land Form on adjacent areas	
	Drainage Patterns	
	Distance to Wells, bores, or springs	
	Distance to coastal margin	
	Distance to buildings	
	Trees or shrubs needing removal or from which the system needs to be protected	
	Features requiring setback distances	
	Area available for wastewater disposal and reserve	
	Area of property	
	Cut off drains required? (Surface/groundwater)	
	Other (specify)	

5	**Site Stability**	
	Is expert assessment necessary?	
	Author	
	Company/Agency	
	Date of report and report Reference code	
6	**Environmental concerns** (eg native plants intolerant of phosphorus load, high water table, swamp, waterway, etc)	
7	**Groundwater depth**	
	Summer	
	Winter	
	Event	
8	**Estimated soil category**	
9	**Recommended DLR**	
10	**Types of land application system suited to site**	
11	**Preferred land application system to be installed and why.**	

12	**Overall evaluation of minimum land application area for the site (include the absorption area, space between and surrounding the absorption area, setbacks and reserve area)**
13	**Other comments, eg special precautions which may be needed:**

Form 1D

	Design
	A design report must include the following;
	A description the treatment unit
	A description the land application system
	A site plan
	Annotated drawings with sufficient information for the installer of;
	· cross sections of components
	· construction drawings
	· pump chamber set-up detail
	· irrigation and other land application field layouts
	· land drains or cut-off drains.
	Show/describe reduced levels between
	· the building foul water drain, the treatment tanks and dosing chamber
	· the treatment system/tanks and gravity fed land application areas
	· on sloping land, the installed reduced levels of each land application trench or bed on the slope contour
	Specifications and verifications appropriate to the system. Such as;
	· Manufacturer specifications for system components and for installation of components,
	· Performance test certificates,
	· Producer Statements,
	· Certified Approvals,
	· Secondary-effluent Producer Statement,
	· Hydraulic design report for any dosing system,

Form 1E

	Site Plan
	A site plan must;
	· be to scale or be annotated with multiple measurements from permanent benchmarks to the wastewater system and reserve area
	· show a north point
	· show boundaries and easements
	· show any clearance distances
	· show ground features and setbacks
	· show relevant spot heights, contours, slopes, terraces or height variations
	· show direction of stormwater run-off
	· show waterbodies including the coast, streams, drains
	· show any areas of unstable land or erosion
	· show gardens and trees (including those that will need to be removed or from which the effluent field will need protection
	· show location of test pits/bores
	· show permeability test location (if applicable)
	· show buildings
	· show driveways
	· show fences
	· show the proposed wastewater system location including tanks, dosing chamber and effluent disposal area
	· show the reserve area location/solution
	· show the cut off drains
	· show where the water flows from down pipes from buildings, sealed surfaces and overflows from water tanks
	· show any drinking water source including tanks (above or in-ground), springs, or bores
	· show any existing septic tanks and effluent area
	· show any pools including where the backwash water goes
	· show any retaining walls

Form 1F

	Hydraulic Assessment
	A hydraulic assessment must consider at a minimum the following;
	· Number of bedrooms and water supply
	· Soil Category and chosen Soil Loading Rate (daily loading rate):
	· Tank working capacity and desludging frequency
	· Effluent Disposal Area Type. (E.g. Trench, bed, irrigation, wetland, etc.)
	· Measurement/ Set up of effluent disposal area. (E.g. depth, width, length, lateral length, cover, runouts, area required, media used, etc.)
	· Mainline/Lateral/irrigation details. (Pipe size, length, and type).
	· Size, flow rate and spacing of orifices/emitters.
	· Total Pump flow rate required
	· Mainline head loss including calculations
	· Lateral head loss including calculations
	· Operating head loss
	· Fittings head loss including calculations
	· Static lift
	· Pump head requirement
	· Pump chamber dimensions (m)
	· Pump chamber size (L)
	· Pipe volume (L)
	· Pump dose to field (L)
	· Pump arm travel required (m)
	· Set up of pump in the pump chamber
	· Recommended pump (require pump specifications including pump curve and minimum space for installation).
	· Diagrams of tanks, effluent disposal on the land and the setup.
	· set up of siphon in a dosing chamber
	An accepted rule of thumb for head loss is; with a maximum of a 20 metre, 33mm pressure pipe with 6mm holes at 1 metre spacings and 0.3 metre squirt height gives, 0.3 metre operating head loss, 0.5 metres lateral head loss, and 2.2 litres per minutes flow rate from each orifice.

Form 1G

Soil Assessment Reporting Sheet

Client Name	Project Address	Company	Pit/Bore hole no.

