SECTION 1. SPILL CHRONOLOGY

The following chronology is included to provide the Trustees a general summary of the incident, as context for the Preassessment Report. It was derived from several sources of information, not all of which are in complete agreement. Thus, the chronology should not be relied upon exclusively for detailed information about the incident.

4 February 1999
At 0830 PST, the *M/V New Carissa*, a 194 meter (m) bulk cargo ship in ballast, went aground 5 kilometers (km) north of the north jetty of the entrance to Coos Bay, Oregon (Fig. 1). The vessel first grounded approximately 375 meters (m) offshore. Initial reports of oil in the water were later corrected saying that no oil had been released. On-scene weather was severe, with 35-50 knot (kt) winds from the SW and 6 m waves breaking over the vessel. Fuel on board included 1,312 metric tons intermediate fuel oil with API (13.6 - 20.8) and 124 metric tons diesel. Figure 2 shows the location of the fuel tanks in the ships holds. The Bureau of Land Management (BLM) closed beaches along North Spit jetty and Horsfall Park to the public.

5 February 1999
Southerly winds were 35-40 kt with 60 kt gusts. Seas were running 7.5 m. A salvage ship had been contracted by the owner, but was unable to depart Astoria because of sea conditions on the Columbia River Bar.

Agency efforts focus on mapping sensitive resources, developing protection priorities, and fine-tuning protection strategies. These maps were distributed with the Incident Accident Plan along with specific operational recommendations for minimizing any potential impacts during salvage or response activities.

6 February 1999
On-scene weather consisted of 40-50 kt sustained south winds with gusts of 60+ kt. Although no oil had been released, the Maritime and Fire Safety Association wildlife rehabilitation trailer was staged by the RP at the BLM ramp as a contingency measure.

7 February 1999
Winds were from the W-SW at 35-40 kt. Salvors on-board reported that the vessel was moving slightly. The vessel was in good condition and had been well maintained. No buckling or cracking and no problems in the engine room were observed.

8 February
Winds were from the W at 25 kt. Personnel on the ship observed oil burping out alongside the ship. Oil was reported on the shoreline by Forest Service staff at 0745. Oil was observed on the beach in the vicinity of the ship and extending 7 km to the north. The salvage master reported that four of the six oil tanks on board were compromised and in contact with seawater. Three of the cargo holds appeared to be open to the seawater with oil contamination reported in some of the ballast tanks (No. 5 port and starboard, No. 4 port) and cargo holds (No. 5 and No. 6). The salvage ship arrived on scene late in the evening.

