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**Site and Soil Evaluation**

**for Onsite Wastewater Management**

**Report**

**TEMPLATE**

**ADDRESS:**

**PROPOSAL:**

**PREPARED FOR:**

**PREPARED BY:**

**REPORT REFERENCE NUMBER:**

**DATE:**

This template has been prepared to provide a tool and guidance for industry practitioners and developers preparing site and soil evaluation reports in accordance with relevant legislation, policies and standards.

Please provide as much detail and information as possible for each stage of the development. You may use a different format but all components in the template must be clearly addressed.

The template has been prepared by the Department of Health, Western Australia (DOHWA) based on the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*, Government Sewerage Policy 2019, State Planning Policy 2.9, AS/NZS 1547 and other supporting documentation. Users of the Site and Soil Evaluation template should review the [DOHWA web site](https://ww2.health.wa.gov.au/Articles/S_T/Site-and-soil-evaluation-for-onsite-wastewater-management) for any updates.

**Document Management**

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| **Version** | **Date** | **Author** | **Reviewed on**  | **Reviewed and Approved by** | **Signature** |
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# 1. INTRODUCTION

## 1.1 Evaluator’s qualifications, experience and professional indemnity

Developers or individual landowners (not DOH or Local Government) are responsible for engaging a suitably qualified professional to undertake a site and soil evaluation (SSE) of land and development proposal to sustainably contain and manage wastewater on their property. The assessment should be sufficiently rigorous and provide sufficient information to enforcement agency for their assessment.

Site evaluators and soil assessors are responsible for all information, technical data and work undertaken to prepare the SSE report and shall certify that the evaluation procedures have been undertaken in accordance with AS/NZS 1547, the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974, Government Sewerage Policy 2019, State Planning Policy 2.9 and any other requirements of the relevant enforcement agency. SSE evaluators should demonstrate, to enforcement agency’s satisfaction, the suitability or otherwise of the site and include all data gathered by the evaluator.

**Guidance:** SSE evaluators may need to provide an enforcement agency with verification of the following requirements:

**Qualifications**

Site evaluators should either possess an appropriate tertiary-level qualification or specific knowledge and practical experience of engineering or soil science, in particular soil hydrological and soil chemical processes.

**Experience**

The SSE evaluators must have suitable professional training and experience. An SSE professional should possess technical expertise and experience with the broader, inter-disciplinary fields of onsite wastewater management, including skills in the interpretation of site, soil and climate conditions, undertaking water balances, selection and design of appropriate wastewater treatment systems, disposal and reuse options, and other relevant skills. Demonstration of training and competenciesthrough similar SSE work undertaken or professional references from industry bodies may allow enforcement agency’s officers, developers or individual landholders to judge the competency and capacity of individuals and organisations to carry out the SSE.

**Professional indemnity**

Individuals should hold relevant indemnity insurance to account for any potential problems that may arise in the future due to inadequate assessment. SSE evaluators should not undertake assessments in areas where they do not hold insurance. Enforcement agency may request to verify the status of the professional indemnity policy.

**Independence**

SSE evaluators need to fully appreciate the consequences of their advice over the long term and follow professional Code of Ethics and Rules of Conduct. SSE professionals need to satisfy themselves that their recommended type of wastewater recycling/disposal system and associated management program are the most appropriate in the circumstances and are suited to the proponent.

**Attachments:**

* A copy of Evaluator’s Professional Indemnity Insurance that covers the work undertaken to evaluate the capacity of a site and its soil for managing wastewater. Complete the table below and include a copy of your Professional Indemnity Insurance as an attachment of this report.

|  |
| --- |
| Site Evaluator Details |
| NameCompany |  |
| PhoneEmail |  |
| QualificationKnowledge, skills and practical experience |  |
| Date of Site Assessment |  |
| Signature Date |  |

## 1.2 Report Summary

Please start with defining the SSE purpose, that is:

* **General assessment:** You have been asked to undertake site suitability assessment for onsite wastewater management and to recommend the type of onsite wastewater system for the proposed development/subdivision (e.g. a primary treatment system with trenches or a secondary treatment system with irrigation). Where the full report is for the purposes of supporting a planning submission under the Government Sewerage Policy 2019 (GSP), additional detail is required to be addressed as per the GSP criteria eg Sewage Sensitive Areas, setbacks to water resources and Land Application Area sizing; **OR**
* **Specific assessment:** You have been asked to propose a particular type of system and therefore you are providing detailed design specifications and management recommendations to support an ‘application to install’ an onsite wastewater system.

Provide an overview of the proposal, the findings of your investigations, key challenges, your recommendations for system type and design and key management plan or risk mitigation recommendations.

**Guidance:** It should be noted that reports being prepared in support of planning proposals, eg town planning schemes and subdivisions, will need to provide further information beyond that required in a SEE in order to address GSP criteria.

# 2. SITE AND DEVELOPMENT DESCRIPTION

Include a description of the location of the site, its zoning under the Local Planning Scheme, number of lots and lot sizes, overall general physical characteristics (including presence/location of waterways, vegetation cover, existing development etc.). Outline the proposal - i.e. is it a subdivision of land, an extension to an existing dwelling or the construction of a new dwelling.

Provide details for estimation of anticipated wastewater volume based on loads from all inputs including sewage and trade waste. The table below is an example to assist in calculation of the anticipated wastewater volumes.

Example:

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Input volume | Load per person | Daily flow(L/day) |
| Accommodation | 50 people | 150 L/day | 7500 |
| Office | 30 people | 30 L/day | 900 |
| Car Wash bay | 20 cars |  | 750 |
| Total | **9150** |

Complete Table 1

### Table 1: Description of the development

|  |  |
| --- | --- |
| Development Characteristic | Description |
| Site Address |  |
| Owner/Developer |  |
| Postal Address |  |
| Contact for SSE  | Ph: | Mob: | Email: |
| Date of field work |  |
| Local Government |  |
| Zoning |  |
| Lot size/s |  |
| Proposal |  |
| Water Supply |  |
| Availability of Sewer |  |
| Development located within: | Public drinking water source area**🞎** | Sewage Sensitive Areas🞎 |
| Anticipated Wastewater Volume | Sewage (L) | Trade waste (L) |

**Guidance:** If the proposal is a subdivision of land please include proposed lot sizes, the number of lots, proposed building envelopes (if any). Make sure you outline the overall size, type and number of dwellings, occupancy rate, number of bedrooms (if any), setbacks from property boundaries, proposed outbuildings and the location of hard surfaced areas. It is strongly recommended to add a google map and photo of the site.

Also include a description of the location including boundaries and whether the site is located in a public drinking water source areas or sewage sensitive areas, and overall general physical characteristics such as location of waterways, direction of surface flows, vegetation cover, location of bores and note groundwater levels if available (visit the [Department of Water and Environmental Regulation website](http://www.water.wa.gov.au/maps-and-data/maps) at <http://www.water.wa.gov.au/maps-and-data/maps>)

# 3. SITE AND SOIL ASSESSMENT

Outline how you went about preparing the site and soil assessment, including any meetings with LG, other agencies or the landowner, desktop analysis and site inspection assessment details and activities, water balance tests etc

**Attachments:**

* Locality Plan
* a fully dimensioned and accurately scaled plan of the proposal, including contours at a sufficient interval to justify your system design, the location of the proposed building envelope and other development works, wastewater management system components and physical site features.
* photographs of the site and soil test location, include a log, GPS coordinates and site plan showing the location of soil sample sites.

