## Corrections to dissertation

The version of the thesis attached is slightly different from the one filed, which was double-spaced, and had different pagination. Principally, the Appendices were numbered as follows:

A1=p 249
B1=p. 294
C1=p 313
D1=p.336
E1=p. 364
Last page = 387

Also, several of the figures in the attached copy are faint: darker copies are provided which can be substituted if wished

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Because there were between 250 and 600 particles in each image, it was important to accurately determine individual particle areas, $d_{mod}$s, and areal proportions. The measurements were done using image analysis. The Gravel Tests demonstrated that sufficient scanline measurements estimated areal proportions, and that there was consistent patterns between the CLDs and the 2DBSDs. Following work on Case History sites (Chapter 5) with melanges of low block volumetric proportions (5 percent and 35 percent) further studies were performed using Gravel Tests results, since these had been generated for images with relatively low areal proportions of between 5 percent and 50 percent; whereas the Triaxial Specimen tracings (Section 2.8), had volumetric proportions ranging between 30 percent and 70 percent.

The Gravel Tests relevant to this dissertation included:

**1**. The calculation of the areal proportion of the gravel.
**2.** The comparison of the "true" areal proportion of the gravel particles to the "apparent" areal proportion evident from linear traverses (*scanlines*) across the images.
**3** The investigation of the effects of varying scanline length and interval on the estimates of block areal proportions, CLDs and 2DBSDs.
**4**. The identification of the optimum number of scanlines required to satisfactorily estimate both the block areal proportions <u>and</u> approximate the 2DBSDs from the CLDs.

Results from the Gravel Tests are presented in Section 4.3, and the data are summarized in Appendix C.

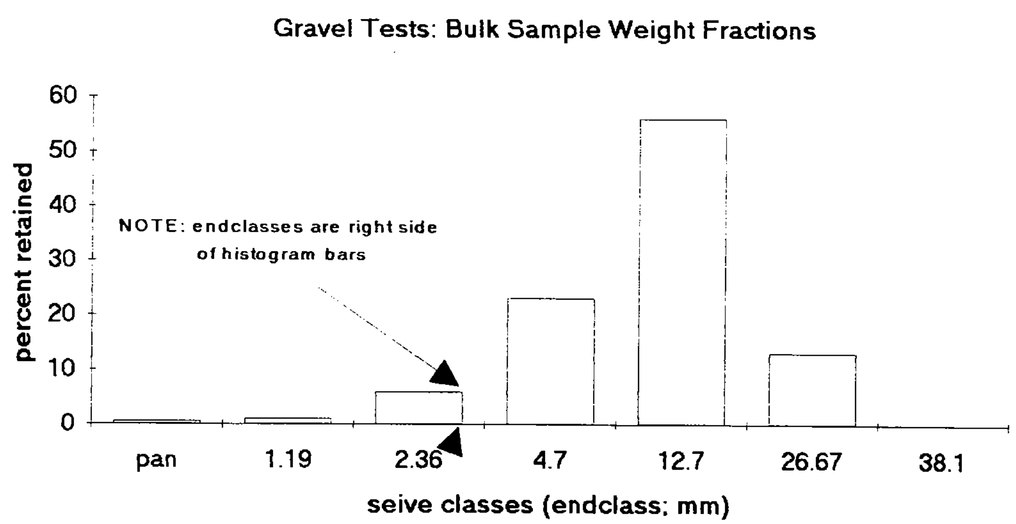


**Figure 2.10** Histogram of weight fractions for parent bulk sample of gravel and sand used for Gravel Tests.

generally shared the maximum dimension endclass, although the absolute maximum length of chord was rarely the same length as the maximum $d_{mod}$. The long chords constitute a relatively small proportion of the total number of chords, because there are few large particles. But, there are many smaller particles, and intersections with these constitute a relatively high proportion of the 45 chords, compared to the smaller proportion (but absolutely greater number) of $d_{mod}$s measured for the 2DBSD. The result is that the CLD appears to be "coarser" than the 2DBSD, and this appearance was typical of the block size distribution plots for both the Gravel Tests and the Triaxial Specimens. Generally, the slopes of the CLDs and 2DBSDs were similar between approximately 25 percent and 85 percent cumulative percent finer.