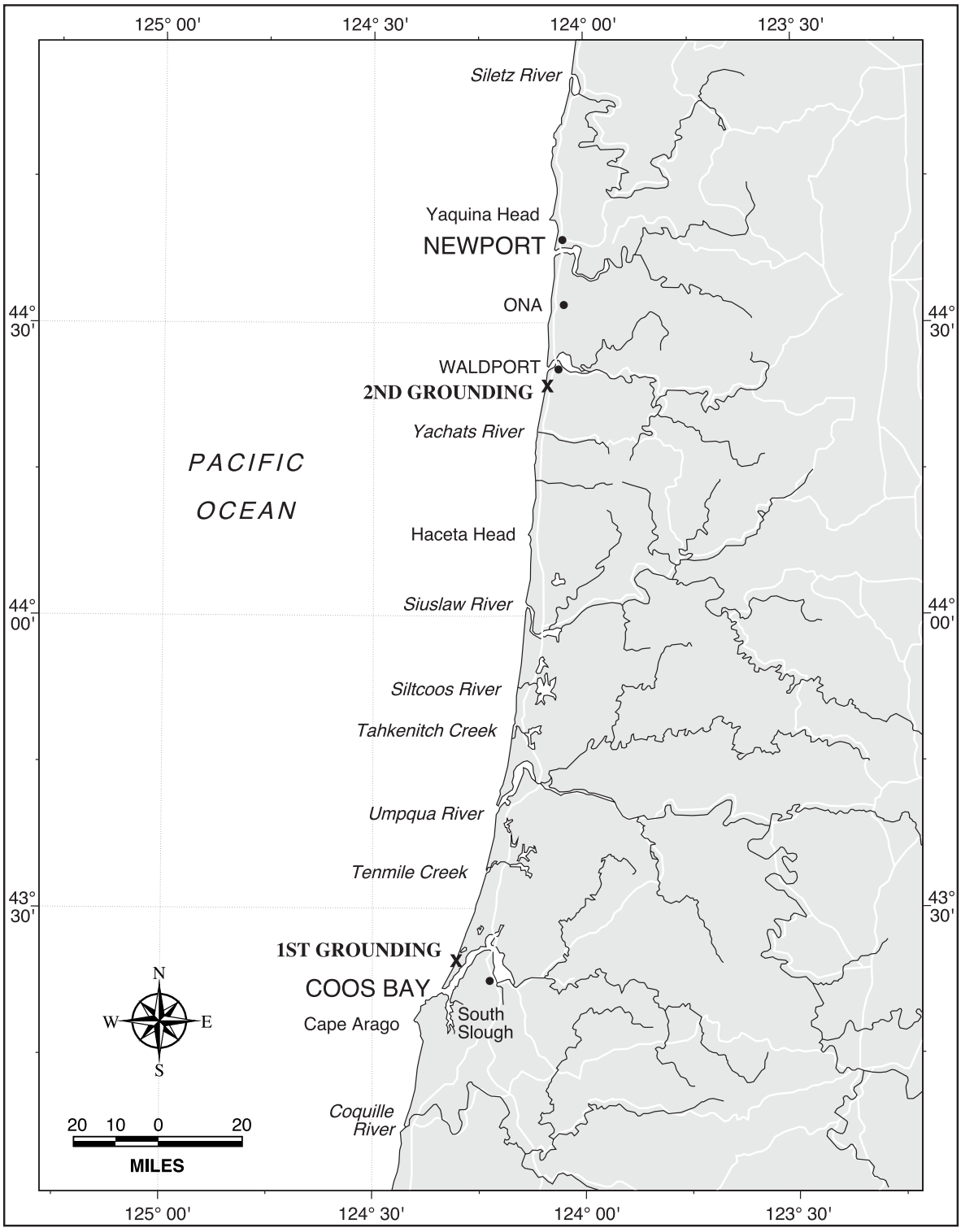

FIGURE 1. Location map showing the two grounding sites for the *M/V New Carissa*.

FIGURE 2. Location of fuel tanks in the hold of the *M/V New Carissa* (The Oregonian web site).

Clean up contractors began manual removal operations on the heavier concentrations of oil near the vessel using squeegees, rakes, brooms, and flat shovels. Snares were staked out along the high tide line. Three shorebirds were observed feeding in the vicinity of the oiled area. Personnel from the International Bird Rescue and Research Corp. were mobilized for wildlife rehabilitation.

9 February 1999
The vessel rotated back towards the shore due to prevailing seas and was once again parallel to the shore. Wave action dug a hole for the vessel and at high tide the vessel rolled 15 degrees. Winds were from the W at 15-20 kt.

The amount of oil being released from the ship was small: 6-8 dull brown streamers ranging in length from 20-80 m long by 1-10 m wide with a silver sheen. A transparent sheen trended from the vessel to the southwest for approximately 3 km. A brown "scum" was observed on the water surface. This scum, though dark in places, did not appear to have any oil associated with it and was thought to be composed of diatoms.

10 February 1999
The main engine room began flooding late the previous night, and a 6 m transverse fracture on the starboard side of the vessel extended through the hull and into cargo hold No. 6. At 0940, the Unified Command decided to exercise the option of burning the fuel in the vessel *in situ*. This decision was based on the continuing deterioration of the vessel integrity, the fact that it had become a constructive total loss, the high winds/seas forecast for Thursday morning, and the forecasted spill trajectory.

