ATTACHMENTS UNDER SEPARATE COVER

ORDINARY COUNCIL MEETING
10 DECEMBER 2024

PORT STEPHENS
COUNCIL

INDEX

PORT STEPHENS COUNCIL
ON-SITE SEWAGE DEVELOPMENT ASSESSMENT FRAMEWORK

DOCUMENT CONTROL SHEET

	Document :	Port Stephens On-site Sewage DAF V1.2
	Organisation	Port Stephens Council
	Contact:	Andrew Weekes
	Reference	

Synopsis :	This Development Assessment Framework sets out minimum requirements for the assessment, design and construction of on-site sewage management systems (both individual systems and unsewered development applications). The Framework adopts a risk based approach based on the outcomes of Council's *Sustainable On-site Sewage Management in Port Stephens Project*. The Framework is a reference document that can be used to confirm how applicants can meet the Minimum Standards and Acceptance Criteria set by Council to ensure unsewered development is undertaken in a safe and sustainable manner. **Please note that this document was originally prepared on behalf of Council by BMT WBM Pty Ltd as part of the *Sustainable On-site Sewage Management in Port Stephens* Project.**

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE OF ISSUE	CHECKED BY		ISSUED BY	
1	30 June 2011		Andrew Weekes	30 June 2011	Andrew Weekes
2	22 August 2011		PSC	22 August 2011	PSC

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ON-SITE SEWAGE MANAGEMENT DEVELOPMENT ASSESSMENT FRAMEWORK

What is the Development Assessment Framework?

The Framework sets out Council's levels of investigation, acceptable solutions (deemed to satisfy) and minimum standards for sewage management in unsewered areas. All unsewered allotments in Port Stephens have been assigned an On-site Sewage Management Hazard Class. This Hazard Class (Low to Very High) determines the level of detail required for supporting information submitted with development applications and applications to install or alter sewage management facilities.

Why has my property been given a Hazard Class?

Sewage management risk mapping has been completed as part of a technical study titled *Sustainable On-site Sewage Management in Port Stephens*. Adoption of a risk based approach enables Council to approve low risk applications with limited delay or the need for detailed studies. On the other hand, high and very high risk sites will require a high level of scientific and engineering input to demonstrate a proposed on-site system is sustainable.

What do I need to do if I want to submit an application?

Contact Council to confirm the On-site Sewage Hazard Class for your property and obtain the relevant documentation. Use the table below to determine whether you require the services of an on-site system installer alone, or if you require more detailed assistance from an environmental / engineering consultant. You can then contact potential technology providers and environmental / engineering consultants (through the Yellow Pages or internet) to obtain quotes for the necessary work. Local installers and consultants are familiar with Council's DAF and will be able to advise you on what your specific requirements are. Alternatively, you can contact Council for advice.

The Process

- Complete Council's application form and engage the services of an installer and/or consultant (depending on your properties Hazard Class) to prepare your application.
- Submit your application to Council with all required supporting information (in accordance with the Framework) and pay the relevant fee in accordance with our current schedule of fees and charges.
- Applications for Low and Medium Hazard allotments prepared in accordance with our Acceptable Solution criteria and Minimum Standards will be assessed and approved promptly. However failure to meet these criteria and standards will result in longer assessment periods, requests for additional information and potential refusal of the application.
- You may be required to attend a site meeting with Council to discuss your application.
- Council will assess the application based on the final information submitted and issue a determination. In the majority of circumstances, the application will be approved subject to a set of conditions to be satisfied before at different stages of the development process can occur.
- However there may be circumstances where the information submitted does not adequately satisfy the concerns of Council or in fact may demonstrate that a particular proposal is not sustainable.

Development Type	Hazard Class	OSSMS Application Form and Fee	Supporting Information for DA	Installer Assistance	Consultant Assistance	DAF Section
Domestic On-site Sewage Management Systems	Low	Yes	N/A	Yes	No[1]	1.1
	Medium					1.1
	High				Yes	1.3
	Very High					1.4
	Effluent Pump-out				No	1.5
	Pump to Sewer					1.6
Subdivision / Increasing Building Entitlements	Low	N/A	Yes	Yes	No[1]	2.1
	Medium					2.2
	High			Yes	Yes	2.3
	Very High					2.4
	Consolidating Lots			Yes	Possible	2.5
Non-domestic On-site Wastewater Management Systems	Low (<10 kL/day)	Yes	Yes	Yes	Yes	3.1
	Medium (<10 kL/day)					
	High					3.2
	Very High					
	All 10-100 kL/day systems					
	>100 kL/day systems					3.3

Note 1: A consultant may be required where Acceptable Solution criteria are not met.

How to Use This Document

This Development Assessment Framework (DAF) sets out the minimum requirements and Acceptable Solutions for proposed on-site sewage management systems and any increase in unsewered building entitlements within the Port Stephens Council Local Government Area (LGA). It is designed as a ready reference for system installers and environmental consultants who design on-site systems. This DAF also refers to other council policy and guideline documents in addition to external technical publications that will assist in meeting Councils Minimum Standards. These requirements vary depending on whether an allotment is classified as Low, Medium, High or Very High Hazard. They also vary for different types of development.

All property owners wishing to submit an application to install an on-site sewage management system will require assistance from an installation firm. In some cases, a more comprehensive Wastewater Management Report will need to be prepared by a suitably qualified environmental / engineering consultant. Development applications resulting in an increase in existing unsewered building entitlements will always require a Wastewater Management Report as will non-domestic on-site systems.

A checklist is provided for each Hazard class that can be used to confirm if the proposed on-site sewage management system or unsewered subdivision is an Acceptable Solution based on Councils planning, development and on-site sewage management policies. **Where an application fits Acceptable Solution criteria approval will be granted promptly. If not, further information will be requested by Council to demonstrate that the proposal meets Minimum Standards.**

Minimum Standards apply to all aspects of the assessment, design and approval process and are divided into the following components.

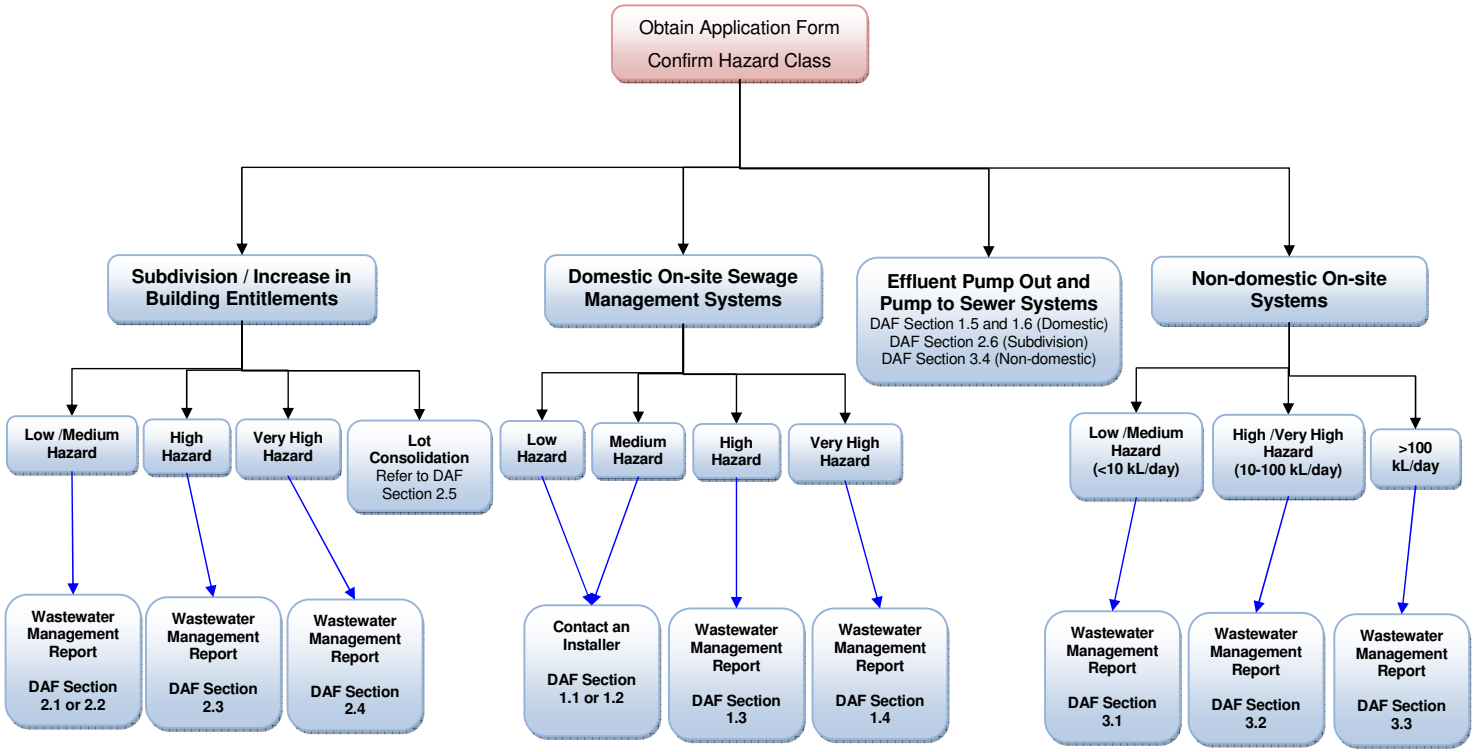
- Site and Soil Assessment:
- System Selection and Sizing:
- Constructability:
- Cumulative Impacts.

This DAF document sets out how applications to install an on-site sewage management systems and development applications that increase existing building entitlements can meet Minimum Standards and recommends resources, tools, standards and guidelines to be used in demonstrating compliance. **An application to install an individual on-site system or unsewered subdivision is unlikely to be approved where an applicant fails to use the recommended resources, tools, standards and guidelines to demonstrate compliance.** Notwithstanding, the DAF does provide flexibility for individual applicants to develop innovative or site specific on-site system designs by allowing for a performance based approach where clear justification is provided and a specific level of assessment and design is undertaken.

In the majority of cases, Councils DAF will reduce the uncertainty associated with how much information is required for approval and streamline / expedite the approval process. However, where specific applications are clearly in contrast to Councils objectives for sustainable and cost appropriate on-site sewage management, the DAF will also make it clear what additional information is required for Council to approve the system / development.

The following flowchart should be used to confirm the level of assistance you will require to prepare information for the application and the relevant component of the DAF applicable to your site. It is not intended that this document be read in its entirety. Users should use the flow chart to direct their attention to the appropriate section.

ITEM 5 - ATTACHMENT 2 DEVELOPMENT ASSESSMENT FRAMEWORK.



1 SINGLE RESIDENTIAL ALLOTMENTS

This component of the DAF covers assessment and approval requirements for individual on-site sewage management systems. It applies where an applicant proposes one or more of the following.

- To construct or alter an on-site sewage management facility under Section 68 of the *Local Government Act (1993)*.
- Development Applications (DA's) for activities that will include wastewater generating activities.

The specific levels of assessment and supporting information required to accompany an application are slightly different depending on the On-site Sewage Hazard Class (Hazard Class) of the allotment. The Hazard Class should be confirmed with Council prior to undertaking any investigations and reference should then be made to the appropriate sub-section below to confirm requirements.

1.1 Low Hazard Allotments

Low Hazard allotments typically contain few constraints to sustainable on-site sewage management and as such the level of investigation and supporting information required is limited. Notwithstanding, it is important that Council is satisfied that the allotment is in fact a Low Hazard site prior to approval. It is also important to confirm site specific conditions to assist in system selection and design. The following summary table should be used as a guide to the investigations and information required for single residential allotments classified as Low Hazard. The following subsections then provide a detailed explanation of how applicants can meet Councils DAF Minimum Standards and Acceptable Solution criteria.

Table 1-1 Low Hazard Assessment Criteria

Requirements for Acceptable Solutions		Compliance?
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	Site and soil assessment undertaken in accordance with Section 1.1.1 of this DAF using Council's Site and Soil Assessment pro-forma?	□
System Selection and Sizing	Design criteria and wastewater generation rate obtained from Council's Minimum Standards in Section 6.2?	□
	System components sized and configured in accordance with Council's Minimum Standards in Section 6?	□
	Chosen OSMS option is in accordance with available Acceptable Solution for this site (Section 5)?	□
	Site plan prepared in accordance with Council's Site and Soil Assessment pro-forma?	□
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form?	□
If you were not able to demonstrate compliance with all of the above Acceptable Solution criteria, you must proceed to the following checklist.		

Acceptance Criteria for Site Specific Designs	
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Completion of a detailed Site and Soil Assessment in accordance with the High Hazard DAF by a suitably qualified consultant.
System Selection and Sizing	Site specific design calculations in accordance with the High Hazard DAF by a suitably qualified consultant.
	Monthly water balance calculations and treatment system/tank accreditation details to be provided.
	List available options and justify selection in accordance with the High Hazard DAF.
	Site plan prepared in accordance with High Hazard DAF (1:500 scale minimum)?
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form?

1.1.1 Site and Soil Assessment

Increased flexibility has been provided in the site and soil assessment process to recognise that the level of detail required in a site and soil assessment is dependent on the characteristics of a property. A unique set of Acceptable Solution criteria have been developed for each hazard class. Naturally, low and medium hazard allotments have less stringent requirements in order to be deemed to comply than high and very high hazard allotments. This section of the DAF summarises the site and soil assessment process for individual on-site sewage management systems on Low Hazard allotments. It also provides guidance on how applicants can meet Acceptable Solution requirements.

Allotments classified as Low Hazard under Council's DAF require less stringent site and soil assessment processes to be undertaken. However, it is still important to confirm that site and soil characteristics pose minimal limitations to on-site sewage management system construction and operation. There are also a number of crucial site and soil parameters that must be confirmed in order to design the system. Where an increase in building entitlements is proposed (e.g. subdivision), it is vital that suitable effluent management areas (EMA's) are identified through site and soil assessment to avoid imposing overly restrictive sewage management requirements on future lot owners.

Council have produced a Site and Soil Assessment pro-forma (the Pro-forma) that may be used for applications to install or alter individual systems on Low and Medium Hazard allotments. Adequate and accurate completion of the Pro-forma will be deemed to comply with Council's requirements. The Pro-forma can be obtained from Council or downloaded from Council's website. Site and soil assessments for Low/Medium Hazard sites can be undertaken using the Pro-forma by either installers or environmental / geotechnical consultants. Installers wishing to undertake assessments may need to provide evidence of successful completion of training in site and soil assessment for on-site sewage management.

Table 1-2 lists the Low Hazard Acceptable Solution criteria. Reference should be made to Table 6-1 for a brief explanation of the important site and soil features that need to be assessed and a list of resources for additional guidance and information. Each site and soil assessment should be undertaken in accordance with the information in the tables in order to be considered an Acceptable Solution. Failure to do so may result in Council requesting a more detailed assessment to be undertaken or delays in the Council assessment process while waiting for additional information. Table 1-2 is reproduced directly from the Site and Soil Assessment Pro-forma and represents a checklist to be completed by an installer or environmental / engineering consultant.

Table 1-2 Low Hazard Acceptable Solution Criteria

1. Site Assessment	Low Hazard	
	Limit	Comply (tick or cross)
Aspect/exposure of disposal area (sun and wind)	**High**	
Slope of disposal area	**< 10%**	
Flooding – is the property flood prone?	**> 1:100 year AEP**	
Hunter Water Special Area (catchment)	**Outside**	
Depth to bedrock or hardpan?	**> 1.0metres**	
Depth to groundwater?	**> 1.0metres**	
Groundwater bore – distance to disposal area?	**> 250 metres**	
Permanent waters – distance to disposal area?	**> 100 metres**	
Dams, drains, intermittent watercourses – distance to disposal area?	**> 40 metres**	
Vegetation - removal for disposal area?	**No**	
Any other health or environmental constraints specific to the property?	**No**	
Soil classification (*AS/NZS 1547:2000)*	**Cat. 2-5**	

Applications must be assessed under the Medium Hazard DAF where site specific investigations confirm a failure to meet any of the Acceptable Solution criteria in this table.

1. Slope may be estimated visually.
2. Subsurface criteria must be assessed through excavation of at least one soil test pit within the proposed land application area(s).
3. Soil classification shall be conducted through textural analysis as described in Appendix 4.1D of *ASNZS1547:2000*.
4. Approval may be required for removal of vegetation under Council's Tree Preservation Order. It is the responsibility of the property owner to obtain approval where necessary.
5. Failure to declare obvious property constraints may trigger additional investigation requirements.

1.1.2 System Selection and Sizing

Applications on Low Hazard allotments can be fast tracked following the basic site and soil assessment through use of the Acceptable Solution Tables to select and design the system. Where the Tables are used to develop system designs, Council are able to approve the proposal promptly with limited need for detailed assessments. However, Council need to be confident that the allotment and on-site system proposed can be classified as Low Hazard. Council also need to be shown that an appropriate choice of on-site sewage management has been made following consideration of key available options. Adoption of standard design principles from this DAF should also enable installers and environmental consultants to develop their own standard application and design material for the variety of on-site system options available within the DAF. The Site and Soil Pro-forma allows an installer/designer to nominate which acceptable solution is proposed for the subject site with the aim of minimising the need for a separate report.

In Low Hazard applications where an Acceptable Solution is not adopted for system selection and sizing, applicants will be required to undertake a more detailed level of assessment in accordance with the High Hazard requirements discussed in Section 1.3.2 and attach calculations to the Site and Soil Pro-forma.

1.1.3 Constructability

The term constructability is used to describe key assessment criteria for proposed on-site sewage management systems that have a significant influence over the long-term sustainability and performance. These key assessment criteria include:

- The relative degree of difficulty associated with installing and constructing an on-site sewage management system.
- The relative capital and operational costs associated with the proposed system.
- Acknowledgement by applicants and notification of future property purchasers of the nature of the proposed system, degree of construction difficulty and capital / operational costs.

They should also be assessed relative to the size and value of the development (whether existing or proposed) to be serviced. This includes the financial and technical capacity of site owners and local installers/service technicians to install and operate the system in perpetuity. Councils Application Form to Install a Sewage Management Facility includes a declaration to be signed by land owners acknowledging that they are aware of constructability issues and implications associated with the proposed on-site system prior to approval.

Low Hazard applications to install an on-site system do not require consideration of constructability beyond provision of a signature from the property owner/applicant confirming that the details and implications (including costs) of the proposed system have been explained to them and that they understand the nature of the proposal.

1.2 Medium Hazard Allotments

Medium Hazard allotments typically contain some moderate constraints to sustainable on-site sewage management that can typically be managed through conventional on-site system designs. Notwithstanding, it is important that Council is satisfied that the allotment is in fact a Medium Hazard site prior to approval. It is also important to confirm site specific conditions to assist in system selection and design. The following summary table should be used as a guide to the investigations and information required for single residential allotments classified as Medium Hazard. The following subsections then provide a detailed explanation of how applicants can meet Councils DAF Minimum Standards and Acceptable Solution criteria.

Table 1-3 Medium Hazard Assessment Criteria

Requirements for Acceptable Solutions		**Compliance?**
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	Site and soil assessment undertaken in accordance with Section 1.2.1 of this DAF using Council's Site and Soil Assessment pro-forma?	□
System Selection and Sizing	Design criteria and wastewater generation rate obtained from Council's Minimum Standards in Section 6.2?	□
	System components sized and configured in accordance with Council's Minimum Standards in Section 6?	□
	Chosen OSMS option is in accordance with available Acceptable Solution for this site (Section 5)?	□
	List available options and justify selection based on site and soil constraints with brief statement.	
	Site plan prepared in accordance with Council's Site and Soil Assessment pro-forma?	□
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form?	□
If you were not able to demonstrate compliance with all of the above Acceptable Solution criteria, you must proceed to the following checklist.		

Acceptance Criteria for Site Specific Designs	
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Completion of a detailed Site and Soil Assessment in accordance with the High Hazard DAF by a suitably qualified consultant.
System Selection and Sizing	Site specific design calculations in accordance with the High Hazard DAF by a suitably qualified consultant.
	Monthly water balance calculations and treatment system/tank accreditation details to be provided.
	Summary table of potential options listing advantages and limitations. Bullet point defining why selected option(s) were selected over all others in accordance with the High Hazard DAF.
	Site plan prepared in accordance with High Hazard DAF (1:500 scale minimum)?
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form?

1.2.1 Site and Soil Assessment

Increased flexibility has been provided in the site and soil assessment process to recognise that the level of detail required in a site and soil assessment is dependent on the characteristics of a property. A unique set of Acceptable Solution criteria have been developed for each hazard class. Naturally, low and medium hazard allotments have less stringent requirements in order to be an Acceptable Solution. This section of the DAF summarises the site and soil assessment process for individual on-site sewage management systems on Medium Hazard allotments. It also provides guidance on how applicants can meet Acceptable Solution requirements.

Allotments classified as Medium Hazard under Council's DAF require less stringent site and soil assessment processes to be undertaken. However, it is still important to confirm that site and soil characteristics pose minimal limitations to on-site sewage management system construction and operation. There are also a number of crucial site and soil parameters that must be confirmed in order to design the system.

Council have produced a Site and Soil Assessment pro-forma (the Pro-forma) that may be used for applications to install or alter individual systems on Medium Hazard allotments. Adequate and accurate completion of the Pro-forma will confirm eligibility for an Acceptable Solution approval. The Pro-forma can be obtained from Council or downloaded from Council's website. Site and soil assessments for Medium Hazard sites can be undertaken using the Pro-forma by either installers or environmental / geotechnical consultants. Installers wishing to undertake assessments may need to provide evidence of successful completion of training in site and soil assessment for on-site sewage management.

Table 1-4 lists the Medium Hazard Acceptable Solution criteria. Reference should be made to Table 6-1 for a brief explanation of the important site and soil features that need to be assessed and a list of resources for additional guidance and information. Each site and soil assessment should be undertaken in accordance with the information in the tables in order to be deemed an Acceptable Solution. Failure to do so may result in Council requesting a more detailed assessment to be undertaken or delays in the Council assessment process while waiting for additional information. The table below is reproduced directly from the Site and Soil Assessment Pro-forma and represents a checklist to be completed by an installer or environmental / engineering consultant.

Table 1-4 Medium Hazard Acceptance Criteria

2. Site Assessment	Medium Hazard	
	Limit	Comply (tick or cross)
Aspect/exposure of disposal area (sun and wind)	**Moderate**	
Slope of disposal area	**10 – 20%**	
Flooding – is the property flood prone?	**> 1:20 year AEP**	
Hunter Water Special Area (catchment)	**Outside**	
Depth to bedrock or hardpan?	**> 0.6metres**	
Depth to groundwater?	**> 0.6metres**	
Groundwater bore – distance to disposal area?	**> 250 metres**	
Permanent waters – distance to disposal area?	**> 100 metres**	
Dams, drains, intermittent watercourses – distance to disposal area?	**< 40 metres**	
Vegetation - removal for disposal area?	**No**	
Any other health or environmental constraints specific to the property?	**No**	
Soil classification (*AS/NZS 1547:2000)*	**Cat. 1-5**	

Applications must be assessed under the Medium Hazard DAF where site specific investigations confirm a failure to meet any of the Acceptable Solution criteria in this table.

1. Slope may be estimated visually.
2. Subsurface criteria must be assessed through excavation of at least one soil test pit within the proposed land application area(s).
3. Soil classification shall be conducted through textural analysis as described in Appendix 4.1D of *ASNZS1547:2000*.
4. Approval may be required for removal of vegetation under Council's Tree Preservation Order. It is the responsibility of the property owner to obtain approval where necessary.
5. Failure to declare obvious property constraints may trigger additional investigation requirements.

1.2.2 System Selection and Sizing

Applications on Medium Hazard allotments can be fast tracked following the basic site and soil assessment through use of the Acceptable Solution Tables (refer to Section 5) to select and design the system. Where the Tables are used to develop system designs, Council are able to approve the proposal promptly with limited need for detailed assessments. However, Council need to be confident that the allotment and on-site system proposed can be classified as Medium Hazard. Council also need to be shown that an appropriate choice of on-site sewage management has been made following consideration of key available options. Adoption of standard design principles from the Acceptable Solutions should also enable installers and environmental consultants to develop their own standard application and design material for the variety of on-site system options available within the DAF. The Site and Soil Pro-forma allows an installer/designer to nominate which acceptable solution is proposed for the subject site with the aim of minimising the need for a separate report.

In Medium Hazard applications where an Acceptable Solution is not adopted for system selection and sizing, applicants will be required to undertake a more detailed level of assessment in accordance with the High Hazard requirements discussed in Section 1.3.2 and attach calculations to the Site and Soil Pro-forma.

1.2.3 Constructability

The term constructability is used to describe key assessment criteria for proposed on-site sewage management systems that have a significant influence over the long-term sustainability and performance.

- The relative degree of difficulty associated with installing and constructing an on-site sewage management system.
- The relative capital and operational costs associated with the proposed system.
- Acknowledgement by applicants and notification of future property purchasers of the nature of the proposed system, degree of construction difficulty and capital / operational costs.

These first two criteria should be assessed relative to a small number of alternative on-site sewage management options appropriate for the site. They should also be assessed relative to the size and value of the development (whether existing or proposed) to be serviced. This includes the financial and technical capacity of site owners and local installers/service technicians to install and operate the system in perpetuity. Councils Application Form to Install a Sewage Management Facility includes a declaration to be signed by land owners acknowledging that they are aware of constructability issues and implications associated with the proposed on-site system prior to approval.

Medium Hazard applications to install an on-site system do not require consideration of constructability beyond provision of a signature from the property owner/applicant confirming that the details and implications (including costs) of the proposed system have been explained to them and that they understand the nature of the proposal.

