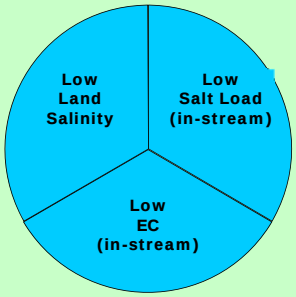
24. Symonston Hydrogeological Landscape

LOCALITIES	**Symonston, Jerrabomberra Creek, Hume**	
MAP SHEET	**Canberra 1:100 000**	
CONFIDENCE LEVEL	**Moderate**	

OVERVIEW

The Symonston Hydrogeological Landscape (HGL) extends from south of Hindmarsh Drive and to the east the boundary coincides with the ACT border (Figure 1). The HGL covers an area of 39 km^2 and receives 600 to 750 mm of rain per annum.

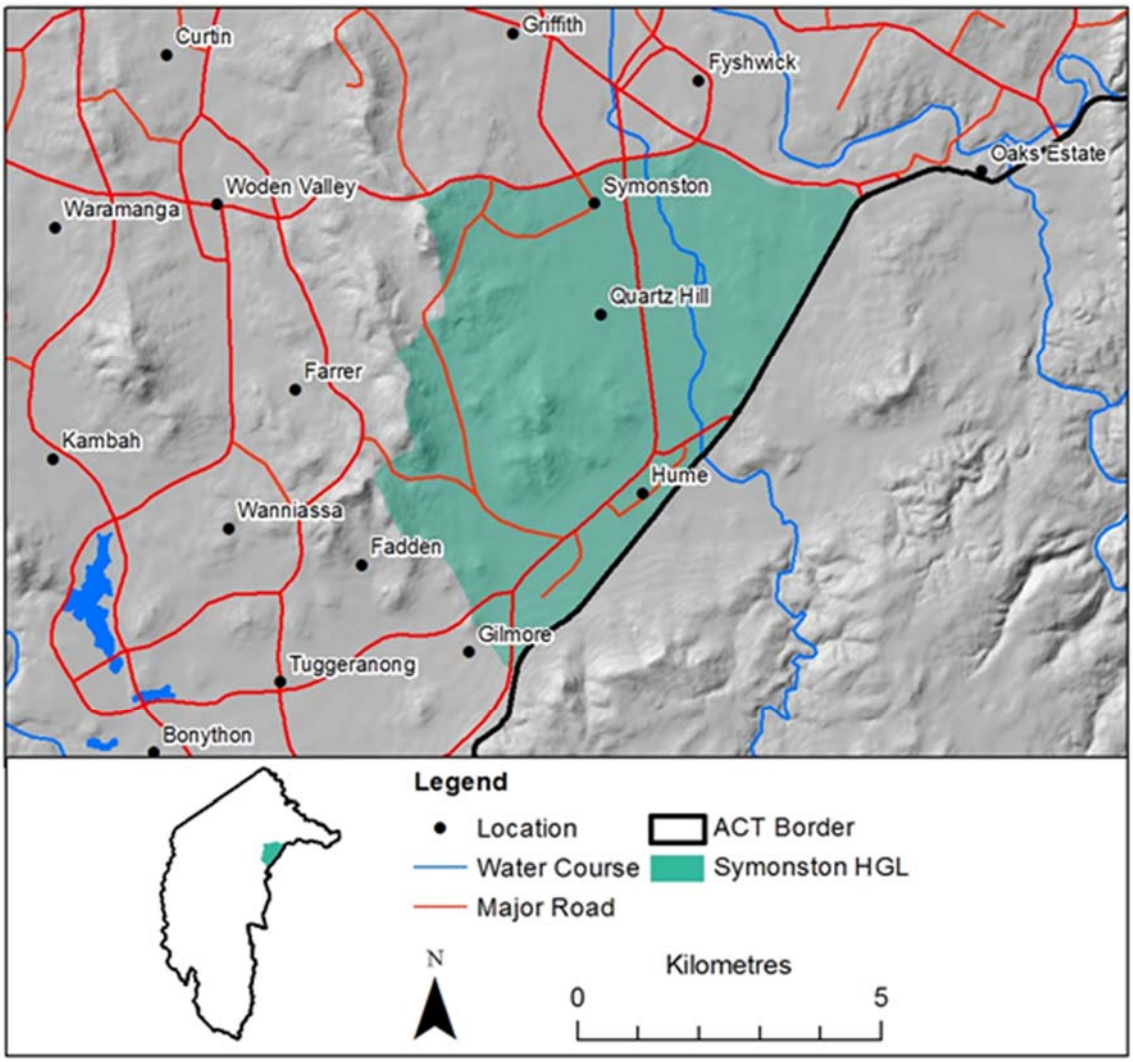


Figure 1: Symonston HGL distribution map.

