

On-site Wastewater Management Training Course

Land Capability Assessment: Desktop Study

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Land Capability Assessment (LCA) or Site and Soil Evaluation (SSE)

- Identify and consider site-specific attributes significant in the selection, design, location and sizing of an OWMS
- Assess the capacity of the land to sustainably manage all wastewater within allotment boundaries (full containment)
- Quantify risk and gather relevant information to inform the design process and formulate a sustainable Wastewater Management Plan
- Assist Council make informed consent decisions

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Regulatory Framework

- The Environment Protection Act 2017 sets out requirements for reducing the risk of harm to the environment or human health from all activities (including domestic wastewater management) using:
 - Part 3.2 General Environmental Duty (GED), and
 - Part 7.3 Obligations for Managers of Land or Infrastructure (OMLI)

Infrastructure includes “wastewater treatment and septic tank systems”

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General Environmental Duty

- Commenced 1 July 2021 under EP Act 2017
- Businesses (and persons) are responsible for protecting the environment and human health
- Intended to reduce the risk of harm from activities:
 - to human health and the environment
 - from pollution or waste

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EP Regulations 2021

- Impose obligations for managers (Councils) relating to onsite wastewater management (OWM) systems (<5,000L/day)
- Council (A20) permit and condition the construction, installation, alteration and validation of OWM systems
- If required by Council, the permit application must be supported by a Land Capability Assessment

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LCA Definition

- Environmental Protection Regulations 2021 (EPR) defines LCA as:
“an assessment of the risks of harm to human health and the environment of the proposed or existing on-site wastewater management system at the site, taking into account the proposed or existing use of the system”
- Regulation 26(2)(e) lists a LCA as prescribed information for an A20 Permit application “if required by the council or Victorian Planning Provisions”

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Reference Materials

- Guideline for Onsite Wastewater Management (GOWM) (EPA, 2024)
- Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems (EDRS Guideline) (EPA, 2024)
- Code of Practice (CoP) – Onsite Wastewater Management, Publication 891.4 (superseded)
- Victorian Land Capability Assessment Framework (2nd Edition, MAV, DEPI & EPA 2014), or as amended

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Victorian LCA Framework

- Model LCA Report (MAV & DSE, 2006 as amended) Document and water balances from www.mav.asn.au
- Victorian Land Capability Assessment Framework (Word - 1.1MB)
- VLCAF irrigation area sizing spreadsheet (Excel – 42.0KB)
- VLCAF trench and bed sizing spreadsheet (Excel – 27.9KB)

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When is LCA required?

- Recommended for all unsewered development
- May not be required by Council if site is considered low risk or if adequate information is already available
- In many LGA's OWMP will inform 'risk' status of unsewered land
- Currently LCA is mandatory for unsewered development in Special Water Supply Catchment areas (Ministers Guideline: Policy 1); where dwelling density >1:40 ha or non-residential development proposed

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Who should undertake LCA?

- Must be completed by a person that Council considers is "suitably qualified and to a standard acceptable to the Council"
- Generally, a person who has appropriate technical expertise and experience in site and soil assessment and on-site wastewater design
- Councils may require written verification of qualifications, experience, professional membership and professional indemnity (PI) insurance

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Consultation and Review

- Consultation is the Key: early consultation between Council and the Assessor is vital in determining what is expected in the LCA, what special issues might apply in the area, or additional information available from Council
- Other matters:
 - planning or sensitivity overlays
 - utility / infrastructure plans
 - legal instruments (e.g. easements)
 - local OWM performance issues

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LCA Objectives


- To demonstrate the site has sufficient suitable area to:
 - Safely install the selected treatment system and effluent dispersal system (EDS), while
 - Achieving appropriate setbacks (buffers)
- To demonstrate the soil is appropriate and of sufficient depth to:
 - Install the preferred EDS, and
 - Treat the quantity and quality of effluent to be applied

