magnetite gabbros, anorthosites, and ferrodiorites (24 per cent of the Complex) completes the mafic part of the Complex. The measurements are from the thickest part of the eastern Bushveld Complex (Vermaak and Von Gruenewald, 1981). It should be noted that I have persisted with the use of the well-known informal stratigraphic subdivision of the Complex, rather than the formal subdivision of the so-called Rustenburg Layered Suite, which has little meaning for anyone other than the professional geologist.

The two most important mineralized layers in the critical zone contain the PGE either in silicate rocks (the Merensky reef) or in the UG-2 chromitite layer, which is a virtually monomineralic rock consisting of the mineral chromite. In both cases, the PGE are predominantly associated with base-metal sulphides.

2.1.1. *The Merensky Reef*

The term 'reef' was inherited from the gold mines on the Witwatersrand. The term 'Merensky layer' would have been infinitely more acceptable although, due to long usage, the ingrained terminology for this layer has been retained. The well-known Merensky reef occurs within a differentially graded cycle of layered rocks which is commonly termed the Merensky (cyclic) unit. The reef is invariably contained within the basal feldspathic pyroxenite layer, colloquially known as 'the Merensky' or the 'Merensky pyroxenite', which grades upward in the cycle to a norite, a 'spotted' anorthosite, and finally to a 'mottled' anorthosite at the top of the cycle. There are many variations of the Merensky reef, which is almost universally accepted as being the payable and mineable layer within the Merensky pyroxenite. In the Rustenburg area, the coarse-grained pegmatoidal layer, sandwiched between two thin chromite stringers at the base of the Merensky pyroxenite, is called the Merensky reef. At the Union and Amandelbult mines, the Merensky reef is an olivine-rich harzburgitic pegmatoid, still with the chromite stringers above and below, but in the eastern part of the western Bushveld (Western Platinum Mine), chromite stringers occur at the base and near the top of the Merensky pyroxenite. The upper chromite is commonly associated with irregular pegmatoidal patches. Although both chromite stringers are mineralized, only the top stringer is mined. In the eastern Bushveld, a pegmatoid with a single chromite stringer occurs at the base. A felspathic pyroxenite can also intervene between this pegmatoid and the footwall at the Atok mine. A further pegmatoid occurs between chromite stringers near the top, although the chromitites can also occur above the pegmatoid. As at Western Platinum Mine, both these duplications of the Rustenburg-type Merensky reef are mineralized in the eastern Bushveld, but only the upper one is mined.

An inescapable fact, deduced from closely spaced sampling (Viljoen, Theron *et al.*, 1986; Viljoen, De Klerk *et al.* 1986; Viljoen and Hieber, 1986; and Mossom, 1986), is that the chromite stringers always register peak PGE values. Some mines (Farquhar, 1986) are virtually dependent on the PGE values of a single chromite stringer for their payability. It is also evident that the entire thickness of the Merensky pyroxenite contains virtually the same total amount of PGE all around the main Bushveld Complex. The variation in grade depends on the thickness of that pyroxenite; the grades are best where the payable Merensky reef is thin, with the chromite stringers close together, and lowest when the chromite stringers are found both at the base and at the top of the Merensky pyroxenite.

There are many variations to the so-called 'normal' Merensky reef on individual mines, and terms like 'rolling reef', 'thin reef', and 'pothole reef' have been used to describe these variations. They are mostly related to abnormal stratigraphies and 'potholes', which affect the normal elevation of the reef due to an enigmatic removal of the footwall layers, which results in the slumping of the reef and its hanging-wall layers into the void so created (Figure 2.5). Many mechanisms have been suggested for the formation of these rather curious, roughly circular features; including mechanical scouring (Schmidt, 1952), thermochemical erosion (Campbell, 1986), suspended plagioclase crystallization (Ballhaus, 1986), and plagioclase resorption (Bourdreau, 1992). However, a new theory of layer-parallel extensional slip (Howard Carr, personal communication, 1993) would seem the most acceptable solution at this time. We need not concern ourselves with these structures, other than noting that they, along with so-called post-Bushveld iron-rich replacement pegmatoid bodies, commonly cause considerable losses of mineable ore.

The footwall rocks of the Merensky cyclic unit are mainly noritic to anorthositic, but are highly variable. In the northern part of the western lobe, the immediate footwall sequence can be highly ultramafic, known locally as the 'pseudoreef' because of its similarity to the Merensky sequence in that area. In the more noritic footwall, a number of persistent marker layers are extremely useful for stratigraphic positioning below the Merensky reef. The hanging wall of the Merensky unit is a differentiated sequence, much like its predecessor, called the Bastard unit, with the barren pyroxenite of the Bastard reef at the base. This unit was originally termed the 'Bastard Merensky', because it was commonly confused with the Merensky reef in the earliest prospecting trenches.