1.3 High Hazard Allotments

High Hazard allotments typically contain moderate to major constraints to sustainable on-site sewage management that require site specific assessment and design to overcome. The following summary table should be used as a guide to the investigations and information required for single residential allotments classified as High Hazard. The following subsections then provide a detailed explanation of how applicants can meet Councils DAF Minimum Standards and Acceptable Solution criteria.

Table 1-5 High Hazard Assessment Criteria

	Acceptance Criteria
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Site and soil assessment undertaken in accordance with Section 1.3.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.
System Selection and Sizing	Design criteria and wastewater generation rate calculated on a site specific basis in accordance with Section 1.3.2 of this DAF by suitably qualified consultant and documented in Wastewater Management Report
	Monthly water balance and annual nutrient calculations to be undertaken in accordance with Table 1-6 of this DAF and the *Technical Manual* by a suitably qualified consultant and documented in Wastewater Management Report. Treatment system/tank accreditation details to be provided.
	Summary table of potential options to be included in Report listing advantages and limitations. Bullet point confirming why selected option is preferred.
	Site plan prepared in accordance with Table 1-6.
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form?
	Attendance at a pre-approval site meeting by a Council officer, designer and owner.

1.3.1 Site and Soil Assessment

Increased flexibility has been provided in the site and soil assessment process to recognise that the level of detail required in a site and soil assessment is dependent on the characteristics of a property. A unique set of acceptance criteria have been developed for each hazard class This section of the DAF summarises the site and soil assessment process for individual on-site sewage management systems on High Hazard allotments. It also provides guidance on how applicants can meet Minimum Standards.

Applications to install or alter an on-site sewage management system for High Hazard allotments cannot use the Council site and soil assessment pro-forma. They must be supported by a Wastewater Management Report prepared in accordance with the Minimum Standards set out in Table 1-6 and Table 6-1. This report should document a more comprehensive site and soil assessment process in addition to presenting design assumptions/calculations and a concept design for the proposed sewage management system. Given that a comprehensive site specific assessment is required for all High Hazard lots, no Acceptable Solution criteria have been assigned. Wastewater consultants must describe and assess site and soil characteristics in sufficient detail to demonstrate to Council how the proposed on-site sewage management system overcomes the nominated constraints (described in more detail in Section 1.3.2).

Site and soil assessment procedures for High hazard allotments should clearly follow nationally recognised standards and guidelines for soil and land survey and on-site sewage management. They should include references to specific procedures undertaken and classification systems used to describe and assess conditions. Refer to Table 6-1 for acceptable standards and guidelines for site and soil assessment procedures. Where individual components of a site and soil assessment are not supported with references to these guidelines and standards, Council may request further justification for Wastewater Management Report outcomes. **Failure to provide this information will result in refusal of the application for High Hazard allotments.**

As a minimum, all of the site and soil parameters described in Table 6-1 must be included in an assessment for High Hazard allotments. It is not adequate to simply list/state the observed or measured value for each parameter. A brief, clear explanation of the implications of the observed / measured value for the on-site system design must be included in the site and soil assessment. **Failure to provide this explanation will result in refusal of the application for High Hazard allotments.**

1.3.2 System Selection and Sizing

Given the likely site and soil limitations present on a high hazard allotment, site specific design calculations must be included in a Wastewater Management Report prepared by a suitably qualified / experienced environmental or engineering consultant. This will assist in selection of a system design capable of overcoming observed constraints. To this end, use of the Acceptable Solution Tables without supporting design calculations is not considered sufficient for High Hazard allotments. The structure and content of High Hazard Wastewater Management Reports essentially follows that traditionally adopted by environmental / geotechnical consultants. There are however, a number of critical components that must be included as a Minimum Standard as part of this DAF. Minimum Standards for preparation and content of High Hazard Wastewater Management Reports are set out in Table 1-6. Key system selection and sizing issues are summarised in the High Hazard Assessment Checklist and Table 1-6. The *Port Stephens On-site Sewage Technical Manual* contains further guidance and resources on system selection and design processes.

1.3.3 Constructability

In addition to provision of a signature from the property owner/applicant (as described above), the on-site system designer (and installer if known or the same party) and property owner will be required to attend a pre-approval site meeting with a Council Officer. At this meeting Council will discuss specific details regarding system design, layout, constructability, costs and maintenance requirements with both the designer (and installer) and property owner to ensure they are workable and considered acceptable to the owner. This will include brief consideration of the justification for selecting the chosen treatment and land application technology over other options. Council will also discuss any special conditions they may be considering for the approval to address potential construction, operation and management risks. If property owners and/or designers/installers are not able to attend a site meeting (or make appropriate alternative arrangements in special cases) or Council have significant concerns regarding the constructability and serviceability of the proposed system, a written constructability assessment may be requested (refer to the Very High Hazard constructability requirements for an explanation of this report).

Table 1-6 Minimum Standard for Wastewater Management Reports: Single High Hazard Lot

SINGLE ALLOTMENT Minimum Standard for High Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of bedrooms and occupants. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Summary of available published soils information for the site. • Soil assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Brief and clear explanation of the implications of observed site and soil features for system design and performance. • Recommendations on any soil amelioration required.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1-2 paragraphs • Table(s) • Bullet point list of recommended design elements to overcome constraints.
System Selection	• Summarise potential treatment and land application systems considered. • Brief statement justifying selection of treatment and land application system.	• Table • Bullet point
Design	• Site specific calculation of design wastewater generation rates in accordance with *AS/NZS 1547:2000*. • Accreditation details for the selected treatment system (where appropriate). • Non-accredited treatment systems will require submission of process design information in accordance with Minimum Standards for Non-domestic (<10 kL/day) systems as detailed in Table 3-5. • Nominated area monthly water balance calculations sized for zero overflow in the wettest month.	• Table and paragraph justifying calculations. • Attach Certificate • Table summarising inputs and assumptions accompanied by a summary table of results.
Site Plan	• Location of tank(s); • Location of boundaries, drains, buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of primary and reserve disposal areas; • Location of stormwater diversion drains and earth bunds (if applicable); • Two metre elevation contours; • Location of drainage pipework (centreline).	• A4 Site Plan (1:500 scale).
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions.	N/A

1.4 Very High Hazard Allotments

Sites classified as Very High Hazard under the DAF are typically unsuitable for the land application of effluent with approval subject to a comprehensive assessment and design process that includes a detailed evaluation of environment and health protection. Approval requires a commensurate level of assessment, design and construction detail to ensure any proposed on-site system meets the objectives of the *Local Government Act 1993*.

Table 1-7 Very High Hazard Assessment Criteria

	Acceptance Criteria
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Site and soil assessment undertaken in accordance with Section 1.4.1 of this DAF (Very High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.
System Selection and Sizing	Design criteria and wastewater generation rate calculated on a site specific basis in accordance by suitably qualified consultant and documented in Wastewater Management Report
	Daily water and nutrient balance calculations to be undertaken in accordance with Section 9 of the *Port Stephens On-site Sewage Technical Manual* by a suitably qualified consultant and documented in Wastewater Management Report. Treatment system/tank accreditation details to be provided. Hydraulic design calculations for all pressure dosed pipework (including drip irrigation) to be provided.
	Summary table of potential options to be included in Report listing advantages and limitations. Preliminary design calculations provided for all potential options along with a clear justification for system selection. Refer to Section 1.4.2 for further guidance.
	Site plan prepared in accordance with Table 1-9and must include all system components on a survey plan with 2m contours (maximum). Design drawings (to scale) of all non-accredited components showing plan and cross section views.
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form.
	Attendance at a pre-approval site meeting by a Council officer, designer and owner.
	Preparation of a 1-2 page Constructability Assessment by a preferred installer confirming the capacity to install the proposed system and approximate cost range.

1.4.1 Site and Soil Assessments

Increased flexibility has been provided in the site and soil assessment process to recognise that the level of detail required in a site and soil assessment is dependent on the characteristics of a property. A unique set of deemed to comply criteria have been developed for each hazard class. This section of the DAF summarises the site and soil assessment process for individual on-site sewage management systems on Very High Hazard allotments. It also provides guidance on how applicants can meet Minimum Standards.

Applications to install or alter an on-site sewage management system for Very High Hazard allotments cannot use the Council site and soil assessment pro-forma. They must be supported by a Wastewater Management Report prepared in accordance with the Minimum Standards set out in Table 1-9 and Table 6-1. This report should document a more comprehensive site and soil assessment process in addition to presenting design assumptions/calculations and a concept design for the proposed sewage management system. Given that a comprehensive site specific assessment is required for all Very High Hazard lots, no Acceptable Solution criteria have been assigned. Wastewater consultants must describe and assess site and soil characteristics in sufficient detail to demonstrate to Council how the proposed on-site sewage management system overcomes the nominated constraints (described in more detail in Section1.4.1).

Site and soil assessment procedures for Very High hazard allotments should clearly follow nationally recognised standards and guidelines for soil and land survey and on-site sewage management. They should include references to specific procedures undertaken and classification systems used to describe and assess conditions. Refer to Table 6-1 for acceptable standards and guidelines for site and soil assessment procedures. Where individual components of a site and soil assessment are not supported with references to these guidelines and standards, Council may request further justification for Wastewater Management Report outcomes. **Failure to provide this information will result in refusal of the application for Very High Hazard allotments.**

As a minimum, all of the site and soil parameters described in Table 6-1 must be included in an assessment for Very Hazard allotments. It is not adequate to simply list/state the observed or measured value for each parameter. A brief, clear explanation of the implications of the observed / measured value for the on-site system design must be included in the site and soil assessment. **Failure to provide this explanation will result in refusal of the application for Very High Hazard allotments.**

In addition to the requirements outlined above, site and soil assessment procedures for Very High Hazard allotments *may* also warrant completion of constant head permeability testing in accordance with *AS/NZS1547:2000*. Results should be used to develop a site specific estimate for saturated hydraulic conductivity and subsequently design loading rates. Site and soil assessors should be aware that due to the highly variable and constrained nature of Very High Hazard lots, Council may request additional investigations on a site specific basis not included in the DAF Minimum Standards. As such, consultants should seek to be proactive in identifying any site specific constraints that require more detailed analysis.

1.4.2 System Selection and Sizing

Lots classified as Very High Hazard display substantial constraints to sustainable on-site sewage management and the installation of new systems requires a high level of site and soil assessment and engineering design input to adequately deal with these constraints. Councils preferred servicing options for Very High Hazard lots are connection to a Hunter Water Corporation sewerage system or installation of a decentralised cluster sewage management system. Applications to install individual on-site sewage management systems on these lots will typically not be supported by Council without high level assessment and engineering input. The structure and content of Very High Hazard Wastewater Management Reports must expand beyond High Hazard Wastewater Management Report requirements and typical existing practice. **Typical environmental / geotechnical consultant reports currently submitted to Council are unlikely to be considered sufficient justification for approval to install a sewage management system on Very High Hazard allotments.** Minimum Standards for preparation and content of Very High Hazard Wastewater Management Reports are set out in Table 1-9. Key system selection and sizing issues are summarised in the Table 1-7and detailed in Table 1-9.

Daily soil water and nutrient modelling must be used in conjunction with one dimensional viral dieoff modelling in shallow groundwater to size land application systems. Reference should be made to Section 9 of the PSC *Technical Manual* for specific guidance. The following performance targets must be met in sizing the land application area.

- No hydraulic surface surcharge in an average rainfall year:

- Average annual nutrient concentrations in deep drainage are no more than 10% higher than existing background pollutant levels as calculated using the approach recommended in Section 10 of the PSC *On-site Sewage Technical Manual*;
- Total viral dieoff in shallow groundwater prior to any water supply bores or receiving waters as calculated by Cromer *et al* (2001) as cited in the PSC *On-site Sewage Technical Manual*.

1.4.3 Constructability

In addition to provision of a signature from the property owner/applicant and attendance by relevant parties at a site meeting (as described above for High Hazard allotments), applications for Very High Hazard allotments will require a written Constructability Assessment to be submitted to Council. A Constructability Assessment is a brief (e.g. 1-2 pages) report prepared by an installer listed in Council's Register of Wastewater Manufacturers, Installers, AWTS Service Agents and Wastewater Consultants to provide Council (and the property owner) with a documented professional opinion on the constructability and serviceability criteria listed in Table 1-8. This includes a general cost estimate for construction/installation and operation of the proposed system.

The Assessment should be undertaken by the company who will be engaged to install/construct the system. A Constructability Assessment is not intended to be exhaustive or unnecessarily large but should document a professional assessment of what the owner (or future) owner of the system can expect during construction and operation. Minimum Standards for a Constructability Assessment are described in Table 1-8.

Table 1-8 Minimum Standards for Constructability Assessments

Constructability / Serviceability Element	Minimum Standard
Degree of difficulty	• Nomination of the degree of difficulty (easy, non-standard or difficult) and comparison of the relative degree of difficulty when compared to alternative on-site system options considered. • Identification of critical design elements / system components that will require non-standard or complex installation/construction procedures.
Land area requirements	• Statement confirming the total land area requirement of the proposed on-site sewage management system and the proportion of total allotment area occupied by the system.
Construction/installation costs	• Estimated cost range including a breakdown of significant components (e.g. treatment unit, land application pipework, excavation, fill e.t.c.).
Operational costs	• Approximate annualised cost for operation, monitoring and maintenance of the selected on-site system. • Timeframe for replacement of critical components.
Owner responsibilities	• Bullet point list of both regular and intermittent operation and maintenance activities associated with the system (including land application area).

Table 1-9 Minimum Standard for Wastewater Management Reports: Very High Hazard Lot

SINGLE ALLOTMENT Minimum Standard for Very High Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of bedrooms and occupants. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site assessment that considers all parameters listed in Table ?? of the DAF in accordance with *AS/NZS 1547:2000*. • Summary of available published soils information for the site. • Soil assessment that considers all parameters listed in Table ?? of the DAF in accordance with *AS/NZS 1547:2000*. • (Where useful) constant head permeability testing in accordance with *AS/NZS1547:2000*. • Detailed explanation of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1-2 paragraphs • Table(s) • Paragraph summarising methodology and table of results. • Up to 1 page of explanation and recommended design elements to overcome constraints. • Up to one page.
System Selection	• Summarise potential treatment and land application systems considered including advantages and limitations. • Preliminary design calculations for a minimum of 2-4 options. • Brief statement justifying selection of treatment and land application system.	• Table. • Summary table. • Paragraph.
Design	• Site specific calculation of design wastewater generation rates in accordance with *AS/NZS 1547:2000* accompanied by water use / wastewater generation data to support design rates for all existing systems upgrades and new non-domestic facilities. • Accreditation details for the selected treatment system. • Non-accredited treatment systems will require submission of process design information in accordance with Minimum Standards for Non-domestic (<10 kL/day) systems as detailed in Table 3-5. • Sizing of land application systems using daily soil water/nutrient balance and pathogen dieoff modelling (see Technical Manual). • Hydraulic design calculations for all pressurised pipework (including drip irrigation). • Design drawings of all non-accredited system components.	• Tables and paragraph justifying calculations. • Attach Certificate • Table summarising inputs and assumptions accompanied by a summary table of results. • A4 schematic (not to scale). • A4 schematic (not to scale).
Site Plan	• Survey plan. • Location of tank(s); • Location of boundaries, buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of primary and reserve disposal areas; • Location of stormwater diversion drains and earth bunds (if applicable); • Two metre elevation contours; • Location of drainage pipework (centreline).	• A4 Site Plan (1:500 scale).
Appendices	• Soil bore logs for all test pits (Permeability test results). • Raw laboratory results for soil analysis. • All design calculations and assumptions.	N/A

1.5 Effluent Pump-Out Systems (Tanker Removal)

An effluent pump-out system utilizes a collection tank (collection well) that receives and stores liquid effluent once it has passed through a septic tank. A road tanker removes the stored liquid effluent on a frequency dependant on the hydraulic loading from the buildings connected to the system. The up front costs for installation of effluent pump-out systems are generally less expensive than treatment systems but they cost significantly more to operate over the life of the system due to on-going pumping and disposal costs.

Tanker removal systems can be subject to ongoing issues involving noise, odour, increased truck movements, increased damage to local roads and misuse and abuse by property owners. There are also limits on the volume of sewage from tankers that can be accepted at local Hunter Water wastewater treatment plants. In essence, effluent pump-out systems are not a sustainable long-term sewage management option. Council will only permit the installation of an effluent pump-out system in a restricted set of circumstances. This section of the DAF sets out situations where effluent pump-out systems will be considered and Minimum Standards for their approval.

Council advocates on-site sewage systems as a legitimate long-term management options where appropriate and sustainable. They should only be used as temporary "stop gap" solutions where Council and/or Hunter Water have identified some form of centralised or community wastewater management as the preferred long-term servicing option. Effluent pump-out should not be used to enable inappropriate or unsustainable development in unsewered areas. Notwithstanding, consideration will be given to pump-out systems where Council have previously approved development (based on previous, less stringent standards) that is no longer considered sustainable.

The following table summarises the types of allotments and developments where effluent pump-out systems will be considered. **Effluent pump-out systems will not be considered for any rezoning, unsewered subdivision (or other increase in building entitlements) or multi-unit development application. They will only be considered for existing unsewered building entitlements where a sustainable on-site sewage management option is not viable.**

Table 1-10 Where Effluent Pump-out Systems will be considered

Development Scenario	Low to High Hazard >4,000m^2 Useable Land	High Hazard 2,000 – 4,000m^2 Useable Land	Very High Hazard >4,000 m^2 Useable Land	Very High Hazard <4,000m^2 Useable Land
Residential (undeveloped)	Not permitted	With justification[1]	With justification[1]	Permitted[2]
Residential (developed)		Permitted[2]		

Note 1: Refer to Section 1.5.1 for a description of Minimum Standards for justifying effluent pump-out.

Note 2: Only permitted without further justification where the nearest sewer connection is >75 metres from the property or the property is located within a Hunter Water Corporation potable water supply protection area.

1.5.1 Minimum Standards for Justification of Effluent Pump-out

In situations where Council are willing to consider effluent pump-out "with justification" in Table 1-10, the following information must be submitted as a Minimum Standard for approval.

- A Wastewater Management Report prepared in accordance with Table 1-9 (residential) or Table 3-11 (non-residential) will need to be submitted to Council. The report will need to demonstrate that;

- based on the outcomes of a site and soil assessment, there is insufficient area to contain a sustainable on-site sewage management service; and/or
- an effluent land application area sized in accordance with Table 1-9/Table 3-11 and Section 9.4 of the PSC On-site Sewage *Technical Manual* cannot realistically be installed on the site.

- A Constructability Assessment prepared in accordance with Table 1-8 will need to be submitted to Council that confirms that installation of an on-site sewage management system is not feasible.
- There may be situations where an on-site sewage management option is technically and environmentally feasible (based on the above assessments) but not the preferred option of the applicant. In these circumstances, the Constructability Assessment will need to include a Net Present Value assessment (20 year duration) that compares life cycle costs between an effluent pump-out and on-site sewage management option. This assessment must demonstrate that life cycle costs for the effluent pump-out system are significantly less than the on-site disposal option (in the order of 50% less expensive).

1.6 Pump to Sewer / Low Pressure Sewer Systems

In some localities within the Port Stephens LGA, Hunter Water Corporation has been unable to construct a conventional gravity sewerage system. In these locations the sewer system available is a pressurized system known as a pump to sewer system. This method requires the installation of a septic tank, collection tank, electrically operated effluent pump, pipework and various valves and controls. The purchase, installation, operation and maintenance of the system are the responsibility of the property owner. The installation of a pump to sewer system requires approval from both Port Stephens Council and Hunter Water Corporation. The continued operation of a pump to sewer system is subject of an annual approval/renewal from Council and routine inspections by Council Staff.

With the implementation of the NSW *Water Industry Competition Act 2006* and increasing prevalence of decentralised community wastewater management systems, small diameter sewerage systems such as pump to sewer, Septic Tank Effluent Pump / Septic Tank Effluent Gravity (STEP/STEG) and low pressure (grinder pump) sewers are becoming more common. Importantly, the preferred management model for these systems is now centralised management through a public or private water utility. Development and rezoning applications that propose the use of decentralised collection systems will require specific consideration by Council, Hunter Water and the developer.

Existing subdivisions / developments where pump to sewer or grinder pump systems are to be installed will still require individual property owners to apply to council for approval to install and operate the on-lot components. In these cases, the Minimum Standards set out in Section 6.3.9 should be followed.

There may also be special cases where individual pump to sewer, STEP/STEG or low pressure sewer systems will offer an opportunity to connect to a Hunter Water Sewer that is not immediately adjacent to the property. This may be a preferred option on lots where on-site sewage management is not sustainable and effluent pump-out is to be avoided.

2 SUBDIVISION / INCREASING BUILDING ENTITLEMENTS

This element of the DAF applies to **any** unsewered development proposal that results in an increase in building entitlements. This may include the subdivision of land but can also capture boundary realignments where the proposed alteration to property boundaries enables an applicant to utilise a building entitlement that was previously constrained. An example of this scenario might be a situation where a lot is entirely floodprone. Following a boundary realignment, a portion of the revised lot may no longer be floodprone, resulting in the potential to increase wastewater discharges to the local environment. It also addresses development applications where existing allotments are to be consolidated into fewer lots.

2.1 Low Hazard Allotments

The DAF provides opportunities for a streamlined development assessment process for Development Applications (DAs) that involve an increase in unsewered building entitlements on Low Hazard allotments. This streamlined process has been included based on the outcomes of Council's *Sustainable On-site Sewage Management* project as detailed in the PSC *On-site Sewage Technical Manual*. This study established baseline standards for unsewered development that where adopted will provide Council with a high degree of confidence that (subject to correct operation and management) on-site systems will not cause detrimental impacts on ecosystems or human health.

On the basis of these baseline conditions, the DAF contains criteria for Acceptable Solutions which applicants can meet to enable prompt approval. Acceptable Solutions are available for Low Hazard allotments and these are listed in the following table. Where Acceptable Solution criteria cannot be met more detailed assessment and design processes will be required and these are also set out in the following table. Please note an applicant may choose not to adopt the Acceptable Solution criteria for a particular development and engage a consultant to prepare a Wastewater Management Report from the outset.

Table 2-1 Increasing Building Entitlements: Low Hazard Assessment Criteria

	Requirements for Acceptable Solutions	Compliance?
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	☐
	2-lot Subdivisions (creation of 1 new entitlement) Small subdivisions on Low Hazard allotments may not require a site and soil assessment. Council will inspect the site and use the Site and Soil Pro-forma provided in Section 1.1.1 to confirm if all Low Hazard criteria can be met for each proposed lot. Where one or more criteria are not met, Council may require a site and soil assessment in accordance with the procedure documented below for >2-lot subdivisions. **>2-lot Subdivisions (creation of more than 1 new entitlement)** Site and soil assessment undertaken in accordance with Section 2.1.1 of this DAF and documented in a Wastewater Management Report by a suitably qualified consultant.	☐
System Selection and Sizing Constructability Cumulative Impacts	Allotment(s) contains a minimum of 4,000 m^2 of usable land?	☐

If you were not able to demonstrate compliance with all of the above Acceptable Solution criteria, you must proceed to the following checklist.	
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Site and soil assessment undertaken in accordance with Section 2.1.1 of this DAF (and documented in a Wastewater Management Report by a suitably qualified consultant.
System Selection and Sizing	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads. EMA's must be shown on subdivision plans (1:500 scale) that are capable of containing land application areas plus reserve (where applicable).
Constructability	
Cumulative Impacts	Simple Cumulative Impact Assessment undertaken by a suitably qualified consultant in accordance with 2.1.4 and Section 10 of the Technical Manual. *Note: A Cumulative Impact Assessment is only required for Low Hazard Allotments where one or more proposed allotment contains less than 4,000 m^2 of useable land.*

2.1.1 Site and Soil Assessment

Where more than one new building entitlement is proposed (regardless of Hazard Class), a site and soil evaluation will need to be completed by a suitably qualified environmental/engineering consultant and documented in a Wastewater Management Report. Assessments conducted prior to the creation of new lots / building entitlements offer an important opportunity to prevent unfavourable land being assigned for the management of effluent for which the consequences are often irreversible once approved. Site and soil investigations essentially follow the procedure listed in Table 6-1. Additional guidance is provided in Appendix 4.1A-4.1F of *ASNZS 1547:*2000. Minimum Standards for site and soil assessment outcomes are listed in Table 2-3

Table 2-3 requires a stronger focus on analysis of the influence of landscape position / characteristics on land capability in comparison to single site assessments. It also requires consideration of the sensitivity of the receiving environment to land application system discharges. For Low Hazard allotments, it is sufficient to identify on the site plan relevant exclusion zones for EMA's provided at least 4,000 m^2 of useable land remains on all proposed lots.

2.1.2 System Selection and Sizing

Development Applications that propose an increase in unsewered building entitlements (e.g. subdivision) also require some consideration of system selection and sizing in order to demonstrate to Council that the proposed allotments are capable of servicing in a sustainable manner. Applications on Low Hazard allotments simply need to demonstrate that a minimum of 4,000 m^2 of usable land is available on each proposed lot. In these cases, typically a wide range of treatment and land application systems are suitable and there is limited need to specify particular options at the subdivision or boundary realignment phase.

2.1.3 Constructability

Development applications on Low Hazard allotments for increased building entitlements will be considered to be an Acceptable Solution with respect to constructability where all proposed lots contain more than 4,000m^2 of usable land. It is assumed that a wide range of land application systems will be feasible on these lots and site conditions are sufficiently flexible to ensure EMAs will allow development to occur.

2.1.4 Cumulative Impacts

Applications for unsewered subdivision or boundary realignments on Low Hazard allotments that result in an increase in building entitlements will be deemed an Acceptable Solution from a cumulative impact perspective where they meet the following conditions.

- Each proposed allotment contains a minimum of 4,000 m^2 of *useable* land; and
- the proposed Effluent Management Areas (EMAs) ensure land application areas will comply with recommended buffer distances listed in Table 6-9.

