On-site Wastewater Management Training Course

Site and Soil Assessment in the Tasmanian Context

Land Capability Assessment Site and Soil Assessment

Aim:

- To identify landscape and soil characteristics that are significant in the selection, location and sizing of an on-site wastewater management system

Site and Soil Characteristics

- The site must have sufficient space for:
  - The treatment system
  - The land application system, and
  - Appropriate buffers
- The soil must be appropriate and of sufficient depth to accept and further treat the quantity and quality of effluent to be discharged

Land Capability

- Defines biogeophysical capacity of land to support a given land use
- Land suitability introduces an economic consideration
- Designs should aim to be both:
  - Sustainable
  - Affordable

Land Capability Classification

- Groups soils into units according to their suitability for particular usage
- Often developed by State agencies for agriculture but commonly not available for on-site wastewater management suitability
- Can be developed for individual regions, catchments etc. using GIS

Land Capability Assessment

- Some Australian states (eg NSW, Vic.) provide guidelines to landscape and soil characteristics that should be considered in on-site wastewater investigations. Tasmania has none now, but in the late 1980s we worked with the *Code of Practice: Site Assessment for Septic Tank Absorption Trenches*, and a decade later, the *1998 Code of Practice for On-site Wastewater Disposal,* which never got past the draft stage.

Land Capability Assessment

- All states and territories rely on AS/NZS 1547 *On-site domestic wastewater management* – the latest version of which is 2012.
- Currently, extra Tasmanian-based guidance is provided by *E23.0 On-Site Wastewater Management Code*, which forms part of the interim 2015 planning schemes of southern Tasmanian Councils, and which calls on AS/NZS 1547.

Land Capability Classification

- We also work with the Director of Building Control's *Guidelines for On-site Wastewater Management Systems*.
- Code E23.0 will not be part of the upcoming statewide planning scheme, and the Director's *Guidelines* will (probably) apply instead.

Stages of Data Collection

- Desktop study
- Site and soil check
- Soil description and profile assessment
- Calculations
- Collection of additional data
- Identify site and soil opportunities and constraints
- Selection and design of appropriate system

Desktop Study

- Collects preliminary data from readily available sources
- Provides an overview of opportunities and constraints
- Determines what information is relevant
- Identifies information gaps and what additional information is required

Stages of Data Collection

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Site and Soil Assessment

Site and Soil Evaluation (AS/NZS 1547) refers to the procedural investigation of land for the purposes of evaluating its potential for onsite sewage management, including land application of effluent

- Should be undertaken by an appropriately qualified person with specific experience in wastewater applications
- Specific advice regarding field investigation procedures in AS/NZS 1547 2012

Site and Soil Assessment

Suitable qualified persons in Tasmania

Column 1 Certificate type	Column 2 Given by	Column 3 Qualifications	Column 4 Speciality area of expertise
On-site wastewater management - Site and soil evaluation (and land application system design)	Civil engineer; or Environmental engineer	Licensed as an Engineer – Civil; or Civil Engineer and has PI insurance; or Environmental Engineer and has PI insurance.	Site and soil evaluation and land application system design.
	Soil scientist	Certified Professional Soil Scientist (Stage 2 or Stage 3) licensed by the Australian Society of Soil Science Inc. and has PI insurance.	
	Environmental geologist; or Geoscientist	BSc major in geology and experience in environmental geology and has PI insurance.	
	Environmental health professional	Approved qualifications to be appointed as an Environmental Health Officer under Public Health Act 1997 and has PI insurance.	
On-site wastewater management - Assessment of system suitability	Civil engineer; or Environmental engineer	Licensed as an Engineer – Civil; or Civil Engineer and has PI insurance; or Environmental Engineer and has PI insurance.	Assessment of on-site wastewater management system suitability.
	Environmental health professional	Approved qualifications to be appointed as an Environmental Health Officer under Public Health Act 1997 and has PI insurance.	

