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State-Federal Natural Resource Damage Assessment

for December 1990-November 1991

Draft Preliminary NRDA Status Report

Bird Study Number 11:

Injury Assessment of Hydrocarbon Uptake by Sea Ducks in Prince William Sound and the Kodiak Archipelago, Alaska

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November 20, 1991

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We gratefully acknowledge the cooperation of ADF&G Habitat Division for documentation of oiling conditions in anadromous streams. In particular we thank Mark Kuwada, Katrin Sundet, Mark Fink and Amy Weseman. We also thank FOSC office of US Coast Guard and the Alaska Department of Environmental Conservation EVOS office for their contributions.

EXECUTIVE SUMMARY

Harlequin ducks, which are resident intertidal feeders breeding in Prince William Sound, experienced the second consecutive year of reproductive failure in the Exxon Valdez oil spill area of Prince William Sound in 1991. Harlequin ducks (HADUs) reproduced normally in northern, eastern and southern Prince William Sound (PWS) in 1990-91. No HADU broods were reported by any State or Federal agency with field teams in the oil spill area of western PWS in 1990. Only one Harlequin duck pair was recorded by Alaska Department of Fish and Game (ADF&G) at any stream mouth surveyed in western PWS oil spill area in a spring 1991 survey. No HADUs were mist-netted in 1991 during 121 hours of capture time at the mouths of 12 anadromous fish streams otherwise meeting a HADU nesting stream profile in the oil spill area of western Prince William Sound. Only one very late brood was recorded in a previously heavily oiled area by ADF&G in mid-September 1991 in the Prince William Sound oil spill area. This brood was observed in the Bay of Isles, Knight Island. Four other broods were observed on the periphery of the oil spill area. The State of Alaska closed Harlequin duck hunting in 1991 in Prince William Sound for the month of September in order to reduce further loss to the remaining resident HADU population.

This study explores two alternative hypothesis for the cessation of reproduction by Harlequin Ducks in western Prince William Sound. Both of the hypotheses are related to the Exxon Valdez Oil Spill (EVOS). The hypotheses are not mutually exclusive. The first hypothesis, the so-called oiling hypothesis, is based on the following rationale. Harlequin Ducks were subject to considerable direct mortality resulting from the EVOS (USFWS, 1989). NRDA Bird Study No. 11 has previously documented levels of petroleum hydrocarbon ingestion by six species of sea ducks, including PWS Harlequins, with resulting physiological effects (Patten, 1990a). In addition to direct mortality associated with the EVOS, Patten (1990a) showed that a significant proportion of the Harlequin population surviving in oiled areas of Prince William Sound and southwestern Kodiak Island was in poor physiological condition. This is associated with consumption of oiled intertidal prey items. Blue mussels (Mytilus) are proposed as an etiological agent for petroleum transmission from the environment to seaducks. Affected ducks exhibit minimal adipose tissue and concentrations of petroleum chemicals and metabolites in liver and bile (Patten, 1990a). The concentration of petroleum chemicals in duck livers suggests either a failure to depurate petrochemicals from their tissues, or continued exposure through their food chain. Previous studies have shown that very small single doses of petroleum exposure, either by ingestion or preening oiled feathers, cause cessation of reproduction in certain seabirds for up to a year (Frey et al., 1986).

Evidence from the few other studies previously conducted on HADU suggests these ducks are sensitive to human disturbance, and that a higher degree of disturbance can be correlated with decreased breeding productivity. This second hypothesis, the so-called disturbance hypothesis, is based on the extraordinary levels of human disturbance to Harlequin habitats (offshore rocks, bays and lagoons, mussel beds, and potential nesting streams) documented in western Prince William Sound from the time of the initial of oil spill clean-up and response in 1989 through 1991.

The combination of oil exposure directly and through the food chain to Harlequin ducks, in conjunction with the massive amounts of disturbance associated with the subsequent clean-up and response activities, has led to cessation of reproduction in these ducks in the oil spill area at least in 1990-91. How long this reproductive failure will continue is unknown, especially in consideration of the unweathered aromatic EVOS crude oil remaining in mussel beds in western Prince William Sound in 1991.

OBJECTIVES

A. To continue to develop a data base describing food habits of six species of sea ducks in Prince William Sound.

B. To obtain data from other OSIAR investigators on petroleum hydrocarbon levels in marine invertebrates, particularly blue mussels (Mytilus), from the Prince William Sound area. To relate this data to levels of petroleum hydrocarbons found by chemical analysis of invertebrates in gut samples from sea ducks collected in oil spill and control areas. To test the hypothesis (at alpha = 0.05) that the incidence of petroleum hydrocarbons in gut samples from collected sea ducks is higher in the oil spill areas than in the control areas investigated in 1989-90.

   Seaduck collection (1989-90) in the oiled areas of Prince William Sound was integrated where possible with the collection sites of blue mussels in oiled areas in order to demonstrate that seaducks feed in contaminated areas on contaminated prey.

C. To estimate by chemical analysis petroleum hydrocarbon levels in collected sea duck tissues and body fluids within 10% of the actual value 95% of the time.

D. To test the hypothesis (at alpha = 0.05) that the incidence of petroleum hydrocarbons in tissues of collected sea ducks is significantly higher in 1989-91 in the oil spill areas than in the control areas.

E. From evidence of histopathology, estimate the ingested petroleum hydrocarbon effects on morbidity, mortality, and reproductive potential of sea ducks. This information may be related to other studies to identify changes in abundance and distribution within the affected areas.

F. Identify potential alternative methods and strategies for restoration of lost use, populations, or habitat where injury is identified.

INTRODUCTION

This report documents the second consecutive year of an essentially complete reproductive failure of Harlequin ducks in the Exxon Valdez oil spill area of western Prince William Sound. The discovery is the result of an investigation of the pathways of oil exposure and resultant sublethal effects to six species of seaducks in Prince William Sound and southwestern Kodiak Island, Alaska, after the Exxon Valdez Oil Spill (EVOS) of March 24, 1989 (Patten, 1990a).

This report also documents oiling and history of disturbance to shoreline habitats, including mussel beds, with known Harlequin duck use in Prince William Sound. HADU's and other seaducks regularly consume blue mussels (Mytilus), among other species of intertidal biota (Patten, 1990a). We propose that blue mussels are an etiological agent for transmission of petroleum hydrocarbons from the environment to seaducks, with mussel beds a pathway of transmission.

Resultant sublethal effects of petroleum exposure in Harlequin ducks in Prince William Sound since 1989 include petroleum residues in liver and bile, poor physiological condition, minimal adipose tissue, and failure to reproduce (Patten, 1990a). Other seaducks studied also showed physiological effects, with petrochemical metabolites in liver and bile samples. Physiological effects of petroleum exposure in the seaducks were related to distance of their feeding niches from the intertidal. Harlequin Ducks, which feed in the intertidal, were most affected; White-winged Scoters, which feed benthically in deeper water (to 30m) were least affected (Patten, 1990a).

HADU's are resident breeders in Prince William Sound, although their population is substantially augmented by the arrival of winter migrants. Harlequin Ducks also nest in other regions of Alaska, such as on mountain streams in the Alaska Range. Bill Taylor, ADF&G, reported HADU nests found near a stream near Paxon, Ak, in the Alaska Range, by aviculturalists in June 1991. HADU's breed along the mid-to upper reaches of short coastal streams in northern, eastern, and southern Prince William Sound (Isleib and Kessel, 1973; Dzinbal, 1982; Patten, 1990b; Crowley, 1991). HADU's were formerly reported as breeding in oiled areas of western Prince William Sound, at least on Naked Island and Eleanor Island (Oakley and Kulitz, 1979; Dzinbal, 1982).

Harlequin Ducks are found in four general habitat types in Prince William Sound. They rest on offshore rocks and feed in intertidal mussel beds throughout the year. They pair and molt in bays and lagoons, and breed along streams in spring and summer. The typical HADU behaviors exhibited in these habitats are not mutually exclusive, but serve for ease of identification. For instance, mussel beds are primarily feeding habitat, but feeding occurs in all four general habitat types. Harlequin Ducks are most likely exposed to EVOS oil through the food chain, but may also ingest oil by preening contaminated feathers.

Literature Review The following section summarizes only most relevant avian studies relating to the post-EVOS cessation of breeding in Harlequin Ducks in Prince William Sound.

Wedge-tailed Shearwaters breeding in Hawaii were treated with small amounts (0.1 - 2.0 ml) of weathered crude oil on upper breast feathers, or by oral doses in capsules, approximately 30 days prior to egg laying. Two ml of weathered oil applied externally to breast plumage resulted in greatly reduced number of eggs laid and complete hatching failure. Oral doses of oil also reduced laying and breeding success. Oil exposure did not cause birds to move to new areas but resulted in nest abandonment and reduced incubation effectiveness. Long-term effects of a single external application of 2.0 ml of weathered oil were demonstrated by a decreased number of birds returning to the colony in the year after dosing and reduced breeding success one year after oil exposure (Fry et al, 1986).

Oil-induced hepatocellular dissociation, hemosiderosis, and renal tubular necrosis was described in auklets and murres exposed to weathered crude or Bunker C (No. 6 fuel) oils (Fry, D.M. and L.J. Lowenstine. 1985).

HADU literature often refers to the potentially detrimental effects of human disturbance. Human activity in proximity to Harlequin breeding streams probably reduces productivity (Bengston, 1972; Kuchel, 1977; Wallen, 1987; Cassierer and Groves, 1991). Undisturbed HADU exhibit a high degree of philopatry (fidelity) to nesting streams, with return rates averaging 50 - 52% (Kuchel, 1977; Wallen, 1987 Cassirer and Groves, 1991). This philopatric behavior facilitates comparison of populations in oiled and unoiled areas of Prince William Sound.

The Canadian Wildlife Service has recently declared the Harlequin duck in eastern Canada to be an Endangered Species (Goudie, 1991). Disturbance, hunting, and marine pollution such as oil spills appear to be the major factors endangering the Harlequin duck population (Goudie, 1991). The USFWS has supported this declaration by closing Harlequin duck hunting in the eastern United States in 1991.

STUDY METHODOLOGY

Harlequin duck broods were noticeably absent in the oil spill area of western Prince William Sound in 1990 (Patten, 1990a). We developed a working hypothesis that there was impairment of the Harlequin Duck reproductive process in the oil spill area of Prince William Sound, and that this impairment was related to oil exposure. The methods for investigating this aspect of the project were designed to answer the following questions: what is the productivity of Harlequin Ducks in oil spill and control areas of Prince William Sound? Is there decreased clutch size in the oil spill area, as compared to unoiled areas? Do eggs hatch? Do ducklings survive? What is the fledging success, as measured in brood size (fledged ducklings/hen) in oiled and unoiled areas? Hens with older ducklings under normal circumstances proceed from nesting streams to intertidal shorelines in late summer, where they can be readily counted.

The 1991 study area included the oil spill affected area of western PWS, including offshore rocks, bays, lagoons and stream mouths on the mainland south from Port Nellie Juan to Bainbridge Is., and from Perry Island southward to Green Island. College Fiord on the NW side of PWS was not considered oiled. Table 1 lists 12 major islands and mainland in the oil spill study area of western PWS with Exxon beach clean-up segment abbreviation added for ease of understanding subsequent references in text and tables.

The anticipated Harlequin duck damage assessment activities in the oil spill area during the 1991 field season included 1) an extensive survey of anadromous streams and molting areas used by HADU's in Prince William Sound; 2) mist-netting incubating females at stream mouths, and later radio-tracking these females to nest sites and 3) determining HADU productivity in the oil spill area and eastern PWS control area by following the hens and offspring through the nesting and brood-rearing cycle.

Two field camps were staffed by crews of 3-4 workers during the 1991 field season. The first camp was located on Knight Island in the oil spill area. The second camp was located in eastern Prince William Sound at Olsen Bay, Port Gravina, in an unoiled area.

The presence of harlequin pairs in spring at stream mouths suggests later breeding use of those streams. Harlequin breeding pairs and young non-breeding females prospect for nest sites during twilight hours in late May and early June along mountain drainages flowing into PWS (Dzinbal, 1982). Incubating females fly from nest sites to feed in intertidal estuaries. This behavior creates an opportunity for mist-netting Harlequin ducks in transit at stream mouths (Dzinbal, 1982). Dzinbal (1982) captured Harlequin hens in Prince William Sound by suspending mist nets over breeding streams as the hens flew to and from intertidal areas to forage. Mist nests were also used by Eldridge (1986) to capture blue ducks (Hymenolaimus malocorhynchos), a river specialist inhabiting New Zealand.

No harlequin duck nests had been intentionally located in North America until this study, although harlequin broods have been regularly observed. Nest sites were to be located by radio-tracking nesting females. Nesting females are secretive and nests otherwise difficult to locate. Sample size goals for radio-tagging included 30 females from the oil spill area of western PWS and 30 females from the unoiled control area of eastern PWS.

A radio transmitter, built by ATS, with a small, 3-month lithium battery pack, weighing less than 5 g, was to be epoxy-glued to the base of the tail retrices of a nesting female. The radio was to be covered by the upper tail coverts with only the whip antennae exposed. The transmitter would be shed by the female during the molt in late summer after brood-rearing was completed. We concluded that this attachment technique was the least intrusive method of radio-tagging these ducks. We considered implanting radio transmitters but the required invasive surgery and reduced effective range (Korschgen et al 1984) added complexity and unacceptable risk.

Tail-mounted transmitters have not been known to interfere with breeding behavior of goshawks (Widen 1982) nor have glue-on back-mounted transmitters impeded copulation of cowbirds (Raim 1978) or mourning doves (Perry 1981) although the antennae extended beyond tail feathers. By mist-netting incubating Harlequin hens, we hoped to avoid interference with copulation although nest abandonment because of capture-induced trauma was a concern.

Boat surveys of shorelines inside and outside the oil spill area were conducted to locate molting sites in mid- to late July as well as census hens with broods in August. Post-or non-breeding males are concentrated while flightless during July in secluded bays and lagoons with extensive rocky intertidal zones. Primary feather molt produces a period of maximum energy demands and is a vital stage in the life cycle. Flightless birds require substantial amounts of high-quality food, located in the immediate vicinity, for primary feather regrowth. The intertidal molting sites are believed highly productive, and are utilized by a variety of other species such as seals, sea otters, seabirds and shorebirds. Restoration of the harlequin duck population in Prince William Sound should include identification of important molting sites and some measure of protection for the areas.

The Harlequin Duck Restoration Study in eastern PWS also served as a control on reproductive aspects of the HADU damage assessment study (Crowley, 1991). The two field crews working on the HADU restoration study captured 23 HADU during 299.5 hours of mist net time on 14 streams from Valdez Arm to Hinchinbrook Island in 1991. The Harlequin Duck Restoration Study also located five harlequin duck nests by radio-tracking incubating females in eastern Prince William Sound (Crowley, 1991). The nest location was an historic first successful application of this methodology.

STUDY RESULTS

Spring 1991 Resident HADU Survey

An extensive boat survey was conducted by ADF&G personnel in late May and early June 1991 to census the resident HADU population in the oil spill area of western Prince William Sound. The survey included 12 islands listed in Table 1. The HADU spring 1991 census indicated a patchily distributed, low density and apparently remnant population of approximately 220 individuals remaining only in secluded bays and lagoons in the oil spill area (Table 2). Few if any HADU remained near Naked Island where they were formerly known to breed (Kulitz, pers. comm; Oakley and Kulitz, 1979).

The 1991 spring census identified 80 males, 85 females, and 51 HADU's of undetermined sex (Table 2). The high ratio of females to males suggests substantial non-breeding. Considerably more males than females usually compose the non-breeding proportion of a Harlequin duck population (Dzinbal, 1982; Jarvis, pers. comm.). Only one HADU pair was recorded in 1991 at any stream mouth surveyed in the oil spill area of western Prince William Sound. A single HADU pair was observed at a stream mouth at Log Jam Cove, KN 211, on 5/26/91 (Table 2). The ADF&G Harlequin duck restoration study team, in comparison, documented high male to female ratio in eastern PWS in 1991. The Restoration Study team observed at least 49 mated pairs, with many more mixed in large flocks in eastern PWS in 1991 (Crowley, 1991).

1991 Spring and Summer HADU Stream Survey and Trapping Effort

Offshore rocks in both oiled and unoiled areas of Prince William Sound are used by HADU's through the year as feeding, roosting, molting and escape sites. HADU's in eastern Prince William Sound fly from offshore rocks to bays and lagoons near stream mouths to conduct courtship activities in April and May (Dzinbal, 1982; Crowley, 1991). Incubation commences in mid-June in eastern PWS and hatching takes place in July (Dzinbal, 1982; Crowley, 1991). HADU broods follow the hen downstream to estuaries in August (Dzinbal, 1982; Crowley 1991).

Table 3a lists characteristics of the lower reaches of typical HADU nesting streams in northern, eastern and southern PWS (See also Patten 1990b). This nesting stream profile was used to select 12 of the larger anadromous fish streams for mist-netting Harlequin ducks in the western PWS oil spill area. The netting took place from early June to mid-July 1991 (Table 5). The streams selected for netting were located on Knight Island (5 sites), Chenega Island (2 sites), Evans Island (1 site), and Culross Island (1 site) and on the mainland (3 sites). These streams met all or most characteristics of sites used by nesting HADU's in unoiled areas of northern, eastern, and southern PWS (Patten, 1990a; Crowley, 1991; see also Table 4).

Streams with waterfalls or cascades of over 10m are believed to preclude egress of Harlequin ducklings and thus form unsuitable breeding habitat (Table 3b). Such streams were excluded from mist-netting. Conversely, although the stream at the head of Mallard Bay (KN 575) (Table 5) was netted for on two occasions in early June 1991 for a total of 18 hours, by mid-summer the stream had diminished to practically nothing, after snow melted. A very well developed and extensive rocky intertidal, however, was present in Mallard Bay, and Harlequins were observed using this habitat on one occasion in July 1990. Thus this stream was selected for netting.

The expected hypothetical take of Harlequin ducks by mist-netting the streams in western PWS, based on the results of the 1991 Restoration Study in eastern PWS, would be 1 duck trapped every 13 hours (23 ducks captured on 14 streams in eastern PWS by two study teams in 299.5 net-hours). No HADU's were netted or even observed using the estuaries at any of the 12 streams in the western PWS oil spill area during 121 hours of mist-netting by one western PWS study team in June and July '91 (Table 5). Probable reasons for this complete failure by Harlequin ducks even to attempt reproduction in previously heavily oiled areas (with a single 1991 exception) are detailed below.

Harlequin ducks regularly used stream estuaries in eastern PWS (Crowley, 1991). The ADF&G HADU Restoration Study Team located five HADU nests from Valdez Arm to Hinchinbrook Island, outside the oil spill area in 1991, by radio-tracking incubating females trapped at stream mouths (Crowley, 1991). The nests were generally located at approximately 1000 ft elevation in mature to old-growth forests near the upper reaches of swiftly flowing streams 1 - 5 m in width. The nests were located under brush on 40-90 degree stream banks with a southern exposure (Crowley, 1991).

1991 HADU Molting Site Survey

HADU molting sites in western PWS are usually located on offshore rocks in protected bays with good food sources. ADF&G boat surveys conducted to identify HADU molting areas in the oil spill area revealed an increased number of flightless individuals (666), predominately males, beginning in mid-July and continuing into early August 1991 (Table 6). Over 50% of the HADU's censused in this survey, approximately 350 individuals, were concentrated near Channel Island (Table 6). Channel Island is located on the extreme southeastern periphery of the oil spill area, between Green and Montague Island.

A second, much smaller group of molting HADU's (57 individuals) occurred in the oil spill area at Foul Bay, on the mainland south of Port Nellie Juan (Table 6). A third group of flightless molting HADU's was recorded at SW Green Island (50 individuals) (Table 6), near Channel Island on the periphery of the oil spill area. This increasing number of molting males in mid-July suggests migration to Prince William Sound after breeding elsewhere. The molting males on Channel Island may breed on nearby Montague Island, interior Alaska, or on the North Slope.

Oiling History of HADU Habitats in Western PWS:

The following is a synopsis of EVOS oiling history of offshore rocks, mussel beds, bays and lagoons, and streams in western PWS. in 1989, 1990, and 1991 (Table 7a,b,c). These habitats have documented use by HADU's, or in the case of streams, are potentially used. Offshore rocks, mussel beds and sites in bays and lagoons are identified by Exxon beach clean-up segment number. Streams are identified by Anadromous Stream Catalog (1990) and/or Exxon beach segment number.

Terminology of the degree of oiling changed from '89 to '91 because the amount of surficial oil on shorelines varied. Reasons for the differences in oil on the shorelines were weathering, storm surf, movement into the substrate, and clean-up activities.

Video footage of shoreline oiling in western PWS is available from Alaska Departments of Fish and Game (Habitat Division) and Environmental Conservation.

Oiling of Offshore Rocks

Offshore rocks in western Prince William Sound, generally located in protected bays and lagoons with good intertidal food sources, are used by molting males in July and early August as escape areas, feeding sites, and as locations for primary feather regrowth (Table 6). HADU molting sites in eastern PWS by comparison are generally located on offshore rocks in relatively shallow water along exposed coastlines.

HADU's observed on offshore rocks in the Bay of Isles throughout the spring and summer of '91 were in the same location and the same place day after day, exhibiting little movement, and apparent unwillingness to fly. This is similar to that of molting male flocks during mid-summer in eastern PWS, except for the lethargic behavior (Crowley, pers. comm). A female HADU observed on the Pleiades Islands exhibited similar lethargic "sick" behavior. Male HADU's observed on offshore rocks in Foul Bay, June 20, 1991, were in poor plumage condition, with dull, untidy featheration, not the expected bright plumage coloration (Jarvis, pers. comm.).

Oiling history of offshore rocks occupied by HADU's in western Prince William Sound in 1989-91 is summarized in Table 7a,b,c. Offshore rocks are identified by location and Exxon beach segment number. Oiled offshore rocks with documented use by HADU's include those near Evans Island, Iktua Bay, Bainbridge Passage Bay, Applegate Island, Pleiades Islands, Junction Island, Knight Island, Crafton Island, Flemming Island, Naked Island, Perry Island, and near mainland sites at Foul Bay and Eshamy Bay.

Table 7a (1989) describes oiling of offshore rocks using the following criteria: concentration, oil types, and width of oil band. These offshore rocks received concentrations of oil ranging from heavy to light in 1989 (Table 7a). Heavy concentrations of oil on offshore rocks (>50% coverage) in June in 1989 generally decreased to medium concentrations (10% - 50% coverage) by September (Table 7a). Oil types encountered on offshore rocks included fresh oil, free oil, pooled oil, oil coating, mousse, tar, asphalt, and buried oil. Oil bands, where documented on offshore rocks, varied in width from .25m (light) at the southern tip of Flemming Island to 25m (heavy) at Applegate Island (Table 7a).

Table 7b (1990) excludes description of width of oil band and oil concentration, since other oil characteristics became more important with the year elapsed time. Fresh oil and free oil became absent, but surface oil residue, asphalt, tarballs, tar cover, buried and oil saturated gravel became prevalent. Buried oil in saturated gravels can potentally release aromatic petroleum hydrocarbons at high tide levels, and thus serve as a continued source of contamination. Buried oil is anoxic until released by tidal action.

Additional information is available for 1990 on oiling of offshore rocks at Green Island, Gibbon Anchorage and N.W. side, Applegate Island, Delenia Island, Junction Islands, Foul Passage, Aguliak Island, Mummy Island, and Squirrel Island. Each oil evaluation presented on table 7 also represents disturbance event requiring a site visit by boat or helicopter. For instance Table 7b includes notation of an EXXON cultural resource evaluation conducted by hovering helicopter on 5/17/90. All offshore rocks and islands in Gibbon Anchorage, Green Island were surveyed. This site has documented HADU usage.

Table 7c (1991) resembles locations in table 7b but buried oil residues and surface oil residues are widespread. As this report is being written (Nov. 1991) these are extant conditions. During the course of time surface oiling becomes less visually evident but buried oil persists. Aromatics continue to bleed from buried oil under certain tidal conditions.

Oiling of Mussel Beds

Mussel beds are included in both oiling and disturbance analyses (Tables 8 and 9) in this report, since these locations serve as feeding sites for Harlequin ducks. HADU's were regularly collected in 1989 - 90 during this study with small blue mussels in their proventriculus. HADU's consume blue mussels by detaching from the substrate and swallowing whole. Ingested mussels are retained in the proventriculus, passed to the gizzard and ground. Soft parts are then digested, and the shell fragments passed through the entire digestive tract. This exposes the duck to petroleum contaminants remaining on the surface of the shell, in the soft parts, and on the byssal threads. Mussel beds probably serve as a pathway for exposure to oil from the environment to seaducks. HADU's also consume a wide variety of other intertidal organisms, which may also serve as etiological agents for petroleum transmission (Patten, 1990a); (Objectives A, B).

Table 7a includes 1989 oiling history of mussel beds in western PWS. Mussel beds are identified by location and Exxon beach segment number. Oiling conditions on mussel beds used by foraging Harlequin ducks ranged from heavy (>50% coverage) in June at Latouche LA015, to medium (10% to 50% coverage) in July at Guguak Cove Lagoon EV070, to light (1% - 10% coverage) in October at Evans Island EV015. No oil was observed at the Point Bainbridge mussel bed in October (Table 7a, 1989), although the oil may have become buried. Oil types in these mussel beds in 1989 included fresh oil, free oil, pooled oil, mousse, tar, asphalt, and buried oil. Oil in mussel beds with time tended to assume mousse, tar, and asphalt forms or to become buried (Table 7b, 1990).

Sediments accumulated beneath established mussel beds form potentially anoxic conditions in protected areas around byssal threads. These mussel beds continue to leak relatively unweathered petroleum hydrocarbons, contaminating filter-feeding mussels for indefinite periods into the future. Where oil mousse was recorded in mussel beds anoxic conditions were formed over buried oil.

Two years after the initial oil spill (1991), unweathered, aromatic crude oil was present in sheens and pools beneath rocks and in contaminated substrates in the mussel beds. ADF&G, ADEC, ADNR and NOAA investigators on June 28 - 30, 1991 observed substantial remaining contamination of sediments among byssal threads underlying mussel beds, even in fairly exposed rocky shores (Segments KN0136A; EL013A; ER020B; Fl004A; DI067A; LA015E; Table 7c).

Oiling of Bays and Lagoons

HADU's use bays and lagoons in Prince William Sound as feeding, resting, and pairing sites. Oiling history of bays and lagoons in western PWS in 1989 is summarized in Table 7a. Oiled bays and lagoons with documented HADU use include Iktua Bay and Iktua Lagoon, Block Island Lagoon, Cabin Bay and Outside Bay on Naked Island, Otter Cove and Mallard Bay on Knight Island and Eshamy Bay on the mainland. The bays and lagoons are identified by location and Exxon beach segment number. Oiling condition of these bays and lagoons in 1989 ranged from heavy (<50% coverage) in May at Otter Cove in Bay of Isles, Knight Island, to moderate (10% to 50% coverage) in June at Iktua Bay, and to a trace tar band in June at Mallard Bay in Drier Bay, Knight Island. Oil type encountered in bays and lagoons in 1989 included fresh oil, free oil, oil coating, mousse, tar, asphalt, and buried oil.

Table 7b (1990) also includes observations of Harlequin ducks by EXXON contracted SSAT (Spring Shoreline Assessment Team) biologists. These Harlequin observations tended to be located in bays and lagoons.

Table 7c (1991) notes even though buried oil and surface oil residue persist, no treatment orders (N/T) were issued by the FOSC (Federal On Scene Coordinator). Since Harlequin ducks spend much time throughout the year feeding in bays and lagoons, bleeding petroleum aromatics may continue to contaminate the food chain.

The following serves as another example of a seaduck food chain contaminated by the EVOS. No commercial fishing was allowed in the EVOS area in 1989. As a result, considerable spawning of unharvested pink salmon occurred in intertidal fresh-water springs. Pink salmon eggs were laid in these oil contaminated gravel beds. Birds such as HADU's were exposed to ingestion of petroleum hydrocarbons by consumption of the contaminated eggs. The salmon eggs were proven contaminated by ADF&G Habitat Div. studies. Herring eggs were also possibly contaminated.

Oiling of Streams

Table 7a includes 1989 oiling conditions of those streams in western PWS potentially used by HADU's for nesting. Stream mouths are identified in this table by location and Exxon beach segment number. The table is keyed to locations where HADU were observed during the 1991 field season. Streams on Naked Island (NA) and Eleanor Island (EL) where HADU's were formerly reported as breeding (Oakley and Kulitz, 1979) are also included. Although no HADU pairs were trapped at any stream mouth during the 1991 spring and summer in the oil spill area of western PWS (Table 5), HADU's were regularly trapped at streams with similar profiles in eastern PWS (Crowley 1991). HADU's were, however, present in bays, lagoons and on offshore rocks near stream mouths in the oil spill area (Table 2). Streams were incorporated in Table 7 if HADU's were observed in the vicinity (Table 2) or if the streams were trapped by the ADF&G team (Table 5).

A sample of 1989 oiling conditions described in Table 7a includes stream sites with the following documentation: a heavy 50 m band of fresh oil and mousse at a stream mouth (LA018) in Sleepy Bay Lagoon became asphalt, tar, and buried oil by the time of the DEC Fall Walk; a moderate band (3m to 10 m) of pooled oil and fresh oil in April at a stream mouth (EL052) in Northwest Bay, Eleanor Island, a previously documented HADU breeding site, became buried oil and tar and asphalt by September; a light .5 m band of mousse and tar at a stream mouth (EV008) at Iktua Bay Lagoon in June became asphalt by October; the stream mouth (KN018) at Otter Cove, Bay of Isles, had a heavy coating of fresh and free oil, oil coating of rocks, and mousse in May 1989, which became tar by September.

The two Naked Island streams ASC# 222-40-12960 at Cabin Bay and 222-40-12950 in Outside Bay (NA-25) are relatively small (Table 7) but HADU broods at Naked Island and Eleanor Island were recorded by Oakley and Kulitz (1979). HADU broods were also mentioned around Naked Island by Dzinbal (1982). The Naked Island beach segment (NA-25) was documented as moderately oiled in 1989 (Table 7a). NA024-026 contained areas of pooled oil, tar coating, tar balls and oil mousse in 1990 (Table 7b). In 1991 NA024-026 contained asphalt, tarballs, tar cover and mousse, although these segments were excluded in 1991 cleanup plans.

Supporting documentation on oiling of anadromous fish streams, where HADU's would be expected to nest in western PWS, is voluminous. Habitat Division, ADF&G, compiled 1989-91 oiling information for PWS streams potentially utilized by Harlequin ducks (Table 7d). This table lists oiling observations and their sources by location and date for Harlequin duck streams. This section describes the selection of streams for Table 7d, sources of oiling data, criteria used for summarizing oiling information, and availability of supplemental data.

Contents of Table 7d

The stream oiling in Table 7d is sorted by ADEC segment number, sub-segment, anadromous stream catalog number (ASC#), and date. For each stream, the stream number, location and oiling summary information is listed under a sub-heading. Where the ASC# could not be clearly identified, the information was listed by segment and subsegment numbers minus oiling summaries. Segment MA002 was included in the table, since it consists of four small islands frequented by Harlequin ducks offshore from potential nesting streams.