The U. S. Coast Guard (USCG) cleared all response personnel from the North Spit in the area of the grounded vessel. At 1806 PST, the Navy Explosive Ordnance Disposal Mobil Unit 11 set and exploded ordnance in all cargo holds to open fuel tanks and ignite the fuel. Post assessment of the vessel indicated only the engine room was burning. To address the potential threat to public safety from the smoke plume generated from the *in situ* burn, air monitoring for smoke particulates (PM10) was conducted by state and federal agencies at three locations in the vicinity of the predicted smoke plume: Empire, North Bend (near the airport), and Umpqua River CG station. The monitors were in place well ahead of the initiation of the burn to collect particulate data before and after initiation of the burn. None of the readings exceeded background levels. Winds were SE at 10-15 kt, which kept most of the oil offshore.

11 February 1999

The second attempt to ignite the fuel in the vessel's tanks/holds was successful. At 1742 PST, the charges were detonated and ignited the fuel onboard. Within approximately an hour, the entire ship was engulfed in flames. As of midnight Thursday, the stern separated from the vessel, with the bow still burning. Winds remained from the SE at 8-12 kt, keeping the plume offshore. Air monitoring continued.

Reports of oiled shorebirds increased. The oiling ranged from slight smudging of feathers to heavy black oil on the stomach, face, and neck. The Oregon Department of Agriculture (ODA), which regulates commercial and recreational shellfish harvest, published a notice that mussel and clam harvesting for human consumption or bait was prohibited on the outer beaches in Coos and Douglas counties due to potential contamination from the *M/V New Carissa* oil spill.

12 February 1999

The vessel continued to burn, but at less intensity. The air monitoring team remained deployed. Toward midday, the wind became SSW bringing the smoke ashore. Particulates levels at Horsfall Beach reached an average of 45 µg/m3, less than a third of the level of concern. A second, roving monitoring team collected samples near Hauser and at the north end of North Bend. At both locations readings were much below the level of concern, reinforcing the fact that there was no significant public exposure to smoke particulates from the smoke plume up to this point. ODA closed Lower Coos Bay and the Charleston Boat Basin to recreational harvest of mussels and clams.

There were reports of stranded tar balls as far north as Umpqua South Spit. Black oil with heavy sheen was observed leaking from the vessel's bow to the shoreline up to the effluent lagoon. ODA published commercial shellfish harvest restrictions due to potential for contamination from the *M/V New Carissa* oil spill for Joe Ney and South Slough, Lower Coos Bay, Umpqua River Triangle So. Jetty, Winchester Bay, and the Umpqua River to Big Bend.

13 February 1999

The fire in the vessel had gone out overnight. It was re-ignited in the afternoon, but burned for less than one hour. Fresh oil continued to be released from the bow, with significant amounts of black oil slicks around the vessel in the afternoon during the ebb tide. Offshore surveys of crab pots 2.5 km to the N and S of the vessel found no evidence of oil on the gear or crabs.

14 February 1999
The oil in the bow was re-ignited by helitorch several times during the afternoon, each burn lasting only about one hour. SCAT surveys reported sporadic tar balls as far north as the Siuslaw River. Significantly more oil was observed around the vessel in the afternoon during ebb tide.

Commercial shellfish harvesting was closed in Douglas and Coos counties, and an advisory against recreational shellfish harvesting was issued by ODA.

15 February 1999
A series of re-ignitions by helitorch occurred during the late afternoon, with little success in maintaining the burn. The vessel continued to leak oil, with sheens extending 8 to 10 km NW of the vessel. By afternoon, the amount of oil around the vessel had significantly decreased.

16 February 1999
The afternoon arrival of a large storm created seas of 6-8 m. The large waves and spring high tides moved the vessel toward the beach to where it could be reached at low tide. It was reported that 130,000-150,000 gallons (gal) of oil and fuel remained in the bow portion of the ship. Tank No. 2, under cargo hold No. 3, contained about 100,000 gal; the remaining oil was in cargo hold No. 2. The residual oil in the vessel was a thick, high viscosity oil.