## 3.1 Site Assessment

The purpose of this section is to develop the appropriate SSE criteria for assessment, by defining the key characteristics of the site and soils that will define the capability of the site to dispose onsite wastewater. It is useful to present this information under subheadings of each of the key parameters, or in tabular form as below.

The Table 2 provides a description of the key characteristics that should be assessed as part of an SSE, both from desktop investigations and field work. Each site characteristic should be assessed, level of constraint identified, and adequate mitigation measure assigned to minimize the risk from onsite wastewater system to public health and the environment. The results of the investigations will be used to determine the site capability for on-site wastewater management, and to design the most appropriate on-site wastewater system for the site.

This risk management approach will ensure that the environmental and public health constraints related to poor onsite wastewater system performance are mitigated, and the siting, design and performance of the system are appropriately managed.

**Level of Constraint (Low, Moderate or High)** is determined applying risk assessment of site characteristics. More information on risk assessment of site characteristics is provided in [Section 3.3](#_3.3_Site_Assessment) and an example of a risk assessment matrix is presented in [Table 6](#_Table_6:_Risk).

***Guidance:***

***Nil or Low:*** *If all constraints are Low, standard designs are generally satisfactory and no mitigation measures are required.*

***Moderate:*** *For each Moderate constraint an appropriate mitigation measure or design modification over and above that of a standard design, should be outlined.*

***High:*** *Any High constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.*

### Table 2: Key Site Characteristics and their Relevance for SSE

| Site Characteristics | Investigations and Reporting | Level of Constraint | Mitigation Measures |
| --- | --- | --- | --- |
| Climate | Climatic averages (rainfall and pan evaporation) for the site locality should be obtained from the nearest [Bureau of Meteorology](http://www.bom.gov.au/wa/?ref=hdr) (BoM) meteorological station or correctly-operated private monitoring station. Maps of meteorological stations and historical climate data are available from the [BoM website](http://www.bom.gov.au/wa/?ref=hdr). The data should be representative of the site’s climate, and preferably recorded over a long historical period (at least 30 years). Local Evaporation data can also be estimated using the Evaporation Data for Western Australia Report published by the Department of Agriculture and Food (2003) (<https://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1058&context=rmtr>) or by estimating evaporation using the energy balance method or other methods.*Note: Where evaporation exceeds rainfall, the stored water levels in the soil profile are reduced, thereby reducing the size of the land application area and generally reducing the risk of off-site effluent export*, *however some contaminants (e.g. nutrients) may build up in the soil profile and could enter the groundwater system for which a risk-based assessment should be applied.* |  |  |
| Exposure | This parameter is determined in the field by noting the amount of tree cover (which provides shading), and the direction that the slopes face where land application of effluent is likely to take place. Note: *High exposure to sun, low shade, good ventilation and a northern aspect maximise evapotranspiration of effluent.* |  |  |
| Vegetation | At the desktop level, existing information on the vegetation should be obtained, to determine the native vegetation of the area. Refer to a [vegetation map for Western Australia](https://www.dpaw.wa.gov.au/images/documents/about/science/pubs/infosheets/sdis077.pdf) is developed by the [Department of Parks and Wildlife](#_REFERENCES_AND_RELATED). In the field, the broad types of vegetation and their level of cover should be noted. Note: *Open grassland is often optimal for effluent disposal. Conversely, water-loving vegetation (such as Melaleuca species) indicates poor drainage.* |  |  |
| Landform and Drainage | The landform should be determined by locating the site on a topographic map to determine its position in the overall landscape (e.g. on a floodplain or crest). In the field, the position of the site, particularly the potential Land Application Area (LAA), should be located in relation to landform elements. The shape of the slope (convex, concave) should be noted. A useful reference for determining landform is the [*Australian Soil and Land Survey Field Handbook* (CSIRO Publishing*,* 2009)](https://ebooks.publish.csiro.au/content/australian-soil-and-land-survey-field-handbook). Note: *Landform that spreads rainfall runoff and limits concentration or ponding of runoff is optimal for LAA. 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. For more information on use of drainage refer to the* [*section 5.2.3 of the GSP*](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September)*.* |  |  |
| Slope | The slope of the site, particularly the potential LAAs, shall be measured in the field using a clinometer and reported as a percentage or gradient (e.g. 10% slope has a fall of 1 metre for every 10 metre distance). *Note:* *Where slope exceeds one in five (1:5), the LAA should be engineered to prevent run-off or ingress to the LAA. In this instance, installation of terracing or diversion drains and reduced DIR according to slope are recommended, refer to* [*Appendix 4*](#_APPENDIX_4_–) *for more information. Surface contours should be provided on the site plan. Low slopes reduce the risk of erosion, slope instability and effluent run-off.* |  |  |
| Fill (imported) | Observe whether soil material has been imported to the site. Fill generally appears different to the site soils and may be unconsolidated or heterogeneous. Brief comment as to the nature of any fill encountered should be made. *Note: Uniform fill with no signs of salinity or acid sulphate soil contamination has favourable hydraulic and plant supporting qualities; conversely, poor quality fill material is not appropriate for effluent application.* *Good quality imported fill may overcome localised deficiencies in the natural soil landscape.* |  |  |
| Surface Gravel and Rock Outcrops | Record the estimated percentage and spatial extent of surface gravel, if present. The nature and amount of rock (general size and percent coverage of site) protruding from the ground should be recorded. *Note: The higher the proportion of gravel and/or rock outcrops, the less volume of soil available for effluent absorption, and increased difficulty in installation. Refer to* [*Appendix 1*](#_Appendix_1) *for vertical setback distances to bedrock and hardpan.* |  |  |
| Erosion Potential | The type and degree of erosion (if present), and the erosion hazard, should be recorded. *Note: Stable slopes, well vegetated surface, short flow paths have low erosion potential. For a full description of erosion types and their recognition, see* [*Australian Soil and Land Survey Field Handbook (2009)*](https://ebooks.publish.csiro.au/content/australian-soil-and-land-survey-field-handbook)*.* |  |  |
| Separation from groundwater | Depending on the area, detailed information about existing private and commercial groundwater bores may be available from  [Department of Water and Environmental Regulation (DWER) website](http://www.water.wa.gov.au/urban-water/bores). Printed and GIS topographic maps from the [Interactive Maps](http://maps.ga.gov.au/interactive-maps/#/) of Geoscience Australia's geospatial services provide information and advice towards the management of Australia's groundwater and surface water resources, including bores. Accessing this information should be done at the desktop level of investigation, and followed up in the field by observing the presence of any bores at the site or neighbouring properties. Also, the height of standing water in the soil survey pits or holes should be recorded in the wettest time of the year. *Note: As the depth to groundwater table increases, the risk of effluent contamination is reduced. Distance to highest groundwater level, taking into account the range of seasonal groundwater conditions should comply with the requirements of* [*Section 5.2.3 of the GSP*](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September)*. Refer to* [*Appendix 1*](#_Appendix_1) *for vertical setback distances to groundwater.**Sites which are deemed wet and have very shallow groundwater should have observation bores installed and monitored during winter and spring to identify the peak level. Sites with groundwater within 0.5m of the natural surface, are not suitable for onsite sewage disposal for lots with area less than one hectare, in view of item* [*7 under Sect 5.1.1 of the GSP*](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September)*.* |  |  |
| Public Drinking WaterSource Areas (PDWSAs) and Sewage Sensitive Areas (SSA) | Identification of public drinking water source areas (PDWSAs) and sewage sensitive areas (SSA) is required by [the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September). Land use planning in PDWSAs is guided by *[Water quality Protection Note 25: Land use Compatibility Tables for Public Drinking Water Source Areas](https://www.water.wa.gov.au/__data/assets/pdf_file/0014/1733/12441.pdf)*.The datasets for PDWSAs in WA can be found at <https://data.gov.au/> or by contacting the nearest DWER regional office. The contact details are available on [DWER’s website](http://www.water.wa.gov.au/maps-and-data/maps): [www.water.wa.gov.au](http://www.water.wa.gov.au)The location of SSA’s in WA can be viewed on the Department of Planning, Lands and Heritage [website](https://www.dplh.wa.gov.au/government-sewerage-policy). Mapping is indicative. The sewage sensitive area boundaries may be refined through higher resolution mapping in accordance with the definition provided in [the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September). |  |  |
| Surface waters and separation from water resources | The location of permanent and seasonal watercourses and other water bodies (e.g. rivers, creeks, dams, lakes, wetlands, springs, billabongs and so on) should be determined from topographic maps and/or aerial or satellite imagery. Printed and GIS topographic maps from the Geoscience Australia service Interactive Maps show a range of surface water features. Identification of water resources and land affected by separation distances shall be done as per [section 5.2.2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September). Includes wellhead protection zones, reservoir protection zones, publicand private drinking water bores, waterways, significant wetlands, drainage systems and land subject to flooding. |  |  |
| Rainfall run-on and 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 should also be recorded. *Note: Elevated and mid-slope positions within landscape, and higher permeability soils, reduce the risk of run-on and upslope seepage.*  |  |  |
| Flood potential | Information regarding the flood recurrence levels for the site should be obtained. DWER has flood mapping of many of the state's major rivers and streams, go to the [Spatial Data Download](https://atlases.water.wa.gov.au/idelve/dowdataext/download/default.html) page. In the field, proximity to watercourses (both seasonal and permanent) should be noted, as well as the position of the site within the landscape (e.g. on a floodplain).*Note: LAA which are seasonally inundated will result in export of effluent or pollutants unless effluent is stored during the wet season*. *An onsite wastewater system shall not be located within any area subject to inundation and/or flooding in 1:10 year Annual Exceedance Probability (AEP) rainfall event. Electronic controls of wastewater systems should be located above the 1:100 year flood level where possible.* |  |  |
| Horizontal Setback Distances | When siting an on-site wastewater system, setbacks should be provided and shown on the site map to various features as recommended in the relevant legislation. In the field, note the distance to relevant features (e.g. property boundaries, watercourses, wetlands and other water bodies, buildings) from both proposed treatment system and LAA. The horizontal and vertical setback distances are listed in [Appendix 1](#_Appendix_1). |  |  |
| Available Land Application Area (LAA) | The total area available for effluent application should be determined, after allowances for typical improvements such as buildings, setback buffers and areas not suitable for effluent application (e.g. areas affected by rock outcrop, excess surface gravel and boggy ground). A minimum required LAA should be calculated as per [Schedule 2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September). *Note: Within the available area, the most appropriate site for LAA should be selected using the above SSE criteria. In the field, soil investigations will be carried out in the areas identified as potential LAAs.* |  |  |