Usable land (for the purpose of on-site sewage management) can be considered to be;

total allotment area excluding dams, intermittent and permanent watercourses and open stormwater drains and pits in addition to the relevant buffer distances prescribed in the Port Stephens Council Development Assessment Framework for those objects.

If either of these conditions is not achieved for an application, it is not an Acceptable Solution and some level of cumulative impact assessment will be necessary. Non-compliant proposals will need to complete this assessment in accordance with the methods described in Council's OSMS Technical Manual and summarised below.

Table 2-2 Procedure for Non-compliant Cumulative Impact Assessment: Low Hazard

Non-compliance scenario	Description	Performance Targets
3,000-4,000 m^2 of Useable Land and/or failure to achieve buffer distances from watercourses, dams, streams and drains.	Simple Risk Assessment Procedure as summarised in Section 2.3.4 and detailed in Section 10.1 of the PSC On-site Sewage Management Technical Manual.	Proposed Land Application Areas (LAAs) sized to prevent hydraulic failure in an average climate year. <10% increase in nutrient loads from existing site conditions.
Minimum lot size < 3,000 m^{2*} (irrespective of achieved buffer distances).	Detailed Risk Assessment Procedure as summarised in Section 2.4.4 and detailed in Section 10.2 of the PSC On-site Sewage Management Technical Manual.	

* Minimum lot sizes < 2,000 m^2 are unlikely to be accepted by Council for new unsewered development.

Table 2-3 Minimum Standard for Wastewater Management Reports:

INCREASE IN BUILDING ENTITLEMENTS Minimum Standard for Low Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of new building entitlements. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000.* • Summary of available published soils information for the site. • Soil assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000.* • Where multiple soil facets are present the site plan should show the approximate boundary between facets. • Brief summary of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1-2 paragraphs • Table(s) • Minimum 3 soil test pits per soil facet. • Bullet point explanations and recommended design elements to overcome constraints. • Paragraph or table.
System Selection and Design	• Reference to Council's *Acceptable Solutions* with confirmation of the systems included in Councils Acceptable Solutions for the subject site. • Summary of minimum footprints of Acceptable Solution LAA's. • Brief statement recommending preferred options amongst Acceptable Solutions.	• Paragraph. • Summary table. • Paragraph or Bullet Points.
Site Plan	• Survey plan. • Proposed allotment boundaries, dimensions and area; • Location of existing buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of exclusion zones (e.g. setback distances and unsuitable site and soil conditions); • Two metre elevation contours; • Location of existing and proposed drainage pipework (centreline).	• Minimum A3 Site Plan (1:500).
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions.	N/A
Cumulative Impact Assessment (Only Where Required)	• Refer to Table 2-10 (Simple) or Table 2-14 (Detailed).	

2.2 Medium Hazard Allotments

The DAF provides opportunities for a streamlined development assessment process for Development Applications (DAs) that involve an increase in unsewered building entitlements on Medium Hazard allotments. This streamlined process has been included based on the outcomes of Council's *Sustainable On-site Sewage Management* project as detailed in the PSC *On-site Sewage Technical Manual*. This study established baseline standards for unsewered development that where adopted will provide Council with a high degree of confidence that (subject to correct operation and management) on-site systems will not cause detrimental impacts on ecosystems or human health.

The DAF contains criteria for Acceptable Solutions which applicants can meet to enable prompt approval. Acceptable Solutions are available for Medium Hazard allotments and these are listed in the following table. Where Acceptable Solution criteria cannot be met more detailed assessment and design processes will be required and these are also set out in the following table. Please note an applicant may choose not to adopt the Acceptable Solution criteria for a particular development and engage a consultant to prepare a Wastewater Management Report from the outset.

Table 2-4 Medium Hazard Assessment Criteria

	Requirements for Acceptable Solutions	**Compliance?**
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	2-lot Subdivisions (creation of 1 new entitlement) Small subdivisions on Medium Hazard allotments may not require a site and soil assessment. Council will inspect the site and use the Site and Soil Pro-forma provided in Section 1.2.1 to confirm if all Medium Hazard criteria can be met for each proposed lot. Where one or more criteria are not met, Council may require a site and soil assessment in accordance with the procedure documented below for >2-lot subdivisions. **>2-lot Subdivisions (creation of more than 1 new entitlement)** Site and soil assessment undertaken in accordance with Section 2.1.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.	□
System Selection and Sizing Constructability Cumulative Impacts	Allotment(s) contains a minimum of 4,000 m^2 of usable land?	□

If you were not able to demonstrate compliance with all of the above Acceptable Solution criteria, you must proceed to the following checklist.	
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Site and soil assessment undertaken in accordance with Section 2.2.1 of this DAF and documented in a Wastewater Management Report by a suitably qualified consultant.
System Selection and Sizing Constructability	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads. EMA's must be shown on subdivision plans that are capable of containing land application areas plus reserve (where applicable).
Cumulative Impacts	Simple (3,000 - 4000 m^2) or Detailed (<3,000 m^2) Cumulative Impact Assessment undertaken by a suitably qualified consultant in accordance with Section 2.2.4 and Section 10 of the Technical Manual.

2.2.1 Site and Soil Assessment

Where more than one new building entitlement is proposed (regardless of Hazard Class), a site and soil evaluation will need to be completed by a suitably qualified environmental/engineering consultant and documented in a Wastewater Management Report. Assessments conducted prior to the creation of new lots / building entitlements offer an important opportunity to prevent unfavourable land being assigned for the management of effluent for which the consequences are often irreversible once approved. Site and soil investigations essentially follow the procedure listed in Table 6-1. Additional guidance is provided in Appendix 4.1A-4.1F of *ASNZS 1547*:2000. Minimum Standards for site and soil assessment outcomes are listed in Table 2-3

Table 2-3 requires a stronger focus on analysis of the influence of landscape position / characteristics on land capability in comparison to single site assessments. It also requires consideration of the sensitivity of the receiving environment to land application system discharges. For Medium Hazard allotments, it is sufficient to identify on the site plan relevant exclusion zones for EMA's provided at least 4,000 m^2 of useable land remains on all proposed lots.

2.2.2 System Selection and Sizing

Development Applications that propose an increase in unsewered building entitlements (e.g. subdivision) also require some consideration of system selection and sizing in order to demonstrate to Council that the proposed allotments are capable of servicing in a sustainable manner. Applications on Medium Hazard allotments simply need to demonstrate that a minimum of 4,000 m^2 of usable land is available on each proposed lot. In these cases, typically a wide range of treatment and land application systems are suitable and there is limited need to specify particular options at the subdivision or boundary realignment phase.

2.2.3 Constructability

Development applications on Medium Hazard allotments for increased building entitlements will be considered an Acceptable Solutions with respect to constructability where all proposed lots contain more than 4,000m^2 of usable land. It is assumed that a wide range of land application systems will be feasible on these lots and site conditions are sufficiently flexible to ensure EMAs will allow development to occur.

2.2.4 Cumulative Impacts

Applications for unsewered subdivision or boundary realignments on Medium Hazard allotments that result in an increase in building entitlements will be an Acceptable Solutions from a cumulative impact perspective where they meet the following conditions.

- Each proposed allotment contains a minimum of 4,000 m^2 of *useable* land; and
- the proposed Effluent Management Areas (EMAs) ensure land application areas will comply with recommended buffer distances listed in Table 6-9.

Usable land (for the purpose of on-site sewage management) can be considered to be;

total allotment area excluding dams, intermittent and permanent watercourses and open stormwater drains and pits in addition to the relevant buffer distances prescribed in the Port Stephens Council Development Assessment Framework (2011) for those objects.

If either of these conditions is not achieved for an application, it cannot be deemed an Acceptable Solution and some level of cumulative impact assessment will be necessary. Non-compliant proposals will need to complete this assessment in accordance with the methods described in Council's OSMS Technical Manual and summarised below.

Table 2-5 Procedure for Non-compliant Cumulative Impact Assessment: Low/Medium Hazard

Non-compliance scenario	Description	Performance Targets
3,000-4,000 m^2 of Useable Land and/or failure to achieve buffer distances from watercourses, dams, streams and drains.	Simple Risk Assessment Procedure as summarised in Section 2.3.4 and detailed in Section 10.1 of the PSC On-site Sewage Management Technical Manual.	Proposed Land Application Areas (LAAs) sized to prevent hydraulic failure in an average climate year. <10% increase in nutrient loads from existing site conditions.
Minimum lot size < 3,000 m^{2*} (irrespective of achieved buffer distances).	Detailed Risk Assessment Procedure as summarised in Section 2.4.4 and detailed in Section 10.2 of the PSC On-site Sewage Management Technical Manual.	

* Minimum lot sizes < 2,000 m^2 are unlikely to be accepted by Council for new unsewered development.

Table 2-6 Minimum Standard for Wastewater Management Reports:

(Increase in building entitlements on Medium Hazard Lots)

INCREASE IN BUILDING ENTITLEMENTS Minimum Standard for Medium Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of new building entitlements. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Summary of available published soils information for the site. • Soil assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Where multiple soil facets are present the site plan should show the approximate boundary between facets. • Brief summary of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1-2 paragraphs • Table(s) • Minimum 3 soil test pits per soil facet. • Bullet point explanations and recommended design elements to overcome constraints. • Paragraph or table.
System Selection and Design	• Reference to Council's *Specification* with confirmation of the systems included in Councils Acceptable Solutions for the subject site. • Summary of minimum footprints of Acceptable Solution LAA's. • Brief statement recommending preferred options amongst Acceptable Solutions.	• Paragraph. • Summary table. • Paragraph or Bullet Points.
Site Plan	• Survey plan. • Proposed allotment boundaries, dimensions and area; • Location of existing buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of exclusion zones (e.g. setback distances and unsuitable site and soil conditions); • Two metre elevation contours; • Location of existing and proposed drainage pipework (centreline).	• Minimum A3 Site Plan (1:500).
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions.	N/A
Cumulative Impact Assessment (Only Where Required)	• Refer to Table 2-10 (Simple) or Table 2-14 (Detailed).	

2.3 High Hazard Allotments

Given that High Hazard allotments typically display one or more significant constraints to sustainable on-site sewage management, the creation of new unsewered building entitlements on these lots requires a higher level of assessment and design to justify approval. Furthermore, Acceptable Solutions are not available for adoption on High Hazard allotments. Site specific assessment and design work is considered mandatory.

Table 2-7 Increasing Building Entitlements: High Hazard Assessment Checklist

	Acceptance Criteria	**Compliance?**
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	Subdivision Procedure in accordance with Section 2.3.1 of this DAF and documented in a Wastewater Management Report by a suitably qualified consultant.	□
System Selection and Sizing Constructability	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads. EMA's must be shown on subdivision plans that are capable of containing land application areas plus reserve (where applicable).	□
Cumulative Impacts	All proposed lots contain at least 3,000 m^2 of Useable Land. All proposed EMA's meet or exceed PSC setback distances for watercourses, dams, creeks and drains. Completion of a Simple Cumulative Impact Assessment in accordance with Section 2.3.4 of this DAF and the PSC On-site Sewage Technical Manual. Outcomes must demonstrate achievement of targets set out in Table 2-8.	□

If you were not able to demonstrate compliance with all of the above Acceptance Criteria, you must proceed to the following checklist.

Site and Soil Assessment System Selection and Sizing Constructability	Must be provided as described above for approval to be issued.
Cumulative Impacts	Detailed Cumulative Impact Assessment undertaken by a suitably qualified consultant in accordance with Section 2.4.4 of this DAF and Section 10.2 of the PSC On-site Sewage Technical Manual. Establishment of an easement over the proposed Effluent Management Area (EMA) as described in Section 2.3.4.

2.3.1 Site and Soil Assessment

Where development applications propose more than one new building entitlement (regardless of Hazard Class), a site and soil evaluation will need to be completed by a suitably qualified environmental/engineering consultant and documented in a Wastewater Management Report. Assessments conducted prior to the creation of new lots / building entitlements offer an important opportunity to prevent unfavourable land being assigned for the management of effluent for which the consequences are often irreversible once approved. Site and soil investigations essentially follow the procedure listed in Table 6-1. Additional guidance is provided in Appendix 4.1A-4.1F of *ASNZS 1547*:2000. Minimum Standards for site and soil assessment outcomes are listed in Table 2-10

Table 2-10 requires a stronger focus on analysis of the influence of landscape position / characteristics on land capability in comparison to single site assessments. It also requires consideration of the sensitivity of the receiving environment to land application system discharges. In the case of increasing building entitlements on High Hazard allotments, scale drawings based on a surveyed plan of the development must be used to illustrate that sustainable LAAs can be located in a suitable location on the allotment with a high level of confidence.

2.3.2 System Selection and Sizing

Development Applications that propose an increase in unsewered building entitlements (e.g. subdivision) also require some consideration of system selection and sizing in order to demonstrate to Council that the proposed allotments are capable of servicing in a sustainable manner. Development Applications on High Hazard allotments require greater consideration of the likely nature and dimensions of prospective on-site systems to ensure the constraints to sustainable performance can be managed. Table 2-7 and Table 2-10 set out minimum standards for system selection and sizing at the Development Application stage for High Hazard allotments. In summary they include;

- a summary of potential treatment and land application systems considered for the site including advantages and disadvantages;
- a brief statement justifying selection of potential treatment and land application systems; and
- indicative sizing of land application systems using the most limiting of monthly water and annual nutrient balance calculations.

2.3.3 Constructability

High Hazard lots require EMA's to be identified on subdivision plans and these EMA's must be capable of fitting the minimum land application area (as determined and documented in the Wastewater Management Report).

2.3.4 Cumulative Impacts

Applications for unsewered subdivision or boundary realignments on High Hazard allotments that result in an increase in building entitlements will be deemed to comply from a cumulative impact perspective where they meet the following conditions.

- Each proposed allotment contains a minimum of 3,000 m^2 of *useable* land;
- A Simple Cumulative Impact Assessment is completed to demonstrate risks are adequately managed (refer to Table 2-8 and the PSC On-site Sewage Technical Manual); and
- the proposed Effluent Management Areas (EMAs) ensure land application areas will comply with recommended buffer distances listed in Table 6-9.

Additionally, in circumstances where minimum lot size for a multiple lot development is less than 4,000 m^2, Council may require the developer to establish an easement (through a Section 88b instrument or similar) over the nominated Effluent Management Area (EMA) to protect it from development in perpetuity.

Minimum Standards and performance targets for completion of a Simple Cumulative Impact Assessment are summarised in the following table. An example methodology and case study demonstrating how a Simple CIA should be undertaken is provided in the PSC On-site Sewage Technical Manual. The Simple CIA is a monthly and yearly mass balance exercise using a published methodology (Jelliffe 2001) that can be completed using simple spreadsheets and typical information obtained during site and soil assessment and on-site sewage management system design processes. Alternative methodologies will be considered but must meet or exceed the Minimum Standards listed below in order to be approved by Council.

Table 2-8 Minimum Standard for Simple Cumulative Impact Assessments

Risk Assessment Component	Minimum Standard
On-lot Land Application Area (LAA) Assessment	• Monthly water balance and annual nutrient balance calculations for each general on-site system LAA type used to size LAA on most limiting value (subsurface nutrient export should therefore be zero/negligible)[1]. Refer to Section 9.2 and 9.3 of the PSC On-site Sewage Technical Manual for Minimum Standards for calculations.
Rainfall-Runoff	• Average annual estimate of runoff volume using a volumetric coefficient of rainfall. Recommend use of Figure 2.3 (and subsequent equations) from Fletcher *et al* (2004).[2] See web link below.
Surface Pollutant Export	• Methodology published by Jelliffe (2001) with slight modification to allow consideration of different system types (equations and an example case study provided in the Technical Manual). http://www.dlg.nsw.gov.au/dlg/dlghome/documents/septicsafe/OSRAS_157-164.pdf
Subsurface Pollutant Export	• Assumed to be negligible proportion of total pollutant load where the following conditions are met. o All proposed lots contain at least 3,000 m2 of Useable Land. o Council buffer distances to permanent and ephemeral watercourses are met. o All land application areas are sized on the most limiting result of a mean monthly water balance or annual nutrient balance. o The lot is classified as Low, Medium or High Hazard. o Any existing systems within the proposed allotments must be upgraded to meet the requirements of the DAF. • Failure to meet these criteria will require a Detailed CIA.
Background Pollutant Loads / Concentrations	• Sourced from Tables 2.44 - 2.45 or Figures 2.15 – 2.23 of Fletcher *et al* (2004).[2] • Acceptable export rates / concentrations sourced from published local studies.
Environment and Health Protection Targets	• No more than 10% increase in average annual nitrogen and phosphorus loads (kg/year) based on existing undeveloped background loads. • All land application areas sized to prevent hydraulic failure (surcharging) in an average rainfall year.

Note 1: Any development including primary dosed LAAs that requires a CIA must adopt the Detailed CIA procedure.
Note 2: Fletcher et al (2004) available from http://www.catchment.crc.org.au/pdfs/technical200408.pdf.

Where a DA for an unsewered increase in building entitlements on a High Hazard allotment does not meet the three deemed to comply criteria, a Detailed CIA will be required as described in Section 2.4.4 and summarised below.

Table 2-9 CIA Requirements for Non-compliant High Hazard Allotments

Non-compliance scenario	Description	Performance Targets
Minimum lot size < 3,000 m^{2*} and/or failure to achieve buffer distances from watercourses, dams, streams and drains.	Detailed Cumulative Impact Assessment procedure as summarised in Section 2.4.4 and detailed in the PSC On-site Sewage Management Technical Manual.	Proposed Land Application Areas (LAAs) sized to prevent hydraulic failure in an average climate year. <10% increase in nutrient loads from existing site conditions.
All multiple lot (unsewered) developments with lots <4,000 m^2.	Council will consider the establishment of an easement over the Effluent Management Area (EMA) to protect availability for sewage management in perpetuity.	

* Minimum lot sizes < 2,000 m^2 are unlikely to be accepted by Council for new unsewered development.

Table 2-10 Minimum Standard for Wastewater Management Reports:

INCREASE IN BUILDING ENTITLEMENTS Minimum Standard for High Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of new building entitlements. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Detailed review of available published soils information for the site. • Soil assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Where multiple soil facets are present the site plan should show the approximate boundary between facets. • Detailed explanation of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1 page • Table(s) • Minimum 3 soil test pits per soil facet. • Up to 1 page of explanation and recommended design elements to overcome constraints. • Up to one page.
System Selection and Design	• Summarise potential treatment and land application systems considered including advantages and limitations. • Brief statement justifying selection of potential treatment and land application systems. • Sizing of land application systems using the most limiting of monthly soil water and annual nutrient balances (see Technical Manual).	• Table. • Paragraph. • Table summarising inputs and assumptions accompanied by a summary table of results and paragraph justifying calculations.
Site Plan	• Survey plan. • Proposed allotment boundaries, dimensions and area; • Location of existing buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of exclusion zones (e.g. setback distances and unsuitable site and soil conditions); • Location of EMAs capable of containing LAAs and reserves (where applicable); • Two metre elevation contours; and • Location of existing and proposed drainage pipework (centreline).	• Minimum A3 Site Plan (1:500).
Cumulative Impacts	• Summary of approach taken and confirmation of compliance with the Minimum Standards documented in Table 2-8. • Methodology documenting the basis and source of input data including reference to site specific data, published information or the *Technical Manual* to justify use. • Results demonstrating compliance with local water quality objectives and adequate management of health risk as defined and demonstrated in Section 10.1.1 of the *Technical Manual*. • Brief discussion of long-term risks to health and environment and recommended management measures to address impacts.	• Up to 1 page. • 2-4 pages of tables, figures and text. • 1-2 pages of tables, figures and text (refer to Section 10.1.1 of the *Technical Manual*). • Up to 1 page.
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions including screenshots of cumulative impact spreadsheets/models.	N/A

2.4 Very High Hazard Allotments

Very High Hazard allotments are significantly constrained with respect to on-site sewage management. The creation of new unsewered building entitlements on these lots will only be considered by Council where comprehensive and highly detailed engineering and environmental evaluation has been completed in accordance with this DAF. This evaluation must demonstrate that the proposed wastewater servicing strategy is achievable and capable of operating for the life of the development as designed. It must also demonstrate that a high level of human health and ecosystem protection will be provided. Acceptable Solutions are not available for adoption on Very High Hazard allotments. Site specific assessment and design work is considered mandatory.

Table 2-11 Increasing Building Entitlements: Very High Hazard Assessment Criteria

	Acceptance Criteria	**Compliance?**
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	Subdivision Procedure in accordance with Section 2.4.1 of this DAF and documented in a Wastewater Management Report by a suitably qualified consultant.	□
System Selection and Sizing	Daily water and nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads (completed as part of a Detailed CIA). Significant detail should be provided to justify nominated effluent quality and land application technologies deemed suitable.	□
Constructability	EMA's must be shown on subdivision plans including an indicative land application system footprint to clearly demonstrate that on-site sewage management is viable on each lot.	□
Cumulative Impacts	All proposed lots contain at least 2,000 m^2 of Useable Land. Setback distances from watercourses, dams, creeks and drains are at least 50% of those specified in Table 6-9 of this DAF. Detailed Cumulative Impact Assessment undertaken by a suitably qualified consultant in accordance with Section 2.4.4 of this DAF and Section 10.2 of the PSC On-site Sewage Technical Manual. Results demonstrate compliance with performance targets. Possible establishment of an easement over the proposed Effluent Management Area (EMA) as described in Section 2.3.4.	□

If you were not able to demonstrate compliance with all of the above Acceptance Criteria, you must proceed to the following checklist.

Site and Soil Assessment	Must be provided as described above for approval to be issued.
System Selection and Sizing	
Constructability	
Cumulative Impacts	Detailed Cumulative Impact Assessment undertaken by a suitably qualified consultant in accordance with Section 2.4.4 of this DAF and Section 10.2 of the PSC On-site Sewage Technical Manual. CIA results demonstrate compliance with performance targets derived from site specific surface and groundwater data. Mandatory establishment of an easement over the proposed Effluent Management Area (EMA) as described in Section 2.3.4. In some circumstances Council will require site specific surface or groundwater modelling and assessment to characterise water flow and pollutant attenuation.

2.4.1 Site and Soil Assessment

Where an increase in building entitlements is proposed on a Very High Hazard lot, a site and soil evaluation will need to be completed by a suitably qualified environmental/engineering consultant and documented in a Wastewater Management Report. Assessments conducted prior to the creation of new lots / building entitlements offer an important opportunity to prevent unfavourable land being assigned for the management of effluent for which the consequences are often irreversible once approved. Site and soil investigations essentially follow the procedure listed in Table 6-1. Additional guidance is provided in Appendix 4.1A-4.1F of *ASNZS 1547*:2000. Minimum Standards for site and soil assessment outcomes are listed in Table 2-14.

Table 2-14 requires a stronger focus on analysis of the influence of landscape position / characteristics on land capability in comparison to single site assessments. It also requires consideration of the sensitivity of the receiving environment to land application system discharges. In the case of increasing building entitlements on Very High Hazard allotments, scale drawings based on a surveyed plan of the development must be used to illustrate that sustainable LAAs can be located in a suitable location on the allotment with a high level of confidence.

2.4.2 System Selection and Sizing

Where an increase in building entitlements is proposed on a Very High Hazard allotment, a high level of information must be provided to Council to demonstrate that the significant limitations associated with the site can be managed through careful design, construction and operation. It should be noted that Council will not normally support increases in building entitlement on Very High Hazard allotments. Table 2-14 sets out the minimum requirements at the DA stage. It can be seen that approval for an increase in unsewered building entitlements on Very High Hazard allotments essentially requires the concept design of every proposed system.

Daily soil water and nutrient modelling must be used in conjunction with one dimensional viral dieoff modelling in shallow groundwater to size land application systems. Reference should be made to Section 9 of the PSC *Technical Manual* for specific guidance. The following performance targets must be met in sizing the land application area.

- No hydraulic surface surcharge in an average rainfall year:
- Average annual nutrient concentrations in deep drainage are no more than 10% higher than existing background pollutant levels as calculated using the approach recommended in Section 10 of the PSC *On-site Sewage Technical Manual*:
- Total viral dieoff in shallow groundwater prior to any water supply bores or receiving waters as calculated by Cromer *et al* (2001) as cited in the PSC *On-site Sewage Technical Manual*.

2.4.3 Constructability

Very High Hazard lots require EMA's to be identified on subdivision plans and these EMA's must be capable of fitting the minimum land application area (as determined and documented in the Wastewater Management Report). In addition to identification of EMA's on subdivision plans, proposed increases in entitlements on Very High Hazard allotments also require an indicative land

application system footprint to be identified on a site plan to clearly demonstrate that EMA's are capable of accommodating proposed land application system.

2.4.4 Cumulative Impacts

Applications for unsewered subdivision or boundary realignments on Very High Hazard allotments that result in an increase in building entitlements will be deemed to comply from a cumulative impact perspective where they meet the following conditions.

- Each proposed allotment contains a minimum of 2,000 m^2 of *useable* land;
- A Detailed Cumulative Impact Assessment is completed to demonstrate risks are adequately managed (refer to Table 2-12 and the PSC On-site Sewage Technical Manual);
- setback distances between the proposed Effluent Management Areas (EMAs) and watercourses, dams, creeks and drains are least 50% of the PSC values specified in Table 6-9; and
- the performance targets specified in Table 2-12 are met for all proposed lots.

In some cases, Council may request a commitment by the developer to establish an easement (through a Section 88b instrument or similar) over the nominated Effluent Management Area (EMA) to protect it from development in perpetuity.