Slope Measurement	Land Form Element	Indicative drainage	Water Table Depth (m)

Ground Cover

Soil Bore or Soil Pit Survey Form												
Layer	Lower depth (mm)	Moisture Condition*	Colour (moist)	Field Texture	Coarse fragments % volume	Structure	Modified Emerson	Soil Category	Consistency	Permeability	Sample Taken (Y/N)	Other Assessment
1												
2												
3												
4												
5												

Use another form if more than five layers of major horizons

*** Describe Moisture Condition as dry, moist, very moist, saturated**

Notes/Comments/Observations	

Signed: _____

Assessor: _____ **Date work done:** _____

Form 1H

Soil Permeability Record Sheet

Client name _____

Project Address _____

_____

_____

Assessor _____

Date _____

Test Site No. _____

Details of Auger hole

Depth _____ mm

Depth of Water _____ mm

Average Diameter _____ mm

Depth to any Impermeable Layer _____ mm

Vegetation at site _____

_____

_____

Time elapsed between first filling and start of measurement _____ minutes

Soil moisture content at the time of excavation _____

General comments about the site

(indications of seasonal water-logging, soil structure, biological pores, etc)

_____

_____

Permeameter and time readings

Test#	-	
Time	**Level in Tube**	**Change**
Q=		
Ksat=		

Test#	-	
Time	**Level in Tube**	**Change**
Q=		
Ksat=		

Appendix 2 Assessment of slope

Assessment of slope

For any site greater than 3° in slope, a cross section survey shall be completed to measure and record the slope gradients and variations of these between the building and the site proposed for the treatment plant and disposal field. This is to enable the levels of each section to be calculated for system design.

As a minimum the survey shall be carried out using the Tape, and Abney level methodology. More accurate methodologies (such as using a theodolite or GPS) can also be used.

The survey shall measure the distance and angle down and along the steepest fall line of the slope to principal change points in gradient measured to a 10cm and 1° accuracy. The survey shall extend a minimum of 20m beyond the proposed disposal field and treatment system locations to incorporate any adjacent slopes and features which could affect the stability of the site (this includes land outside of the lot boundaries).

At least 5m of the ground beneath the building behind the sewer outlet point shall also be surveyed. Measurement across the fall lines of slopes shall be avoided.

The location of any features of significance shall also be noted, including areas of land-slippage, erosion, watercourses, fences, trees, and adjacent water shedding slopes.

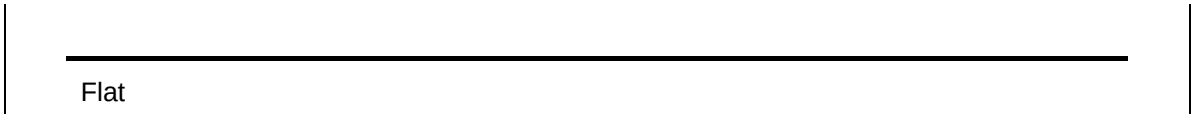
The survey information shall be presented on a true scale cross section which is to be included with the site assessment report. The location of the cross section survey line shall be shown on the scale plan for the site.

Table A4.1 Table of slopes

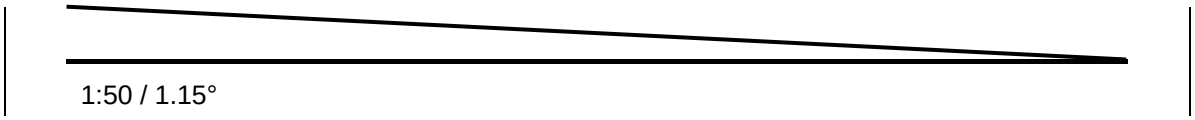
Slope (%)	Angle (°)	Ratio	Description
3	1.5	1v to 33h	Very gentle
4	2	1v to 25h	Very gentle
5	3	1v to 20h	Very gentle
10	6	1v to 10h	Gentle
15	9	1v to 6.7h	Gentle
20	11	1v to 5h	Gentle to moderate
25	14	1v to 4h	Gentle to moderate
30	17	1v to 3.3h	Moderate
35	19	1v to 3h	Moderate
40	22	1v to 2.5h	Moderate to steep
45	24	1v to 2.25h	Moderate to steep
50	27	1v to 2h	Steep
55	29	1v to 1.8h	Steep
60	31	1v to 1.7h	Steep to Very Steep
65	33	1v to 1.5h	Steep to Very Steep
70	35	1v to 1.45h	Very Steep

Slope visual guide

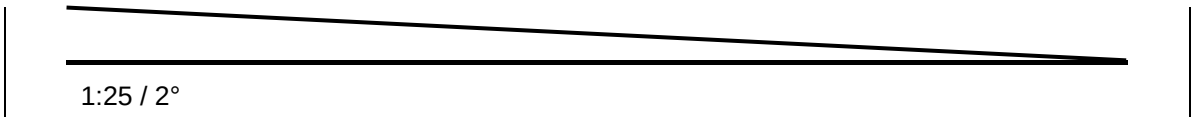
These visual interpretations of slopes must be used as a guide only and cannot substitute for on-site measurement of slope.