Sources of Information

All available Habitat-generated data sources were used and supplemented with ADEC data, ADF&G Commfish/Sportfish survey sketches, and data from the joint government/Exxon surveys.

Habitat data sources consist of PWS 1989 logs, treatment and oiling summary reports, data forms and sketches associated with ANADSCAT (1990 Anadromous Stream Cleanup Assessment Team), Pre-ASAP (Habitat pre-screening for the 1989 August Shoreline Assessment Program), MAYSAP (1991 May Shoreline Assessment Program), treatment monitoring, the 1989/1990 Winter study data, and miscellaneous surveys conducted by Habitat in conjunction with other agencies. This information was supplemented with data from the photos, videos and sediment sample databases when necessary. In some cases videos were reviewed and abstracted to further document oiling conditions.

Sources for 1989 oiling conditions include oiling categories from the SCAT (Shoreline Cleanup Assessment Program, the earliest 1989 survey) and the ADEC Fall Beach Survey (Fall Walk-a-thon) which were incorporated when applicable. Where Habitat oiling information seemed insufficient or oiling descriptions covered a wide range, ADEC Gundlach transect data, ADEC monitoring reports, references to descriptive ADEC photos, and detailed SCAT descriptions were added as available.

Oiling categories

The comments section includes 1989 information from the SCAT survey, and the 1989 DEC FALL SURVEY, containing oiling conditions from the DEC computer maps at stream mouths. The 1990 and 1991 oiling conditions are from ANADSCAT and MAYSAP surveys conducted by an interagency team from EXXON, Coast Guard, NOAA, and ADF&G. Caution is urged in evaluating these comments, however, since oiling classifications varied among years, agencies, and to some extent, varied slightly among observers. The comments are intended to provide general information for comparative purposes. The following paragraph summarizes Habitat Div. criteria in evaluating oiling conditions from the compiled comments.

Oiling criteria

Assigning oiling categories by year to the compiled stream information was not a simple task since the quality and detail of observations (especially in 1989), varied widely and both oiling criteria and the character of the oiling itself changed during 1989-91. Thus 1989 criteria largely ignored subsurface oiling, and although streams were monitoried with some respect to subsurface contamination in 1990, this issue was not fully addressed until the 1991 MAYSAP survey.

The Habitat Division EVOS group jointly reviewed individual oiling comments for all Harlequin duck streams and assigned oiling categories along the following guidelines:

The SCAT and DEC Fall Beach surveys were used as comparisons for all other observations, and were thus not included in the Habitat oiling summaries. Whenever there were no Habitat observations for a given stream within a year, or information was considered insufficient, the Habitat summary was considered N/A. For each year, oiling was summarized with emphasis on the earliest and most detailed information of the season in order to reflect untreated conditions. In cases where only late-season observations were available, no attempt was made to back-extrapolate oiling to previous surveys such as SCAT or the 1989/1990 Winter Study.

A combination of oiling criteria was used in an attempt to standardize oiling categories among the three years. This standardization was heavily dependent upon field sketches of oiling conditions and dimensions of oiled areas. In determining oiling criteria, a "sifting process" was used in which major criteria were first applied and then adjusted using further considerations. A list of oiling criteria is available from Habitat Division, ADF&G, Anchorage.

The primary consideration consisted of a combination of band width and percent coverage criteria from the Shoreline Field Treatment Manual (1989) and the Cleanup Monitoring Standard Operating Procedures Manual (1990). Within that framework, the proximity and mobility of the oiled area to the stream were considered, using a 50 m radius as the limit. Alternatively, such as in the case of segment KN 134, geographical features such as tombolos or rocky outcrops that may form a barrier to oil reaching the stream were taken into account.

As subsurface oiling became evident, the extent and type of subsurface oiling was considered in application of the categories. Although surface oiling was greatly reduced in 1991, subsurface oiling continues to persist. The 1991 oiling categories reflect a greater emphasis on type and percent of subsurface oiling. The oiling summary values are noted with "subsurface" where the amount of subsurface oiling affected the oiling category. The persistence of oiling is best demonstrated in individual descriptions of 1991 subsurface oiling conditions.

For example, in EL052, ASC# 226-10-16902, heavy surface oil coverage was documented in an ADEC photograph taken in mid-April 1989. After eight days, however, the survey crew found considerably less surface oiling in a detailed survey. Persistent subsurface oiling was found in this segment during the next two years. The stream mouth area would have qualified as medium oiling according to band width/coverage criteria established later in 1989, but Habitat Division classified this oiling as heavy with respect to the initial photograph. The 1990 data indicate medium oiling and some penetration. The 1991 classification is considered as light oiling, according to the main criteria, but this is qualified with the "subsurface" notation, according to MAYSAP documentation.

Photographs and videos documenting oiling information on the anadromous streams included in Table 7 and 8 are available from Habitat Division, ADF&G.

Disturbance to HADU Habitats Associated with EVOS Clean-up and Response Activities

Extraordinary levels of human disturbance to Harlequin habitats (offshore rocks, bays and lagoons, mussel beds, and potential nesting streams) have been documented in western Prince William Sound from the time of the initial of oil spill clean-up and response in 1989 through 1991 (Table 8a,b,c,d,e,f). References are listed in the definitions section at the end of each table.

The NRDA Management Team considers any EVOS Response activities as disturbance and hence part of EVOS Damage Assessment. The oil spill clean-up activities by Exxon, VECO, and other contractors, as well as state and federal agency monitoring and research efforts, are all considered here as part of the EVOS Response. Direct human disturbance is classified into four categories: mechanical and manual clean-up activities, chemical treatments, and ship, boat, and fixed and rotary wing aircraft supporting operations. We believe the actual extent of disturbance to Harlequin habitats in western Prince William Sound 1989-91 was far larger than our present documentation.

All data for the disturbance tables was located in the USCG segment file system, Federal On-Scene Coordinators Office, Suite 920, 9th Floor, Key Bank Building, Anchorage, Alaska. The Task Force composition data (see below) came from the Exxon daily reports for 1989 on file at the Oil Spill Public Information Center (OSPIC) in Anchorage.

Human disturbance reported in Table 8 includes examples of the following treatments: Mechanical operation may involve a small four-wheel drive tractor known as a "Bobcat" with a backhoe turning subsurface oil to the surface of a gravel beach prior to a pressurized hot water wash of the shoreline. Manual operation may involve wiping of rocks by hand with absorbent "pom poms", or physical removal of oiled debris such as rocks, gravel, wood, or marine algae from the shoreline (Table 8). Chemical treatment, so-called bioremediation, is a fertilizer with a solvent, known as Inipol (see text, below: Table 9). Custom-Blen (TM) is a time-released granular fertilizer applied to the shoreline as pellets which may be ingested by birds (Table 9). These fertilizers are intended to cause the growth of oil-ingesting bacteria.

Table 8a contains a chronological account of mechanical and manual treatment disturbance to four HADU habitats in 1989 spring, summer and fall. The disturbance is quantified by month in man-days and treatment days. Offshore rocks, mussel beds, bays and lagoons, and potential nesting streams are identified by location and Exxon beach segment number. Only sites with documented HADU use in '91 are included in this table. The disturbance to Harlequin habitats includes the following: thousands of man-days of manual/mechanical treatments of individual shoreline segments and offshore rocks from May through September 1989 (Table 8a); thousands of gallons of chemical treatment (Inipol) applied to entire island shorelines (Tables 9a,c); and very heavy boat and ship traffic in summer 1989 in bays and lagoons in the oil spill area (see page 24).

Treatment of KN500 provides an example of mechanical/manual disturbance to Harlequin habitat. Surficial oil at KN500 stream site was initially removed by hot-water wash in 1989 (508 man-days of disturbance; Table 8a; for 1990 treatment of KN500 see Table 8d). Clean-up activities at KN 500 on July 11, 1991, at stream mouth ASC# 226-10-16996, released a layer of heavy brown crude oil on the surface of the small bay, accompanied by a extensive sheen and odor of aromatics (Table 8e). Mechanical clean-up activities (a backhoe) brought up and released subsurface oil in the stream estuary (Table 8e). The oil, buried approximately 6 inches deep, escaped the containment booms and covered much of the small bay. This sort of activity has occurred every summer since 1989, and amounts to a constant source of exposure to intertidal organisms in the vicinity, and eventually HADU's and other biota. An adjacent pocket beach at KN500A has received no treatment and still retains substantial amounts of buried oil.

Disturbance to Offshore Rocks

Oiled offshore rocks, although considered by Exxon to be a high energy environment subject to natural cleaning and biologically sensitive, were treated as part of oil spill clean-up and response.

Landing craft and barges transported multiple high pressure hoses, supporting hydraulic cranes, and similar equipment to offshore rocks in the oil spill area (Table 8). Clean-up personnel then hosed off rocks with pressurized hot water. Floating booms were intended to confine oil washed from rocks to the immediate vicinity. Various skimmers (watercraft) removed oil from the water surface. Occasionally, offshore rocks were scrubbed by hand with absorbent "pom poms". Oiled debris was placed in garbage bags and removed. The disturbance to Harlequin habitats in 1989 at offshore rock sites (identified by segment number), ranged from a team of seven people scrubbing the rocks by hand for one day in July at Chenega CH011 to 565 man-days during 51 days of pressurized hot-water "treatment" of offshore rocks at Perry Island PR002 (Table 8a,b).

Molting HADU, which are flightless, are vulnerable to disturbance and oiling of their habitats (Table 8d,e,f), as well as natural predation. Offshore rock habitat offers protection and food and therefore HADU's intensively utilize these sites. Because of their flightless condition, molting HADU are obligated to feed in the immediate vicinity of these offshore rocks. From 1989 until the present, oil persists in many of these habitats. The following is an abbreviated list of adjacent offshore rock/mussel bed - feeding/molting habitats.

Fleming Island.....FL003.....FL004A

Chenega Island.....CH010.....CH011

Bainbridge Island.....BA006C.....BA004

TTREATMENTS to adjacent offshore rock/mussel bed habitats (see also 89-91 Disturbance Table 8 series)

Mechanical\Manual	89	90	91	Chemical	89	90	91
CH011	y	y	n		y	y	?
CH010	y	y	y		y	y	?
BA004	y	n	n		?	n	?
BA006	n	y	y		?	y	y
FL003	n	n	n		n	n	n
FL004A	y	y	y		?	y	?

Note that except for FL003 all the above segments were treated manually\mechanically at least one time during the three year period. Mechanical and manual cleanup activities occurred when molting HADU males were present.

Chemical treatments (both Inipol and Customblen) also occurred during the time of molting (Table 9a,b,c,d,e,f). Flightless HADU males residing at offshore rock areas such as BA006, FL003, and CH011 would be obligated to feed at nearby oiled, Inipoled mussel bed sites such as CH010, BA004, BA006, and FL004 (see mussel bed habitat in Table 9).

Disturbance to Mussel Beds

Oil spill clean-up crews received instructions not to disturb mussel beds contaminated with EVOS oil in western PWS, since the sites were considered "biologically sensitive". Established mussel beds were thus intended not to be subjected to pressurized hot-water clean-up. Mussel beds did however receive both manual/mechanical and chemical treatments. For example, mussel beds on Bainbridge Island BA004, received 23 mandays of hand-washing in two days of August 1989 (Table 8a). A mussel bed on Evans Island EV015 received 95 man-days of pressurized hot-water washing during 18 treatment days in July and August 1989 (Table 8a). Hot water wash off oiled upper beach segments conducted as part of Exxon clean-up activities in 1989 caused oil in the upper intertidal to flow downward, recontaminating Fucus and mussel bed areas (Table 8a,b).

Table 8d contains manual/mechanical disturbance to Harlequin habitats for 1990. This table contains information on oiling and treatment status for mussels beds, season of treatment activity, mandays and treatment days of disturbance, and equipment used. In 1990 most treatment of oiled mussel beds was manual, and involved shovel removal of oiled gravel, rake tilling (which may involve addition of Customblen fertilizer) and hand wiping of larger rocks. Other mussel beds were sprayed with Inipol, a solvent of polyethylene glycol ether carrying nitrogen and phosphorus fertilizers (Table 9 series; see Inipol Section, below).

Table 8(e,f) contains manual/mechanical disturbance to mussel beds in 1991. Similar to 1990, most treatment activity was manual clean-up. On occasion, a small Hitachi tracked backhoe was used for mechanical tilling in segments with mussel beds (LA15E; KN300A; ER20B). A helicopter was used in 1991 to transport a small clean-up crew to segments (LA15E, CH10B) which supported mussel beds.

Disturbance to Bays and Lagoons

Table 8a contains three examples of mechanical/manual treatment disturbance to Harlequin habitats in bays and lagoons with documented HADU use. Foul Passage at Disk Island DI059 received 46 treatment days of pressurized hot-water washing in June and July 1989. The disturbance involved use of a variety of heavy equipment during 390 mandays (Table 9a). A cove and stream site at Knight Island KN500 received 62 treatment days of hot-water wash in July 1989. Disturbance to Herring Point, KN 500 involved use of heavy equipment during 508 man-days (Table 9a). Log Jam Cove at Knight Island KN 211 received 261 mandays of disturbance during 29 treatment days of heavy equipment use in June and August 1989 (Table 9a).

Table 8d presents information on 1990 manual/mechanical disturbance to bays and lagoons with documented Harlequin use. Spot-washing (steam-cleaning with a high-pressure hose) occurred in segment AE5A. A Hitachi backhoe was used to mechanically till oiled segments in LA18A and KN211E. A caterpillar tractor (size D4) was used for mechanical tilling at segments KN500B and LA18A. Use of the backhoe and caterpillar tractor also required a 120-ft landing ship which deposited heavy equipment on the beach from a bow ramp.

Table 8 (e,f) presents similar information on 1991 disturbance to bays and lagoons.

Fixed-wing aircraft operations included Cessna 206 and DeHavilland Twin Otter on floats and amphibious Turbo-Beaver. These aircraft made frequent flights to and from bays and lagoons, carrying personnel and supplies through the entire '89 -'91 oil spill period (see also Helicopter Disturbance Table 10).

Segment KN115 lies along the northeastern portion of the entrance to Herring Bay on Knight Island. Segment KN115 meets many requirements for Harlequin habitat. The entrance to the cove at KN115 lies approximately one mile from offshore rocks. Because of numerous treatment days by Exxon crews it was included in Table 8c. Note the remarkable number of mandays (3404) expended on segment KN115. This is a significant amount of disturbance.

Ships and boats occupied many bays and lagoons in the oil spill area 1989-91. While this disturbance is difficult to quantify, the following represents composition of Task Force 3, a fleet of ships, berthing vessels, and smaller support vessels in Herring Bay in 1989. There were six such task forces in 1989. This represents large-scale disturbance in a single bay over an extended period of time.

Task Force 3 occupied Herring Bay for the following time period:

JUNE 1989....6\15\89 TO 6\30\89
JULY 1989....7\1\89 TO 7\31\89
AUGUST 1989..8\1\89 TO 8\3\89

Task Force 3 consisted of the following vessels:

BERTHING VESSELS:
USS MOUNT VERNON.....195BUNKS
PACIFIC NORTHWEST EXPLORER..(COMMAND VESSEL) 70BUNKS
FOSS 280 (BARGE).....200BUNKS

TOTAL BUNKS 465

TASK FORCE III

LCV'S	MAXI BARGE
USN 929	
USN 748	SCI-2 OMNI HOT WATER UNIT
USN 749	KC-31 HOT WATER UNIT
USN 849	H030- HOT WATER UNIT
USN 820	
USN 838	
LEO	SKIMMERS
SEA NIK	
USN 888	3 EGMOPOLS
USN 847	
USNG 8389	
USNG 8097	
USNG 8138	
USNG 8139	
USNG 8387	

In addition to these vessels there was a floating helicopter refueling barge capable of handling 3 helicopters. This refueling barge was in Herring Bay for approximately 3 months. The Seley incinerator barge and tug also anchored in Herring Bay. Numerous skimmer craft such as salmon purse seiners, large mud boats, supply vessel traffic, crewboats, and scientific supply and research vessels used Herring Bay during the summer of 1989. Some Inipol vessels were also in Herring Bay. This is not a complete list.

Definitions of vessel terminology:

EGMOPOL.....A skimming machine used to pick up oil from the surface of the water.
MUDBOAT.....A large steel vessel, usually over 100 feet in length, with a large open deck for hauling cargo. Originallly used to haul well pipe and drilling muds to off-shore oil rigs.
LCV .....This is another designation for a landing craft.

KC-31 and H-30 are indentifying numbers on the hulls of vessels carrying hot water units for beach washing.

SCI-2 is an identifying number on the hull of an omni barge, a self-propelled hipress and high heat water spraying unit.

Maxi barges, as explained previously, are barges carrying hipressure pumps, boilers, oil contaiment boom, and long lengths of high pressure hose for beach washing.

Disturbance to Streams

Exxon or its contractors were not allowed to work in most catalogued anadromous fish streams in '89; however, many streams used by pink salmon were not catalogued until in '90. Two streams in particular at LA18A and KN701B were so heavily oiled in 1989 that mechanical/manual treatment was permitted. Thus some anadromous fish spawning streams (potential HADU breeding streams) did receive treatment effects, involving hot-water wash (Table 8a,b) and bioremediation (Inipol) chemical treatment (Table 9a,c).

A stream at segment EL052 on Eleanor Island, which was known to support breeding HADUs before the EVOS, received 267 mandays of disturbance in May 1989 during 18 treatment days of hot-water wash from heavy equipment (Table 8a). This site further received 662 mandays of disturbance in June 1989, involving 73 treatment days of pressurized hot-water wash from various pieces of heavy equipment.

Table 8d contains manual/mechanical treatment disturbance in 1990. Most treatment is manual; no caterpillar tractors or backhoes were used. A helicopter clean-up worked in KN401B for six mandays. The usual segment received 16 - 20 mandays and six treatment days of disturbance during 1990.

Inipol and Other Chemical Treatments

Bioremediation is the process of removing pollutants from the environment using microorganisms to degrade the polluting chemicals into harmless byproducts, i.e. biodegradation. Bioremediation involves, in many cases, enhancing natural biodegradation processes by optimizing specific environmental conditions, i.e. fertilization.

Three types of bioremediation were tested during the summer of 1989: oleophilic fertilizer (Inipol EAP22); slow release fertilizer (Customblen) and soluble spray fertilizers (Table 9a,c). It is not the intent here to delve at length into the toxicity of these chemical treatments, but simply to document their use in Harlequin habitats, which amounts to yet another series of disturbance events.

Oleophilic fertilizers contain oleic acid which is added to a liquid base to soften the target oil. This enables the fertilizer to adhere to the oil more effectively. The other two types resemble the pellitized or liquid fertilizers purchased for application to lawns.

Inipol EAP22 is a oleophilic fertilizer purchased from the French company Elf Aquitane (a major French oil industry; Table 9d). Inipol is a liquid material designed to dissolve nitrogen and phosphorus nutrients into spilled crude oil. Chemically Inipol is described as a mixture of an oily substance (oleic acid, a surfactant) commonly found in fats and oils, a phosphate containing shampoo-like material (laurel phosphate, a surfactant), and a garden fertilizer (urea). Inipol notably also contains polyethylene glycol ether -- 2-butoxy-1-ethanol (alias ethylene glycol nonobutly ether or butyl cellosolve or 2-butoxyethanol). This glycol ether, a substance similar to antifreeze, is used as an oil dispersant and solvent.

Inipol EAP22 consists of the following chemicals:

oleic acid.....26% surfactant
urea.....16%
laurel phosphate....23% surfactant
water.....24%
2-butoxy-1-ethanol..11% solvent\dispersant

The nitrate/phosphate urea fertilizer fosters bacterial breakdown of crude oil. Inipol is applied to oiled beaches in a pressurized spray based on the square footage of the oiled area; 0.0075 gallons/sq ft are intended to be applied. Personnel applying Inipol must wear full protective gear, since the solvent in Inipol penetrates exposed skin and is toxic to vertebrates.

Slow Release Fertilizers (Customblen)

These slow release fertilizers consist of ammonium nitrate and phosphate salts packed in an inert material (mineral or vegetable in nature) that allows slow release of the nutrients over time. The major chemical used was urea fertilizer granules about the size of BB shot produced by Sierra Chemicals. The granules were broadcast by a hand crank fertilizer spreader at the rate of 0.0033lb/ft2.

Soluable Spray

Nitrogen and phosphorous in the form of ammonium nitrate and sodium phosphate were mixed with sea water to produce a fertilizer solution that could be applied to the beaches via a sprinkler system at low tide. This allowed deep penetration of nutrients into the beach sediments. During the test of this system at Passage Cove, 6 pounds of nitrogen and 5 pounds of phosphorous fertilizer were applied daily per hectare.

Bacterial Requirements

Bacteria which are capable of breaking down hydrocarbons (oil) require the following:

Oxygen required for respiration, nitrogen and phosphorous.

Nitrogen and phosphorus are needed by the bacteria to convert oil hydrocarbons into cellular componets such as DNA, proteins, and carbohydrates. The beaches of PWS lack nitrogen and phosphorous in the large quantities required by bacteria. The addition of fertilizers containing ammonia and phosphate balances the amount of oil hydrocarbons available to the bacteria and increases the rate of oil degradation (in theory).

Temperature

The optimal temperature for bacterial growth and oil degredation is 70 F, with lower temperatures slowing growth and breakdown (Prichard, 1990). However, according to Sirvins and Angles (1986), temperature is not a limiting factor with acclimated bacteria even in Antarctica at temperatures of 3 degrees centigrade.

Oil Availability

Not all types of oil are biodegradable. Tarry asphaltene residues contain many degradable materials, but lack of soluability makes asphaltenes difficult for bacteria to degrade. The extreme form of this is asphalt pavement (a common occurence on PWS beaches) which is not degraded. Oil softeners, surfactants, dispersants, and emulsifiers can be used to soften these asphaltenes, but toxicity to vertebrates renders extreme treatments impractical.

Toxicity of Slow Release Customblen

Slow release customblem and soluable spray fertilizers have ammonia flush toxicity. Sixty percent of the applied fertilizer is released as urea, microbally converted to ammonia. Ammonia can be especially harmful to aquatic species in areas of poor tidal flushing, preventing rapid dilution. Ammonia at concentrations of 1 ppm is toxic to invertebrates (mussel larvae). However, this chemical must reach the particular concentration for a sustained period of 48 to 96 hours before it will affect indigenous species. (Prichard, 1990). Ammonia and urea are well known substances. It appears there is little conflict among agencies regarding toxicity. Possible problems could result from an incoming tide or a contrary current carrying the ammonia up a salmon stream over the spawning beds, into a sensitive marsh area, or by foraging birds ingesting Customblen pellets. LD50 studies on Bobwhite quail indicated 5 grams of pellets per quail caused death within 8 hours of dosage. 50% of the quail dosed with 1 gram of pellets (40 pellets) died within 36 hours. None of the birds dosed with 0.2 grams of pellets died (Fairbrother, 1990).

Inipol Toxicity

A basic supposition regarding Inipol toxicity is that once Inipol mixed with water it becomes nontoxic. This is difficult to prove however since there are no proven analytical methods to qunatify Inipol in seawater (Clark, 1990). When sprayed directly on intertidal organisms above the water level, Inipol kills most of them (Viteri, 1990). The most toxic component of Inipol is 2-butoxyethanol ethylene glycol monobutyl. This is an oil dispersant and industrial solvent. In humans it can cause dizziness, respiratory irritation, unconsciounesss, and even death. Inipol can be absorbed directly through the skin and can cause blood and kidney damage (MSDS comparison,1989).

Inipol may injure birds which feed upon it before it dissolves (MSDS comparison, 1989). In the worst case scenario developed by EPA the pulse of Inipol in the nearshore water was estimated at 293 ppm. This is above the LC50 values for herring, stickleback, mussel larvae, oyster larvae, and mysid larvae. The 293 ppm figure, however, is suspect since the same paper states "There is no proven analytical method to quantify Inipol in seawater" (Pritchard, 1990). Inipol is toxic at concentrations of 35 to 100 mg/liter (Pritchard, 1990). Lauryl sulfate, used as a "witness product" for laurel phosphate, which composes 23% of Inipol, has the following LC50 toxicity: for shrimp....300 ppm and for cockles.....15 ppm (Sirvins and Angles, 1986). There is, however, no further documentation on the toxicity of laurel phosphate.

Inipol was not intended to be sprayed on anadromous stream mouths, but entire sections of shorelines of Knight Island on the SE side from Hogan Bay to Point Helena and other oiled areas of Knight Island have been sprayed with Inipol (Table 9a,c). Inipol was used extensively throughout the three years of oil spill cleanup. Excessive use of Inipol on island beaches and stream mouths in Herring Bay, Knight Island, by Exxon personnel in '89 resulted in a citation from DEC (Table 9b). This was before additional anadromous streams were included in the ASC catalog (1990). Non-documented salmon streams (e.g. EL052) were sprayed with Inipol in 1989 (Table 9a).

Table 9e contains 1990 bioremediation application by segment and by habitat type, and Table 9f presents 1991 applications. In 1990 DI067a on Disk Island was used as a bioremediation products test site. This mussel bed has documented Harlequin usage. ER20b on Elrington Island was liquid fertilizer test site for ten days in 1990. KN132b, an anadromous stream, was an Inipol test site with subsequent sampling by helicopter.

During the 1989-1991 Exxon Valdez oil spill several chemicals were applied to the shorelines of Prince William Sound. The toxic affects of chemicals such as urea and ammonia are well documented, while the effect on wildlife of other chemicals such as laurel phosphate (23% of Inipol) were almost completely unknown. Many of the areas receiving chemicals (such as test site KN211E where 3 different dispersants were applied in 1989, or on SOP treated shorelines) were areas with documented Harlequin use (Table 9c). Two of the chemicals selected for extensive application were Inipol and Customblen, both bioremediation enhancers. The following is an example of quantities of Inipol and Customblen applied to the PWS environment 1989-1991.

Total Inipol and Customblen applied in Prince William Sound in 1989:
Inipol.....60,896 gallons
Customblen.....14,412 pounds

Total Inipol and Customblen applied to representative and documented HADU habitat sites in 1989:
Inipol.....7361 gallons
Customblen.....1288 pounds

Total Inipol and Customblen applied to representative and documented HADU habitat sites in 1990:
Inipol.....3,318 gallons
Customblen.....11,587 pounds

Total Inipol and Customblen applied to selected HADU habitat sites in 1991:
Inipol.....991 gallons*
Customblen.....982.8 *

* These figures are incomplete due to partial records kept by USCG and ADEC.

Helicopter Disturbance

Prolonged and extensive aircraft activity throughout the Prince William Sound oil spill area 1989-1991 may be a contributing factor to the observed reproductive failure of Harlequin ducks. The secretive behavior of Harlequin hens (Crowley, 1991) is apparent during the critical spring nesting period. This avoidance behavior renders Harlequins vulnerable to human disturbance. Helicopter disturbance may be a significant contribution to the failure of Harlequin Ducks to colonize vacant nesting areas in western PWS and abandon former nesting habitat. Review of helicopter flight logs during oil spill operations, especially at those conducted at anadromous stream sites, indicates low level aerial overflights were prolonged and extensive (Table 10). Helicopters were used during the oil spill cleanup and response as a main transportation source. Critical anadromous streams were a major target of impact studies on salmon, most of which were conducted by helicopter. EXXON maintained control of the majority of aircraft operations during oil spill activities. Table 10 is a small sample of helicopter surveys documented during the spill. The litigation-sensitive nature of aerial activity has limited the availability of data.

Table 10 documents frequent landings by large helicopters at stream mouths in 1990 PREANADSCAT stream surveys, 1990 ANADSCAT stream surveys, 1990 USFWS eagle nest surveys, 1990 helicopter salmon census and 1991 MAYSAP stream surveys.

Monitoring Activities at Stream Mouths in Western PWS:

A variety of agencies and consulting companies conducted surveys to determine oil-related effects on salmon streams (i.e. potential Harlequin nesting streams) in western PWS after the EVOS. Exxon contractors included the consulting companies Dames and Moore, Woodward Clyde, America North, and others. Specific data concerning these research activities are yet unavailable from Exxon but may amount to a very significant amount of disturbance to potential Harlequin breeding streams. Each visit by these stream survey contractors amounted to a disturbance event to the habitat.

For instance, Exxon contractors placed Vebert boxes in stream mouths in fall of '89 and winter of '90. The study was expanded in April - May '90 to census emergent pink salmon smolt in approximately 12 streams in the oil spill area. Sites included 2 streams on Chenega CH-1, Evans Island, Snug Harbor, Sleepy Bay and Shelter Bay. These stream mouth sites were visited by helicopter every day for two months.

Examples of post-EVOS State and Federal agency monitoring and research activities include weir construction on anadromous streams, and other wildlife studies such as the present Harlequin Duck project. ADF&G constructed weir sites on larger anadromous fish streams, those most likely to have been used by nesting Harlequin Ducks in western PWS, in spring '90 and '91 (Table 11a,b). The weirs, intended to facilitate enumeration of smolt in spring or spawning adults in summer and fall, were initially erected in 1990 to monitor oil spill effects on salmon. Disturbance to potentially breeding HADU's was probable. The weirs were constructed of galvanized steel pipe placed vertically bank to bank in the stream channel, with a supporting framework of wooden lattice and fine mesh netting.

Each weir site is accompanied by a supporting field camp and boat mooring system. Weir sites are monitored by 2-3 ADF&G personnel from spring (for salmon fry escapement) through fall (for spawning adult salmon) (Table 11c). Weirs will not restrict movement of flight-capable ducks along streams, but will definitely block egress from the stream by flightless young accompanying hens to salt water, since the netting extends up the stream bank.

West side PWS creeks judged suitable for HADU breeding include at least Eshamy Creek and Ewan Creek the on mainland and Brizgaloff Creek and Totemoff Creek on Chenega Island. Two of these sites are now CF weir sites (Table 11a,b). These sites otherwise resemble known HADU breeding sites such as on Six-mile Creek and Resurrection Creek near Hope, Ak. (Twait, pers. comm.). Twait observed HADU ducklings upstream and in the intertidal in these creeks near Hope. Carl Clark, Twait's grandfather, also located HADU nests on Resurrection Creek, under overhanging rocks. These west side PWS creeks also resemble east side PWS Stellar Creek, a documented Harlequin breeding stream (Dzinbal, 1982, Crowley, 1991).

Table 12 represents oil contamination in PWS mussel beds documented and described in initial joint agency oil spill clean up and response surveys in spring 1989 (see also mussel bed oiling in Table 7a,b,c). Persistant oiling was documented in mussel beds in 1991 (see Table 7c). Current data on status of mussel beds oiled in 1989 is not otherwise available.

Mussel Petrochemical Contaminant Data Collected by Other NRDA Investigators '89 -'91 (Objective B).

ADEC (1989) collected samples of blue mussels in the oil spill area of western PWS in May and June 1989. Mussel tissues, but not shells or byssal threads, were analyzed for PAH (polynuclear aromatic hydrocarbons) and TPH (total petroleum hydrocarbons) by Enseco - Erco Laboratory. These data are preliminary only. Samples were taken from the following sites: Esther Passage, Wilson Bay, Shelter Bay, Herring Bay, Block Island, Bay of Isles, Northwest Bay. Esther Island was an unimpacted reference control site. Wilson Bay was a lightly impacted site. Shelter Bay was a moderately impacted site. Herring Bay, Block Island, and Bay of Isles were heavily impacted sites.

