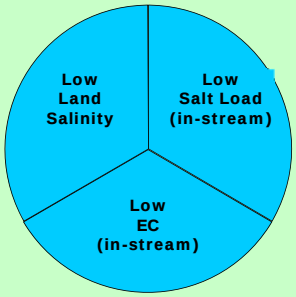
3. Brindabella Hydrogeological Landscape

LOCALITIES	**Brindabella, Brindabella Road, Mt Coree**
MAP SHEET	**Brindabella 1:100 000**
CONFIDENCE LEVEL	**Moderate**



OVERVIEW

The Brindabella Hydrogeological Landscape (HGL) occurs as a small area in the north west of the ACT (Figure 1). It extends across the border into NSW where it occupies a much greater area. The HGL covers an area of 9 km^2 and receives 950 to 1200 mm of rain per annum.

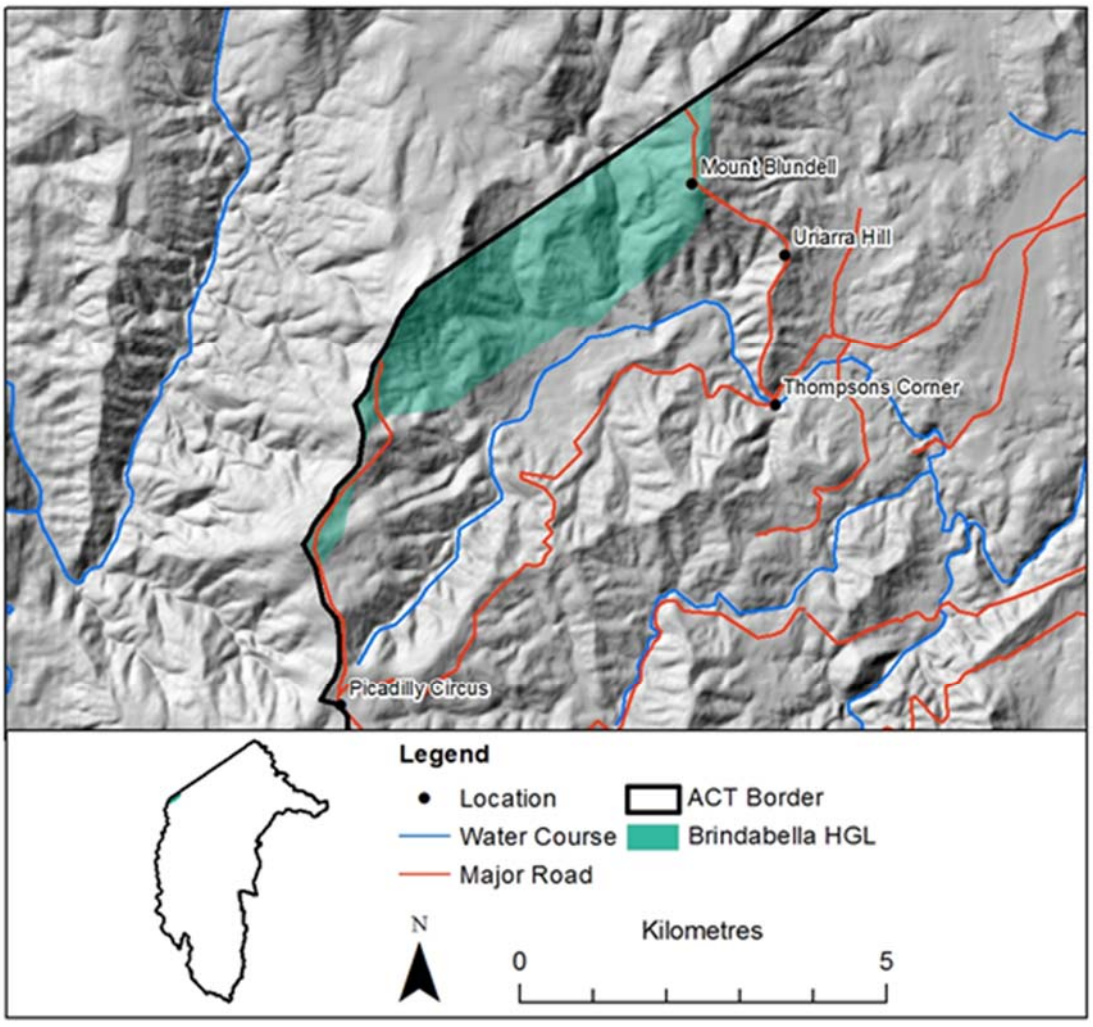


Figure 1: Brindabella HGL distribution map.