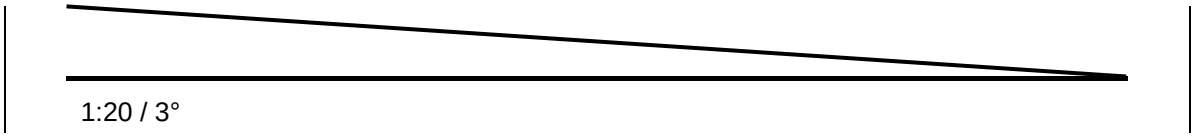
Flat



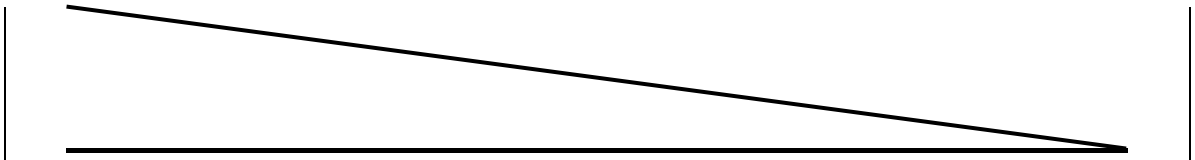
1:50 / 1.15°



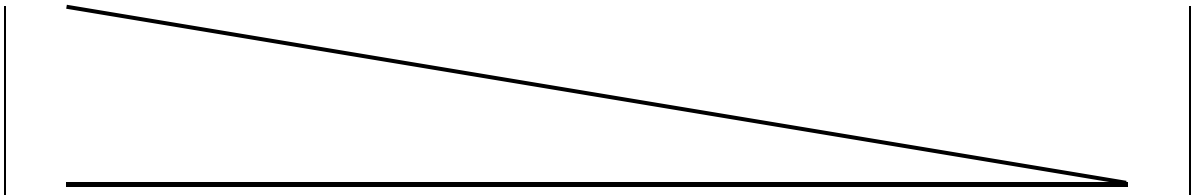
1:25 / 2°



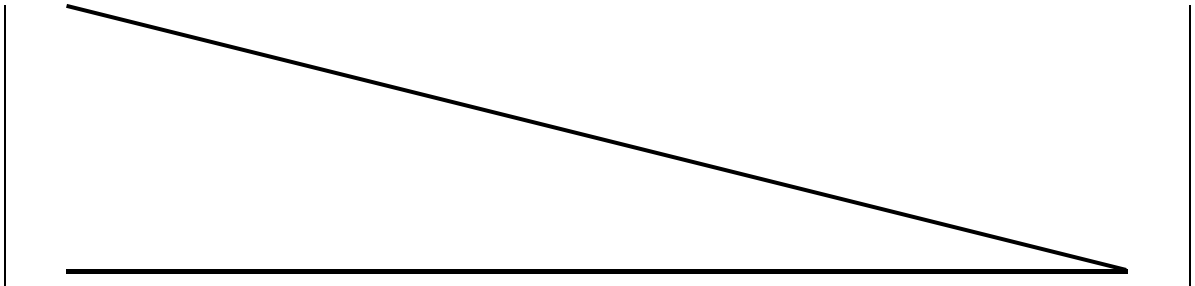
1:20 / 3°



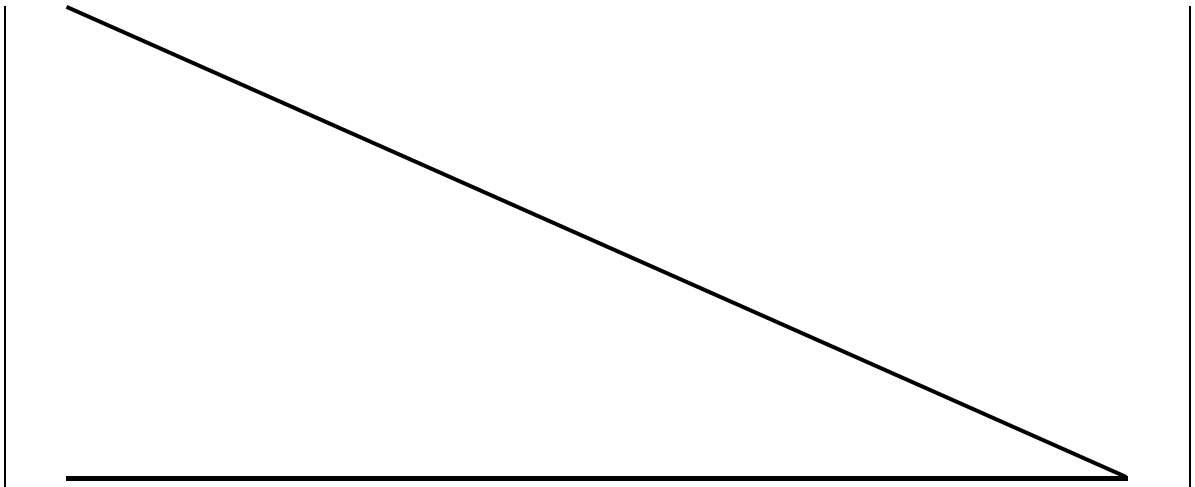
1:10 / 6°



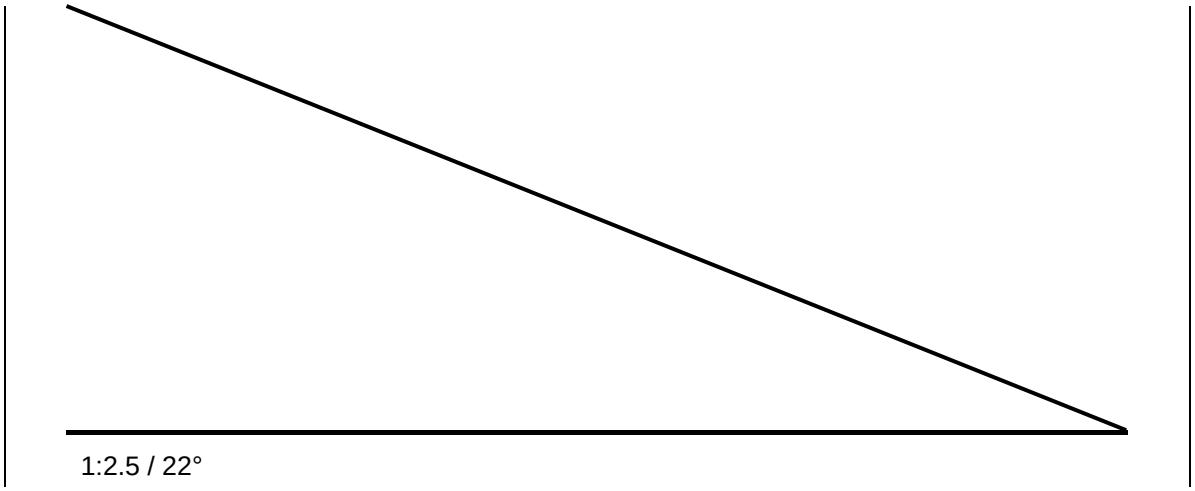
1:6 / 10°



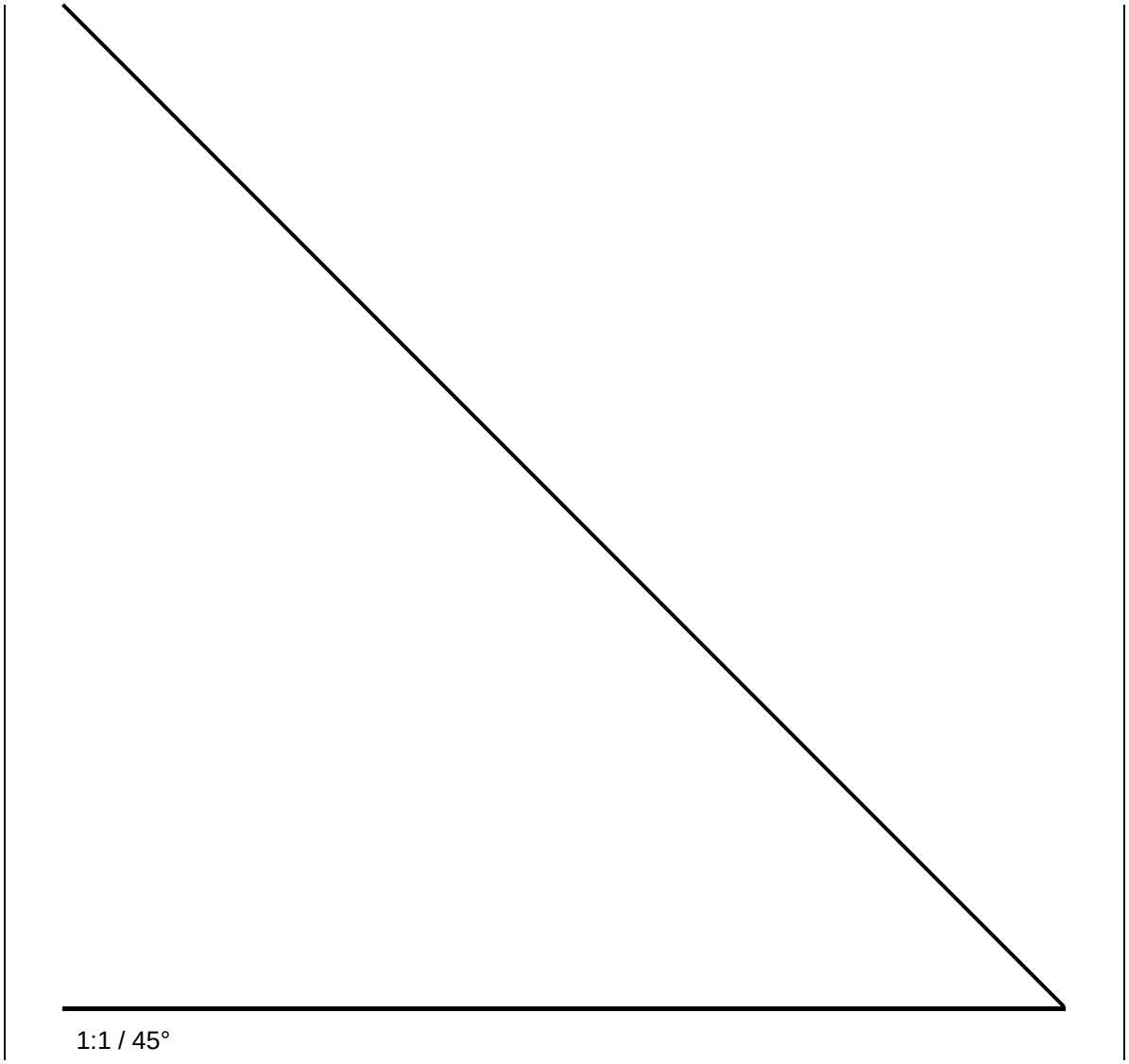
1:4 / 14°



1:3 / 19°



1:2.5 / 22°


1:1 / 45°

Appendix 3 Assessment of site stability

Assessment of site stability

Under the Building Act (2004), Council may refuse a building consent if it is not adequately satisfied that the land on which the system is located is subject or is likely to be subject to one or more natural hazards; or the system is likely to accelerate, worsen, or result in a natural hazard on that land or any other property, unless adequate mitigation measures are incorporated into the design to the satisfaction of the Territorial Authority.

AS/NZS 1547:2000 Figure 4.1B2 and Table 4.1C1 provide associated guidance and should be reviewed by the practitioner.

Provision of evidence relating to natural hazards

Evidence shall be provided to confirm that the site proposed for the effluent treatment and disposal system is unlikely to be subject to natural hazards; these hazards being

1. erosion (including coastal erosion, bank erosion, and sheet erosion)
2. falling debris (including soil and rock)
3. subsidence
4. inundation (including flooding, overland flow, storm surge, tidal effects, and ponding)