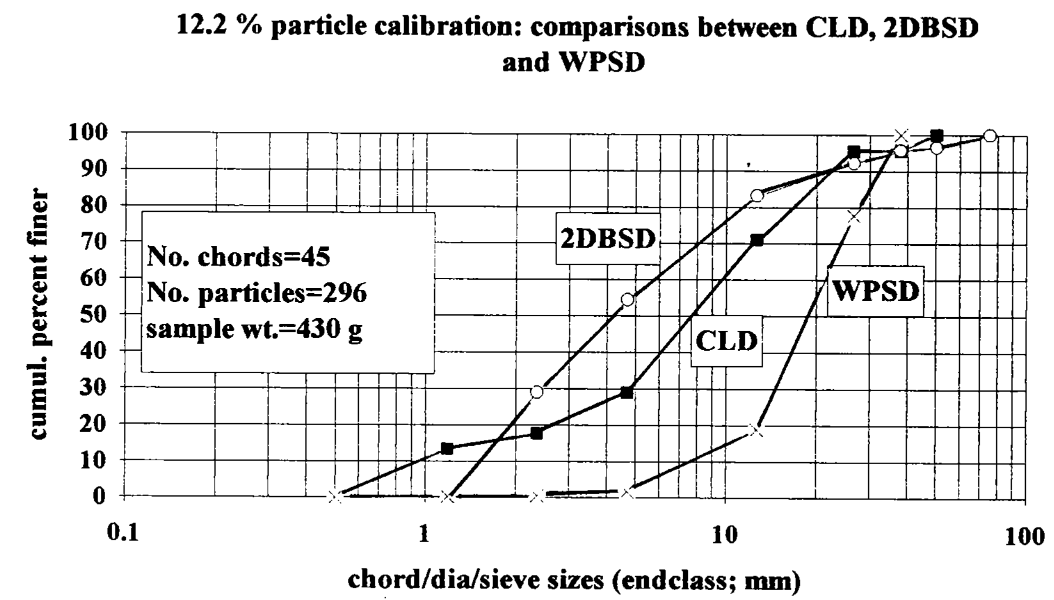


**Figure 4.5:** Comparisons between CLD, 2DBSD and WPSD for Gravel Tests setup of 12.2 percent block areal proportion

The apparent "coarseness" of the CLDs was an unexpected result. Intuitively, a distribution of chords should be "finer" than a distribution of block "diameters" ($d_{mod}$s) because chords would rarely be as long as block "diameters". The minimum dimensions of the 2DBSDs were generally the same as that for the WPSDs. And, there was an inevitable "fines tail" (*coda*) to the CLD due to the numerous chords shorter than the smallest $d_{mod}$. The coda was composed of chords shorter than about 1 percent to 5 percent of the length of the longest chord. Because they were so small, the coda could be neglected, just as small classes are abandoned in the stereological method of Lord and Willis (1951), illustrated in Figure 2.2. The endclass size of the smallest particle was assumed to be about 2 percent of the of the magnitude of the largest endclass.

In summary, plots such as Figure 4.5 showed :
**1.** The largest CLD endclass was generally was the same as the largest 2DBSD $d_{mod}$ class
**2.** The CLDs and 2DBSDs had similar appearances, but the CLD was generally "coarser"
**3**. The CLD coda was for very small sizes could be abandoned, and an endclass size for the smallest particle could be approximated.

The results of the Gravel Tests suggested that the CLDs for some arrays of particles could serve as approximate 2DBSDs, particularly if the CLDs were translated leftward ("finer"). A procedure was devised to effect such translations but is not presented here since it was not tested on self-similar CLDs.