The Brindabella HGL is characterised by the Mountain Creek Volcanics geology in the southern extent of the greater Brindabella Ranges (Figure 2). The area is mostly Namadgi National Park, with some minor areas of Uriarra State Forest on the lower slope.

In NSW the Mountain Creek Volcanic landscapes are often saline where they have been cleared, but in the ACT the small area of this landscape is heavily vegetated and steep, with high runoff, and salinity is not an issue.

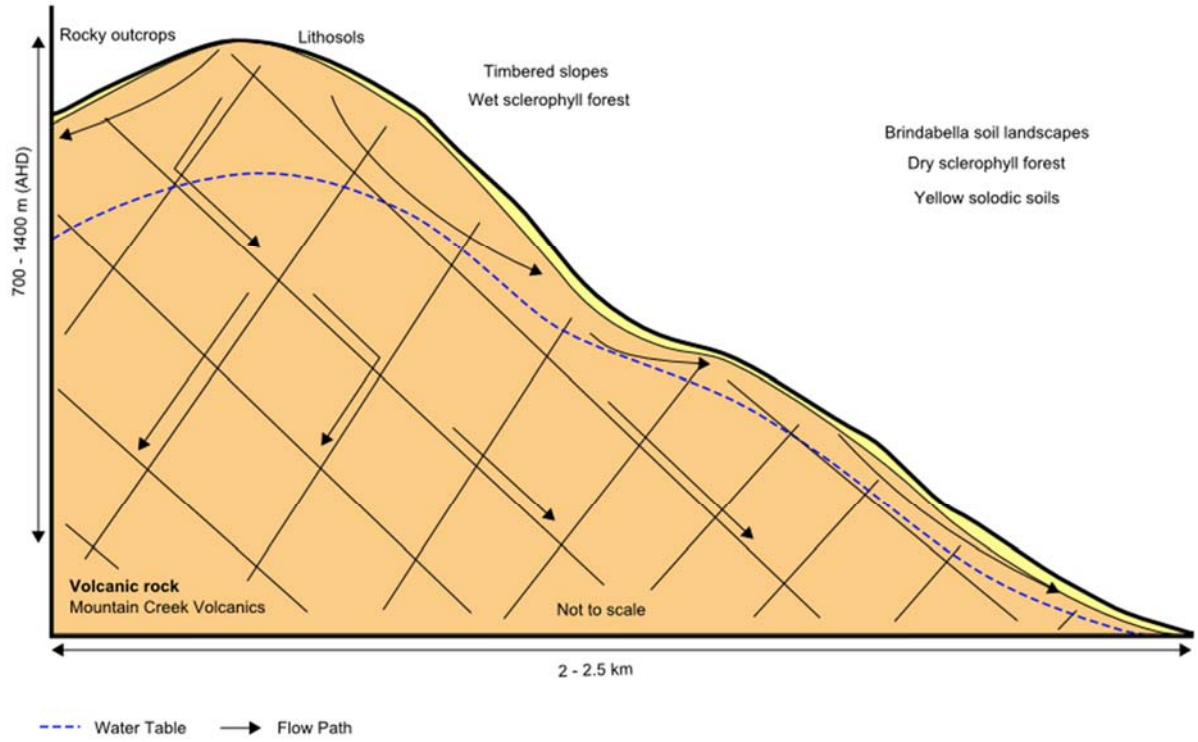


Figure 2: Conceptual cross-section for Brindabella HGL showing the distribution of regolith and landforms, salt sites if present, and flow paths of water infiltrating the system.