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LCA Objectives


- The Site must have sufficient space for:
 - The onsite wastewater treatment plant
 - The effluent dispersal system, and
 - Appropriate separation distances (setbacks)
- Designs should aim to be:
 - Sustainable (long-term benefit)
 - Achievable (practically constructable)
 - Acceptable (Owner and Regulator)
 - Affordable (value for money)

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Level of Investigation


The guidance documents recommend different 'levels of investigation' depending on project intent, scale or stage of the planning process:

- **Subdivision or Rezoning** – focus on regional or site-wide implications of OWMS (soil characterisation, climate effects, system suitability, minimum lot sizes, natural feature buffers, cumulative impacts, wastewater servicing approach, planning considerations etc.)
- **Single-lot Development** – at this scale investigation will focus on site-specific attributes (site buffers, soil controls, drainage etc.), EAA soil suitability, optimising OWMS (treatment / application) options and considering construction and management issues

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Undertaking LCA

- Single-lot or subdivision/planning scheme changes
- Focus here is on single-lot LCAs
- Reporting based on Victorian Land Capability Assessment Framework (MAV, 2014) and Australian Standard AS/NZS1547:2012
- LCA assigns a level of constraint to each site and soil characteristic
- Should be undertaken "as early as possible in the project planning phase"

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LCA Framework procedure

- Site Details
- Desktop Assessment (focus of this session)
- Field Investigation (Site and Soil assessment) and Interpretation
- Constraint (Risk) Analysis
- OWMS (Treatment and EDS) Design
- Risk Mitigation
- Management and Maintenance
- Detailed Site Plans

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Desktop Study

- Undertaken in consultation with the Site owner
- Collate previously mapped information to develop a preliminary overview of the site (constraints map)
- Identify data gaps for further investigation
- Identify unsuitable site or soil conditions for OWM
- Target locations for soil boreholes or test pits
- Suitable first step for all levels of investigation for development, from rezoning, to subdivision, to individual lot design

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'Site' features to consider

- Aspect
- Climate
- Erosion and landslip
- Fill
- Flooding
- Groundwater
- Suitable land area
- Landform
- Rock outcrops
- Setback distances
- Site drainage
- Run-on and run-off
- Seepage
- Slope (%)
- Surface hydrology
- Vegetation and cover

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Level of Constraint

- EDRS Guideline (EPA, 2024) does not take a 'prescriptive' approach to assessing Site information
- The level of 'Limitation' for each characteristic must be interpreted by the LCA practitioner (assessor)
- AS/NZS 1547:2012 directs the user to take a systems approach to SSE, incorporating a range of information (research, empirical and anecdotal) to describe the appropriate level of constraint
- Other guidelines (e.g. VCLAF) have used a semi-quantitative approach to apply a hazard or constraint 'rating' to Site attributes

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Data of Interest

- Cadastre and planning mapping (lot boundaries, roads, land zoning and planning specifications)
- Topographic mapping (contours, landscape position, landform and surface hydrology)
- Imagery (aerial photos – current and historic)
- Geological and soil mapping (soil landscapes, soil test data)
- Groundwater resources (domestic and public supply bores and wells)

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Data of Interest

- Land use mapping (adjacent and regional context e.g. agriculture)
- Environmental overlays (flooding, bushfire, ecology and drinking water catchments)
- Location of services (water, electricity, gas etc.)
- Strategic Plans (development strategies, lot size requirements, backlog sewer areas etc.)
- Known OWMS limitations (poor soils, shallow rock or GW in locality)

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Additional Data

- Climate data (rainfall and evaporation) – 30 years
- Local knowledge OWMS limitations (poor soils, shallow rock, groundwater, seasonal inundation)
- Owner discussion:
 - Resourcing / capacity and understanding
 - Existing OWMS (capacity and operability)
 - Existing services or usage patterns, not mapped
 - Future-proofing or planning

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Council Resources

- Many Councils have their own GIS database containing cadastre and property information
- Some Councils will have layers for contours, flood, bushfire, planning, vegetation, assets
- Councils may link OWMS and development applications and approvals to property data
- You may be able to add / import data layers to the existing council managed GIS. Confirm parameters with your GIS support staff