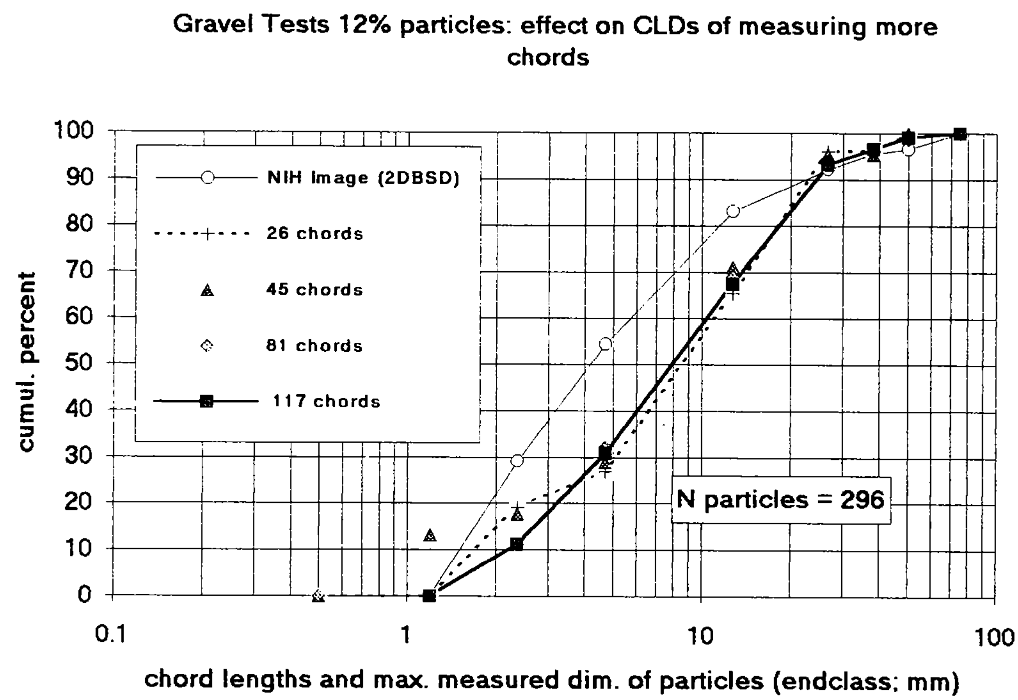


**Figure 4.6** Showing that there was relatively little effect on CLDs when the total length of scanlines was increased and more chords were measured for the 12% areal proportion Gravel Tests setup. Even when the number of chords was half the number of blocks, the CLDs maintained their relative appearance and distance from the 2DBSD. The 26, 45, 81 and 117 chords were measured from 10, 20, 30 and 40 scanlines (respectively) on the same image.

dispersed, and are only approximately correlated to the areal proportions, shown in Figure 4.11a, and the nominal volumetric proportions.

