A. Alvie Locality Report

1a. Introduction

Alvie is a rural locality located approximately 12km northwest of Colac on the western side of Lake Corangamite within the Western Volcanic Plain landscape and Red Rock region. Alvie lies at the foot of the Red Rock Scenic Reserve, an old scoria formation that formed due to violent volcanic eruptions, which is a popular tourist attraction.

There are approximately 174 and 33 unsewered properties/parcels located within the Alvie locality and town respectively, with 28 DWM system permits that have been inspected to date by COS. The current DWM permits and their associated treatment system and LAA method within the Alvie locality are summarised as follows:

- 2 AWTS (1 subsurface irrigation, 1 unknown);
- 20 septic tanks (6 trenches and 14 unknown);
- 1 worm farm (1 subsurface irrigation); and
- 5 unknown (2 trenches and 3 unknown).

No site investigations were conducted within the Alvie locality as part of the 2014 field assessments; however, soil investigations were conducted to confirm the soil type.

2a. Background Documentation

Refer to the following documents for additional detail specifically regarding the locality:

- Red Rock Region Community Infrastructure Plan (September, 2013);
- COS Planning Scheme; and
- Rural Living Strategy (2011)

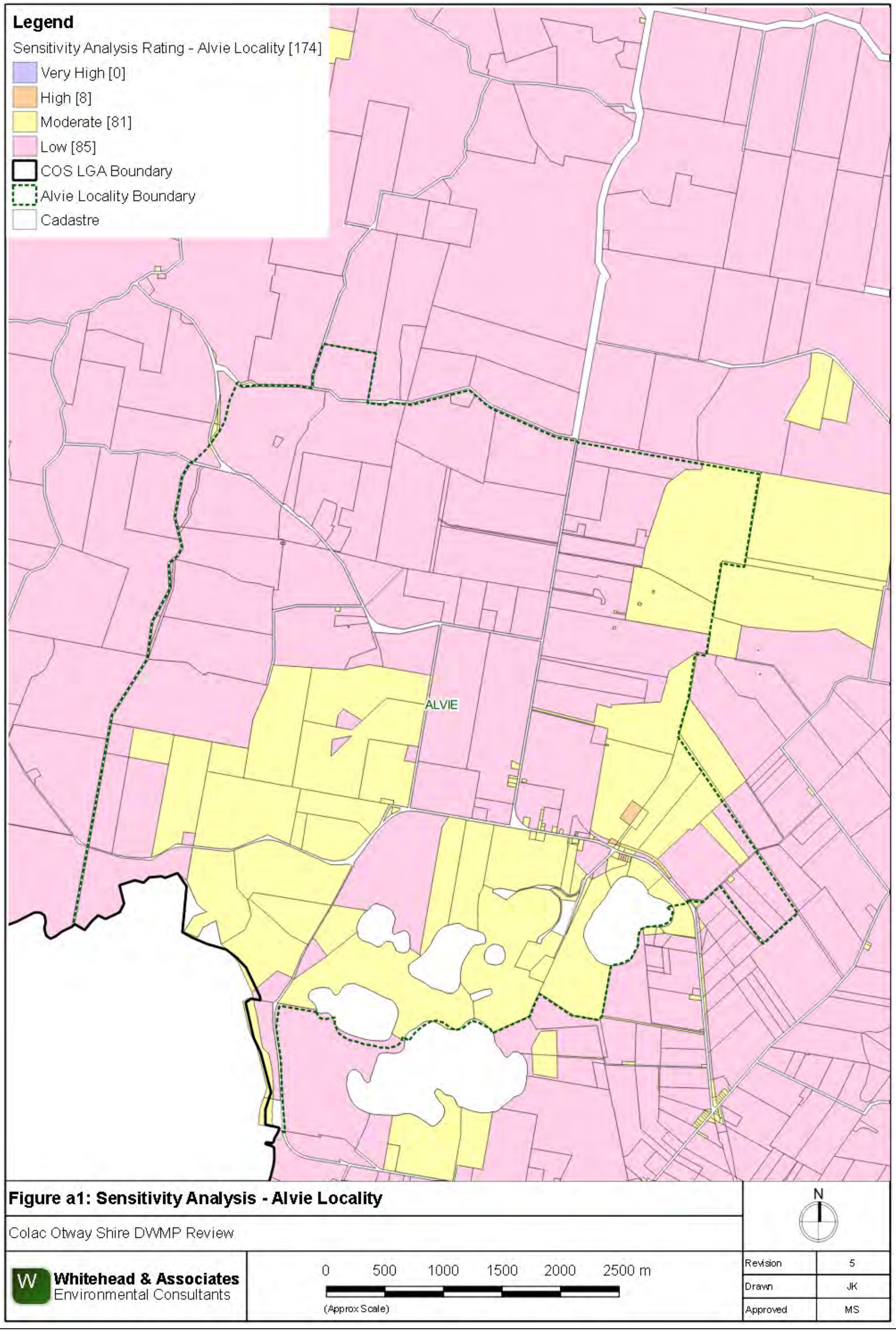
3a. Summary of Constraints to DWM

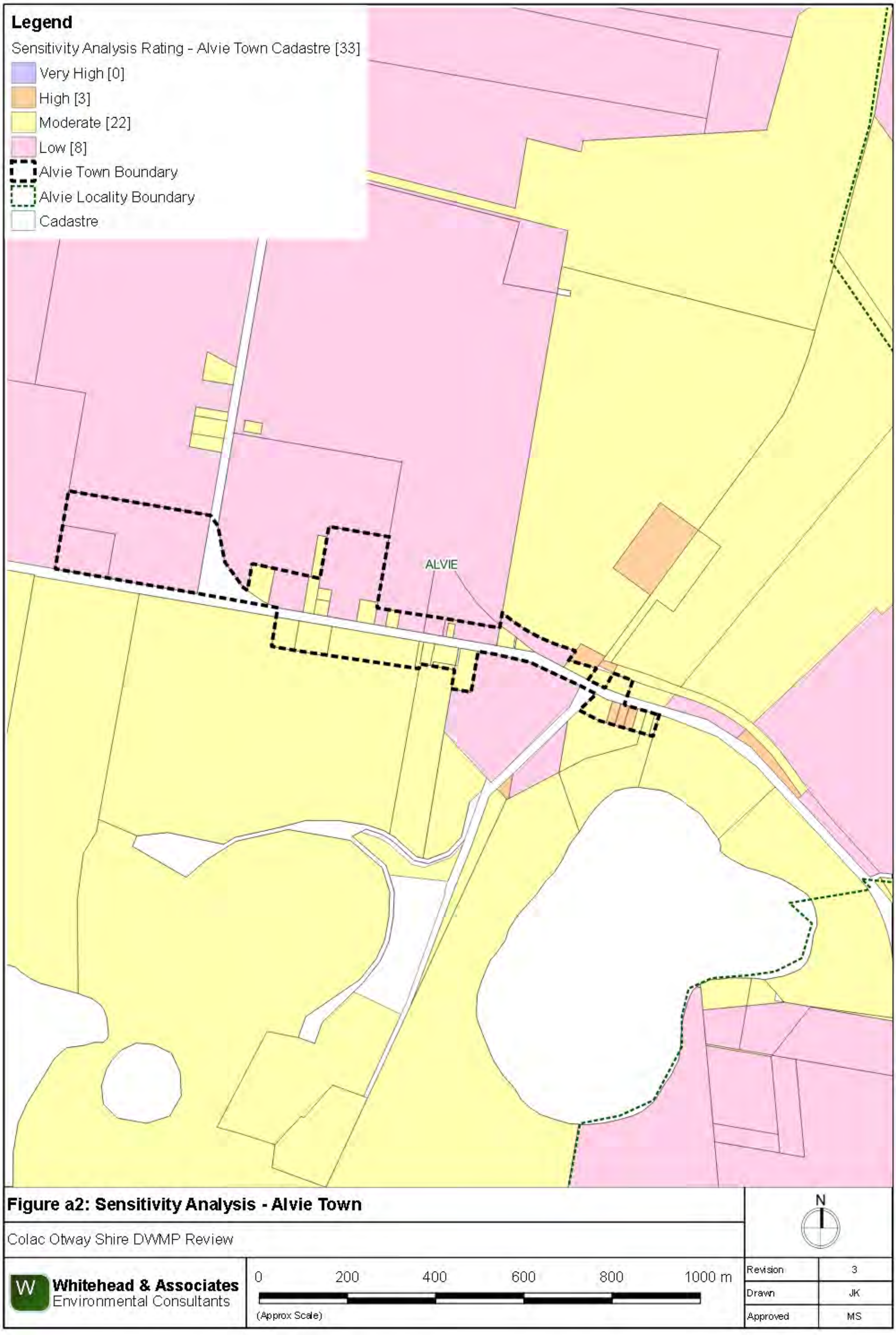
Characteristic	Description
Climate Zone	Zone 2.
Surface waterways & catchments	Alvie contains a number of lakes, predominantly in the region to the south of the locality, that have formed within the Western Volcanic Plains; including Lake Coragulac (southeast near town), Lake Wernwrap, Lake Purdiguluc and Lake Gnalinegurk.
Groundwater	Proximity to groundwater bores: significant throughout the locality with a high density of groundwater bores.
Land subject to inundation	To the south of the town around the lakes.
Useable lot area **Town (Locality)**	High: 12 (23) Moderate: 11 (27)

