LAND CAPABILITY ASSESSMENT TEMPLATE FOR

HIGH RISK SITES

AND

SITES WITHIN A DECLARED WATER SUPPLY CATCHMENT AREA

This template is only to be used if the site is rated as being high risk after you have used Council's Risk Calculator **OR** for a site located within a Declared Special Water Supply Catchment. It is based on the EPA Code of Practice – Onsite Wastewater Management 2013.

The purpose of this template is to streamline the application process by identifying Council's minimum standards for an LCA in a high risk area and to achieve a greater consistency in assessment standards.

Please provide as much detail and information as possible. You may also wish to present information in a different way.

ADDRESS:

CLIENT:

PROPOSAL:

PREPARED BY:

REPORT REFERENCE NUMBER:

DATE:

1. SUMMARY OF FINDINGS AND RECOMMENDATIONS

Please start with defining the purpose of the land capability assessment, that is:

- *Have you been asked to identify the general classification of system appropriate for the proposed development/subdivision (eg a traditional septic with trenches or an AWTS;* ***OR***
- *Does this assessment identify a particular brand of system and therefore provides detailed design specifications and management recommendations.*

Provide an overview of the proposal, the findings of your investigations, key challenges, your recommendations for system type and design and key management plan/soil renovation recommendations.

2. SITE AND DEVELOPMENT OVERVIEW

Include a description of the location of the site, its zoning under the Strathbogie Planning Scheme, lot size and overall general physical characteristics (including presence/location of waterways, vegetation cover, existing development etc).

Outline the proposal ie is it a subdivision of land, an extension to an existing dwelling or the construction of a new dwelling.

Handy Hint No 1: *Make sure you outline the overall size of dwelling, number of bedrooms, number of bathrooms, setbacks from property boundaries, proposed outbuildings and the location of hard surfaced areas. If the proposal is a subdivision of land please include proposed lot sizes, the number of lots, proposed building envelopes (if any).*

Also include a description of overall general physical characteristics such as location of waterways (including ephemeral waterways), direction of surface flows, vegetation cover, location of bores and note nearby groundwater levels if available.

Attachments:

- *a fully dimensioned and accurately scaled plan of the proposal*
- *a full feature survey of the site*
- *photographs of the site and proposed system/dispersal area locations.*

3. INVESTIGATION METHOD

Outline how you went about preparing the land capability assessment, including any meetings with council or the landowner, desktop analysis and site inspection details and activities, water and nutrient balance tests etc.

Attachments:

- *Include a log, GPS coordinates and site plan showing the location of soil sample sites.*

4. DESKTOP REVIEW AND SITE INSPECTION FINDINGS

Provide a description of the key findings, which must include all of the following sections plus any additional data you believe is relevant.

4.1 Rainfall & Evaporation Data for the Locality

Complete Table 1.

Handy Hint No. 2: *Links to weather stations within the Shire are available from Council's website.*

Table 1 Redistribution of Rainfall

Rainfall to be redistributed (9th decile)								mm / yr				
Minimum mean rainfall								mm				
9th decile (annual) – mean rainfall (annual)								mm				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Deviation from minimum mean (mm)												
Redistributed rainfall (mm)*												

* The distribution is adjusted in proportion to the deviation of means from the minimum mean.

Complete Table 2.

Table 2 Weather Station and Rainfall Details

Weather Station:							**Number:**						
Data timeframe:				**Latitude:**			**Longitude:**			**Elevation:**			
Statistic	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Mean													
Lowest													
5th %ile													
10th %ile													
Median													
90th %ile													
95th %ile													
Highest													

Handy Hint No. 3: *Links to weather stations within the Shire are available from Council's website.*

4.2 Slope and Aspect
Insert a summary.

4.3 Slope Stability
Insert a summary.

4.4 Surface Drainage

Include information about distances to nearest waterways, including ephemeral waterways and direction of surface flows in relation to the proposed effluent disposal area.

Handy Hint No. 4: *Contours, waterways and drainage lines must be clearly shown on the site and system design plans. Photos of key features and the proposed location of the system should also be included as attachments.*

4.5 Existing Vegetation
Insert a summary.

4.6 Groundwater

Identify if there are any groundwater bores on, or in the vicinity of, the site. The on-site assessment needs to seek out by observation any bores within and near the proposed dispersal area as not all bores will be registered. Determine from the Victorian Groundwater Database the groundwater level in the locality, if data for the locality is available, using http://maps.ubspatial.com.au/vvg.php).