## 3.2 Soil Assessment

The first step is to find published soil and geological information relevant to the site. Soil descriptions and other information for the land, broad-scale (1:50,000 to 1:1,000,000) maps of soils for the whole of Australia have been collated in the [Australian Soils Research Information System](http://www.asris.csiro.au/) (ASRIS). Geological maps are typically available at 1:250,000, available from [Geoscience Australia](https://www.ga.gov.au/). It is also recommended that the soil database held by the [Department of Agriculture and Food](https://www.agric.wa.gov.au/climate-land-water/soils) is used, as this provides information on typical soil profiles in many parts of the State.

It is important that the description of soil characteristics is undertaken using methodologies described in the Australian Soil and Land Survey Field Handbook and that soil colours are described using Munsell colour-charts to ensure consistency.

Caution should be taken with the use of broad-scale mapping data in the evaluation of individual or even subdivision scale development. Field verification should always be undertaken to provide detailed information for the SSE.

After the desktop assessment has been completed, detailed soil assessment should be undertaken at the site, to characterise the soils in the different landform elements present (if there is more than one). This is done because soil forming processes differ depending on the position in the landscape (e.g. crests compared to lower slopes); and therefore the resulting soils can be significantly different, with different land capability for on-site wastewater management.

At least two test pits or boreholes should be dug or excavated in each potential land application area identified during the site assessment for single lot development proposals; and at least one test pit per lot for subdivision development proposals. Appendix C in AS/NZ1547:2012 provides guidance on the number of soil profiles that should be described in the survey.

[Table 3](#_Table_3:_) describes the physical soil characteristics that should be assessed in the soil survey and how to describe and assess the parameters. [Table 4](#_Table_4:_) describes the principal soil texture categories for on-site wastewater management. [Table 5](#_Table_5:_Soil) describes the chemical soil characteristics that are pertinent to site and soil evaluation for on-site wastewater management.

### Table 3: Soil Physical Characteristics for SSE

|  |  |  |  |
| --- | --- | --- | --- |
| Characteristic | Investigations and Reporting | Level of Constraint | Mitigation Measures |
| Profile Depth | To a depth consistent with setback distances to groundwater (see [Appendix 1](#_Appendix_1)) and at least 1.5m (2.0m in PDWSAs) below disposal depth or until limited by unfavorable layer, equipment refusal, or permanent water table. 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) and water table should also be recorded. |  |  |
| Depth to watertable | If water enters the excavation from the surrounding soil, the depth to which it comes should be recorded. The height of standing water in the soil survey pits or holes should be recorded in the wettest time of the year (see [Appendix 1](#_APPENDIX_1-_Horizontal) for setback distances to groundwater). |  |  |
| Coarse Fragments (%) | The size and percentage of course fragments (stones and segregations) in each soil layer should be recorded. |  |  |
| Soil Colour and Mottling | The dominant soil colour of each soil layer should be determined. The extent (%) and colour of any mottles (patches of different coloured soil) present should also be described and interpreted (i.e. presence of seasonal or permanent water tables). *Note: Include a photograph to illustrate.* |  |  |
| Soil Field Texture | The behaviour of a small amount of moist soil which has been manipulated (a bolus) between the fingers gives an indication of the texture (relative amounts of sand, silt, and clay) of the soil sample. The texture for each layer should be recorded. |  |  |
| 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. At the very least the degree (e.g. strong, moderate, or weak) of pedality of each layer should be noted.*Note: Include a photograph to illustrate* *soil structure and any screening through sieves performed to determine particle make up, clay, stone content etc.* |  |  |
| Soil Permeability and Design Loading Rates | Once a soil’s textural and structural characteristics are determined, a permeability category can be assigned from AS/NZ1547:2012. Six soil categories from sands to heavy clays are used to assign indicative permeability, that is, the rate at which clean water percolates through the soil of that texture (see [Table 4](#_Table_4:_) below).*Note 1: Soil permeability needs to be directly measured when there is some doubt as to soil texture, structure or likely permeability. The measurement can be done using a device such as a double ring or constant head permeameter.* *Table 5.2 in AS/NZS 1547:2012 describes Design Loading Rates (DLRs) and Design Irrigation Rates (DIRs) for various effluent application systems according to soil type and effluent quality (primary or secondary treatment).* *Note 2: The DLR and DIR values for the most limiting layer within the uppermost part of the soil through which the treated effluent will move should be used. For instance, in a texture-contrast soil with a very shallow loamy topsoil and heavy clay subsoil, the subsoil is the limiting layer for percolation and this material should be used for the DLR.* |  |  |