Symonston HGL is defined by a subcatchment boundary (Figure 2). The area has steep hills which are mostly heavily timbered nature reserves. The majority of the area is low lying, with significant rural lands to the south.

The land use is mostly grazing, with some wetlands and industrial land. Development is occurring in the industrial zone fringe. The area between the border and either side of the Monaro Highway is well managed grazing lands, with some minor erosion. There are large riparian areas in this lower landscape.

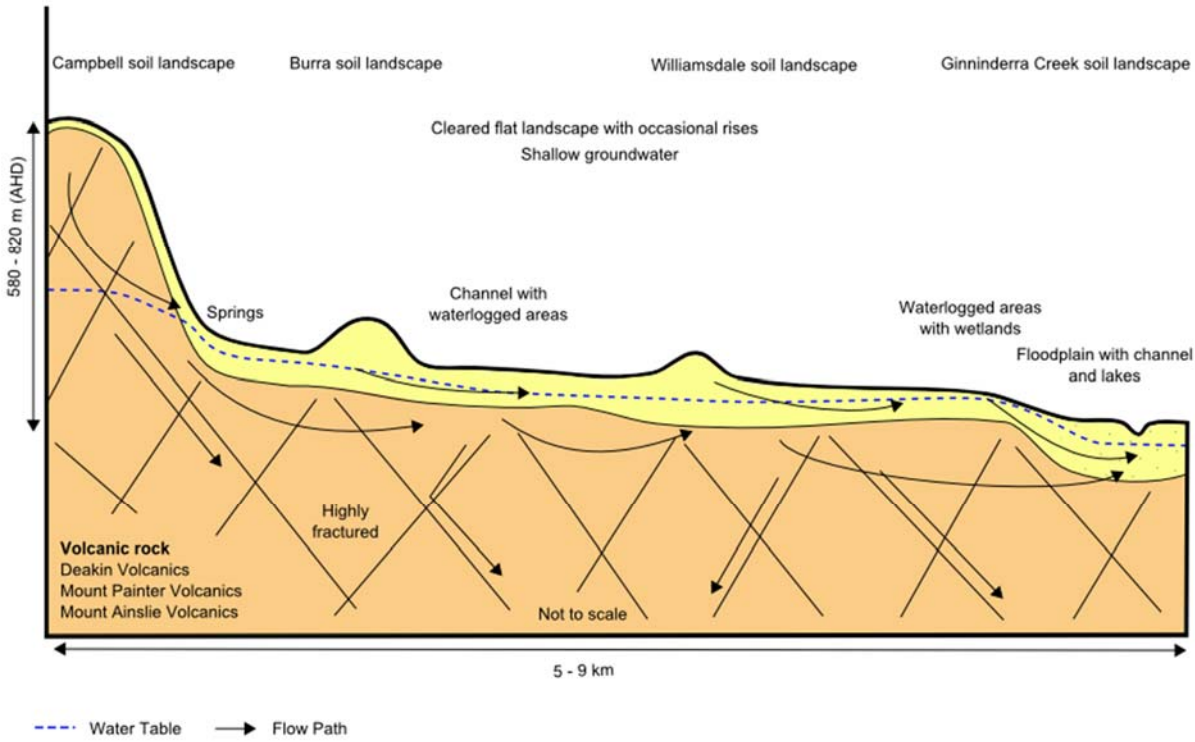


Figure 2: Conceptual cross-section for Symonston HGL showing the distribution of regolith and landforms, salt sites if present, and flow paths of water infiltrating the system.

There is little evidence of salinity in this HGL (Table 1).

Table 1: Symonston HGL salinity expression.

SALINITY EXPRESSION	
Land Salinity (Occurrence)	Low – no land salinity observed, except in minor area of the Jerrabomberra Wetlands
Salt Load (Export)	Low – little evidence of elevated EC in intermittent streams.
EC (Water Quality)	Low – some marginal spikes occur

Salt store refers to the amount of salt stored in soil and geology materials. Salt availability refers to how easily this salt can be moved by water. Salt stored within Symonston HGL has moderate mobility. There is a moderate salt store that has moderate availability (Table 2).