5. slippage.

In addition, evidence must be provided and confirmation given that the proposed effluent treatment and disposal system is unlikely to induce natural hazards (as listed above) during or following the installation, construction or functioning of the effluent system.

Requirements for identifying land stability features in the site evaluation report

Evidence in support of a stable site shall include (but is not limited to) the absence of any undulations, hummocks, tension cracks, scarps, terracettes, soil creep, land slippage, surface erosion, subsurface erosion ("under runners") within 8m of the system.

The location of all surface features within 20m of the site for the effluent system shall be clearly identified to scale on the site plan. Photographs of the site for the effluent system shall be included in the assessment report providing visual evidence of areas of stability and instability.

Within the Site Evaluation Report the site area identified for the proposed effluent system should be described detailing if the area;

Is concave, convex, or planar,

Is smooth, or undulating/hummocky,

Is affected by soil creep, land-slippage, surface erosion, piping erosion ('under-runners'), sink holes,

Is within 8m of an area of slope movement or erosion

The site aspect, its underlying geology, and whether it is underlain by fill should be noted.

Requirement for geotechnical investigation on slopes greater than 6°

A geotechnical investigation of the effluent system shall be carried out by a suitably qualified professional for sites located on slopes which are greater than **6° (1v:10h)** which display evidence of any undulations, hummocks, tension cracks, scarps, terracettes, soil creep, land slippage, surface erosion, subsurface erosion ("under runners") or any other form of land movement, land deformation, settlement, subsidence or erosion. Council reserves the right to request a geotechnical report for the site.

In addition, a geotechnical investigation shall be carried out by a suitably qualified professional for all slopes within 6m of the proposed treatment and disposal system which display evidence of land movement and /or erosion to determine the potential for the regression of these hazards back into the effluent system over the next 50 years.

The geotechnical investigation report prepared by a suitably qualified professional shall include numeric stability analyses of the site and slopes under full saturation and the delineation of land which has a factor of safety equal to or greater than 1.1 under these same conditions (i.e. the determination of set back lines to avoid areas of instability and erosion). The set back distance shall be shown on the scale plan for the site. Specific engineering design will be required for the areas of the treatment plant or disposal field which extend into land which has a factor of safety less than 1.1 or which is likely to be subject to lateral movement of more than 25mm over the next 50 years.