Level of Investigation

AS/NZS 1547 recommends different 'levels of investigation' depending on project intent or scale

- **Subdivision or Rezoning** – investigation will focus on regional or site-wide implications of on-site wastewater management (soil characterisation, system suitability, system density, cumulative impacts, planning considerations etc.)
- **Single-lot Development** – at this scale investigation will focus on site-specific attributes (buffers, soil controls, drainage etc.) and optimising wastewater management (treatment / application) options

Site and Soil Characteristics

- AS/NZS 1547 2012 provides information in Appendices B-D of site and soil characteristics that should be considered in on-site wastewater investigations
- Similar guidance is provided in the Excel-based computer application *Trench*®: *Land Suitability and System Sizing for On-site Wastewater Management*. *Trench*® is as useful and relevant as it was when it was released 20 years ago.

Trench® Site Characteristics

Slope angle
Slope form
Surface drainage
Flood potential
Heavy rain events
Aspect (Southern hemi.)
Frequency of strong winds
Wastewater volume
SAR of septic tank effluent
SAR of sullage

Soil thickness
Depth to bedrock
Surface rock outcrop
Cobbles in soil
Soil pH
Soil bulk density
Soil dispersion
Adopted permeability

Trench® Environmental Sensitivity Characteristics

Cation exchange capacity
Phos. adsorp. capacity
Annual rainfall excess
Min. depth to water table
Annual nutrient load
G'water environ. value
Min. separation dist. required
Risk to adjacent bores
Surf. water env. value
Dist. to nearest surface water
Dist. to nearest other feature
Risk of slope instability
Distance to landslip

Desktop Study – Google Earth

Information sources include:

- Satellite imagery *www.google.com/earth/*
- Free to download and activate
- Image quality varies
- Provides information on location (latitude/longitude), elevation and has capacity for measurement of distance
- Images can be rotated for different views (Street View)

Google Earth

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Google Earth

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Google Earth

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2016

Google Earth

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Google Earth (street view)

2010

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Desktop Study - thelist

Information sources include:

- *www.thelist.tas.gov.au*
- Tasmania-only; dozens of useful overlays which can be superimposed on each other, in different order, with controllable transparencies
- Free to download and activate
- Also provides information on location (latitude/longitude), elevation and has capacity for measurement of distance and area

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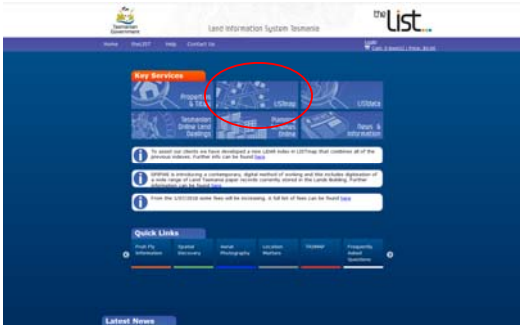
www.thelist.tas.gov.au



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Desktop Study - Topographic Maps

Show:

- Landscape
- Contours
- Anthropogenic (human) features
- Cadastral boundaries
- Grid references
- 1:25,000 maps have 10 m contours

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Topographic Maps

Can determine:

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

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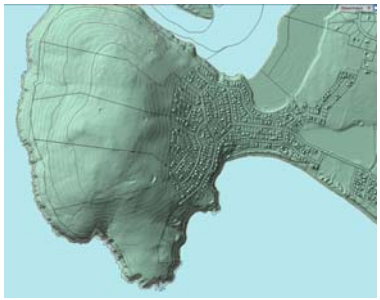
Topographic Maps (from thelist)

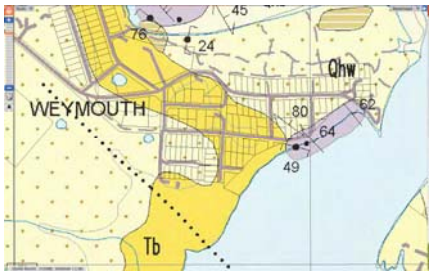
Hillshade Maps (from thelist)



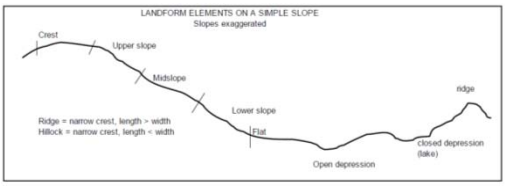
Desktop Study - Geological Maps

- Scanned 1:250,000 geological maps of much of Australia are available from Geoscience Australia *www.geoscience.gov.au*
- Scanned 1:25,000, 1:50,000 and 1:250,000 geological maps of most of Tasmania are available from Mineral Resources Tasmania *www.mrt.tas.gov.au* and *www.thelist.tas.gov.au*