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Maps and Spatial Data

- Department of Transport and Planning manage VicMap™ www.land.vic.gov.au/maps-and-spatial
- VicMap is government data source
- Data is viewable on Digital Twin Victoria
- Available to government, private industry and public
- Provides maps (topographic), spatial data and imagery (aerial, elevation)
- May have licencing costs for some services

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Site Imagery

Information sources include:

- Satellite imagery www.google.com/earth/
 - Free to download and activate
- Nearmap
 - Subscription service
- Provides information on location (latitude/longitude), elevation and has capacity for measurement and historical imagery
- Images can be rotated for different views (including Street View)

Example - Area of Interest



Topographic Maps

Can determine or identify:

- Cadastral boundaries
- Shape of land
- Drainage direction
- Water bodies and drainage lines
- Slope
- Relief (difference in elevation)
- Aspect (facing direction)

Example - Area of Interest



Slope Configuration

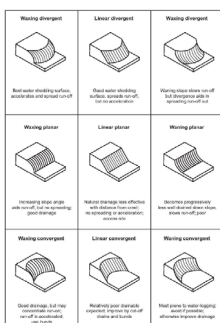


FIGURE C2 SLOPE CONFIGURATION AND SURFACE DRAINAGE

- Slope (gradient and shape)
- Important to understand how surface water will flow in or near LAA
- Waxing / waning / linear
- Converging or diverging

Interactive Spatial Data - National

- Geoscience Australia www.ga.gov.au
 - GA Portal – Geological, boreholes, minerals, ASRIS (soils), digital elevation
- Elvis – Elevation and Depth – Foundation Spatial Data elevation.fsd.org.au
 - Digital Elevation Model, Point Cloud and Bathymetry – used to generate contours
 - LIDAR data available to 0.5-1.0m resolution

Interactive Spatial Data - Victoria

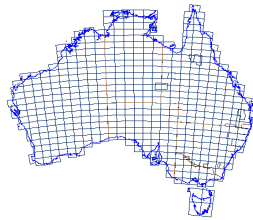
- Resources Victoria – GeoVic
resources.vic.gov.au/geology-exploration/maps-reports-data
 - Registered or anonymous user option
 - Geological, mineral, land-use, borehole and well data
- MapshareVic
www.mapshare.vic.gov.au/mapsharevic
 - Property data, SWSC, wetlands, contours

Interactive Spatial Data - Victoria

- Department of Transport and Planning – VicPlan
- www.mapshare.vic.gov.au/vicplan
 - Special Water Supply Catchment Areas
 - Planning (projects, zones)
 - Other (heritage, bushfire, contours)
 - Property (parcels, crown land, roads)

Geological Maps

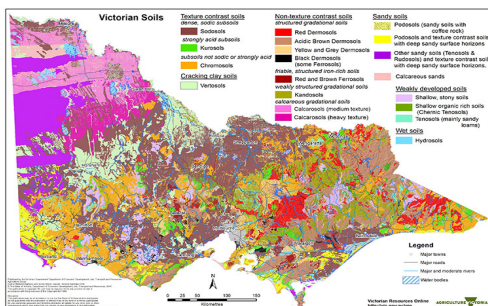
- Scanned 1:250,000 geological maps of much of Australia available from Geoscience Australia:
- www.geoscience.gov.au
- Geological maps of Victoria available from:
- <http://dpistore.efirst.com.au>



Soil Information Sources

- Atlas of Australian Resources, Volume 1 Soils and Land Use (Division of National Mapping, Canberra, 1980)
- Victorian Resources Online (VRO) soils maps and data from Agriculture Victoria
vro.agriculture.vic.gov.au
 - Generally 1:100,000 – 1:250,000 scale
 - Detailed 1:25,000 (irrigation regions)