Mussel samples from Esther Island had most polynuclear aromatic hydrocarbons not detected. Total petroleum hydrocarbons were barely above detection limits or not detected.

Mussel tissue samples from Wilson Bay, a lightly impacted site, had May and June 1989 mussel tissue samples with low levels of polynuclear aromatic hydrocarbons and low or not detectable levels of total petroleum hydrocarbons.

Mussel tissue samples from Shelter Bay, a moderately impacted site, had elevated levels of pristane and phytane, and C19, C20, and C25 petroleum hydrocarbon analytes. Mussel tissues also had elevated levels of C3- and C4-naphthalenes, C3-fluorene, C1-, C2-C3- and C4-phenanthrenes/anthracenes, and C1-, C2-, C3-dibenzothiophenes.

The 1989 mussel tissue samples from heavily oiled sites at Block Island, Herring Bay, Northwest Bay, and Bay of Isles had elevated levels of C17, pristane, C19, C21, C23, C24, and C25 analytes. The mussel tissue samples also had particularly elevated levels of C2-, C3-, and C4-naphthalenes, C1-, C2-, and C3-fluorenes, C1-, C2- and C3-phenanthrene/anthracenes, and C1-, C2- C3-dibenzothiophenes. The general tendency with increasing site oiling is for a greater number of petroleum hydrocarbon analytes to appear in the mussel tissue analysis, with elevated levels (in ug/kg dry weight) of polynuclear aromatic hydrocarbon exposure.

NMFS (NOAA) collected more than 500 fish and shellfish samples from the track of the EVOS in July, August, and September 1989 (Varanasi et al, 1990). Tissue samples (edible flesh for a subsistence survey) were analyzed for aromatic contaminants (ACs) from petroleum (alkylated and unsubstituted aromatic hydrocarbons with 2-7 benzenoid rings and dibenzothiophenes). Intertidal molluscs (mussels, clams, chitons, and snails) from Chenega Bay in PWS, Windy Bay on the southern Kenai Peninsula, Kodiak City, and Old Harbor on Kodiak Island consistently had more than 100 parts per billion (ppb) aromatic contaminants, with levels in mussels from Windy Bay and Kodiak as high as 12,000 to 18,000 ppb.

NMFS analyzed edible flesh of an additional 28 composite mussel samples from the track of the EVOS in winter 1990. NMFS analyzed a total of 20 further samples of edible flesh of mussels in summer 1990. Most of the occurrences of high AC levels were for mussels from Windy Bay. High AC levels in summer 1990 were from mussels in the upper intertidal, which exhibited visible signs of oil. Mussel samples collected in the lower intertidal zone had much lower levels of ACs. In the summer 1990 sampling, the 1990 winter scenario was repeated, with high AC levels again found in mussels from the upper intertidal zone but not in those from the lower intertidal. The results of this analysis indicate continued exposure of mussels to ACs at Windy Bay, with highest levels found in the intertidal zone. Additionally, compared to Windy Bay, mussels from Chenega Bay were exposed to a well weathered oil. At both of these sites there was little evidence of a substantial decrease in the exposure of mussels to AC's by 1990.

NOAA collected an additional 75 samples of shellfish during April 1991 at Windy Bay. High concentrations of ACs were present in mussel samples collected in the upper intertidal zone in the winter and summer of 1990. Concentrations of ACs at this site in the spring of 1990 and spring of 1991 were much lower. Continued investigation of this site should indicated whether the decrease over time is actual or a seasonal phenomenon.

NMFS, NRDA investigators Karinen and Babcock (1991) have recently reported high levels of total petroleum aromatics and selected hydrocarbon groups in mussels sampled in several locations in western Prince William Sound in June 1991. Levels of phenanthrenes, dibenothiopenes, and chryesenes in mussels at beds in Bay of Isles, at Latouche Island and Eleanor Island were particularly high. The high levels of aromatics tend to confirm field observations of unweathered crude oil remaining in mussel beds in Prince William Sound in 1991.
University of Alaska Professor Glen Juday has also conducted studies at Green Island since 1987 and now notes major changes in species composition of intertidal biota since the oil spill.

STATUS OF INJURY ASSESSMENT

Discussion of Reproductive Failure of Harlequin Ducks in Western Prince William Sound

Results of the 1991 field investigation of resident Harlequin Ducks in the oil spill area of western Prince William Sound indicate a patchily distributed, apparently remnant, low density population remaining in spring only in areas of the best foraging habitat (Table 2); a subsequent failure to pair and conduct courtship activities (Table 2); a failure to prospect for nest sites (Table 5); and a failure to nest, lay eggs, and produce broods (Table 14). This amounts to an essentially complete cessation of reproduction.

Harlequin Ducks in northern, eastern and southern Prince William Sound by comparison paired actively, prospected for nest sites, and produced broods (Patten, 1990a,b; Crowley, 1991) Radio-tracking incubating hens enabled location of five Harlequin duck nests in 1991 between Valdez Arm and Hinchenbrook Island. This is the first successful application of this methodology.

The potential causes of HADU reproductive failure:

a) mortality of philopatric females formerly nesting on streams in western PWS as a direct result of the 1989 oil spill.
As of September 1989, 213 HADU's, as well as 112 unidentified seaducks, were retrieved from the oil spill area and cataloged by USFWS (1989). These should be considered minimal numbers of dead and retrieved Harlequin ducks from the oil spill.

b) continued exposure of surviving HADU to contaminated food chain in the oil spill area, resulting in sublethal effects, including poor physiological condition, minimal adipose tissue, and petroleum metabolites in liver and bile (Patten, 1990a).

c) pending petrochemical analysis of seaduck proventriculus samples submitted to USFWS, and additional liver and bile data, may support the hypothesis of reproductive impairment in seabirds via ingestion of petrochemicals suggested by Fry et al, (1986). Contaminated proventriculus samples indicate consumption of oiled intertidal prey. The presence of a spectrum of petroleum chemicals in seaduck liver tissue in conjunction with lower levels of napathalene and phenanthrene metabolites in bile (Patten 1990a) contrasts with harbor seals, which have higher levels of metabolites in bile and no petrochemicals in tissues (Frost, pers. comm.). The harbor seals are apparently able to depurate petrochemicals from their tissues. This suggests that seaducks fail to depurate petrochemicals from their tissues, or continued exposure through their food chain. This lends credence to the hypothesis of petroleum exposure to Harlequin ducks through the food chain and their subsequent failure to reproduce (see also Fry et al, 1986).

d) Massive amounts of human disturbance to stream mouths and other Harlequin habitats included thousands of man-days of manual cleaning, mechanical tilling, hot-water treatment, Inipol , weir construction, agency and contractor visits, ship and boat traffic in bays and lagoons, and low-level overflights by fixed-wing aircraft and helicopters. Since Harlequin ducks are sensitive to disturbance, and high levels of disturbance can be correlated with poor reproductive performance, this is the alternative hypothesis for the cessation of Harlequin reproduction in the oil spill area of western Prince William Sound.

e) One HADU brood was observed on a rocky reef at the SW end of Crafton Island near Loomis Creek in the oil spill area in Fall of 1989. This brood of three was collected for analysis of physiological condition and petroleum residues in tissues.

f) No broods were observed in '90 in oil spill area, although HADU reproduction was observed in N, E, and S PWS in '90 (Patten, 1990b).

g) No HADU attempts at reproduction were observed in '91 in oil spill area, with one exception. One very late HADU brood was observed in a heavily oiled area by ADF&G in the Bay of Isles, Knight Island, PWS oil spill area, in mid-September 1991. Four other broods were observed on the periphery of the oil spill area in 1991 (Table 14). The essentially complete HADU reproductive failure in the oil spill area was indicated by only one pair recorded in spring 1991 surveys at any stream mouth investigated in the oil spill area (Table 2), and confirmed by a lack of prospecting for nest sites along streams (Table 5). Mist-netting for 121 net-hours at 12 stream mouths in spring and early summer 1991 in western Prince William Sound indicated complete lack of stream use by HADU's (Table 5). These 12 anadromous fish streams otherwise met the PWS HADU nesting stream profile (Patten, 1990b; Crowley, 1991).

Interim Conclusions 1989-1991

This study since 1989 has increasingly focused on the sublethal effects of petroleum exposure to Harlequin Ducks, which are a resident breeding waterfowl species in Prince William Sound. Harlequin Ducks are intertidal feeders, consuming a wide variety of intertidal organisms, including limpets, small clams, hermit crabs, snails, and blue mussels. The food items have been documented in proventriculus samples obtained from collected Harlequin Ducks in PWS. Blue mussels are also consumed by five other waterfowl species in this study. These species are Barrow's and Common Goldeneyes, and three species of Scoters, especially the Surf Scoter, which feeds both intertidally and subtidally. Analysis of levels of petroleum residues in liver and bile of these species of seaducks have been of sufficiently high levels to meet full USFWS criteria for internal exposure to oil. Although affected birds are distributed in a very patchy fashion, approximately 40% of collected Harlequin Ducks and goldeneyes taken in 1989-90 have been in poor physiological condition upon necropsy, with minimal adipose tissue. A failure to reproduce in Harlequin Ducks was first noted in 1990 and documented in 1991 in the PWS oil spill area. Harlequin Ducks reproduced normally in control area study sites in northern, eastern and southern PWS in 1991. The other seaduck species do not breed in PWS. Other studies in the seabird literature have indicated that single dosages of petroleum exposure through ingestion or preening oiled feathers have resulted in failure to reproduce for up to one year (Fry et al, 1986).

Blue mussels are well known for their ability to concentrate and retain pollutants such as oil. As long as mussel beds remain contaminated with unweathered, aromatic EVOS crude oil, exposure to seaducks will continue through the food chain with blue mussels as a principal etiological agent, with resultant physiological effects, including failure to reproduce.

The massive amounts of disturbance associated with EVOS cleanup and response activities should appreciably diminish in 1992, creating conditions suitable for testing the disturbance hypothesis.

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TABLE 1

Table 1

Major islands and mainland in the western Prince William Sound EVOS oil spill area with Exxon clean-up beach segment identifier abbreviation

Culross CU
Perry PR
Naked NA
Disk DI
Ingot IN
Knight KN
Chenega CH
Mainland MA
Bainbridge BA
Evans EV
Latouche LA
Green GR

TABLE 2

Table 2
SPRING HARLEQUIN SURVEYS
OIL SPILL AREA, PRINCE WILLIAM SOUND 1991

LOCATION	SEGMENT	DATE	TIME	# FEMALES	# MALES	ACTIVITY
BAY OF ISLES, (WEST ARM)	KN201*	5/24	1300	-0-	-0-	
OTTER LAKE	KN018	5/24	2200	-0-	-0-	
BAY OF ISLES	KN022*	5/25	0800	5	10	SITTING
MARSHA BAY	(ALL)	5/26	0900	-0-	-0-	
RUA COVE	KN213	5/26	0830	-0-	-0-	
SNUG HARBOR	(ALL)	5/26	0930	-0-	-0-	
HOGAN BAY	(ALL)	5/26	1030	-0-	-0-	
LOWER PASSAGE	KN103*	5/26	1330	-0-	-0-	
FOUL PASS	IN031	5/26	1400	-0-	-0-	
LEWIS BAY	(ALL)	5/26	1500	-0-	-0-	
LOG JAM BAY	KN211\210*	5/26	1900	1	1	FEEDING
OTTER ISLAND	KN020*	5/26	2200	7	1	SITTING
BAY OF ISLES	KN019	5/26	2130	2	1	SWIMMING
HERRING BAY, SOLF COVE.	KN144B*	5/29	0900	7	5	SITTING
ALL SEGMENTS FROM FROM HERRING PT. TO L. HERRING BAY		5/29	1300	-0-	-0-	
DRIER BAY, PORT AUDRY	KN575	5/30	0930	-0-	1	FLYING
MALLARD BAY	KN575	5/30	1000	-0-	-0-	
JOHNSON BAY, AT S ENTRANCE	KN554*	5/30	1140	9 (PLUS 5 OF UNDERTERMINED SEX)	5	SITTING
LOG JAM BAY	KN211*	5/31	1045	-0-	-0-	
NW BAY ELANORE	(ALL)	5/31	0900	-0-	-0-	
BLOCK ISLAND	(ALL)	5/31	0930	-0-	-0-	
FOUL PASS	IN031*	5/31	1000	-0-	-0-	
DISK ISLAND	DI059A	5/31	1015	-0-	-0-	
LOG JAM BAY	KN211*	5/31	1030	-0-	-0-	
BAY OF ISLES	KN022*	5/31	1110	11 (PLUS 3 OF UNDERTERMINED SEX)	6	SWIMMING
OTTER ISLAND	KN020*	5/31	1900	10 (PLUS 15 OF UNDERTERMINED SEX)	10	SWIMMING
FOUL BAY	MA002	6/1	0930	15 (PLUS 30 OF UNDERTERMINED SEX)	17	SWIMMING
MAIN BAY	MA005A	6/1	1050	12	14	FLYING & SWIMMING
PT NELLI JUAN	MA001	6/1	1330	1	1	SITTING
BAY OF ISLES	KN021*	6/1	1530	(28 OF UNDERTERMINED SEX)		
GREEN ISLAND,	GR302	6/2	1040	2	-0-	IN FLIGHT

SPRING HARLEQUIN SURVEYS
PRINCE WILLIAM SOUND 1991

LOCATION	SEGMENT	DATE	TIME	# FEMALES	# MALES	ACTIVITY
GREEN ISLAND	GR103	6/2	1055	-0-	-0-	
LA TOUCHE IS.	LA21-LA37	6/2	1200	-0-	-0-	
HORSESHOE BAY TO WINDY BAY,						
POWDER POINT	LA024	6/2	1245	-0-	-0-	
JOHNSON BAY	KN554*	6/2	1345	1	1	FLYING
LOWER HERRING	(ALL)	6/2	1400	-0-	-0-	
NAKED ISLAND	NA025	6/19	1000	-0-	-0-	
OUTSIDE BAY	"	"	"	-0-	-0-	
HERRING BAY	KN144B*	6/19	1745	2	3	SITTING
BAY OF ISLES	KNO2O*	6/19	1915	6	14	FLYING/SITTING
WEST ARM	KN201*	6/20	0930	-0-	-0-	
OTTER CREEK	KN018	6/20	1000	-0-	-0-	
BAY OF ISLES	KN022*	6/20	1025	3	9	FEEDING
FOUL BAY	INO31	6/20	1120	10	8	
				(10 OF UNDETERMINED SEX)		
JOHNSON BAY	(ALL)	6/20	1220	-0-	-0-	
DRIER BAY	(ENTRANCE)	6/20	1435	-0-	-0-	
JUNCTION IS.	CH011A	6/21	1230	-0-	-0-	
CHENEGA IS.	CH001	6/21	1320	-0-	-0-	
(stream mouth, too exposed to anchor)						
KAKE COVE	CH017	6/21	1400	-0-	-0-	
PLEIADES IS.	PL001	6/22	1110	1	-0-	(LOOKING SICK)
JOHNSON BAY (ENTRANCE)		7/6	1515	(3 OF UNDERTERMINED SEX)		
APPLEGATE IS.	AE004	7/7	1120	6	10	(MAYBE MOLTING)
PICTURESQUE COVE,						
CULROSS PASSAGE	(NO SEG)	7/7	1230	(CREEK ENDING W/WATERFALL)		-0-
CULROSS IS.	CU011	7/7	1330	(CREEK ENDING W/WATERFALL)		-0-
S.NELLI JUAN	NJ001A	7/7	1335	(CREEK W\STEEP CASCADE)		-0-
ESHAMY BAY	EB007	7/7	1405	(GUNBOAT CREEK/CASCADE)		-0-
DELENIA IS.	DE001M	7/10	1215	2	4 (sitting on rocks)	
WHALE BAY W	WH504	7/10	1400	1 flying	1 (sitting on rocks)	
PERRY ISLAND,	PR003	7/27	1035	-0-	1 flying	
South Bay	PR001	7/27	1100	-0-	-0-	
GRANIT BAY	GB002	8/4	1000	-0-	-0-	
MASKED BAY	NONE	8/4	1050	(2 GROUPS OF 7 MALES)		
MALLARD BAY	KN575	8/4	1300	-0-	-0-	

TOTAL MALE	80
TOTAL FEMALE	85
TOTAL UNDETERMINED SEX	51
TOTAL	216

* DUPLICATE SURVEYS

TABLE 3a&b

Table 3a

Lower reaches of the typical PWS HADU nesting stream have the following characteristic profile:

offshore rocks
semi-enclosed lagoon with extensive intertidal
stream 30-50 ft wide at mouth
lake-fed with relatively constant velocity of flow
anadromous fish spawning
no major obstacles, such as large vertical waterfalls or excessively turbulent and lengthy cascades

Table 3b

PWS Oil Spill Area: Streams with Waterfalls/Cascade of sufficient vertical distance (greater than 10 m) believed to preclude egress of HADU ducklings, thus forming unsuitable breeding habitat

Stream/Area	ASC#	Date of Visit	Observers
Louis Bay	226-10-16890	May 26, 1991	Crowe, Hastings
Solf Cove, Herring Bay: failed fish ladder	226-10-16960	June 7, 1991	Patten, Hastings
Gunboat Creek, Eshamy Bay	225-30-15070	June 24, 1991	Jarvis, Patten
Culross Is.	224-20-13024	July 7, 1991	Crowe, Twait
Culross Is. Applegate area pink salmon spawn at mouth intertidally below cascade	224-20-12995	July 7, 1991	Crowe, Twait
Picturesque Cove mainland near Applegate	224-30-14780	July 7, 1991	Crowe, Twait
Point Nellie Juan	224-40-14990	July 7, 1991	Crowe, Twait

Hidden Bay: fjord with cascades only

Perry Is. nine very short streams catalogued as pink salmon spawning sites only: suspected unsuitable HADU breeding habitat

TABLE 4

Table 4

Characteristics of
ASC Stream No. 226-20-16300 at West Arm, Whale Bay (WH504):

semi-enclosed bay
offshore rocks
extensive post-'64 uplifted intertidal with Fucus and extensive mussel beds

stream 30 ft wide at mouth to estuary
lake fed
moderate slope to stream
no cascade
relatively constant rate of flow
anadromous fish runs: sockeye, pink, chum, silver salmon
old-growth forest borders stream
south exposure to Port Bainbridge
north exposure to mouth of stream
small cobble to gravel substrate on stream bed
lake connected on south by stream flowing to Port Bainbridge; north also to West Arm, Whale Bay

Note: This stream serves as an example of an expected HADU nesting stream in western PWS. This stream was mist-netted for 11 hours on 7/10/91 with zero HADU trapped (see Table 5, below)

TABLE 5

Table 5

MIST NET SITES ON STREAMS
OIL SPILL AREA, PRINCE WILLIAM SOUND 1991

LOCATION	SEGMENT	DATE	AK STEAM CATALOG	NET TIME	RESULTS
SNUG HARBOR	KN402	6/3	ASC 226-30-16820	12 HOURS	-0-
MALLARD BAY	KN575	6/8	ASC 226-20-16980	9 HOURS	-0-
MALLARD BAY	KN575	6/9	ASC 226-20-16980	9 HOUSS	-0-
OTTER BAY	KN018	6/6	ASC 226-20-16880	8.5 HOURS	-0-
OTTER BAY	KN018	6/7	ASC 226-20-16880	8.5 HOURS	-0-
BAY OF ISLES (WEST ARM)	KN201	6/11	ASC 226-30-16870	8 HOURS	-0-
KAKE COVE	CH017	6/22	ASC 226-20-16270	12 HOURS	-0-
PADDY BAY	PA001	6/24	ASC 226-20-26010	12 HOURS	-0-
BRIZGALOFF CR.	NONE	7/4	ASC 226-20-16230	12 HOURS	-0-
WHALE BAY S.	WH502	7/8	ASC 226-20-16340	12 HOURS	-0-
WHALE BAY W.	WH504	7/10	ASC 226-20-16300	11 HOURS	-0-
IKTUA BAY	EV008	7/18	ASC 226-20-16300	9 HOURS	-0-
CULROSS PASS.	NONE	7/19	ASC 224-30-14800	9 HOURS	-0-
CAMP CREEK	KN132	7/6	ASC 226-30-16982		-0-
(Camp Creek was 24 hour watch throughout the summer)					
12 STREAMS			one study team	121 TOTAL HRS.	

NOTE: TRAP TIMES STARTED ON DATE SHOWN AND CONTINUED THROUGH MIDNIGHT AND INTO THE FOLLOWING DAY.

TABLE 6

Table 6

MOLTING SITE SURVEYS
OIL SPILL AREA, PRINCE WILLIAM SOUND 1991

LOCATION	SEGMENT	DATE	TIME	# HADUs TTL	# FLIGHTLESS
SW FLEMMING IS	FL003	7/19	1045	18	18
BAINBRIDGE IS.	BA006	7/19	1130	23	23
LUCKY BAY	KN600	7/19	1450	5	5
FOUL BAY	MA002	7/20	1230	57	57
APPLEGATE IS.	AG004	7/20	1130	8, 1 FEMALE	7
OTTER ISLAND	KN021	7/25	1145	5 MALES	2
FOUL PASSAGE	IN031	7/25	1815	5, 2 FEMALE	1
BAY OF ISLES	KN022	7/25	1730	25, 1 FEMALE	24
HERRING BAY	KN141A	7/25	1000	5, 1 FEMALE	3
CHANNEL IS.	GR004	7/26	1200	350	350
GREEN ISLAND	GR300	7/26	1250	50	50
GIBBON ANCH	GR002	7/26	1130	29	29
HERRING POINT	KN500A	8/3	1100	5	5
NW KNIGHT IS.	KN500A/B	8/3	1115	4	4
NW KNIGHT IS.	KN504	8/3	1200	11	10
JUNCTION IS.	CHO11	8/4	1215	26, 1 FEMALE	25
MASKED BAY	NONE	8/4	1050	14	14
SMALL BAY	KN553	8/4	1400	7	7
ESHAMY BAY	EB009	8/5	1015	5	5
ESHAMY LAGOON	EB012/013	8/5	1040	7	7
CRAFTON ISLAND	CR004	8/5	1100	7	7

TOTAL COUNT	666
TOTAL FLIGHTLESS	653
TOTAL FEMALES	6

TABLE 7a

TABLE 7a

1989 HARLEQUIN [illegible]ABITAT *
OILING CONDITIONS

LOCATION	HARLEQUIN DUCK HABITAT	SEGMENT	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	BAND WIDTH
EVANS ISLAND	MUSSEL BED SAMPLE SITE OFFSHORE ROCKS	EV015	SCAT	6/17/89	MOD> LT	MOUSSE,TAR	
			USCG SIGN OFF	8/29/89	MOD> LT		
			DEC FALL WALK	10/14/89	HVY> LT	TAR,AP,MS,ST BURIED OIL	
IKTUA BAY, LAGOON	POTENTIAL BREEDING AREA STREAM NET SITE	EV008	SCAT	6/6/89	LT>	MOUSSE,TAR	.5 Meters
			USCG SIGN OFF	7/28/89	MOD>		
			DEC FALL WALK	10/13/89	LT>	AP,STAIN	
IKTUA BAY	ADJACENT OFFSHORE ROCKS MOLTING AREA	EV010	SCAT	6/16/89	MOD>	MOUSSE,TAR	
			USCG SIGN OFF	7/28/89	LT>		
			DEC FALL WALK	10/13/89	LT>	TAR	
GUGUAK COVE, LAGOON	MUSSEL BED SAMPLE SITE PROBABLE BREADING STREAM	EV070	SCAT	7/19/89	MOD>	POOLED OIL MS,TAR,FR	
	USCG SIGN OFF DOES NOT EXIST FOR EV070 1989						
		EV070	DEC FALL WALK	10/13/89	VERY LIGHT	NO	
NORTH TIP ELRINGTON ISLAND	MUSSEL BED SAMPLE SITE	ER020	SCAT	7/1/89	HEAVY>	FO,MS,TAR	
			USCG SIGN OFF	9/13/89	HEAVY>	BURIED OIL	
			USCG SIGN OFF	9/17/89	LIGHT	BURIED OIL	
			DEC FALL WALK	10/1/89	HEAVY>	BURIED OIL	
			USCG SIGN OFF	10/2/89	HEAVY>	BURIED & MOBILE OIL	

LOCATION	HARLEQUIN DUCK HABITAT	SEG	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	BAND
LATOUCHE, NORTH TIP	MUSSEL BED SAMPLE SITE	LA	SCAT	6/16/89	HEAVY	OP,FR,MS,TAR BURIED OIL	
			USCG SIGN OFF	9/14/89	HEAVY> LIGHT		
			DEC FALL WALK	10/3/89	HEAVY> LIGHT	MS,TAR,AP,ST BURIED OIL	
LA TOUCHE ISLAND SLEEPY BAY	MUSSEL SAMPLE SITE PROBABLE BREEDING STREAM	LA018	SCAT	6/14/89	HEAVY	FRESH OIL MOUSSE	50 Meters
			USCG SIGN OFF	7/16/89	MODERATE>	BURIED OIL	
			DEC FALL WALK	6/3/89	HEAVY	MS,AP,TAR BURIED OIL	
BLOCK ISLAND LAGOON & HELIPORT	MUSSEL BED SAMPLE SITE	EL013A	SCAT	9/15 /89	HEAVY	MS,ST,TAR	3 to 6 Meters
			USCG SIGN OFF	7/4/89	LIGHT		
			DEC FALL WALK	9/15/89	HEAVY	BURIED OIL	
POINT BAINBRIDGE	MUSSEL BED SAMPLE SITE	BA004	SCAT	7/30/89	MODERATE> LIGHT	TAR,ASPHALT	
			USCG SIGN OFF	9/6/89	MODERATE		
			DEC FALL WALK	10/2/89	NO OIL		
BAINBRIDGE PASSAGE	MOLTING SITE, OFFSHORE ROCKS	BA006	SCAT	7/23/89	NO OIL		
			USCG SIGN OFF	8/10/89	LIGHT	BURIED OIL	
			DEC FALL WALK	10/12/89	MODERATE> LIGHT	TAR,ASPHALT	
NORTHWEST BAY	PROBABLE BREEDING STREAM & FEEDING AREA	EL052	SCAT	4/22/89	MODERATE>	POOLED OIL FREE OIL	3 to 10 Meters
			USCG SIGN OFF	6/14/89	MODERATE> LIGHT	BURIED OIL	
			DEC FALL WALK	9/19/89	MODERATE> LIGHT	TAR,ASPHALT	

LOCATION	HARLEQUIN DUCK HABITAT	SEG	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	BAND
APPLEGATE ISLAND	MOLTING & FEEDING AREA	AE004	SCAT	5/25/89	HEAVY>	MS,TAR CT	Meters
			USCG SIGN OFF	5/25/89	LIGHT		
			DEC FALL WALK	9/14/89	HEAVY>	MOUSSE,TAR STAIN	
APPLEGATE ISLAND	MOLTING & FEEDING OFFSHORE ROCKS	AE004	SCAT	5/25/89	HEAVY>	MOUSSE,TAR COAT	25 Meters
			SIGN OFF	8/4/89	LIGHT	BURIED OIL	
			DEC FALL WALK	9/13/89	MODERATE> LIGHT	MS,TAR,ST BURIED OIL	
APPLEGATE ISLAND, LAGOON	MOLTING & FEEDING AREA OFFSHORE ROCKS	AE005	SCAT	5/26/89	HEAVY>	MOUSSE,TAR ASPHALT	15 Meters
			USCG SIGN OFF	8/26/89	HEAVY> MODERATE		
			DEC FALL WALK	9/13/89	HEAVY> LIGHT	MS,TAR,AP,ST BURIED OIL	
FOUL BAY	MOLTING & FEEDING SITES OFFSHORE ROCKS	MA002	SCAT	5/22/89	HEAVY> MODERATE	MOUSSE FREE OIL	15 Meters
			USCG SIGN OFF	8/24/89	MODERATE> LIGHT		
			DEC FALL WALK	9/13/89	MODERATE> LIGHT	MS,TAR BURIED OIL	4 to 30 Meters
NORTH ENTRANCE BAY OF ISLES	ROOSTING & FEEDING SITES	KN020	SCAT	5/12/89	MODERATE>	FRESH	15 Meters
			USCG SIGN OFF	8/1/89	LIGHT>	BURIED OIL	
			DEC FALL WALK	9/20/89	MOD>	TAR	
BAY OF ISLES, ENTRANCE	MOLTING, FEEDING, ROOSTING AREAS OFFSHORE ROCKS	KN022	SCAT	5/12/89	HEAVY> MODERATE	FREE OIL MOUSSE	2 to 3 Meters
	NO FURTHER SURVEYS CONDUCTED AT KN022 1989						
BAY OF ISLES, OTTER COVE	PROBABLE BREEDING AREA STREAM NET SITE	KN018	SCAT	5/11/89	HEAVY>	FREE OIL CT,MS,FS	
			USCG SIGN OFF	8/1/89	LIGHT		
			DEC FALL WALK	9/20/89	MODERATE> LIGHT	TAR	

LOCATION	HARLEQUIN DUCK HABITAT	SEGM	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	BAND
DEATH LAGOON BAY OF ISLES	MUSSEL BED SAMPLE SITE	KN15	SCAT	5/4/89	HEAVY>	100% MOUSSE	
			USCG SIGN OFF	7/19/89	LIGHT		
			DEC FALL WALK	10/1/89	HEAVY	MOUSSE,TAR ST,APSHALT	
WEST ARM, BAY OF ISLES LAGOON	PROBABLE BREEDING & FEEDING SITE STREAM NET SITE	KN201	SCAT	5/22/89	LIGHT	TAR,MOUSSE	
			USCG SIGN OFF	7/7/89	MODERATE>		
			DEC FALL WALK	10/1/89	LIGHT	TAR,MOUSSE BURIED OIL	
PLEIADES ISLANDS	MOLTING & FEEDING, OFFSHORE ROCKS	PL001	SCAT	8/2/89	HEAVY	TAR	15 M
	LAST SURVEY CONDUCTED AT THIS SITE						
JUNCTION ISLAND	MOLTING & FEEDING AREA OFFSHORE ROCKS	CH011	SCAT	7/6/89	HEAVY	TAR,MOUSSE FS,FR,CT	
			USCG SIGN OFF	8/3/89	MODERATE> LIGHT		
			DEC FALL WALK	10/19/89	HEAVY> MODERATE	MOUSSE,TAR ASPHALT	
CHENEGA ISLAND, KAKE COVE	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	CH017	SCAT	7/18/89	LIGHT	TAR	.25 Meters
	NO RECORD OF THIS SITE BEING SIGNED OFF BY USCG						
			DEC FALL WALK	10/2/89	VERY LIGHT	STAIN	
CHENEGA ISLAND, NORTH TIP	MUSSEL SAMPLE SITE	CH010	SCAT	7/4 & 7/5/89	HEAVY	FRESH OIL,CT MS,TAR,OF	
			USCG SIGN OFF	8/3/98	MODERATE>	BURIED OIL	
			DEC FALL WALK	9/19/89	HEAVY>	MS,TAR,AP,ST BURIED OIL	
DELENIA ISLAND DANGEROUS PASSAGE	MOLTING AREA	THIS SEGMENT WAS NOT SURVEYED UNTIL THE 1991 MAYSAP SURVEYS					