Table 2: Symonston HGL salt store and availability.

SALT MOBILITY			
	Low availability	**Moderate** availability	**High** availability
High salt store			
Moderate salt store		**Symonston**	
Low salt store			

Overall salinity hazard is based on the likelihood of salinity occurring and how much impact it would have. The overall salinity hazard in Symonston HGL is low. This is due to the moderate likelihood that salinity issues will occur and that they would have potentially limited impacts (Table 3).

Table 3: Likelihood of salinity occurrence, potential impact and overall hazard of salinity for Symonston HGL.

OVERALL SALINITY HAZARD			
	Limited potential impact	**Significant** potential impact	**Severe** potential impact
High likelihood of occurrence			
Moderate likelihood of occurrence	**Symonston**		
Low likelihood of occurrence			

LANDSCAPE FEATURES

The following photographs illustrate landscapes and specific features observed in this HGL. Information used to define the HGL is summarised in Table 4.

Photo 1: Photograph across the landscape incorporating the lower elements of Jerrabomberra Creek and heavily wooded ridge lines (Photo: DPI / A Nicholson).

Photo 2: A view to the west to Red Hill along Hindmarsh Drive with the Geoscience Australia building in the background (Photo: DPI / A Nicholson).

Photo 3: The upper catchment of Jerrabomberra Creek (Photo: DPI / A Nicholson).

Photo 4: Lower landscape looking north-west over Symonston HGL from Lanyon Drive (Photo: DPI / A Nicholson).

Photo 5: Creek unit and vegetation assemblage in the alluvial area of Symonston HGL (Photo: DPI / A Nicholson).

Photo 6: Landscape view to the south across Symonston HGL from Mt Ainslie, indicating low relief landforms and rural land use (Photo: DPI / A Nicholson).

Table 4: Summary of information used to define Symonston HGL.

Lithology *(Raymond et al. 2007; Geoscience Australia 2015)*	This HGL comprises a range of rock types including felsic volcanics, sedimentary rocks and unconsolidated sediments. Key lithologies include: • Deakin Volcanics • Mount Painter Volcanics • Mount Ainslie Volcanics
Annual Rainfall	600–750 mm
Regolith and Landforms	Soil generally <1 m deep higher in the landscape and >1 m deep on lower slopes and in drainage lines. Deeper soil and imperfect drainage in the lower landscape provide moderate potential for salt store. Slopes generally 10–32%; 0–10% in wide and flat valley bottoms Elevation range is 560–850 m
Soil Landscapes *(Jenkins 1993; Jenkins 2000; Cook & Jenkins in prep)*	The following soil landscapes are dominant in this HGL: • Williamsdale • Burra Clastic Rudosols or Leptic Tenosols (Lithosols) on crests generally confined to the western margins of this HGL. Red Chromosols and Red Kurosols (Red Podzolic Soils) and Red Kandosols (Red Earths) occur from crests to mid slope positions. Brown Chromosols (Yellow Podzolic Soils and Brown Kandosols (Yellow Earths) on better drained lower slopes. Poorly drained Sodosols (Solodic Soils) in the lowest slope positions. Due to sodicity, slope position and imperfect drainage the Sodosols have the greatest potential for land degradation and dryland salinity. Hydrosols and Stratic Rudosols (Alluvial Soils) on floodplains.
Land and Soil Capability	Class 5
Land Use	• grazing • industrial • Mugga Lane Resource Management Centre • wetlands (in creeks)
Key Land Degradation Issues	• water erosion • soil acidity
Native Vegetation *(Keith 2004; Gellie 2005; Dept. of Environment 2012)*	This HGL is situated within the IBRA7 South Eastern Highlands (Murrumbateman subregion) The HGL is extensively cleared with remaining vegetation formations comprising Grassy Woodland and Dry Sclerophyll Forest Local vegetation is described by Gellie (2005)

HYDROGEOLOGY

Typical values for the hydrogeological parameters of this HGL are summarised in Table 5.

Table 5: Summary of values for typical hydrogeological parameters of Symonston HGL.