Characteristic	Description
	Low: 10 (111) Compliant: 0 (13)
Minimum lot size compliance with Planning Scheme Zoning	The town is predominantly zoned as Township, with some Public Use Zone. Land in the wider locality area is predominantly in the Farming Zone, with land associated with the lakes in the Public Conservation and Resource Zone. Compliancy is variable throughout the locality, with the majority of the town compliant. Compliant: 28 (51) Non-compliant: 5 (123)
Slope **Town (Locality)**	High: 1 (18) (higher towards Lake Coragulac) Moderate: 7 (15) Low: 25 (141)
Geology	Northwest region – unnamed stony rises of Newer Volcanic Group; Town – unnamed phreatomagmatic deposits (tuff rings) of Newer Volcanic Group; Eastern and southern regions – unnamed scoria deposits (scoria cones and agglutinated spatter rims) of Newer Volcanic Group; and Some unnamed non-marine swamp, lake and estuarine deposits.
Soil suitability **Town (Locality)**	High: 0 (15) Moderate: 33 (159) Low: 0 (0) The town consists of soil landscape unit ‘101’ (moderate rating) which forms in the undulating low hills of the Western Volcanic Plains and consists of friable mottled black texture contrast soil and neutral black gradational soils to depths less than 1.5m. The soils consist of moderately structured clay loam over strongly structured medium clay to heavy clay. Limitations include restricted drainage. The western and surrounding regions of the locality consists of soil landscape unit ‘114’ (moderate rating) which forms in the undulating basalt plains and stony rises and consists of gradational and friable mottled textured contrast soils to depths of less than 1.5m. The soils consist of strongly structured clay loam over strongly structured medium clay. There are some landform depressions to the north of the town.

Characteristic	Description
Sensitivity Overlay	Depth to Groundwater Compliance: all compliant. Landslip: Nil. Vegetation: Red Rock Scenic Reserve and lakes to the south (Coragulac, Werowrap, Corangamite, and Gnalinegurk).
Sensitivity Analysis Rating **Town (Locality)**	Very High: 0 (0) High: 3 (8) Moderate: 22 (81) Low: 8 (85)

4a. Sensitivity Analysis (Maps)


Legend
Sensitivity Analysis Rating - Alvie Locality [174]
Very High [0]
High [8]
Moderate [81]
Low [85]
COS LGA Boundary
Alvie Locality Boundary
Cadastre
ALVIE
Figure a1: Sensitivity Analysis - Alvie Locality
Colac Otway Shire DWMP Review
N
Whitehead & Associates
Environmental Consultants
0 500 1000 1500 2000 2500 m
(Approx Scale)
Revision 5
Drawn JK
Approved MS


Legend
Sensitivity Analysis Rating - Alvie Town Cadastre [33]
Very High [0]
High [3]
Moderate [22]
Low [8]
Alvie Town Boundary
Alvie Locality Boundary
Cadastre
ALVIE
Figure a2: Sensitivity Analysis - Alvie Town
Colac Otway Shire DWMP Review
Whitehead & Associates
Environmental Consultants
0
200
400
600
800
1000 m
(Approx Scale)
N
Revision
3
Drawn
JK
Approved
MS

5a. System Selection

Due to the dominance of heavy-textured soils in the Alvie area, conventional absorption trenches and beds are not likely to be feasible and are discouraged. Appendix A of the EPA Code of Practice (2013) prohibits LPED systems on Category 5 and 6 soils (medium to heavy clays). The System Sizing Tables (below) indicate which systems are likely to be the most appropriate for the locality.

6a. System Sizing Tables

Sizing Tables for each system type were created using conservative monthly water balances, following methods described in the MAV Model LCA, 2014. Monthly 70th percentile rainfall and average evapotranspiration data for Alvie was sourced from SILO (Scientific Information for Land Owners) climate databases, which are managed by the Queensland Government. The SILO databases use accurate meteorological data collected throughout Australia over long time periods.

The Design Loading Rates (DLRs) and Design Irrigation Rates (DIRs) were taken from the EPA Code of Practice. Where the Code of Practice has precluded use of a particular type of system on a certain soil type, it is shown as 'Not Applicable' for that soil type in the Sizing Tables. Where the evapotranspiration deficit requires unrealistically large land application areas for a particular system on a certain soil type, it is also shown as 'Not Applicable' for that soil type in the Sizing Tables. Detailed, site-specific LCAs and system designs would be required to further investigate the feasibility of systems deemed 'Not Applicable' in the sizing tables. Mitigation measures (such as importation of topsoil to appropriate depths in the land application area), may be required to sustainably achieve land application of effluent on constrained properties/parcels.