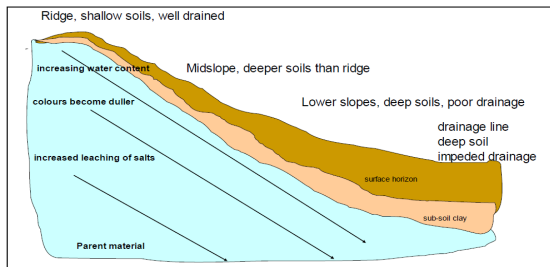
Soil Maps



Soil Spatial Data

- Australian Soil Resource Information System (ASRIS) - [retired in 2024](#)
 - Metadata and limited file access still available
- Australian National Soil Information System (ANSIS) - TERN soil and landscape grid (90m resolution)
<https://www.csiro.au/en/research/natural-environment/land/Soil/ANSIS>

Soil Properties and Topography



Position in landscape significant in soil profile characteristics

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Climate Data

- Bureau of Meteorology www.bom.gov.au
- Rainfall
- Evaporation
- Consider data range (years) and location suitability
- Compile local climate data into zones across the council area based on topography
- SILO data drill is available if no suitable or local station

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Rainfall and Evaporation Data

- Use to prepare a preliminary water balance

Site name: MELBOURNE AIRPORT		Site number: 096202		Commenced: 1970											
Latitude: 37° 57' S		Longitude: 144° 53' E		Elevation: 113 m											
		Operational status: Open													
Statistics		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years
Mean rainfall (mm)	41.4	38.6	36.0	45.3	39.7	39.7	35.0	41.6	41.2	55.7	63.4	61.0	626.2	56	1970-2006
Highest rainfall (mm)	156.4	205.6	142.2	141.6	155.5	126.0	94.4	91.1	127.0	146.0	158.0	138.0	620.8	96	1970-2006
Date	2001	2006	2001	1977	1974	2013	1987	1975	1993	2002	1988	1999	1970	96	1970-2006
Lowest rainfall (mm)	1.0	1.0	2.4	4.6	6.0	10.4	7.0	15.4	8.2	5.6	10.2	1.8	310.2	96	1970-2006
Date	2009	1991	2004	1989	2009	2009	1994	2011	2009	2007	2002	1979	1989	96	1970-2006
Decile 1 rainfall (mm)	9.1	5.0	10.9	13.4	13.2	14.5	12.4	20.5	18.8	21.3	25.5	13.7	96	96	1970-2006
Decile 5 (median) rainfall (mm)	40.0	24.2	30.0	38.0	38.8	35.6	34.2	40.6	40.2	43.9	52.9	43.1	96	96	1970-2006
Decile 9 rainfall (mm)	89.9	91.6	69.8	60.3	61.4	63.4	60.0	69.0	76.8	110.7	115.0	94.0	96	96	1970-2006
Highest daily rainfall (mm)	68.6	138.8	98.2	124.4	124.4	78.8	44.8	37.0	68.8	78.8	68.8	79.4	138.8	96	1970-2006
Date	06/01/1992	10/12/2001	23/04/1997	16/04/1977	01/04/2012	20/07/2007	07/04/1987	29/04/1987	16/01/1987	16/01/1987	27/04/1987	03/12/1987	06/01/1992	96	1970-2006
Mean number of days of rain	8.2	6.8	8.9	10.2	12.4	13.4	13.9	11.4	13.9	13.3	11.8	9.6	137.8	96	1970-2006
Mean number of days of rain > 1 mm	5.0	4.1	5.5	6.4	7.5	8.2	8.1	8.6	8.9	8.8	7.9	6.1	86.1	96	1970-2006
Mean number of days of rain > 10 mm	1.4	1.0	1.0	1.2	0.9	0.7	0.5	0.8	1.0	1.5	1.6	1.5	13.3	96	1970-2006
Mean number of days of rain > 25 mm	0.3	0.3	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.2	0.4	0.4	2.6	96	1970-2006
Mean daily evaporation (mm)	8.1	7.1	5.7	3.9	2.5	1.8	2.0	2.8	4.0	5.2	6.0	7.4	4.7	21	1989-2005