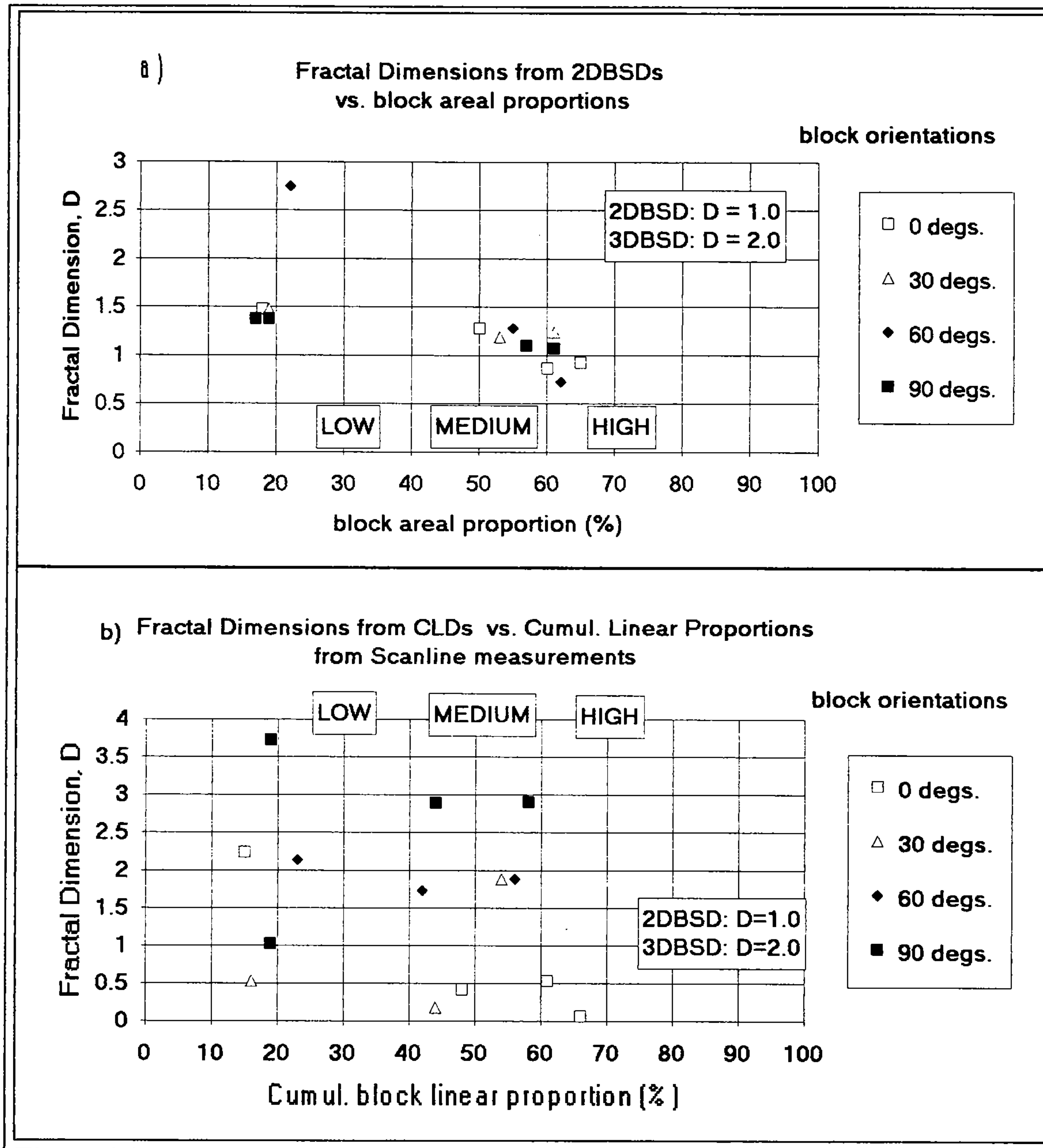


**Figure 4.11** Relationships between Fractal Dimensions, block orientations and block linear proportions or 14 Triaxial Specimen tracings: a) 2DBSDs from $d_{mod}$ measurements; and b) CLDs from scanline data

2. The block areal proportions in Figure 4.11a are clustered into two groups, except for the maverick point at (21%, 2.7). In general, the fractal dimensions of the 2DBSDs range between 0.7 and 1.5, with an average of about 1.0. This is the theoretically expected fractal dimension for the self-similar 2DBSD, since the 3DBSD for the model melange

# CHAPTER 5 CASE HISTORIES

## 5.0 INTRODUCTION

The three case histories presented here demonstrate the applicability of the methods developed to estimate the block volumetric proportion and block size distributions of some Franciscan melanges from measurements of drill core. At the Lone Tree Slide, the estimates were checked against field work, and from a contractor's records. The locations of the Case Histories are shown on Figure 5.1.