4.7 Soil Unit Types

Insert a written summary. Identify soil types as per AS1547:2012 and Table 9 of the EPA's Code of Practice (click on the following link http://www.epa.vic.gov.au/~/media/Publications/891%203.pdf). Bore samples should be to a minimum depth of 1.4 metres.

4.8 Subsurface Soil Profile

Provide an explanation of the soil horizon types, structures, pH and electrical conductivity, along with any other relevant details. Bore samples should be to a minimum depth of 1.4 metres.

4.9 Soil Permeability

Outline of findings including the depth of test holes, hydraulic testing results and other relevant details.

Complete Table 3.

Table 3 Determination of Saturated Hydraulic Conductivity (Ksat) Land-Soil Unit (Insert)

Hole No.	Depth (cm)	Radius (cm)	Depth to rock (cm)	Head (cm)	Q (cm^3 / min)	Ksat (m / day)
Geometric Mean:						

4.10 Basement Permeability (ie the layer below the soil profile)

Provide an assessment of basement permeability with particular reference to buffer distances.

4.11 Colloid Stability

Outline results of Emerson Crumb Tests, Dispersion Index tests and observations.

4.12 Soil Classification

Identify the classification of the soil type using the categories referenced in Table 9 of the EPA's Code of Practice (refer to page 49 using the following link http://www.epa.vic.gov.au/~/media/Publications/891%203.pdf).

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:

- *a diagram of the soil profile from onsite test sites*
- *colour photos of the bore test samples.*

4.13 Nutrient Attenuation

Provide a description of the water/nutrient balance results, concluding with the recommended area required for wastewater dispersal and the daily application rate of effluent.

4.14 Wastewater Generation Calculation

Include calculations of the anticipated volumes of wastewater that are likely to be generated from the proposed development, ensuring that any rooms that could be used as a bedroom (eg a study) are included.

Handy Hint No. 5: *the standard EPA design calculation of* ***Number of Bedrooms + 1 x 150 litres per bedroom*** *must be used unless you have included a rationale and detailed design to justify a reduction in wastewater volumes.*

(Note: the 150 litres per bedroom figure is to be used due to the high rainfall rates in the Shire, the fact that around 50% of dwellings are not permanent residences and the need for systems to be designed to cope with peak daily flows).

Complete Table 4.

Table 4 Water Nutrient Balance

ITEM	UNIT	#	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Days in month		D	31	28	31	30	31	30	31	31	30	31	30	31	365
Evaporation (mean)	mm	A													
Rainfall (90th percentile wet year adjusted)	mm	B1													
Effective rainfall	mm	B2													
Peak seepage loss* (ie deep seepage plus lateral flow)	mm	B3													
Evapotranspiration	mm	C1													
Waste Loading (C1 + B3 – B2)	mm	C2													
Net evaporation from lagoons (10 (0.8 A – B1 x lagoon area in ha)))	litres	NL													
Volume of wastewater	lt	E													
Total irrigation water (E – NL) – G	mm	F													
Irrigation area (E / C2) Annual	m^2	G													
Storage / Surcharge	mm	H													
Actual seepage loss	mm	J													
Direct crop coefficient		I													
Rainfall retained	%	K	* Seepage loss (peak) equals deep seepage plus lateral flow: 6mm (<12% ksat after renovation)												
Lagoon area	ha	L													
			Crop Factor												
Wastewater (irrigation)	l	M	0.7	0.7	0.7	0.6	0.5	0.45	0.4	0.45	0.55	0.65	0.7	0.7	Pasture
Seepage loss (peak)	mm	N	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	Shade
Irrigation Area (no storage)	m^2	P2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	Fescue.
Application rate	mm	Q	1	1	1	1	1	1	1	1	1	1	1	1	Woodlot
Nitrogen in effluent	mg/l	R	**Nitrogen Uptake**												
Denitrification rate	%	S			Species	kg/ha/y	pH	Species	kg/ha/y	pH	Species	kg/ha/y	pH		
Plant uptake	kg/ha/y	T			Ryegrass	200	5.6 – 8.5	Bent grass	170	5.6 – 6.9	Grapes	200	6.1 – 7.9		
Average daily seepage	mm	U			Eucalyptus	90	5.6 – 6.9	Couch grass	280	6.1 – 6.9	Lemons	90	6.1 – 6.9		
Annual nitrogen load	Kg/y	V			Lucerne	220	6.1 – 7.9	Clover	180	6.1 – 6.9	C cunn'a	220	6.1 – 7.9		
Area for nitrogen uptake	m^2	W			Tall fescue	150 – 320	6.1 – 6.9	Buffalo (soft)	280	6.1 – 6.9	P radiata	150	5.6 – 6.9		
Application rate	mm	X			Rye/clover	220	6.1 – 6.9	Sorghum	90	5.6 – 6.9	Poplars	115	5.6 – 6.5		
LAA (for slope 10 – 20%)	mm	Ø	= LAA (hydraulic x 1.2)												
Design application rate	mm	Ø1													