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SILO Data Drill

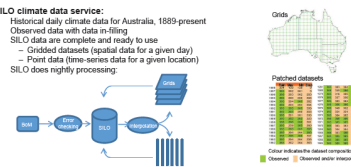
- QLD DNR www.longpaddock.qld.gov.au/silo/

SILO Climate data online resource

SILO (Scientific Information for Land Owners) is a Queensland Government database containing point and gridded daily climate data for Australia from 1889 until present. SILO was designed to serve the needs of agricultural and hydrological modelling and bridges the gap between meteorological services and modellers. SILO provides daily point and spatially interpolated data with continuous (no missing days) datasets covering the period of 1889 until present. Consistent long-term climate data-series supports various modelling efforts within the Australian environmental sciences community.

SILO climate data service:

- Historical daily climate data for Australia, 1889-present
- Observed data with data in-filling
- SILO data are complete and ready to use
 - Gridded datasets (spatial data for a given day)
 - Point data (time-series data for a given location)
- SILO does nightly processing



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Groundwater Resources

- Visualising Victoria's Groundwater www.vvg.org.au
 - Groundwater bores, mineral bores, depth of watertable, drill a virtual bore
 - Other (EPA audit reports and registered sites, wetlands, ecosystems, elevation, geology, SWSCA, CMA)
- DELWP Water Measurement Information System (WMIS) www.data.water.vic.gov.au
 - Surface water, groundwater, state bores

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Groundwater Mapping

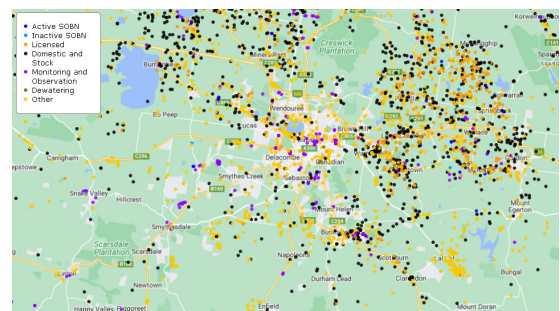


Image: DELWP (GW bores Ballarat)

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Flood Information

- Melbourne Water
- Local Flood Planning Overlays (SBO, LSIO, FO and UFZ)
- Local Catchment Management Authority
- Australian Flood Risk Information Portal – Geoscience Australia
afrip.ga.gov.au/flood-study-web/#/search
 - Pins and data on flood studies and sources

Other Resources

- Hydrological maps (waterways)
- Vegetation maps
- Bushfire maps
- Special Water Supply Catchment maps
- Maps of services (water, sewer)
- Local studies
- Council planning documents

Utility / Services Search

- Before You Dig Australia
www.byda.com.au
- Asset location referral service
- Interactive map to order asset plans
- Protection of people and assets
- Certified locator database (Telstra)

Desktop Summary

- Tabulate data
- Assessment or rating – assign Level of 'limitation' for OWMS
 - Design on most limiting feature/s,
 - Engineer out limiting features, or
 - Provide mitigation to address limitation
- Designs should aim to reduce all Site limitations to 'low' or 'minor'

Constraint Matrix

Constraint Feature	Site Characteristics				
	Low	Moderate	High	Applicable	
Lot Area	>10ha	5-10ha	2-5ha	0.4-2ha	<0.4ha
Aspect	North facing, high wind / sun exposure, no shading	Minor shading	Open, restricted sun / wind exposure	Persistent shading	South facing, low sun/wind exposure, heavy shading
Climate	Excess of evaporation over rainfall in the wettest months	Rainfall approximately to evaporation	Excess of rainfall over evaporation in the wettest months	Rainfall exceeds evaporation for five (5) months of the year (May – September)	
Flooding	Above 1% AEP Flood level	1-5% AEP Flood level	Below 5% AEP Flood level	Above 1% AEP	
Proximity to watercourse	Setback distance complies with the requirements of Table 4-10 of GOWM (2024)	60m-100m, >100m (drinking supply)	Setback distance does not comply with the requirements of Table 4-10 of GOWM (2024)	Setbacks achieved	
Slope	ABS / SI <5%	6-10%	>10%	<4% SSI/CSDI	
Landform	Creeps, outward draining and convex	Side slopes, linear	10-20%	Drainage plains, inward draining and concave	Relatively flat, no discernible landform with minimal water shedding
Depth to seasonal watertable	>5m	2-5m	1.2-2m	0.9-1.2m	<0.9m
Rock and outcrop	NI	10-20%		>50%	NI