### Table 4: Soil Texture Categories and Indicative Permeability (from Table 5.2 of AS/NZS 1547:2012)

|  |  |  |  |
| --- | --- | --- | --- |
| Soil Permeability Category | Soil Texture | Soil Structure | Indicative Permeability (m/d) (*KSa* 1)*t* |
| 1 | Gravels and Sands | Structureless | >3.0 |
| 2 | Sandy Loams | Weakly Structured | >3.0 |
| Massive | 1.4-3.0 |
| 3 | Loams | Highly/moderately structured | 1.5-3.0 |
| Weakly Structured or Massive | 0.5-1.5 |
| 4 | Clay Loams | Highly/moderately structured | 0.5-1.5 |
| Weakly Structured | 0.12-0.5 |
| Massive | 0.06-0.12 |
| 5 | Light Clays | Highly/moderately structured | 0.12-0.5 |
| Weakly Structured | 0.06-0.12 |
| Massive | <0.06 |
| 6 | Medium to Heavy Clays | Highly/moderately structured | 0.06-0.5 |
| Weakly Structured/ Massive | <0.06 |

**1** *KSat*: Saturated Hydraulic Conductivity

### Table 5: Soil Chemical Characteristics for SSE

| Characteristic | Investigations and Interpretation | Chemical Test Required |
| --- | --- | --- |
| pH | The pH of 1:5 soil/water suspensions can be measured using a hand held pH meter, or a sample can be sent to a laboratory. Simple field test kits are accurate to the nearest 0.5 of a pH point and can be useful for rapid assessment of approximate pH levels.The pH trend down through the profile should then be assessed, e.g. acid, neutral, or alkaline. *Note: Acid soils (pH <5) or alkaline soils (pH>8) may provide an unsuitable environment for plant growth, and the use of ameliorants (such as lime and gypsum) may then be investigated.* | A pH test should be carried out on a soil sample from each horizon from each test pit excavated during the soil assessment.This test can be carried out using a hand held pH meter, or in a soil testing laboratory. |
| Electrical Conductivity (salinity) | Electrical conductivity is used to infer the salinity of the soil and its potential impact on plant growth. The EC of the saturated extract (ECe) is calculated by first measuring the electrical conductivity of 1:5 soil in water suspensions and using appropriate multiplier factors to convert EC (1:5) to ECe. It can be measured with a hand-held EC meter.*Note: Moderate (range) to high (range) salinity typically inhibits or limits growth of many plant species, thereby reducing plant uptake of nutrients and increasing the risk of erosion on the LAA and potential seasonal groundwater rise.*  | An EC test should be carried out on a soil sample from each horizon from each test pit excavated during the soil assessment.This test can be carried out using a hand held EC meter, or in a soil testing laboratory. |
| Sodicity (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 degradation, waterlogging and reduced permeability. | ESP should be carried out if there is any evidence of dispersion, slaking, or structural decline in the soils on or near the potential land application area/s.This test is carried out in a soil testing laboratory. |
| Phosphorus adsorption (mg/kg) | Phosphorus adsorption (P-sorption) is the capacity of soils to ‘take up’ or immobilise phosphorus. All sites should be carefully managed to limit the risk of future groundwater contamination by Phosphorus. Soils with high P- sorption capacity can absorb excess phosphorus not taken up by plants. The effectiveness of this depends not only on sorption capacity but also, the depth and permeability of the soil and current saturation level. Refer to [Appendix 2](#_APPENDIX_2) for Indicative Phosphorus Sorption Uptake Values for each soil types. Consideration is required of the capacity of the soil to adsorb phosphorus, environmental values and pollution pathways, for which a risk-based assessment should be applied.*Note: Sandy soils typically have low P- sorption capacity. In sensitive coastal plain areas soil testing will be needed to determine the soil’s P-sorption capacity for any nutrient balances undertaken. Clay soils and soils high in iron and/or aluminium often have high P- sorption (up to 450 mg/kg and greater).*  | There are a range of P- sorption tests, carried out in a soil testing laboratory. |

**Guidance:** The aim of the soil assessment is to describe, evaluate, and report on the characteristics of the soils present at the site to:

* *assess the capability of the soils to assimilate treated wastewater; and*
* *design a wastewater management system.*

*It is useful if the physical and chemical characteristics of the soil are presented in table form in the report. For added clarity, the table/s can have an additional column which describes the level of constraint that the parameter poses for land application of effluent (i.e. ‘low’, ‘moderate’ or ‘high’) and mitigation measures. More information on risk assessment of site characteristics is provided in* [*Section 3.3*](#_3.3_Site_Assessment) *and an example of a risk assessment matrix is presented in* [*Table 6*](#_Table_6:_Risk)*.*

*Graphic bore logs of the soil test pits should be included as an appendix to the report. This allows the regulator to see at a glance what the soil profile is like and therefore aids their understanding of its characteristics. The bore logs should be of adequate diameter to clearly show the following:*

* *Depth of each horizon and depth of excavation*
* *Soil type and texture of each horizon*
* *Presence of groundwater tables (if encountered)*
* *Depth of refusal, e.g. on bedrock or hard pan (if encountered)*
* *Descriptions of other features such as mottling, gravel, etc.*

GPS coordinates of the locations of where the samples were taken are required (there are smart phone applications that enable you to do this easily and cost effectively if you don’t have surveying equipment).

**Attachments:**

* Soil Bore Logs and a diagram of the soil profile from onsite test sites
* colour photos of the bore test samples.

## 3.3 Site Assessment Results

The results and interpretation of the desktop and field investigations are used to determine whether effluent can be contained within the property boundaries and if onsite wastewater management is feasible.

Provide a summary of any limiting and high-risk factors identified in [Section 3](#_3._SITE_AND). An example of a risk assessment matrix for site characteristics is presented in [Table 6](#_Table_6:_Risk) below. Note that the level of constraint can apply to the entire site or just the proposed LAA(s).

