Situated in the Western Plains sub-province of the Newer Volcanics Province (NVP) of Victoria, SE Australia, Mt. Rouse has produced lava flows more than triple those of other NVP centres in terms of both area and volume. Alternating eruption styles from magmatic to phreatomagmatic, particularly during later stages, indicate periodic water influx during eruption. Previous dating of Mt Rouse flows has yielded ages of 0.3 to 0.4 Ma, suggesting polygenetic volcanism in a monogenetic volcanic field. Systematic sampling and detailed geochemistry were used to trace petrogenetic evolution and provide mantle source constraints. All lavas are weakly alkaline basalts whereas pyroclastics range from basanites to trachy-basalts and alkali basalts. Pyroclastics have more strongly light-enriched REE patterns. The latest surge deposits have higher silica contents, similar to those of lavas. It is concluded that Mt. Rouse is polymagmatic, with the lavas and pyroclastics constituting at least two magma batches. The two suites are probably co-genetic, produced by a declining degree of partial melting (from the lavas to the pyroclastics) of a mantle source(s) containing residual garnet, as shown by a plot of Gd/Yb vs La/Sm.