Minimum Standards for completion of a Detailed Cumulative Impact Assessment are summarised in Table 2-12. An example methodology and case study demonstrating how a Detailed CIA should be undertaken is provided in the PSC On-site Sewage Technical Manual. The Detailed CIA involves daily mass balance modelling of on-site sewage management system performance and catchment runoff and pollutant loads to estimate the potential human health and ecosystem impacts of multiple on-site systems. Detailed CIA will require specialist input from consultants with catchment / water quality modelling and assessment experience and expertise and the application of computer software designed to assess these impacts. Alternative methodologies will be considered but must meet or exceed the Minimum Standards listed below in order to be approved by Council.

Table 2-12 Minimum Standard for Detailed Cumulative Impact Assessment

Risk Assessment Component	Minimum Standard
On-lot Land Application Area (LAA) Assessment	• Daily water and nutrient mass balance modelling on a site specific basis used to derive average annual hydraulic and pollutant loads to surface and subsurface export routes. Viral die-off modelling.
Rainfall-Runoff and Groundwater Recharge	• Continuous daily rainfall-runoff, nutrient and pathogen mass balance modelling using MUSIC (or equivalent) used to derive average annual values.
Background Pollutant Loads / Concentrations	• Sourced from Chapter 2 of Fletcher *et al* (2004). • Acceptable export rates / concentrations sourced from published local studies. • Site specific data where available or necessary.
Surface and Subsurface Pollutant Export	• Application of catchment attenuation factor (provided in Table 10-4 of the Technical Manual) to combined surface and subsurface on-site loads based on broad characteristics of the receiving environment.[2] • Mass balance combining attenuated on-site system flows and loads with catchment inputs.
Environment and Health Protection Targets[3]	• No more than 10% increase in average annual nitrogen and phosphorus loads (kg/year) based on existing undeveloped background loads. • All land application areas sized to prevent hydraulic failure (surcharging) in an average rainfall year.

Note 1: Fletcher et al (2004) available from http://www.catchment.crc.org.au/pdfs/technical200408.pdf.

Note 2: Refer to Section 7.5.5 of the Technical Manual for explanation of attenuation factor derivation.
Note 3: Site specific targets can be developed and justified on a case by case basis. Outcomes must meet or exceed those achieved by the above targets.

Where a DA for an unsewered increase in building entitlement on a Very High Hazard allotment does not meet the four deemed to comply criteria, it is unlikely that Council will approve the development. Where an applicant wishes to pursue a non-compliant DA on a Very High Hazard allotment, the additional information summarised in the table below must be provided / used in the Detailed CIA process. Results of the Detailed CIA must clearly demonstrate that long-term risks to human health and the environment are adequately managed through the proposed on-site sewage management servicing concepts. Council can provide no assurances that non-compliant proposals will be approved following completion of the investigations described below.

Table 2-13 Assessment Requirements for Non-compliant Very High Hazard Allotments

Non-compliance scenario	Description	Performance Targets
Minimum lot size < 2,000 m^{2*} and/or failure to achieve 50% buffer distances from watercourses, dams, streams and drains.	Detailed Cumulative Impact Assessment Procedure as summarised in Section 2.4.4 and detailed in the PSC On-site Sewage Management Technical Manual. Collection of site specific surface and (where relevant) groundwater quality data for use in the Detailed CIA. Potential completion of site specific surface and groundwater investigations to characterise water flow and quality.	Proposed Land Application Areas (LAAs) sized to prevent hydraulic failure in an average climate year. <10% increase in nutrient loads from existing site conditions.
	Council will require the establishment of an easement over the Effluent Management Area (EMA) to protect availability for sewage management in perpetuity.	

* Minimum lot sizes < 2,000 m^2 are unlikely to be accepted by Council for new unsewered development.

Table 2-14 Minimum Standard for Wastewater Management Reports

INCREASE IN BUILDING ENTITLEMENTS Minimum Standard for Very High Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of new building entitlements. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Detailed review of available published soils information for the site. • Soil assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Where multiple soil facets are present the site plan should show the approximate boundary between facets. • Detailed explanation of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1 page • Table(s) • Minimum 3 soil test pits per soil facet. • Up to 1 page of explanation and recommended design elements to overcome constraints. • Up to one page.
System Selection and Design	• Summarise potential treatment and land application systems considered including advantages and limitations. • Detailed justification of selection of potential treatment and land application systems. • Sizing of land application systems using daily soil water, nutrient and pathogen balances (see Technical Manual). These calculations will be undertaken as part of the detailed cumulative impact assessment.	• Table. • 1-2 pages. • Table summarising inputs and assumptions accompanied by a summary table of results and paragraph justifying calculations.
Site Plan	• Survey plan. • Proposed allotment boundaries, dimensions and area; • Location of existing buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of exclusion zones (e.g. setback distances and unsuitable site and soil conditions); • Location of EMAs and an indicative LAA and reserves (where applicable) to clearly demonstrate viability; • Two metre elevation contours; and • Location of existing and proposed drainage pipework (centreline).	• Minimum A3 Site Plan (1:500)..
Cumulative Impacts	• Summary of approach taken and confirmation of compliance with the Minimum Standards documented in Table 2-12. • Methodology documenting the basis and source of input data including reference to site specific data, published information or the *Technical Manual* to justify use. • Results demonstrating compliance with local water quality objectives and adequate management of health risk as defined and demonstrated in Section 7 and 10 of the *Technical Manual*. • Brief discussion of long-term risks to health and environment and recommended management measures to address impacts.	• Up to 2 pages. • 4-8 pages of tables, figures and text. • 4-8 pages of tables, figures and text (refer to the *Technical Manual*). • Up to 4 pages.
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions including screenshots of cumulative impact spreadsheets/models.	N/A

2.5 Consolidation of Unsewered Allotments

Development Applications (DAs) that propose the consolidation of existing unsewered allotments require specific consideration with respect to on-site sewage management. The three primary considerations include:

- *Actual* changes in the number of on-site sewage management systems proposed:
- Proposed reduction in the number of existing building entitlements (potential future systems): and
- The On-site Sewage Hazard Class of the subject property.

When considering the consolidation of existing allotments, the Single Lot Hazard Class must be used.

DAs that propose consolidation of Low and Medium Hazard allotments will be considered an Acceptable Solution in the vast majority of circumstances. As such, approval of sewage management aspects of the DA will be prompt. Applications on High Hazard allotments will still need to demonstrate that proposed wastewater management options address identified constraints. However, less stringent requirements have been assigned with respect to Cumulative Impact Assessment (CIA). Very High Hazard allotments will still require a high level of investigation, assessment and design to be undertaken to support wastewater management options.

The following checklists set out Acceptable Solutions and Minimum Standards for development applications proposing to consolidate unsewered allotments. They refer to applicable DAF components previously set out for subdivisions and increases in building entitlements.

2.5.1 Low Hazard Allotments

Development proponents for applications involving the consolidation of Low Hazard allotments (based on existing conditions) will need to address the requirements set out in the following checklist. Where all proposed allotments contain 4,000 m^2 or more Useable Land, a full Wastewater Management Report will not be required. Applicants will need to submit a site plan demonstrating the availability of 4,000 m^2 of Useable Land. Council will then use the Site and Soil Pro-forma to confirm the site meets the Low Hazard site and soil criteria.

Where one or more of the consolidated lots contains less than 4,000 m^2 of Useable Land, a Wastewater Management Report completed in accordance with Table 2-10 (excluding the Cumulative Impact Assessment).

Table 2-15 Consolidating Building Entitlements: Low Hazard Assessment Checklist

	Requirements for Acceptable Solutions	Compliance?
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	Consolidation with no proposed lots <4,000 m^2 Useable Land Small consolidations on Low Hazard allotments may not require a site and soil assessment. Council will inspect the site and use the Site and Soil Pro-forma provided in Section 1.1.1 to confirm if all Low Hazard criteria can be met for each proposed lot. Where one or more criteria are not met, Council may require a site and soil assessment in accordance with the procedure documented below for >2-lot subdivisions. **Consolidation with 1 or more proposed lots <4,000 m^2 Useable Land** Site and soil assessment undertaken in accordance with Section 2.3.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.	□
System Selection and Sizing	Allotment(s) contains a minimum of 4,000 m^2 of usable land?	□
Constructability	All proposed EMA's meet or exceed PSC setback distances for watercourses, dams, creeks and drains.	□
Cumulative Impacts		□

If you were not able to demonstrate compliance with all of the above Acceptance Criteria, you must proceed to the following checklist	
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Site and soil assessment undertaken in accordance with Section 2.3.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.
System Selection and Sizing Constructability Cumulative Impacts	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads. EMA's must be shown on subdivision plans that are capable of containing land application areas plus reserve (where applicable).

2.5.2 Medium Hazard Allotments

Development proponents for applications involving the consolidation of Medium Hazard allotments (based on existing conditions) will need to address the requirements set out in the following checklist. Where all proposed allotments contain 4,000 m^2 or more Useable Land and setback distances are met, a full Wastewater Management Report will not be required. Applicants will need to submit a site plan demonstrating the availability of 4,000 m^2 of Useable Land. Council will then use the Site and Soil Pro-forma to confirm the site meets the Medium Hazard site and soil criteria.

Where one or more of the consolidated lots contains less than 4,000 m^2 of Useable Land and/or setback distances are not achieved, a Wastewater Management Report completed in accordance with Table 2-10 (excluding the Cumulative Impact Assessment).

Table 2-16 Consolidating Building Entitlements: Medium Hazard Assessment Checklist

	Requirements for Acceptable Solutions	Compliance?
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	☐
	Consolidation with no proposed lots <4,000 m^2 Useable Land may not require a site and soil assessment. Council will inspect the site and use the Site and Soil Pro-forma provided in Section 1.1.1 to confirm if all Low Hazard criteria can be met for each proposed lot. Where one or more criteria are not met, Council may require a site and soil assessment in accordance with the procedure documented below for >2-lot subdivisions. **Consolidation with 1 or more proposed lots <4,000 m^2 Useable Land** Site and soil assessment undertaken in accordance with Section 2.3.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.	☐
System Selection and Sizing	Allotment(s) contains a minimum of 4,000 m^2 of usable land?	☐
Constructability	All proposed EMA's meet or exceed PSC setback distances for watercourses, dams, creeks and drains.	☐
Cumulative Impacts		☐

If you were not able to demonstrate compliance with all of the above Acceptance Criteria, you must proceed to the following checklist

Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Site and soil assessment undertaken in accordance with Section 2.3.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.
System Selection and Sizing	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads. EMA's must be shown on subdivision plans that are capable of containing land application areas plus reserve (where applicable).
Constructability	
Cumulative Impacts	Completion of a Simple Cumulative Impact Assessment in accordance with Section 2.3.4 of this DAF and the PSC On-site Sewage Technical Manual. Outcomes must demonstrate achievement of targets set out in Table 2-8.

2.5.3 High Hazard Allotments

Development proponents for applications involving the consolidation of High Hazard allotments (based on existing conditions) will need to address the requirements set out in the following checklist. A Wastewater Management Report (in accordance with Minimum Standards in Table 2-10) will be required for all consolidation DA's on High Hazard allotments.

Where all proposed allotments contain 4,000 m^2 or more Useable Land and setback distances are met, indicative system sizing will be required, however site specific Cumulative Impact Assessments will not. Where one or more of the consolidated lots contains less than 4,000 m^2 of Useable Land and/or setback distances are not achieved, a Simple CIA will be required to be submitted in support of the application.

Table 2-17 Consolidating Building Entitlements: High Hazard Assessment Checklist

	Requirements for Acceptable Solutions	**Compliance?**
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	Site and soil assessment undertaken in accordance with Section 2.3.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.	□
System Selection and Sizing	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads. EMA's must be shown on subdivision plans that are capable of containing land application areas plus reserve (where applicable).	□
Constructability		□
Cumulative Impacts	Allotment(s) contains a minimum of 4,000 m^2 of Useable land? All proposed EMA's meet or exceed PSC setback distances for watercourses, dams, creeks and drains.	□

If you were not able to demonstrate compliance with all of the above Acceptance Criteria, you must proceed to the following checklist	
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?
	Site and soil assessment undertaken in accordance with Section 2.3.1 of this DAF (High Hazard Procedure) and documented in a Wastewater Management Report by a suitably qualified consultant.
System Selection and Sizing	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads. EMA's must be shown on subdivision plans that are capable of containing land application areas plus reserve (where applicable).
Constructability	
Cumulative Impacts	Completion of a Simple Cumulative Impact Assessment in accordance with Section 2.3.4 of this DAF and the PSC On-site Sewage Technical Manual. Outcomes must demonstrate achievement of targets set out in Table 2-8.

2.5.4 Very High Hazard Allotments

Development proponents for applications involving the consolidation of Very High Hazard allotments (based on existing conditions) will need to address the requirements set out in the following checklist. In these circumstances, site constraints justify careful assessment and design procedures even where total building entitlements are proposed to be reduced. A Wastewater Management Report (in accordance with Minimum Standards in Table 2-14) will be required for all consolidation DA's on Very High Hazard allotments.

Where all proposed allotments contain 2,000 - 3,000 m^2 or more Useable Land and setback distances are met, indicative system sizing will be required in conjunction with a Simple Cumulative Impact Assessments. Where one or more of the consolidated lots contains less than 4,000 m^2 of Useable Land and/or setback distances are not achieved, a Detailed CIA will be required to be submitted in support of the application. Proposals that involve creation of any new allotment that is less than 2,000 m^2 or fails to achieve 50% setback distances between EMA's and watercourses, dams, creeks and drains are unlikely to be approved under the DAF.

Table 2-18 Consolidating Building Entitlements: Very High Hazard Assessment Checklist

	Requirements for Acceptable Solutions	**Compliance?**
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	□
	Subdivision Procedure in accordance with Section 2.4.1 of this DAF and documented in a Wastewater Management Report by a suitably qualified consultant.	□
System Selection and Sizing	Monthly water balance and annual nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads.	□
Constructability	EMA's must be shown on subdivision plans including an indicative land application system footprint to clearly demonstrate that on-site sewage management is viable on each lot.	□
Cumulative Impacts	All proposed lots contain at least 3,000 m^2 of Useable Land. All proposed EMA's meet or exceed PSC setback distances for watercourses, dams, creeks and drains. Completion of a Simple Cumulative Impact Assessment in accordance with Section 2.3.4 of this DAF and the PSC On-site Sewage Technical Manual. Outcomes must demonstrate achievement of targets set out in Table 2-8.	□

If you were not able to demonstrate compliance with all of the above Acceptance Criteria, you must proceed to the following checklist	
Site and Soil Assessment	Must be provided as described above for approval to be issued.
System Selection and Sizing	Daily water and nutrient calculations undertaken to size a range of suitable land application systems for a range of design wastewater loads (completed as part of a Detailed CIA). Significant detail should be provided to justify nominated effluent quality and land application technologies deemed suitable.
Constructability	EMA's must be shown on subdivision plans including an indicative land application system footprint to clearly demonstrate that on-site sewage management is viable on each lot.
Cumulative Impacts	All proposed lots contain at least 2,000 m^2 of Useable Land. Setback distances from watercourses, dams, creeks and drains are at least 50% of those specified in Table 6-9 of this DAF. Detailed Cumulative Impact Assessment undertaken by a suitably qualified consultant in accordance with Section 2.4.4 of this DAF and Section 10.2 of the PSC On-site Sewage Technical Manual. Results demonstrate compliance with performance targets. Possible establishment of an easement over the proposed Effluent Management Area (EMA) as described in Section 2.3.4.

2.6 Effluent Pump Out

As previously discussed in Section 1.5 effluent pump-out systems are not advocated by Council as a sustainable long-term wastewater servicing scenario. They will be considered in specific circumstances where alternative, sustainable options are not feasible or not affordable and a building entitlement already exists. As such **effluent pump-out systems will not be considered for any unsewered development application that proposes an increase in building entitlements.**

3 NON-DOMESTIC DEVELOPMENT

For the purposes of this DAF, non-domestic development can be defined as any unsewered development involving one or more of the following;

- commercial or industrial activities;
- institutional facilities (e.g. schools, community halls, recreation facilities); and
- on-site / decentralised sewage management systems for residential flows greater than 2,000 L/day.

Non-domestic development may involve construction of a single on-site wastewater management system, multiple facilities to receive different waste streams (e.g. trade or food processing waste) or a decentralised community wastewater system comprising collection, treatment and potentially effluent management. Non-domestic systems may also involve collection of wastewater from a subdivision or commercial/industrial development and conveyance to an existing sewerage system.

Non-domestic developments typically generate wastewater with unique and variable characteristics that require site specific consideration to ensure efficient operation and adequate protection of ecosystems and human health. They also typically involve development of a large proportion of site area leaving limited space for sustainable effluent management. In some cases, site activities also increase the potential for exposure of the public to untreated or treated wastewater.

Very few domestic scale on-site sewage management systems are capable of servicing non-domestic facilities >2,000 L/day whilst meeting Council objectives in the long-term without alteration through site specific design.

Under Section 68 of the *Local Government Act 1993*, Council are the responsible authority for approval to install, alter and operate systems of sewage management not licensed under the *Protection of Environment Operations Act (1997)*. This can include systems receiving up to 750 kL/day or 2,500 Equivalent Persons (EP).

The DAF for non-domestic systems reflects the increased influence system size and complexity has on sustainability in comparison to land capability. As design wastewater flows and loads increase, the level of detail required for investigation and design of systems also increases.

3.1 Low and Medium Hazard Allotments (<10 kL/day)

DAF requirements for non-domestic systems on Low and Medium Hazard allotments reflect the higher risk associated with a larger flow system. Even on unconstrained lots, non-domestic systems still have the potential to cause significant impact and historically have been prone to poor design, construction, operation and maintenance. Assessment and design requirements for Low and Medium Hazard allotments are also restricted to smaller non-domestic systems with an average design wastewater flow of <10 kL/day.

Table 3-1 Non-Domestic Low/Medium Hazard Assessment Criteria[1]

	Acceptance Criteria[2]	**DAF Section**
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	
	Site and soil assessment undertaken in accordance with Minimum Standards set out in Section 3.1.1 and documented in a Wastewater Management Report by a suitably qualified and experienced wastewater consultant.	3.1.1
System Selection and Sizing	Summarise potential treatment and land application systems considered and justify preferred option in the Wastewater Management Report.	3.1.2
	Site specific wastewater characterisation based on best available information including seasonal variation.	
	Site specific design and performance criteria confirmed based on guidelines and reported performance.	
	Brief process design outlining rationale, performance and capacity to manage flow and loads.	
	Sizing of land application systems using most limiting of monthly soil water and annual nutrient balance.	
	Preliminary hydraulic design of collection, treatment and land application components.	
	Site plan prepared in accordance with Council's Minimum Standard	Table 3-5
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form?	3.1.3
	Attendance at a pre-approval site meeting by a Council officer, designer and owner.	
	Preparation of a 1-2 page Constructability Assessment by a preferred installer confirming the capacity to install the proposed system and approximate cost range	
Cumulative Impacts	Simple Cumulative impact assessment undertaken by a suitably qualified consultant in accordance with the DAF. Assessment must demonstrate achievement of buffer distances and demonstrate sufficient useable land.	3.1.4
Commissioning and Performance Validation	Preparation of schematic as-built drawing of all system components. Certification by installer that the system has been constructed in accordance with the design. Validation monitoring that consists of monthly sampling as described below. Preparation and submission of an Operation, Monitoring and Maintenance Plan to Council for approval.	3.1.5

Note 1: Limited to systems with an estimated Average Dry Weather Flow (ADWF) <10 kL/day on Low/Medium Hazard allotments.

Note 2: Council have no Acceptable Solution options for Non-Domestic systems. Site specific assessment and design is required.

3.1.1 Site and Soil Assessment

Non-domestic wastewater management systems are not suitable for adoption of Acceptable Solution options or standard designs. This also applies to site and soil assessment where the nature of the wastewater being generated can compound with normally minor or moderate bio-physical constraints to increase risk of design and performance failure significantly in comparison to domestic systems.

Use of Council's Site and Soil Pro-forma will not be accepted for any non-domestic application to install a wastewater management system or for an unsewered increase in building entitlements involving non-domestic systems. Site and soil procedures shall follow procedures set out in Table 3-5 and Table 6-1.

Given that a comprehensive site specific assessment is required for non-domestic systems on Low and Medium Hazard lots, no deemed to comply criteria have been assigned. Wastewater consultants must describe and assess site and soil characteristics in sufficient detail to allow Council to identify the key constraints that must be addressed in the design of the on-site sewage management system. Wastewater Management Reports must then clearly explain how the adopted system design overcomes the nominated constraints (described in more detail in Section 3.1.2).

Site and soil assessment procedures for non-domestic systems on Low / Medium Hazard allotments should clearly follow nationally recognised standards and guidelines for soil and land survey and on-site sewage management. They should include references to specific procedures undertaken and classification systems used to describe and assess conditions. Refer to Table 6-1 for acceptable standards and guidelines for site and soil assessment procedures. Where individual components of a site and soil assessment are not supported with references to these guidelines and standards, Council may request further justification for Wastewater Management Report outcomes. **Failure to provide this information will result in refusal of the application for non-domestic systems/allotments.**

As a minimum, all of the site and soil parameters described in Table 6-1 must be included in an assessment for non-domestic systems on Low / Medium Hazard allotments. It is not adequate to simply list/state the observed or measured value for each parameter. A brief but clear explanation of the implications of the observed / measured value for the on-site system design must be included in the site and soil assessment.

3.1.2 System Selection and Sizing

Given the unique and variable nature of non-domestic wastewater sources, site specific design calculations must be included in a Wastewater Management Report prepared by a suitably qualified / experienced environmental or engineering consultant. This will assist in selection of a system design capable of overcoming observed constraints. To this end, use of the Acceptable Solution Tables is not considered sufficient for any non-domestic systems (regardless of Hazard Class). System selection and design should follow a feasibility and process design procedure reflective of good engineering practice as set out in Crites and Tchobanoglous (1998).

The specific structure and content of system selection and design outcomes for these systems shall follow that set out in the minimum standards for preparation of Wastewater Management Reports in Table 3-5.

3.1.3 Constructability

In addition to provision of a signature from the property owner/applicant and attendance by relevant parties at a site meeting (as described in Section 1.3.3), applications for non-domestic systems on Low / Medium Hazard allotments will require a written Constructability Assessment to be submitted to Council. A Constructability Assessment is a brief (e.g. 1-2 pages) report prepared by an installer / technology provider of medium scale on-site wastewater management systems to provide Council (and the property owner) with a documented professional opinion on the constructability and serviceability criteria listed in Table 3-2. This includes a general cost estimate for construction/installation and operation of the proposed system.

The Assessment should be undertaken by a company capable of installing / constructing the type of system proposed. A Constructability Assessment is not intended to be exhaustive or unnecessarily large but should document a professional assessment of what the owner (or future) owner of the system can expect during construction and operation. Minimum Standards for a Constructability Assessment are described in Table 3-2.

Table 3-2 Minimum Standards for Constructability Assessments

Constructability / Serviceability Element	Minimum Standard
Degree of difficulty	• Nomination of the degree of difficulty (easy, non-standard or difficult) and comparison of the relative degree of difficulty when compared to alternative on-site system options considered. • Identification of critical design elements / system components that will require non-standard or complex installation/construction procedures.
Land area requirements	• Statement confirming the total land area requirement of the proposed on-site sewage management system and the proportion of total allotment area occupied by the system.
Construction/installation costs	• Estimated cost range including a breakdown of significant components (e.g. treatment unit, land application pipework, excavation, fill e.t.c.).
Operational costs	• Approximate annualised cost for operation, monitoring and maintenance of the selected on-site system. • Timeframe for replacement of critical components.
Owner responsibilities	• Bullet point list of both regular and intermittent operation and maintenance activities associated with the system (including land application area). Identification of who will complete each task.

3.1.4 Cumulative Impacts

Applications for non-domestic systems on Low / Medium Hazard allotments are likely to increase total wastewater loads discharged to a particular sub-catchment by a significant proportion. Such applications will be deemed to comply from a cumulative impact perspective where they meet the following conditions.

- The applicant demonstrates that sufficient, *useable* land area exists to fit a properly designed and sized system to service the proposed non-domestic facility in the long-term;
- A Simple Cumulative Impact Assessment is completed to demonstrate risks are adequately managed (refer to the Table 3-3 and the PSC On-site Sewage Technical Manual); and
- the proposed Effluent Management Areas (EMAs) ensure land application areas will comply with recommended buffer distances listed in Table 6-9.

Minimum Standards for completion of a Simple Cumulative Impact Assessment are summarised in the following table. An example methodology and case study demonstrating how a Simple CIA should be undertaken is provided in the PSC On-site Sewage Technical Manual. The Simple CIA is a monthly and yearly mass balance exercise using a published methodology (Jelliffe 2001) that can be completed using simple spreadsheets and typical information obtained during site and soil assessment and on-site sewage management system design processes. Alternative methodologies will be considered but must meet or exceed the Minimum Standards listed below in order to be approved by Council.