5. LAND CAPABILITY ASSESSMENT

Complete Table 5.

Table 5 Land Capability Assessment

LAND	LAND CAPABILITY RISK RATING				AMELIORATIVE MEASURES & RISK REDUCTION
FEATURE	**LOW**	**MEDIUM**	**HIGH**	**LIMITING / UNSUITABLE**	
Available land for LAA	Exceeds LAA and duplicate LAA requirements	Meets LAA and duplicate LAA requirements	Meets LAA and partial duplicate LAA requirements	Insufficient LAA area	
Aspect	North, north-east or north-west	East, west, or south-west	South or south-east	South – full shade	
Exposure	Full sun and / or high wind or minimal shading	Partial shade	Limited light, little wind, heavily shaded area	Perpetual shade	
Slope Form	Convex or divergent side slopes	Straight sided slopes	Concave or convergent side slopes	Locally depressed	
Slope Gradient Trenches & beds	< 5%	5 – 10%	10 – 15%	> 15%	
Slope Gradient Subsurface Irrigation	< 10%	10 – 30%	30 – 40%	> 40%	
Site drainage Run off / run on	LAA backs onto crest or ridge	Moderate likelihood	High likelihood	Cut off drain not possible	
Landslip *	Potential	Potential	Potential	Existing	
Erosion Potential	Low	Moderate	High	No practical amelioration	
Flood / inundation	Never	< 1 AEP	5%AEP	> 5% AEP	
Distance to surface waters (m)	Buffer distances exceeds all Code requirements	Buffer distances complies with all Code requirements	Buffer distances do not comply with all/some Code requirements	< 40 m	***Please list the setback distances that fail to comply with Code of Practice requirements in this column***
Distance to groundwater bores (m)	No bores on site or within a significant distance	Buffer distances comply with the Code	Buffer distances do not comply with the Code	No suitable treatment method	
Vegetation	Plentiful / healthy vegetation	Moderate vegetation	Sparse or limited vegetation	Propagation not possible	
Depth to water table (potentiometric) (m)	> 2 m	2 – 1.5 m	1.5 m	1.5 m - Surface	
Depth to water table (seasonal parched) (m)	> 1.5 m	< 0.5 m	0.5 – 1.5 m	0.5m - Surface	
Rainfall ** (9th decile) (mm)	< 500 mm	500 – 750 mm	750 – 1000 mm	> 1000 mm	
Pan evaporation (mean) (mm)	1250 – 1500 mm	1000 – 1250 mm	750 – 1000 mm	< 750 mm	
SOIL PROFILE CHARACTERISTICS					
Structure	High or moderately structured	Weakly structured	Structureless, massive or hardpan		
Fill materials	Nil or mapped good quality topsoil	Mapped variable depth and quality materials	Variable quality and / or uncontrolled filling	Uncontrolled poor quality / unsuitable filling	
THICKNESS OF SOIL (M) AT THE LOCATION OF:					
Trenches & beds	> 1.4 m	>1.4m	< 1.4 m	< 1.2 m	
Subsurface irrigation	> 1.5 m	1 – 1.5 m	0.75 m	< 0.75 m	
PERMEABILITY					
Permeability *** (limiting horizon) (m / day)	0.15 – 0.3	0.03 – 0.15 0.3 – 0.6	0.01 – 0.03 0.6 – 3.0	> 3.0 < 0.03	
Permeability **** (buffer evaluation) (m / day)	< 0.3	0.3 – 3	3 – 5	> 5	

* Landslip assessment is based on proposed hydraulic loading, slope, profile characteristics and past/present land use

** 9th decile monthly rainfalls used in water balance analyses

*** Saturated hydraulic conductivity measured in situ

**** Saturated hydraulic conductivity estimated from AS/NZS 1547:2012 and data base.

5.1 Calculation of the Edis Algorithm

Complete Table 6, then calculate the risk value using the Edis algorithm, as outlined below.

