

Fluvial Characteristics of the Diamondiferous Droogeveldt Gravels, Vaal Valley, South Africa

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Abstract

The Late Cretaceous to early Tertiary Droogeveldt gravels, one of the more famous alluvial diamond diggings in the Vaal basin of South Africa for both grade and large stone size, were totally exploited in the earlier part of this century. The best recoveries were obtained from high elevation (1,100- to 1,130-m elev) bimodal gravels situated in narrow (2- to 20-m wide), straight-sided, bedrock depressions <1 km long, some 5 to 10 km from the current Vaal River (1,000-m elev). These gravels, forming a fining-upward profile, comprise cobble to pebble, silica-rich clasts characteristic of the current Vaal drainage basin set among now-weathered bedrock boulders derived locally from the underlying Archean Ventersdorp volcanic rocks. The gravel-filled depressions, known by the early mining community as "sluits" coincide with major structural lineaments in the Ventersdorp bedrock. Although the now rare, remnant weathered profiles resemble colluvium or debris flow-type deposits, the presence of potholed and smooth, polished, but irregular bedrock footwall in the sluits as well as rounded and percussion-scarred silica clasts points to a more energetic fluvial influence. The well-jointed bedrock sidewalls of the sluits provided readily accessible boulders (oversize clasts) to these gully-like features. Thus, the exceptional diamond concentrations and large stone size in the Droogeveldt gravels are attributed to a combination of primary, fixed turbulent zones formed by the narrow bedrock gullies with attendant pothole and scour trapsites, and secondary, quasi-fixed turbulent zones associated with the locally derived boulders (oversize clasts) in a paleo-Vaal River drainage.

The sluits are not eroded kimberlite dikes and the bulk of their diamonds are likely to be sourced from the Cretaceous kimberlites in the greater Kimberley area.