17 February 1999
The effects of the storm were dramatic. The beach was significantly eroded; as much as 2 m of beach was scoured in some locations. The scouring of the beaches also removed most of the stranded oil. The plan to tow the bow to sea and sink it was approved, but the weather delayed attempts to attach a tow line. With the bow so close to shore and stabilized, a decision was made to pump oil from the vessel to shore-based tanks during low tide events over the next three days. No floating oil was observed in the vicinity of the bow and stern during both morning and afternoon overflights.

18-21 February 1999
USCG and Navy Supervisor of Salvage staged equipment at the beach for lightering operations. Pumping began late on 20 February. Shoreline cleanup continued with manual removal of scattered tar balls and tar patties. Most SCAT teams were demobilized after 18 February because little new oiling was observed.

22 February 1999
Gale force winds and high seas caused lightering operations from the bow section to be discontinued for safety reasons. Continued pumping was not considered cost effective because of the high viscosity and cold temperature of the remaining oil. Towing the bow offshore awaited a weather window. It was later estimated that only about 200 gal of oil were removed from the vessel during pumping.

23-25 February 1999
High winds delayed RP efforts to pass a tow line from the tug to the bow and pull the bow off the shore. No floating oil was observed during overflights. SCAT surveys resumed, reporting widely scattered and fairly weathered tar balls.

26 February 1999
The tug attached the hawser to the bow, and readied to pull during the next high tide. Floating oil was observed around the vessel, as patches of brown to dull silver sheens, about 50 m long with an accompanying small band of silver sheen extending about 150 m to the north-northwest.

27-28 February 1999
Towing operations were successful over these two days in orienting the bow section offshore and pulling the bow about 10 m seaward. No sheens or oil were visible near the vessel.

1 March 1999
After four days of steady pulling, especially during high tides, the bow of the *M/V New Carissa* was towed through the last of two sandbars at 2137 PST into open water. No sheens or oil were visible near the vessel during overflights.

2 March 1999
The tow line to the *M/V New Carissa's* bow section parted at about 1700 PST. The bow section was approximately 90 km WNW of Coos Bay (43° 40.3N, 125° 10.9'W) and drifted downwind at about 5 kt. Winds were 50-60 kts from the SSW. A severe winter storm was passing through the area and wind gusts of up to 100 kts were predicted with seas expected to be over 9 m.

3 March 1999
The bow section grounded again at about 0700 PST just outside the mouth of Alsea Bay (some 110 km north of Coos Bay). The command post was moved to the Waldport Middle School, in Waldport, OR. The afternoon overflight from Coos Bay to just north of the Alsea Bay reported sheens and tar balls visible near the bow section, and on the shoreline just inshore of the vessel.

Governor Patterson State Beach was closed to the public. ODA alerted the public that mussel and clam harvesting was not advised on the beaches and bays of Lane and Lincoln counties due to potential contamination.

4-7 March 1999
Preparations were made for towing the bow off once again. No floating oil was observed. The tow line was secured on 6 March to the bow section and the tug started pulling.

On March 4, commercial shellfish harvesting was closed by ODA in Yaquina, as well as commercial bait shrimp harvesting in Alsea Bay. Also, recreational harvest of mussels and clams was prohibited on the beaches near Waldport and inside Alsea and Yaquina Bays, until the risk of oil contamination was assessed. (It should be noted that during the advisories against shellfish harvesting in Lincoln County following the second grounding, the beaches were already closed for shellfish harvesting due to the presence of the toxin domoic acid.) ODA lifted the shellfish harvest restrictions from the *M/V New Carissa* oil spill for all of Coos and Douglas counties (beaches and estuaries) with the exception of Joe Ney Slough, in the immediate vicinity of the stern section on North Spit, and Bastendorf Beach near the So. Jetty entrance.