LOCATION	HARLEQUIN DUCK HABITAT	SEGME	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	BAND W
KNIGHT ISLAND, WEST SHORE	FEEDING & ROOSTING AREAS OFFSHORE ROCKS	KN500	SCAT	6/5/89	MODERATE	FRESH OIL,TAR,MS,C T	
			USCG SIGN OFF	7/23/89	LIGHT		
			DEC FALL WALK	9/26/89	HEAVY> LIGHT	TAR,ASPHALT BURIED OIL	
HERRING POINT	MOLTING & FEEDING AREA OFFSHORE ROCKS	KN300	SCAT	5/2/89	MODERATE	FRESH OIL	
			USCG SIGN OFF	6/3/89			
			DEC FALL WALK	9/16/89	HEAVY> LIGHT	TAR BURIED OIL	
SOUTH TIP CRAFTON ISLAND	MOLTING & FEEDING AREA OFFSHORE ROCKS	CR004	SCAT	5/7/89	MODERATE>	MOUSSE	20 Meters
			USCG SIGN OFF	8/17/89	LIGHT	BURIED OIL	
			DEC FALL WALK	9/12/89	MODERATE> LIGHT	OP,MS,TAR,AP BURIED OIL	
SNUG HARBOR	FEEDING AREA & STREAM NET SITE	KN401	SCAT	6/11/89	HEAVY> MODERATE	POOLED OIL MOUSSE, TAR	2 to 20 Meters
			USCG SIGN OFF	8/20/89	HEAVY> MODERATE	BURIED OIL	
			DEC FALL WALK	9/30/89	HEAVY>	MOUSSE,TAR STAIN	
LOG JAM BAY	FEEDING & MOLTING AREA	KN211	SCAT	5/24/89	HEAVY	FRESH OIL MOUSSE, TAR	1 to 75 Meters
			SIGN OFF	9/13/89	HEAVY	BURIED OIL	
			DEC FALL WALK	9/20/89	HEAVY> BURIED OIL	POOLED OIL MOUSSE,AP,ST	
FLEMMING ISLAND	MUSSEL SAMPLE SITE	FL004	SCAT	7/15/89	HEAVY>	OP,MS,TAR	10M
			USCG SIGN OFF	8/9/89	MODERATE>		
			USCG SIGN OFF	8/10/89	LIGHT>		
			DEC FALL WALK	10/17/89	HEAVY> BURIED OIL	MOUSSE,TAR ASPHALT	

LOCATION	HARLEQUIN DUCK HABITAT	SEG	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	[illegible]
FLEMMING ISLAND SOUTH TIP	MOLTING & FEEDING AREA OFFSHORE ROCKS	FL003	SCAT	7/12/89	LIGHT	TAR	.25 Meters
			USCG SIGN OFF	7/28/89	LIGHT		
			DEC FALL WALK	10/19/89	LIGHT	TAR,STAIN	
HERRING BAY	MOLTING & FEEDING AREA OFFSHORE ROCKS	KN141	SCAT	7/12/89	HEAVY> LIGHT	MOUSSE,TAR FREE OIL	16 Meters
			SIGN OFF	8/28/89	MODERATE> LIGHT		
			DEC FALL WALK	9/15/89	HEAVY> LIGHT	ASPHALT	
NORTH SHORE HERRING BAY	MUSSEL BED SAMPLE SITE	KN113	SCAT	5/1/89	HEAVY		5 to 10 Meters
			USCG SIGN OFF	8/2/89	HEAVY>		
			USCG SIGN OFF	8/30/89	MODERATE>		
			DEC FALL WALK	9/16/89	HEAVY> BURIED OIL	MOUSSE,STAIN TAR	
HERRING BAY ADF&G CAMP	PROBABLE BREEDING & FEEDING AREA STREAM HABITAT	KN132	SCAT	5/4/89	MODERATE	TAR	2 to 30 Meters
		NO RECORD OF SIGN OFF BY USCG					
			DEC FALL WALK	9/16/89	HEAVY> LIGHT	TAR BURIED OIL	
NAKED ISLAND, CABIN BAY	PROBABLE BREEDING & FEEDING AREA	NA024	SCAT	8/15/89	LIGHT	MOUSSE,TAR	3 Meters
			USCG SIGN OFF				
			DEC FALL WALK	9/26/89	LIGHT	MS,TAR,AP BURIED OIL	
NAKED ISLAND, OUTSIDE BAY	PROBABLE BREEDING & FEEDING AREA	NA026	SCAT	8/15/89	LIGHT	COAT,TAR	
			USCG SIGN OFF				
			DEC FALL WALK	9/25/89	MODERATE> LIGHT	TAR BURIED OIL	

LOCATION	HARLEQUIN DUCK HABITAT	SEGMENT	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	BAND
FOUL PASSAGE	MOLTING & FEEDING AREA OFFSHORE ROCKS	D1059	SCAT	4/26/89	HEAVY> MODERATE	TAR BURIED OIL	
			USCG SIGN OFF	7/19/89	MODERATE>	BURIED OIL	
			DEC FALL WALK	9/15/89	HEAVY> LIGHT	ASPHALT BURIED OIL	
WHALE BAY, SOUTH ARM	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	WH502	THIS SEGMENT WAS NOT SURVEYED UNTIL THE SPRING OF 1990				
WHALE BAY, MAINLAND	MOLTING & FEEDING AREAS OFFSHORE ROCKS & STREAM AREA	WH003	SCAT	8/1/89	NO OIL		
	SCAT ON 8/1/89 WAS THE ONLY SURVEY OF WH003 IN 1989 LATER SURVEYS IN 1990 REVEALED EXTENSIVE OILING TO THIS AREA						
WHALE BAY, WEST ARM	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	WH504	THIS SEGMENT WAS NOT SURVEYED UNTIL THE SPRING OF 1990				
PADDY BAY	BREEDING & FEEDING AREAS STREAM NET SITE	PA001	SCAT	7/19/89	LIGHT	TAR	.5 Meter
			USCG SIGN OFF	8/11/89	VERY LIGHT		
		NO FURTHER SURVEYS OF THIS SEGMENT					
ESHAMY BAY, SOUTH ARM	MOLTING & FEEDING AREA	EB009	SCAT	5/27/89	LIGHT	FRESH OIL	
			USCG SIGN OFF	8/4/89	LIGHT		
		NO FURTHER SURVEYS OF THIS SEGMENT					
AGULIAK ISLAND	MOLTING & FEEDING AREA OFFSHORE ROCKS	AG001	SCAT	6/21/89	HEAVY	TAR	3 to 6 Meters
			USCG SIGN OFF	7/20/89	LIGHT	BURIED OIL	
			DEC FALL WALK	9/28/89	LIGHT	TAR,ASPHALT	
AGULIAK ISLAND	MOLTING & FEEDING AREA OFFSHORE ROCKS	AG009	SCAT	8/21/89	HEAVY> MODERATE	MOUSSE,TAR	2 Meters
			USCG SIGN OFF	8/30/89	MODERATE>	BURIED OIL	
	NO FURTHER SURVEYS RECORDED						

LOCATION	HARLEQUIN DUCK HABITAT	SEGI	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	
MUMMY ISLAND	FEEDING & MOLTING AREA OFFSHORE ROCKS	MU900	SCAT	8/21/89	HEAVY>	FREE OIL MOUSSE,TAR	2 Meters
			USCG SIGN OFF	8/30/89	VERY LIGHT		
	NO FURTHER SURVEYS RECORDED						
SQUIRREL ISLAND	MOLTING & FEEDING AREA OFFSHORE ROCKS	SL001	SCAT	6/24/89	HEAVY	TAR	
			SIGN OFF	8/3/89	MODERATE>	TAR BURIED OIL	
			DEC FALL WALK	10/2/89	HEAVY> LIGHT	TAR BURIED OIL	
DRIER BAY, MALLARD BAY	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	KN575	SCAT	6/8/89	TRACE TAR BAND		
			USCG SIGN OFF				
			DEC FALL WALK	9/29/89	VERY LIGHT	TAR,STAIN	
PERRY ISLAND, SOUTH TIP	MOLTING & FEEDING AREA OFFSHORE ROCKS	PR003	SCAT	5/18/89	MODERATE>	FREE OIL MOUSSE	
			USCG SIGN OFF	6/13/89	LIGHT	BURIED OIL	
			DEC FALL WALK	9/12/89	HEAVY> LIGHT	MS,TAR,AP,ST BURIED OIL	
GREEN ISLAND NORTH COAST	MUSSEL BED SAMPLE SITE & PROBABLE FEEDING AREA	GR101	SCAT	5/16/89	MODERATE>	MOUSSE & TAR	10 & 20 Meters
			DEC FALL WALK	10/3/89	HEAVY> BURIED OIL	TAR,ASPHALT STAIN	
CHANNEL ISLAND	MOLTING AREA	GR004A	SCAT	5/2/89	TRACE AMOUNT	STAIN	
GR004 WAS RECOMMENDED FOR NO TREATMENT AND A N/T ORDER WAS SIGNED BY FOSC 5/4/89							
GREEN ISLAND SOUTH END	MOLTING AREA	GR300A	SCAT	8/11/89	VERY LIGHT	STAIN	3cm
			DEC FALL WALK	10/2/89	VERY LIGHT	ASPHALT (SPORADIC)	
GR300A WAS RECOMMENDED FOR NO TREATMENT AND A N/T ORDER WAS SIGNED BY THE FOSC							

LOCATION	HARLEQUIN DUCK HABITAT	SEGME	TYPE SURVEY	DATE	DEGREE OF OIL CONTAMINATION	DESCRIPTION OF OILING	BAND W
DISK ISLAND	MUSSEL SAMPLE SITE	D1067A	SCAT	6/16/89	HEAVY BURIED OIL	POOLED OIL, FM MOUSSE, TAR	
			USCG SIGN OFF	6/16/89	HEAVY>		
			DEC FALL WALK	9/16/89	HEAVY>	MS, TAR BURIED OIL	
PERRY ISLAND SOUTH SHORE	MOLTING & FEEDING AREA OFFSHORE ROCKS	PR002	SCAT	5/18/89	HEAVY>	FREE OIL MOUSSE, COAT	20 Meter
			USCG SIGN OFF	8/27/89	HEAVY	BURIED OIL	
			DEC FALL WALK	9/13/89	HEAVY>	TAR, BURIED OIL	

ST	Stain
OF	Oil Film
MS	Mousse
OP	Pooled Oil
T	Tar
FS	Fresh Oil
AP	Asphalt
SUB	Subsurface Oil
CT	Oil Coating
M	Meter measurement
FR	Fresh Crude Oil
>	Decreasing
HEAVY	Heavy oiling conditions
MODERATE	Moderate oiling conditions
LIGHT	Moderate oiling conditions

SCAT Shoreline Cleanup Assessment Team's initial survey of oiling conditions after the spill.

USCG SIGN OFF Coast Guard release saying further cleanup not necessary.

DEC FALL WALK Department of Environmental Conservation's last shoreline oiling evaluation in the 1989 season.

NOTE: All surveys are considered a source of disturbance particularly ones conducted by helicopter.

* This table incorporates locations of Harlequin Ducks observations during the 1991 field season.

WP51/TOM/89FORM2.TC2

TABLE 7b

TABLE 7b

1990 HARLEQUIN DUCK HABITAT OILING CONDITIONS IN PRINCE WILLIAM SOUND

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL DESCRIPTION
EVANS ISLAND	MUSSEL BED SAMPLE SITE OFFSHORE ROCKS	EV015A	SSAT	4/20/90	AP,MS
			DEC	8/7/90	OP,MS,BURIED OP & OR
			ASAP	8/7/90	CT,ST,MS
IKTUA BAY LAGOON	STREAM NET SITE POTENTIAL BREEDING AREA	EV008	THIS SEGMENT WAS NOT INCLUDED IN SURVEY OR CLEANUP PLAN FOR 1990		
IKTUA BAY	ADJACENT OFFSHORE ROCKS, MOLTING AREA	EV010	SSAT	4/23/90	CT,CT,TAR PATTIES
			DEC	6/5/90	OP,TB,ST,CT
			ASAP	8/6/90	ST,MS, TAR PATTIES
GUGUAK COVE, LAGOON	MUSSEL BED SAMPLE SITE & PROBABLE BREEDING STREAM SITE	EV070	SSAT	4/6/90	CV,ST,TAR PATTIES, BURIED OR & OF OIL
			ASAP	8/3/90	SOR,CV,TAR PATTIES
ELRINGTON ISLAND NORTH TIP	MUSSEL SAMPLE SITE	ER020B	SSAT	4/7/90	AP,CV,CT,ST BURIED OP,OR & OF
			ASAP	9/7/90	TARMATS,ASPHALT,MOUSSE
LATOUCHE	MUSSEL BED SAMPLE SITE	LA015E	SSAT	4/1/90	CT,ST BURIED OR
			ASAP		
SLEEPY BAY	MUSSEL SAMPLE SITE, PROBABLE BREEDING STREAM	LA018	SSAT	4/24/90	OP,AP,MS,CV,ST BURIED OR & OP OIL
			ASAP	8/21/90	AP,SOR,CT,ST BURIED OR OIL
GREEN ISLAND, N.W. SIDE	MUSSEL SAMPLE SITE, OFFSHORE ROCKS	GR101	SSAT	4/7/90	CT,ST BURIED OR & OP
			ASAP	8/14/90	HEAVY CT,AP,SOR
GREEN ISLAND GIBBON ANCHORAGE	MOLTING AREA, OFFSHORE ROCKS	GR015A	SSAT	4/7/90	TAR COAT, STAIN
	EXXON CULTURAL RESOURCE EVALUATION SURVEY CONDUCTED BY HOVERING HELICOPTER*			5/17/90	(ALL ISLANDS SURVEYED)
			DSA	7/15/90	COAT & STAIN
GREEN ISLAND, SOUTH END	MOLTING AREA	GR300A	SSAT	4/8/90	STAIN ONLY
		N/T ORDER WAS SIGNED FOSC & CLEANUP ACTIVITIES CEASED 4/26/90			
CHANNEL ISLAND	MOLTING AREA	GR004A	SSAT	4/8/90	STAIN ONLY
		N/T ORDER WAS SIGNED FOSC & CLEANUP ACTIVITIES CEASED 4/26/90			

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL DESCRIPTION
POINT BAINBRIDE	MUSSEL BED SAMPLE SITE	BA004	SSAT	3/31/90	POOLED OIL, CV, C.
		N/T ORDER WAS SIGNED FOSC & CLEANUP ACTIVITIES CEASED 4/5/90			
BAINBRIDGE PASSAGE, BAY	MOLTING SITE, OFFSHORE ROCKS	BA0068&C	SSAT	4/24/90	AP,CT,ST, BURIED OR OIL
			ASAP	8/4/90	MS,SOR
WEST COVE, DISK ISLAND	MUSSEL SAMPLE SITE	D1067A	SSAT	4/19/90	AP,CT,FM BURIED OR
			ASAP	8/20/90	SOR,CV,CT,ST,TAR PATTIES BURIED OP & OR
NORTHWEST BAY ELEANOR ISLAND	PROBABLE BREEDING HABITAT & FEEDING AREA	EL052	SSAT	4/4/90	AP,TB,CV,ST BURIED OP & OR OIL
			ASAP	8/8/90	SOR,CV,CT,ST BURIED OP,OR,OF OIL
BLOCK ISLAND LAGOON & HELIPORT	FEEDING & MOLTING HABITAT	EL015	SSAT	4/8/90	AP,CB,CT,TB,TAR PATTIES POOLED OIL
			ASAP	8/12/90	AP,CT,ST,SOR,TAR
BLOCK ISLAND LAGOON & HELIPORT	MUSSEL SAMPLE SITE	EL013A	SSAT	4/8/90	ASPHALT, POOLED OIL BURIED OR OIL
			ASAP	8/2/90	AP,SOR,CV,CT BURIED OR OILING
APPLEGATE ISLAND	MOLTING & FEEDING & OFFSHORE ROCKS	AE004 A&B	SSAT	5/12/90	MS,AP,SOR,CV,CT,POOLED OIL BURIED OR & OF
			ASAP	8/22/90	AP,SOR,CV,CT BURIED OP & OR OIL
APPLEGATE ISLAND, LAGOON	MOLTING & FEEDING HABITAT, OFFSHORE ROCKS	AE005 A,B&C	SSAT	4/3/90	AP,MS,CV,POOLED OIL BURIED OP,OR,SF OIL
		DURING THIS SURVEY 4 MALE & 3 FEMALE HARLEQUIN DUCKS WERE OBSERVED BY SSAT BIOLOGIST			
			DEC FALL WALK	9/13/90	MS,TAR,AP,ST BURIED OIL
FOUL BAY,ISLANDS & OFFSHORE ROCKS	MOLTING & FEEDING SITES	MA002A	SSAT	4/06/90	AP & BURIED OR OIL (OCCURING ON ALL ISANDS)
		SURVEYED DURING CLEANUP		6/7/90	MS,CV,CT,ST BURIED OR & OF
OTTER COVE, BAY OF ISLES	PROBABLE BREEDING & FEEDING SITE STREAM NET SITE	KN018	SSAT	4/2/90	CT,CV
NORTH ENTRANCE TO BAY OF ISLES	MOLTING & FEEDING AREAS	KN020	SSAT	4/25/90	CT ONLY

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL DESCRIPTION
OFFSHORE ROCKS, ENTRANCE TO BAY OF ISLES	MOLTING, FEEDING & ROOSTING HABITAT	KN022	THESE ISLANDS WERE NOT INCLUDED IN THE SHORELINE CLEANUP OR SURVEYS DURING THE 1990 SEASON		
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTVITIES CEASED ON 4/27/90				
BAY OF ISLES DEATH LAGOON	MUSSEL SAMPLE SITE	KN136A	SSAT	3/30/90	AP,CV,CT,ST BURIED OP & OR
			ASAP	8/10/90	AP,SOR,CT,ST BURIED OR OIL
WEST ARM, BAY OF ISLES LAGOON	PROBABLE BREEDING & FEEDING SITE STREAM NET SITE	KN201	SSAT	9/9/90	TB,AP,CT TAR PATTIES
			ASAP	8/9/90	AP,CT,ST,MS TAR PATTIES
PLEIADES ISLANDS	MOLTING & FEEDING OFFSHORE ROCKS	PL001	SSAT	4/1/90	CT, OP BURIED OF OIL
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTIVITES CEASED ON 4/11/90				
DELENIA ISLANDS	OFFSHORE ROCKS AND MUSSEL SAMPLE SITE	DE001	THIS SITE WAS NOT INCLUDED IN CLEANUP UNTIL 1991		
CHENEGA ISLAND, NORTH TIP	MUSSEL SAMPLE SITE & FEEDING AREA	CH010B	SSAT	4/5/90	OP,TAR PATTIES BURIED OP & OR OILING
		3 HARLEQUIN DUCKS OBSERVED DURING SSAT BY TEAM BIOLOGIST			
			ASAP	8/4/90	CT,ST,FM BURIED OR
JUNCTION ISLANDS	MOLTING & FEEDING OFFSHORE ROCKS	CH011	SSAT	4/5/90	AP,OP BURIED OP OIL
		DURING THIS SURVEY 2 MALE AND 1 FEMALE HARLEQUIN DUCKS WERE OBSERVED BY SSAT BIOLOGIST			
			SSAT NO.2	4/23/90	AP,OP,TAR PATTIES, BURIED OP OIL
		DURING THIS SURVEY 20 HARLEQUIN DUCKS WERE OBSERVED BY SSAT BIOLOGIST			
			ASAP	8/4/90	SOR,MS,BURIED OR OILING
KAKE COVE	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	CH017	THIS SEGMENT WAS EXCLUDED FOR THE 1990 CLEANUP PLANS		
KNIGHT ISLAND WEST SHORE	FEEDING & ROOSTING AREAS, OFFSHORE ROCKS	KN500	SSAT	4/8/90	CV,AP,CT BURIED OR OILING
			ASAP	8/3/90	SOR,CT,FM BURIED OR OILING
HERRING POINT	MOLTING & FEEDING AREA OFFSHORE ROCKS	KN300	SSAT	3/3/90	AP,CT BURIED OR OIL
			ASAP	8/10/90	SOR,CT,CV, BURIED OR OILING

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL DESCRIPTION
SOUTH TIP, CRAFTON ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	CR004	SSAT	4/4/90	POOLED OIL,CV,CT,F.
		DURING THIS SURVEY 4 HARLEQUIN DUCKS WERE OBSERVED BY SSAT BIOLOGIST			
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTIVIES CEASED ON 4/25/90				
SNUG HARBOR	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	KN401	SSAT	4/7/90	AP,MS,CV,CT, POOLED OIL TAR PATTIES
			ASAP NO.1	8/2/90	AP,CT,MS
			ASAP NO.2	9/19/90	AP,SOR,MS,ST
LOG JAM BAY	FEEDING & MOLTING AREA, STREAM HABITAT	KN211C&D	SSAT	4/2/90	CV,CT, TAR BALLS
	A NO TREATMENT ORDER WAS SIGNED BY THE FOSC AND CLEANUP ACTIVIES CEASED ON 5/9/90				
FLEMMING ISLAND	MUSSEL SAMPLE SITE	FL004A	SSAT	4/9/90	AP,CV BURIED OP & OR
			ASAP	8/5/90	AP,OP,SOR
FLEMMING ISLAND SOUTH TIP	MOLTING & FEEDING AREA, OFFSHORE ROCKS	FL003	SSAT	4/21/90	CT,TB, TAR PATTIES
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTIVITES CEASED ON 5/18/90				
HERRING BAY	MOLTING & FEEDING AREA	KN141A&B	SSAT	3/31/90	CV,CT,ST,FM BURIED OP/OR/OF
			ASAP	8/11/90	SOR,CT, BURIED OR OIL
HERRING BAY	MUSSEL SAMPLE SITE	KN113B	SSAT	5/5/90	CT,ST BURIED OP & OR
			ASAP	8/2/90	SOR,CT BURIED OR
HERRING BAY ADF&G CAMP	PROBABLE BREEDING & FEEDING AREA STREAM HABITAT	KN132	SSAT	3/31/90	AP,CT BURIED OP OILING
			ASAP	8/10/90	SOR,CT,CV BURIED OR OILING
NAKED ISLAND, CABIN BAY	PROBABLE BREEDING & FEEDING AREA	NA024A&F	SSAT	4/3/90	POOLED OIL,CT,MS
			ASAP	8/9/90	MOUSSE
NAKED ISLAND, OUTSIDE BAY	PROBABLE BREEDING & FEEDING AREA	NA026B	SSAT	4/5/90	OP,TB,CT,TAR PATTIES
			ASAP	8/9/90	NO OIL OBSERVED
FOUL PASSAGE	MOLTING & FEEDING AREA, OFFSHORE ROCKS	DI059	SSAT	4/20/90	CT,TB, BURIED OR & OP OIL
		THIS WAS THE LAST SURVEY OF THIS SEASON			
WHALE BAY, SOUTH ARM	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	WH502	DEC	10/12/90	TAR,AP,ST VERY LIGHT

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL DESCRIPTION
WHALE BAY, MAINLAND	MOLTING, FEEDING & OFFSHORE ROCKS STREAM HABITAT	WH003	SSAT	4/1/90	CT,AP,ST,FM BURIED OR & OF OILING
			ASAP	8/5/90	SOR,CT BURIED OIL
WHALE BAY, WEST ARM	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	WH504	DEC	10/12/90	NO OIL OBSERVED
PADDY BAY	BREEDING, FEEDING STREAM NET SITE	PA001	NO INFORMATION FOR THIS SEGMENT IN 1990		
ESHAMY BAY, SOUTH ARM	MOLTING & FEEDING AREA	EB009	SSAT	4/10/90	CT,TAR BALLS
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTIVITES CEASED ON 4/25/90				
AGULIAK ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	AG001	SSAT	4/6/90	CT,CV,ST
	A N/T ORDER WAS SIGNED BY THE FOSC AND CLEANUP ACTIVITIES CEASED ON 4/21/90				
AGULIAK ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	AG009 A&B	SSAT	4/25/90	MS,AP,TB,CV,CT,TB BURIED OR OILING
			ASAP	8/17/90	SOR,CV,CT BURIED OR OILING
MUMMY ISLAND	FEEDING & MOLTING AREA, OFFSHORE ROCKS	MU900	SSAT	4/2/90	AP,CT TAR PATTIES
SQUIRREL ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	SL001 ABC&D	SSAT	4/5/90	AP,CV,CT BURIED OP,OF OILING
			ASAP	8/6/90	SOR,CV,AP BURIED OR,OF OILING
MALLARD BAY, DRIER BAY	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	KN575	SSAT	4/22/90	CT,TAR PATTIES TARBALLS
		DURING THIS SURVEY 5 HARLEQUIN DUCKS WERE OBSERVED BY THE SSAT BIOLOGIST			
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTIVITES CEASED ON 4/30/90				
SOUTH TIP, PERRY ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	PR003	SSAT	3/30/90	CT,AP,CV
			ASAP	8/21/90	SOR,CV,AP,MS BURIED OP,OR OILING
PERRY ISLAND SOUTH SHORE	MOLTING & FEEDING AREA, OFFSHORE ROCKS	PR002	SSAT	4/30/90	MS,CV,CT,ST BURIED OP & OF OILING
			DEC	6/20/90	ST,OF BURIED OR OILING
			ASAP	8/21/90	CT,ST BURIED OR,OP,OF OILING

MS	oil mousse (thick fresh brown oozing tar)
OP	pooled oil (where has pooled on surface or into a freshly dug pit)
ST	oil stain (where oil has left stain on bedrock or boulders)
SOR	surface oil residue (any oil on the surface of beach area, similar to asphalt)
N/T	no treatment
AP	asphalt
TB	tarballs (generally small areas of thick surface tar or asphalt)
CV	tar cover (bedrock or boulders that are covered with tar)
OR	oil residue (oil saturated gravel)
CT	tar coating (bedrock or boulders that are coated with weathered tar)
OF	oil film (film of oil coating subsurface gravel or surface gravel)

ABBREVIATIONS

SSAT	Spring Shoreline Assessment Team's initial survey of oiling conditions after the spill.
ASAP	August Shoreline Assessment Program
DEC	Department of Environmental Conservation's shoreline oiling evaluation survey.
FOSC	Federal On Scene Coordinator (in charge of cleanup) Usually the USCG Admiral.
TAG	Technical Advisory Group (consisting of USCG FOSC, DEC, EXXON, NOAA)

* This table incorporates locations of Harlequin Ducks observed and documented during the 1990 Spring Shoreline Assessment Program.

* All surveys may also be considered a source of disturbance to Harlequin duck habitat particularly when conducted by helicopter.

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TABLE 7c

TABLE 7c

1991 HARLEQUIN DUCK HAB OILING CONDITIONS IN PRINCE WILLIAM SOUND

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL TYPE
EVANS ISLAND	MUSSEL BED SAMPLE SITE OFFSHORE ROCKS	EV015A	MAYSAP	4/30/91	AP,CV,ST BURIED HOR & MOR
	A N/T ORDER WAS ISSUED BY THE COAST GUARD AND ALL CLEANUP ACTIVIES CEASED ON 5/20/91				
IKTUA BAY LAGOON	STREAM NET SITE, POTENTIAL BREEDING AREA	EV008B	MAYSAP	4/27/91	SOR
A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVITES CEASED 5/13/91					
IKTUA BAY	ADJACENT OFFSHORE ROCKS, MOLTING AREA	EV010	THIS SEGMENT WAS EXCLUDED FROM THE 1991 CLEANUP PLANS		
GUGUAK COVE, LAGOON	MUSSEL BED SAMPLE SITE & PROBABLE BREEDING STREAM SITE	EV070E	MAYSAP	5/25/91	AP,SOR,CT BURIED LOR
			SVPSR	7/25/91	SOR, BURIED HOR,MOR & LOR
ELRINGTON ISLAND NORTH TIP	MUSSEL SAMPLE SITE	ER020B	MAYSAP	5/23/91	AP,MS,SOR,CV,CT,ST BURIED OP,HOR
			SVPSR	7/10/91	MS & BURIED HOR
LATOUCHE	MUSSEL BED SAMPLE SITE	LA015E	MAYSAP	5/23/91	AP,MS,TB,SOR,CV,ST BURIED OP,HOR,MOR,LOR,OF
			SVPSR	7/15/91	BURIED HOR & MOR
SLEEPY BAY	MUSSEL SAMPLE SITE, PROBABLE BREEDING STREAM	LA018	MAYSAP	5/3/91	AP,SOR BURIED MOR & OP OIL
			SVPSR	8/3/91	AP,MS,SOR BURIED OP,HOR,MOR,TR
GREEN ISLAND, N.W. SIDE	MUSSEL SAMPLE SITE, OFFSHORE ROCKS	GR101 A&B	MAYSAP	5/2/91	SOR,CT,TB BURIED MOR,LOR & HOR
N/T ORDERS WERE ISSUED BY THE FOSC. ALL CLEANUP ACTIVITIES CEASED 6/8/91					
		A	SVPSR	6/28/91	HSOR,CV,CT,ST
		B	SVPSR	8/20/91	AP,HSOR,LOR,OP
GREEN ISLAND GIBBON ANCHORAGE	MOLTING AREA, OFFSHORE ROCKS	GR015A	THIS SEGMENT WAS EXCLUDED FROM THE 1991 CLEANUP PLANS		
GREEN ISLAND, SOUTH END	MOLTING AREA	GR300A	THIS SEGMENT WAS EXCLUDED FROM 1991 CLEANUP PLANS		
CHANNEL ISLAND	MOLTING AREA	GR004A	THIS SEGMENT WAS EXCLUDED FROM 1991 CLEANUP PLANS		
POINT BAINBRIDE	MUSSEL BED SAMPLE SITE	BA004A	MAYSAP	5/26/91	AP,MS,SOR,CT
		N/T ORDER WAS SIGNED FOSC & CLEANUP ACTIVITIES CEASED 6/8/91			
			SVPSR	6/24/91	MS,SOR,TB,CV,CT,ST,OP BURIED MOR