Provide the following information to support findings of the SSE report:

* Provide basis for erosion rating
* Describe the nature of the fill and compaction
* Refer to setback buffers for groundwater bores and specific waterway types
* Provide date and weather conditions
* Use local anecdotal information

***Guidance:***

***Nil or Low:*** *If all constraints are Low, conventional/standard designs are generally satisfactory.*

***Moderate:*** *For each Moderate constraint an appropriate design modification over and above that of a standard design, should be outlined.*

***High:*** *Any High constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.*

### Table 6: Risk Assessment of Site Characteristics

|  |  |  |
| --- | --- | --- |
| Characteristic | Level of Constraint | Assessed Level of Constraint for Site |
| **Nil or Low** | **Moderate** | **High** |
| General Characteristics |
| Climate (difference between average annual rainfall and average pan evaporation, mm/year) | Excess of evaporation over rainfall in the wettest months | Rainfall approximates to evaporation | Excess of rainfall over evaporation in the wettest months |  |
| Exposure to sun and wind | Full sun and/or high wind orminimal shading and North / North-East / North-West aspect | Dappled lightEast / West / South-East / South-West aspect | Limited patches of light and little wind to heavily shaded all day and South aspect |  |
| Vegetation coverage over the site | Plentiful vegetation with healthy growth and good potential for nutrient uptakeTurf or pasture | Limited variety of vegetation | Sparse vegetation or no vegetation, dense forest withlittle understorey |  |
| Landslip (or landslip potential) | Nil | Low to moderate | High or Severe |  |
| Slope Form(affects water shedding ability) | Hill crests, convex or divergent side-slopes and plains | Straight side-slopes and footslopes | Floodplains, concave or convergent side-slopes and incised channels |  |
| Site Drainage(qualitative)  | No visible signs or likelihood of dampness, even in wet season | Some signs or likelihood of dampness Moist soil but no standing water in soil pit.  | Wet soil, moisture-loving plants, standing water in pit; water ponding on surface |  |
| Slope gradient (%): |
| (a) for absorption trenches and beds | <5% | 5-15% | >15% |  |
| (b) for surface/ subsurface irrigation | <10% | 10-20% | >20% |  |
| Erosion(or potential for erosion) | Nil or Low | Moderate | Severe |  |
| Fill(imported) | No fill at present or fill is good quality topsoil or minimal fill required | Moderate coverage and good quality fill | Extensive poor-quality fill and variable quality fill |  |
| Flood frequency (AEP) | Less than 1 in 100 years | Between 100 and 20 years | More than 1 in 20 years |  |
| Privet bore used for household/drinking water purposes | No bores onsite or on neighbouring properties | >30m to the nearest privet bore  | <30m to the nearest privet bore  |  |
| Proximity to water resources | >100m  | <100m but reduced setback is supported (refer to [Section 5.2.2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September)) | <100m and reduced setback is not supported (refer to [Section 5.2.2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September)) |  |
| Groundwater (wettest time of the year) | >2m  | 2.0 – 0.6m need for fill to achieve setbacks listed in [Appendix 1](#_Appendix_1) | <0.6m fill is not practical to achieve setbacks listed in [Appendix 1](#_Appendix_1) |  |
| Land areaavailable for LAA | Exceeds the minimum required LAA size of AS1547 or [Schedule 2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September) | Meets the minimum required LAA size of AS1547 or [Schedule 2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September) | Insufficient area available for LAA as per AS1547 or [Schedule 2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September) |  |
| Rock outcrops (% of surface) | <10% | 10-20% | >20% |  |
| Site Drainage(qualitative)  | No visible signs or likelihood of dampness, even in wet season | Some signs or likelihood of dampness Moist soil but no standing water in soil pit.  | Wet soil, moisture-loving plants, standing water in pit; water ponding on surface |  |
| Stormwater run-on/run-off | Low likelihood of stormwater run-on/run-off | Moderate likelihood of stormwater run-on/run-off, need for diversionary structures | High likelihood of inundation by stormwater run-on/run-off, diversion not practical |  |
| Soil profile characteristics |
| Soil permeabilityCategory (AS1547) | 2 and 3 | 4 and 5 | 1 and 6 |  |
| Profile depth | >2m | 2.0-1.0 | < 1.0m  |  |
| Hardpan or bedrock  | >1.5m | 1.5-0.6mSpecial design requirements and distribution techniques or soil modificationwill be necessary, depends on quality of treated wastewater and type of LAS | <0.6m |  |
| Presence of mottling | None |  | Extensive |  |
| Course fragments | < 10% | 10-40% | >40% |  |
| pH | 6-8 | 4.5-6 | <4.5, >8 |  |
| Electrical Conductivity(ECe)(dS/m) | <0.3 | 0.3-2 | >2 |  |
| Sodicity ESP% | <3 | 6-8 | >8 |  |
| Phosphorus adsorption (mg/kg) | >500 | 200-500 | <200 |  |

# 4. WASTEWATER MANAGEMENT SYSTEM TYPE AND DESIGN

The level of detail you provide in this section will vary depending on the purpose of the SSE:

* **General assessment:** You have been asked to undertake site suitability assessment for onsite wastewater management and to recommend the type of onsite wastewater system for the proposed development/subdivision (e.g. a primary treatment system with trenches or a secondary treatment system with irrigation). **OR**
* **Specific assessment:** You have been asked to propose a particular type of system and therefore you are providing detailed design specifications, sizing and management recommendations to support an ‘application to install’ an onsite wastewater system.

The below sections provide further details on what information should be included in the above SSE reports.

## 4.1 General assessment SSE – Selection and design of the system

Selection and basic design of on-site wastewater systems requires consideration of the treatment

system, treatment quality or level of treatment of effluent, and land application area and system, all of which must be within the capability of the land on which the system will be sited. The field investigations, sampling and analysis of site and soil conditions aim to confirm whether the proposed treatment and land application area can be accommodated within the site.

Outline:

* how the system selection and general design parameters address the findings in Table 6, focusing on limiting and/or high risk factors;
* how onsite wastewater system complies with GSP, relevant Australian Standards and legislation requirements, or if these requirements are not met how your design mitigates risks arising from the non-compliances;
* size of the LAA should be estimated based on [Schedule 2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September); and
* what management strategies are in place to ensure ongoing compliance with the relevant Standards and legislation.

**Guidance:** *There are many options available for treatment of wastewater based on desired disposal/reuse of the treated wastewater these are outlined in* [*Appendix 3*](#_APPENDIX_3). *The DOH* [*website*](https://ww2.health.wa.gov.au/Articles/A_E/Approved-wastewater-systems) *provides guidance on sourcing approved wastewater systems.*

## 4.2 Specific assessment SSE - Sizing for treatment system and land application area

A wastewater system should be designed and sized using conservative design inputs and site-specific information. The wastewater system hydraulic loading rates are prescribed in Regulation 29 and Schedule 9 of the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974* and further interpreted in the [Supplement to Regulation 29 and Schedule 9 - Wastewater system loading rates](https://ww2.health.wa.gov.au/Articles/S_T/Supplement-to-Regulation-29-and-Schedule-9-Wastewater-system-loading-rates). There is a [Wastewater Calculator](https://ww2.health.wa.gov.au/Articles/A_E/Apply-to-install-a-wastewater-system) on the DOH website which can assist in sizing wastewater systems.