Aquifer Type	Unconfined to semi-confined in fractured rock and saprolite Lateral flow through unconsolidated colluvial sediments on lower slopes
Hydraulic Conductivity	Moderate Range: 10^{-2}–10 m/day
Aquifer Transmissivity	Moderate Range: 2–100 m^2/day
Specific Yield	Moderate Range: 5–15%
Hydraulic Gradient	Gentle Range: <10%
Groundwater Salinity	Fresh to marginal Range: <800–1600 µS/cm
Depth to Watertable	Shallow to intermediate (localised waterlogging) Range: <2–8 m
Typical Sub-Catchment Size	Small (<100 ha)
Scale (Flow Length)	Local Flow length: <5 km (short)
Recharge Estimate	Moderate
Residence Time	Medium (years)
Responsiveness to Change	Medium (years)

MANAGEMENT OPTIONS

Overarching salinity management strategies have specific biophysical outcomes. These are achieved by implementing a series of targeted land management actions that take into account the opportunities and constraints of the particular HGL. The actions recognise the need for diffuse and specific activities within the landscape to impact on salinity. Further explanation of land management functions, strategies and actions can be found in Wooldridge *et al.* (2015).

Salinity is driven by interactions between water-use capacity of vegetation, physical soil properties and hydrogeological processes within the HGL.

Actions that influence the way water is used by vegetation or stored in the soil profile will have impacts on recharge. The influence of both continual and episodic recharge and the impacts of extreme weather events should be considered when deciding on appropriate management actions. Short and long-term climate cycles also should be considered as they have a bearing on salinity processes, particularly salt load and land salinity.

Landscape Functions – Symonston HGL

Functions this landscape provides within a catchment scale salinity context:

- **E.** The landscape receives and stores salt load through irrigation or surface flow.
- **H.** The landscape contains high hazard for generating sodic and saline sediments.

Landscape Management Strategies – Symonston HGL

Appropriate strategies pertinent to this landscape:

- **Stop discrete landscape recharge (3).**
- **Discharge rehabilitation and management (4)**: Discharge sites appear in the landscape during wet climate cycles. Improved management of these saline areas can reduce the impact of salinisation and prevent large negative impacts during wet cycles. Discharge management will also limit on-site land degradation.

Key Management Focus – Symonston HGL

This landscape has mainly rural with minor industrial uses, with large areas of grazing lands around the riparian areas of Jerrabomberra Creek. The key focus is to manage the water quality going to Jerrabomberra Creek in terms of sediment load that is generated in the catchment and from stream bank sources. There is significant development on the NSW side of the border; the Queanbeyan suburb of Jerrabomberra and the proposed suburbs of Tralee and Environa. Changes in water quality in Jerrabombera Creek can imact downstream on Lake Burley Griffin and on the Murrumbidgee River.

Specific Land Management Opportunities

Specific opportunities for this HGL:

- native vegetation and grasslands
- grasslands on the lower landscape, with riparian areas in relatively good condition adjacent to Jerrabomberra Creek.

Specific Land Management Constraints

Constraints on land management in this HGL include:

- riparian areas are sensitive to large scale landscape change and to influx of sediment
- waterlogging.

Specific Targeted Actions

Management areas for this HGL are illustrated in Figures 3 and 4. The specific management actions for these areas are described in Table 6.