Table 3-3 Minimum Standard for Simple Cumulative Impact Assessments

Risk Assessment Component	Minimum Standard
On-lot Land Application Area (LAA) Assessment	• Monthly water balance and annual nutrient balance calculations for each general on-site system LAA type used to size LAA on most limiting value (subsurface nutrient export should therefore be zero/negligible)[1]. Refer to Section 9.2 and 9.3 of the PSC On-site Sewage Technical Manual for Minimum Standards for calculations.
Rainfall-Runoff	• Average annual estimate of runoff volume using a volumetric coefficient of rainfall. Recommend use of Figure 2.3 (and subsequent equations) from Fletcher *et al* (2004).[2] See web link below.
Surface Pollutant Export	• Methodology published by Jelliffe (2001) with slight modification to allow consideration of different system types (equations and an example case study provided in the Technical Manual). http://www.dlg.nsw.gov.au/dlg/dlghome/documents/septicsafe/OSRAS_157-164.pdf
Subsurface Pollutant Export	• Assumed to be negligible proportion of total pollutant load where the following conditions are met. o All proposed lots contain at least 3,000 m2 of Useable Land. o Council buffer distances to permanent and ephemeral watercourses are met. o All land application areas are sized on the most limiting result of a mean monthly water balance or annual nutrient balance. o The lot is classified as Low, Medium or High Hazard. o Any existing systems within the proposed allotments must be upgraded to meet the requirements of the DAF. • Failure to meet these criteria will require a Detailed CIA.
Background Pollutant Loads / Concentrations	• Sourced from Tables 2.44 - 2.45 or Figures 2.15 – 2.23 of Fletcher *et al* (2004).[2] • Acceptable export rates / concentrations sourced from published local studies.
Environment and Health Protection Targets	• No more than 10% increase in average annual nitrogen and phosphorus loads (kg/year) based on existing undeveloped background loads. • All land application areas sized to prevent hydraulic failure (surcharging) in an average rainfall year.

Where an application for an unsewered non-domestic development on a Low / Medium Hazard allotment does not meet the three deemed to comply criteria, a Detailed CIA will be required as described for Very High Hazard assessment as summarised below.

Table 3-4 Assessment Requirements for Non-compliant Non-domestic Systems

(Low/Medium Allotments)

Non-compliance scenario	Description	Performance Target
Failure to achieve buffer distances from watercourses, dams, streams and drains and/or failure to demonstrate sufficient useable land.	Detailed Cumulative Impact Assessment procedure as summarised in Section 3.2.4 and detailed in the PSC On-site Sewage Management Technical Manual.	No more than 10% increase in average annual nitrogen and phosphorus loads (kg/year) based on existing undeveloped background loads. All land application areas sized to prevent hydraulic failure (surcharging) in an average rainfall year.

Please note that given the significant variation in the types and sizes of non-domestic on-site systems observed, Council may, at its discretion, request a less or more stringent level of assessment in relation to cumulative impacts. Such decisions will be made based on site specific conditions.

Table 3-5 Minimum Standard for Wastewater Management Reports:

NON-DOMESTIC SYSTEMS (ADWF <10 kL/day) Minimum Standard for Low/Medium Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Description of proposed facility (including equivalent persons). • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Summary of available published soils information for the site. • Soil assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with DECCW (2004), *AS/NZS 1547:2000*. • Brief and clear explanation of the implications of observed site and soil features for system design and performance. • Brief assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts.	• Paragraph and locality map. • Paragraph or table • 1-2 paragraphs • Table(s), minimum 3 soil test pits per soil facet. • Bullet point list of recommended design elements to overcome constraints. • 1-2 paragraphs
System Selection	• Summarise potential treatment and land application systems considered including advantages and limitations. • Brief statement justifying selection of potential treatment and land application systems.	• Table. • Paragraph.
Design	• Site specific wastewater characterisation based on best available published or local information including consideration of seasonal / monthly variation. • Establish site specific design criteria based on typical / published performance. • Brief process design outlining rationale, assumed performance and capacity to manage design flows and loads. Process performance should be supported by published data or information that demonstrates the suitability of the process to the site and development. • Sizing of land application systems using the most limiting of monthly soil water and annual nutrient balances (see Technical Manual). • Preliminary hydraulic design of collection, treatment and land application components.	• Seasonal / monthly time series of flow and loads and 1-2 paragraphs + table justification (refer to Section 9 the *Technical Manual*). • Paragraph and bullet points. • 1-2 pages including supporting tables and figures. • Tables summarising inputs, assumptions and results and paragraph justifying calculations. • Tables and process schematic.
Site Plan	• Location of boundaries, buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location / extent of all system components (including any reserve areas); • Two metre elevation contours; and • Location of existing and proposed drainage pipework (centreline).	• Minimum A3 Site Plan (1:500).
Cumulative Impacts	• Summary of approach taken and confirmation of compliance with the Minimum Standards documented in 3.1.4. • Methodology documenting the basis and source of input data including reference to site specific data, published information or the *Technical Manual* to justify use. • Results demonstrating compliance with local water quality objectives and adequate management of health risk as defined and demonstrated in Section 10 of the *Technical Manual*. • Brief discussion of long-term risks to health and environment and recommended management measures to address impacts.	• Up to 1 page. • 2-4 pages of tables, figures and text (refer to the *Technical Manual*). • 1-2 pages of tables, figures and text (refer to the *Technical Manual*). • Up to 1 page.
Appendices	• Soil bore logs for all test pits and raw laboratory results. • All design calculations and assumptions including screenshots of cumulative impact spreadsheets/models.	N/A

3.1.5 Commissioning and Performance Validation

Given the site specific nature of non-domestic on-site systems, greater consideration of system commissioning and performance validation is required. This will ensure the wastewater management system design approved is translated into a successfully operating system. Council's Minimum Standards for system commissioning and performance validation for Low/Medium Hazard non-domestic systems (<10kL/day) are summarised in the following table.

Table 3-6 Minimum Standards: Commissioning / Validation of Low/Medium Hazard

NON-DOMESTIC SYSTEMS (ADWF <10 kL/day) Minimum Standard for Low/Medium Hazard Commissioning / Performance Validation		
Element	**Minimum Standard**	**Nominal Level of Detail**
As-built Drawings	• Schematic diagram showing the approximate location and process design of: o All pipework and valves: o treatment and storage tanks / components: o Land application components: o Electrical / controls: and o Reuse components (where applicable).	A4 schematic (not to scale) diagram.
Certification of Installation	• Written statement from installer declaring that the system has been installed / constructed in accordance with Council's conditions of approval.	N/A
Validation Monitoring	• System operator to complete the following monitoring and analysis for a three month period: o daily wastewater volumes entering / discharging from the system: o weekly pH and turbidity reading for final effluent: o weekly visual confirmation of proper function of each system component: o monthly influent quality sampling for BOD_5, TSS, TN, TP, pH and Faecal coliforms: o monthly effluent quality sampling for BOD_5, TSS, TN, TKN, TON, TP and Faecal coliforms • System operator to analyse and summarise the outcomes of this monitoring and confirm the installed system is operating to specification and council's conditions of approval. • Other, site specific validation monitoring as required at the discretion of Council or the system designer.	• Manual readings of water supply meters, installation of smart meters. • Turbidity tube and hand held pH • Procedure to be documented in OM&M Manual. • Other parameters as required based on any site specific factors. • Brief (3-5 pages) letter report to be submitted to Council.
Operation, Monitoring and Maintenance Plan	• Must include as-built drawing(s) and a step by step description of each system component, operation and performance expectations. • Establish minimum daily, weekly and monthly OM&M tasks through use of checklists. • Troubleshooting advice / Frequently Asked Questions. • Contact details for key personnel including service and maintenance technician(s), site operator and emergency contact. • Details of performance validation monitoring.	• Schematic site plan (not to scale) • OM&M Plan nominal 10-30 pages. Level of detail commensurate with size and complexity of the system.

3.2 High and Very High Hazard Allotments plus all Systems with ADWF 10-100 kL/day

The DAF requires more comprehensive assessment and design procedures to be adopted for non-domestic systems on High to Very High Hazard allotments. Site constraints and the significant variation in wastewater flows and loads typically observed with non-domestic systems can compound to create increased risks of system failure and ecosystem / health impacts. **Included in this classification are all systems with an average dry weather flow between 10-100 kL/day, regardless of hazard class.** This reflects the higher potential for impact associated with larger sized systems and the higher level of engineering and science expertise required for assessment and design.

Table 3-7 Non-Domestic High/Very High Hazard Assessment Checklist[1,2]

	Acceptance Criteria[3]	DAF Section
Site and Soil Assessment	On-site Sewage Management Hazard Class confirmed by the designer/installer?	3.2.1
	Site and soil assessment undertaken in accordance with Minimum Standards set out in Section 3.2.1 and documented in a Wastewater Management Report by a suitably qualified and experienced wastewater consultant.	
System Selection and Sizing	Preliminary design calculations for a minimum 2-4 options accompanied by NPV assessment.	3.2.2
	Summarise potential treatment and land application systems considered and justify preferred option in the Wastewater Management Report.	
	Detailed wastewater characterisation including temporal variation using existing data for subject site or similar facilities.	
	Site specific design and performance criteria confirmed based on guidelines and reported performance.	
	Process design outlining rationale, performance and capacity to manage flow and loads.	
	Sizing of land application systems using daily soil water, nutrient and pathogen modelling.	
	Hydraulic design of collection, treatment and land application components.	
	Design drawings (CAD or similar) and specifications for all system components.	
	Site plan prepared in accordance with Council's Minimum Standard	Table 3-11
Constructability	Owner / applicant has signed the statement within the Section 68 Application Form?	3.2.3
	Attendance at a pre-approval site meeting by a Council officer, designer and owner.	
	Preparation of a 1-2 page Constructability Assessment by a preferred installer confirming the capacity to install the proposed system and approximate cost range.	
Cumulative Impacts	Detailed Cumulative Impact Assessment completed in accordance with the DAF by a suitably qualified consultant. Establishment of an easement over the proposed Effluent Management Area (EMA) as described in Section. Assessment must demonstrate achievement of buffer distances, demonstrate sufficient useable land and achievement of long-term ecosystem and health protection objectives.	3.2.4
Commissioning and Performance Validation	Preparation of as-built drawings of all system components. Certification[4] by installer and designer that the system has been constructed in accordance with the design. Performance validation monitoring as described in 3.2.5 for either; a) systems on High/Very High Hazard lots with ADWF<10kL/day; or be) all systems with ADWF >10kL/day. Preparation and submission of an Operation, Monitoring and Maintenance Plan to Council for approval.	3.2.5

Note 1: Limited to systems with an estimated Average Dry Weather Flow (ADWF) <100 kL/day on High/Very High Hazard allotments.

Note 2: Includes Systems with an estimate ADWF 10-100 kL/day irrespective of Hazard Class

Note 3: Council have no Acceptable Solution options for Non-Domestic systems. Site specific assessment and design is required.

Note 4: This certification consists of a written declaration from either the designer or installer of an on-site wastewater management system. It is not a certification recognised under the National Construction Code (2011) and does not replace the need to obtain these certifications.

3.2.1 Site and Soil Assessments

Applications to install or alter an on-site sewage management system for non-domestic systems on High and Very High Hazard allotments cannot use the Council site and soil assessment pro-forma. Similarly, any on-site or community wastewater management system with an Average Dry Weather Flow (ADWF) greater than 10 kL/day must also adhere to these site and soil assessment procedures. They must be supported by a Wastewater Management Report prepared in accordance with *AS/NZS 1547:2000* and the NSW guidelines *Effluent Use by Irrigation* (DECCW, 2004). This report should document a comprehensive site and soil assessment process in addition to presenting design assumptions/calculations and a concept design for the proposed sewage management system. Minimum Standards for site and soil assessment are contained in Table 6-1. Specific minimum requirements for non-domestic systems on High / Very High Hazard lots and systems with ADWF 10-100 kL/day are listed in Table 3-11. Further details on the required content and structure of Site and Soil assessment are provided in Table 6-1 of this document.

Given that a comprehensive site specific assessment is required for all High and Very High Hazard lots, no deemed to comply criteria have been assigned. Wastewater consultants must describe and assess site and soil characteristics in sufficient detail to allow Council to identify the key constraints that must be addressed in the design of the on-site sewage management system. Wastewater Management Reports must then clearly explain how the adopted system design overcomes the nominated constraints (described in more detail in Section 3.2.2).

Site and soil assessment procedures for High / Very High hazard allotments should clearly follow nationally recognised standards and guidelines for soil and land survey and on-site sewage management. They should include references to specific procedures undertaken and classification systems used to describe and assess conditions. Refer to Table 6-1 for acceptable standards and guidelines for site and soil assessment procedures. Where individual components of a site and soil assessment are not supported with references to these guidelines and standards, Council may request further justification for Wastewater Management Report outcomes. **Failure to provide this information will result in refusal of the application for High and Very High Hazard allotments.**

As a minimum, all of the site and soil parameters described in Table 6-1 must be included in an assessment for High and Very Hazard allotments. It is not adequate to simply list/state the observed or measured value for each parameter. A comprehensive and clear explanation of the implications of the observed / measured value for the on-site system design must be included in the site and soil assessment. **Failure to provide this explanation will result in refusal of the application for High and Very High Hazard allotments.**

In addition to the requirements outlined above, site and soil assessment procedures for non-domestic systems on High / Very High Hazard allotments may also require constant head permeability testing in accordance with *AS/NZS1547:2000*. Results should be used to develop a site specific estimate for saturated hydraulic conductivity and subsequently design loading rates.

Site and soil assessors should be aware that due to the highly variable and constrained nature of Very High Hazard lots, Council may request additional investigations on a site specific basis not included in the DAF Minimum Standards. As such, consultants should seek to be proactive in identifying any site specific constraints that require more detailed analysis.

3.2.2 System Selection and Sizing

Given the unique and variable nature of non-domestic wastewater sources, site specific design calculations must be included in a detailed Wastewater Management Report prepared by a suitably qualified / experienced environmental or engineering consultant. The consultant must have experience in non-domestic scale systems. This will assist in selection of a system design capable of overcoming observed constraints. To this end, use of the Acceptable Solution Tables is not considered sufficient for any non-domestic systems (regardless of Hazard Class). System selection and design should follow a feasibility and process design procedure reflective of good engineering practice as set out in Crites and Tchobanoglous (1998) and Section 9.5 of the *PSC On-site Sewage Technical Manual*.

For non-domestic systems on High / Very High Hazard allotments **or** any non-domestic system with ADWF 10-100 kL/day, a specification should be provided that clearly describes all system components to a sufficient level of detail to allow tendering for design and construction. This will ensure Council can readily understand the full extent of the proposed system. The specific structure and content of system selection and design outcomes for these systems shall follow that set out in the minimum standards for preparation of Wastewater Management Reports in Table 3-11.

Daily soil water and nutrient modelling must be used in conjunction with one dimensional viral dieoff modelling in shallow groundwater to size land application systems. Reference should be made to Section 9 of the PSC *Technical Manual* for specific guidance. The following performance targets must be met in sizing the land application area.

- No hydraulic surface surcharge in an average rainfall year:
- Average annual nutrient concentrations in deep drainage are no more than 10% higher than existing background pollutant levels as calculated using the approach recommended in Section 10 of the PSC *On-site Sewage Technical Manual*;
- total viral dieoff in shallow groundwater prior to any water supply bores or receiving waters as calculated by Cromer *et al* (2001) as cited in the PSC *On-site Sewage Technical Manual*.

3.2.3 Constructability

In addition to provision of a signature from the property owner/applicant and attendance by relevant parties at a site meeting (as described in Section 1.3.3), applications for non-domestic systems will require a written Constructability Assessment to be submitted to Council. A Constructability Assessment is a brief (e.g. 1-2 pages) report prepared by an installer / technology provider of

medium scale on-site wastewater management systems to provide Council (and the property owner) with a documented professional opinion on the constructability and serviceability criteria listed in Table 3-8. This includes a general cost estimate for construction/installation and operation of the proposed system.

The Assessment should be undertaken by a company capable of installing / constructing the type of system proposed. A Constructability Assessment is not intended to be exhaustive or unnecessarily large but should document a professional assessment of what the owner (or future) owner of the system can expect during construction and operation. Minimum Standards for a Constructability Assessment are described in Table 3-2.

Table 3-8 Minimum Standards for Constructability Assessments

Constructability / Serviceability Element	Minimum Standard
Degree of difficulty	• Nomination of the degree of difficulty (easy, non-standard or difficult) and comparison of the relative degree of difficulty when compared to alternative on-site system options considered. • Identification of critical design elements / system components that will require non-standard or complex installation/construction procedures.
Land area requirements	• Statement confirming the total land area requirement of the proposed on-site sewage management system and the proportion of total allotment area occupied by the system.
Construction/installation costs	• Estimated cost range including a breakdown of significant components (e.g. treatment unit, land application pipework, excavation, fill e.t.c.).
Operational costs	• Approximate annualised cost for operation, monitoring and maintenance of the selected on-site system. • Timeframe for replacement of critical components.
Owner responsibilities	• Bullet point list of both regular and intermittent operation and maintenance activities associated with the system (including land application area). Identification of who will complete each task.

3.2.4 Cumulative Impacts

Applications for non-domestic systems on High / Very High Hazard allotments and non-domestic systems with ADWF between 10-100 kL/day shall be deemed to comply from a cumulative impact perspective where they meet the following conditions.

- Scale detailed design drawings (prepared in CAD or similar) shall be provided with the design to demonstrate that sufficient, *useable* land area exists to fit a properly designed and sized system to service the proposed non-domestic facility in the long-term;
- A Detailed Cumulative Impact Assessment is completed to demonstrate risks are adequately managed (refer to Table 3-9, Table 3-10 and the PSC On-site Sewage Technical Manual);
- the proposed Effluent Management Areas (EMAs) ensure land application areas will comply with recommended buffer distances listed in Table 6-9; and

Minimum Standards for completion of a Detailed Cumulative Impact Assessment are summarised in Table 3-9. An example methodology and case study demonstrating how a Detailed CIA should be undertaken is provided in the PSC On-site Sewage Technical Manual. The Detailed CIA involves daily mass balance modelling of on-site sewage management system performance and catchment runoff and pollutant loads to estimate the potential human health and ecosystem impacts of multiple on-site systems. Detailed CIA will require specialist input from consultants with catchment / water quality modelling and assessment experience and expertise and the application of computer software

designed to assess these impacts. Alternative methodologies will be considered but must meet or exceed the Minimum Standards listed below in order to be approved by Council.

Table 3-9 Minimum Standard for Detailed Cumulative Impact Assessment

Risk Assessment Component	Minimum Standard
On-lot Land Application Area (LAA) Assessment	• Daily water and nutrient mass balance modelling on a site specific basis used to derive average annual hydraulic and pollutant loads to surface and subsurface export routes. Viral die-off modelling.
Rainfall-Runoff and Groundwater Recharge	• Continuous daily rainfall-runoff, nutrient and pathogen mass balance modelling using MUSIC (or equivalent) used to derive average annual values.
Background Pollutant Loads / Concentrations	• Sourced from Chapter 2 of Fletcher *et al* (2004). • Acceptable export rates / concentrations sourced from published local studies. • Site specific data where available or necessary.
Surface and Subsurface Pollutant Export	• Application of catchment attenuation factor (provided in the *Technical Manual*) to combined surface and subsurface on-site loads based on broad characteristics of the receiving environment.[2] • Mass balance combining attenuated on-site system flows and loads with catchment inputs.
Environment and Health Protection Targets[3]	• No more than 10% increase in average annual nitrogen and phosphorus loads (kg/year) based on existing undeveloped background loads. • Proposed Land Application Areas (LAAs) sized to prevent hydraulic failure in an average climate year.

Where an application for an unsewered non-domestic development on a High / Very High Hazard allotment does not meet the four deemed to comply criteria, it is unlikely that Council will approve the development. Where an applicant wishes to pursue a non-compliant DA on a High / Very High Hazard allotment, the additional information summarised in the table below must be provided / used in the Detailed CIA process. Results of the Detailed CIA must clearly demonstrate that long-term risks to human health and the environment are adequately managed through the proposed on-site sewage management servicing concepts. This requirement also applies to any non-domestic systems with an ADWF 10-100 kL/day.

Table 3-10 Assessment Requirements for Non-compliant Very High Hazard Allotments

Non-compliance scenario	Description	Performance Targets
Failure to achieve 50% buffer distances from watercourses, dams, streams and drains. Failure to demonstrate achievement of long-term water quality and health protection objectives.	Detailed Cumulative Impact Assessment Procedure as summarised in Table 3-9 and detailed in the PSC On-site Sewage Management Technical Manual. Collection of site specific surface and (where relevant) groundwater quality data for use in the Detailed CIA. Potential completion of site specific surface and groundwater investigations to characterise water flow and quality.	Proposed Land Application Areas (LAAs) sized to prevent hydraulic failure in an average climate year. <10% increase in nutrient loads from existing site conditions.
	Council will require the establishment of an easement over the Effluent Management Area (EMA) to protect availability for sewage management in perpetuity.	

Table 3-11 Minimum Standard for Wastewater Management Reports

NON-DOMESTIC SYSTEMS (ADWF 10-100 kL/day) Minimum Standard for High/Very High Hazard Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Description of proposed facility (including equivalent persons). • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Detailed review of available published soils information for the site. • Soil assessment that considers all parameters listed in Table 6-1 of the DAF in accordance with *AS/NZS 1547:2000*. • Where multiple soil facets are present the site plan should show the approximate boundary between facets. • Detailed explanation of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1 page • Table(s) • Minimum 3 soil test pits per soil facet. • Up to 1 page of explanation and recommended design elements to overcome constraints. • Up to one page.
System Selection	• Summarise potential treatment and land application systems considered including advantages and limitations. • Preliminary design calculations for a minimum of 2-4 options. • Brief statement justifying selection of treatment and land application system.	• Table. • Summary table. • Paragraph.
Design	• Detailed wastewater characterisation (quality and quantity) including temporal variation using existing data for the subject site or similar facilities. • Establishment of clear, site specific design criteria based on typical or published performance. • Process design in accordance with Tchobanoglous and Burton (2003) or Crites and Tchobanoglous (1997) detailing the rationale, assumed performance and capacity to manage design flows and loads. Process performance should be supported by published data or information that demonstrates the suitability of the process to the site and development. • Daily water, nutrient and pathogen modelling to size any land application areas (see PSC Technical Manual). • Hydraulic design of collection, treatment and land application components to demonstrate viability of the process. • Design drawings (CAD or similar) and specifications for all system components.	• Monthly/daily time series of flow and loads and 1-2 paragraphs + table justification (refer to Section 9 the *Technical Manual*). • 1 page and table. • 2-4 pages including supporting tables and figures. • Tables summarising inputs, assumptions and results and paragraph justifying calculations. • Tables and process schematic. • Scale drawings prepared in CAD (or similar) and engineering specification sufficient for detailed design and construction.

Site Plan	• Survey plan. • Proposed allotment boundaries, dimensions and area; • Location of existing buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of exclusion zones (e.g. setback distances and unsuitable site and soil conditions); • Location of all system components and any reserve areas to clearly demonstrate viability; • Half metre elevation contours; and • Location of existing and proposed drainage pipework (centreline).	• Minimum A3 Site Plan (1:500). CAD or similar.
Cumulative Impacts	• Summary of approach taken and confirmation of compliance with the Minimum Standards documented in 3.2.4. • Methodology documenting the basis and source of input data including reference to site specific data, published information or the *Technical Manual* to justify use. • Results demonstrating compliance with local water quality objectives and adequate management of health risk as defined and demonstrated in Table 3-9 and Section 10 of the *Technical Manual*. • Brief discussion of long-term risks to health and environment and recommended management measures to address impacts.	• Up to 2 pages. • 4-8 pages of tables, figures and text. • 4-8 pages of tables, figures and text. • Up to 4 pages.
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions including screenshots of cumulative impact spreadsheets/models.	N/A

3.2.5 Commissioning and Performance Validation

Given the site specific nature of non-domestic on-site systems, greater consideration of system commissioning and performance validation is required. This will ensure the wastewater management system design approved is translated into a successfully operating system. Council's Minimum Standards for system commissioning and performance validation for High/Very High Hazard non-domestic systems **(including all systems 10-100 kL/day)** are summarised in the following table.

Minimum Standards have been split into two components to recognise some of the variation in scale and complexity observed in non-domestic systems. Please note that Council may at its discretion require more or less than included in the following Minimum Standards where site specific circumstances justify such a change.

Table 3-12 Minimum Standards: Commissioning / Validation of High/Very High Hazard Lots

NON-DOMESTIC SYSTEMS (ADWF <10 kL/day) Minimum Standard for High/Very High Hazard Commissioning / Performance Validation		
Element	**Minimum Standard**	**Nominal Level of Detail**
As-built Drawings	• Scale site plan showing the approximate location and process design of: o All pipework and valves: o treatment and storage tanks / components: o Land application components: o Electrical / controls: and o Reuse components (where applicable).	A4 (to scale) site plan (based on survey). Wastewater management system components need not be surveyed.
Certification of Installation	• Written statement from installer declaring that the system has been installed / constructed in accordance with Council's conditions of approval. • Written statement from designer confirming that the system has been installed / constructed in accordance with the design.	N/A
Validation Monitoring	• System operator to complete the following monitoring and analysis for a three month period: o daily wastewater volumes entering / discharging from the system: o weekly pH and turbidity reading for final effluent: o weekly visual confirmation of proper function of each system component: o monthly influent quality sampling for BOD_5, TSS, TN, TP, pH and Faecal coliforms: o monthly effluent quality sampling for BOD_5, TSS, TN, TKN, TON, TP and Faecal coliforms • System operator to analyse and summarise the outcomes of this monitoring and confirm the installed system is operating to specification and council's conditions of approval. • Other, site specific validation monitoring as required at the discretion of Council or the system designer.	• Manual readings of water supply meters, installation of smart meters. • Turbidity tube and hand held pH • Procedure to be documented in OM&M Manual. • Other parameters as required based on any site specific factors. • Brief (3-5 pages) letter report to be submitted to Council.
Operation, Monitoring and Maintenance Plan	• Must include as-built drawing(s) and a step by step description of each system component, operation and performance expectations. • Establish minimum daily, weekly and monthly OM&M tasks through use of checklists. • Troubleshooting advice / Frequently Asked Questions. • Contact details for key personnel including service and maintenance technician(s), site operator and emergency contact. • Details of performance validation monitoring.	• Surveyed site plan (to scale) • OM&M Plan nominal 10-30 pages. Level of detail commensurate with size and complexity of the system.