Geological Map (from thelist)



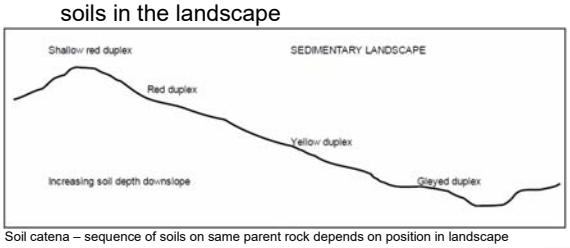
Desktop Study - Landform Elements



Landform elements on a simple slope

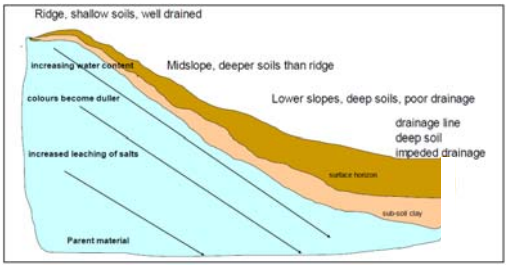
Soil Landscape

- The soil landscape describes the pattern of soils in the landscape



Soil catena – sequence of soils on same parent rock depends on position in landscape

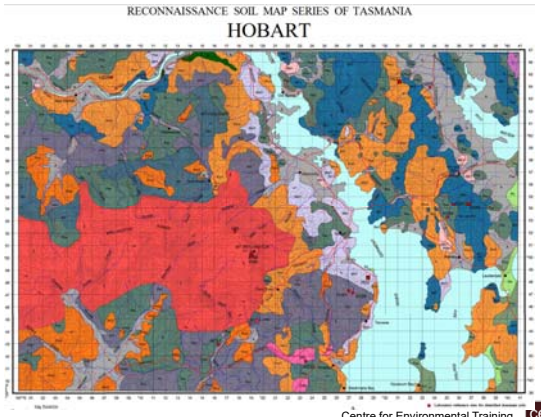
Soil Properties and Topography



Position in landscape significant in soil profile characteristics

Soil Maps Sources

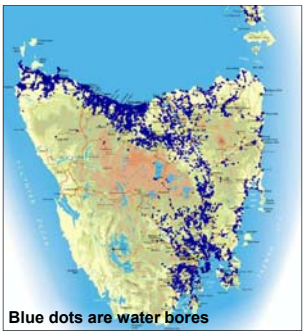
- Atlas of Australian Resources, Volume 1 Soils and Land Use (Division of National Mapping, Canberra, 1980)
- Tasmanian reconnaissance soils maps and data from Department of Primary Industries, Parks, Water and Environment (DPIPWE)
- Soil maps of parts of Tasmania on www.thelist.tas.gov.au



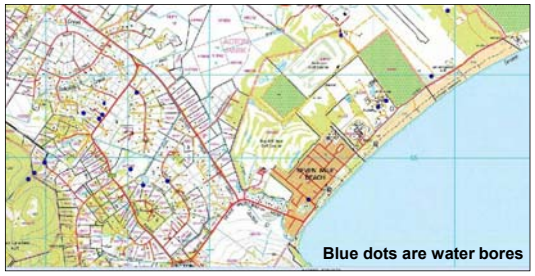
Desktop Study - Water bore maps

- Water bore map and data from the Groundwater Information Access Portal of the Department of Primary Industries, Parks, Water and Environment (DPIPWE)

Water bore maps



Water bore map



Climate Data

- Bureau of Meteorology *www.bom.gov.au*
- Rainfall
- Evaporation; evapotranspiration

Rainfall and Evaporation Data

- Use to prepare a water balance

Monthly rainfall

Weymouth (Tam O'Shanter)