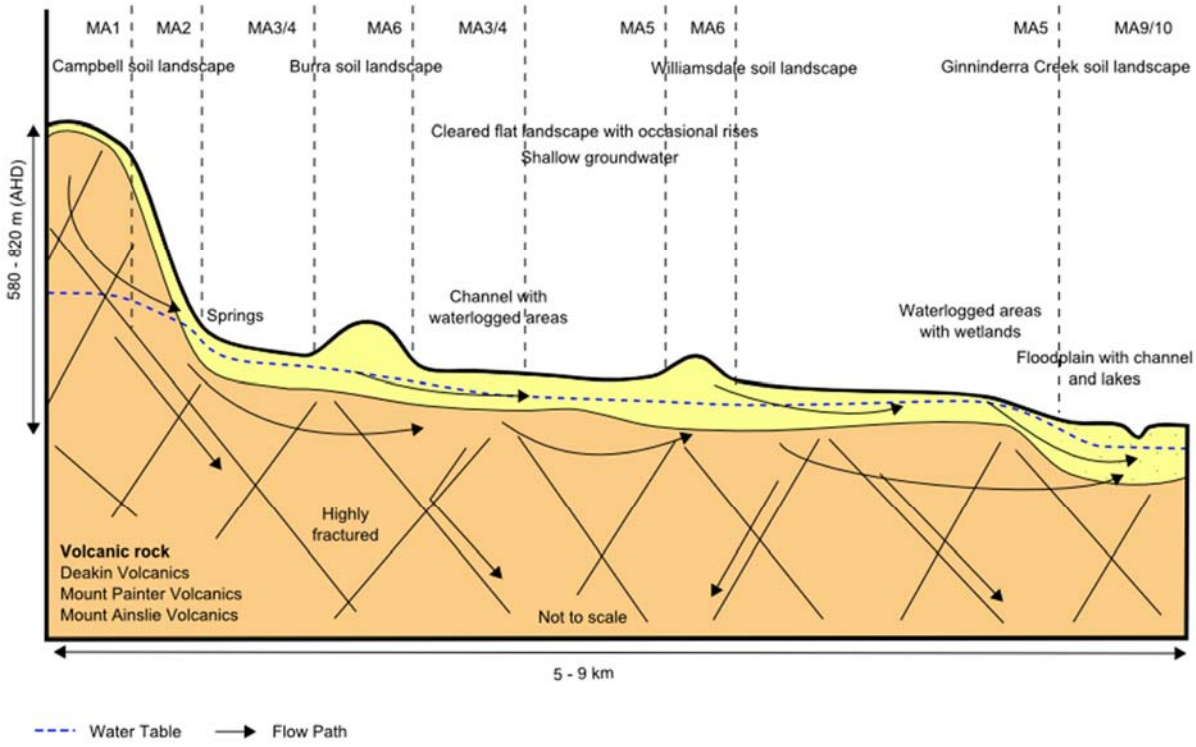


Figure 3: Management cross-section for Symonston HGL showing defined management areas.