Table 3-13 Minimum Standards: Commissioning / Validation of 10-100 kL/day Systems

NON-DOMESTIC SYSTEMS (ADWF 10-100 kL/day) Minimum Standard for Commissioning / Performance Validation (Regardless of Hazard Class)		
Element	**Minimum Standard**	**Nominal Level of Detail**
As-built Drawings	• Fully surveyed site plan showing the location and process design of: o All pipework and valves: o treatment and storage tanks / components: o Land application components: o Electrical / controls: and o Reuse components (where applicable).	A3 surveyed site plan (to scale).
Certification of Installation	• Written statement from installer declaring that the system has been installed / constructed in accordance with Council's conditions of approval. • Written statement from designer confirming that the system has been installed / constructed in accordance with the design. • A written statement from any third party peer reviewer engaged as a requirement of Council during the application to install / DA process.	N/A
Validation Monitoring	• System operator to complete the following monitoring and analysis for a six month period: o hourly wastewater volumes entering / discharging from the system: o Daily **(first 3 months)** followed by weekly **(second 3 months)** pH and turbidity readings for final effluent: o weekly visual confirmation of proper function of each system component: o Weekly **(first 3 months)** followed by monthly **(second 3 months)** influent quality sampling for BOD_5, TSS, TN, TP, pH and Faecal coliforms: o Weekly **(first 3 months)** followed by monthly **(second 3 months)** effluent quality sampling for BOD_5, TSS, TN, TKN, TON, TP and Faecal coliforms • System operator to analyse and summarise the outcomes of this monitoring and confirm the installed system is operating to specification and council's conditions of approval. • Third party peer review of Performance Validation will be required where a peer reviewer was engaged as a requirement of Council during the application to install / DA process. • Other, site specific validation monitoring as required at the discretion of Council or the system designer.	• Installation of smart meter(s) that allow measurement of wastewater inputs (e.g. sub-metering of water supply). • Turbidity tube and hand held pH or continuous logging. • Procedure to be documented in OM&M Manual. • Other parameters as required based on any site specific factors. • 10-20 page report to be submitted to Council.
Operation, Monitoring and Maintenance Plan	• Must include as-built drawing(s) and a step by step description of each system component, design capacities, operation and performance expectations. • Establish minimum daily, weekly and monthly OM&M tasks through use of checklists. • Troubleshooting advice / Frequently Asked Questions. • Contact details for key personnel including service and maintenance technician(s), site operator and emergency contact. • Details of performance validation monitoring.	• Schematic site plan (not to scale) • OM&M Plan nominal 20-50 pages. Level of detail commensurate with size and complexity of the system.

3.3 On-site and Community Systems >100 kL/day

Any on-site or decentralised wastewater management system with an ADWF greater than 100 kL/day requires specialist input into assessment, design, approval and construction. This DAF does not provide specific direction on requirements for these systems. A general guide to approval processes for these systems is as follows.

- Council will require a comprehensive feasibility study to be undertaken that clearly justifies the preferred option of the applicant against realistic alternatives (including life cycle analysis).
- Development Applications (DA) will need to be accompanied by a preliminary design and environmental assessment justifying that the system is feasible and will meet ecosystem / health protection objectives.
- The *Section 68* application to install a wastewater management system shall be accompanied by a detailed design including drawings and specifications.
- Construction supervision and certification by a suitably qualified engineering consultant will be required.

Council may engage an independent consultant to complete a technical peer review of the application at the various project stages. The costs of this peer review will be borne by the applicant. Individuals or organisations considering submission of a DA for an activity that will generate more than 100 kL/day ADWF should contact Council at the earliest point to ensure they are fully aware of information requirements and performance objectives.

3.4 Non-Domestic Effluent Pump Out Systems

An effluent pump-out system utilizes a collection tank (collection well) that receives and stores liquid effluent once it has passed through a septic tank. A road tanker removes the stored liquid effluent on a frequency dependant on the hydraulic loading from the buildings connected to the system. The up front costs for installation of effluent pump-out systems are generally less expensive than treatment systems but they cost significantly more to operate over the life of the system due to on-going pumping and disposal costs.

Tanker removal systems can be subject to ongoing issues involving noise, odour, increased truck movements, increased damage to local roads and misuse and abuse by property owners. There are also limits on the volume of sewage from tankers that can be accepted at local Hunter Water wastewater treatment plants. In essence, effluent pump-out systems are not a sustainable long-term sewage management option. Council will only permit the installation of an effluent pump-out system in a restricted set of circumstances. This section of the DAF sets out situations where effluent pump-out systems will be considered and Minimum Standards for their approval.

Council advocates on-site sewage systems as a legitimate long-term management options where appropriate and sustainable. They should only be used as temporary “stop gap” solutions where Council and/or Hunter Water have identified some form of centralised or community wastewater management as the preferred long-term servicing option. Effluent pump-out should not be used to enable inappropriate or unsustainable development in unsewered areas. Notwithstanding,

consideration will be given to pump-out systems where Council have previously approved development (based on previous, less stringent standards) that is no longer considered sustainable.

The following table summarises the types of allotments and non-domestic developments where effluent pump-out systems will be considered. **Effluent pump-out systems will not be considered for any rezoning, unsewered subdivision (or other increase in building entitlements) or multi-unit development application. They will only be considered for existing unsewered building entitlements where a sustainable on-site sewage management option is not viable.**

Table 3-14 Where Effluent Pump-out Systems will be considered in non-domestic situations

Development Scenario	Low to High Hazard >4,000m^2 Useable Land	High Hazard 2,000 – 4,000m^2 Useable Land	Very High Hazard >4,000 m^2 Useable Land	Very High Hazard <4,000m^2 Useable Land
Non-residential	Not permitted	With justification[1]		

Note 1: Refer to Section 1.5.1 for a description of Minimum Standards for justifying effluent pump-out.

Note 2: Only permitted without further justification where the nearest sewer connection is >75 metres from the property or the property is located within a Hunter Water Corporation potable water supply protection area.

3.4.1 Minimum Standards for Justification of Effluent Pump-out

In situations where Council are willing to consider effluent pump-out "with justification" in Table 1-10, the following information must be submitted as a Minimum Standard for approval.

- A Wastewater Management Report prepared in accordance with Table 1-9 (residential) or Table 3-11 (non-residential) will need to be submitted to Council. The report will need to demonstrate that;
  - based on the outcomes of a site and soil assessment, there is insufficient area to contain a sustainable on-site sewage management service; and/or
  - an effluent land application area sized in accordance with Table 1-9/Table 3-11 and Section 9.4 of the PSC On-site Sewage *Technical Manual* cannot realistically be installed on the site.
- A Constructability Assessment prepared in accordance with Table 1-8 will need to be submitted to Council that confirms that installation of an on-site sewage management system is not feasible.
- There may be situations where an on-site sewage management option is technically and environmentally feasible (based on the above assessments) but not the preferred option of the applicant. In these circumstances, the Constructability Assessment will need to include a Net Present Value assessment (20 year duration) that compares life cycle costs between an effluent pump-out and on-site sewage management option. This assessment must demonstrate that life cycle costs for the effluent pump-out system are significantly less than the on-site disposal option (in the order of 50% less expensive).

4 TECHNICAL PEER REVIEW OF APPLICATIONS

It should be noted that in any situation where Council have concerns about the suitability of a proposed on-site sewage management system or the validity of any information and calculations submitted, they may request a technical peer review be undertaken by a independent scientist or engineer with expertise in the field. This is particularly applicable to applications for individual systems (domestic or non-domestic) or unsewered increases in building entitlements on High and Very High Hazard allotments. In all cases, the costs of this peer review will be borne by the applicant. Applications that meet Acceptable Solution criteria will not require technical peer review.

5 ACCEPTABLE SOLUTIONS

Section 5 and 6 of the DAF effectively replace Councils *On-site Sewage Management Specification 2007*. This section sets out Council's Acceptable Solutions included in the DAF for unsewered development of Low and Medium Hazard allotments. The Acceptable Solutions offer an opportunity for applicants to select a wastewater servicing concept that is considered an effective and safe option for the majority of Low and Medium Hazard lots. This allows Council to approve applications more promptly in the knowledge that the proposed system is designed to meet performance objectives.

The contents of this section (and Appendix A) are intended to be used as a reference once an applicant has determined their minimum requirements for supporting information to be provided with their application from the DAF. Users of the DAF should select the appropriate sections applicable to their application using the DAF checklists and Minimum Standards for Wastewater Management Reports (contained in Sections 1.1 to 2.5).

As explained in the preceding DAF Sections, Council have developed a suite of Acceptable Solutions for on-site sewage management that aim to streamline approval processes for systems proposed for Low and Medium Hazard allotments. It recognises that on lots with few constraints to sustainable on-site sewage management, the need for detailed investigations and design calculations is reduced. Council's Acceptable Solutions are considered conservative wastewater servicing options that provide a high level of assurance that our objectives will be met. Subject to some minimum and relatively simple information requirements for applications to install, use of an Acceptable Solution will typically result in prompt approval by Council.

The Acceptable Solutions are comprised of a set of common system types and sizes considered appropriate for specific site conditions. Essentially, the user can select a type of on-site system and minimum basal area for the land application area based on five fundamental characteristics of the development. For some development sites with very few constraints, a wide range of Acceptable Solution options will be available. For other, moderately constrained sites, some options may be excluded. The user should follow the decision key provided below to find the Acceptable Solution table that matches their site.

The rationale and methodology for development of the Acceptable Solution Tables is contained in Section 8 of the PSC On-site Sewage Technical Manual.

Acceptable Solutions may only be used for domestic on-site sewage management systems proposed on Low to Medium Hazard allotments. The DAF does not however, prescribe use of Acceptable Solutions. Individual applicants are able to submit site specific designs subject to provision of the relevant supporting information and calculations applicable to that development.

5.1 How to Use the Acceptable Solutions

Figure 5-1 illustrates the information required to allow selection of Acceptable Solutions for a specific site. Reference should be made to Figure 5-2 to determine which climate zone a site is located within. From this point the required information should be readily available from site and soil assessment and system design activities completed as part of the Low and Medium Hazard DAF.

Selection of the design soil class should be completed using the Design Loading Rate (DLR) tables in Appendix 4.2A of *ASNZS1547:2000*. The design soil class should be assigned based on the soil horizon with the most limiting DLR within 600mm of the base of the LAA or the point of discharge.

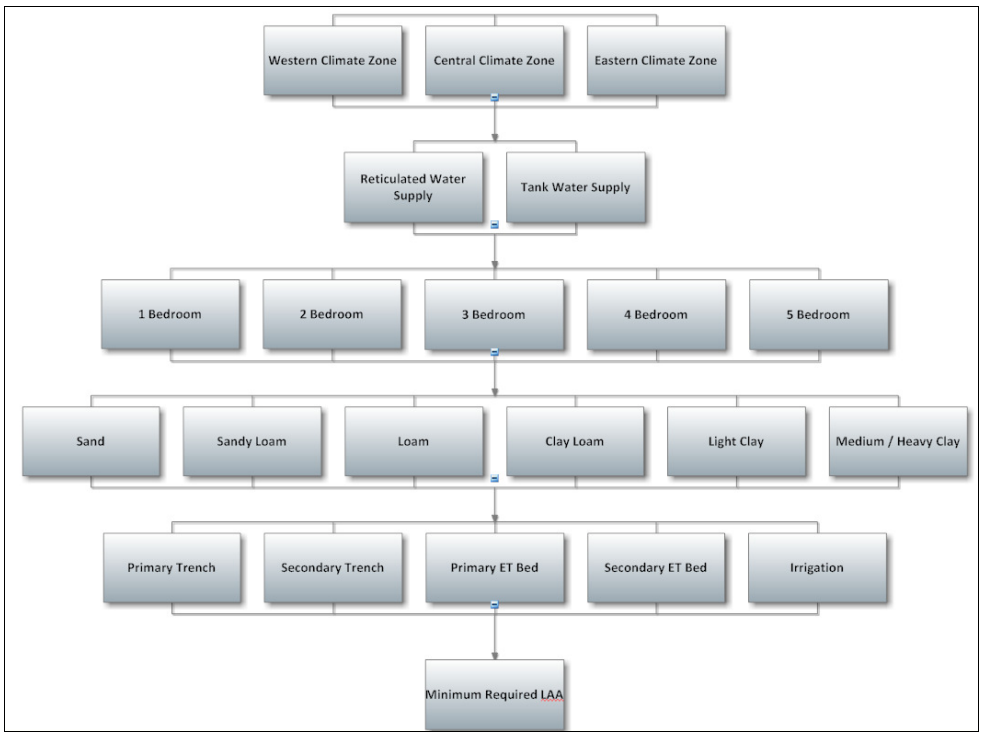


Figure 5-1 Decision Tree for Selection of Acceptable Solutions

Reference should then be made to Appendix A for selection of the applicable Acceptable Solution table.

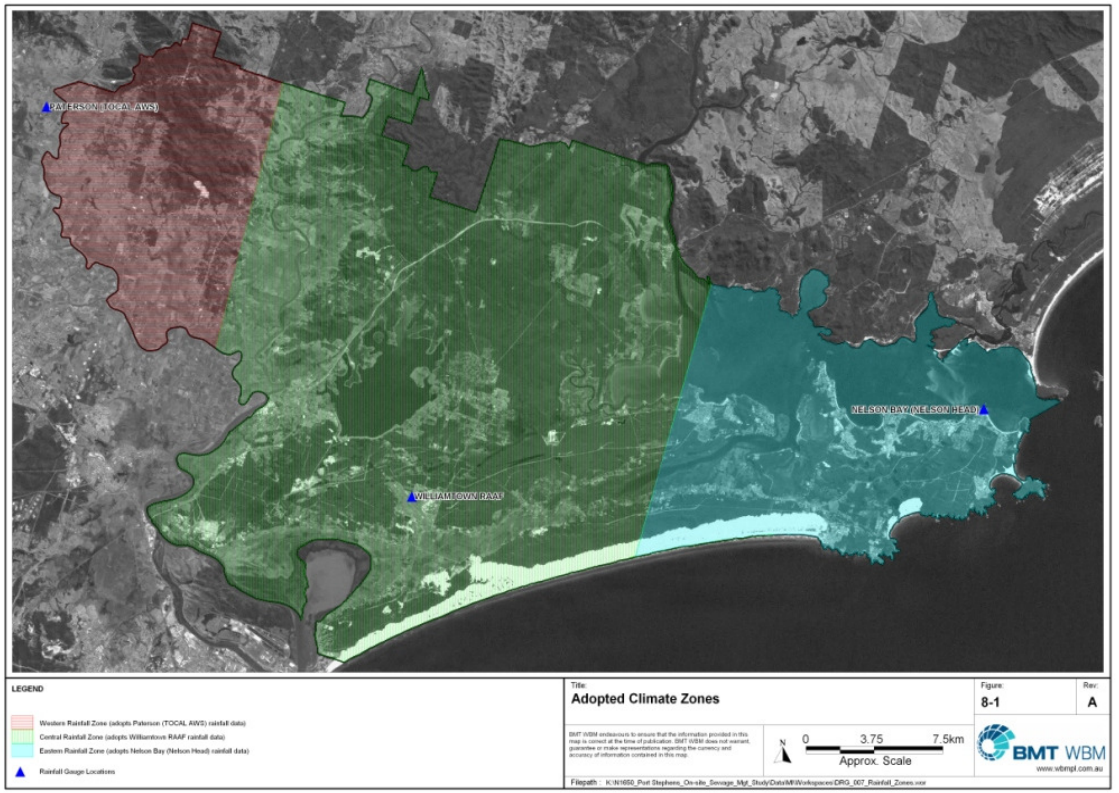


Figure 5-2 Climate Zones for Acceptable Solution Tables

6 MINIMUM STANDARDS

These Minimum Standards provide performance based guidance and criteria that ensure various aspects of the design and construction of on-site systems are undertaken in accordance with Council's requirements. The contents of this section are intended to be used as a reference once an applicant has determined their minimum requirements for supporting information to be provided with their application from the DAF. Users of the DAF should select the appropriate sections applicable to their application using the DAF checklists and Minimum Standards for Wastewater Management Reports (contained in Sections 1 to 2.6).

6.1 Minimum Standards for Site and Soil Assessment

Table 6-1 contains the guidance on minimum levels of investigation for site and soil assessments. This Minimum Standard is applicable to site and soil assessments completed for all unsewered developments excluding applications to install single on-site sewage management systems on Low and Medium Hazard lots. For these scenarios, Table 6-1 still provides comprehensive guidance to assist in use of the Site and Soil Pro-forma. The Minimum Standards also list additional resources and recognised standards the user can source to assist in submitting a suitable site and soil assessment.

Table 6-1 Minimum Standards for Site and Soil Assessment Procedures

Site or Soil Feature	Explanation	Additional Resources
Slope	The slope of the site, particularly the proposed Land Application Area (LAA), may be measured in the field by the site and soil assessor / installer using a clinometer or estimated using survey information or visual checks and reported in percent slope.	*Australian Soil and Land Survey Field Handbook (CSIRO, 2009)* and *AS1547:2000*
Exposure	This parameter should be determined in the field from noting the amount of tree cover (which provides shading), and the direction that the slopes face (aspect) where land application of effluent is likely to take place.	
Vegetation	The general type of vegetation cover over the proposed LAA should be recorded, preferably even specific species. An assessment of the coverage of vegetation on the ground surface and general vigour should be made.	
Flood Potential	If possible, information regarding the flood annual accedence probability (AEP) elevations for the site should be detailed (Council has this information). In the field, proximity to watercourses (both intermittent and permanent) should be noted, as well as position in the landscape (for example on a floodplain).	Council flood planning engineer.
Run-on and Up-slope Seepage	Evidence of run-on to the proposed LAA should be noted (such as sediment dams on the surface). The presence of wet ground or seepage upslope should also be recorded.	*Australian Soil and Land Survey Field Handbook (CSIRO, 2009)* and *AS1547:2000*
Site Drainage	From the field investigation, a record of observation and a description of the shape of the land should be provided to indicate whether water will be shed or will soak in. This gives an evaluation of the surface drainage. Subsurface drainage can be determined by the presence of mottled colours in the soil profile, which indicates waterlogging. The moisture content of the soil during dry periods also reflects the capacity for drainage.	
Depth to Limiting Horizon	A hole or pit should be dug, by hand or machine, to at least 1.0 metres below the base of the LAA or to refusal. The depth of the excavation should be recorded, along with the depth of each distinctive soil layer or horizon. The presence of hardened layers (hardpans) should also be recorded.	
Buffer distances	When siting land application areas, buffer setbacks should be provided to various features as appropriate to the specific site. Guidance is provided in Table 6-9 on recommended (deemed to comply) buffer distances. In the field, note the distance to relevant features from this table from both treatment systems and proposed LAAs. If the buffer distances differ from those recommended in Table 6-9 the proposed on-site system cannot be considered a deemed to comply Low Hazard system. In this case further justification will be required and the proposal may be assessed under a higher hazard DAF.	PSC On-site Sewage Management Technical Manual (2010).
Depth to Groundwater (permanent or episodic)	If water enters the excavation from the surrounding soil the depth to which it comes should be recorded. Grey greyed or heavily mottled subsoils can also provide an estimate of permanent and episodic groundwater levels. Groundwater maps and bore logs, available from the NSW Office of Water website, can be included with the Pro-forma to support the application.	*Australian Soil and Land Survey Field Handbook (CSIRO, 2009)* and *AS1547:2000*
Soil Texture	The Pro-forma provides a table to record the texture of each layer of soil. The installer / site and soil assessor determines this by manipulating a small amount of moist soil (a bolus) between her/his fingers which an indication of the texture (relative amounts of sand, silt, loam and clay) of the soil sample. The technique for this procedure is described in McDonald *et al* (1990).	
Coarse Fragments	The size and percentage of course fragments (stones and segregations) in each soil layer should be recorded.	
Rocks and Rock Outcrops	The nature and amount of rock (particularly bedrock – both general size and percent coverage of site) protruding from the ground that is observed over the site should be recorded in the report.	
Presence of Fill	Any imported fill material should be identified and described. The fill maybe clean soil from nearby excavation or fill containing construction rubble or of a material that is poorly suited to land application. Fill should be described consistently with the natural soil profile.	

Site or Soil Feature	Explanation	Additional Resources
Soil Structure	Soil structure is the distinctness, size, and shape of the peds. A ped is a natural soil aggregate consisting of a cluster of primary particles and separated from adjoining peds by surfaces of weakness (Brewer, 1960). Soil structure should be described from a fresh vertical exposure (it cannot be taken from an augured hole). Further information on pedality may be found in McDonald et al (1990). At the very least, the degree (for example strong, moderate, or weak) of pedality of each layer, and the shape of the peds, should be shown in a report.	
pH	The pH of 1:5 soil/water suspensions is measured using a hand held pH/EC meter. Alternatively, samples may be sent to a laboratory for the test to be performed. The assessor should test the pH trend down through the profile, for example acid, neutral, or alkaline. Acid soils (pH < 5) or alkaline soils (pH > 8) may provide an unsuitable environment for plant growth, and the assessor may recommend the use of ameliorants (MAV, 2006).	
EC	The electrical conductivity of the saturated extract (ECE) is calculated by first measuring the electrical conductivity of 1:5 soils in water suspensions and using appropriate multiplier factors to convert EC (1:5) to ECE. This figure infers the salinity of the soil and its potential impact on plant growth. Assessors can measure it in the field with a hand-held meter or in the laboratory (MAV, 2006).	
Emerson Aggregate Class	The Emerson Aggregate Test is used to assess soil dispersability and susceptibility to erosion and structural degradation. It provides a simple, field based assessment of aggregate stability and dispersability.	Refer to *ASNZS1547:2000*, *AS1289.3.8.1* and Hazelton and Murphy (2007)
Cation Exchange Capacity (Cations)	CEC is the capacity of the soil to hold and exchange cations. It is a major controlling agent of stability of soil structure, nutrient availability for plant growth, soil pH and other factors. A low CEC means the soil has a low resistance to changes in soil chemistry that are caused by land use (Hazelton and Murphy, 2007). The levels and relative proportions/ratios of the key cations (calcium, magnesium, potassium and sodium) can also provide useful information on the capacity of a soil to accept wastewater and potential amelioration measures.	
Exchangeable Sodium Percentage (ESP)	The proportion of sodium on the cation exchange sites reported as a percentage of exchangeable cations. Levels above 6% may cause soil structural problems and reduced permeability. ESP should be considered in conjunction with Emerson Aggregate Class and cation levels to determine the best management approach.	Hazelton and Murphy (2007)
Phosphorus sorption	Used to calculate the immobilisation of phosphorus by the soil. Sandy soils are mostly low in P sorption and need not be tested. Clay soils and soils high in iron and/or aluminium often have high P-sorption. The most useful information is obtained from a multi-point test.	

6.2 Wastewater Generation Allowances

For the purposes of estimating hydraulic load Table 6-2 provides basic wastewater allowances for key site activities. Further published wastewater generation rates are available in the following references.

- *ASNZS 1547:2000*:
- *NSW Health Septic Tank and Collection Well Accreditation Guideline (2001)*:
- Crites and Tchobanoglous *(1998) Small and Decentralised Wastewater treatment Systems*:
- *USEPA (2002) On-site Wastewater Treatment Manual*.

Site specific design wastewater flows and loads are highly variable and all published values should be considered estimates. Conservatism should be applied when site specific data is not available to support designs.

Table 6-2 Summary of Key Wastewater Generation Allowances

Effluent Source	Wastewater Allowances (litres/person/day)	
	Reticulated Supply Bore Supply River/Creek Supply	Roof Supply
Residential	180	**140**
Motel (resident/guest)	180	**140**
Industrial (with shower)	43	**-**
Industrial (without shower)	27	**-**
Restaurants	28	**-**
Refer to AS1547: 2000 (Appendix 4.2D) and Septic Tank and Accreditation Guideline, December 2001 for further typical flow design allowances. Refer to Crites and Tchobanoglous (1998) for further guidance on non-domestic flow and load allowances.		

- **Reduction** in water allowances based on the installation of water reducing fixtures will generally **not** be considered.
- **Increase** in allowances will be considered where spa baths and other high water use fixtures are proposed.
- Where possible (for existing development on a reticulated supply) **actual water usage data** should be used for calculations. Make allowances for water use not directed to the sewage management facility (eg. Garden use, car washing). Recent water use metering projects have typically identified external water consumption to constitute 25-30% of total water consumption.
- For development using a roof water supply consider the installation of a **water meter**.
- When calculating total hydraulic load - **equivalent population (EP)** is obtained by multiplying the number of bedrooms in the dwelling by a factor of 1.6. **Total hydraulic load** (daily) is calculated by multiplying the equivalent persons (residential) by the nominated daily water allowance figure OR multiplying the number of actual staff/employees (commercial/industrial) by the nominated daily water allowance figure.
- With commercial or industrial developments factor into the calculations **shift work and/or weekend work**. The DAF sets out requirements for more comprehensive design wastewater flow and load estimation for Very High Hazard and non-domestic sites.
- Facilities generating non-standard pollutant loads will also require special consideration.

6.3 Minimum Standards: Treatment Systems

In order to achieve regulatory performance objectives it is critical that the choice of the treatment system be matched to the environmental and topographical constraints of the property, the method of land application (if applicable), the future requirements of the property and the possible "re-use" requirements of the applicant. System selection should consider capital costs, operational and maintenance costs as well as system reliability and replacement component availability and costs (in essence, the life cycle costs). The constructability assessment process included in the DAF includes consideration by applicants of the capital and operating costs and obligations associated with a selected treatment system. Council needs to be satisfied that the selected treatment technology is an affordable and appropriate option for the proposed development that is unlikely to be subject to operational failure in the long-term.