About this page

All years of data | PDF

Summary statistics for all years

Information about climate statistics

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	56.6	27.3	53.5	59.6	65.7	85.6	81.1	68.4	67.2	59.8	51.7	48.8	734.6
Lowest	7.2	1.1	3.0	21.2	12.6	23.2	25.8	20.8	22.0	7.2	10.4	15.0	404.3
5th %ile	12.4	5.8	11.8	23.3	18.3	28.2	33.3	24.1	27.2	10.9	11.0	15.2	496.8
10th %ile	14.7	7.0	20.5	24.0	18.7	30.8	49.0	30.2	33.2	12.5	14.8	16.2	589.2
Median	45.4	24.8	47.0	55.2	61.8	68.2	83.5	62.8	64.3	60.6	53.3	50.8	778.2
90th %ile	114.0	44.9	96.1	108.4	125.5	152.0	111.0	146.7	107.4	90.4	81.7	80.0	930.0
95th %ile	117.9	50.8	112.0	112.2	132.7	162.2	128.1	175.6	112.4	98.0	105.7	116.0	931.6
Highest	133.0	75.0	124.4	119.0	148.8	199.4	143.0	236.8	119.6	160.4	110.4	120.8	933.2

Mean daily evaporation (mm)

5.9	5.4	4.4	3.2	2.1	1.7	1.9	2.9	4.0	4.6	5.8	6.5

Other Resources

- Vegetation maps
- Air photographs
- Local studies
- Dial Before You Dig (DBYD) for buried services (water, electricity, gas, NBN, telephone) and recently, aboriginal heritage.

Desktop Summary

- Tabulate data
- Assessment or rating
- Design on most limiting feature, or
- Engineer out limiting features

Site Assessment: NSW Rating

Site Feature	Relevant System(s)	Minor Limitation	Moderate Limitation	Major Limitation	Restrictive Feature
Flood potential	All land application systems	Rare, above 1 in 20 year flood contour		Frequent, below 1 in 20 year flood contour	Transport of wastewater off-site
	All treatment systems	Vents, openings, and electrical components above 1 in 100 year flood contour		Vents, openings, and electrical components below 1 in 100 year flood contour	Transport of wastewater off-site. System failure and electrocution hazard
Exposure	All land application systems	High sun and wind exposure		Low sun and wind exposure	Poor evapotranspiration
Slope%	Surface irrigation	0-6	6-12	>12	Run-off, erosion
	Sub-surface irrigation	0-10	10-20	>20	Run-off, erosion
	Absorption system	0-10	10-20	>20	Run-off, erosion
Landform	All systems	Hill crests, convex side slopes and plains	Concave side slopes and footslopes	Drainage plains and incised channels	Groundwater pollution hazard Resurfacing hazard
Run-on and upslope seepage	All land application systems	None - low	Moderate	High - diversion not practical	Transport of wastewater off-site.

Site Assessment: Trench® Rating

Summary of Ranks for Site Capability Factors

Click on any factor below to see or amend its rank	Trench defaults Rank 1 2 3 4 5	Site Limitation	Amended to Rank 1 2 3 4 5	Site Limitation	Review factor
Expected Design Area	X X X	Moderate		No change	
Disposal system density	X X X X X	Very high	X X X	Moderate	
Slope angle	X	Very low		No change	
Slope form					No data
Surface drainage	X	Very low		No change	
Flood potential	X	Very low		No change	
Heavy rain events	X X X	Moderate		No change	
Aspect					No data
Frequency of strong	X X X	Moderate		No change	
Wastewater volume	X X X X X	Very high	X X X	Moderate	
Septic effluent SAR	X X	Low		No change	
Sullage SAR	X X X	Moderate		No change	
Thickness of soil	X	Very low		No change	
Depth to bedrock	X	Very low		No change	
Percent surface outcrop	X	Very low		No change	
Percent cobbles in soil	X	Very low		No change	
Soil pH	X	Very low		No change	
Soil bulk density	X X X	Moderate		No change	
Soil dispersion	X	Very low		No change	
Permeability	X X X X X	Very high	X X X	Moderate	

Desktop Study

- 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 – the study will have identified potentially suitable effluent management areas (EMAs) from available information 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) locations
- Indicative groundwater depth

