Appendix 4:

Diatom methods

Preparation of diatom samples followed standard laboratory methods (Palmer and Abbott, 1986) with a minimum count of 250 diatom valves possible for most samples. With only very small amounts of sediment taken from the archive cores we could not experiment with different densities of residue on the slides, therefore we have found it better to use, where appropriate, photographs taken from other cores in Alaska that we have studied.

The two key reference volumes for coastal and estuarine diatoms are based on NW European material (Hartley et al., 1996; Van der Werff and Huls, 1958-1974) together with supplementary information from the Pacific Northwest (Hemphill-Haley, 1993) and flora of north American freshwater species (Patrick and Reimer, 1966; Patrick and Reimer, 1975).

In broad terms, the order of diatom salinity classes (Appendix 1) should reflect change from tidal flat through tidal marsh, to freshwater marsh and bog. Marine (polyhalobous) and brackish (mesohalobous) groups usually dominate tidal flat environments and freshwater groups tolerant of different degrees of salinity (oligohalobous-halophile and oligohalobous-indifferent) become dominant through the transition from tidal marsh to freshwater marsh. Salt-intolerant species (halophobous) characterise the most landward communities, including those from acidic bogs above the level of highest tides.

The summary salinity classes were originally defined in the studies in NW Europe. Samples from upper Cook Inlet show that the environmental tolerances of a number of species are much broader. For example *Navicula cari* var *cincta*,*Tabellaria fenestrata* and *T.flocculosa* are classified within different freshwater groups (Appendix 1) yet we have found them across tidal marshes and tidal flat locations around upper Cook Inlet (Hamilton and Shennan, 2005).