Information provided in this section should include comments about:

* nature of the development (commercial/domestic/mix use)
* water usage
* wastewater and trade waste generation
* trade waste management
* sizing of treatment systems
* design, location and size of land application system (including trench length if applicable)
* daily application rates
* information about fill, if applicable

**Guidance:** *Details of commonly used methodologies for water balances are provided in the AS/NZS 1547:2012. These methods are offered as a guide on possible methods only; there is no single accepted methodology for water balances. All water balance calculations are simply estimates; they are not exact replications of what actually happens on a land application area. Small variations in the inputs to water balances can result in large differences in estimated land application area. A conservative approach should be used when undertaking water balances, to ensure the objectives of the relevant guidelines are met.*

### 4.2.1 Water Balance

A water balance for the operation of the wastewater system is required to be carried out on at least a monthly basis over a year to demonstrate that the system will be able to operate in a satisfactory manner throughout the year without producing excessive seepage to the water table or causing surface waterlogging and surface runoff from the site. The water balance will also be required to indicate whether a wet weather storage will be required to store wastewater during wet periods of the year and, if required, to determine the necessary capacity of the storage.

In simple terms, a water balance can be used to estimate irrigation area requirements based on climate and wastewater production. It is expressed as:

|  |  |  |
| --- | --- | --- |
| **INPUTS** | **=** | **OUTPUTS** |
| precipitation + applied wastewater | = | evapotranspiration + percolation + runoff |

Wet weather storage can also be factored into the general equation as follows:

INPUT – OUTPUT = STORAGE REQUIREMENT

**Guidance*:*** *A water balance can be carried out using the attached Water Balance excel spreadsheet. Table 7 describes the water balance parameters and how to apply them.*

### Table 7: Key Parameters of Water Balance Calculations

|  |  |
| --- | --- |
| Parameter | Discussion |
| Precipitation | refers to deposits of water, either in liquid or solid form that reach the earth from the atmosphere; it can include rain, sleet, snow, hail, dew and frost. In the WA climate, precipitation is in the form of rain and dew, and potentially frost in some desert areas. |
| Evapotranspiration | is the removal of water from soil by evaporation and by transpiration from plants. Monthly evapotranspiration is estimated to be a percentage of the monthly evaporation. This percentage is determined for a particular vegetation type by using a ‘crop factor’. Crop factors vary, depending on the type of plant being grown, the local soil conditions, the time of the year, and exposure of the site. Due to generally high year-round daytime temperatures in the WA, a crop factor of 0.8-1.0 would be appropriate for design purposes. |
| Percolation | is the movement of liquid downwards through the soil profile, beneath the root zone. A design percolation rate can be taken from AS/NZS1547:2012, depending on the soil type at the site. |
| Retained Rainfall | is the proportion of precipitation that is absorbed within the proposed land application area. This factor varies considerably with soil type; sandy soils will retain most or all water, while clay soils and thin soils will yield a high level of runoff. Slope also has an influence on runoff. The retained rainfall factor should be determined on a case by case basis from the results of the site and soil assessment. Australian Rainfall and Runoff (Pilgrim et al 1997 with current edition under review) provides useful information. |
| Wet Weather Storage | Refers to a discrete facility, commonly a tank, used to store effluent during and rainfall when the soil is too wet to accept any effluent (when effluent would run off instead of percolating through the profile). The volume of storage required for wet months can be determined by adding up the surplus hydraulic load for each month from a monthly water balance. Wet weather storage or off-site sewage management should be seriously considered for unsewered properties and subdivisions. |

**Guidance:** *In the southwestern part of the State, it is recommend to use the preliminary water-balance assessment outlined in* [*Appendix*](#_APPENDIX_4_-) *5 which indicates the number of months each year when rainfall exceeds the rate of pan-evaporation rate in the southern part of the State (elsewhere in WA, pan-evaporation typically exceeds monthly rainfall throughout the year except in the northern part of the Kimberley region).*

*Generally, onsite wastewater* *disposal should not take place during periods of the year when rainfall exceeds evaporation as there is a high risk that the wastewater will percolate through the soil profile to the water table, a* *wet weather storage should be considered.* *If wastewater cannot be applied to land for a significant portion of the year, then on-site wastewater management is not likely to be appropriate.*

## 4.3 Siting and Configuration of the Land Application Area

### 4.3.1 Setback Distances

Setback distances from wastewater system are required to help prevent human contact, maintain public amenity and protect sensitive environments. Indicate whether the proposed wastewater system can achieve the minimum required setback distances outlined in [Appendix 1](#_Appendix_1) and any other.

### 4.3.2 Stormwater Management

The need to provide diversion drains or other such structures to prevent stormwater running

into the LAA should be described here, and the location of any such structures should be shown on the site plan:

* *Terracing, diversion drains and cut off drains*
* *drainage management.*

**Guidance:** *Examples of slope mitigation measures like terracing, diversion drains and cut off drains are shown in* [*Appendix 4*](#_APPENDIX_4_–)*.*

**Attachments:**

* *a scaled and dimensioned site plan showing the location of the system, land application areas, buffer distances, cut off and diversion drains etc*
* *contours must also be included for land around the proposed system and land application area locations*
* *Water Balance calculation.*

# 5. MONITORING, OPERATION AND MAINTENANCE

*This section should only be used if the SSE identifies a specific type of system.* *General guidance should be provided on how to monitor, operate, and maintain all components of the on-site wastewater management system, including the treatment and land application systems for both of wastewater and trade waste.*

**Guidance:** *This section is to be used to outline the management of the land-soil unit constraints and the day to day operation of the onsite wastewater system where owner is the developer or where requirements can be incorporated as approval conditions and maintenance of the onsite wastewater system.*

*It should be written with the needs of the landowner in mind to assist them in fulfilling their obligations in terms of ongoing maintenance of the system and the site, system monitoring and service contracts.*

*You may include comments around what must be done in terms of:*

* *effluent quality treatment standards (eg primary, secondary, advance secondary as per AS1547)*
* Trade waste collection and management
* *land application area requirements*
* *the distribution system*
* *soil restoration (ie application of lime/gypsum or import of topsoil/permeable layer)*
* *buffer planting and management*
* *vegetation*
* *cut off drains*
* *outfall areas*
* *fencing*
* *servicing and maintenance requirements / schedules*
* *operational and maintenance manuals and troubleshooting procedures*
* *requirements around the submission of maintenance reports to LG*
* *contingency plan.*

*You may also like to include comments on the potential for, and what actions landowners could take in the event of:*

* *system failure and mechanical breakdown*
* *accidents*
* *operational breakdown; and*
* *maintenance breakdown.*