In most cases, the effluent quality required to be produced for a site will be determined by the capability of a site to assimilate sewage and the sensitivity of the receiving environment. Constrained sites typically require higher levels of control over the dosing and distribution of wastewater and a cleaner effluent. Less constrained sites can typically be serviced by simpler systems producing a relatively lower quality effluent. Council (through this DAF) advocate selection of treatment systems on a 'fit for purpose' basis. Unless a site owner has a specific preference and motivation for operating their wastewater management system, a treatment system should only be as complex as it needs to be to allow safe and sustainable land application.

6.3.1 Effluent Quality

For the purpose of this document treatment systems will be defined in terms of minimum effluent quality standards. Table 6-3 includes minimum effluent quality standards and typical system types able to meet the specific standard. Many types of treatment systems are available commercially that are able to meet either secondary or advanced secondary effluent quality standards.

Table 6-3 Minimum Effluent Quality Standards

Treatment Standard	Minimum Effluent Quality (90% Percentile)		System Types Able to Meet Standard
Primary	None provided		• Septic Tank
Secondary	Biochemical Oxygen Demand (BOD)	20mg/L	• Standard Aerated Wastewater Treatment System (AWTS) [a.] • Some Wet Composting Systems [b.]
	Total Suspended Solids (TSS)	30mg/L	
	Thermotolerant Coliforms	30cfu/100mL	
Advanced Secondary	Biochemical Oxygen Demand (BOD)	10mg/L	• Aerobic Sand (media) Filter (recirculating or single pass) [c.] • Some Biofilters [d.] • Some Mechanical Treatment Systems [d.] • Textile Filters
	Total Suspended Solids (TSS)	10mg/L	
	Thermotolerant Coliforms	10cfu/100mL	
	Nutrients - Nitrogen (Total) Phosphorus (Total)	Council may require specific nutrient levels be achieved dependent on individual environmental conditions.	

NOTES

a. A standard AWTS will be considered a secondary treatment system unless the manufacturer/installer can produce effluent quality data that demonstrates the system can consistently achieve a higher level of treatment. The monitoring data will only be accepted by Council if it includes influent and effluent results, sampling and analysis is performed be a NATA accredited laboratory (or equivalent) and is representative of an extended monitoring period.

b. Wet composting treatment systems may be accepted as secondary treatment systems if the manufacturer/installer can produce effluent quality data that demonstrates the system can consistently achieve the required level of treatment. The data will only be accepted by Council if it includes influent and effluent results, sampling and analysis is performed be a NATA accredited laboratory (or equivalent) and is representative of an extended monitoring period. The installation of a suitable disinfection system will be required if surface or sub-surface land application is proposed.

c. Aerobic sand (media) filters must meet appropriate design standards acceptable to Council. The installation of a suitable disinfection system will be required if surface or sub-surface land application is proposed.

d. Biofilters and mechanical treatment systems may be accepted as secondary or advanced treatment systems if the manufacturer/installer can produce effluent quality data that demonstrates the system can consistently achieve the required level of treatment. The data will only be accepted by Council if it includes influent and effluent results, sampling and analysis is performed be a NATA accredited laboratory (or equivalent) and is representative of an extended monitoring period. The installation of a suitable disinfection system may be required if surface or sub-surface land application is proposed.

6.3.2 System Accreditation

It is a requirement that all domestic treatment and storage systems (less than 2,000 L/day) hold accreditation with NSW Health or other appropriate accreditation body. Additionally, domestic treatment and storage tanks are to be constructed in accordance with the relevant parts of Australian Standard AS1546. Domestic on-site sewage treatment systems can be designed and constructed on a site specific basis without accreditation (subject to Council approval) for an individual house.

All non-domestic systems and domestic systems greater than 2000 L/day do not require NSW Health accreditation. It is important to note that the accreditation issued for domestic on-site sewage management devices is restricted in this way. The use of multiple NSW Health accredited domestic treatment units to manage non-domestic and >2000 L/day facilities will not remove the need for a site specific process design (see Section 2.5) and engineering assessment.

6.3.3 Tanks and Other Vessels

6.3.3.1 Construction

All tanks (regardless of material) and other wastewater management vessels must be constructed to ensure they can meet the performance objectives of ASNZS1546.1: 2008. They must be;

- effectively designed;
- structurally sound and capable of meeting load tests;
- watertight (as defined in the Standard);

- fitted with appropriate, watertight fittings and access openings for maintenance; and
- suitable for holding corrosive material.

Tanks and vessels used in domestic on-site sewage management systems (<2,000 L/day) must be accredited by NSW Health with the exception of site specific designs. In these cases, tanks and vessels will still need to meet the performance objectives of *ASNZS1546.1:2008* (the Standard). This may require certification by the supplier / builder of the vessel. Refer to Clause 1.2.2 of the Standard.

Tanks and vessels used in non-domestic wastewater management systems do not require NSW Health accreditation. However, they too must meet the performance objectives of *ASNZS1546.1:2008* as a minimum. All pre-cast vessels will need to be accompanied by certification from the supplier that the vessel meets these objectives. Vessels that are constructed in-situ will require certification from a structural engineer.

There may be some circumstances when a wastewater management vessel will be required to exceed the performance objectives of *ASNZS1546.1:2008* (e.g. with respect to watertightness or load bearing strength).

6.3.3.2 Installation

- Tanks and vessels should generally be installed to good construction practice in accordance with the Standard. This includes excavation, bedding, compaction and backfilling procedures.
- All Sewage Management Facilities must be installed such that the top of the lid of the facility is located a minimum of 150mm above surrounding finished ground surface. This may be an access riser where a watertight seal is established between the tank lid and riser.
- Consideration must be given to hydrostatic uplift potential for tanks installed in ground subject to permanent or periodic high groundwater. Anchoring may be required, particularly where a pump well or holding tank is concerned (i.e. a tank that remains effectively empty for extended periods.
- Septic tanks do not require venting at the tank. House vents installed in accordance with *ASNZS3500* will be sufficient.

6.3.4 Septic Tank and Pump Well Sizing

Septic tanks have traditionally been undersized in NSW, largely as a result of adoption of short desludging frequencies. Research conducted over the last 20 years has confirmed that larger septic tanks, being desludged less frequently result in significant improvements in overall system performance. Desludging tanks too frequently prevents the establishment of good anaerobic digestion of sludge and scum, which reduces effluent quality and increases sludge build-up. The following table presents Council's *Minimum Standards* for septic tank and pump well capacities. They are based on a minimum desludging frequency of five years. Council encourage the use of even larger septic tanks, based on 8-12 year desludging frequencies.

Table 6-4 Minimum Septic Tank Capacities for Residential Systems

Number Bedrooms	Septic Tank Capacity [1,2] (Litres)
3	**3000**
4	**3500**
5	**4500**
6	**6000**

1. Assumes reticulated water supply and 1.6 persons per bedroom occupancy
2. Volumes represent operational volumes (i.e. to outlet invert)

Pump wells may be required to receive septic tank effluent for pumped or siphon dosing of a land application system or additional treatment component. Pump wells must meet the following minimum standards.

- A minimum of 24 hours of emergency storage shall be provided above the high level alarm. This storage can be reduced to 12 hours where a duty and standby pump are installed.
- Pump wells must be fitted with an audio/visual high level alarm float switch or sensor to notify the owner of an operational problem. High risk applications may require provision of remote monitoring (e.g. telemetry) that enables service contractors (and potentially Council) to be notified or high levels (as a minimum).
- Where pump operation is controlled by a timer, a low level pump-off and high level pump-on float switch or sensor shall be installed to override the timer. A high level alarm is still required.

6.3.5 Plumbing, Drainage and Electrical Work

All plumbing and drainage work associated with on-site sewage management systems must be completed in accordance with the National Construction Code (NCC) which incorporates the Plumbing Code of Australia (PCA 2011). The NSW Government is in the process of adopting the NCC and PCA in replacement of the NSW Plumbing and Drainage Code as of 2011. In effect, sanitary plumbing and drainage work must be undertaken in accordance with *ASNZS3500.2* by a licenced plumber and drainlayer both prior to and following adoption of the PCA / NCC.

All electrical work must be conducted by a licenced electrician in accordance with relevant standards such as *ASNZS 3000.2007*. Within on-site wastewater work, a restricted electrical licence may be sufficient for some jobs.

6.3.6 Flood Prone Land

All treatment systems shall be installed to protect electrical components and minimise the discharge of effluent directly into flood waters. Any unsealed electrical connections/components shall be located at a height at or above the habitable floor level (HFL) relevant to the property subject of the Notice of Determination. Where possible the top of the lid of the facility is to be located at or above the 1% Annual Exceedence Probability elevation (Council's Flood Prone Land level). In some cases this is not feasible due to construction of the building on piles. In these cases, the main lid to the facility shall be sealed with a durable, waterproof sealant. Access lids/openings that require periodic removal for inspection and maintenance shall be sealed with silicate sealant or similar.

All Sewage Management Facilities must be installed such that the top of the lid of the facility is located a minimum of 150mm above surrounding finished ground surface regardless of whether the property is subject to inundation by surface water (flooding) or not,

6.3.7 Standard Installation Conditions

Standard installation conditions apply to all treatment systems regardless of the system type. It is important that all the conditions within the Notice of Determination are complied with to ensure its continued safe and correct operation. A copy of the standard installation conditions can be obtained from Council. Additional system and/or site specific conditions may be included with each Notice of Determination at the discretion of the Council Officer.

6.3.8 Dual Occupancy Development

It is the preference of Council that multi residential developments whether attached or detached (I.e. dual occupancy) on single allotments be each serviced by **individual** sewage management systems of a type, size and design appropriate to the proposed development, hydraulic load, influent quality and effluent quality requirements. Council will consider the connection of multiple dwellings/buildings to a single system of sewage management where it can be demonstrated by the applicant that the total hydraulic load is significantly lower than the rated capacity of the system or where the proposed dual occupancy is a time limited consent. The connection of multiple treatment systems to a common land application area will be considered by Council where it can be demonstrated by the applicant that the area is capable of accepting the combined hydraulic and nutrient loads and the environmental and health related impacts are acceptable.

Where multiple buildings are connected to a single system, only one approval to operate will be issued. As a result, a single party must be willing to be nominated as the operator.

6.3.9 Effluent Pump-out

Section 1.5 of this DAF sets out the circumstances where effluent pump-out systems will be considered and potentially permitted. Where pump-out systems are permitted, the following Minimum Standards apply.

- The system should consist of a septic tank with gravity drainage to a collection well. A draw-off line and standpipe for tanker connection will be required. The following minimum capacities apply for effluent pump out systems, calculated based on NSW Health *Septic Tank and Collection Well Accreditation Guidelines*. Non-residential systems should be calculated in accordance with these guidelines.

Table 6-5 Minimum Septic Tank and Collection Tank Capacities for Pump-out Systems

Number Bedrooms	Septic Tank Capacity [1] (Litres)	Collection Well Capacity [1] (Litres)
3	3000	**6000**
4	3500	**7500**
5	4500	**10000**
6	6000	**12500**

1. **Assumes reticulated water supply**

- ***Alarm Systems*** - All collection wells shall have high water level alarms installed into the collection well(s) and must incorporate both audible (buzzer) and visual (strobe) alarm components.
  - A muting facility for the audible alarm is to be designed into the alarm system. The muting facility shall reset to audible after 24hours.
  - The alarm panel shall be located in a visible position within the dwelling/building or other location approved by Council. The location of alarm panels within electrical meter boxes or other confined space is not permitted.
  - The float switch shall be set at a level such that on activation two (2) days storage remains within the collection well.
  - On commercial or industrial sites the provision of an information sign may be required that provides contact names and telephone numbers should the alarm be observed to be activated.
  - For commercial/industrial systems high water level alarms utilising telemetry technology (back to base monitoring) may be conditional.
- ***Standpipe, Draw-off Lines and Fittings*** – Draw-off lines shall be constructed of Class 9 PVC pipe that conforms to the relevant Australian Standard. The diameter of the draw-off line shall be a minimum of 80mm for collection wells with a capacity of up to 10,000 litres. For collection well capacities greater than 10,000 litres the draw-off line shall be 100mm in diameter. The draw-off line must be buried below ground to protect the pipework from UV and physical damage.
  - Standpipes are to be constructed of a suitable material resistant to damage by ultra-violet rays and the weather in general. Suitable materials may include corrosion resistant metals or stabilized PVC. The standpipe is to be securely supported by a suitable fixing method.
  - The provision of a suitable connector for tanker connection is to be fitted to the end of the standpipe and must include an end-cap. A suitable fitting may include a screw on adapter or camlock.
  - A shut-off or stop valve shall be fitted where the height of the standpipe outlet is physically lower than the lid of the collection well.
  - The standpipe shall be located in a position that permits the safe parking of the effluent removal tanker. The standpipe shall not to be located outside the property boundary.

6.3.10 Pump to Sewer Systems

The volume capacities of the septic tank and effluent collection well shall be calculated based on the NSW Health Department Septic Tank and Collection Well Accreditation Guideline, December 2001 and Hunter Water Corporation requirements. Table 6-6 below provides minimum septic tank and collection well tank capacities for residential dwellings for Pump to Sewer.

Table 6-6 Minimum Septic Tank and Collection Tank Capacities for Pump to Sewer Systems

Number Bedrooms	Septic Tank Capacity [1] (Litres)	Collection Well Capacity [1,2] (Litres)
3	3000	**2700**
4	3500	**3500**
5	4500	**4300**
6	6000	**5400**

1. **Assumes reticulated water supply**
2. **Assumes single pump system and 3 days storage**

The installation of a pump to sewer system shall be in accordance with Hunter Water Corporations Technical Specifications for Pressure Sewer Systems (available from **Hunter Water Corporation**). A summary of the main hardware components is listed in Table 6-7.

Table 6-7 Summary of Typical Hardware Requirements for a Pump to Sewer System

Hardware Requirement
• **Pump type to be open vane or positive displacement**
• **Pump Head (max) above total system resistance no greater than 20metres**
• **Pump Flow rate (max) to be <20Litres/minute**
• **Pump to be fitted with pressure relief valve or equivalent**
• **Metallic or PVC suction pipe installed 100mm from bottom of tank**
• **Non-return valve + Stop valve (isolating valve) + Union to be installed on outlet of pump**
• **Approved isolating valve + non-return valve installed into rising main at property boundary**
• **High water level alarm (refer Appendix A)**
• **Time control device in accordance with HWC requirements**

6.4 Minimum Standards: Land Application Systems (General)

The DAF provides direction on the information and calculations required to demonstrate that an applicant has selected, designed and sized a land application system to a level of detail appropriate for the site. Council's *On-site Sewage Management Technical Manual* also provides guidance on minimum standards for selection, design and sizing of land application systems. Where an applicant is seeking approval for an individual on-site system on a Low or Medium Hazard lot, use of Council's Acceptable Solution tables effectively eliminates the need to undertake detailed design calculations. This section of the DAF sets out critical Minimum Standards that apply to all land application system types.

6.4.1 Effluent Quality Requirements for Land Application

6.4.1.1 Domestic Systems (< 2,000 L/day)

Council advocate a risk based approach to determining suitable effluent quality for specific land application methods. Table 6-8 is generally consistent with **NSW Health Advisory Note 4 (May 2006),** with one critical difference. Council will consider the subsurface irrigation of secondary effluent without active disinfection where a health risk assessment demonstrates acceptable risks. This deviation seeks to establish consistency between effluent land application and reuse.

Table 6-8 Minimum Effluent Quality Requirements for Land Application and Reuse

Land Application System	Primary	Secondary (no disinfection)	Secondary (disinfection)	Advanced Secondary (disinfection)
Absorption and Evapo-transpiration Trenches and Beds	Yes	Yes	Yes	Yes
Mounds / Raised Systems	Yes	Yes	Yes	Yes
Subsurface Irrigation	No	With justfication[1]	Yes	Yes
Surface Irrigation	No	No	Yes	Yes
Residential Reuse	No	No	No	Yes

Note 1: Subsurface irrigation of secondary treated effluent without active disinfection will be considered where a health risk assessment is completed in accordance with the Australian Guidelines for Water Recycling: Managing Health and Environmental Risk (Phase 1) that demonstrates risk management is commensurate with standards imposed on equivalent water recycling schemes.

6.4.1.2 Non-Domestic Systems

NSW Health Advisory Note 4 (May 2006) is not applicable to any system greater than 2,000 L/day in flow or of a non-domestic nature. Selection of both a treatment and effluent management or reuse option that is appropriate for a site will be a critical part of system selection processes for non-domestic systems. Refer to Section 3.1.2 and 3.2.2 for more detail. Importantly, Council will typically support land application by pressure compensating subsurface irrigation of secondary effluent with or without active disinfection.

6.4.2 Matters for Consideration: Selection and Design of Land Application Systems

This DAF sets out Minimum Standards for the selection and design of wastewater systems that increases the level of detail based on potential risk. Designers will need to balance the following factors in selecting a suitable land application system and effluent quality.

- Site and soil constraints and the limitations they place on the assimilation of effluent.
- Climate, exposure and vegetation growth potential.
- Setback distances to sensitive receptors (Table 6-9).
- Opportunities to minimise energy usage demands (pumping requirements).
- *Prior and future land use*: determine any prior land use activities that may impact on design and operation of subsurface system. Consider future land use to ensure structures are not built over or other activities do not impact on the land application system.
- Owner preferences for the location of buildings and services.

Further guidance on system selection and design is provided in the *On-site Sewage Technical Manual* and *ASNZS1547:2000*. In particular Section 4.2B1 of *ASNZS1547:2000* provides guidance on land application measures that will assist with managing constraints. When a property subject of the application contains significant environmental or topographical constraints, suitable measures must be designed into the system (either treatment, land application or both) to mitigate the constraints environmental or health related impact. Mitigation options should be tested through design calculations and modelling (as per this DAF) to demonstrate that they overcome identified constraints.

Significant research from Australia and worldwide has been conducted into the factors that influence the performance of on-site sewage land application systems. A number of consistent recommendations have evolved out of this research relating to effective design of land application systems.

Intermittent dosing / **resting** allows time for aerobic breakdown of the biomat or biofilms that form on soil surfaces. It also encourages breakdown of nutrients and other pollutants. During wet, cool conditions it minimises opportunities for saturated soil conditions.

Division of land application areas into sub-zones goes hand in hand with intermittent dosing and provides additional redundancy into a design in the event of minor component failure.

Provision of more than 600mm of unsaturated soil between the point of application and limiting layers (e.g. bedrock or weathered rock) or groundwater has been shown in a range of soils to deliver a high level of effluent polishing and disinfection. In some cases this may require the use of raised irrigation beds.

Even effluent distribution using pressure dosing (e.g. pressure compensating drip irrigation or LPED) maximises the active surface area of a land application system and minimises the potential for localised failure due to variable levels.

These four principles can be used to overcome the majority of site constraints and when coupled with rigorous sizing procedures (e.g. water balance) and careful construction, can offer a very high level of performance.

Regardless of system type, all land application systems must be installed parallel with the contour of the land.

It should be noted that while this DAF does not preclude the use of gravity dosed trenches and beds, there are only limited sites within the Port Stephens LGA where they will be suitable. Effective gravity dosing of trenches and beds can be challenging and requires careful excavation and survey procedures during construction. Historically, the accepted design life of gravity dosed trenches and beds (5-10 years) was actually a product of undersizing and poor construction practice (in addition to other factors).

With the advent of pressure compensating subsurface irrigation, it is often cheaper and more effective to install a secondary treatment system with drip irrigation rather than construct a robust evapo-transpiration bed. Intermittently pressure dosed trenches and beds receiving secondary treated effluent are more likely to be considered, particularly for sites where space is constricted.

6.4.3 Wet Weather Storage

In most cases the use of wet weather storage facilities will not be approved for domestic or residential applications. It is preferable that wet weather storage be designed into the physical size of the land application area or that wet weather be managed through conservative loading rates rather than the installation of storage tanks. The incorporation of wet weather storage facilities (tanks) as a method of handling excess effluent during periods of rainfall will only be approved in specific circumstances and subject to careful design of monitoring and control systems. Wet weather storage will be considered for non-domestic systems or reuse facilities.

6.4.4 Retaining Walls

Due to the potential for soils within land application areas to become unstable, retaining walls greater than 600mm in height shall be designed by an appropriately qualified and experienced engineer. Construction of the retaining walls shall be performed by appropriately experienced persons in accordance with the engineered plans with the final works to be engineer certified with a copy of the certification provided to Council.

6.4.5 Soil Improvement Works

Where recommended as an outcome of a site and soil assessment, it may be conditioned in the consent that soil improvement works are to be undertaken. Soil improvement works will be required where the surface or soil within the land application area is considered unsuitable for plant growth or effluent assimilation in its present state. It may also be recommended as a preventative measure (e.g. application of gypsum to maintain a lower Exchangeable Sodium Percentage). Barriers to the efficient, appropriate and long term disposal of effluent can include:

- Soil pH (plant growth and pollutant assimilation):
- Soil salinity (measured as electrical conductivity):

- Sodicity (measured as exchangeable sodium percentage):
- Dispersiveness (Emerson aggregate test)
- Cation exchange capacity (CEC): and/or
- Heavily compacted soils.

Site and soil reports prepared by Wastewater consultants will generally contain recommended soil improvement works if soil problems are identified. Council staff that identify soil problems as part of the site inspection and assessment process may also require remediation works be undertaken. It is important that the soil remediation works are carefully designed and correctly performed. Soil improvement works may include one or a combination of the following:

- The addition of gypsum (quantities must be calculated by a suitably qualified person):
- The addition of lime (quantities must be calculated by a suitably qualified person):
- The addition of organic matter (improvement of poor natural soils with composted materials):
- The importation of fill material (soil types must be suitable for land application and this activity may be subject to a development application under the *Environmental Planning and Assessment Act*):
- The importation of amended soil (higher phosphorus sorption capacity):
- The removal of rock ("floaters" and loose boulders):
- The ploughing of the soil within the land application area (typically to a depth of 200mm): and
- The laying of turf, application of seed or planting of suitable vegetation species.

The importation of fill will require specification of a suitable soil type and careful design to prevent failure at the fill / natural soil interface. Refer to the *Standard Designs for Tilligerry Creek* report for more details.

6.4.6 Diversion Drains

A diversion drain will typically be required on all land application area types where there is potential for stormwater to enter the area. Diversion drains, also known as spoon drains, dish drains or "V" drains are essential in keeping the land application area as dry as possible. If there is potential for stormwater to enter the land application area then a diversion drain will be required. The diversion drain shall be constructed in such a way that it protects the entire land application area without directing the stormwater onto neighbouring properties. On highly sloping properties, cut-off drains may be required (refer diagram in AS1547 or similar).

6.4.7 Earth Bunds

Where a surface irrigation land application area is located in close proximity [and upslope] from a property boundary or sensitive receiving environment an earth bund must be constructed. Design and construction of the earth bund shall consider the following principles:

- Be located downslope of the irrigation area to prevent contaminated runoff leaving the land application area:

- Be sufficiently distanced from the lowest spray heads such that effluent is fully contained:
- Be constructed from heavy earth (Clay Loam) not susceptible to erosion or leaching:
- Be compacted to a minimum height of 300mm:
- Be stabilised with turf or other suitable material to reduce the susceptibility for erosion:
- Be designed to restrict the transportation of effluent outside the bounds of the land application area: and
- Be constructed to permit ease of maintenance with consideration given to extending the length of the batters.

As an alternative to earth bunds, raised garden beds (300mm minimum height) may be constructed. The installation of shrubs and trees at natural ground level will not be considered an alternative to an earth bund.

6.5 Minimum Standards: Subsurface Irrigation

Subsurface irrigation or drip technology involves the installation of a matrix of small diameter pressure compensating dripline within the land application area that emit effluent through specially designed emitters at very low flow rates (typically less than 3 L/hr from each emitter). It is important that the pipework is buried within the root zone of the vegetation, whether grass or shrubs, typically 150 – 200mm below ground surface. Lateral (horizontal) spacings for the pipework is typically between 600mm and 1000mm (maximum spacing permitted) depending on soil type. It is critical that the lateral (horizontal) spacings be matched to the soil type to prevent “zebra” striping, a sign of inefficient effluent distribution.

Only commercially available pressure compensating subsurface irrigation pipework specifically designed for the dispersal of treated wastewater is to be installed. Pressure compensation is critical to effective land application as it ensures even distribution of effluent over variable topography. Effluent dripline either comes with in-built root inhibitor and bacteriocide or requires dosing through an erosional filter system. Pressure compensating subsurface drip irrigation requires secondary quality effluent as a minimum to prevent blockage (without automated self backflushing filtration). Advanced secondary effluent is preferred for a long operational life. The disposal of septic tank effluent using this disposal method is not permitted.

It is important that an appropriately qualified and experienced person or company be consulted for the design work such that the design and size of the disposal area can be properly matched to the hydraulic loading, nutrient loading, soil type, climatic and topographical conditions of the property. An under sized or poorly designed system will lead to failure with potential environmental and health related impacts. Alternatively, an over sized or over designed system could lead to the poor distribution of effluent, un-necessary cost burden and the un-necessary sterilization of land.

Drip technology is a well established industry and as such companies producing subsurface products have written excellent design and installation guidelines. Manufacturer’s specifications, standard drawings and design guidelines should be used to support applications. Care must still be taken to ensure the disposal area design considers both the manufacturers recommended design guidelines as well as the specific site, soil and climatic conditions of the property in question.

A critical element of the design process is hydraulic design including selection of appropriate dripline, dosing and flush manifold pipe, lateral and emitter spacings and pump performance. Dripline typically needs an operating pressure at the emitter of 10-40 m to maintain pressure compensation. As such, higher head, low flow pumps are required to service drip irrigation systems that differ from pumps traditionally used in on-site sewage management. For smaller systems, standard sizing tables and charts from dripline manufacturers will typically suffice for hydraulic design. Larger systems will require a full hydraulic analysis to be undertaken where Total Dynamic Head (TDH) for the proposed system is determined. From this point a suitable pump, capable of delivering the end of line pressure (10-40 m) can be selected. Checks should also be completed to ensure the pump is capable of delivering flushing flows during open valve conditions.