Setbacks (or Buffers)

- Provide mitigation against unidentified or unintended hazards
- Reduce potential pathways for human and environmental exposure
- Valuable and cost-effective risk management strategy for OWMS
- Table 4-10 in the GOWM (Tier 1) defines conservative minimum setback distances based on level of treatment (primary, secondary etc.)

Risk-based Setbacks

- Risk-based setback selection based on procedure described in AS/NZS 1547:2012 (Appendix R)
 - Assess local constraints (site, soil and system) to ensure protection of public health, the environment and amenity
 - Allow a reduction in setback distance related to the mitigation of risk
- Described as Tier 2 approach in the EDRS (EPA, 2024), Section 4.5
- Table 24 (EDRS) sets out 'ranges' for individual constraint items associated with relevant site / system features

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AS/NZS 1547:2012 Buffers

TABLE 24
GUIDELINES FOR HORIZONTAL AND VERTICAL SETBACK DISTANCES
(to be used in conjunction with Table 10)

Site feature	Setback distance range (m) (see Note 1)	Site constraint items of specific concern (see Note 2)
Property boundary	1.5 – 30 (see Note 2)	A, D, J
Buildings/houses	0.5 – 5 (see Note 2)	A, D, J
Surface water (see Note 3)	10 – 100	A, B, C, E, H, I, J
Born, well (see Notes 3 and 4)	10 – 50	A, C, F, L
Recreational areas (children's play areas, swimming pools and so on) (see Note 2)	3 – 15 (see Note 3 and 4)	A, E, J
In-ground water tank	4 – 15 (see Note 10)	A, E, J
Retaining wall and excavated areas, enclosures, cottages (see Note 11)	0.5 to 20' angle (see Note 12 and 13)	D, G, H
Groundwater (see Notes 5, 6, and 10)	0.5 to 1.5	A, C, F, H, L
Reservoir or setback	0.5 to 1.5	A, C, J

TABLE 25
SITE CONSTRAINT SCALE FOR DETERMINATION OF SETBACK DISTANCES
(used in conjunction with Table 10)

Site feature	Constraint Scale	Constraint Scale (see Note 1)	Constraint Scale (see Note 2)
A	Effluent quality (with disinfection and contractual service agreement)	Secondary treated effluent. No disinfection and/or irregular servicing	Primary treated effluent
B	Surface water pollution hazard	Category 1 to 3 soils no surface water down gradient within 100m; low rainfall area	Category 4 to 6 soils permanent surface water <50m down gradient; high rainfall; high resource/environmental value
C	Slope	0-6% (surface effluent application) 0-10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
D	Fall direction	Downgradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
E	Drainage	No visible signs of saturation	Visible seepage; moisture tolerant vegetation; low lying area
F	Flood Potential	Above 1 in 20-year flood contour	Below 1 in 20-year flood contour
G	Application Method	Subsurface or subsoil application	Surface/above ground application

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Risk-based Setback - example

Constraint Item	Constraint Scale	
	Low Risk	High Risk
Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
Surface water pollution hazard	Category 1 to 3 soils no surface water down gradient within 100m; low rainfall area	Category 4 to 6 soils permanent surface water <50m down gradient; high rainfall; high resource/environmental value
Slope	0-6% (surface effluent application) 0-10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
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Risk-based Setback - example