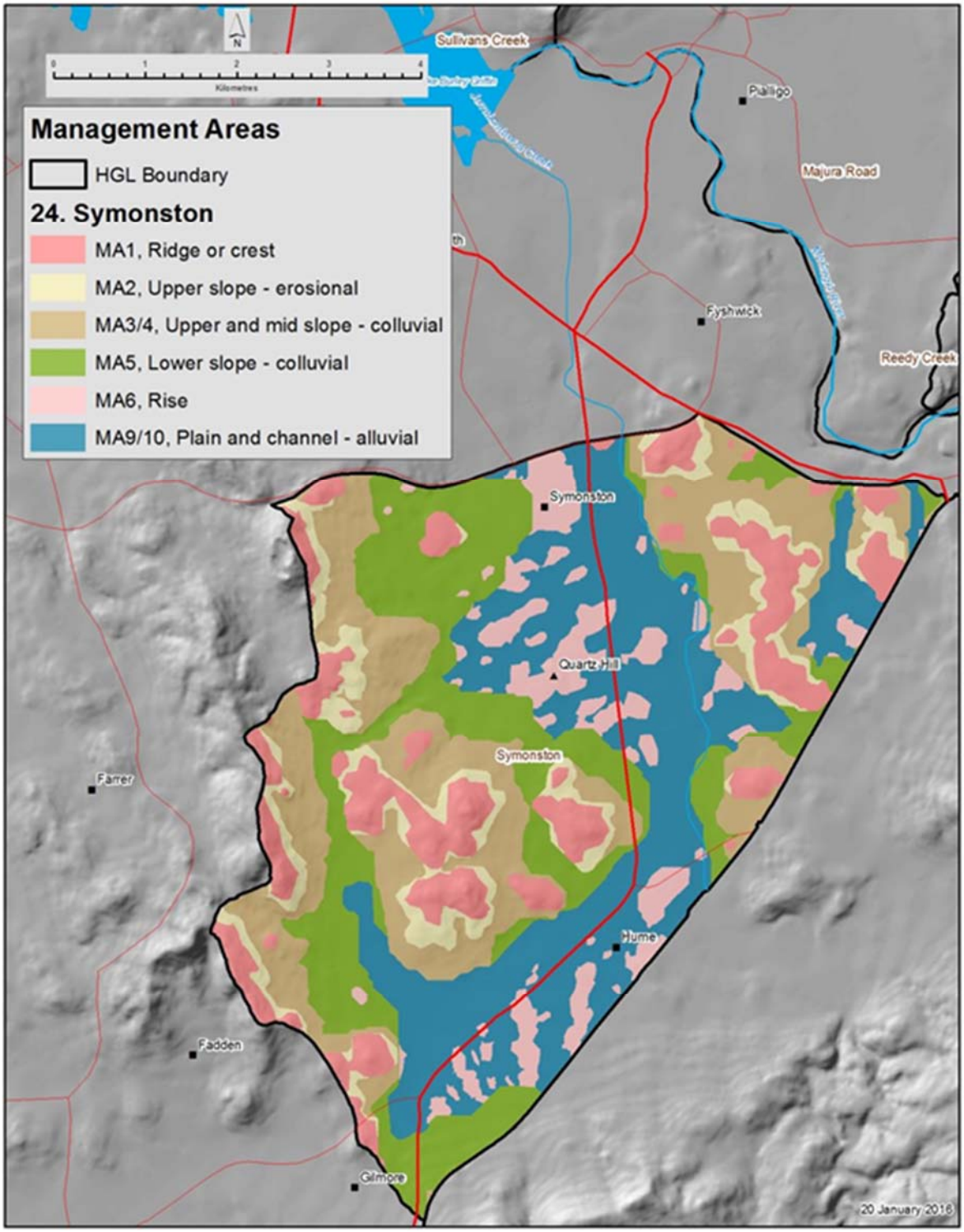


Figure 4: Spatial distribution of management areas for Symonston HGL.

Table 6: Specific management actions for management areas within Symonston HGL.

Management Area (MA)	Action
MA 1 (RIDGES)	**Vegetation for ecosystem function** Maintain and improve existing native woody vegetation to reduce discharge **(VE3)**
MA 2 (UPPER SLOPE – EROSIONAL)	**Vegetation for ecosystem function** Maintain and improve existing native woody vegetation to reduce discharge **(VE3)** **Vegetation for production** Improve grazing management of existing perennial pastures to manage recharge **(VP1)** Improve grazing management to improve or maintain native pastures to manage recharge **(VP5)**
MA 3/4 (UPPER SLOPE – COLLUVIAL & MID SLOPES)	**Vegetation for ecosystem function** Maintain and improve existing native woody vegetation to reduce discharge **(VE3)** Establish and manage trees to integrate into existing farming infrastructure and logistics and for multiple outcomes including reduced recharge **(VE5)** Interception planting of trees to target shallow groundwater **(VE2)** **Vegetation for production** Improve grazing management of existing perennial pastures to manage recharge **(VP1)** Establish and manage perennial pastures to manage recharge **(VP2)** Improve grazing management to improve or maintain native pastures to manage recharge **(VP5)**
MA 5 (LOWER SLOPE – COLLUVIUM)	**Vegetation for production** Improve grazing management of existing perennial pastures to manage recharge **(VP1)** Establish and manage perennial pastures to manage recharge **(VP2)** Establish and manage perennial pastures to intercept shallow lateral groundwater flow **(VP3)** Improve grazing management to improve or maintain native pastures to manage recharge **(VP5)**

Management Area (MA)	Action
MA 6 (RISE)	**Vegetation for ecosystem function** Maintain and improve existing native woody vegetation to reduce discharge **(VE3)** Establish and manage trees to integrate into existing farming infrastructure and logistics and for multiple outcomes including reduced recharge **(VE5)** **Vegetation for production** Improve grazing management of existing perennial pastures to manage recharge **(VP1)** Improve grazing management to improve or maintain native pastures to manage recharge **(VP5)**
MA 9/10 (ALLUVIAL AREAS , CHANNELS & WETLANDS – CREEKS)	**Vegetation for ecosystem function** Maintain and improve riparian native vegetation to reduce discharge to streams **(VE4)** **Vegetation for production** Improve grazing management of existing perennial pastures to manage recharge **(VP1)** **Engineering** Use of groundwater to supplement and replace surface water for farm stock water supply **(E1)**

High Hazard Land Use

There are some management actions that should be discouraged in this HGL as they will have negative impacts on salinity (Table 7).

Table 7: Management actions having negative salinity impacts in Symonston HGL.

At Risk Management Areas	Action
MA 1, 2 3, 4, 5, 6	Poor management of grazing pastures **(DLU2)** Clearing and poor management of native vegetation **(DLU4)** Locating infrastructure on discharge areas **(DLU7)** Deep ripping of soils to maximise water infiltration to subsoil **(DLU11)**
MA 5	Annual cropping (**DLU3)**
MA 9/10	Poor management of grazing pastures **(DLU2)** Locating infrastructure on discharge areas **(DLU7)** Poor soil management – loss of surface soil layers **(DLU10)**

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