*You can also include the following specific recommendations:*

* *Have a suitably qualified maintenance contractor service the secondary and advanced secondary treatment system every three months, as required by Council under the approval to operate.*
* *Annual inspections should be undertaken on treatment tanks and desludging undertaken on annual, two yearly or four yearly cycles depending on the size of the tank installed.*
* *All land application systems should be sited in an area that will not be frequented by vehicle or foot traffic, or will not be built on or covered with paved over.*
* *Any subsurface irrigation areas should be vegetated (i.e. with grass that can be mown regularly) to encourage growth and maximise nutrient uptake.*
* *Irrigation lines should be maintained as per manufacturer’s instructions (e.g. flushing).*
* *Mound systems should be planted with grass to stabilise the soil, but deep rooted shrubs should be avoided. Grass should be cut regularly to promote growth.*
* *Stormwater and surface run-on should be diverted around, or away from, land application areas.*
* *Land owners should be cognisant of the operation of their system and monitor the treatment and land application area to identify any potential issues (e.g. insufficient septic treatment, clogging of the system, pooling of treated effluent).*
* *The volume of wastewater produced should remain the same and not exceed the operational capacity of the system, it will ensure the effective long term operation of the systems*
* *Chemicals, large quantities of cleaning products, fats, oils and grease, and food scraps should not be discharged to the wastewater treatment and disposal system, as they risk overloading or interfering with the functioning of the system.*

*For detailed information on the design, construction, operation and maintenance of the various systems,*

*refer to the manufactures instruction and the DOH system approval.*

# 6. CONCLUSION AND RECOMMENDATIONS

*It is important that the conclusion and recommendations discussion are written in plain English so*

*that an audience with a marginal soil science background will be able to understand and act*

*upon the recommendations. The relationship between the assessment and the recommended*

*solution must also be outlined and clearly explained in this section.*

*When system design is required, it is important that the system is designed on the most limiting factor and final sizing of the land application area is clearly nominated in this section of the SSE. An appropriate justification of the design procedure should be provided.*

# REFERENCES AND RELATED DOCUMENTS

Beard JS, Beeston GR, Harvey JM, Hopkins AJM, Shepherd DP (2013). The vegetation of Western Australia at the 1:3,000,000 scale. Explanatory memoir. Second edition. Conservation Science Western Australia 9, 1 pp.1–152, is available from <http://www.dpaw.wa.gov.au/cswajournal>

Department of Agriculture Western Australia (2003). [Evaporation Data for Western Australia. Resource Management Technical Report No. 65](https://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1058&context=rmtr).

Department of Environment and Conservation (NSW). 2004. Use of effluent by irrigation.

<https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/epa/effguide.pdf>

Department of Planning, Land and Heritage. [State Planning Policy 2.9 - Water resources and the Water Resources Guidelines](https://www.dplh.wa.gov.au/policy-and-legislation/state-planning-framework/state-planning-policies/state-planning-policy-2-9-water-resources)

Department of Planning, Land and Heritage. Government Sewerage Policy (2019)

<https://www.dplh.wa.gov.au/government-sewerage-policy>

Department of Water and Environmental Regulation. [Water quality Protection Note 25: Land use Compatibility Tables for Public Drinking Water Source Areas.](https://www.water.wa.gov.au/__data/assets/pdf_file/0014/1733/12441.pdf)

Health (Miscellaneous Provisions) Act 1911

<https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_412_homepage.html>

Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974

<https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_1581_homepage.html>

Standards Australia / Standards New Zealand (2012). AS/NZS 1547:2012 On-site Domestic wastewater Management.

WaterNSW (2019), [Designing and Installing On-Site Wastewater Systems](https://www.waternsw.com.au/__data/assets/pdf_file/0003/58251/Designing-and-Installing-On-Site-Wastewater-Systems-WaterNSW-CRP-2019.pdf)

Water resource mapping. Policy mapping is available online and can be viewed at [www.dplh.wa.gov.au](http://www.dplh.wa.gov.au).

# GLOSSARY AND DEFINITIONS

|  |  |
| --- | --- |
| Term/Abbreviation | Definition/Description |
| AS/NZS | Australian Standards/New Zealand Standards |
| DLR | Design Loading Rates |
| DIR | Design Irrigation Rate |
| DOH | Department of Health |
| DPLH | Department of Planning, Lands and Heritage |
| DWER | Department of Water and Environmental Regulation |
| Effluent | The liquid discharged from a wastewater treatment unit |
| Floodplain | The extend of flooding in an area in a one percent (1 in 100) Annual Exceedance Probability flood event for a particular waterway, which includes the floodway and flood fringe areas. |
| Groundwater | The area of an aquifer in which all pores and fractures are saturated with water. Also known as water in the phreatic zone. |
| GSP | Government Sewerage Policy 2019 |
| L | Litre |
| Land Application Area (LAA) | The unencumbered plan area to which treated sewage from an on-site sewage system is distributed for further in-soil treatment and absorption or evaporation. This area is restricted to the distribution of treated sewage. |
| Land Application System (LAS) | The system used to apply effluent from a wastewater treatment unit into or onto the soil for further in-soil treatment and absorption or evaporation |
| LG | Local Government |
| m | Metre |
| On-site wastewater system | A wastewater treatment and disposal or reuse system that receives treats and applies wastewater to a land application area located within the boundaries of the freehold lot or survey strata within which wastewater was generated.  |
| Primary treatment | The separation of suspended material from sewage in septic tanks, primary settling chambers, or other structures (including those which may be used to treat trade waste), before discharge to either a land application area or secondary treatment process. (For example, septic tanks with leach drains). |
| Priority areas | The Priority 1, 2, 3 and 3\* areas assigned by the Department of Water and Environmental Regulation to guide land use and management decisions. |
| Public drinking water source area (PDWSA) | Underground water pollution control areas, catchment areas and water reserves that are constituted under the Metropolitan Water Supply, Sewerage, and Drainage Act 1909 or the Country Areas Water Supply Act 1947. |
| Reticulated sewerage | A network of sewers and associated wastewater treatment plant managed by a sewerage service provider. |
| Secondary treatment | Microbiological digestion and physical settling and filtering processes and decomposition of sewage constituents following primary treatment |
| Secondary treatment system | A sewage treatment system which produces treated sewage of secondary standard equal to or less than, i.e. 20 mg/L of Biochemical Oxygen Demand (BOD), 30 mg/L of Total suspended solids (TSS) and 10 cfu/100 mL of Escherichia (E) coli (for example, an aerobic treatment unit). |
| Sewage | Any kind of sewage, faecal matter or urine, and any waste composed wholly or in part of liquid |
| Sewerage service provider | A person or entity that provides a sewerage service in accordance with the Water Services Act 2012. |
| Site and soil evaluation | An assessment of all relevant constraints and the risks to public health and the environment of an on-site sewage system in accordance with AS/NZS 1547 On-site domestic wastewater management. |
| SPP 2.9 | State Planning Policy 2.9 – Water Resources |
| Trade waste | Any wastewater, discharged from a business or industry, aside from that which comes from staff amenities or office facilities. |
| WAPC | The Western Australian Planning Commission |
| Wastewater | Is consistent to the definition of “sewage”, and does not include stormwater, surface water or ground water of a type that is ordinarily drained from land as part of the provision of a drainage service. This includes trade waste. |
| Water resources | Includes watercourses, waterways and their estuaries, inlets and floodplains, wetlands, groundwater, surface water, stormwater and drainage. A water resource includes all aspects of the water resource, including water, organisms and other components and ecosystems that contribute to the physical condition and ecological health of the water resource. |
| WWTP | Wastewater treatment plant |