Sizing Tables for the Alvie locality are provided below.

7a. General Conclusion

The properties/parcels within Alvie have been predominantly assigned a Moderate or Low Sensitivity Rating to sustainable DWM. Predominantly, both Standard and Council LCAs will be required, with the use of System Sizing tables deemed appropriate. The constraints within Alvie are quite low in comparison to other localities, with particular attention directed towards ensuring that the quality of the groundwater resources is maintained and the correct decommissioning of groundwater bores occurs where necessary.

Alvie and Beeac

Drip and Spray Irrigation Systems* - Secondary Treated Effluent only								
	Soil Category	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)**	
	DIR (mm)	**5**	**5**	**4**	**3.5**	**3**	**2**	
Development Type	**Daily (L/day)**	**Total min. irrigation area required for zero wet weather effluent storage (m^2) not including spacing and setbacks**						
5 + bedroom residence	1,080	268		356	426	530	1,039	
4 bedroom residence	900	223		297	355	442	866	
1-3 bedroom residence	720	127		237	284	353	693	
Note: * irrigation system sizes are based on the assumption that the land application area is less than 10% slope. Reductions in DIR apply for slopes above 10% according to Table M2 of AS1547:2012								

Conventional Absorption Trenches and Beds - Primary or Secondary Treated Effluent									
	Soil Category	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Weak Loams & High/Mod Clay Loams (3 & 4)**	**Weak Clay Loams (4)**	**Massive Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)**
	DLR (mm)	**Not supported (Alternative Land Application System Required)**							
Development Type	**Daily (L/day)**								
5 + bedroom residence	1,080								
4 bedroom residence	900								
1-3 bedroom residence	720								

Evapotranspiration-Absorption Trenches and Beds - Primary or Secondary Treated Effluent (Category 1 to 5) and Secondary Treated Effluent only (Category 6)									
	Soil Category	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3a)**	**Weak/Massive Loams (3b)**	**High/Mod Clay Loams (4a)**	**Weak Clay Loams (4b) & Strong Light Clays (5a)**	**Massive Clay Loams (4c) and Mod & Weak Light Clays (5b, 5c)**	**Medium to Heavy Clays (6) - Secondary Effluent Only**
	DLR (mm)	**20***	**20***	**15**	**10**	**12**	**8**	**5**	**5**
Development Type	**Daily (L/day)**	**Total min. basal or 'wetted' area required for zero wet weather effluent storage (m^2) not including spacing and setbacks**							
5 + bedroom residence	1,080	58		78	123	100	128	281	
4 bedroom residence	900	48		65	102	83	132	234	
1-3 bedroom residence	720	39		52	82	67	106	188	
Note: * Gravels, Sands and sandy loams are unsuitable for conventional absorption trenches and beds if there is a high watertable, including seasonal and perched watertables. Value based on average of conservative rate and maximum rate for Category 2b and 3a soils in AS1547:2012									

LPED Irrigation Systems - Primary or Secondary Treated Effluent								
	Soil Category	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)**	
	DIR (mm)	**N/A (Alternative Land Application System Required)**	**4**	**3.5**	**3**	**N/A (Alternative Land Application System Required)**	**N/A (Alternative Land Application System Required)**	
Development Type	**Daily (L/day)**		**Total min. basal or 'wetted' area required (m^2)†**					
5 + bedroom residence	1,080		379	460	584			
4 bedroom residence	900		316	383	487			
1-3 bedroom residence	720		253	307	390			
† required for zero wet weather storage (m^2) not including spacing & setbacks								

Wick Trenches and Beds - Secondary Treated Effluent Only									
	Soil Category	**Gravels & Sands (1)**	**Sandy Loams (2) Loams (3) & High/Mod Clay Loams (4a,b)**	**Weak Clay Loams (4)**	**Massive Clay Loams (4)**	**Strong Light Clays (5a)**	**Moderate Light Clays (5b)**	**Weak Light Clays (5c)**	**Medium to Heavy Clays (6)**
	DLR (mm)	**25**	**30**	**20**	**10**	**12**	**8**	**8**	**5**
Development Type	**Daily (L/day)**	**Total min. basal or 'wetted' area required for zero wet weather effluent storage (m^2) not including spacing and setbacks**							
5 + bedroom residence	1,080	46	38	58	123	100	128		281
4 bedroom residence	900	38	32	48	102	83	132		234
1-3 bedroom residence	720	31	25	39	82	67	106		188