8 March 1999
The bow was successfully towed off the beach at 0315 PST. Shoreline surveys conducted in the vicinity of where the bow had been stranded observed no evidence of recent oiling. Afternoon over flights of the bow section under tow noted a 3 m wide band of light silver sheen trailing behind the bow section. ODA reopened commercial shellfish harvesting and recreational clamming in Yaquina Bay.

10 March 1999
The remaining commercial shellfish harvest restrictions were lifted. Governor Patterson State Beach was re-opened to the public.

11 March 1999
The bow section was sunk by a combination of explosive charges, naval gun fire, and a torpedo from the submarine USS *Bremerton* at 1500 PST at position 43-31.6N; 130-26.6W in 3400 m of water 515 km west of the Oregon coast. On scene observers reported an oil slick about 1,000 m. Arriving on scene, the *Oregon Responder* searched for the slick, without success. Beach cleanup workers at Waldport, Newport, Yaquina Bay, Alsea Bay, and Coos Bay areas continued to recover small volumes of oiled materials.

12 March 1999
Overflight observers reported oil sheen in two areas: 1) ~1.5 km north of the disposal site, blotches of silver sheen with scattered spots of heavier oil, 1,000 m by 100 m; and 2) ~16 km northeast of the site, rainbow, with 30 percent cover of streaks of dark sheen and blotches of visible oil, in the shape of a right triangle, with sides of 2.8 km and 1.2 km. Oil in both areas was determined to be non-recoverable.

22 March 1999
The remaining recreational shellfish harvest restrictions were lifted.

End of March-18 April 1999
Operations on the stern removed approximately 25 cubic yards (yd^3) of debris, 54 drums of assorted HAZMAT (paints, batteries, lube oil, burnt paint cans, etc.), and more than 10,000 gal of oil/water (mostly oil) skimmed from the flooded engine room. Beach inspection teams inspected and signed off all beaches in Waldport, OR. In Coos Bay, signoffs were completed from Ten Mile Creek north and for all areas south of the entrance to Coos Bay.

19-30 April 1999
USCG takes over operations to have divers locate and open 16 tanks with possible oil. Divers eventually locate 14 tanks and open 13. Oil recovery efforts aboard stern by skimming ended, with 3,345 gals of fuel and 12 cubic yards of solid waste recovered during 16-30 April. FOSC requested RRT approval to use a surface washing agent, to be used with high pressure wash to clean engine room bulkheads.

4-11 May 1999
Beach observers reported in increase in tarball concentrations in segments N1 and N2. Beach Response Crews mobilized to clean beaches in areas of tar ball impacts. Cleanup of engine room using a surface washing agent (Cytosol) to clean engine room surfaces and equipment was completed on 11 May.

20 May 1999
Twenty tanks and four engine compartments were accessed with 4,120 gals of oil and water and 78 yd^3 of solid waste removed during USCG-led operations onboard stern 16 April to 20 May. FOSC determined the substantial threat of discharge to be mitigated, and oil removal operations aboard the stern section of the *M/V New Carissa* to be complete.

Beach inspection team members conducted trenching of beaches near the stern section during -0.7 m low tides to inspect spring transition beach sands for possible tar ball deposition. Trenches were 20 m long and 0.6 m deep in areas. No evidence of oil in the trenches was found. Weathered tar balls (0.6-1.2 cm) were found from north jetty to south of Horsfall Staging (N1-N3). These tar balls were described as very light, with an average concentration of less than $1/m^2$. Concentrations were sporadic, with some areas having no tar balls. The greatest tar ball concentrations were near the wreck. These tar balls appeared fresh, from pea to quarter sized.

June
Monitoring teams continued to survey the beaches in the Coos Bay area, and notified Beach Response Crews to clean beaches in areas of tar ball impacts in the vicinity of the stern and at plover nesting sites. Daily tar ball recoveries from beach segments were reported as 100-150 grams (g) up to 4.5 kilograms (Kg). Removal of the accommodation block of the stern began 2 June and was completed on 13 June. Surficial sediment sampling was conducted on 20 June. Sorbent sleeves, 1.5 m long by 7.6 cm wide and weighted with chain, were dragged along the bottom in the vicinity of the stern to detect the presence of oil, in or on the bottom sand. No oil was detected.