Appendix 4 Criteria for on-site wastewater systems on sloping and/or erosion affected ground

Criteria for on-site wastewater systems on sloping and/or erosion affected ground

1. Maximum slope gradient and depth for installation of specific land application systems

The maximum slope gradient and depth in which a disposal unit can be installed on ground is:

- 14° (1v to 4h) for seepage beds up to 1.6m deep
- 3° (1v to 20h) for ETS beds
- 19° (1v to 3h) for trenches up to 1.0m deep
- 22° (1v to 2.5h) for shallow installations up to 0.3m deep

provided that the base of the excavation for the disposal unit is equal to or greater than 5m down slope of the building or adjacent structure and that the slope does not show evidence of being affected by slope instability and/or erosion, unless a specific engineering assessment of the proposal is completed by a suitably qualified professional confirming that the disposal field is unlikely to adversely affect the stability of the slope or the building during construction and during its operation.

2. Maximum widths for trenches and ETS beds on slopes

Provided that the disposal field site is not likely to be subject to slope movement and/or erosion, and is isolated from areas of instability and erosion, the maximum width and length of seepage and ETS beds shall be consistent with design set out AS/NZS 1457:2000. There must be certainty that a level bottom is formed during construction to avoid over saturation of any portion of the slope. Unstable sloping land or sites in close proximity to areas of instability and erosion will require a geotechnical investigation and analysis of the site carried out by a suitably qualified professional, and recommendations for engineering measures to adequately protect the effluent system from slope instability and/or erosion are required.

3. Minimum set back distance from areas of slope movement and/or erosion

The minimum set back distance from slopes that display evidence of undulations, hummocks, tension cracks, scarps, terracettes, soil creep, land slippage, surface erosion, subsurface erosion ("under-runners") or any other form of land movement, land deformation, settlement, subsidence or erosion shall be 6m, unless a geotechnical investigation and analysis of the site carried out by a suitably qualified professional confirms that the proposed separation distance is adequate or provides recommendations for engineering measures to adequately protect the effluent system from slope instability and/or erosion.

4. Minimum set back distances from land features

The effluent treatment and disposal system shall be located a minimum distance away from embankments, escarpments, top/base/toe of slope, retaining structures and buildings unless a specific engineering assessment has been undertaken by a suitably qualified professional confirming that the proposal is unlikely to affect that feature. The minimum disposal field set back distance shall be;

- 1.5 x the height of any embankment
- 1.5 x the height of any slope
- 2 x the height of a retaining wall
- 1.5 x the depth of the foundations of any building with a minimum distance of 1.5m
- above a 45° line drawn from the base of any building foundation;
- 5 metres to the top of a shear plane

5. Siting Tanks on or within slopes

A specific geotechnical investigation of the site proposed for any tank located on or within a slope greater than 6° (1v:10h) that displays evidence of any undulations, hummocks, tension cracks, scarps, terracettes, soil creep, land slippage, surface erosion, subsurface erosion ("under-runners") or any other form of land movement, land deformation, settlement, subsidence or erosion shall be carried out by a suitably qualified professional. Appropriate evidence shall show that the site proposed for the tank is unlikely to be subject to slope instability or that the tank will not induce slope instability.

6. Requirements for cut-off drains on sloping land

Unless qualified otherwise, a surface cut-off drain shall be constructed 3m upslope of the effluent disposal field for all sites which are 1v:20h (3°, 5%) or steeper. Unless a specific engineering assessment is undertaken by a suitably qualified professional, the surface drain shall;

- be located in stable ground;
- have a maximum depth of 0.3m for slope gradients over 1v to 4h with a maximum slope gradient of 1v to 2.5h
- have side slopes no steeper than 1v:1h to minimise the potential for local instability;
- have a minimum longitudinal gradient of 1v to 50h to promote water flow and to minimise ponding;
- be grassed, or lined with erosion protection material or geotextile should the base gradient exceed 1v:20h.

7. Requirements for cut-off trenches on sloping land

A subsurface cut-off trench shall be installed on the upslope of the effluent disposal field for all sites which are 1v:20h (3°) or steeper and where the depth to the groundwater table is equal to or less than the depth of the drainage unit plus 0.6m. Unless a specific engineering assessment is undertaken by a suitably qualified professional, the subsurface cut-off drain shall;

- be located in stable ground;
- be limited to ground with a maximum slope of 19° (1v to 3h) for trenches up to 1.0m deep or less;
- have a minimum longitudinal gradient of 1v to 50h to promote water flow;
- be installed with perforated drainage coil surrounded by clean no-fines angular drainage metal graded between 7mm and 25mm enclosed in filter geotextile fabric;
- be capped with 0.3m of well compacted cohesive soil

Appendix 5 Summary of clearances, setbacks and maximum slope gradients for discharges

Summary of clearances, setbacks and maximum slope gradients for discharges

Criteria A - Clearance to water tables from discharges

1. For Permitted activity discharges of wastewater or greywater, the depth of the soil absorption zone below the point of discharge to the highest water table shall be no less than:

   a) 600mm for primary treated effluent

   b) 400mm for secondary treated effluent

   c) 300mm for tertiary treated effluent

2. For Permitted activities for discharges of wastewater or greywater, the depth of the soil absorption zone below the point of discharge to an impermeable layer shall be no less than:

   a) 600mm for primary treated effluent

   b) 400mm for secondary treated effluent

   c) 300mm for tertiary treated effluent

   The clearance criteria do not apply to systems established before April 2002.