Table 6 Major Factors Influencing the Likelihood of Consequential Impacts of Primary Onsite Wastewater Management Systems

(Source – Approaches for Risk Analysis of Development with Onsite Wastewater Disposal in Open, Potable Water Supply Catchments (Dr Robert Edis, April 2014)

LAND FEATURE	LAND CAPABILITY RISK RATING				COMMENTS
	LOW (Rating of 1)	MEDIUM (Rating of 2)	HIGH (Rating of 3)	RISK RATING	
R res Distance to reservoir (km)	> 15 km	2 – 15 km	< 2 km		
R soil Soil type rating (from Appendix C of the Edis Report available from Council's website)	1	2	3		
R riv Distance to River (m)	> 80 m	40 – 80 m	< 40 m		
R str Distance to Stream (m)	> 80 m	40 – 80 m	< 40 m		
R drain Distance to Drain (m)	> 40 m	10 – 40 m	< 10 m		
R lot Lot size (ha)	> 10 ha	2 – 10 ha	0.2 – 2 ha		
R LCA LCA rating (from Table 5 above)	1 – 2	3	4 – 5		
R fail System fail rate (%)	< 5 %	5 – 10 %	> 10%		
R dens Density (dwellings/km^2)	< 20	20 – 40	> 40		

Low Risk = Rn of < 2.5
Medium Risk = Rn of 2.5 – 5
High Risk = Rn of > 5

Rn = ((R res + R soil) x (R riv + R str + R drain + R lot) + (2 x R LCA) + (3 x R fail x R den)) / 10

The risk rating is ……

5.2 Risk Management & Mitigation Measures

Provide a summary of any limiting and high risk factors identified in Tables 5 and 6.

6. SYSTEM TYPE AND DESIGN

Handy Hint No. 6: *the level of detail you provide in this section will vary depending on the purpose of the LCA – that is whether it is an overall assessment to identify the type of system required or if you have been asked to identify the exact model of system to be used.*

Outline:

- *how the system selection and general design parameters address the findings in Table 1, focusing on limiting and/or high risk factors;*
- *how onsite system treatment complies with EPA Code of Practice Standards, or if these standards are not met how your design mitigates risks arising from the non compliances; and*
- *what management strategies are in place to ensure ongoing compliance with the COP.*

Include the design loading results as per Table 9 of the EPA Code of Practice (refer to page 49 of the document, which can be accessed by clicking on this link http://www.epa.vic.gov.au/~/media/Publications/891%203.pdf).

Information provided in this section should include comments about:

- *water usage*
- *selection of system/standard of treatment required*
- *sizing of treatment systems*
- *load balancing*
- *zoned dosing (include projected nitrogen uptake rates)*
- *design and location of disposal field (including trench length if applicable)*
- *daily application rates*
- *size of land application areas*
- *reserve areas*
- *buffer distances*
- *cut off drains.*

Attachments:

- *a scaled and dimensioned site plan showing the location of the system, irrigation areas, cut off drains and buffer distances etc*
- *contours must also be included.*

7. OWNER'S INFORMATION - SYSTEM MANAGEMENT AND MAINTENANCE

Handy Hint No. 7: *This section should only be used if the LCA identifies a specific type of system.*

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 Permit 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 is it 20/30 standard)*
- *land application area requirements*
- *the distribution system*
- *soil renovation (ie application of gypsum/lime or import of topsoil)*

- *buffer planting and management*
- *vegetation*
- *cut off drains*
- *outfall areas*
- *fencing*
- *servicing and maintenance requirements / schedules*
- *requirements around the submission of maintenance reports to Council.*

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.*

8. ASSESSOR'S QUALIFICATIONS AND INSURANCE DETAILS

Please outline the qualifications that enable you to prepare a land capability assessment and details of insurances.

9. ATTACHMENTS