July
RP-directed beach teams responded to impacts of oil in snowy plover habitat and in near the stern. Daily tar ball recoveries from segments were reported as 100-150 g up to 5 Kg.

A mystery spill of oil determined not to be *M/V New Carissa* oil resulted in a sudden increase in tar ball stranding in the Coos Bay area on 17-20 July. The USCG assumed cleanup from this non-*M/V New Carissa* oiling event, terminating their effort on 27 July. RP-directed beach teams continued to recover increased amounts of tar balls in all regularly monitored plover beach areas.

August-September
Efforts to remove the stern continued. Tar balls continued to strand intermittently on the outer beaches near the stern. Several snowy plovers were observed during this period with oil on their feathers.

October-December
Efforts to remove the stern continued. Several attempts were made to tow the stern, and some movement to sea was achieved, but the progress made was lost when the tugs were forced to abort and the tow was pushed back to near her original position by storm seas. Wreck removal activities were suspended in November. Tar balls continued to strand intermittently on the outer beaches near the stern.

SECTION 2. CHARACTERISTICS OF THE SPILLED PRODUCTS

Characterizing the oils released from the *M/V New Carissa* during February and March 1999 is complicated because: 1) four different products were loaded onto the vessel (two diesels and two bunker fuels); 2) it was not possible to collect all the desirable source samples directly from the vessel tanks; 3) information on which products were loaded into which tanks is not available; and 4) oil was released both before and after the ship was set on fire. Despite these complexities, it is still possible to draw conclusions about whether the oil present in environmental samples matches oil released from the *M/V New Carissa*.

There are four "testament" samples that were obtained at the time of fueling, and a sample of oil (ET-2) collected from the beach immediately adjacent to the vessel on 11 February 1999. These five samples comprise surrogate source data for characterizing the released products. Payne and Driskell (1999) evaluated available data on these samples, as part of their analysis of water samples collected during the spill. Figure 3 shows the polynuclear aromatic hydrocarbons (PAH) and Figure 4 shows the individual n-alkane distributions for these "source" samples. Abbreviations in the samples names are: MDO = marine diesel oil; MFO = marine fuel oil; and BFO = bunker fuel oil. The number after these abbreviations refers to the viscosity of the oil in centistokes. The marine fuel oil is a type of bunker oil.

As described in Section 3, other oils and petroleum products were present on the stern section and released in small quantities from April-December during operations to clean and remove the stern. However, this report focuses on the releases from the bow since these were the larger in volume and potential impact.

The patterns of the PAH and n-alkane distributions for the four "source" samples are very different, even within the general groups of diesel and bunker oils. The diesels contained between 5.2-5.8 percent by weight PAH. However, the composition of the PAHs in the two diesels are very different, with the MDO 1/19 containing a higher percentage of naphthalenes, relative to the other PAH (the first five bars in the histogram in Fig. 3 represent the naphthalenes and are much higher than the other groups of PAH).

The two bunker fuels had very different total PAH, with the MFO 280 containing only 0.54 percent and the BFO 280 containing 5.6 percent, or ten times higher. Therefore, if both bunkers were released, the PAH pattern of the BFO 280 would dominate in any samples collected. The PAH pattern of the beach sample collected right near the ship (bottom PAH pattern in Fig. 3) looks more like the BFO (both patterns are dominated by naphthalenes). However, the n-alkane pattern (Fig. 4) of the beach sample looks more like the MFO. Obviously, both bunker oils were released from the vessel, but in unknown proportions.

FIGURE 3. PAH distribution for the oil samples taken during loading of fuels on the *M/V New Carissa*, and a beached oil sample collected adjacent to the vessel on 11 February (Payne and Driskell, 1999).

FIGURE 4. n-alkane distribution for the oil samples taken during loading of fuels on the *M/V New Carissa*, and a beached oil sample collected adjacent to the vessel on 11 February (Payne and Driskell, 1999).