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

Table 1: Brindabella HGL salinity expression.

SALINITY EXPRESSION	
Land Salinity (Occurrence)	Low
Salt Load (Export)	Low
EC (Water Quality)	Low

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 Brindabella HGL has low mobility. There is a low salt store that has moderate availability (Table 2).

Table 2: Brindabella HGL salt store and availability.

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

Overall salinity hazard is based on the likelihood of salinity occurring and how much impact it will have. The overall salinity hazard in Brindabella HGL is very low. This is due to the low 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 Brindabella HGL.

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

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: Steep vegetated hills of Brindabella HGL (Photo: OEH / W Cook).

Photo 2: Brindabella HGL linking to Picadilly HGL in the foreground (Photo: OEH / W Cook).

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

Lithology *(Raymond et al. 2007; Geoscience Australia 2015)*	This HGL comprises felsic volcanics. Key lithologies include: • Mountain Creek Volcanics
Annual Rainfall	950–1200 mm
Regolith and Landforms	Soil generally < 1 m with deeper pockets associated with saprolite along fractures. Shallow depth and high rainfall provide low potential for salt store. Slopes generally 10–32%; 35–56% in highest areas; 0–10% in valley bottoms Elevation range is 700–1400 m
Soil Landscapes *(Jenkins 1993; Jenkins 2000; Cook & Jenkins in prep)*	The following soil landscape is dominant in this HGL: • Brindabella Tenosols (Alpine Humus Soils) and transitional Alpine Humus soils occupy the highest elevations. The high level of humus means the soil can hold and release a large amount of water. This water tends to be fresh with low levels of salinity. Organosols (Peats) occur in the generally small bogs/swamps. Soils on the slopes of this HGL tend to be shallow loam topsoils, the degree of development of a clay subsoil the determining factor in the soil type. Leptic Rudosols (Lithosols) and Tenosols

	(Lithosols) are common on most slopes. Where subsoils have developed Red Kandosols (Red Earths) and Red Chromosols and Red Kurosols (Red Podzolic Soils) are common.
Land and Soil Capability	Class 7
Land Use	National park and minor forestry
Key Land Degradation Issues	• minor gully and sheet erosion • shallow soils • mass movement
Native Vegetation *(Keith 2004; Gellie 2005; Dept. of Environment 2012)*	This HGL is situated within the IBRA7 South Eastern Highlands (Bondo subregion) The HGL has only partially cleared land with vegetation formations comprised mostly of Grassy Woodlands and Wet 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 Brindabella HGL.

Aquifer Type	Unconfined to semi-confined in fractured rock and saprolite Lateral flow through unconsolidated colluvial sediments on lower slopes
Hydraulic Conductivity	Low Range: $<10^{-2}$ m/day
Aquifer Transmissivity	Low Range: <2 m^2/day
Specific Yield	Low Range: <5%
Hydraulic Gradient	Steep Range: >30%
Groundwater Salinity	Fresh Range: <800 µS/cm
Depth to Watertable	Deep Range: >8 m
Typical Sub-Catchment Size	Small (<100 ha)
Scale (Flow Length)	Small Flow length: <5 km (short)

Recharge Estimate	Low
Residence Time	Short to medium (months to years)
Responsiveness to Change	Fast to medium (months to 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 – Brindabella HGL

Functions this landscape provides within a catchment scale salinity context:

- **A.** The landscape provides fresh water runoff as an **important water source.**
- **B.** The landscape provides fresh water runoff as an **important dilution flow source.**

Landscape Management Strategies – Brindabella HGL

Appropriate strategies pertinent to this landscape:

- **Maintain or maximise runoff (10)**
- **Maintain current hydrology (11)**

Key Management Focus – Brindabella HGL

The key focus of Brindabella HGL is water supply: management for both water quality and quantity. Soil and water management should be the focus in minor forestry areas to reduce potential erosion.

Specific Land Management Opportunities

Specific opportunities for this HGL:

- large areas of native vegetation
- public land – national park
- hydrology is mainly intact.