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL TYPE
BAINBRIDGE PASSAGE, BAY	MOLTING SITE, OFFSHORE ROCKS	BA006C	MAYSAP	5/21/91	AP,MS,TB,SOR,CV,[illegible] BURIED OP
		SUBSEGMENT B	SVPSR	5/12/91	AP,MS,TB
WEST COVE, DISK ISLAND	MUSSEL SAMPLE SITE	D1067A	MAYSAP	5/22/91	TB,SOR,CT,ST BURIED HOR,MOR
A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVITIES CEASED 6/30/91					
NORTHWEST BAY ELEANOR ISLAND	PROBABLE BREEDING HABITAT & FEEDING AREA	EL052 A	MAYSAP	5/21/91	DV,ST BURIED MOR & LOR
		SUBSEGMENT B	MAYSAP	4/27/91	SOR BURIED HOR,MOR & OF
BLOCK ISLAND LAGOON & HELIPORT	FEEDING & MOLTING HABITAT	EL015	MAYSAP	4/30/91	SOR,CV,CT,ST BURIED HOR & OF
A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVITIES CEASED 5/15/91					
BLOCK ISLAND LAGOON & HELIPORT	MUSSEL SAMPLE SITE	EL013A	MAYSAP	4/30/91	TB,SOR,CV,ST,CT BURIED HOR,HOR
			SVPSR	5/4/91	AP,HSOR BURIED HOR
APPLEGATE ISLAND	MOLTING & FEEDING & OFFSHORE ROCKS	AE004 A&B	MAYSAP	5/2/91 and 5/5/91	MS,AP,TB,SOR,CT BURIED OF & TR
			2 HARLEQUIN DUCKS OBSERVED DURING MAYSAP SURVEY		
A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVITIES CEASED 5/2/91 FOR SUBSEGMENT A AND 5/25/91 FOR SUBSEGMENT B					
APPLEGATE ISLAND, LAGOON	MOLTING & FEEDING HABITAT, OFFSHORE ROCKS	AE005 A,B&C	MAYSAP	5/2/91	MS,CT BURIED OF
A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVITIES CEASED ON 5/20/91					
FOUL BAY,ISLANDS & OFFSHORE ROCKS	MOLTING & FEEDING SITES	MA002A	MAYSAP	5/22/91	AP,SOR,MS,CT
		2 HARLEQUIN DUCKS WERE OBSERVED DURING MAYSAP SURVEY			
NORTH SHORE ENTRANCE TO BAY OF ISLES	FEEDING AND ROOSTING AREA	KN020	THIS SEGMENT WAS NOT INCLUDED IN THE 1991 CLEANUP PLANS		
OFFSHORE ROCKS, ENTRANCE TO BAY OF ISLES	MOLTING, FEEDING & ROOSTING HABITAT	KN022	THESE ISLANDS WERE NOT INCLUDED IN THE SHORELINE CLEANUP OR SURVEYS DURING THE 1991 SEASON		
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTVITIES CEASED ON 4/27/91				
		KN018	THIS SEGMENT WAS EXCLUDED IN 1991 CLEANUP PLANS		

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL TYPE
BAY OF ISLES DEATH LAGOON	MUSSEL SAMPLE SITE	KN136A	MAYSAP	5/4/91	TARMATS,AP,SOR,CV,CT, BURIED HOR,MOR,LOR
			SVPSR	7/17/91	AP,SOR,CV,CT,ST BURIED HOR,MOR,LOR
WEST ARM, BAY OF ISLES LAGOON	PROBABLE BREEDING & FEEDING SITE STREAM NET SITE	KN201	MAYSAP	5/2/91	SOR,TAR PATTIES
	A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVIIES CEASED ON 5/25/91				
PLEIADES ISLANDS	MOLTING & FEEDING OFFSHORE ROCKS	PL001	THIS SEGMENT WAS EXCLUDED FOR THE 1991 CLEANUP PLAN		
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTIVITES CEASED ON 4/11/91				
DELENIA ISLANDS	OFFSHORE ROCKS, FEEDING AND MOLTING AREA	DE001	MAYSAP	5/2/91	TB,SOR,CV,ST
CHENEGA ISLAND, NORTH TIP	MUSSEL SAMPLE SITE & FEEDING AREA	CH010B	MAYSAP	5/1/91	SOR,TARMAT
A N/T ORDER WAS SIGNED BY THE FOSC AND ALL CLEANUP ACTIVITIES CEASED 5/21/91					
			SVPSR	7/11/91	HSOR, BURIED HOR & MOR
JUNCTION ISLANDS	MOLTING & FEEDING OFFSHORE ROCKS	CH011	MAYSAP	5/1/91	SOR,CT,AP,TAR
			SVPSR	7/1/91	SOR,CT,ST,TB
KAKE COVE	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	CH017	THIS SEGMENT WAS EXCLUDED FOR THE 1991 CLEANUP PLANS		
KNIGHT ISLAND WEST SHORE	FEEDING & ROOSTING AREAS, OFFSHORE ROCKS	KN500 A&B	MAYSAP	4/30/91	SOR,CV BURIED HOR,MOR,LOR
		A	SVPSR	6/10/91	BURIED HOR & MOR
		B	SVPSR	8/1/91	BURIED HOR & LOR
HERRING POINT	MOLTING & FEEDING AREA OFFSHORE ROCKS	KN300 A	MAYSAP	9/30/91	SOR BURIED OP & HOR
			SVPSR	4/80/91	SOR,CT,CV, BURIED OR OILING
SOUTH TIP, CRAFTON ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	CR004 AB&C	MAYSAP	5/20/91	SOR,CV,CT,ST,OP BURIED HOR
		A	SVPSR	7/2/91	MS,OP
		B	SVPSR	7/20/91	SOR,CV,ST,MOR,LOR
SNUG HARBOR	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	KN401 B&C	MAYSAP	4/26/91	AP,TB,SOR,CT
LOG JAM BAY	FEEDING & MOLTING AREA, STREAM HABITAT	KN211C&D	MAYSAP	4/2/91	SOR,CT,TAR BALLS
A N/T TREATMENT ORDER WAS SIGNED BY THE FOSC AN CLEANUP ACTIVIES CEASED ON 4/29/91 FOR SUBSEGMENT C AND 6/6/91 FOR SUBSEGMENT D					
FLEMMING ISLAND	MUSSEL SAMPLE SITE	FL004A	MAYSAP	5/12/91	AP,SOR,CV,CT BURIED OP,HOR,MOR

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL TYPE
FLEMMING ISLAND SOUTH TIP	MOLTING & FEEDING AREA, OFFSHORE ROCKS	FL003	THIS SEGMENT WAS EXCLUDED FROM THE 1991 CLEANUP PLA		
HERRING BAY	MOLTING & FEEDING AREA	KN141A&B	MAYSAP	5/19/91	SOR,CV,CT,ST,FM BURIED MOR,LOR,TR
A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVITIES CEASED ON 5/31/91					
HERRING BAY	MUSSEL SAMPLE SITE	KN113B	MAYSAP	4/29/91	BURIED HOR/HOR
A N/T ORDER WAS ISSUED AND ALL CLEANUP ACTIVITIES CEASED 5/14/91					
			SVPSR	7/19/91	STAIN ONLY
HERRING BAY ADF&G CAMP	PROBABLE BREEDING & FEEDING AREA STREAM HABITAT	KN132B	MAYSAP	5/1/91	AP,SOR BURIED OIL
		D	MAYSAP	5/24/91	SOR,ST,CV BURIED HOR,MOR,LOR
		B (STREAM)	SVPSR	8/1/91	AP,SOR BURIED HOR,MOR,LOR
NAKED ISLAND, CABIN BAY	PROBABLE BREEDING & FEEDING AREA	NA024 A&F	MAYSAP	5/1/91	AP,TB
N/T ORDERER SIGNED BY THE FOSC ALL CLEANUP ACTIVITIES CEASED AS OF 5/25/91					
		A	SVPSR	5/14/91	MS,CV,CT
NAKED ISLAND, OUTSIDE BAY	PROBABLE BREEDING & FEEDING AREA	NA026B	THIS SEGMENT WAS EXCLUDED IN 1991 CLEANUP PLANS		
FOUL PASSAGE	MOLTING & FEEDING AREA, OFFSHORE ROCKS	DI059	THIS SEGMENT WAS EXCLUDED IN 1991 CLEANUP PLANS		
WHALE BAY, SOUTH ARM	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	WH502	MAYSAP	5/2/91	CV,CT
A N/T ORDER WAS SIGNED BY THE FOSC AND ALL TREATMENT CEASED 6/10/91					
WHALE BAY, MAINLAND	MOLTING, FEEDING & OFFSHORE ROCKS STREAM HABITAT	WH003	SSAT	4/1/91	CT,AP,ST,FM BURIED OR & OF OILING
			ASAP	8/5/91	SOR,CT BURIED OIL
WHALE BAY, WEST ARM	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE	WH504	DEC	10/12/91	NO OIL OBSERVED
PADDY BAY	BREEDING & FEEDING AREA STREAM NET SITE	PA001	THIS SEGMENT WAS EXCLUDED FOR TREATMENT IN 1991		
ESHAMY BAY, SOUTH ARM	MOLTING & FEEDING AREA	EB009	MAYSAP	4/29/91	TAR BALLS, VERY LIGHT
	A N/T ORDER WAS SIGNED BY THE FOSC & CLEANUP ACTIVITES CEASED ON 5/15/91				
AGULIAK ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	AG001 A&B	SSAT	6/8/91	AP,MSOR BURIED OP OIL
	A N/T ORDER WAS SIGNED BY THE FOSC AND CLEANUP ACTIVITIES CEASED ON 7/8/91				

LOCATION	HARLEQUIN DUCK HABITAT TYPE	SEGMENT	TYPE SURVEY	DATE	OIL TYPE
AGULIAK ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS MUSSEL BED AREA	AG009 A	MAYSAP	5/4/91	LSOR,OP BURIED OP, MOR
			2 HARLEQUIN DUCKS OBSERVED DURING SURVEY		
MUMMY ISLAND	FEEDING & MOLTING AREA, OFFSHORE ROCKS	MU900	MAYSAP	5/19/91	SOR BURIED OP/MOR
A N/T ORDER WAS ISSUED BY THE FOSC AND CLEANUP ACTIVITIES CEASED ON 6/8/91					
SQUIRREL ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	SL001 ABCD&E	MAYSAP	5/4/91	TB,SOR,CT,ST
A N/T ORDER WAS ISSUED BY THE FOSC AND ALL CLEANUP ACTIVITIES CEASED 5/20/91					
MALLARD BAY, DRIER BAY	PROBABLE BREEDING & FEEDING AREA STREAM NET SITE		THIS SEGMENT WAS EXCLUDED IN THE 1991 CLEANUP PLAN		
SOUTH TIP, PERRY ISLAND	MOLTING & FEEDING AREA, OFFSHORE ROCKS	PR003 ACD	MAYSAP	5/4/91	AP,MS,SOR,CT
			4 HARLEQUIN DUCKS WERE OBSERVED DURING MAYSAP SURVEY		
PERRY ISLAND SOUTH SHORE	MOLTING & FEEDING AREA, OFFSHORE ROCKS	PR002	MAYSAP	4/26/91	SOR,CT BURIED HOR,MOR,TR
			DEC	6/20/91	ST,OF BURIED OR OILING
			ASAP	8/21/91	CT,ST BURIED OR,OP,OF OILING

MS Oil Mousse (weathered thick brown tar)
OP Pooled Oil (surface or buried mobile oil)
ST Oil Stain
N/T No Treatment
AP Asphalt (weathered mousse or tar that is lying on the substrate surface cementing it together)
TB Tarballs (small localized areas of mousse)
CV Tar Cover (boulders or bedrock covered with tar)
CT Tar Coating (boulders or bedrock coated with tar)
OF Oil Film
HOR Heavy Oil Residue (buried oil that has heavily permeated gravel)
MOR Moderate Oil Residue (buried oil that has moderately permeated gravel)
LOR Light Oil Residue (buried oil that has lightly permeated gravel)
SOR Surface Oil Residue (any oil that is on surface of a beach substrate, similar to asphalt)
HSOR Heavy Surface Oil Residue
MSOR Moderate Surface Oil Residue
LSOR Light Surface Oil Residue

DESCRIPTIONS IN ( ) ARE AN UNOFFICIAL ATTEMPT TO CLARIFY OILING DEFINITIONS.

MAYSAP May Shoreline Assessment Program (1991)

SVPSR State Vessels Progress Status Report (1991)

DEC Department of Environmental Conservation's shoreline oiling evaluation survey.

FOSC Federal On Scene Coordinator (in charge of cleanup) Usually the USCG Admiral.

TAG Technical Advisory Group (consisting of USCG FOSC, DEC, EXXON, NOAA)

* This table incorporates locations of Harlequin Ducks observed and documented during the 1991 Spring Shoreline Assessment Program.

Note: Definitions and description of oiling change with the individual and agency making the observations. Most observations are general.

WP51/TOM/91FORM.TWC

TABLE 7d

HARLEQUIN DUCK STREAM OILING INFO SELECTED COLUMNS FROM DETAILED REPORT

LOCATION	SEGMENT STREAM#	DATE	COMMENTS
BAINBRIDGE ISLAND	BA006 A 2264016269	07/23/89	NO OIL OBSERVED IN SEGMENT.
BAINBRIDGE ISLAND	BA006 A 2264016269	08/10/89	GENERAL - 1% LIGHT & 2% VERY LIGHT SURFACE OIL FOR SEGMENT OCCASIONAL TAR PATTIES, SUBSURFACE OIL. (GENERAL FOR ENTIRE SEGMENT).
BAINBRIDGE ISLAND	BA006 A 2264016279	07/23/89	NO OIL OBSERVED IN SEGMENT.
BAINBRIDGE ISLAND	BA006 A 2264016279	08/10/89	GENERAL - 1% LIGHT & 2% VERY LIGHT SURFACE OIL FOR SEGMENT OCCASIONAL TAR PATTIES, SUBSURFACE OIL. (GENERAL FOR ENTIRE SEGMENT).
CHENEGA ISLAND, NORTH	CH001 2262016280	06/29/89	NORTH BANK: 12' WIDE OIL BAND ALONG STREAM BANK, WITH SOME PENETRATION, WIDENING TO 30-40' FARTHER NORTH ALONG BEACH. MOUSSE/SAND TARMATS DEPOSITED IN UITZ ADJACENT TO BAND. THE 30-40' WIDE OIL BAND BEGINS 50' NORTH OF STREAM. SOUTH BANK: SOUTH OF STREAM, THE BEACH APPEARS UNOILED BUT CLEAN SHALE IS BEING DEPOSITED OVER A RELATIVELY NARROW BAND OF MOUSSE WHICH APPEARS TO END 25' AWAY FROM STREAM. SKETCH. (VALDEZ OFFICE FIELD LOG ENTRY ON PAGES 60-61).
CHENEGA ISLAND, NORTH	CH001 2262016280	06/29/89	MAPS. SOUTH OF STREAM, NARROW BAND OF MOUSSE ENDS APPROXIMATELY 25FT FROM STREAM. ON THE NORTH SIDE OF THE STREAM TIP A 30-40FT WIDE BAND STOPS APPROXIMATELY 50FT NORTH OF STREAM. MOUSSE, SAND/TARMATS HAVE BEEN DEPOSITED IN UITZ. OIL IS PRESENT ON NORTH BANK IN 12FT WIDE AREA.
CHENEGA ISLAND, NORTH	CH001 2262016280	07/02/89	HEAVY OIL NORTH OF STREAM, MOD IMMEDIATELY ADJACENT STREAM BEACH ON SOUTH SIDE OF STREAM. LIGHT 1-2M BAND, BEACH ON TIP NORTH SIDE OF STREAM MODERATE 5-6M WIDE BAND. SKETCH.

CHENEGA ISLAND, NORTH	CH001 2262016280	07/26/89	BEACH HEAVILY OILED UP TO STREAM BANK.
CHENEGA ISLAND, NORTH	CH001 2262016280	07/26/89	BEACH HEAVILY OILED, BUT STREAM AND ADJACENT SUBSTRATE ONLY MOD TO LIGHTLY OILED.
CHENEGA ISLAND, NORTH	CH001 2262016280	07/28/89	AT MOUTH - THICK, NARROW BAND OF OIL/MOUSSE JUST NORTH OF STREAM MOUTH.
CHENEGA ISLAND, NORTH	CH001 2262016280	08/13/89	MODERATELY OILED. OILED TAR MOUSSE BAND, MAP 19.
CHENEGA ISLAND, NORTH	CH001 2262016280	10/01/89	(NOTE: DAY OF DATE NOT AVAILABLE). WEST OF STREAM: OIL ON ROCKS IN A 30 FT WIDE ZONE. AREA ON EAST HAS DEEPER PENETRATION IN VICINITY OF ADEC STATION. A 20 FT WIDE BAND OF MOUSSE AND OILY DEBRIS IS 30 FT NORTH OF STREAM. OILED ZONE VARIES 3-75 FT WIDE WITH INTERMITTENT COVERAGE AND PENETRATION.
CHENEGA ISLAND, NORTH	CH001 2262016280	10/14/89	HIGH EXPOSURE. HEAVY TO MODERATE OILING.
CHENEGA ISLAND, NORTH	CH001 2262016280	12/09/89	MAPS. 1 X 30M OIL BAND ON SOUTH BANK - MITZ >75% COVERAGE, 13CM PENETRATION. 8 X 50M OIL BAND ON NORTH BANK <1%. FILM ON SURFACE.
CHENEGA ISLAND, NORTH	CH001 2262016280	04/13/90	SMALL BAND OF ASPHALT ON RIGHT SIDE OF STREAM, 2 FEET WIDE, 30 FEET LONG. OIL ON STREAM BANK.
CHENEGA ISLAND, NORTH	CH001 2262016280	04/25/90	SMALL AREA OF TARMAT IS ONLY SIGN THAT THIS BEACH HAS BEEN OILED. OIL ON STREAM BANK.

CHENEGA ISLAND, NORTH	CH001 2262016280		TRANSECT NORTH OF STREAM. AVERAGE OIL DEPTH = 5CM, AVERAGE THICKNESS .05CM. BAND WIDTH 25M ON 04/08/89. SUMMARY: JULY 89: BEACH WITH REALTIVELY NARROW BAND OF OILING. 04/08/89: 6-9M WIDE BAND WITH 60-95% COVERAGE. 05/22/89: 25M WIDE OILED ZONE WITH 5-98% COVERAGE.
CHENEGA ISLAND, NORTH	CH002 B 2262016180	05/25/89	AERIAL PHOTO OF OIL BAND BY STREAM.
CHENEGA ISLAND, NORTH	CH002 B 2262016180	06/02/89	HEAVY OIL BAND UP TO 20M WIDE ON WEST SIDE OF STREAM. 25CM PENETRATION. EAST SIDE OF STREAM HAS OIL BAND 1 TO 10M WIDE. GOOD SKETCH.
CHENEGA ISLAND, NORTH	CH002 B 2262016180	06/29/89	WEST BANK: OIL BAND VARIES FROM 3-12' WIDE, INTERMITTENT, THEN TO 75' WIDE, INTERMITTENT COVERAGE WITH PENETRATION. OILY DEAD FUCUS MATS ADJACENT TO CHANNEL. EAST BANK: 10-30' WIDE CLEAN AREA ALONG STREAM CHANNEL, WITH <10-20' WIDE OIL/MOUSSE BAND ADJACENT TO IT. OIL COMES TO WITHIN 10 FT OF STREAM CHANNEL IN AN OILED CHANNEL BANK. DEEPER PENETRATION ON EAST SIDE. (IN VALDEZ OFFICE FIELD LOG ON PAGES 59-60).
CHENEGA ISLAND, NORTH	CH002 B 2262016180	07/05/89	COBBLE & GRAVEL BEACH CONTAINS OIL AND SOME MOUSSE, DEPOSITS 12" WIDE, OIL COVERAGE 80-90%. LOOKS LIKE REOILING.
CHENEGA ISLAND, NORTH	CH002 B 2262016180	07/05/89	AREA TO WEST HAS A WIDE BAND OF OILED COBBLE (50-75FT WIDE) WITH MOUSSE PATTIES IN PATCHES. AREA RE-OILED: 2X40' AREA OF OILED SEDIMENTS ALONG WESTERN STREAM BANK (PER SKETCH), MOUSSE, OILED DEBRIS AND SEDIMENTS SHOWN ON EAST SIDE.
CHENEGA ISLAND, NORTH	CH002 B 2262016180	07/09/89	MOD-HEAVY 12FT WIDE.
CHENEGA ISLAND, NORTH	CH002 B 2262016180	07/11/89	BAND OF OIL ON WEST BANK EXTENDS AROUND EDGE OF COVE.

CHENEGA ISLAND, NORTH	CH002 2262016180	B	07/11/89	POST TREATMENT. OIL IN STREAM CHANNEL SUBSTRATE, WEST BANK STILL LOTS OF OIL - 8" OR MORE. EAST BANK - OILED SEDIMENTS, HALF REMOVED.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	07/26/89	STREAM ITSELF APPEARED TO BE OIL-FREE, HOWEVER, NORTH BANK HAD A HEAVY BAND OF MOUSSE - ABOUT 25-30' WIDE X 150YDS LONG.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	07/26/89	ENTIRE AREA MODERATELY TO HEAVILY OILED.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	07/28/89	OILED SEDIMENTS HAD BEEN REMOVED FROM 40FT LONG X 2-3FT WIDE BAND ON EAST BANK. WEST BANK AND STREAM DELTA HAD WIDE BAND OF OIL. PENETRATION TO >8". (IT IS) LIKELY THAT OIL HAD ENTERED STREAM CHANNEL SUBSTRATE DUE TO PENETRATION. SOME MANUAL (TREATMENT) HAD BEEN DONE.
CHENEGA ISLAND, NORTH TIP	CH002 2262016180	B	07/31/89	MOUTH OF STREAM HEAVILY OILED.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	08/05/89	DETAILED SUMMARY OF OIL PENETRATION ON STREAM SITE.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	08/13/89	HEAVILY OILED. SAMPLE 89RLG009V, MAP #18.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	09/07/89	APPEARS MODERATELY OILED. POST TREATMENT ASSESSMENT.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	10/14/89	HEAVY OILING. RICK GUSTIN HAS GOOD BASIC INFO FROM JULY SURVEY.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	11/02/89	HEAVY BAND IN MID TO UITZ ON LEFT BANK. MODERATE TO HEAVY ON RIGHT BANK. OIL INTO STREAM BED. 11 X 45M OIL BAND ON LEFT BANK. 7.6 X 67M OIL BAND ON RIGHT BANK.
CHENEGA ISLAND, NORTH	CH002 2262016180	B	04/13/90	HEAVILY OILED. SEE WINTER PROJECT MAP. OIL ON STREAM BANKS.

CHENEGA ISLAND, NORTH	CH002	B	04/26/90	WEST SIDE OF STREAM: 2x30M BAND AP IN UITZ AND 20X30M AREA OF SPORADIC TARMAT LYING ADJACENT TO IT IN MITZ 6CM
	2262016180			THICK. EAST BANK UPSTREAM: 6X4M BROKEN AP 3CM THICK IN GRASSY AREA AND A 2X60M SPORADIC AP IN UITZ 6CM THICK. AP BAND PARTIALLY BURIED ON WEST SIDE.
CHENEGA ISLAND, NORTH	CH002	B	08/06/90	WEST SIDE OF STREAM: 2 BANDS OF OIL: A 44M LONG X 1M WIDE BAND OF PATCHY TARMAT/OR SEDIMENTS IN THE UITZ - BELOW
	2262016180			THE SWASH ZONE. A 32M LONG X 3-5M WIDE BAND IN THE LUITZ OF BROKEN TARMAT/OR SEDIMENTS. EAST SIDE: SPORADIC PATCHES TARMAT/OP/OR SEDIMENTS 4M FROM THE STREAM CHANNEL IN THE MITZ. REASSESS IN SPRING.
CHENEGA ISLAND, NORTH	CH002	B	05/05/91	PER OG SKETCH. EAST BANK: AT MOUTH, 2X20M 1% AP BAND. FURTHER UPSTREAM SMALL PATCHES OF .2X2M 15% CV, 1X3M 10% SOR
	2262016180			AND .2X5M 1% HSOR ADJACENT TO STREAM BANK. WEST BANK: HEAVIEST OILING IN VICINITY OF STREAM IS 8X22M BAND WITH 2% AP AND 5% HSOR. REST IS SMALL PATCHES OF CV AND AP WELL REMOVED FROM STREAM. MAD FORM LISTS 20CM PENETRATION AND MOR FOR THE OIL BAND.
CHENEGA ISLAND, NORTH	CH002	B	06/13/91	WORK ORDER WAS FOLLOWED. SUGGEST THAT ADF&G REASSESS THIS SITE AT A LATER DATE FOR RE-TILLING TREATMENT. "MOST ALL
	2262016180			OF THE OILING WAS TILLED WITH VERY LITTLE REMOVAL. IT WAS 80% LOR AND 20% MOR".
CHENEGA ISLAND, NORTH	CH002	B	08/22/91	HEAVIEST REMAINING OIL IS A 1 X 3 METER PATCH OF HOR/OP LOCATED IN AREA B ON THE WEST SIDE OF THE STREAM. COVERED
	2262016180			BY CLEAN SEDIMENT. IT MISSED TREATMENT IN 1991. DUE TO ITS DISTANCE FROM THE STREAM, IT DOES NOT APPEAR TO POSE A THREAT TO THE STREAM. OTHER AREAS OF SURFACE OIL ARE LIGHT. NO REASSESSMENT NECESSARY IN 1992. LOTS OF PINKS IN STREAM AND BAY.
CHENEGA ISLAND, PRESTON COVE	CH010		08/01/89	RAT VISIT TO ASSESS TREATMENT. HEAVY TO MOD OIL.
CHENEGA ISLAND, KAKE COVE	CH017	A	07/11/89	TRACE OF RANDOM TAR DROPS ON COBBLES & PEBBLE IN MID ITZ. LIGHT SHEEN OBSERVED ON SMALL POOLS IN TIDAL STREAM
	2262016262			CHANNELS. (SKETCH)

CHENEGA ISLAND, KAKE COVE	CH017 2262016262	A	08/08/89	KAKE COVE AREA WAS OILED VERY LIGHTLY. STREAM ON WESTERN EDGE HAD 300 PINKS AT MOUTH.
CHENEGA ISLAND, KAKE KOVE	CH017 2262016262	A	08/13/89	89RLG008V, #16260 MAP #20, APPEARED LITTLE TO NO OIL IN AREA AT STREAM MOUTH.
CHENEGA ISLAND,	CH017 2262016270	A	07/11/89	"RANDOM DROPS ON BOULDERS" FROM SKETCH.
CHENEGA ISLAND, KAKE COVE	CH017 2262016270	A	07/26/89	VERY LIGHT OILING.
CHENEGA ISLAND, KAKE COVE	CH017 2262016270	A	08/08/89	KAKE COVE AREA WAS OILED VERY LIGHTLY. 1000 PINKS AT MOUTH. WALKED STREAM UP TO SMALL LAKE.
CHENEGA ISLAND, KAKE COVE	CH017 2262016270	A	08/25/89	LIGHT OILING IN COVE, NONE IN STREAM, TAR MOUSSE BAND IN UITZ.
CHENEGA ISLAND, KAKE COVE	CH017 2262016270	A	09/11/89	NO OIL SIGHTED.
CHENEGA ISLAND, KAKE COVE	CH017 2262016270	A	01/05/90	"NO OILING VISIBLE"
CHENEGA ISLAND, KAKE COVE	CH017 CANNOT ID	A	08/13/89	KAKE COVE: 2 VISITS IN 1 DAY TO SAMPLE.
CRAFTON ISLAND	CR004		07/30/89	BEACH HEAVILY TO MODERATELY OILED. TREATMENT OCCURRING, VISIT BY RAT.
MAINLAND, ESHAMY BAY, NORTH OF MOUTH, LOOMIS CREEK	EB001 2253015060	A	05/22/89	MODERATELY OILED, SKETCH MUSSEL BED AT STREAM MOUTH HAS HIGH CONCENTRATION OF OIL COATING, HEAVILY OILED FUCUS NORTH SIDE OF STREAM ON OUTCROP. (WAS LISTED AS EB002).
MAINLAND, ESHAMY BAY, NORTH OF MOUTH, LOOMIS CREEK	EB001 2253015060	A	06/06/89	REPORTED OILED MUSSEL BED NOT CONFIRMED (TIDE TOO HIGH).

MAINLAND, ESHAMY BAY, NORTH OF MOUTH, LOOMIS CREEK	EB001 2253015060	A	06/06/89	NO HEAVY OILING OBSERVED.
MAINLAND, ESHAMY BAY, NORTH OF MOUTH, LOOMIS CREEK	EB001 2253015060	A	07/31/89	ISOLATED PATCHES OF OIL FROM LIGHT TO MODERATE, SOME MOUSSE OIL LANDED NEAR LOW TIDE. (WAS LISTED AS EB002).
MAINLAND, ESHAMY BAY, NORTH OF MOUTH, LOOMIS CREEK	EB001 2253015060	A	08/21/89	MAP #2, 89RLG078V, NO OIL SAMPLE FOUND.
MAINLAND, ESHAMY BAY, NORTH OF MOUTH, LOOMIS CREEK	EB001 2253015060	A	01/05/90	"NO OILING VISIBLE" (SEGMENT IN LOG IS EB002).
MAINLAND, ESHAMY BAY, BELOW GUNBOAT LAKES	EB007 2253015070	A	05/30/89	NO SPECIFICS ON STREAM AREA, NO SKETCH WITH PACKET. GENERAL = VERY LIGHT OILING, RARE SMALL TAR BALLS. >1%.
MAINLAND, ESHAMY BAY, BELOW GUNBOAT LAKES	EB007 2253015070	A	08/04/89	2% MED SURFACE OIL FOR SEGMENT 2% LIGHT SURFACE OIL.
MAINLAND, ESHAMY BAY, BELOW GUNBOAT LAKES	EB007 2253015070	A	09/06/89	BOOMED IN FRONT OF CREEK. VERY LITTLE OIL IN ESHAMY; A FEW LIGHTLY OILED SPOTS ON THE SOUTH SIDE NEAR THE MOUTH OF THE BAY, ANADROMOUS STREAM LOOKED GOOD.
MAINLAND, ESHAMY BAY, BELOW GUNBOAT LAKES	EB007 2253015070	A	09/11/89	VERY LIGHT TO NO OIL SHOWN FOR SEGMENT IN GENERAL. NO DESIGNATION MADE FOR SALMON STREAM AREA - PERHAPS BECAUSE A BOOM ACROSS THE COVE KEPT THEM OUT. SURVEY BY SKIFF AND FOOT.
MAINLAND, ESHAMY BAY, SOUTHEAST	EB009 2253015160	A	08/21/89	SORBENT BOOM BLOCKING FISH PASSAGE.
MAINLAND, ESHAMY BAY, SOUTHEAST	EB009 2253015160	A	08/21/89	RAT MOVED BOOM AT EB THAT WAS BLOCKING FISH PASSAGE.

MAINLAND, ESHAMY BAY, SOUTHEAST	EB009 A 2253015160		RARE TAR BALLS (FOR SEGMENT). HAND CLEAN.
MAINLAND, ESHAMY BAY	EB009 2253015140	06/06/89	NO OILING EVIDENT EXCEPT OILED FUCUS IN STORM BERM AND TAR BALLS. NO VISIBLE OILING ADJACENT TO STREAM. OILED FUCUS IN HIGH TIDE STORM BERM WEST OF STREAM, AND VERY SPOTTY TAR BALLS. NO SHEEN IN CHANNEL WITH AGITIATION. AREA BELKOW BANK HAS OILY FUCUS AND DEBRIS, INCLUDING ONE DEAD HEAVILY OILED BIRD. PER PHOTO: OIL APPEARS TO BE WITHIN 50M OF STREAM.
MAINLAND, ESHAMY BAY	EB009	05/30/89	NO OIL OBSERVED. SKETCH NOT WITH PACKET.
MAINLAND, ESHAMY BAY, EB009, EB012, EB013	EB009 A	07/29/89	RAT VISIT TO SITES TO PREASSESS FOR CLEANUP.
ELEANOR ISLAND, UPPER PASSAGE	EL015 A 2261016906	04/15/89	MOD TO LIGHT, PATCHY OIL BAND 30% COVERAGE, 1CM PENETRATION 0.5CM THICKNESS, NO SKETCH WITH PACKAGE.
ELEANOR ISLAND, UPPER PASSAGE	EL015 A 2261016906	09/14/89	SKETCH HAS LABEL "VERY LIGHT" OIL BAND ON BOTH SIDES OF STREAM IN UITZ, YET QUALIFIES AS 'LIGHT' DUE TO THE AREA OF OILING SHOWN.
ELEANOR ISLAND, UPPER PASSAGE	EL015 A 2261016906	09/15/89	REFERRED TO AS "EL010". A "VERY LIGHT" DESIGNATION WAS GIVEN TO THE STREAM AREA.
ELEANOR ISLAND, UPPER PASSAGE	EL015 A 2261016906	11/06/89	REFERRED TO AS "EL010". DISCUSSES TREATMENT TO SEGMENT. GUNDLACH STUDY SITE #7. NO SPECIFICS ON STREAM.
ELEANOR ISLAND, UPPER PASSAGE	EL015 A 2261016906	04/13/90	BANDS OF ASPHALT AND MOUSSE AT UPPER INTERTIDAL ON BOTH SIDES OF CREEK. PENETRATION 2". SHOVEL/STEAM.
ELEANOR ISLAND, UPPER PASSAGE	EL015 A 2261016906	04/23/90	OIL PRESENT INCLUDES A 100M X 1 M WIDE BAND OF INTERMITTENT TAR PATTIES RUNNING THE LENGTH OF THE UITZ ON NORTH SIDE OF STREAM. A 2M WIDE LIGHTLY OILED BAND IN M & UITZ ON SOUTH SIDE OF STREAM & OILED ORGANIC DEBRIS ON SOUTH SIDE IN SWASH ZONE, OILED LOG. OIL 1-2CM THICK.