Constraint Item	Constraint Scale		
	Low Risk	Moderate Risk	High Risk
Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Secondary treated effluent. No disinfection and/or irregular servicing	Primary treated effluent
Surface water pollution hazard	Category 1 to 3 soils no surface water down gradient within 100m; low rainfall area	Category 1 to 6 no surface water down gradient within 50m; moderate rainfall area	Category 4 to 6 soils permanent surface water <50m down gradient; high rainfall; high resource/environmental value
Slope	0-6% (surface effluent application) 0-10% (subsurface effluent application)	7-10% (surface application) 10-30% (subsurface application)	>10% (surface effluent application) >30% (subsurface effluent application)
Fall direction	Downgradient of surface water body, property boundary, recreational area	Cross-gradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
Drainage	No visible signs of saturation	Misting noted in subsoil with no signs of surface saturation	Visible seepage; moisture tolerant vegetation; low lying area
Flood Potential	Above 1 in 20-year flood contour	—	Below 1 in 20-year flood contour
Application Method	Subsurface or subsoil application	—	Surface/above ground application

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Risk-based Setback - example

Constraint Item	Constraint Scale		
	Low Risk	Moderate Risk	High Risk
Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Secondary treated effluent. No disinfection and/or irregular servicing	Primary treated effluent
Surface water pollution hazard	Category 1 to 3 soils no surface water down gradient within 100m; low rainfall area	Category 1 to 6 no surface water down gradient within 50m; moderate rainfall area	Category 4 to 6 soils permanent surface water <50m down gradient; high rainfall; high resource/environmental value
Slope	0-6% (surface effluent application) 0-10% (subsurface effluent application)	7-10% (surface application) 10-30% (subsurface application)	>10% (surface effluent application) >30% (subsurface effluent application)
Fall direction	Downgradient of surface water body, property boundary, recreational area	Cross-gradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
Drainage	No visible signs of saturation	Misting noted in subsoil with no signs of surface saturation	Visible seepage; moisture tolerant vegetation; low lying area
Flood Potential	Above 1 in 20-year flood contour	—	Below 1 in 20-year flood contour
Application Method	Subsurface or subsoil application	—	Surface/above ground application

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Preliminary Constraints Mapping

- Undertaken in advance of, and to prepare for, field study
- Guides field study
- Identifies data gaps to be filled by field study
- Most importantly, saves time and money

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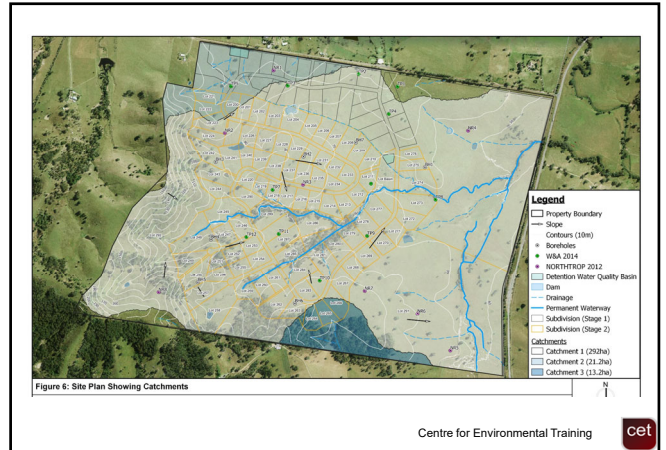
Into the Field We Go.....

