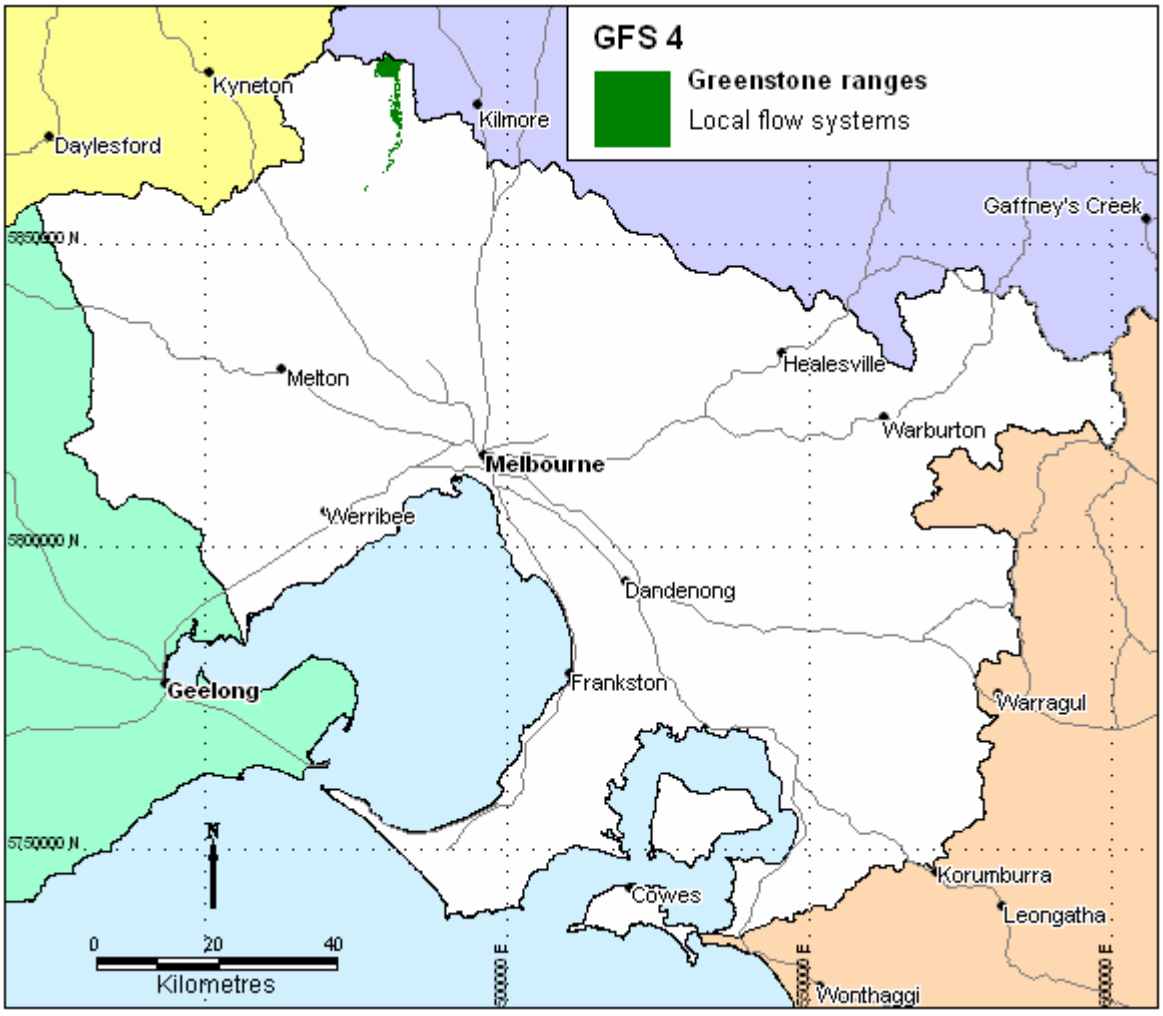
# Local flow systems in the Greenstone ranges

***Region:*** Northern PPWP CMA region

***Type areas:*** Mount William, and connected north-south ridge east of Romsey and Lancefield.

***Brief description:*** The Mount William greenstone belt is recognised as part of the ancient Cambrian seafloor (~ 550 Ma) now exposed along a major geological fault zone. Metamorphosed dolerites and basalts, termed greenstones (Mount William Metabasalt), are overlain by the Knowsley East Shale, which is, in turn, overlain by the Goldie Chert. The sequence of metamorphosed igneous and sedimentary rocks has been tilted and deformed by subsequent tectonic mountain building episodes. Local groundwater flow systems occur in the fractured rocks, although the flow paths can be quite complex.