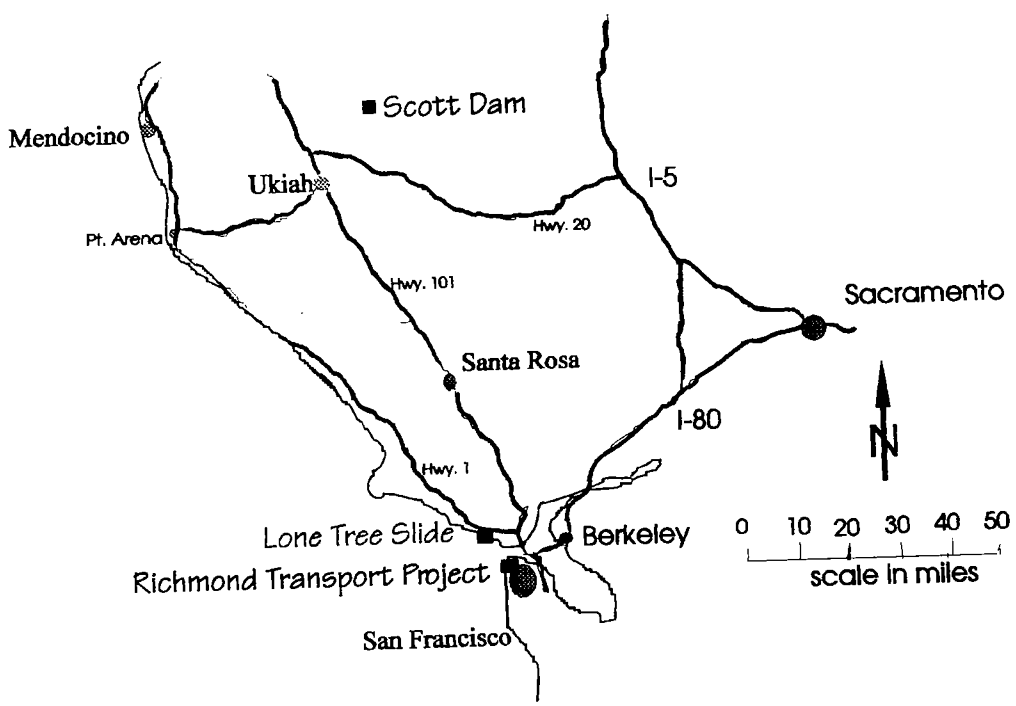


Figure 5.1 Locations of the Scott Dam, Lone Tree Slide and Richmond Transport Project Case Histories