ELEANOR ISLAND, UPPER PASSAGE	EL015 A 2261016906	06/21/91	LSOR IN CRUMBLE STAGE. AREA K BROKEN UP. AREA C BROKEN UP. AREA AROUND TOMBOLO NOT SURVEYED, FOUND TO HAVE LSOR ALSO BROKEN UP. NOT RECOMMENDED FOR FUTURE REASSESSMENT. REMAINING OIL IS CT AND ST ON SURFACE; LOR AND OF IN SUBSURFACE.
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	04/13/89	HEAVILY OILED. 40M WIDE OIL BAND WITH OVER 50% COVERAGE. TRANSECT CROSSES STREAM.
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	04/13/89	EARLY AERIAL PHOTO OF OILING. SHOWS WIDE OIL COVERAGE.
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	04/22/89	MODERATE OILING LISTED 3-10M WIDE BAND OVER 100% OF SEGMENT. LIGHT OILING ON MOST OF INNERMOST COVE, AREA. NO SKETCH WITH PACKET.
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	05/02/89	LIGHT TO MODERATELY OILED SHORELINE, 2 STREAMS APPEAR CLEAN. (SECOND STREAM IS UNCATALOGUED).
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	09/14/89	HEAVY OILING SHOWN ON SKETCH FOR STREAM AREA. 100% OIL COVERAGE.
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	09/14/89	MODERATELY OILED.
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	01/04/90	(FROM MAP) CT/ST APPROX. 50% COVERAGE IN UFTZ APPROX. 20M WIDE X 145M LONG THROUGH STREAM. EXTENDS HIGHER UP ALONG STREAM. APPROX. 60M ON EITHER SIDE OF STREAM. THE UPPER PORTION OF UITZ COVERED BY SNOW.
ELEANOR ISLAND, NORTHWEST BAY	EL052 B 2261016902	04/13/90	LARGE OILED SECTION SURROUNDING BOULDERS NEAR STREAM IN UPPER INTERTIDAL AND MID INTERTIDAL. SOMEWHAT COVERED A NEW ADVANCING STORM GENERATED GRAVEL BAR. GRAVEL AND LARGE BOULDERS COATED: 1- 2" DEEP IN SEDIMENTS. SHOVEL/STEAM. SCATTERED SPOTS OF OIL UPPER INTERTIDAL. OIL ON STREAM BANKS.

ELEANOR ISLAND, NORTHWEST BAY	EL052 2261016902	B	04/24/90	UPPER INTERTIDAL IS SPORADICALLY DOTTED WITH MOUSSE PATTIES, SOME OF WHICH PENETRATE 2-3 CM. NO OILED DEBRIS WAS NOTICED IN THE SUPRATIDAL OR ABOVE. THE SALMON STREAM EDGE AND BANK APPEARED UNOILED/NO SHEEN WAS KICKED UP IN STREAM SEDIMENTS EXCEPT A LIGHTLY SHEENED AREA IN THE LOWER SECTION OF THE MIDDLE ITZ. THE SINGLE LARGEST AREA OF OILING IS IN THE MIDDLE INTERTIDAL ZONE, NEAR SEVERAL LARGE BEDROCK BOULDERS. IT APPEARS A LARGE SEGMENT OF OIL WAS DEPOSITED HERE AND PENETRATED AT LEAST 4 CM, POSSIBLE DEEPER IN AREAS. THIS OIL APPEARS TO BE HIGHLY MOBILE AND IF DISTURBED PUTS OUT HEAVY SHEEN. ITS NEARNESS TO THE SALMON SPAWNING GRAVELS IS CAUSE FOR CONCERN. NO OIL ON STREAM BANKS.
ELEANOR ISLAND, NORTHWEST BAY	EL052 2261016902	B	08/06/90	WEST SIDE OF STREAM: A 11M LONG X 6M WIDE PATCH OF HEAVY TO MOD 'OR' SEDIMENTS IN MITZ - 1 M WEST OF STREAM CHANNEL. 62M WEST OF CHANNEL: A 7M WIDE X 10M LONG AREA OF 'OR' SEDIMENT IN MITZ IN STREAM SEEP - GIVES OFF RAINBOW SHEEN WHEN DISTURBED. EAST SIDE: A 3M LONG X 2M WIDE PATCH OF 'OR' SEDIMENT - 17.5M FROM STREAM CHANNEL MITZ - SEVERAL SMALLER PATCHES SAME AREA. MITZ COULD CONTAIN A LENSE OF OIL, RUNNING THE LENGTH. REASSESS NEXT SPRING. PAIR OF HERON APPEAR TO BE NESTING NEARBY. SEVERAL PINKS SEEN JUMPING FAR OFFSHORE. NO OIL SIGHTED ON STREAM BANKS.
ELEANOR ISLAND, NORTHWEST BAY	EL052 2261016902	B	04/27/91	RECOMMEND MANUAL TILLING OF BURIED 'HOR' IN SEEP ALONG WITH MOPPING OIL WITH POMPOMS. RETURN TO THIS SEGMENT 4/28/91 TO FINISH OG MAPPING. VERY MINUTE AMOUNTS OF SURFACE OIL WERE VISIBLE. RETURN 4/30/91 TUESDAY.
ELEANOR ISLAND, NORTHWEST BAY	EL052 2261016902	B	05/28/91	THE WORK ORDER WAS SATISFACTORILY COMPLETED, HOWEVER, WE WERE UNABLE TO LOCATE 'HOR' SEDIMENT NEAR PIT 5. AREA OF PITS 8 & 9 RECEIVED A VERY THOROUGH TILLING WITH A NATURAL WATER FLUSH ASSISTING THE PROCESS. PIT 4 WAS TILLED WITH RAINBOW & SILVER SHEEN RELEASED. AREA A WAS RAKED, BEING SO WEATHERED THAT IT DID NOT WARRANT REMOVAL. NO OIL RECOVERY WAS ATTEMPTED. STREAM IS IN GOOD SHAPE NOW, BUT WARRANTS A FINAL ASSESSMENT BY ADF&G IN AUGUST TO DETERMINE REMAINING OIL & APPLY ANY FINAL TREATMENT.

EVANS ISLAND, IKTUA BAY	EV007 A 2264016550	06/16/89	GENERAL OILING LIGHT FOR SEGMENT, NO OIL OBSERVED BY STREAM. A PAIR OF HARLEQUIN DUCKS SIGHTED.
EVANS ISLAND, IKTUA BAY	EV007 A 2264016550	07/23/89	NO OIL OBSERVED.
EVANS ISLAND, IKTUA BAY	EV007 A 2264016550	02/19/90	INDIRECT OBSERVATION; MENTIONS THAT THIS STREAM WAS TO BE OUR UNOILED CONTROL FOR MFO SAMPLES.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016543	06/16/89	MOUSSE BAND 0.5M WIDE & PATCHES AT HIGH ITZ-SKETCH. SEMI-CONTINUOUS BAND OF MOUSSE/DEBRIS AT MID-TIDE BETWEEN STREAMS.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016543	07/22/89	FLOCK OF HARLEQUIN DUCKS, LITTLE OIL SEEN - RAT VISIT.
EVANS ISLAND, IKTUAL BAY	EV008 B 2264016543	07/23/89	THE STREAM BANKS APPEAR UNOILED, SHORELINE BETWEEN (STREAMS), ESPECIALLY THE FAR WESTERN ONE (16543), CONTAINED SCATTERED MOUSSE PATCHES WHICH NEED TREATING.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016543	08/16/89	SEMI-CONTINUOUS BAND (.5M WIDE) OF MOUSSE/DEBRIS AT MID-TIDE. OVERALL OILING FOR SEGMENT IS LIGHT TO NO OIL.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016543	08/31/89	NO OIL SAMPLE FOUND, MAP #9 #16590.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016545	06/16/89	MOUSSE BAND 0.5M WIDE & PATCHES AT HIGH ITZ-SKETCH. SEMI-CONTINUOUS BAND OF MOUSSE/DEBRIS AT MID-TIDE BETWEEN STREAMS.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016545	07/22/89	LITTLE OIL SEEN. FLOCK OF HARLEQUINS OBSERVED.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016545	07/22/89	LIGHT OIL AT HEAD OF BAY.

EVANS ISLAND, IKTUA BAY	EV008 B 2264016545	07/23/89	THE STREAM BANKS APPEAR UNOILED, SHORELINE BETWEEN (STREAMS), ESPECIALLY THE FAR WESTERN ONE (16543), CONTAINED SCATTERED MOUSSE PATCHES WHICH NEED TREATING.
EVANS ISLAND, IKTUA BAY	EV008 B 2264016545	10/13/89	NO STREAM 2264016546 ON MAP. 2264016545 SHOWS VERY LIGHT OIL BOTH SIDES OF STREAM.
EVANS ISLAND, GUGUAK COVE	EV070 G 2264016509	07/18/89	07/18/89 AND 07/19/89 LIGHT OILING RECORDED NEAR STREAM VIA SKETCH. SEGMENT CONTAINS HEAVY TO LIGHT OIL.
EVANS ISLAND, GUGUAK COVE	EV070 G 2264016509	08/19/89	STREAM INSIDE THIS LAGOON HAS PINKS. THICK OIL SHEEN AND FREE FLOATING MOUSSE IN THE STREAM ENTRANCE.
EVANS ISLAND, GUGUAK COVE	EV070 G 2264016509	09/18/89	3MM MOUSSE AND OIL SHEEN FLOATING OVER THIS STREAM AREA.
EVANS ISLAND, GUGUAK COVE	EV070 G 2264016509	04/11/90	SMALL PATCH OF TAR/ASPHALT RIGHT SIDE OF STREAM FACING DOWN STREAM. EASY SHOVEL AND BAG REMOVAL. OIL ON STREAM BANKS.
EVANS ISLAND, GUGUAK COVE	EV070 G 2264016509	04/21/90	VERY SPORADIC STAIN, ASPHALT, TAR, AND BURIED MOUSSE. OIL QUANTITY AND DISTRIBUTION RELATIVE TO STREAM, DO NOT PLACE SALMON OR OTHER ORGANISMS AT RISK. NO TREATMENT IS RECOMMENDED. NO OIL ON STREAM BANKS, BUT WITHIN ONE MILE OF STREAM.
EVANS ISLAND, GUGUAK BAY,	EV070 H 2264016498	09/09/89	SITE Y, ON EVANS, NO VISIBLE OIL 89RLG186V.
MAINLAND, EWAN BAY, HEAD OF LAGOON	EW001 2262016030	07/28/89	LIGHT OIL PRESENT IN SEGMENT, NO SKETCH, NO SPECIFICS ON STREAMS.
MAINLAND, EWAN BAY, WEST SIDE	EW001 2262016036	07/28/89	LIGHT OIL PRESENT IN SEGMENT, NO SKETCH, NO SPECIFICS ON STREAMS.

GREEN ISLAND, GIBBON GIBBON ANCHORAGE	GR103 A 2272017880	05/16/89	MODERATE OILING, 10-25M WIDE CONTINUOUS OIL BAND OVER 80% OF SEGMENT, 12CM THICK.
GREEN ISLAND, GIBBON GIBBON ANCORAGE	GR103 A 2272017880	06/29/89	10FT X 25FT OIL PATCH IN STREAM DELTA, 20FT X 30FT PATCH WEST SIDE OF STREAM, 30FT WIDE OIL BAND ON EAST SIDE OF STREAM. POOLED OIL.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	07/08/89	WEST BANK: MODERATE, 35' X 15' X 10CM. EAST BANK: HEAVY.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	07/10/89	25' X 10' OILED AREA IN STREAM DELTA, 30' X 20' OILED AREA ON WEST BANK. 30' WIDE OILED BAND ON EAST SIDE OF STREAM.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	07/10/89	POST ASSESSMENT OF TREATMENT. HEAVY PATCH OF OIL 50' X 250' MITZ IN UPENDED BEDROCK ON NORTH SIDE OF STREAM.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	07/11/89	WAS REOILED; ABOUT 9.5 MILE BAND RANGING FROM 10' TO +50' WIDE; 20' X 8' OIL PATCH.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	07/11/89	25' X 10', STILL 2+" OF PENETRATION.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	07/28/89	30FT WIDE OILED ZONE, EAST SIDE OF STREAM. 20' X 30' AREA ON WEST BANK AND A 25' X 10' OILED AREA BETWEEN THE 2 CHANNELS. 30-40 BAGS REMOVED FROM THOSE 2 AREAS. 2+" PENETRATION. VERY DEEP OIL PENETRATION IN CREVICES OF SLATE SUBSTRATE, EAST SIDE OF STREAM.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	08/08/89	THE STREAM APPEARED TO HAVE FLUSHED MOST OF THE VISIBLE OIL FROM THE STREAM BED, IN CONTRAST TO THE HEAVILY OILED BEACHES ON EITHER SIDE OF THE STREAM. (INFO ALSO IN RAT DAILY LOG ON DISKETTE).
GREEN ISLAND, GIBBON ANCHORAGE	GR103 A 2272017880	08/08/89	OILED ON NORTH SIDE OF STREAM. TARRY COATING ON THE ROCKS 2-3MM THICK. (STREAM) HAD OIL ADJACENT TO IT IN A LARGE COBBLE/BOULDER/FRACTURED SHALE SETTING.

GREEN ISLAND, GIBBON ANCHORAGE	GR103 2272017880	A	04/12/90	THIS IS THE NE TIP OF GREEN ISLAND WHICH WAS LITERALLY HOSED DOWN WITH LIQUID INIPOL ON AUGUST 8, 1989, AGAINST EPA PROTOCOL. IT WAS HEAVILY OILED AND EXPOSED TO ALL WINTERS STORMS. HIGH EXPOSURE TO NEW NW SHEENS AND OILED DEBRIS. STILL HEAVY TO MODERATE OIL IN THE CREEK AND ON BANKS, ESPECIALLY NORTH AND EAST OF CREEK. THICK TAR AND AP MUCH LARGER ROCK. OIL SEEMS WORSE IN UITZ EXTENDING DOWN INTO UPPER HALF OF MITZ. SHEENS VISIBLE IN POOLS OF WATER.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 2272017880	A	04/23/90	TARMAT PRESENT ON WEST SIDE STREAM BANK 10M X 4M X 10CM. TAR PATTIES INTERSPERSED IN SHALE BEDROCK ON EAST BANK OF STREAM. OIL COAT & STAIN ON SHALE BEDROCK IN MID & UPPER ITZ. OILED GRASS & SCATTERED TARBALLS IN UIT & SWASH ZONE. SOME SHEEN ON WATER WHEN AGITATED.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 2272017880	A	08/12/90	2000-3000 PINKS IN THE STREAM, 1000 OFF THE MOUTH, 2 PINK CARCASSES. SEVERAL LIVE COHO IN THE STREAM. NORTH SIDE OF STREAM - 3 INTERMITTENT BANDS OR/OP SEDIMENTS MOSTLY EMBEDDED IN UPTURNED SHALE BEDROCK; ONE JUST ABOVE FUCUS LINE, ONE IN UMITZ AND ONE IN UITZ JUST BELOW GRASS LINE. SOUTH SIDE - A 13M LONG X 5-7M WIDE AREA OF LIGHT TO MOD 'OR' SEDIMENTS ON THE STREAM BANK AND EXTENDING INTO THE STREAMBED - LOCATED 21M DOWN THE BEACH FROM GRASS LINE. ALSO A BROKEN BAND OF 'OR' SEDIMENTS AT THE GRASS LINE. REC - REASSESSMENT NEXT SPRING.
GREEN ISLAND, GIBBON ANCHORAGE	GR103 2272017880	A	04/26/91	EAGLE ON NEST. SITE #1 - 'H & MSOR' SEDIMENTS TRAPPED IN BEDROCK INTERSTICES, SHEEN RAINBOW & SILVER WHEN DISTURBED. SITE #2 - 'AP' 5 METERS FROM STREAM BANK. SITE #3 - 'AP, HSOR', ALONG GRASSLINE.
INGOT ISLAND, INGOT ISLAND,	IN024 IN024		05/12/89 09/13/89	COREXIT 7664 TEST SITE HEAVILY OILED AND BOUNDED BY FRESHWATER STREAM. "BEACH AT SOUTH END OF SEGMENT. 30FT BAND OF HEAVILY OILED SURFACE-SUBSURFACE IS AT LEAST 10", HITZ-MITZ." NORTHWEST
INGOT ISLAND, FOUL PASSAGE	IN031 2261016916	A	04/17/89	HEAVY OILING, CENTRAL PORTION OF SEGMENT (STREAM LOCATION) IS FINES WITH GRASS FLATS, THE OIL WIDTH IS 7-50M WITH 10CM PENETRATION.

INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	09/02/89	HEAVILY OILED EITHER SIDE OF STREAM.
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	09/12/89	HIGH TIDE. 10FT SOUTH OF STREAM, LONG PATCH MOD TO HEAVY OILED GRAVEL 2" DEEP. BEACH WAS MOST LIKELY TREATED UP TO STREAM BANK.
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	09/13/89	BEACH MED TO HEAVILY OILED. SOME OIL IN STREAM GRAVEL. EGGS IN OILED GRAVELS. SUBSURFACE OILING.
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	09/15/89	HEAVILY OILED 15M WIDE X 75M LONG OIL BAND BOTH SIDES OF STREAM PER SKETCH. OIL CONTINUES TO STREAM BANKS.
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	09/15/89	HEAVILY OILED 15M X 75M BAND.
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	09/22/89	SAMPLE WITH OIL AREA A, 89TWC257V.
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	09/22/89	STILL MOD TO HEAVILY OILED IN A WIDE BAND (30-40FT) AT U & MITZ HEAVY SUBSURFACE OILING NEAR PRESENT TIDE LINE.
INGOT ISLAND, FOUL PASS	IN031 A 2261016916	01/04/90	WAS CALLED "16106", "HEAVY TO MODERATE".
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	01/04/90	10 X 50M+ HEAVY OIL BAND ON LEFT SIDE OF STREAM. 20 X 30M HEAVY OIL BAND ON RIGHT SIDE OF STREAM. 80 % COVERAGE, 1-2" THICK. 18-25M WIDE BAND OF LIGHT OIL IN LITZ - 1-2" THICK.
INGOT ISLAND, FOUL PASSAGE	IN031 A 2261016916	04/13/90	HEAVILY OILED SEDIMENTS IN AND OUTSIDE OF STREAM. 3-4" PENETRATION DOWN TO GROUND WATER. OIL IN UPPER AND MID INTERTIDAL.

INGOT ISLAND, FOUL PASSAGE	IN031 2261016916	A	04/24/90	SOME VERY THIN TARMATS ALONG EAST BANK OF STREAM. SHEEN FROM GRAVELS IN STREAM ITSELF. UITZ: OILED GRAVELS AND ROCK PRIMARILY UNDER SIDE ON WEST SIDE STREAM. MITZ: TARMAT AND OIL ON STREAM BANKS. THIN CRUST OF OILED MAT AND VEGETATION ALONG EAST SIDE OF STREAM IN MIDDLE & UPPER ITZ. OILED GRAVELS AND SANDS ON WEST SIDE OF STREAM EDGE. AREAS WHERE SHEENS OCCUR IN THE STREAMBED. THIN PATCHES OF OILED MATS IN UPPER ITZ ON WEST SIDE OF STREAM. PATCHES OF TARMAT ON EAST SIDE OF THE STREAM IN MIDDLE ITZ AREA.
KNIGHT ISLAND, BAY OF ISLES OTTER BAY	KN018 2263016880	A	05/11/89	OILING GENERALLY LIGHT TO MOD WITH 2 HEAVILY OILED AREAS IN SEGMENT, BUT CANNOT IDENTIFY LOCATION, AS NO SCAT SKETCH IS AVAILABLE. WAS SEGMENT KN042. RECOMMEND HAND-WIPE.
KNIGHT ISLAND, BAY OF ISLES OTTER BAY	KN018 2263016880	A	09/20/89	NO OILING DETERMINATION MADE FOR STREAM AREA ON SKETCH. VERY LIGHT OILING RECORDED FOR ADJACENT AREA.
KNIGHT ISLAND, LOUIS BAY	KN103 2261016922	A	04/29/89	MODERATE OIL BAND DIRECTLY EAST OF STREAM (SKETCH) 3-10M BAND WIDTH - 55% SEGMENT. MODERATE OILING FOR STREAM AREA.
KNIGHT ISLAND, LOUIS BAY	KN103 2261016922	A	10/20/89	OIL BAND 56' X 5'. OIL DEPTH 2" 80% COVERAGE. MOUSSE, COATED, TARRY. OIL BAND 25-30%; MOUSSE, STAIN, COATED, TARRY.
KNIGHT ISLAND, LOUIS BAY	KN103 2261016922	A	10/20/89	MODERATE BAND OF OIL BECOMES HEAVY ALONG UITZ ON RIGHT SIDE OF STREAM. LEFT SIDE LIGHT TO MODERATE. RIGHT BANK 6.8M X 120M BAND. LEFT SIDE: 1.5 X 17.1M.
KNIGHT ISLAND, LOUIS BAY	KN103 2261016922	A	11/04/89	HEAVY COATING ON BEDROCK. MOUSSE COATED COBBLES. SOME IMPROVEMENT.
KNIGHT ISLAND, LOUIS BAY	KN103 2261016922	A	11/07/89	OILING EXTENT INFO, LIGHT TO HEAVY. NO OIL DETECTED IN STREAMBED GRAVEL.
KNIGHT ISLAND, LOUIS BAY	KN103 2261016922	A	04/12/90	HEAVY DEPOSITS OF ASPHALT/MOUSSE. PENETRATION 3-4". MOUSSE PATTIES, OILED SANDS. MAY TAKE DREDGING TO CLEAN UP THIS. OIL ON STREAM BANKS.

KNIGHT ISLAND, LOUIS BAY	KN103 A 2261016922	04/21/90	SHALLOW SURFACE(50CM - 1M WIDE) OILED BAND ON EAST SIDE OF STREAM IN UITZ. WHEN CRUST IS BROKEN OIL APPEARS DARK BLACK/BROWN AND VERY MOBILE. SPORADIC 30CM WIDE BAND RUNNING IN LUITZ ON WEST SIDE - NO PENETRATION. OIL ON STREAM BANKS.
KNIGHT ISLAND, LOUIS BAY	KN103 A 2261016922	05/01/91	THE SMALL AMOUNT OF REMAINING 'AP/HOR' SEDIMENTS WERE REMOVED DURING THE SURVEY. REMAINING 'LSOR' SEDIMENTS WERE TILLED. NO SUBSURFACE OIL DETECTED. NO TREATMENT RECOMMENDED.
KNIGHT ISLAND, LOUIS BAY	KN106 E 2261016890	04/29/89	LIGHT OR NO OIL. MOST OF SEGMENT IS CLEAN OR HAS ONLY A SMALL BAND OF LIGHT OIL AT HIGH TIDE LEVEL. NO SKETCH OR SPECIFICS ON STREAM.
KNIGHT ISLAND, LOUIS BAY	KN106 E 2261016890	05/17/89	VERY LIGHT OR NO OIL.
KNIGHT ISLAND, LOUIS BAY	KN106 E 2261016890	07/24/89	POST TREATMENT OIL: 1.5% LIGHT, 98.5% NONE FOR SEGMENT.
KNIGHT ISLAND, LOUIS BAY	KN106 E 2261016890	09/18/89	NO OIL FOUND. NO CARCASSES OR LIVE FISH OBSERVED. OTHER STREAMS IN THIS SEGMENT WERE UNOILED AND NO SIGN OF SALMON WAS OBSERVED.
KNIGHT ISLAND, LOUIS BAY	KN106 E 2261016890	04/27/90	VERY RICH INTERTIDAL ZONE. VERY LIGHT OILING. SEVERAL SMALL MOUSSE PATTIES WERE NOTED ON THE WEST SIDE OF STREAM IN A .5X.5 M AREA. ONE PATTY ON EAST SIDE. NO OIL ON STREAM BANKS.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 B 2261016982	05/04/89	3 BEACHES IN SEG - ALL MOD OILED, STREAM IN BEACH #3 CONTINUOUS 2-30M OILED BAND. OIL PENETRATION 5 CM. MODERATE OIL WITH SOME MOUSSE 200M UPSTREAM.
KNIGHT ISLAND, HERRING BAY, WEST SIDE	KN132 B 2261016982	05/17/89	HEAVY OILING TO NORTH, ALONG ROCKS. (REFERRED TO AS #692).
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 B 2261016982	06/12/89	MEDIUM TO HEAVY OILING. EXXON STUDY SITE.

KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 2261016982	B	06/20/89	SHORELINE NEAR STREAM HAS NOT BEEN TREATED. HEAVY OILING OIL PATTIES MADE IT WELL INTO THE STREAM. MAIN AREA OF CONCERN IS ENTRY. MOUTH HAS NOT BEEN BOOMED OFF. (REFERRED TO AS #16910).
KNIGHT ISLAND, HERRING BAY, WEST SIDE	KN132 2261016982	B	07/13/89	BOOMING AROUND STREAM, RAT DISCUSS TREATMENT WITH USCG.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 2261016982	B	07/28/89	RECORDED AS 2261016920. RAT HAD RECOMMENDED NO TREATMENT. WEST BANK UNTREATED PER DAMES AND MOORE. SUBSEQUENTLY ONE AREA FLAGGED AND MANUALLY REMOVED (AS SEEN FROM HELICOPTER). LATER RAT REQUESTED ADDITIONAL MANUAL REMOVAL.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 2261016982	B	08/04/89	HEAVILY OILED ON THE RIGHT BANK. LIGHT TO MOD 150M UPSTREAM SITE #4 4.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 2261016982	B	08/04/89	OILED BAND IS PROBABLY 400-500 YARDS WIDE FROM LOW TIDE TO UPPER LINE, HEAVILY OILED.
KNIGHT ISLAND, HERRINFG BAY, WEST SIDE	KN132 2261016982	B	09/02/89	HEAVILY OILED. MAP.
KNIGHT ISLAND, HERRING BAY, WEST SIDE	KN132 2261016982	B	09/16/89	HEAVILY OILED. MAP.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 2261016982	B	10/16/89	"MOUSSE & HEAVY SHEEN ON WATER. WIND BLOWING DIRECTLY INTO COVE AND BLOWING OIL UPSTREAM."
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 2261016982	B	11/05/89	MAPS, DATASHEETS. HEAVILY OILED IN MID TO UITZ ON LEFT BANK. LIGHT OIL AND TAR PATCHES IN LITZ. 17 X 41.3M OIL BAND ON LEFT BANK - 100% COVERAGE. 14.4M LONG BAND ON RIGHT BANK WITH 70% COVERAGE.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 2261016982	B	11/05/89	USEFUL VISUAL/AUDIO DESCRIPTION OF VERY HEAVY OILING FROM AIR AND GROUND WITH PIT INFORMATION & SURVEY FROM BEACH. #1 IN VIDEO LOG 4941-5220.

KNIGHT ISLAND, HERRING BAY, WEST SIDE	KN132 B 2261016982	11/05/89	DESCRIPTION OF OILING BY TRANSECT PLOT. LIGHT TO HEAVY.
KNIGHT ISLAND, HERRING HERRING BAY WEST SIDE	KN132 B 2261016982	04/21/90	HEAVIEST OILING OCCURS IN A 60M LONG X 10M WIDE BAND IN THE MID AND UPPER ITZ ON THE WEST BANK OF THE STREAM. OIL ON STREAM BANKS. A THIN LAYER OF ANGULAR ROCKS/COBBLE COVERS THE OIL SATURATED FINES. THE UNDER SIDES OF THE SURFACE ROCKS HAVE A SPORADIC OIL COAT. SCATTERED TARBALLS ARE PRESENT WITHIN THE GRASSY TIDE POOL AREA AND UPSTREAM ON THE EAST SIDE OF THE STREAM.
KNIGHT ISLAND, HERRING BAY, WEST SIDE	KN132 B 2261016982	07/12/90	VIOLATION OF 100M BUFFER FROM STREAM BY EXXON FOR INIPOL APPLICATION.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 B 2261016982	08/14/90	SOME SCATTERED PATCHES OF MOUSSE AND 'OR' REMAIN ON LEFT SIDE OF STREAM ABOVE CONSTRUCTION AT WEIR. PRIMARY REMAINING OIL IS ON THE 70M RIGHT BANK BELOW WEIR. IT CONSISTS OF HEAVY 'OR' WHICH IS TURNING TO ASPHALT ON THE BEACH (WHICH HAS BEEN TILLED AND BIO'D). OIL OBSERVED ON STREAM BANKS.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 B 2261016982	05/01/91	TWO PINK FRY IN STREAM. STREAM/BEACH AREA IS IMPROVING BUT STILL IN NEED OF TREATMENT. ADF&G PERSONNEL REPORTED THAT WHEN THE SUN COMES OUT, THE OIL LIQUIFIES & STARTS OOZING TOWARDS THE STREAM. OG'S ESTIMATES ON % COVERAGE INCLUDES ALL THE ROCK & BOULDER SURFACES IN THE OILED AREA. SO IT IS A DECPTIVELY LOW FIGURE. FYKE NET ACROSS STREAM - ADF&G PERSONNEL HAD FRY CAUGHT TO CODED-WIRE TAG. MAXIMUM OIL DEPTH FOUND - 15CM.
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 B 2261016982	06/04/91	THE WEATHER CONDITIONS WERE NOT CONDUCIVE TO LAYING OUT BOOM TO CONTAIN SHEENING. I PHONED DEC BASE AND ASKED FOR THIS TO BE WAIVED. ERNIE PIPER GAVE ME PERMISSION TO USE MY DISCRETION. SHEENS WERE NOT FREQUENT AND WIND/WAVE ACTION GUARANTEED THAT ANYTHING RELEASED WOULD BE DISPERSED QUICKLY. CARE WAS TAKEN NEAR THE ANAD SITE. CUSTOMBLEN WAS NOT APPLIED NEAR THE STREAM. ADF&G PERSONNEL WERE ON SITE TAGGING FISH. THEY WERE INFORMED OF OUR ACTIVITY AND GIVEN MSDS'S ON CUSTOMBLEN. RECOMMENDED FOR FUTURE REASSESSMENT.

KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 B 2261016982	06/07/91	AREAS IN MITZ AND UITZ REMAIN OILED. OILING CONDITIONS RANGE FROM 'OP/AP', 'HSOR' AND SUBSURFACE 'MOR'. WORK ORDERS FOR THIS AREA MAY HAVE BEEN FOLLOWED, HOWEVER, SERIOUS AMOUNTS OF OIL REMAIN ADJACENT TO THIS ANADROMOUS STREAM. FISH & GAME REPRESENTATIVES WERE NOT PRESENT WHEN THE CLEANUP EFFORT WAS CONDUCTED. THIS SURVEY WAS DONE DURING A HOT SUNNY PERIOD WHEN OILING CONDITIONS WERE EASILY OBSERVED. THE ENTIRE SEGMENT SMELLED OF CRUDE OIL. SUGGESTION IS THAT THIS STREAM BE REASSESSED BY THE TAG FOR POSSIBLE MECHANICAL TILLING AS MANUAL WORK APPEARS TO BE INADEQUATE.
KNIGHT ISLAND, HERRING BAY, WEST SIDE	KN132 B 2261016982	08/01/91	SURFACE OIL (AP/HSOR) LOCATED THROUGHOUT SEGMENT FROM THE WEST SIDE OF STREAM NORTH TO THE FIRST BEDROCK OUTCROP. SUBSURFACE OIL (MOR TO LOR) LOCATED NEAR GRASSY POINT, SOUTHWEST END ADJACENT TO STREAM. HOR LOCATED IN SEGMENT FROM FIRST RUN OFF STREAM (ENTRANCE TO CAMP), NORTH TO BEDROCK OUTCROP. PINKS OBSERVED JUMPING NEAR THE MOUTH, BUT NO PINKS HAVE MOVED PAST THE WEIR. *SURVEY FOCUSED ON DOCUMENTED OILING TREATED IN 1991. DIMENSIONS: 8X10M 5% AP/HSOR, 21X10M 30% AP/HSOR, 36X5M 35% AP/HSOR, 40X5M 40% AP/HSOR, 30X5M 40% AP/HSOR, 1X1M 100% AP ON SURFACE. SUBSURFACE: 20X5M MOR-LOR, 5X36M HOR-MOR, 5X40M HOR-MOR, 6X6M HOR.
KNIGHT ISLAND HERRING BAY, WEST SIDE	KN132 B 2261016982		AERIAL PHOTO OF WIDE OIL BAND BY STREAM. (1989)
KNIGHT ISLAND, HERRING BAY WEST SIDE	KN132 B 2261016982		TRANSECT RUNS ADJACENT TO STREAM, THEN CROSSES STREAM. FROM SUMMARY: OCTOBER 1989: ESTIMATED SURFACE COVERAGE OF 80% IN MITZ TO UITZ. ASPHALT PAVEMENT COMMON THROUGHOUT UPPER ZONE. ASPHALT PENETRATION 5-10CM. 06/06/89: 14 M WIDE OIL BAND.
KNIGHT ISLAND BAY OF ISLES SOUTH ARM	KN134 A 2263016865	05/03/89	HEAVY OIL, OVER 100% OF SEGMENT SKETCH, 10-85M WIDE BAND 90% MOUSSE.
KNIGHT ISLAND SOUTH ARM BAY OF ISLES	KN134 A 2263016865	05/17/89	AERIAL PHOTO SHOWING WIDE OIL BAND BY STREAM.

KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	08/31/89	RECENTLY BIOREMEDIATED. 20 YD BUFFER LEFT ADJACENT TO STREAM. WAS HEAVILY OILED AND WAS MECHANICALLY TREATED PRIOR TO BIOREMEDIATION. LITTLENECK CLAMS OILED, STILL ALIVE.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	08/31/89	OILED FROM HITZ DOWN 100FT TO LITZ.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	09/10/89	MAP OF OILING, MOD TO HEAVY, SOME SUBSURFACE OILING. APPEARS RE-OILED. BIOREMEDIATION APPEARED INEFFECTIVE.
KNIGHT ISLAND, BAY OF ISLES, SOUTH ARM	KN134 A 2263016865	09/10/89	APPEARS REOILED. BIOREMEDIATION APPEARED INEFFECTIVE.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	09/10/89	REOILING MAY HAVE OCCURRED. BEACH WORSE THAN EARLIER IN FULL SUN. MOUSSE HAD HARDENED.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	01/02/90	HEAVILY OILED. A 35 X 5M BAND OF 4-6 IN THICK ASPHALT IS ALONG THE WEST BANK WITH 80% COVERAGE. IMMEDIATELY ADJACENT TO THAT (5M FROM STREAM) IS A 20 X 20M HEAVY OIL BAND (4 IN THICK WITH 90% COVERAGE). SNOW MAY BE COVERING MORE OIL. EAST BANK IN STREAM GRAVEL BAR HAS LIGHT OIL.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	04/12/90	AREA IS HEAVILY OILED WITH LARGE AREAS OF ASPHALT MOUSSE. PENETRATION 4-6", POSSIBLY MORE IN (OTHER) AREAS. THICK COATINGS ON BEDROCK- PROTRUSIONS CARPETED WITH NEEDLES. OIL ON STREAM BANKS.
KNIGHT ISLAND BAY OF ISLES SOUTH ARM	KN134 A 2263016865	04/22/90	(UITZ) PRIMARY OIL OF CONCERN IS FLAT ON NORTH SIDE OF CREEK, 3-4 CM THICK TARMATS, VERY MOBILE ON UNDERSIDE. SOME 1-2 MM COATINGS ON BEDROCK. SOME MOUSSE PATTIES 40 YARDS NORTH IN MITZ. SOME OILED GRASSES & DEBRIS IN UITZ. NO OIL NOTED IN STREAM OR AT STREAM'S EDGE. TOP OF KNOLL NORTH OF STREAM HAS 2 PARTIALLY OILED TREES (STUMP & ROOTS) ALSO OILED GRASSES/KELP/DEBRIS. THE UITZ AND SUPRA ITZ ARE STILL PARTLY COVERED IN SNOW AND HAVE THICK AREAS OF OILED DEBRIS/MOUSSE ETC. MAJORITY OF TARMATS LIE IN MIDDLE TO UPPER

KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	08/15/90	OILING CONDITIONS ARE PRIMARILY ON THE NORTH BANK OF THE STREAM. THEY CONSIST OF REMNANTS OF ONCE LARGE TARMATS, SOME OF WHICH ARE STILL PRESENT. THERE ARE POCKETS OF HEAVY 'OR' SEDIMENTS AND SOME 'OP' IN THE CREVICES OF THE LARGER BEDROCK RIB THAT SEPARATES THE STREAM FROM THE BEACH SEGMENT. REASSESSMENT SPRING 1991. OIL OBSERVED ON STREAM BANKS.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	05/13/91	OILING OF CONCERN CONSISTS OF 2 PATCHES OF REMNANT TARMAT IN DEPRESSION ON NORTH SIDE OF STREAM. AREA RECEIVED THOROUGH TILLING BY LOCAL RESPONSE GROUP IN FALL 90. TARMAT HAS REFORMED OVER WINTER. REMAINING H/MSOR SEDIMENTS.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN134 A 2263016865	06/08/91	WORK ORDER WAS COMPLETED TO MY SATISFACTION. A CREW OF 2-3 PEOPLE & MYSELF WORKED FROM 1700-1815 REMOVING THE REMAINING 'AP' & 'SOR' FROM LOCATIONS A & B. A THOROUGH TREATMENT WAS ACCOMPLISHED. ALL AGENCY REPS AGREED THAT THE APPLICATION OF CUSTOMBLEN WAS UNNECESSARY DUE TO THE SMALL AMOUNT OF RESIDUAL OIL REMAINING. I WAS NOT PRESENT WHEN THE CREW TREATED OILED COVE TO THE WEST, WHICH IS IN THE SAME SUBSEGMENT, THAT AREA HOWEVER DOES NOT APPEAR TO POSE A THREAT OF CONTAMINATION TO THE STREAM.
KNIGHT ISLAND, BAY OF ISLES, WEST ARM	KN201 A 2263016869		REASONABLY CLEAN; SOME SPOTS OF OIL, MOUSSE CONCENTRATION AREA.
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016870	04/26/89	LIGHT OILING - BAND OF OILY VEG 1-2M WIDE BOTH SIDES OF STREAM IN UITZ 50M LONG. BLOTCHES SEVERAL FEET WIDE AND LONG ALL THROUGHOUT, ITZ, OIL IN SUBSTRATE WITHIN THE STREAM.
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016870	04/26/89	BAND OF OILY VEGETATION 1-5' WIDE. BLOTCHES SEVERAL FEET WIDE AND LONG ALL THROUGHOUT AREA.

KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016870	05/22/89	PATCHES OF MODERATELY AND LIGHTLY OILED ALGAE AND PEBBLES BETWEEN STREAMS "PER SKETCH" MANUAL REMOVAL OF OILED GRAVEL AND DEBRIS. GREEN-WINGED TEAL IN PROBABLE SALMON STREAM FLOOD PLAIN. EXERCISE CARE IN ADJACENT GRASSY AREA - CUT OILED GRASSES BY HAND. SCOOP & SHOVEL PATCHES OF OILED SOIL/GRAVEL.
KNIGHT ISLAND BAY OF ISLES WEST ARM	KN201 A 2263016870	05/22/89	STREAM OUTLET FLOWED INTO SHALLOW BASIN. OUTLET WAS BOOMED. OIL IN BASIN WAS MOSTLY OILY DEBRIS OR MOUSSE. ENTRANCE HEAVILY OILED OUTSIDE BOOM.
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016870	06/06/89	ONE OILED ADULT SEAL IN LAGOON. OILING IN UITZ IN QUANTITIES WHERE MECHANICAL TREATMENT COULD BE USED, APPROXIMATELY 300 FT FROM CHANNEL.
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016870	07/11/89	TREATMENT RECOMMENDATIONS - ADDITIONAL WORK NEEDED. NEW OILING AT HIGH TIDE LINE OVER 300 M FROM MOUTH. (PHOTO).
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016870	07/28/89	BOOMED LAGOON. MODERATE TO HEAVILY OILED SEGMENT, NORTH AND SOUTH OF LAGOON MOUTH.
KNIGHT ISLAND, BAY OF ISLES, WEST ARM	KN201 A 2263016870	08/30/89	"LIGHT TO MODERATE OILING ALONG LARGE BOULDERS. NO CLEANUP HERE."
KNIGHT ISLAND, BAY OF ISLES, WEST ARM	KN201 A 2263016870	09/10/89	3 X 3FT PATCH OF TARRY MOUSSE.
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016870	06/01/90	LIGHT OILING - SCATTERED TAR PATTIES, OILED GRASSES, BROKEN TARMATS IN UITZ TO LITZ IN RANDOM PATCHES. NO ANADSCAT.
KNIGHT ISLAND, BAY OF ISLES, WEST ARM	KN201 A 263016872	05/22/89	LIGHT OILING.

KNIGHT ISLAND, BAY OF ISLES, WEST ARM	KN201 A 2263016872	07/14/89	STREAM REASONABLY CLEAN, A COUPLE OF SPOTS OF OIL.
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016872	04/12/90	MOUSSE PATTIES FOUND ON EITHER SIDE OF STREAM, UPPER INTERTIDAL ZONE TO EDGE OF LOW TIDE STREAM CHANNEL. PATCHES OF MOUSSE OILED FINESAND GRAVELS. SOME OILED VEGETATION, PENETRATION 2-3". OIL ON STREAM BANKS, POSSIBLY IN STREAM BED. OIL IN STREAMBED: POSSIBLY
KNIGHT ISLAND, BAY OF ISLES WEST ARM	KN201 A 2263016872	04/22/90	PRIMARY AREA OF OILING IN UPPER INTERTIDAL ON BOTH SIDES OF STREAM E & W. THIN BROKEN RANDOM TARMATS 2-4 CM THICK. NO APPARENT OIL IN STREAM. SMALL SCATTERED MOUSSE PATTIES RIGHT DOWN TO LOW TIDE (0.3), 10 SQUARE METER AREA OF MOUSSE PATTIES. OIL ON STREAM BANKS, NOT IN STREAM BED.
KNIGHT ISLAND WEST ARM BAY OF ISLES	KN201 2263016870	05/22/89	LIGHT OIL - SMALL PATCHES OF OIL ARE IN GRAVEL OF STREAM FLOOD PLAIN.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN205 B 2263016860	05/22/89	MODERATE TO LIGHT OILING. SKETCH. THICK MOUSSE BY BOTH STREAMS. 2M X 5M BLACK POOL 2-4CM DEEP IN GRASS ADJACENT TO STREAM.
KNIGHT ISLAND, BAY OF ISLES, SOUTH ARM	KN205 B 2263016860	05/22/89	OILING TAPERS OFF TO WEST OF STREAM. SOME MOUSSE PATTIES.
KNIGHT ISLAND, BAY OF ISLES, SOUTH ARM	KN205 B 2263016860	05/23/89	SPOT CLEANING OF MOUSSE PATTIES.
KNIGHT ISLAND, BAY OF ISLES, SOUTH ARM	KN205 B 2263016860	05/27/89	THE PINK STREAM RECEIVED LIGHT OILING. FRY TRAP.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN205 B 2263016860	06/08/89	SKETCH SHOWS BAND OF POOLED MOUSSE ON WEST SIDE OF STREAM, ALONG STREAM BANK AND THEN CONTINUING WEST. 95% OIL COVERAGE IN BAND.

KNIGHT ISLAND, BAY OF ISLES, SOUTH ARM	KN205 B 2263016860	01/02/90	"NOT CONSIDERED" (FOR FUTURE TREATMENT).
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN205 B 2263016860	04/12/90	PATCHY AREAS OF MOUSSE & ASPHALT. MOSTLY S & E OF STREAM. OIL ON STREAM BANKS.
KNIGHT ISLAND, BAY OF ISLES SOUTH ARM	KN205 B 2263016860	04/27/90	A LARGE, FLAT ROCK/COBBLE BEACH. OIL NOTED INCLUDES A NARROW BAND OF SCATTERED TARBALLS AND PATTIES ON THE EAST SIDE OF STREAM ALONG THE MITZ AND AN INTERMITTENT TAR BAND, 50M X 2M 4CM DEEP, ALONG THE UITZ ON THE WEST SIDE OF THE STREAM. INCLUDED IN THIS BAND ON ITS NEAR STREAM EDGE IS AN AREA OF CONTINUOUS SOFT ASPHALT PAVEMENT - APPROX 4MX 1M X 6CM DEEP. SNOW IS COVERING THE SITZ ON THE EAST SIDE OF STREAM, COULD NOT CHECK FOR OILING. OIL ON STREAM BANKS.
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 C 2261016880	05/24/89	HEAVILY OILED, 13-15M WIDE OIL BAND CONTINUOUS, 3M WIDE MODERATELY OILED, 10M WIDE LIGHT OILING, 12CM PENETRATION.
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 C 2261016880	08/24/89	BEACH APPEARS HEAVILY OILED. OIL SAMPLES TAKEN (SUBSEGMENT AND STREAM# FROM CHEMDATA INFO).
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 C 2261016880	09/06/89	3' WIDE - 6" DEEP BAND OF MOUSSE/GRAVEL IN STORM BERM. POST TREATMENT.
KNIGHT ISLAND, LOG JAM BAY FROM BAY OF ISLES	KN211 C 2261016880	09/06/89	5-6 LARGE TAR BALLS WITHIN 10FT OF STREAM. HEAVILY OILED 3' WIDE BAND OF MOUSSEY GRAVEL (6" DEEP) RAN LENGTH OF BEACH IN UITZ - STORM BERM. AN OIL SHEEN AROSE IN WATER BY SHORELINE AS WE WALKED ALONG. POST TREATMENT.
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 C 2261016880	09/20/89	4M BAND MOUSSE FROM GRASS LINE TO BEACH ON CLIFF BAND. 1.5-4M WIDE BAND SOUTH SIDE OF STREAM ON CLIFF. THICK MOUSSE BAND COATING MUSSELS. PHOTO DESCRIPTIONS. NO OIL FOUND IN STREAM BED. LIGHT BAND OF OIL (RUNS) ENTIRE BEACH FROM HT-LMT.

KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 2261016880	C	04/12/90	"THICK BANDS 1-2MM THICK FROM STREAM EDGE TO 16' HIGH ON CLIFFS (NEEDLES, OIL, MOUSSE)." PER SKETCH, EAST BANK OF STREAM IS PARALLELED BY OIL BAND THAT EXTENDS TO CLIFFS. FURTHER UPSTREAM, OIL APPEARS TO BE IN LOG JAM THAT SPANS STREAM. NO OIL IS SHOWN ON WEST BANK. NO DIMENSIONS PROVIDED.
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 2261016880	C	04/22/90	IN LOG JAM AT CREEK - AT OILED POM-POM CAUGHT IN LOGS. PITS DUG IN UITZ SHOWED NO OIL. IT APPEARS THAT THE UITZ WAS WORKED OVER BY STORMS. OIL ON EAST CLIFF FACES IS WEATHERED AND STICKY. NO OIL NOTICED ON LOGS IN JAM. SMALL AMOUNTS OF OIL SCATTERED OVER SURFACE OF BEACH. SOME BURIED OIL IN UITZ (LIGHT). THIN DISTRIBUTION OF OILED PEBBLES, FUCUS AND ROCK CLUMPS OVER 50-60% OF BEACH LENGTH. ADDITIONAL FROM OG SHEET: NON-OILED UITZ PITS WERE DUG ON WEST SIDE OF STREAM. "TRACE OF SURFACE OIL AND COAT/STAIN ON STEEP ROCK WALLS AND 2 MOUSSE BALLS AT SUPRA ITZ BERM ON BEACH".
KNIGHT ISLAND, LOG JAM BAY NORTH BAY OF ISLES	KN211 2261016875	E	05/24/89	HEAVILY OILED, 10-50M. WIDE CONTINUOUS OIL BAND - 200M LONG, SKETCH - BEACH 4.
KNIGHT ISLAND, NORTH FROM BAY OF ISLES	KN211 2261016875	E	06/26/89	BP1100X TEST OBSERVATIONS: "TEST SITE MODERATELY TO HEAVILY OILED IN A 15-20M BAND ABOVE 'GREEN LINE'." MALFUNCTION DURING BP1100X APPLICATION CAUSED TIDE TO COVER 3/4 OF TREATMENT PLOTS BEFORE WASHING RESUMED, RESULTING IN OIL THROUGHOUT THE WATER COLUMN WITHIN THE INNER BOOM. THE OIL RE-COALESCED AND WAS REDEPOSITED ON BEACH. DID NOT OBSERVE ANY RECOVERY OF OIL. AFTERMATH: "ROCK SURFACES APPEARED CLEANER, BUT MUCH OIL STILL IN SEDIMENTS".
KNIGHT ISLAND, LOG JAM BAY	KN211 2261016875	E	06/30/89	AERIAL PHOTO SHOWING WIDE OIL BAND COVERING MOST OF ITZ.
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 2261016875	E	04/12/90	THIS COVE WAS SLATHERED AND NEVER PROPERLY DEALT WITH. HEAVILY OILED BAND OF DRIFT WOOD AND DEBRIS CHOKING STREAM AS IT CROSSES BEACH TO OCEAN FROM SMALL LAKE.

KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 2261016875	E	04/22/90	OUTLET OF LAKE IS CHOKED WITH OILED LOGS, NEEDLES, KELP, MOUSSE, SHEEN ON CREEK. THICK LAYERS OF OILED VEGETATION/FUCUS ETC. SOME SHEEN DOWN STREAM FROM LOG JAM IN BRAIDED STREAM ON BEACH. (COPPER SHEEN) OILED DEBRIS CONTINUES IN UITZ ON BOTH SIDES OF CREEK 30-35 METERS EAST OF CREEK/ 15-20 METERS WEST OF CREEK.
KNIGHT ISLAND, BAY OF ISLES	KN211 2261016875	E	04/22/90	LARGE HEAVILY OILED LOG JAM IN STREAM. 25 X 25M STREAMBED AND BANK AREA HEAVILY OILED (>45CM PENETRATION). MITZ AND LITZ STREAMBED CONTAINS MOUSSE AND SUBSURFACE OIL - STEADY SHEEN. ADJACENT BEACH HAS .25 X 10M HEAVY OIL WITH 34CM PENETRATION. THICK LAYERS OF OILED VEGETATION IN SUPRATIDAL ALONG BEACH TO EAST. (THIS INFO WAS TAKEN FROM OG SKETCH IN ANADCAT AND SUPPLEMENTS THE COMMENTS OF THE MAD FORM).
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 2261016875	E	05/24/90	A HUGE PILE OF DRIFTWOOD LOGS IN STREAM IS SOAKED WITH OIL AND MUCH OIL IS IN THE STREAM AND INTERTIDAL SUBSTRATE.
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 2261016875	E	08/04/90	STREAM BANKS AND STREAM BED STILL HEAVILY OILED: 30M LONG X 25M WIDE AREA OF STREAM BED HAS HEAVY TO MOD 'OR' - BLACK BEADS AND RAINBOW SHEEN IN PITS DUG IN SPAWNING AREA. STREAM BANKS ADJACENT TO POOL ARE 'OR' SEDIMENTS WITH OILED ORGANICS. OILED LOGS THAT HAD BEEN PUSHED ASIDE ARE ALREADY MIGRATING TO STREAM BED. SUBSURFACE OIL LENSE IN STORM BERM ON EAST SIDE. POSSIBLE HEAVY OIL UNDER PILED UP LOGS ON BANKS. REASSESS NEXT SPRING.

KNIGHT ISLAND, NORTH FROM BAY OF ISLES	KN211 2261016875	E	05/01/91	THIS BEACH/STREAM AREA CONTAINED A LOT OF NEW MATERIAL (I.E. GRAVEL) ON TOP OF THE OLD, DUE TO STORM ACTIVITY OVER WINTER. GRAVELS HAVE FILLED IN THE STREAM CHANNEL COMING OUT OF THE POND - SITE OF LOG JAM. THERE WAS A BAND OF NEWLY DEPOSITED OILY DEBRIS (ORGANIC) IN THE SWASH ZONE ALONG THE BEACH. THIS WAS THE ONLY OIL WE DETECTED OTHER THAN A SLIGHT SILVER SHEEN ON THE STREAM AS IT RAN OVER & BETWEEN THE ROCKS & COBBLE. TO TRULY ASSESS OIL PRESENT, DEEPER PITS NEED TO BE DUG IN STORM BERMS, ETC. NO TREATMENT WAS RECOMMENDED FOR THIS STREAM AREA BECAUSE WE COULD FIND LITTLE OIL THAT WAS ACCESSIBLE TO TREAT. IT IS SUCH A HIGH ENERGY BEACH THAT IT WAS EITHER FLUSHED OUT OR BURIED, PROBABLY BOTH.
KNIGHT ISLAND, LOG JAM BAY BAY OF ISLES	KN211 2261016875	E		BEACH HEAVILY OILED DURING FIRST WEEK OF SPILL. TRANSECT SOUTH OF STREAM. OIL BAND 18M WIDE. BY AUGUST 89, TOTAL BEACH HAS 65% SURFACE OIL COVERAGE, SUBSURFACE COVERAGE INCREASED. GRAVEL AROUND STREAM IS CLEAN, MAYBE LIGHT STAINING.
KNIGHT ISLAND, LOG JAM BAY	KN211		09/20/89	2 FRESHWATER STREAMS, HEAVILY OILED, MAP. HEAVY OIL SEDIMENTS IN STREAM BED. BOTH STREAMS HAVE WATERFALLS.
KNIGHT ISLAND, LOG JAM BAY	KN211		09/08/89	OVERFLIGHT - OBSERVED HEAVY MOUSSE AND SHEEN IN WATER.
KNIGHT ISLAND, RUA COVE	KN213 2263016853	B	06/01/89	LIGHTLY OILED. 30% COVERAGE OF TOTAL BEACH. DRIED MOUSSE, STAIN ON BOULDERS. NO OIL AT DEPTH OR UNDERNEATH BOULDERS.
KNIGHT ISLAND, RUA COVE	KN213 2263016853	B	08/16/89	HEAVILY OILED AT MOUTH 2-6" LAYER OF MOUSSE, 25' X 30' OIL BAND ON SOUTH SIDE.
KNIGHT ISLAND, RUA RUA COVE	KN213 2263016853	B	08/17/89	2-6" THICK LAYER OF MOUSSE & OILED ORGANIC DEBRIS IN M & UITZ - 25 X 30 FT.LONG BEACH.
KNIGHT ISLAND, RUA COVE	KN213 2263016853	B	08/24/89	OIL SAMPLE, HEAVY OIL, 89RLG106V.

KNIGHT ISLAND, RUA RUA COVE	KN213 B 2263016853	08/29/89	MAP & DESCRIPTIONS OF LIGHT TO HEAVY OILING, TREATMENT CONSIDERATIONS.
KNIGHT ISLAND, RUA COVE	KN213 B 2263916853	09/06/89	THE STREAM BANKS HAD BEEN HEAVILY OILED UP TO THE SWASH LINE. MOUSSE/GRAVEL ERODED INTO STREAM.
KNIGHT ISLAND, RUA COVE	KN213 B 2263016853	09/08/89	OIL LINE STILL HEAVY AT HIGH TIDE LINE. BEACH NORTH OF STREAM HAS HEAVY OILING.
KNIGHT ISLAND, RUA RUA COVE	KN213 B 2263016853	09/13/89	THICK AP, MOBILE OIL AND HEAVILY OILED DEBRIS. NORTHERN SECTION ABOVE STILL VERY HEAVILY OILED.
KNIGHT ISLAND, RUA RUA COVE	KN213 B 2263016853	01/20/90	40 X 40M HEAVY OIL BAND ON SOUTH BANK OF STREAM - 6" THICK. 40 X 2M HEAVY OIL BAND ON NORTH BANK.
KNIGHT ISLAND, RUA COVE	KN213 B 2263016853	04/12/90	PENETRATION VARIED FROM 1-2MM TO 4-6" OR NONE. LARGE PATCHES OF MOUSSE ON SOUTH SIDE OF STREAM. HEAVILY OILED CLIFFS ON NORTH TAR LIKE WITH NEEDLES COMPRESSED ON THEM. OIL ON STREAM BANKS.
KNIGHT ISLAND, RUA COVE	KN213 B 2263016853	04/27/90	VERY HEAVY OILING REMAINS AT THIS SITE.
KNIGHT ISLAND, RUA COVE	KN213 B 2263016853	04/27/90	NOTE: LARGE EAGLE NEST LEFT SIDE OF CREEK. OIL ON STREAM BANKS. TREATMENT RECOMMENDATIONS.
KNIGHT ISLAND, RUA COVE	KN213 B 2263016853	08/04/90	5000 PINKS OFF MOUTH AND IN STREAM, SOME SPAWNERS. TARMAT REFORMING IN TARMAT AREAS. RECENT STORM EXPOSED 'OR' SEDIMENTS IN UPPER STORM BERM ON SOUTHERN STREAM BANK - ERODING INTO STREAM. SHEEN ON POOL. LOWER STORM BERM HAS BURIED OIL LENSE, PART OF WHICH WAS REMOVED. REASSESS NEXT SPRING.

KNIGHT ISLAND, RUA COVE	KN213 2263016853	B	05/13/91	AREA LOOKS 100% IMPROVED FROM 1 YEAR AGO. RESIDUAL TARMAT/MOUSSE STILL PRESENT IN SITE #1 AND SHOULD BE REMOVED. SITE #3 ON STREAM BANK CONTAINS 'LOR' SEDIMENTS WHICH SHOULD BE MANUALLY TILLED. 'HSOR' SEDIMENT IN SITE #5 THAT ARE ACCESSIBLE SHOULD BE REMOVED. SITE #6 CONTAINS ACCESSIBLE 'HOR' SEDIMENTS WHICH, IF NOT REMOVED, WILL REMAIN BECAUSE THEY ARE IN SHELTERED AREA. I WAS UNABLE TO LOCATE OIL IN STORM BERMS THAT I SAW LAST FALL. ACTIVE BERM AREA: GRAVELS HAD BEEN REMOVED & NEW LOGS DEPOSITED BY STORMS. IMPOSSIBLE TO TILL AREA NEAR STREAM - STREAM COULD MIGRATE. UNDISCOVERED RESIDUAL 'HSOR' SEDIMENTS TO RIGHT OF SITE #3 MAY BECOME APPARENT WHEN WEATHER WARMS OR SOME ROCKS ARE TURNED.
KNIGHT ISLAND, RUA COVE	KN213 2263016853	B	06/19/91	TREATMENT TO THIS STREAM AREA WAS VERY THOROUGH. IT INCLUDED NEW OILED AREAS NOT IDENTIFIED IN MAYSAP 91. 5X5M HMOR/OP SOUTH OF STREAM REMAINS. I TILLED THE AREA OF SUBSURFACE OIL ALONG THE STREAM BANK. THIS OIL IS CHARACTERIZED AS GLOBS OF MOUSSE UNDERNEATH AND BETWEEN ROCKS. THE AREA OF SITE 6 (H & I ON OG MAP) STILL CONTAINS HEAVY OILING AND SHOULD BE REASSESSED. AREA OF SUBSURFACE ON STREAM BANK COULD BE RETILLED AT THE SAME TIME. SURFACE OIL CHARACTERISTICS ALSO INCLUDED 'DB'.
KNIGHT ISLAND, RUA COVE	KN213 2263016853	B	06/25/91	THE AREA ALONG SOUTHERN STREAM BANK COULD BE RETILLED, BUT IT IS "SPOTTY" AND MIGHT NOT BE NECESSARY. THE 'HOR' IN SITE 6 COULD BE REMOVED IF THE STATE VESSEL WAS IN THE AREA. WE DID LOOK AT 213C, JUST NORTH AROUND THE CORNER AND NOTED SOME MOUSSE AND FLOWING OIL AMONGST THE BOULDER FIELD. OVERALL 213C HAD BEEN CLEANED AS BEST AS COULD BE EXPECTED. MAY HAVE HAD MORE MANUAL REMOVAL - DSA, JEFF GINNALIAS, DEC - WORKED AFTER DFG SURVEY.