An in-line disc filter should be installed for final effluent filtration prior irrigation. Vacuum breakers and flush valves will be required for each sub-zone. Laterals should still be installed parallel with land contours despite the pressure compensating emitters. Valve access boxes should be installed at all corners of the field.

6.6 Minimum Standards: Surface Irrigation

Surface irrigation involves the use of spray heads or surface drippers to apply secondary treated and disinfected effluent directly to the surface of garden beds or lawn. Surface irrigation was historically the dominant approved method of land application for Aerated Wastewater Treatment Systems (AWTS). Whilst being lower cost to install, surface irrigation has typically been done poorly with respect to on-site sewage management and is prone to operational, health and environmental failure. Surface irrigation on single residential lots is not considered good practice worldwide and Council supports this assertion based on many years of experience auditing existing systems. There are however, specific circumstances where Council will consider or allow surface irrigation, subject to the following Minimum Standards.

6.6.1 New Development

New developments will generally not be permitted to install surface irrigation land application areas. Only sub-surface or sub-soil methods of disposal will be permitted except where circumstances exist that requires the use of an alternative approach to either a subsurface or sub soil technique. The approval of surface irrigation in this instance remains at the discretion of Council. Surface irrigation may be considered more seriously for larger commercial developments or for genuine reuse projects.

6.6.2 Existing Surface Irrigation Systems

The continued use of surface irrigation on properties operating systems approved prior to the adoption of this document will be permitted where it can be shown through inspections by Council staff that the continued operation poses minimal environmental and/or health related impacts. Where environmental and/or health related impacts are determined through Council inspections the continued approval of surface irrigation may be withdrawn. In this instance an alternative method of land application will be required OR if insufficient useable land exists the conversion to an effluent pump-out system may be enforced.

Many surface spray irrigation systems installed prior to 1998 are unable to comply with current guidelines including prescribed buffer distances due to the small size of the property. In these situations it is necessary for the property owner to **maximize the distribution of treated effluent** around the property in such a manner that has minimal environmental and health related impacts. Council may permit the installation of a semi-fixed surface irrigation design on a property operating an approved disinfecting secondary treatment system with surface irrigation subject to the following criteria:

- Garden hose (green or any colour other than lilac) and black irrigation pipe is not permitted to be used above ground.
- Consider the use of pressure compensating drippers in garden beds (professional hydraulic design is essential to prevent damage to the irrigation pump).
- Above ground hose must be lilac in colour, 19 – 25mm in diameter, flexible and have an appropriate warning indelibly printed along the length of the hose.
- The length of the above ground hose shall be limited such that any attached spray heads are unable to be located where the effluent can potentially impact on the environment or public health.
- Multiple spray heads of an approved type must be operational during any pump cycle.
- The continued use of "spray bars" will be considered.
- Consider the installation of multiple in-ground "turf" valves (with lilac coloured lids) located at strategic positions around the property to which short lengths of lilac hose and sprayers can be connected.

6.6.3 Spray Heads (Standard Type)

Only spray heads complying with AS1547:2000 will be approved for use. Spray heads must be capable of controlling the droplet size, throw and plume height such that the potential for production of aerosols (and subsequent wind drift) is reduced. Typical spray heads approved for use includes rotary types (rotor rain mini sprinklers or equivalent), wobblers and low pressure pop-ups.

6.6.4 Spray Heads (Impulse/Pulsating Pop-Ups)

The use of large capacity high pressure pop-ups (eg ELGO 2688) may be approved subject to compliance with:

- Increased buffer distances from residential buildings and boundaries (refer Fact Sheet #2).
- The throw distance must not exceed a radius of 5metres.
- Installation of a minimum number of spray heads is required to ensure an appropriate "wetted" coverage.
- Each pop-up shall be fitted with an anti-siphon valve or equivalent device.
- Irrigation pump shall have the required capacity to effectively operate the spray heads.

6.7 Minimum Standard: Sub-soil Trenches and Beds

This method ensures that effluent is disposed a minimum 300mm below finished ground level and includes evapo-transpiration areas, absorption trenches/beds and Low Pressure Effluent Drains (LPED). As previously discussed the use of this method with primary treated effluent is restricted under the DAF and Acceptable Solutions. An example where a primary effluent system may be appropriate is a high dune location with a low population density and no other environmental constraints. Secondary dosed trenches and beds will be considered more readily and may offer opportunities on sites with limited available area.

The design and construction of evapo-transpiration areas and absorption trenches/beds should generally be conducted in accordance with Part 4.2 and 4.5 of *ASNZS1547:2000*. Guidance on the design and construction of LPED (pressure dosed) beds can be obtained from Council's *Standard On-site Sewage Management System Designs for Tilligerry Creek* (2005). It is Council's preference that absorption trenches/beds be designed to incorporate a pressure dosing system. The use of sub soil trench and bed designs incorporating gravity distribution methods are severely restricted under the Acceptable Solution tables. Regardless of dosing method, the base of trenches and beds must be level and as such regular spot levels must be taken during construction. Extreme care is essential when installing any gravity flow splitter devices as incorrect levels can impede long-term operation. Gravity splitter devices are also prone to subsidence / movement after construction.

Trenches and beds should be divided into a sufficient number of zones that no individual trench or bed exceeds 30 metres in length. A reserve area is required for trenches and beds receiving primary effluent. Recent research from the USA has shown that the application of secondary quality effluent to trenches and beds does not result in significant biofilm build-up and as such, a reserve area is not necessary.

6.8 Minimum Standards: Mounds / Raised Beds

There are two common environments in Port Stephens where the use of raised systems can overcome constraints and ensure effective assimilation of effluent.

- Estuarine and floodplain landscapes where episodic or permanent groundwater is in close proximity (<1m) to the surface and/or the site is under the 5% AEP flood elevation.
- Colluvial and erosional landscapes where a limiting layer (hardpan, bedrock or weathered material) is in close proximity to the surface.

Raised systems (of any kind) require a higher level of engineering and construction detail that invariably comes at a higher cost. Poor or inadequate design and construction practices can lead to failure, commonly in the following manner.

- Breakout of effluent from the toe of the raised bed due to;
  - poor preparation of the existing soil surface;
  - use of poor quality media;
  - lack of care in laying fill material / setting levels; and/or

- underestimating the linear loading rate or basal loading rate.

- Blockage / failure of the pressure dosing manifold (particularly primary dosed systems) due to;
  - poor hydraulic design and subsequent adoption of an inadequate pump, incorrect orifice size / spacing and failure to achieve scouring velocities;
  - insufficient or infrequent flushing / cleaning of sludge from the laterals;
  - treatment failure at the tanks due to lack of maintenance / shock hydraulic and chemical loads etc; and/or
  - poor construction practice (e.g. inconsistent orifice diameters and levels, failure to clear construction debris from manifolds etc).

Detailed advice on the design and construction of raised systems can be obtained from Council's *On-site Sewage Management System Designs for Tilligerry Creek* (2005) although it must be noted that the standard sizing / dimensions in this document are applicable to a limited range of dwelling scenarios in typical Tilligerry Creek environments. The designs do not preclude the completion of a site specific design where conditions vary from the generic conditions detailed in that document. Notwithstanding, the critical design and construction elements for raised systems are covered and can be used to develop designs for other sites. The technical references in the back of the Standard Designs can be used to complete detailed, site specific designs.

6.8.1 Raised Subsurface Irrigation Beds

Raised subsurface irrigation beds offer a highly effective, best practice land application option for constrained sites when coupled with a reliable secondary or advanced secondary treatment system. While these raised beds are less sensitive to poor design and construction practice, they still require careful consideration of the following issues.

- While greater flexibility exists in media (fill) selection (due to lower areal loading rates and high effluent quality), raised subsurface irrigation beds still require careful preparation of the existing ground underneath the bed and laying of fill to minimise the potential for breakout.
- Research from the USA into raised systems confirms local experience that assignment of a Linear Loading Rate based on soil structure, texture, depth and slope is still critical.
- Effective water and nutrient uptake requires a good vegetation cover with the preference being turf. Raised garden beds planted with grasses, shrubs and trees will only be considered on a site by site basis subject to justification from the designer. Shrubs and trees typically display a significantly greater reduction in evapo-transpiration during non-growth periods.
- Raised irrigation beds will not typically be accepted on sites with slopes >10% with clay loam to clay sub-soils without a comprehensive engineering design for the soil / fill material, hydraulic design of the irrigation system and any geotechnical / structural design issues associated with retaining walls.

6.8.2 Wisconsin Mounds

Wisconsin Mounds offer an opportunity to achieve high levels of effluent treatment prior to high groundwater or rock without the need for a secondary treatment device. They can however be

comparable in cost and selection of an appropriate system will depend on a number of site specific factors and owner preferences. Operational evidence from thousands of mound systems in the USA has consistently proven that while they require more cost and technical/construction effort at the front end, total life cycle costs and life spans for mounds are a favourable. When designed and constructed properly, mounds are highly effective, relatively low maintenance options. However, sites without a limiting layer close to the ground surface may not warrant installation of a mound system. Detailed guidance on the design and construction of mounds should be obtained from Council's *On-site Sewage Management System Designs for Tilligerry Creek* (2005) and Converse J.C. and Tyler, E.J. (2000). Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual. University of Wisconsin-Madison – found at: http://www.wisc.edu/sswmp/pub_15_24.pdf.

6.8.3 Raised Pressure Dosed Beds

As previously discussed, raised pressure dosed evapo-transpiration / absorption beds may be an option for a limited number of sites. Council's *On-site Sewage Management System Designs for Tilligerry Creek* (2005) and the useful references included in that document should be used as a Minimum Standard for these systems.

6.8.4 Amended Soil Mounds

Amended soil mounds can be a useful option where a site is in close proximity to a sensitive receiving environment with respect to phosphorus. However, these systems must demonstrate their capability for sustainable long-term performance in order to be approved. Inspection of existing amended soil mounds in the region has identified a higher than typical hydraulic failure rate caused by a range of design and construction factors. **Of critical importance is the recognition that amended soil mounds are not a closed system. A comparable volume of effluent to other land application options discharges into the environment from these systems.**

A comprehensive water balance must be completed for all amended soil mounds that acknowledges the following points.

- There is no empirical evidence to suggest that mound systems achieve higher evapo-transpiration rates than other systems. Typical crop factors should be used.
- Where a sand bed is to be included under the cells for absorption of effluent, no evapo-transpiration can be allowed for and the minimum Design Loading Rates from *ASNZS1547:2000* must be adopted. The limited (and inconsistent) performance data available for these systems would confirm first principles that sufficient BOD and TSS remains in effluent to allow development of anaerobic biofilms. The installation of an impermeable seal above the bed also acts to prevent oxygen transfer through the soil, a process identified in research as critical to preventing hydraulic failure of land application systems.
- Designers should recognise that hydraulically, amended soil mounds operate as slightly impeded, gravity dosed evapo-transpiration beds and as such should be subject to the same limitation on their use. Gravity dosed beds of any kind are not permitted in many locations in Port Stephens due to the challenges associated with even distribution of effluent.

Given that final effluent discharging into the environment is somewhere between primary and secondary effluent (with the exception of phosphorus), the nutrient and pathogen assessments required under this DAF also apply to these systems. To this end performance data for amended soil mounds of the ***same design configuration*** servicing a similar facility must be provided to support any stated effluent quality performance.

6.9 Buffer Distances

When designing a land application area it is critical to ensure that sufficient useable land is available on the allotment following consideration of buffer zones. Buffer zones are especially important when proposing the installation of an on-site system in environmentally sensitive locations. Where prescribed buffer distances are not achievable it may be necessary to mitigate any adverse impacts by improving the quality of effluent treatment by careful selection of the treatment system. The DAF sets out procedures and design requirements for situations where the recommended minimum buffer distances cannot be achieved.

Table 6-9 Minimum Buffer Distances for On-site System Land Application Systems

System / Land Application Type	Limiting Factor	Minimum Buffer Distance (m)
All Land Application Systems	Permanent surface waters such as: Lakes, rivers, creeks and streams	➢ 100m
	Domestic groundwater wells and bores	➢ 250m
	Other waters such as: Farm dams, intermittent waterways and drainage channels	➢ 40m
Surface Spray Irrigation (Standard Spray Heads)	Driveways and property boundaries	➢ 6m if area up gradient ➢ 3m if area down gradient
	Dwellings and buildings	➢ 15m
	Paths and walkways	➢ 3m
	Swimming pools	➢ 6m
Surface Spray Irrigation (Large Capacity Pop-Ups)	Dwellings and buildings	➢ 20m
	Property boundaries	➢ 10m
	Throw distance (radius)	➢ No greater than 5m
	Plume height	➢ No greater than 0.5m
Surface Drip and Trickle Irrigation	Dwellings and buildings, swimming pools, property boundaries and driveways	➢ 6m if area up gradient ➢ 3m if area down gradient
Subsurface Irrigation	Dwellings and buildings, swimming pools, property boundaries and driveways	➢ 6m if area up gradient ➢ 3m if area down gradient
	Depth to Hardpan or Bedrock	➢ 0.6m below level of pipework
Absorption System	*Property boundary*	➢ 12m if area up gradient ➢ 6m if area down gradient
	Dwellings and buildings, swimming pools and driveways	➢ 6m if area up gradient ➢ 3m if area down gradient
	Depth to Hardpan or Bedrock	➢ 0.6m below base of trench/bed

APPENDIX A: ACCEPTABLE SOLUTION SIZING TABLES

Climate Zone	Bedroom Size	Water Supply	Table	Page
West	One	Reticulated	A-1	A-2
		Tank	A-6	A-4
	Two	Reticulated	A-2	A-2
		Tank	A-7	A-5
	Three	Reticulated	A-3	A-3
		Tank	A-8	A-5
	Four	Reticulated	A-4	A-3
		Tank	A-9	A-6
	Five	Reticulated	A-5	A-4
		Tank	A-10	A-6
Central	One	Reticulated	A-11	A-7
		Tank	A-16	A-9
	Two	Reticulated	A-12	A-7
		Tank	A-17	A-10
	Three	Reticulated	A-13	A-8
		Tank	A-18	A-10
	Four	Reticulated	A-14	A-8
		Tank	A-19	A-11
	Five	Reticulated	A-15	A-9
		Tank	A-20	A-11
East	One	Reticulated	A-21	A-12
		Tank	A-26	A-14
	Two	Reticulated	A-22	A-14
		Tank	A-27	A-15
	Three	Reticulated	A-23	A-13
		Tank	A-28	A-15
	Four	Reticulated	A-24	A-13
		Tank	A-29	A-16
	Five	Reticulated	A-25	A-14
		Tank	A-30	A-16

Reticulated Water Supply

One Bedroom Dwellings

Table 6-10 Acceptable Solutions West Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	25[4]		15[4]		100
Sandy Loams					
Loams	35		25		150
Clay loams	50		35		
Light clays	65[4]		45		200
Medium/heavy clays	65[4]				250
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Two Bedroom Dwellings

Table A-2 Acceptable Solutions West Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	35[4]	40[4]	30[4]		200
Sandy Loams	50[4]				
Loams	70[4]		50		250
Clay loams	100[4]		70[4]		
Light clays	130[4]		85[4]		350
Medium/heavy clays	130[4]				500
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Three Bedroom Dwellings

Table A-3 Acceptable Solutions West Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	45[4]		30[4]		250
Sandy Loams	60[4]		40[4]		
Loams	90[4]		60		350
Clay loams	120[4]		90[4]		
Light clays	Note 5		110[4]		400
Medium/heavy clays	Note 5				600
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

c) average slope of <10% across LAA; and

a) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Four Bedroom Dwellings

Table A-4 Acceptable Solutions West Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	55[4]		35[4]		250
Sandy Loams	70[4]		45[4]		
Loams	105[4]		70[4]		350
Clay loams	145[4]		105[4]		400
Light clays	Note 5		130[4]		500
Medium/heavy clays	Note 5				700
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Five Bedroom Dwellings

Table A-5 Acceptable Solutions West Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	65[4]		40[4]		300
Sandy Loams	85[4]		50[4]		
Loams	120[4]		85[4]		400
Clay loams	Note 5		120[4]		450
Light clays	Note 5				600
Medium/heavy clays					800
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Tank Water Supply

One Bedroom Dwellings

Table A-6 Acceptable Solutions West Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	20[4]				100
Sandy Loams					
Loams	30		20		100
Clay loams	40		30		
Light clays	55		35		150
Medium/heavy clays	55				200
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Two Bedroom Dwellings

Table A-7 Acceptable Solutions West Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	40[4]		25[4]		150
Sandy Loams					
Loams	55		40		200
Clay loams	75[4]		55		
Light clays	105[4]		70[4]		250
Medium/heavy clays	105[4]				400
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Three Bedroom Dwellings

Table A-8 Acceptable Solutions West Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	35[4]		20[4]		200
Sandy Loams	50[4]		30[4]		
Loams	70[4]		50		250
Clay loams	95[4]		70[4]		
Light clays	130[4]		85[4]		300
Medium/heavy clays	130[4]				450
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Four Bedroom Dwellings

Table A-9 Acceptable Solutions West Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	45[4]		25[4]		200
Sandy Loams	55[4]		35[4]		
Loams	80[4]		55		250
Clay loams	115[4]		80[4]		300
Light clays	Note 5		100[4]		400
Medium/heavy clays	Note 5				550
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Five Bedroom Dwellings

Table A-10 Acceptable Solutions West Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	50[4]		30[4]		250
Sandy Loams	65[4]		40[4]		
Loams	95[4]		65[4]		300
Clay loams	130[4]		95[4]		350
Light clays	Note 5		115[4]		450
Medium/heavy clays	Note 5				650
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Central Climate Zone (see Figure 5-2)

Reticulated Water Supply

One Bedroom Dwellings

Table A-11 Acceptable Solutions Central Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	25[4]		15[4]		150
Sandy Loams					
Loams	40		25		200
Clay loams	55		40		
Light clays	75[4]		50		350
Medium/heavy clays	75[4]				900
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Two Bedroom Dwellings

Table A-12 Acceptable Solutions Central Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	40[4]		25[4]		250
Sandy Loams	50[4]		30[4]		
Loams	75[4]		50		350
Clay loams	105[4]		75[4]		400
Light clays	Note 5		95[4]		650
Medium/heavy clays	Note 5				1500
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Three Bedroom Dwellings

Table A-13 Acceptable Solutions Central Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	50[4]		30[4]		300
Sandy Loams	65[4]		40[4]		
Loams	95[4]		65[4]		400
Clay loams	135[4]		95[4]		500
Light clays	Note 5		115[4]		800
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Four Bedroom Dwellings

Table A-14 Acceptable Solutions Central Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	55[4]		35[4]		350
Sandy Loams	75[4]		45[4]		
Loams	Note 5		110[4]		600
Clay loams	Note 5		140[4]		1000
Light clays	Note 5				
Medium/heavy clays					
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Five Bedroom Dwellings

Table A-15 Acceptable Solutions Central Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	65[4]		40[4]		400
Sandy Loams	85[4]		55[4]		
Loams	130[4]		85[4]		600
Clay loams	Note 5		130[4]		700
Light clays	Note 5				1150
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;
a) average slope of <10% across LAA; and
b) 600mm depth of soil from base of trench to limiting layer or watertable.
Note 2: Beds only considered an Acceptable Solution on sites with;
a) average slope of <5% across the LAA; and
b) 600mm depth of soil from base of bed to limiting layer or watertable.
Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.
Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.
Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Tank Water Supply

One Bedroom Dwellings

Table A-16 Acceptable Solutions Central Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	20[4]				100
Sandy Loams					
Loams	30		20		150
Clay loams	45		30		
Light clays	60[4]		35		250
Medium/heavy clays	60[4]				700
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;
a) average slope of <10% across LAA; and
b) 600mm depth of soil from base of trench to limiting layer or watertable.
Note 2: Beds only considered an Acceptable Solution on sites with;
a) average slope of <5% across the LAA; and
b) 600mm depth of soil from base of bed to limiting layer or watertable.
Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.
Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Two Bedroom Dwellings

Table A-17 Acceptable Solutions Central Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	40[4]		25[4]		200
Sandy Loams					
Loams	60[4]		40		250
Clay loams	85[4]		60[4]		
Light clays	115[4]		75[4]		400
Medium/heavy clays	115[4]				1400
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

c) average slope of <5% across the LAA; and

a) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Three Bedroom Dwellings

Table A-18 Acceptable Solutions Central Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	40[4]		25[4]		250
Sandy Loams	50[4]		30[4]		
Loams	75[4]		50		300
Clay loams	100[4]		75[4]		
Light clays	145[4]		90[4]		650
Medium/heavy clays	145[4]		135[4]		Note 5
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Four Bedroom Dwellings

Table A-19 Acceptable Solutions Central Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	45[4]		25[4]		300
Sandy Loams	60[4]		35[4]		
Loams	90[4]		60[4]		400
Clay loams	125[4]		90[4]		450
Light clays	Note 5		110[4]		750
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Five Bedroom Dwellings

Table A-20 Acceptable Solutions Central Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	50[4]		30[4]		300
Sandy Loams	70[4]		40[4]		
Loams	100[4]		70[4]		450
Clay loams	145[4]		100[4]		550
Light clays	Note 5		125[4]		900
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

East Climate Zone (see Figure 5-2)

Reticulated Water Supply

One Bedroom Dwellings

Table A-21 Acceptable Solutions East Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	30[4]		15[4]		200
Sandy Loams					
Loams	45		30		300
Clay loams	65[4]		45		450
Light clays	100[4]		55		Note 5
Medium/heavy clays	100[4]				Note 5
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Two Bedroom Dwellings

Table A-22 Acceptable Solutions Central Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	40[4]		25[4]		350
Sandy Loams	55[4]		30[4]		
Loams	85[4]		55		550
Clay loams	130[4]		85[4]		850
Light clays	Note 5		110[4]		Note 5
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Three Bedroom Dwellings

Table A-23 Acceptable Solutions East Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	50[4]		30[4]		400
Sandy Loams	70[4]		40[4]		
Loams	105[4]		70[4]		700
Clay loams	Note 5		105[4]		1100
Light clays	Note 5		140[4]		Note 5
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Four Bedroom Dwellings

Table A-24 Acceptable Solutions East Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	60[4]		35[4]		500
Sandy Loams	80[4]		50[4]		
Loams	125[4]		80[4]		900
Clay loams	Note 5		125[4]		1200
Light clays	Note 5				
Medium/heavy clays					
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Five Bedroom Dwellings

Table A-25 Acceptable Solutions East Reticulated

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	70[4]		40[4]		600
Sandy Loams	95[4]		55[4]		
Loams	Note 5		95[4]		600
Clay loams	Note 5				1500
Light clays	Note 5				
Medium/heavy clays					
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;
a) average slope of <10% across LAA; and
b) 600mm depth of soil from base of trench to limiting layer or watertable.
Note 2: Beds only considered an Acceptable Solution on sites with;
a) average slope of <5% across the LAA; and
b) 600mm depth of soil from base of bed to limiting layer or watertable.
Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.
Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.
Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Tank Water Supply

One Bedroom Dwellings

Table A-26 Acceptable Solutions East Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	25[4]				150
Sandy Loams					
Loams	35		25		250
Clay loams	50		35		350
Light clays	80[4]		45		Note 5
Medium/heavy clays	80[4]				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;
a) average slope of <10% across LAA; and
b) 600mm depth of soil from base of trench to limiting layer or watertable.
Note 2: Beds only considered an Acceptable Solution on sites with;
a) average slope of <5% across the LAA; and
b) 600mm depth of soil from base of bed to limiting layer or watertable.
Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.
Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.
Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Two Bedroom Dwellings

Table A-27 Acceptable Solutions East Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	35[4]		20[4]		250
Sandy Loams	45[4]		25[4]		
Loams	65[4]		45		450
Clay loams	100[4]		65[4]		650
Light clays	Note 5		85[4]		Note 5
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Three Bedroom Dwellings

Table A-28 Acceptable Solutions East Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	40[4]		25[4]		350
Sandy Loams	55[4]		30[4]		
Loams	85[4]		55		550
Clay loams	125[4]		85[4]		850
Light clays	Note 5		110[4]		Note 5
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Four Bedroom Dwellings

Table A-29 Acceptable Solutions East Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	50[4]		25[4]		400
Sandy Loams	65[4]		40[4]		
Loams	100[4]		65[4]		650
Clay loams	Note 5		100[4]		1000
Light clays	Note 5		130[4]		Note 5
Medium/heavy clays	Note 5				
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.

Five Bedroom Dwellings

Table A-30 Acceptable Solutions East Tank

Soil Class	On-site Sewage Management System Types				
	PT/Trench[1]	PT/Bed[2]	ST/Trench[1]	ST/Bed[2]	SSI[3]
Sands	55[4]		30[4]		450
Sandy Loams	75[4]		45[4]		
Loams	115[4]		75[4]		800
Clay loams	Note 5		115[4]		1200
Light clays	Note 5				
Medium/heavy clays					
All values are basal area of LAA in m^2					

Note 1: Trenches only considered Acceptable Solution on sites with;

a) average slope of <10% across LAA; and

b) 600mm depth of soil from base of trench to limiting layer or watertable.

Note 2: Beds only considered an Acceptable Solution on sites with;

a) average slope of <5% across the LAA; and

b) 600mm depth of soil from base of bed to limiting layer or watertable.

Note 3: Subsurface irrigation only considered an Acceptable Solution on sites with 600mm or greater depth of soil from base of trench to limiting layer or watertable.

Note 4: Trenches and beds >60 m^2 or in sand to sandy loam soil must be pressure dosed to qualify as an acceptable solution.

Note 5: These LAA sizes are too large to be considered an Acceptable Solution.