Where present, the coarse pegmatoidal Merensky reef layer is well mineralized with coarse base-metal sulphides, and is thus easily recognizable. Where the reef is not coarse, the sulphides are more discrete, but the reef can usually be identified by the existence of the chromitite stringer(s). In some areas of the eastern lobe, the mineralized pegmatoid may occur either as irregular patches or as muffin-shaped, ellipsoidal blobs. This habit is highly variable, and the pegmatoid can also form a layer. Towards the Pilanesberg, north of Rustenburg, much of the mineralization occurs in the

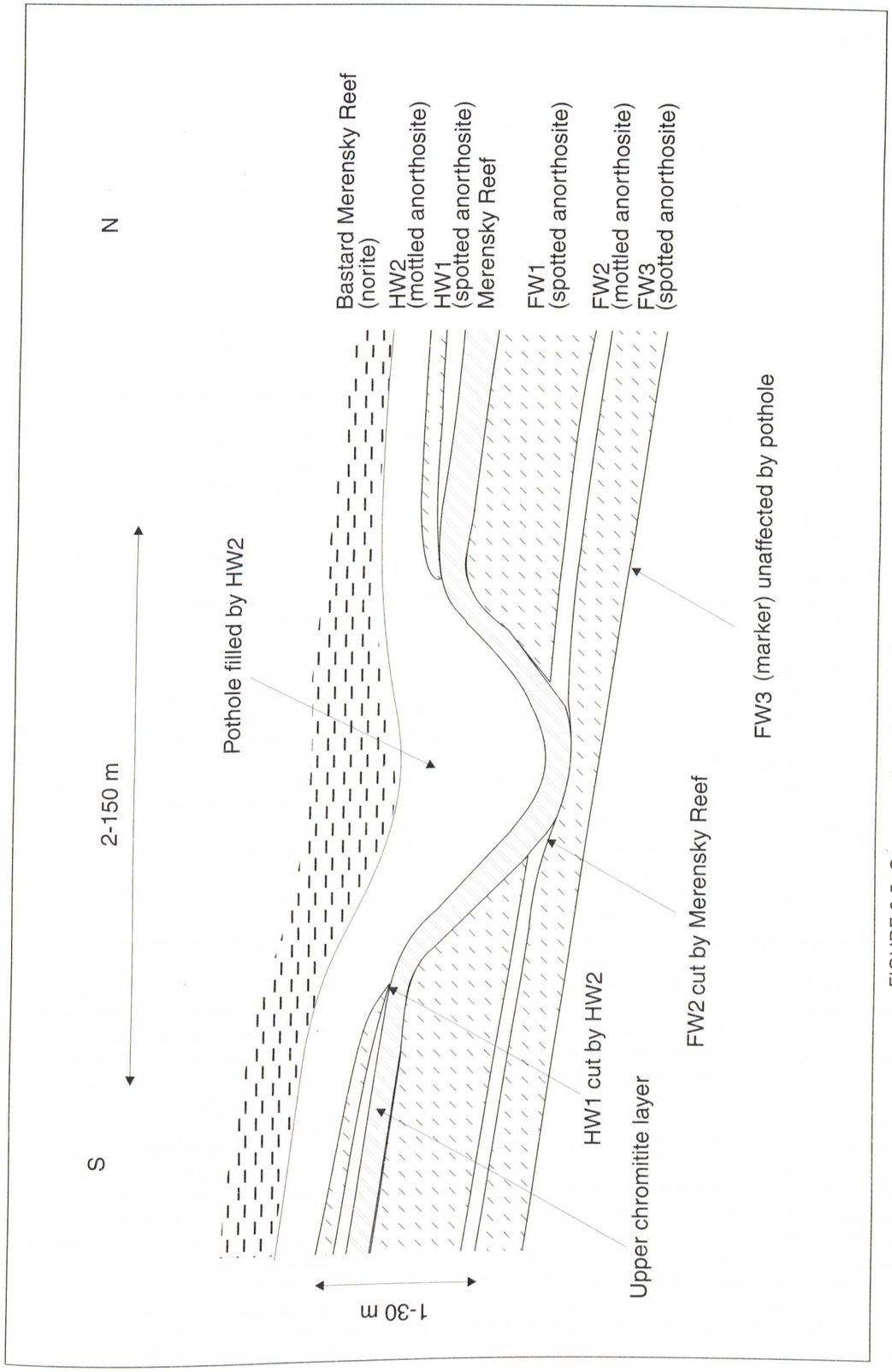

FIGURE 2.5. Cross-sectio