Specific Land Management Constraints

Constraints on land management in this HGL include:

- shallow soils
- fire regime will have a large impact on the hydrology of this HGL
- access and topography limit land management options
- it is difficult to limit the access of feral animals to sensitive areas – riparian zones
- infrastructure – access track construction, location and maintenance.

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.

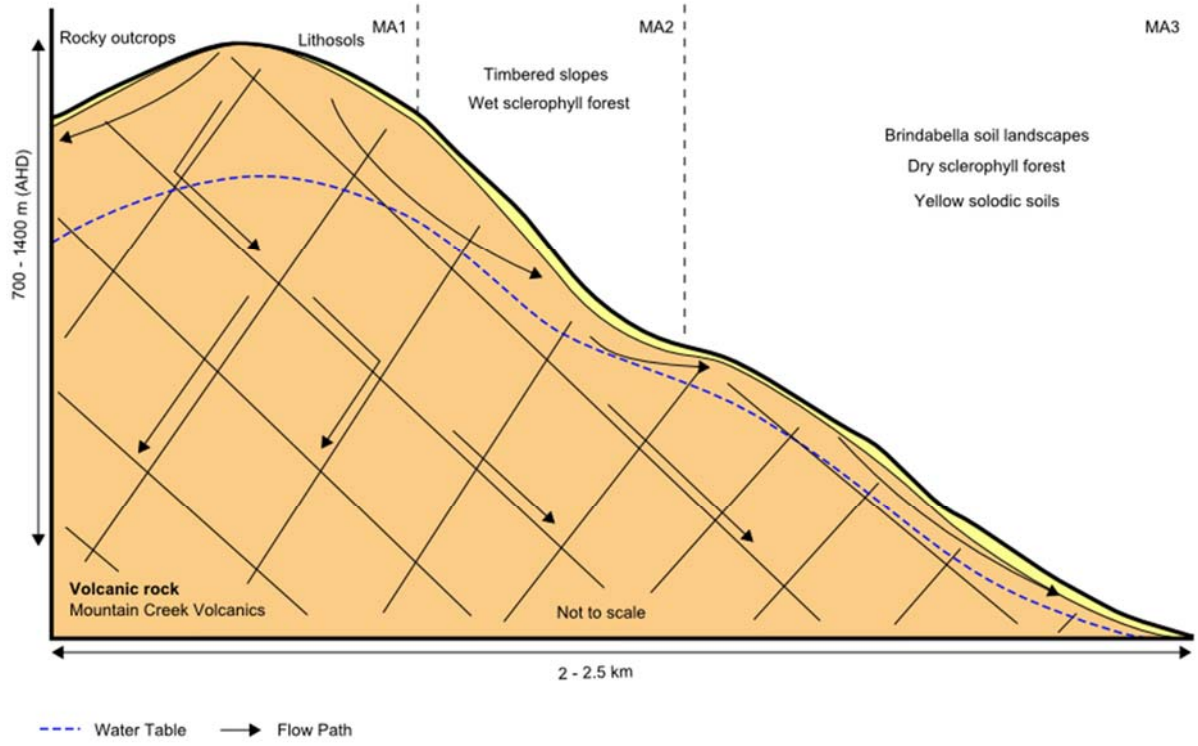


Figure 3: Management cross-section for Brindabella HGL showing defined management areas.