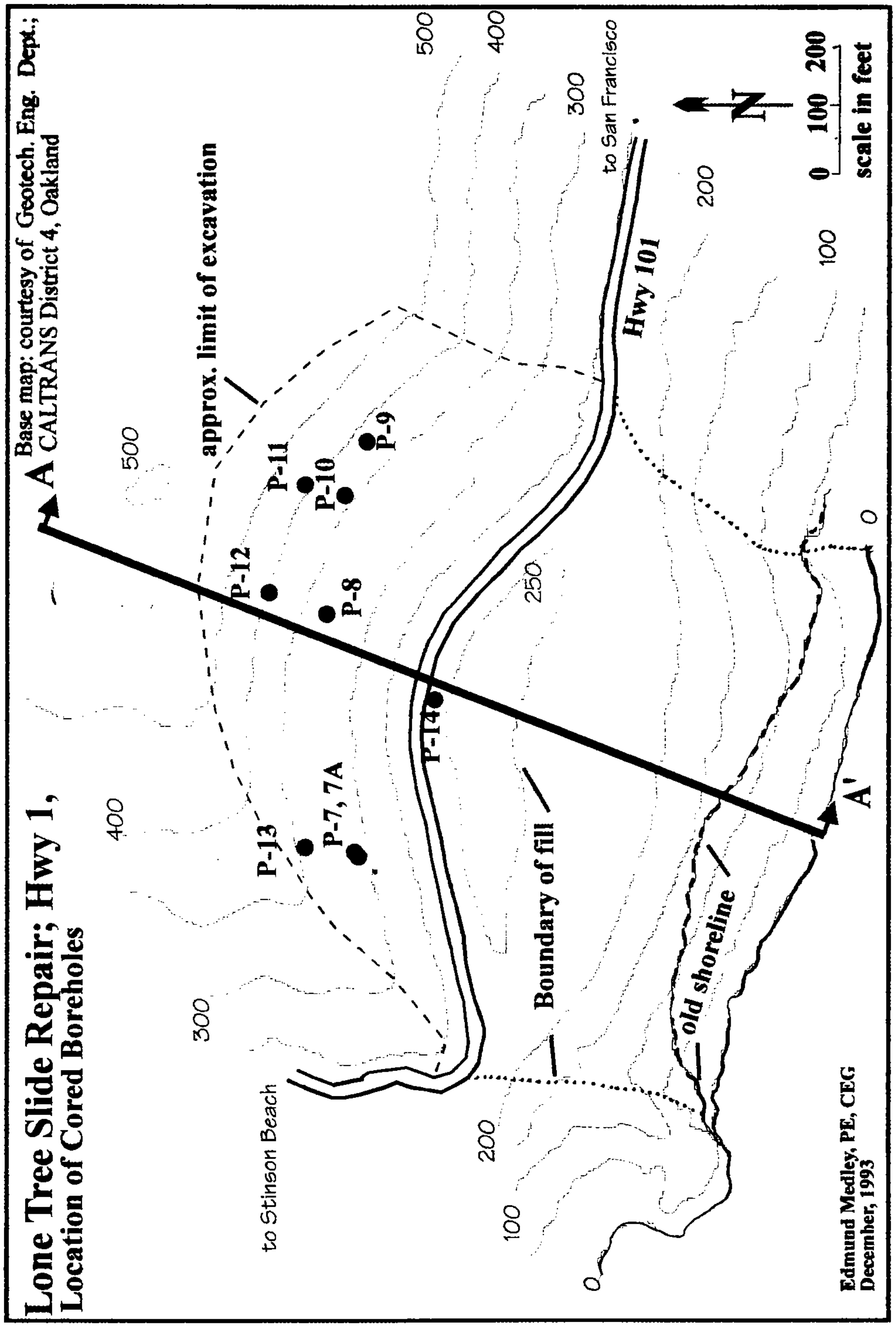


**Figure 5.2** Plan of Lone Tree Slide, Highway 1, Marin Co., California

lithologies sorted by the relative numerical proportion of the blocks as well as by the proportion based on blocks sizes, as characterized by the $d_{mod}$s of the blocks. The proportions are similar, as they were for Figure 3.8. The similarity is because the average size of the blocks, of any lithology, are alike. At Lone Tree Slide, siltstone blocks were significant, and composed about 10 percent of the total number of blocks.

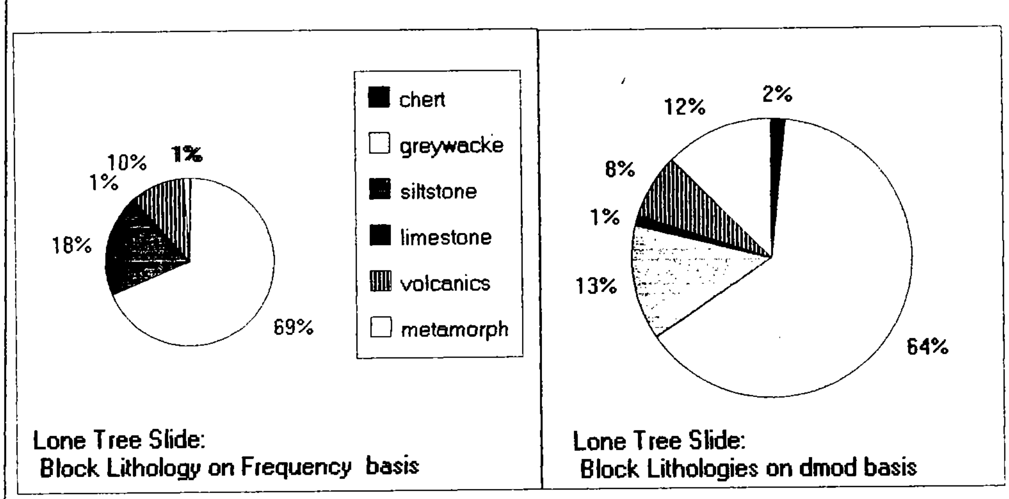


**Figure 5.4** Lithology of blocks at Lone Tree Slide

### 5.1.5 Estimation and Verification of Block Volumetric Proportion

Medley and Goodman (1994) and Medley (1994) estimated that the block volumetric proportion of the landslide material was 4.5 percent, as measured in the portions of the core previously defined as "excavation segments". The block volumetric proportion of the intact melange below the excavated surface was estimated as 28 percent. These estimates were based on the proportion of all blocks in the core, including those as small as 5 cm. The plot in Figure 2.9 shows that the fractional contribution of small blocks to the total of $d_{mod}$s is considerable, and inclusion of small blocks in this case gave too high a block volumetric proportion for both intact and failed melange. The revised estimates here are based on the concept of the geotechnical significance of blocks introduced in Section 1.2 and amplified in Section 2.6. As indicated in Section 6.1, the geotechnically significant blocks at the Lone Tree Slide were blocks larger than 1.5 m, the block/matrix threshold size at the scale of the landslide thickness. Because most of the blocks mapped had been greater than about 1 m, the threshold was relaxed to 1.0 m.