***Problem statement:*** Salinity occurs as groundwater discharge to the creeks which have formed along the base of the range. These creeks include Deep Creek, and are the upper tributaries to the Maribyrnong River system. The local groundwater flow systems of the greenstone ranges may contribute a component of the salinity, although a complex conjunction of flow systems occur in this region. No salinity has been mapped within this GFS.

# Landscape attributes

***Geology:*** Cambrian marine sediments, volcanoclastics, metasediments, and metavolcanics (greenstones) (Emm, Eug, Ev) includes the Mount William Metabasalts, Knowsley East Shale (formerly the Monegeetta Shale) and the Goldie Chert.

***Topography:*** Low ridge formed by a chain of rounded hills.

***Land Systems:***

Central Victorian Uplands

*2.1 West Victorian Dissected Uplands – Midlands*

***Regolith:*** A complex mosaic of shallow stony soils, exposed rock outcrop, and deep clay soils, depending on the underlying parent material, slope and landscape position.

***Annual rainfall:*** 700 mm to 850 mm

***Dominant mid-1800s vegetation type:*** Forest with minor Woodland

***Current dominant land uses:*** Grazing, cropping, viticulture.

***Mapping method:*** Outcrop geology


*Mount William landscape*

## Hydrogeology

***Aquifer type (porosity):*** Fractured rock (secondary porosity)

***Aquifer type (conditions):*** Unconfined to semi-confined by the colluvium and alluvium developed along the flanks of the ridge.

***Hydraulic Conductivity (lateral permeability):*** Low. Probably less than 1 m/d.

***Aquifer Transmissivity:*** Moderate. Probably less than 20$m^2$/d.

***Aquifer Storativity:*** Probably less than 0.05

***Hydraulic gradient:*** Low to locally moderate

***Flow length:*** Generally from one to three kilometres.

***Catchment size:*** Generally <300 Ha

***Recharge estimate:*** Unknown, but probably quite low.

***Temporal distribution of recharge:*** Seasonal (winter and spring).

***Spatial distribution of recharge:*** Catchment wide where outcrop occurs.

***Aquifer uses:*** Unknown. Some minor use for stock water (if any).

## Salinity

***Groundwater salinity (TDS):*** Unknown.

***Salt store:*** Low to moderate.

***Salinity occurrence:*** None mapped within the unit, but some discharge has been reported along the eastern flank. Probably contributes to the salinity in Deep Creek and tributaries to the Upper Maribyrnong River.

***Soil Salinity Rating:*** None mapped.

***Salt export:*** Baseflow contribution to Deep Creek and possible salt wash-off from isolated discharge sites.

***Salt impacts:*** Off-site. On-site unknown, but not considered significant.

## Risk

***Soil salinity hazard:*** Low

***Water salinity hazard:*** Moderate

***Assets at risk:*** May impact on the water quality and biodiversity of Deep Creek and the Maribyrnong River.

***Responsiveness to land management:*** Should be high.

*Right:*

*Goldie Chert exposed in a road cutting at Goldie North*

# Management Options

Salinity currently presents a moderate issue on the Mt William Range, ranging from isolated discharge sites on its eastern flanks to moderately saline baseflow contributed to Deep Creek (albeit this contribution is probably a largely natural one exacerbated by land use change). Given the high rainfall in this area these salinity conditions are unlikely to be significantly altered unless there is substantial revegetation of the range. Maintenance of healthy vegetative cover across the range to reduce runoff, in addition to discharge site treatment, is probably the most practicable solutions.

**Dryland agriculture options** for managing salinity in local flow in the **greenstone ranges**.

**Salinity focus: Lower slopes of Mt. William range**

| Options | Treatments | Comments |
|---|---|---|
| Biological Management of recharge | Perennial pastures | Low to moderate impact– rainfall too high for significant recharge benefit. Healthy pasture coverage will tend to reduce run-off, hence waterlogging |
| | Crop management | Low impact– generally not significant land use in these landscapes, and rainfall above 700 mm |
| | Trees/woody vegetation | Low to moderate impact– thinner crest soils will reduce impact. Unless mass plantings (unlikely), scale of impact will be limited. Belts may intercept run-off |
| Engineering intervention | Surface drainage | Low impact– surface waterlogging not a significant issue. |
| | Groundwater pumping | Low to moderate impact– cost and disposal issues. Complex fractured rock aquifer. |
| Productive uses of saline land and water | Salt tolerant pastures | Moderate to high impact– useful to assist stabilising salt affected areas. |
| | Halophytic vegetation | Low impact– climate not likely to be conducive |
| | Saline aquaculture | Low impact– not suited to local environs. Only minor discharge |
| | Salt harvesting | Low impact– groundwater is not sufficiently saline |
| | Others | See OPUS database (NDSP) |

### Management implications given projected land use

No large scale land use change expected in the short to medium term. Some horticultural development may occur in the future (e.g. vineyards) that may have implication for local hydrology.