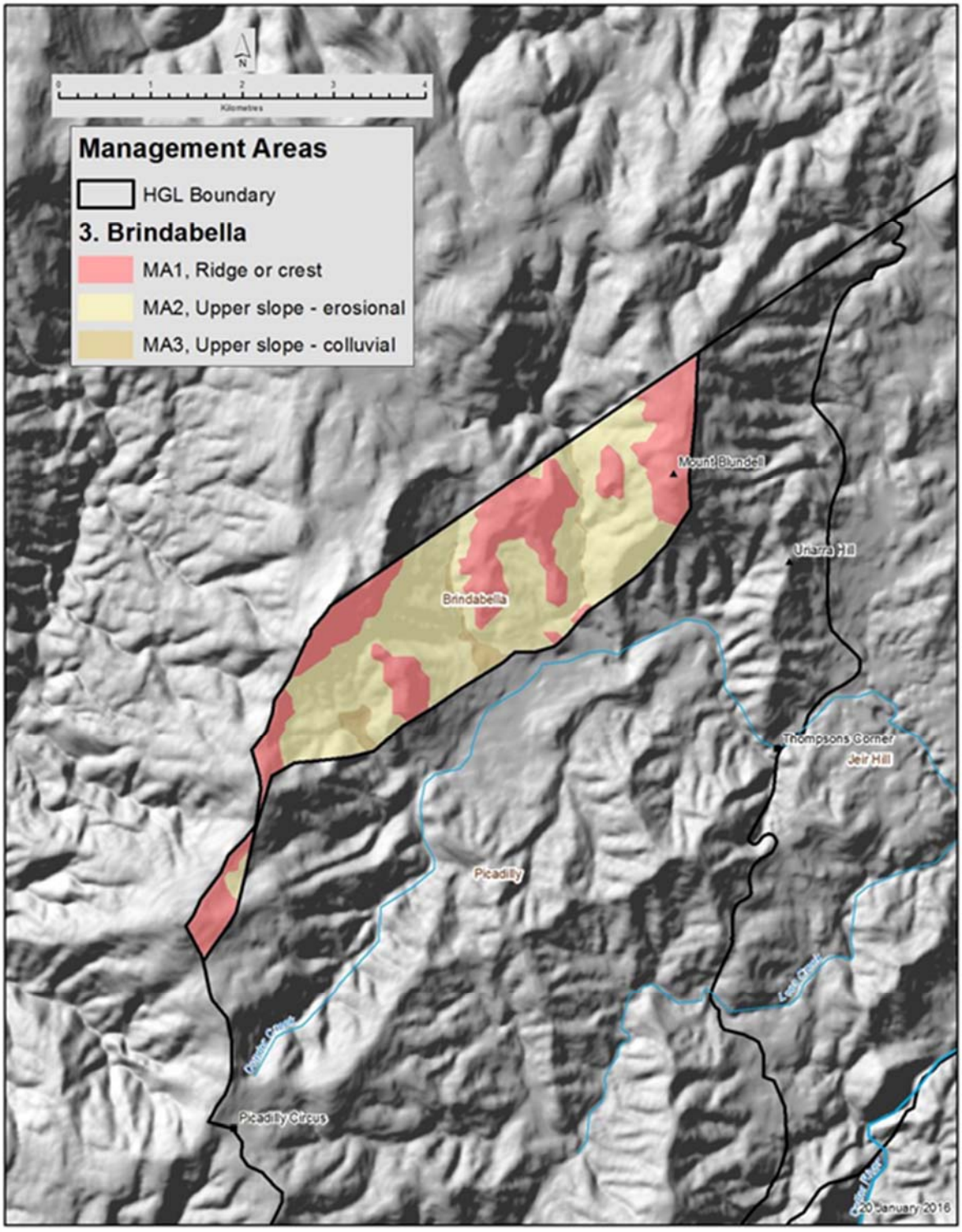


Figure 4: Spatial distribution of management areas for Brindabella HGL.

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

Management Area (MA)	Action
MA 1 (RIDGES)	**Vegetation for ecosystem function** Maintain and improve existing native vegetation to protect current landscape hydrology **(VE8)**
MA 2 (UPPER SLOPE – EROSIONAL)	**Vegetation for ecosystem function** Maintain and improve existing native vegetation to protect current landscape hydrology **(VE8)**
MA 3 (UPPER SLOPE – COLLUVIAL)	**Vegetation for ecosystem function** Maintain and improve existing native vegetation to protect current landscape hydrology **(VE8)**

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 Brindabella HGL.

At Risk Management Areas	Action
MA 1 & 2	Clearing and poor management of native vegetation **(DLU4)**
MA 3	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)**

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