3. For Permitted activity pit latrines, the depth from the base of the pit to the highest water table shall be no less than 2 metres.

4. For Permitted activity discharge to land of septage within the property it originated from, the depth from the base of the discharge pit to the highest water table or to any impermeable layer shall be 2 metres.

5. For Permitted activity discharge to land through deep bores, the depth from the base of the deep bore to the highest water table or any impermeable layer shall be 2 metres.

6. For Controlled activity composting toilets, the depth below the point of discharge to the highest water table shall be 600mm.

Criteria B – Setbacks from land and water features and structures for discharges

1. For Permitted activities, discharges of wastewater or greywater shall be no closer than:

   (i) 1.5 meters from a property boundary, or;

   (ii) 2 meters from a boundary interfacing with a beach or dune where there is also:

   20 meters of vegetative cover between the discharge and the beach margin; or

   20 meters of vegetative cover between the discharge and the dune crest; or

   (iii) 5 meters from a dune crest if dune is within the property boundary; or

   20 meters to any water body, artificial water body or coastal water; or

20 meters to any dam or pond except any dam or pond specifically constructed for the treatment of wastewater; or

20 meters of any bore used for human drinking water; or

20 meters to any bore used for irrigation water or stock drinking water; or

20 meters of any stock drinking water pond or dam; or

1.5 meters of any surface land drain that is exclusively contained on the property other than a land drain specifically constructed above a land application system to protect that system from inundation; or

5 meters of any surface land drain that is not exclusively contained on the property; or

1.5 meters vertically and 1.5 meters horizontally to a subsurface land drain.

For systems established before April 2002, only criteria (a) to (d) apply.

For systems established after April 2002 but prior to notification of this Rule, only criteria (a) to (f) apply.

For systems established after notification of this Rule, criteria (a) to (i) apply.

2. Permitted Activity discharges from pit latrines shall be no closer than:

   a) 20 metres of the edge of a water body, artificial water body or coastal water; or

   b) 50 metres of a bore, well or spring used for a buildings water supply, stock water or irrigation water; or

   c) 1000 meters up flow and 150 meters down flow of a community drinking water supply; or

   d) 20 metres of any subsurface land drain; or

   e) 10 metres of any property boundary; or

   f) 5 metres of any surface land drain; or

   g) 5 metres of any building used for habitable purposes.

3. Controlled Activity discharges from composting toilets shall be no closer than:

   a. 5 metres of any property boundary; or

   b. 5 metres of any drain; or

   c. 20 metres of any water body, artificial water body or coastal water; or

   d. 5 metres of any building used for habitable purposes; or

   e. 20 metres of land used to produce food crops for human consumption

4. Permitted Activity discharges to land of septage from the same property shall be no closer than:

   a) 150 metres from the property boundary; or

   b) 150 metres from any building used for habitable, commercial or industrial purposes; or

c) 100 metres from any water body, artificial water body or coastal water; or

d) 150 metres of a bore, well or spring used for a building's water supply, stock water or irrigation water; or

e) 1000 meters up flow and 150 meters down flow of a community drinking water supply; or

f) an area sensitive to coastal hazard.

4. Permitted Activity discharges to land from deep bores shall be no closer than:

a. 20 metres of the edge of a water body, artificial water body or coastal water; or

b. 50 metres of a bore, well or spring used for a buildings water supply, stock water or irrigation water; or

c. 1000 meters up flow and 150 meters down flow of a community drinking water supply; or

d. 20 metres of any subsurface land drain; or

e. 20 metres of any property boundary; or

f. 20 metres of any surface land drain.

Criteria C - Land stability setbacks and maximum slope gradients for installation of land application systems

For all new systems established as Permitted Activities after notification of this Rule, discharges of wastewater or greywater shall meet the following setback requirements:

a) Minimum setback distance from areas of slope movement and/or erosion

The minimum setback distance from areas of slope movement and/or erosion shall be **8m,** unless a geotechnical investigation and analysis of the site carried out by a suitably qualified professional confirms that the proposed separation distance is adequate or provides recommendations for engineering measures to adequately protect the effluent system from slope instability and/or erosion.

b) Minimum setback distances from land features

The wastewater treatment and land application system shall be located a minimum distance away from embankments, escarpments, base/toe of slope, retaining structures, and buildings, unless a specific engineering assessment has been undertaken by a suitably qualified professional confirming that the proposal is unlikely to affect that feature. The minimum disposal field setback distance shall be:

- 1.5 x the height of any embankment;
- 1.5 x the height of any slope;
- 1.5 x the height of a retaining wall;
- 1.5 x the depth of the foundations of any building with a minimum distance of 1.5m;
- above a 45° line drawn from the base of any building foundation;
- 5 metres to the top of a shear plane

unless site specific geotechnical requirements differ.

c) The maximum slope gradient and depth in which a disposal system can be installed is

- 14° (1v to 4h) for seepage beds up to 1.6 metres deep
- 3° (1v to 20h) for ETS beds
- 19° (1v to 3h) for trenches up to 1.0 metre deep
- 22° (1v to 2.5h) for shallow installations up to 0.3 metres deep

provided that the base of the excavation for the disposal unit is equal to or greater than 5 metres from the building or adjacent structure and that the slope does not show evidence of being affected by slope instability and/or erosion; unless a specific engineering assessment of the proposal is completed by a suitably qualified professional confirming that the disposal field is unlikely to adversely affect the stability of the slope or the building during construction and operation.