Figure 5.5 shows the proportion of all blocks in each borehole with chords greater than 1.0 m. Using the procedure outlined in Section 2.8.3, and summarized in Figure 5.6, the

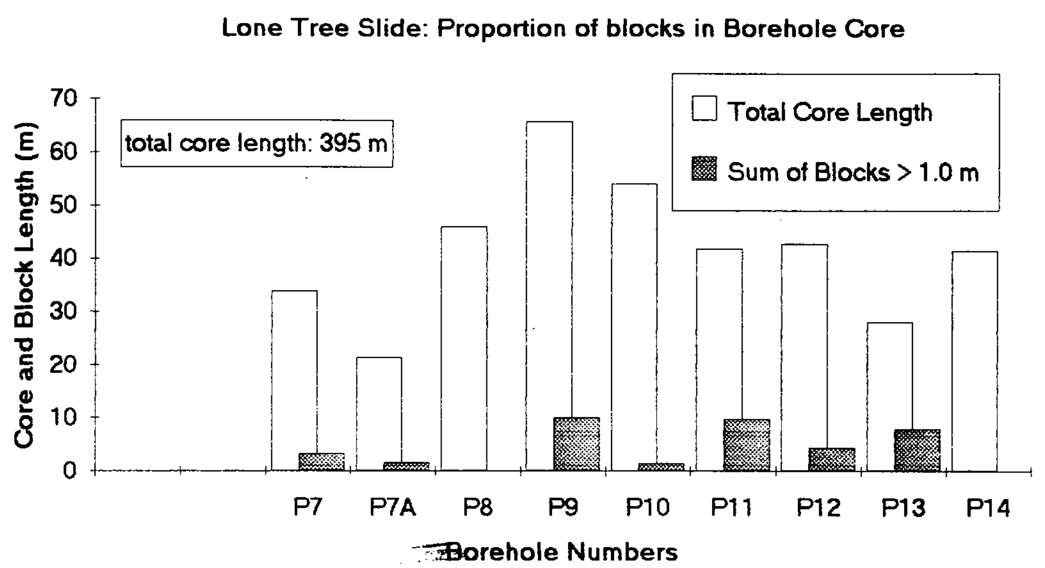


**Figure 5.5** Proportions of blocks in Lone Tree Slide core

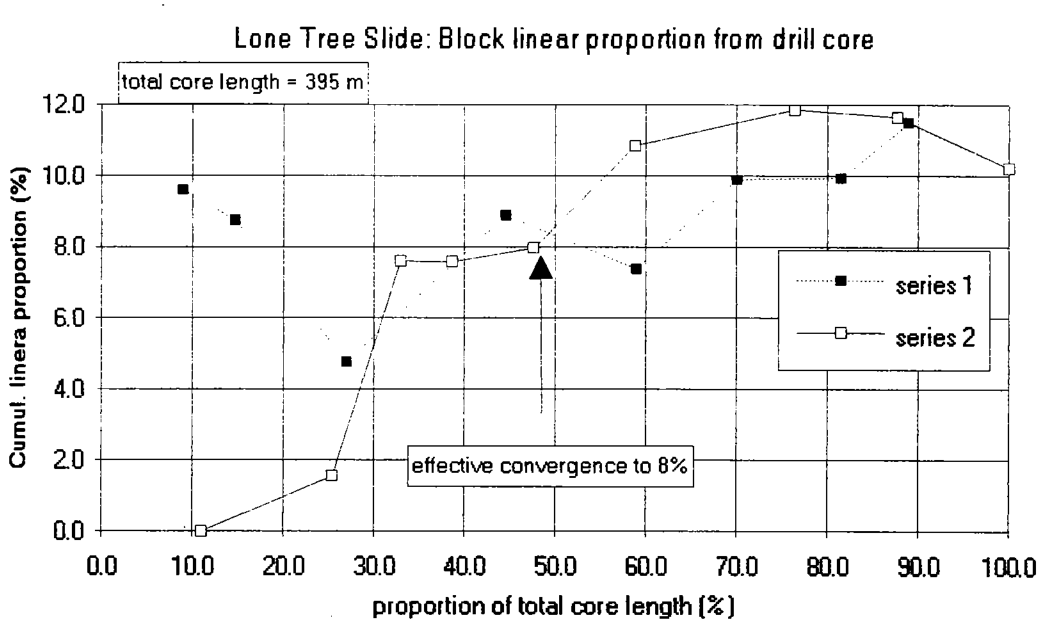


**Figure 5.6** Estimation of block linear proportion at Lone Tree Slide, based on drill core.

cumulative block linear proportion was estimated as 10 percent, with an effective convergence to 8 percent at approximately 50 percent of the total length of the core, or about 190 m, (620 feet). Since the largest local block was estimated to be about 30 m, the