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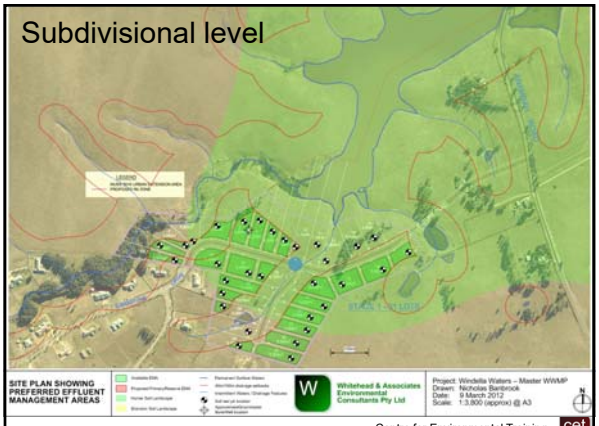
Subdivisional level



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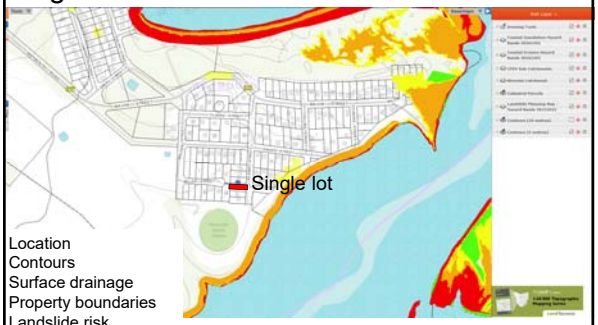
Single-lot level



Location
Contours
Surface drainage
Property boundaries
Landslide risk
Coastal erosion risk
Coastal inundation risk

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Single-lot level

Property boundaries
Vegetation
Surface drainage
Behaviour of existing wastewater systems

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Single-lot level

DBYD underground services

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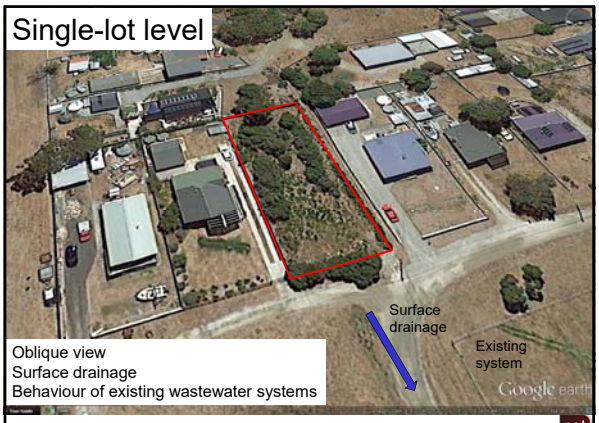
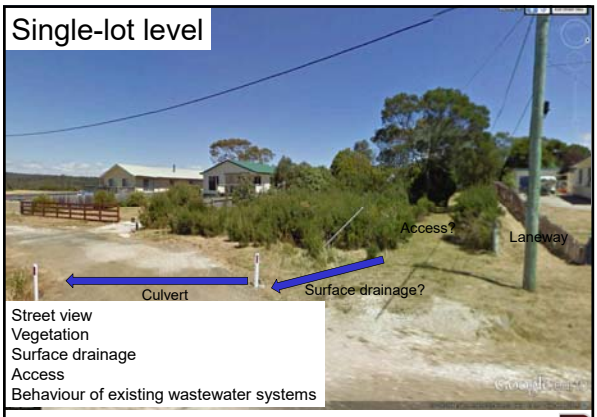
Single-lot level



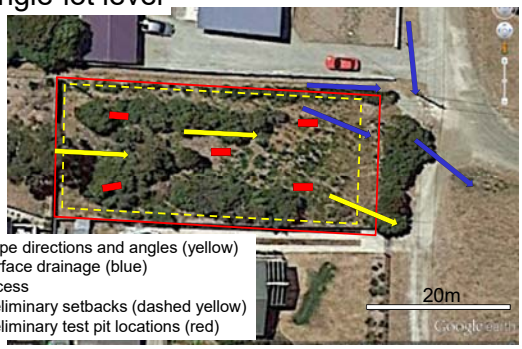
Oblique view
Surface drainage
Behaviour of existing wastewater systems

Single-lot level



Street view
Vegetation
Surface drainage
Access
Behaviour of existing wastewater systems

Single-lot level



Slope directions and angles (yellow)
Surface drainage (blue)
Access
Preliminary setbacks (dashed yellow)
Preliminary test pit locations (red)

Into the Field We Go……..