Appendix 6 Guidance for Resource Consent applications

1. Discharge to land resource consents – discharge permits

The Design Report and the Site and Soil Evaluation Report, must be submitted with any application for discharge permit. An application must also be accompanied by an Assessment of Environmental Effects (AEE) prepared in accordance with Section 88 and the Fourth Schedule of the Resource Management Act. The level of additional information required for an AEE will depend on the discharge proposal. Generally, a quality Site and Soil Evaluation Report and Design Report should cover the information needed for an AEE.

Applications are assessed, and depending on the proposal and which (RPDLW) rule that applies, notification may be required. Notification can be limited to potential affected parties or can be the public generally.

Dependant on the proposal and notification process, an application may be considered by a reporting officer of the Council or by way of a hearing before a Committee of the Council.

Approved resource consents are time bound and are conditional. Compliance with conditions is required. Monitoring of compliance is completed by Council Officers. Generally the term of a discharge permit for an on-site wastewater system is limited to 15 years.

2. Assessments of effects on the environment

The following notes are to assist people preparing an Assessment of Environment Effects (AEE) for a resource consent application for a discharge permit.

Section 88 of the Resource Management Act 1991 requires that all applications for resource consent include an assessment of the actual or potential effects that the proposed activity may have on the environment and the ways in which adverse effects can be mitigated.

Schedule 4 to the Act lists the matters that should be included in such assessments or considered in their preparation. An assessment of effects of the discharge should include, but is not limited to, the following matters:

a) A complete description of the proposal including details of the occupancy and duration of occupancy of the building the discharge originates from.

b) The periods of year the when the discharge will occur and any expected peaks in the discharge volume during the year.

c) Full details of the design of the treatment and land application systems, including treatment tank(s), effluent outlet filter(s), hydraulic design and energy requirements of the system.

d) Details of the installation and maintenance for the treatment and land application systems, including estimated effluent quality from the anticipated system performance.

e) Scale plans of the proposed treatment and land application systems and proximity to surface water bodies, land drains, bores or springs, buildings, other structures and boundaries.

f) An assessment of the suitability of the site for the discharge including soil identification and permeability, land slope, groundwater depth, land flooding potential, land inundation potential, land stability and current land uses.

g) Availability of land and reserve areas for land disposal of discharges.

h) Adverse effects and potential effects of the discharge on human and stock health including transmission of disease.

i) Adverse effects including cumulative adverse effects of the discharge and other discharges on groundwater quality, surface water quality and soil.

j) Timing and manner for decommissioning discharge systems.

k) Control of safety hazards from the treatment and land application systems.

Proposed mitigation measures

Possible alternative methods of treatment and disposal should be assessed and considered and the best practicable option for discharges at the proposed site should be adopted.

The assessment should identify how the proposed treatment and disposal of the discharge will protect against any actual or potential effects on the environment, or alternatively minimise any adverse effects on the environment.

The application should describe proposed mitigation measures to help prevent or reduce the actual or potential effects of the discharge. Mitigation should include a contingency plan in the event of system malfunction and the maintenance requirements for the systems, for example, the on-site effluent storage capacity of the system and alarm systems.

The proposed discharge must not create land instability that would result in damage to the treatment or disposal system, buildings or environment. The applicant must detail any mitigation measures required to prevent land instability from the discharge.

The application should describe how nuisance or risks to health from the discharge will be prevented.

The system design and functional performance should prevent effluent ponding, flooding or run-off on the surface of any land or to any water way. Groundwater should be protected from contamination and soils protected from oversaturation.

The application must demonstrate the land used for the discharge activity must be protected from inundation and conflicting land uses that may cause adverse effect on the environment from the discharge.

People who may be interested or affected and consultation carried out

The assessment should identify people interested in or affected by the proposal, the consultation done and any response to the views of those consulted. This will vary depending upon system location, effluent volumes and the proposed methods of treatment and disposal. The applications should include details of any contact made with neighbouring landowners, occupiers and organisations. The applicant should include any comments made by consulted parties and the response to them.

Monitoring requirements

Where the scale or significance of the activity or effects are such that monitoring is required, the assessment should include a description of how, once the proposal is approved, effects will be monitored and by whom.