# ATTACHMENTS

1. A copy of evaluator’s Professional Indemnity Insurance
2. Locality plan with indicative distances to water resources, sensitive areas and PDWSA
3. Fully dimensioned and accurately scaled plan of the proposal, including lots sizes, contours at a sufficient interval to justify your system design, the location of the proposed building envelope and other development works, wastewater management system components, physical site features, cut off drains and setback distances etc
4. Photographs of the site and soil test location including a log, GPS coordinates and site plan showing the location of soil sample sites.
5. Soil Bore Logs, cololur photo of each test site and a diagram of the soil profile from onsite test sites
6. Water Balance calculation.
7. Proposed onsite wastewater system design

# APPENDIX 1- Horizontal and vertical setback distances

|  |  |
| --- | --- |
| Site Feature | Setback Distance, m (m) |
| Horizontal setback distances |
| Treatment tanks to buildings, property boundaries, driveways, paths and other tanks | 1.2 |
| Tranches, beds and soak wells to boundary, building, tanks and other land application systems | 1.8 |
| Tranches, beds and soak wells to trafficable areas | 1.2 |
| Any land application system to wells, stream, private bores or underground source of water intended for human consumption | 30 |
| Tranches, beds and soak wells to subsoil drainage or open drainage channel (as per [Section 5.2.2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September) a separation of 100m is required if there is discharge into a waterway or significant wetland without treatment of the discharge) | 6.0 |
| Spray Irrigation:* Boundaries, buildings, driveways etc
* Sub-soil and open drain
* Swimming pool
* Treatment tanks
 | 1.86.03.01.2 |
| Subsurface Dripper:* Boundaries, buildings, treatment tanks, driveways etc
* Sub-soil and open drain
* Swimming pool
* Garden bore
 | 0.53.02.010.0 |
| On-site wastewater system to water resources (for more details refer to [Section 5.2.2 of the GSP](https://www.dplh.wa.gov.au/getmedia/27d85e1b-22d9-41b8-a72a-aa99f7b5d1e7/POL-Government_Sewerage_Policy_2019September)) | 100 |
| On-site wastewater system must not be located within any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event |
| Vertical setback distances |
| Discharge point of the on-site wastewater system to the highest known groundwater level:* PDWSA
* Sensitive water resource areas
* All other areas -
	+ Sands
	+ Gravels
	+ Loams and heavy soils
 | 2.01.51.51.00.6 |
| Hardpan or bedrock (depends on quality of treated wastewater and type of LAS) | 0.6-1.5 |

# APPENDIX 2 – Indicative Phosphorus Sorption Uptake Values for each soil type

|  |  |  |  |
| --- | --- | --- | --- |
| Soil Category | Texture | Structure | Acceptable Psorp (mg/kg) |
| 1  | Gravels and sands1  | Structureless  | 50  |
| 2a  | Sandy loams  | Weak  | 100  |
| 2b  | Sandy loams  | Massive  | 100  |
| 3a  | Loams  | High / moderate  | 200  |
| 3b  | Loams  | Weak / massive  | 200  |
| 4a  | Clay loams  | High / moderate  | 400  |
| 4b  | Clay loams  | Weak  | 400  |
| 4c  | Clay loams  | Massive  | 400  |
| 5a  | Light clays  | Strong  | 500  |
| 5b  | Light clays  | Moderate  | 500  |
| 5c  | Light clays  | Weak / massive  | 500  |
| 6a  | Med-heavy clays  | Strong  | 600  |
| 6b  | Med-heavy clays  | Moderate  | 600  |
| 6c  | Med-heavy clays  | Weak / massive  | 600  |

Source: WaterNSW (2019), [Designing and Installing On-Site Wastewater Systems](https://www.waternsw.com.au/__data/assets/pdf_file/0003/58251/Designing-and-Installing-On-Site-Wastewater-Systems-WaterNSW-CRP-2019.pdf)

Note 1: Some gravel and sands in Western Australia, for example Bassendean Sand prevalent on the Swan Coastal Plain, have zero or near zero capacity to adsorb phosphorus.

# APPENDIX 3 - Type of treatment and land application systems

**Type of treatment and land application systems available\***

|  |  |  |
| --- | --- | --- |
| Level of Treatment | Treatment System Examples | Land Application and Reuse System |
| Primary | * Septic tank
* Greywater diversion device
* Waterless composting toilet
* Composting toilet
 | * Subsurface absorption system
* Evapotranspiration beds
* Amended soil and mounds
* Burial (for composting toilets)
 |
| Secondary | * Aerated wastewater treatment system
* Greywater treatment system
 | * Subsurface irrigation
* Surface spray or drip irrigation
* Other disposal systems appropriate for primary treated effluent as above
 |
| Advance secondary | * Membrane system
* Greywater treatment with disinfection
* Secondary treatment with additional disinfection (UV, chlorination etc.)
 | * Restricted non-potable reuse (e.g. toilet flushing, outdoor use)
* Other disposal systems as above
 |

\*check the list of approved wastewater systems on [DOH website](https://ww2.health.wa.gov.au/Articles/A_E/Approved-wastewater-systems)

**Common land application systems (adapted from AS/NZS 1547:2012)**

|  |  |
| --- | --- |
| System | Considerations |
| ConventionalAbsorptionTrench and Beds | * Only requires primary effluent treatment
* Cheaper to install than other methods, and not influenced by climatic factors.
* Requires deep soil, generally > 1.5 m, above limiting layers (e.g. bedrock or seasonal water tables)
* Treatment by absorption trench may be impeded due to high % of coarse fragments
* Soil supplementation may be an option to improve absorptive capacity
* Sodic soils may lose permeability over life of system; larger trench lengths required
* Ideal for sites with little to no constraints in terms of soil depth, rock content, waterlogging, inundation or shallow water tables
 |
| Amended soil and Mounds | * Beneficial for shallow soils, high rock contents, or high water tables
* Requires an above-ground mound for effluent absorption that contains imported sand/soil
* Treatment will not be limited by soil absorption capacity, and less influenced by sodic soils as new soil can be imported.
* Not influenced by climatic factors
 |
| Subsurface Irrigation | * Secondary treatment is required prior to irrigation
* Suitable for areas of high exposure with high evaporation rates (limited during wet season)
* Suitable for sites with shallow soils
* Not suitable for areas that are seasonally inundated or waterlogged
* Sodic soils may lose permeability over life of system; but sodicity generally lower in surface soils than subsoils
* Can be hindered by high rock or gravel content
 |

# APPENDIX 4 – Examples of slope mitigation measures

|  |
| --- |
| **Terracing, diversion drains and cut off drains** |
|  |
|  |

|  |
| --- |
| Recommended reductions in DIR according to slope (adopted from Table M2 AS/NZS 1547:2012) |
| Slope | **Reduction in DIR** |
| Flat up to 10% | No reduction |
| 10% to 20% | 20% |
| 10% to 30% | 50% |
| >30% | Advice required from a suitably qualified and experienced person |

# APPENDIX 5 - Number of months each year when rainfall exceeds pan-evaporation in the southern part of WA.

This information was compiled using rainfall data from the Bureau of Meteorology, and pan-evaporation data from the Department of Agriculture and Food of WA.

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