THE UNIVERSITY OF ADELAIDE

S-TYPE GRANITE FORMATION AT VIVONNE BAY, KANGAROO ISLAND

by SIMON F. MITCHELL B.Sc.

November, 1990

S-TYPE GRANITE FORMATION AT VIVONNE BAY, KANGAROO ISLAND

Simon F.Mitchell, B.Sc.

SI-5316-6326-III
KINGSCOTE 1:250000 SHEET
VIVONNE 1:50000 SHEET

Thesis submitted as partial fulfilment
of the Honours degree of Bachelor of Science

University of Adelaide
Department of Geology and Geophysics

October, 1990

TABLE OF CONTENTS

List of Tables and Figures

ABSTRACT

Demonstrating a genetic association between a granite and the surrounding country rock by field relationships is usually difficult. However, wave cut platform exposures at Vivonne Bay, Kangaroo Island, display a variety of granites, each of which has evolved under different but related processes. Both field relationships and geochemical analyses were used to describe the granite-migmatite association and allow the processes of formation to be assessed.

There are five major granite lithologies recognised along the Vivonne Bay section, viz; biotite granite,.garnet granite, leucocratic granite, felsic granite and porphyritic granite. Field relationships indicate that the leucocratic granite, felsic granite and garnet granite are small (<200m) intrusives, while the porphyritic granite is a kilometre scale intrusion which forms the "core" of the section. The small scale (<200m) biotite granite is intimatly associated with a biotite metasediment and granitised metasediment (or subgranite). The level of metamorphism of the metasediments is very high, reaching migmatite grade in most parts of the section, and is proportional to the proximity of the porphyritic granite core.

Geochemical analyses indicate two major trends. The first trend suggests the intrusive granites form a fractionation relationship and the second trend implies that the biotite granite is the product of partial melting of the metasediments. Mass balance modeling and an analysis of the trace element distribution reinforced the suggested trends. This study concluded that the granites at Vivonne Bay represent four different stages in melt evolution;

Stage 1: Unsegregated partial melting of the metasediments producing a subgranite

Stage 2: Metre scale segregations of partial melt from the metasediments producing a biotite granite

Stage 3: Kilometre scale pluton accumulations of biotite granite melts producing a porphyritic granite

Stage 4: Fractionation from the porphyritic granite producing a garnet granite.