soils from all the contaminated sites sampled (Table 2). The mobility of the spilled fuel depends on the fuel's physical characteristics (Gore *et al.* 1999). Lighter fuels such as JP8 jet fuel or Diesel Fuel Arctic (DFA) are highly mobile, whereas heavier hydraulic and lubricating oils are less mobile. At the DFA-contaminated Bull Pass site, hydrocarbons were detected at high levels at the 60 cm depth where the mobile fuel was perched on bedrock. In contrast, at Marble Point hydrocarbon levels were below detectable levels in soil from the 27-40 cm depth, in the soil reported here, where a relatively less mobile oil had not penetrated a clay-rich soil horizon of low permeability. At Scott Base, soil sampling was limited by the presence of ice-cemented ground at about 20 cm depth in early December. It is likely that the ice-cemented permafrost surface, at about 35 cm at Scott Base, restricts downward movement of fuels.

Chemical characterisation of the hydrocarbon contaminants from all sites identified *n*-alkanes and aromatic compounds (Table 2), some of which occur on the USEPA Priority Pollutant List. While hopanes, a constituent of hydraulic and lubricating oils, were detected in soil from the former Marble Point Camp site (Weston and Aislabie, submitted), we have not yet analysed soils from the Scott Base site for hopanes.

Climate data and soil temperature profiles

Comparison between the three study sites (Table 3) indicates that Scott Base is markedly cooler and windier than either Marble Point or Bull Pass. Bull Pass has the longest period in which air temperatures exceed zero.

Comparison of temperature profiles between hydrocarbon-contaminated and control sites (Figure 2) at Scott Base and Marble Point indicates that during fine weather the summer soil temperature at the contaminated-soil surface is often warmer (by up to 7° C) than at the adjacent control

Table 2: Levels of total petroleum hydrocarbons (TPH) [A], classes of hydrocarbons, identified at each site using GC[B], and the description of site contamination for three locations in the Ross Sea region, Antarctica.

Location	TPH $\mu g\ g^{-1}$ dry weight	Class of Hydrocarbons	Description of site contamination
Scott Base: drum storage site			
0–2 cm	25 100	C10–C40 *n*-alkanes	Storage area for drums of hydraulic and lubricating oils. Hydrocarbons spilled during movement and distribution.
10–20 cm	4190	polyaromatic hydrocarbons	
Marble Point: Old Marble Point Camp site			
0–3 cm	29100	C13–C40 *n*-alkanes	Oil stains on soil surface at site of Old Marble Point Camp assumed to be hydraulic and lubricating oils.
3–12 cm	18300	polyaromatic hydrocarbons	
12–27 cm	200	hopanes	
27–40 cm	<20		
40–55 cm	<20		
55–75	<20		
Bull Pass: seismic bore-hole site			
0–2 cm	<30	C9–C15 *n*-alkanes	Diesel fuel Arctic was spilled in 1985 during seismic bore-hole drilling. Contaminated surface soil was removed. Sample site was down-slope from original spill site.
2–8 cm	260	monoaromatic compounds	
8–16 cm	1260		
16–35 cm	960		
35–50 cm	2470		
50–60 cm	9000		
60–65 cm	9500		

[A] Total petroleum hydrocarbon levels in soil from control sites near the spill sites were <30 $\mu g\ g^{-1}$ dried weight, except for the Scott Base site which was < 500 $\mu g\ g^{-1}$.
[B] Data from Aislabie *et al.* (1999), Weston and Aislabie (submitted).