Desktop Study – will have identified potentially suitable effluent land application area (LAA) from available sources

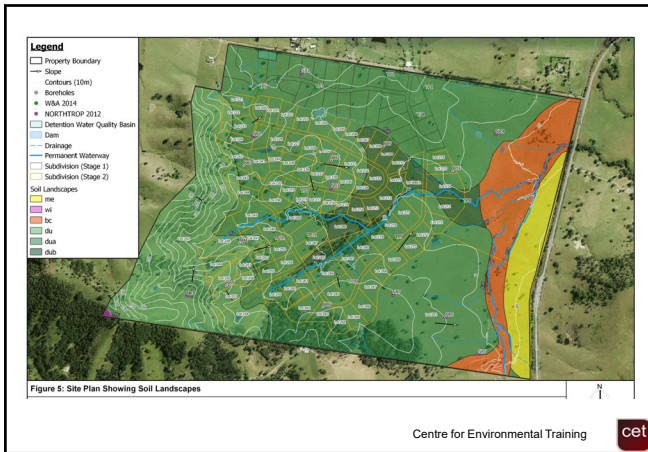
A preliminary constraints map will also identify:

- Appropriate setback areas from natural or built features (existing and proposed)
- Identified physical constraints (e.g. bedrock, fill)
- Data gaps (areas for investigation)
- Regional soil landscapes (including boundaries)
- Recommended soil (test pit/bore) locations
- Indicative groundwater depth

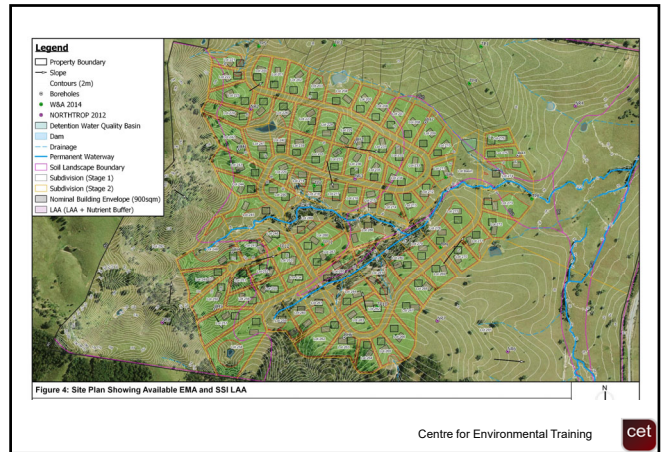
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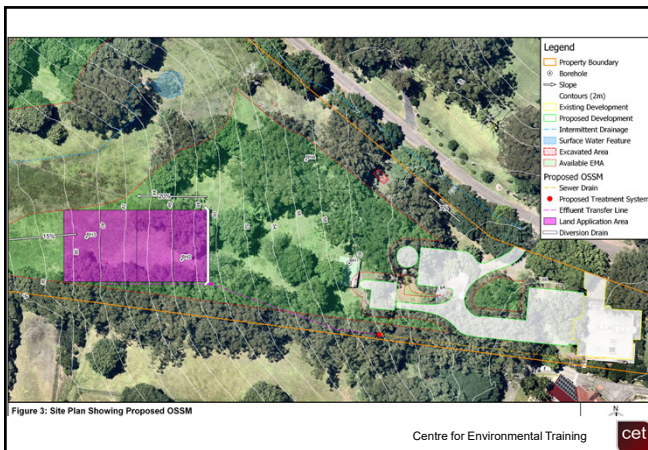
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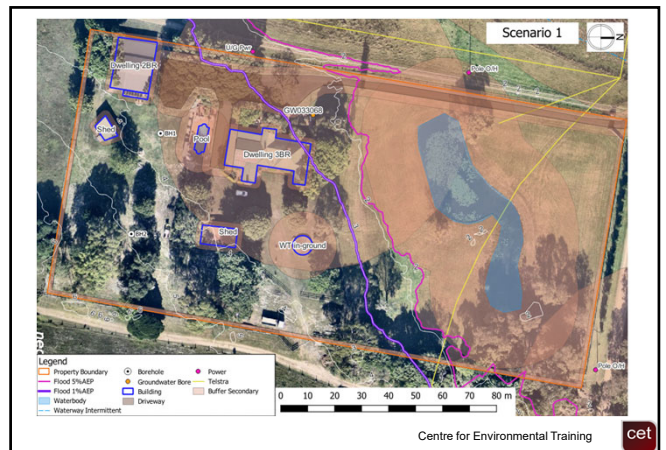
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