KNIGHT ISLAND RUA COVE	KN213 B 2263016853	08/02/91	NEW AREA OF SUBSURFACE OIL DISCOVERED ALONG CLIFF EDGE - SITE D. SUBSURFACE OIL ALONG STREAM BANK IMPROVED (SITE E) - SLIGHT SILVER SHEEN IN 2 PITS ONLY. SMALL 'HSOR' PATCH ON NORTH STREAM BANK - SITE C - SHOULD BE RETILLED. SITE F CONTAINS A 2 X 18 PATCH H/MOR WHICH SHOULD BE REMOVED. THIS OIL IS LOCATED IN SHELTERED LOCATION - VERY SLOW DEGRADATION RATE. AREAS F AND C WARRANT REASSESSMENT IN 1992. STREAM AREA IS IN RELATIVELY GOOD SHAPE. *SURVEY FOCUSED ON DOCUMENTED OIL TREATED IN 1991.
KNIGHT ISLAND, RUA COVE	KN213 B 2263016853		AERIAL PHOTO SHOWING OIL BAND.
KNIGHT ISLAND, RUA COVE	KN213 B 2263016853		TRANSECT LOCATED APPROXIMATELY 125M NORTH OF STREAM. PER SUMMARY: VERY HEAVILY OILED SITE. AUGUST 89: 100% OIL COVERAGE OF BEACH WITH POOLED MOUSSE BETWEEN BOULDERS. NOVEMBER 89: ASPHALT COVERED 40% OF BEACH SURFACE IN DRAINAGE AREA TO SOUTH OF TRANSECT (ADJACENT TO STREAM).
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	06/10/89	SKETCH LISTS "SOME VERY SCATTERED SPOTS OF MOUSSE ON BEACH". SKETCH DOES NOT SHOW OIL LOCATION.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	06/11/89	MODERATE OILING. AT MOUTH OF RIVER: 100X10M HEAVY OILING BAND WITH SOME POOLING IN SU. LOCALLY HEAVY. LIGHT OILING ON BEDROCK, NORTH SIDE OF STREAM.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	06/17/89	STREAM IS BOOMED, AREA OUTSIDE BOOM IS OILED ON THE SOUTH SIDE.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	08/04/89	HEAVILY OILED THICK MOUSSE, GRASSY FLAT HIT HARD, VISIT TO STREAM VIA CHOPPER.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	08/06/89	SALMON STREAM ON BORDER 1M X 100M BAND OF HEAVY OILING, WITH SOME POOLING IN SUPRA-INTERTIDAL.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	08/15/89	OIL IN PATCHES IN GRASS VEGETATION.

KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	08/16/89	LIGHT OIL SHEEN ON STREAM BANK WHERE WE WALKED. 1-3FT OILED BAND WITH SOME MOUSSE IN UITZ.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	08/16/89	1-3FT WIDE BAND OF OIL ON SOUTH BANKS OF STREAM. WE CAUSED A SHEEN IN WATER BY BOOM.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	09/06/89	ADVISED THAT MANUAL TREATMENT HAD OCCURRED TO STREAM AREA.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	09/30/89	SKETCH SHOWS VERY LIGHT OILING FOR NORTH STREAM BANK AREA.
KNIGHT ISLAND, SNUGB HARBOR	KN401 B 2263016820	09/30/89	KN401/402. SKETCH SHOWS "LIGHT TO VERY LIGHT" OILING AREA ALONG SOUTH STREAM BANK. 4M WIDE OIL BAND IN "LIGHT" AREA.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	04/12/90	SOME SHEEN/STICKY FILM VISIBLE. SHOVEL REMOVAL. OIL ON STREAM BANKS.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	04/27/90	RECOMMENDATIONS. CHECK THE AREA NOW COVERED BY SNOW. NO OIL ON STREAM BANKS, BUT WITHIN ONE MILE OF STREAM (MAP). PER OG SKETCH: SOUTH BANK OF STREAM PARALLELED AT APPROXIMATELY 10M DISTANCE BY BAND OF SCATTERED TAR MATS AND PATTIES (70X4M, 3CM THICK), FURTHER UPSTREAM POCKET OF OILED VEGETATION FAIRLY DISTANT FROM STREAM. FURTHER UPSTREAM, 2 OILED LOGS IN STREAM. NO OILING IS INDICATED FOR SOUTH BANK. PITS REVEALED NO SUBSURFACE OILING.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	08/15/90	PRIMARY AREA OF OILING CONSISTS OF A THIN BAND OF TARMAT ON THE LEFT BANK AS YOU FACE UPSTREAM. IT IS IN THE UPPER ITZ, BUT IT IS DOWN NEAR THE LOWER ITZ MOUTH AREA OF THE STREAM. SOME LARGE PATCHES 1 X 1M OF TARMAT STILL REMAIN NEAR AND IN SMALL FEEDER STREAM CHANNEL. UNSATISFACTORY WORK WAS DONE ON REMOVAL OF REMAINING TARMAT STRIP. SUGGEST REASSESSMENT SPRING 1991. OIL OBSERVED ON STREAM BANKS.

KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	04/26/91	STREAM AREA LOOKS IN GOOD SHAPE. THE MAJORITY OF THE HSOR WAS REMOVED FROM SITE #1 DURING SURVEY. THE OIL IS LOCATED IN & JUST BELOW THE GRASSY SWASH ZONE & SHOULD RECEIVE TREATMENT BEFORE THE GRASS HIDES IT.
KNIGHT ISLAND, SNUG HARBOR	KN401 B 2263016820	05/28/91	WORK ORDER COMPLETED. AREA ADRESSED ON WORK ORDER QUITE A DISTANCE FROM CATALOGUED STREAM AND NOT A THREAT TO STREAM. OIL REMAINING NEAR STREAM RELATIVELY INSIGNIFICANT BUT ITS PRESENCE AND CONDITION SHOULD BE ASSESSED BY ADF&G IN AUGUST 1991.
KNIGHT ISLAND, HOGAN BAY	KN411 A 2263016810	06/21/89	LIGHT OIL BAND AT HIGH TIDE ON EAST SIDE OF STREAM INSIDE ADF&g MARKER. 100+ METERS FROM STREAM DELTA. SKETCH.
KNIGHT ISLAND, HOGAN BAY	KN411 A 2263016810	08/15/89	NO SIGN OF OIL.
KNIGHT ISLAND, HOGAN BAY	KN411 A 2263016810	08/15/89	NO BANK SAMPLE TAKEN AS NO OIL SLICK OR PATCHES SEEN.
KNIGHT ISLAND, HOGAN BAY	KN411 A 2263016810		BAY APPEARED TO BE MOSTLY OILED WITH OCCASIONAL HEAVILY OILED SEGMENT. BOOM STILL IN PLACE NEAR THE STREAM MOUTH. (BOOM STATEMENT APPARENTLY REFERS TO #16810).
KNIGHT ISLAND, NORTHWEST TIP	KN500 A 2261016992	06/05/89	OVERALL OILING CONDITIONS ARE MODERATE. <5M WIDE OIL BAND - 50+% COVERAGE, 0-10CM OIL PENETRATION.
KNIGHT ISLAND, NORTHWEST TIP	KN500 A 2261016992	09/26/89	HEAVY OILING PER SKETCH. "72M BAND, STICKY/TARRY 3-4MM THICK, MITZ OVER 15 CM DEEP."
KNIGHT ISLAND, NORTHWEST TIP	KN500 A 2261016992	01/02/90	"HEAVILY OILED".
KNIGHT ISLAND, NORTHWEST TIP	KN500 A 2261016992	04/12/90	DEAD OILED DEBRIS EVERYWHERE. REEKS OF OIL. HEAVY OIL BANDS ON CLIFFS. OIL ON STREAM BANKS.

KNIGHT ISLAND, NORTHWEST TIP	KN500 A 2261016992	04/21/90	OILED AREA THAT NEEDS THE MOST ATTENTION IS ON THE NORTH BANK OF THE STREAM NEAR THE MOUTH IN THE UITZ. A SMALL STREAM COMING FROM THE NORTH AND CONNECTING WITH MAIN STREAM CONTAINS MODERATELY OILED GRAVELS WHICH WHEN AGITATED PRODUCE A SILVER TO BROWN SHEEN. THIS FLOW LIKELY FEEDS A SALMON SPAWNING/REARING AREA. OIL ON STREAM BANKS. MODERATE OILING ON NORTH SIDE OF STREAM, LIGHT ON SOUTH SIDE.
KNIGHT ISLAND, NORTHWEST TIP	KN500 A 2261016992	08/15/90	OIL NEAR STREAM IS PRIMARILY ON THE NORTH BANK - SOME TARMAT REMAINS NEAR STREAM. LARGE UPPER ITZ BOULDERS PACKED WITH 'OP' AND MOUSSE ON SOUTH SIDE. 2 SMALL COVES ON NORTH SIDE OF STREAM HAVE BURIED SUBSURFACE OIL. IT STILL REMAINS. NO FISH PRESENT. OIL OBSERVED ON STREAM BANKS.
KNIGHT ISLAND, NORTHWEST TIP	KN500 A 2261016992	04/30/91	BURIED OIL IN SITE #1 & 2. SITE # 2 IS IN AND DIRECTLY ADJACENT TO THE STREAM FLOW THROUGH THE INTERTIDAL AREA. SITE #2 RECOMMEND THOROUGH TILLING IN AND AROUND STREAM FLOW. SITE #1 ALSO RECOMMEND TILLING TO BRING OILED DEPOSITS TO THE SURFACE. (SEE MAP FOR SITES) NOTE: SITE #1 WAS NOT RECORDED ON OG MAP AS EXXON ADVISOR DID NOT WANT IT FOR DATA.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 B 2261016996	06/05/89	OVERALL OILING CONDITIONS ARE MODERATE. >5M WIDE OILED BAND WITH 50+% COVERAGE.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 B 2261016996	09/26/89	OILING HEAVY PER SKETCH. "100% COVER. > 1M BAND IN HITZ AND MITZ. OVER 15CM DEEP. ASPHALT".
KNIGHT ISLAND, NORTHWEST SIDE	KN500 B 2261016996	01/02/90	"HEAVILY OILED".
KNIGHT ISLAND, NORTHWEST SIDE	KN500 B 2261016996	01/04/90	HEAVY OIL THROUGHOUT ITZ. NORTH BANK HAS 80M X 30 TO 40M BAND OF HEAVY OIL. SOUTH BANK HAS 70 X 70M BAND OF HEAVY OIL, 6-24 IN PENETRATION WITH 100% COVERAGE.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 B 2261016996	04/12/90	A DISASTER, THICK OIL EVERYWHERE. OIL ON STREAM BANKS.

KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	04/24/90	OILED HEAVILY IN NORTH SIDE SPOTS (UPPER LITZ), MID-ITZ CENTER OF COVE NEAR STREAM, UPPER ITZ: OIL MATS & OIL ALONG STREAM. SOUTH SIDE OF COVE: UPPER ITZ LARGE TARMATS/LIGHT OILED BOULDER. MID ITZ SOUTH SIDE TARMAT (210 FEET 2/3 LENGTH OF STREAM CHANNEL OILED DOWN TO WATER) . OG SKETCH INDICATES HEAVY OILING IN UITZ, MITZ AND LITZ ON NORTH SIDE OF STREAM AND IN MITZ ON SOUTH SIDE OF STREAM. OIL PRESENT ALONG STREAM BANKS.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	08/15/90	BOTH SIDES OF THIS STREAM HAVE EXTENSIVE AREAS OF OILING. THE NORTH SIDE HAS POCKETS OF HEAVY-MODERATE 'OR' IN THE MID TO LOWER ITZ NEAR CLIFFS. THIS MAY REFORM INTO LENSE OF OIL DURING THE WINTER. THE UPPER ITZ ON THE NORTH SIDE HAS THE REMNANTS OF A LARGE TARMAT. OILING PERSISTS INTO STREAM CHANNEL APPROX 20 FEET DOWN FROM POINT WHERE STREAM CHANNEL CUTS THE BERM. THE SOUTH SIDE HAS LARGE AREAS OF MOD TO LIGHT 'OR' STRETCHING FROM UPPER ITZ TO THE UPPER 1/4 OF THE LITZ. NO FISH PRESENT.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	09/04/90	"KN500, HERRING BAY, SOUTHERN COVE HEAVILY OILED".
KNIGHT ISLAND, HERRING BAY	KN500 2261016996	B	09/08/90	SKETCH SHOWS HEAVY OILING ON BOTH SIDES OF STREAM IN MITZ AND LITZ. TRANSECT RUNS PARALLEL AND ADJACENT TO STREAM ON SOUTH.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	04/30/91	ALL PIT INFORMATION WAS RECORDED BY OG IN THE FIELD SITE. OBVIOUSLY ALL SITES ON THIS MAP DESCRIBE A VERY LARGE AREA THAT REMAINS OILED. ALL GRAVEL SEEMS TO BE SATURATED WITH OIL INCLUDING THE FIRST 6CM ON THE SURFACE.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	06/07/91	AREAS OF SUBSURFACE OIL,(HOR AND MOR), ADDRESSED IN WORK ORDER WERE HOPEFULLY DEGRADED TO LOR AND SOME MOR. OTHER AREAS OF LOR NOT ADDRESSED BY WORK ORDER REMAIN. AREA OF CONCERN IS LOR IN STREAM BED ON SOUTH SIDE. SHOULD BE RE-EVALUATED. IT IS LOCATED DIRECTLY ADJACENT TO LOWER MID STREAM GRAVEL BAR.

KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	06/25/91	AIMEE STATED THAT THE CLEANUP WENT WELL, ACCORDING TO THE WORK ORDER BUT THE LOR - MOR IN AREA ADJACENT TO THE STREAM NEEDED TO BE WORKED. MECHANICAL TILLING WAS SUGGESTED FOR THE H - MOR AREA AT THE NORTH SIDE OF THE COVE.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	07/11/91	NOT TILLED WITH INCOMING TIDE. BACKHOE PEELED THE OILED SEDIMENT (LOR TO HOR, OP) BACK AWAY FROM THE STREAM CHANNEL AND SPREAD IT OUT TO INCREASE THE SURFACE AREA AVAILABLE FOR DEGRADATION. OIL OBSERVED TO 18" (DEEP). THE LARGER AREA WAS TILLED WITH THE INCOMING TIDE. PORTIONS OF THIS AREA CONTAINED BLACK OIL AT 4-8" DEPTH WHICH HAD NOT BEEN TOUCHED BY THE 1990 TILLING OPERATION). A SIGNIFICANT QUANTITY OF OIL WILL CONTINUE TO BE PRESENT ON KN500B. SNARE BOOM WITH POMPOMS DRAPED ON IT WAS SET IN PLACE. ADDITIONAL BOOM WAS DEPLOYED BEYOND THE PRIMARY AREA BECAUSE SHEEN AND BLACK OIL WAS ESCAPING THE BOOM AREA, PORTION OF THE BOOM WAS SATURATED BLACK WITH OIL.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	08/01/91	MECHANICALLY TILLED AREAS C AND D, STILL WITH OIL (NO OIL LENSE IN ITS DUE TO MIXING). EXPOSED HOR TO MOR, SHEENING, BLACK BEADING WHEN DISTURBED. NO SURFACE OIL TO SPEAK OF OTHER THAN COATS OR STAINS ON BEDROCK. NEW TARMAT POSSIBLY TO BE FORMED FROM OIL EXPOSED FROM TILLING. NEEDS TO BE REASSESSED IN SPRING OF 1992. NO PINKS OBSERVED. *SURVEY FOCUSED ON DOCUMENTED OILING TREATED IN 1991. DIMENSIONS: LOR: 10X7M. MOR-HOR: 8X5M, 8X10M, 13X46M. THE LATTER 2 AREAS WERE MECHANICALLY TILLED IN JUNE 91.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	08/26/91	TAG MEMBERS INSPECTED THE SITE IN RESPONSE TO ADF&G SURVEY DATED 8/1/91. TAG MEMBERS MANUALLY TILLED, EXPOSED, RELOCATED AREA ON SOUTH SIDE OF BEACH. EXXON AGREED TO TREAT REMAINING 2 AREAS WITH DON BOLLINGER BIO CREW. CLEANUP FROM 0945 TO 1130. RECOMMENDED FOR FUTURE REASSESSMENT.
KNIGHT ISLAND, NORTHWEST SIDE	KN500 2261016996	B	08/26/91	TAG DECIDED IN FAVOR OF FURTHER TREATMENT TO STREAM SITE THIS YEAR. WHILE ON SITE, WE MANUALLY TILLED PARTS OF AREAS A AND B ON SOUTH SIDE OF STREAM. TILLING WAS WITHOUT THE TIDE AND NO ATTEMPT WAS MADE AT OIL RECOVERY.

KNIGHT ISLAND, NORTHWEST SIDE	KN500 B 2261016996	08/29/91	MANUALLY TILLED SITE 1 (NORTH END BY BEDROCK WALL) AND SITE 2 (SOUTH STREAM BANK). SITE 1 BEGAN W/HIGH TIDE AND TILLED H2O AREA, CHASING SHEEN DOWN TO BOOM. EFFECTIVE: BROWN SHEEN TURNED TO RAINBOW. STILL A WIDE AREA OF SHEEN REMAINED. AREA TREATED: 40M X 15M. AT SITE 2, RELOCATED ABOUT A 12-15M LENGTH OF SEDIMENT ALONG STREAMBED. AREA SHEENED HEAVILY, MORE SO THAN SITE 1. BROWN SHEEN TO RAINBOW. MOSTLY RAINBOW WHEN COMPLETE. SOME DISTURBANCE OF STREAMBED OCCURRED FROM RELOCATION. MORE OIL STILL IN SEDIMENTS, BUT DIMINISHED. CUSTOMBLEN APPLIED AT SITE 1 ONLY. SOME COAT/STAIN ON BEDROCK AT SITE 1.
KNIGHT ISLAND, LOWER HERRING BAY	KN551 2262016846	09/23/89	#89TWC273V. NO OIL, AREA D.
KNIGHT ISLAND, LOWER HERRING BAY	KN551 2262016862	09/22/89	#89TWC264V. NO OIL, AREA H.
KNIGHT ISLAND, LOWER HERRING BAY	KN551 2262016868	09/23/89	#89TWC268V. NO OIL, AREA L.
KNIGHT ISLAND, LOWER HERRING BAY	KN551 2262016881. N/A	06/07/89	NO OIL OBSERVED IN BAY. STREAMS# 2262016862, 2262016846, 2262016868,
KNIGHT ISLAND, LOWER HERRING BAY,	KN551 N/A	07/28/89	VERY LIGHT OILING - 1% FOR WHOLE BAY.
KNIGHT ISLAND, LOWER HERRING BAY	KN552 A 2262016895	09/23/89	#89TWC270V. NO OIL, AREA S.
KNIGHT ISLAND, JOHNSON BAY	KN554 2262016940	06/22/89	NO OIL OBSERVED NEAR STREAM, LIGHT OIL AT ENTRANCE OF BAY.
KNIGHT ISLAND, DRIER BAY MALLARD BAY	KN575 2262016980	06/13/89	NO OIL LISTED FOR MALLARD BAY. NO TREATMENT RECOMMENDED. GOLDEN EYE OBSERVED.

KNIGHT ISLAND, MUMMY BAY	KN602 B 2264016851	07/30/89	LIGHT OILING. A 1-4M WIDE BROWN OIL BAND PASSES THROUGH STREAM CHANNELS AND CONTINUES ON BOTH SIDES OF STREAM. 5 CM OIL PENETRATION IN STREAM - SHEEN PRODUCED. LOCALS SAY THAT IT MAY NOT BE EXXON VALDEX OIL. GOOD SKETCH. STREAM# WAS 2264016820 AT TIME OF SURVEY.
KNIGHT ISLAND, MUMMY BAY	KN602 B 2264016851	04/12/90	OIL FOUND ON SOUTH SIDE OF STREAM (RIGHT FACING IN) DRIP LINE OF TAR ON CLIFFS NEXT TO STREAM. 1MM PENETRATION. OIL ON STREAM BANKS.
KNIGHT ISLAND, MUMMY BAY	KN602 B 2264016851	04/27/90	VERY LIGHT OIL: A 1X2M TAR PATTY 2CM THICK RESIDES BETWEEN STREAM CHANNELS IN DELTA AREA. SPORADIC STAIN ON ROCKS ON BOTH SIDES OF STREAM. OIL ON STREAM BANKS.
KNIGHT ISLAND, THUMB BAY	KN605 2264016797	06/30/89	(DATE WAS 06/31/89). NO OIL OBSERVED IN SEGMENT.
KNIGHT ISLAND, THUMB BAY	KN605 2264016797	08/15/89	NO OIL OBSERVED, OLD CANNERY.
KNIGHT ISLAND, THUMB BAY	KN605 2264016797	08/15/89	MAP 33, 89TWC033V, NO BANK SAMPLE TAKEN AS NO OIL OBSERVED AT SITE.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	04/24/89	SKETCH SHOWS HEAVY OILING IN LARGE BAND ALONG STREAM ON EAST SIDE, HEAVY OILING IN SMALLER BAND ALONG WEST SIDE, AND HEAVY OILING WITHIN STREAM CHANNEL BELOW MERGER OF CHANNELS.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	06/02/89	LIGHT TO MODERATE OILING. MODERATE AT STREAM MOUTH ONLY. 10% OF OILING CONTINUOUS IN 10-12M BAND. 90% SPORADIC OILING. SKETCH SHOWS CREEK BED AS OIL-FREE.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	06/17/89	10-12' X 1/2-3/4 MILE OIL BAND ON EAST BANK OF EASTERN CH WEST BANK OF EASTERN CHANNEL HAD A 6X30' BAND OF OIL. GRAVELS WERE SATURATED TO A DEPTH OF 3-5" AND BROWN MOUSSE SLUMPED DOWN TO BELOW CHANNEL AT HIGH TIDE. MAP.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	06/17/89	NO VISIBLE OIL TO WEST OF STREAM. EAST SIDE OF STREAM HAS WEATHERED OIL AND MOUSSE IN AN AREA OF 10 X 2M. GRAVELS ARE SATURATED TO 3-5".

KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/02/89	DEPTH OF OIL ON EAST BANK: TOOK DEPTH EVERY 10 CM AND MEASURED 5-6CM DEEP MOUSSE.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/05/89	ONGOING TREATMENT - OIL/MOUSSE WAS SEEPING OUT OF SEDIMENTS INTO STREAM. CRITCHLOW SAID STREAM LOOKED DIFFERENT THAN WHEN HE CLASSIFIED IT PRIORITY 2 - OILED STUMP HAD NOT BEEN IN STREAM CHANNEL THEN.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/05/89	CONTINUOUS 6-8' BAND OF MOUSSE.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/06/89	SHORELINE HEAVILY COVERED WITH A COATING OF MOUSSE, WITH 1/2 DEEP POCKETS.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/08/89	HEAVY, 90% COVERAGE. (SEGMENT WAS KN035 IN LOG).
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/10/89	PER SKETCH. WEST BANK, EAST CHANNEL: 2M WIDE MOUSSE BAND, 2-5CM PENETRATION. OIL-SOAKED FUCUS AND DEBRIS NEAR STUMP. SPORADIC MOUSSE PATTIES IN M,LITZ. EAST BANK, EAST CHANNEL: STARTING UP STREAM IN SUPRA ITZ, A 10-12X4M MOUSSE BAND, 1-5 CM THICK FOLLOWED BY A 4M WIDE OILED BAND, 1-3CM THICK IN UITZ. ADJACENT TO THIS IN MITZ IS A <1CM THICK OIL COATING OVER SEDIMENT AND IN LITZ. OCCASIONAL MOUSSE PATTIES. MOUSSE FLOWS DOWN-SLOPE INTO STREAM, AND IS IN STREAM AT HIGHER TIDE LEVELS.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/11/89	SOME REMOVAL OF MOUSSE AND SEDIMENTS. HOWEVER, SEEPAGE CONTINUES ON BOTH BANKS.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/12/89	5-6CM PENETRATION OF BROWN, RUNNY MOUSSE MEASURED FOR 25M. MOUSSE COVERS BOULDERS IN STREAM CHANNEL. LARGE VERY HEAVILY OILED DRIFT LOG IN STREAM.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/26/89	POST TREATMENT - RESIDUE MOUSSE PATTIES, OILED FUCUS, POOLED MOUSSE 4MM DEEP PENETRATION ON STREAM BANK.

KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/26/89	HEAVILY OILED, MAP. POST TREATMENT ASSESSMENT. EASTERN BANK: APPROX. 6M WIDE BAND OF MOUSSY OIL IS STILL PRESENT ALONBG STREAM BANK IN UITZ AND MITZ. IN PLACES OIL CONTINUES INTO STREAM ITSELF. 7MM PENETRATION RECORDED 8" FROM STREAM ON EAST SIDE. MOUSSE FLOWS TOWARDS STREAM CHANNEL WITHIN 6". WESTERN BANK ALSO CONTAINED A THIN COATING OF MOUSSE. PART OF OILED STUMP REMAINS.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/26/89	50YDS X 100FT AREA OF MOUSSE IN PATCHES ABOUT 4MM DEEP, MOUSSE GOES DOWN INTO CREEK.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/28/89	MOUSSE 5-6CM DEPTH; THE LENGTH OF THE CONTAMINATED AREA WAS CONTINUING TO SEEP INTO STREAM (MOUSSE HAD BEEN RAKED). FURTHER WORK NEEDED.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	08/02/89	POOLS OF MOUSSE ON BOTH BANKS, SHEEN. FISH AT STREAM MOUTH.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	08/03/89	MID TREATMENT. OIL SHEEN EXTENDING 50FT INTO BAY. 150 BAGS OF OILED GRAVEL REMOVED JULY 4-6TH. EXTENDED PERMIT ISSUED.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	08/08/89	20' X 150' BAND OF MOUSSE MIXED WITH FINE GRAVELS .5-2" THICK - OOZING TOWARDS STREAM. LEFT BANK - PATCHES OF MOUSSE, LARGE OILED BOULDERS AND OILED STUMP IN STREAM.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	08/08/89	STREAM HEAVILY OILED. OIL COVERAGE EXTENDS FROM HIGH TIDE AT VEGETATION LINE TO STREAM CHANNEL AT LOW TIDE.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	08/10/89	THE EAST BEACH WAS OILED THROUGHOUT ITS ENTIRE LENGTH WITH AN AVERAGE OIL DEPTH OF 2-3 INCHES, MAXIMUM 6-8 INCHES. 14 BAGS OF OILED SEDIMENT REMOVED AT 1800.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	08/11/89	"STREAM IS ONE OF THE MORE HEAVILY OILED ONES. THE ORIGINAL SCAT LISTED MODERATE TO LIGHT; I THINK IT SHOULD HAVE BEEN MODERATE TO HEAVY. OIL IN THE STREAM. SEDIMENTS ARE TOTALLY COVERED BY WATER MOST OF THE TIME."

KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/11/89	AERIAL OBSERVATION: "STREAM SEEMED TO BE PROGRESSING WITH SHOVELS. SLICK WAS COMING OFF ISLAND AND NOT BEING CONTAINED, HEADED TOWARD STREAM.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/15/89	PHOTOS SHOW HEAVY OILING ON STREAM, WRITTEN INFO IS GENERAL.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/15/89	20' X 100' AREA HAD OILY SEDIMENTS REMOVED. LEFT BANK STILL HAS QUITE A BIT OF OIL. OILED STUMP WAS WINCHED UP THE BANK.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/16/89	MAP #33, HEAVY OIL IN GRAVEL 89RLG050V.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/28/89	PARTIALLY TREATED. "LOWER PART OF BANK STILL QUITE HEAVILY OILED."
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/29/89	BIOREMEDIATE ON WEST SIDE ONLY.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/29/89	MAP SHOWS HEAVILY OILED AREAS ON EAST AND WEST BANKS OF EASTERN STREAM CHANNEL.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/29/89	MAP OF TREATED VS. UNTREATED PORTIONS, SHEENING. TIDE HIGH.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	09/08/89	"LOOKS GOOD - NO SHEEN ON WATER."
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	09/13/89	"BEACH BELOW RICK'S MANUAL CLEANING TURNED INTO 2-3" THICK AP. NO SIGN OF DIFFERENCE FROM BIOREMEDIATION. APPEARS REOILED - VERY THICK".
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	09/30/89	COVERS WHOLE SEGMENT. OILING L, VL, H WITH MAX PENETRATION 8 CM, THICKNESS 40-60 MM. MOUSSE, STICKY, TARRY AND ASPHALT. ALTHOUGH THE TICK MARK IN THE SKETCH SHOWS THE STREAM MOUTH TO BE WITHIN THE VL REGION, THE ASSOCIATED NOTES ON THE SKETCH INDICATE THAT THE STREAM'S MOUTH IS WITHIN THE HEAVILY OILED REGION.

KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	10/20/89	TREATMENT REPORT FOR AUGUST 10-12, 1989, WITH EMPHASIS ON PROBLEMS OCCURRING THROUGHOUT TREATMENT. MOST OF 200M LENGTH OF EAST BANK IS OILED WITH THICK PATCHES OF MOUSSE. FREE OIL IN POOLS. LARGE OIL-SOAKED LOG IN STREAM.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	10/20/89	DATA FORMS AND MAPS. EAST BANK: HEAVY OILING ALONG BANK AND BEACH, APPROXIMATELY 12X15M AND 20X1 M ALONG STREAM. WEST BANK: MODERATE OILING ADJACENT TO STREAM, HEAVY OILING WITHIN 4M FROM STREAM EXTENDING TO 8M FROM STREAM. (APPROXIMATIONS WERE TAKEN OFF MAP).
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	12/08/89	HEAVY CONTAMINATION NOTED DURING MFO SAMPLING.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	04/13/90	THIS PLACE IS A DISASTER - IT NEEDS SHOVEL/STEAM. SEE MAP #KN701684LH: NOTHING HAS CHANGED, IT LOOKS WORSE THAN IT DID AFTER WE FINISHED SHOVEL REMOVAL AUGUST 12.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	04/27/90	TAKEN FROM OG SKETCH TO SUPPLEMENT MAD DATABASE. EAST BANK: 10X25M STAIN ON AREA CLEANED IN 89 IN LITZ/MITZ, AND 1X24M AP IN SAME AREA IN UITZ. THEN A 4X35M AP AREA FOLLOWED BY A 2X20M AP AREA. WEST BANK: 1X12M OILED GRASS FOLLOWED BY A 5X15M AP/OP AREA. KEN CRITCHLOW: "THIS STREAM SITE IS VERY HEAVILY OILED, PARTICULARLY ALONG THE LEFT BANK IN THE ENTIRE INTERTIDAL". "THE AP ON LEFT BANK IS THICK AND SHOWED SIGNS OF MOBILITY EVEN AT NEAR FREEZING TEMPERATURES".
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	04/27/90	THE STREAM BANKS APPEARED IN MUCH THE SAME CONDITION AS THEY WERE LAST FALL AFTER TREATMENT. OIL ON BANKS. SEE MAP AND RECOMMENDATION FOR OILING CONDITIONS.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	04/27/90	VERY HEAVILY OILED. SOME NATURAL CLEANING OCCURRED OVER WINTER. HE EXPECTS INCREASED OIL MOBILITY IN SUMMER, MORE CONTAMINATION.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	07/01/90	THICK MOBILE OIL IN BAND IN UITZ ON EASTERN BANK, RUNNING INTO STREAM. SURFACE AND SUBSURFACE OIL ON BOTH BANKS. SHEENING INTO STREAM FROM BOTH BANKS.

KNIGHT ISLAND, MARSHA MARSHA BAY	KN701 2263016840	B	07/23/90	ADDITIONAL INFO ON OILING FOR WORK ORDER MODIFICATION. HEAVIEST ACCUMULATIONS OF OILING OCCUR IN THE UITZ IN A 1X50M AREA AMONG LARGE ROCKS BY GRASS LINE. SKETCH.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	07/27/90	TREATMENT DESCRIPTIONS FROM MAY 26 TO JULY 27, 1990.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	08/12/90	3000-4000 (SALMON) SIGHTED AT MOUTH AT HIGH TIDE ON 8/11/90, NO SPAWNERS. WEST BANK: SPORADIC ASPHALT/MOUSSE/OR IN AN AREA 26M LONG X 1-7M WIDE. OIL EXTENDS INTO STREAM BED WHICH SHEENS INTO STREAM WHEN AGITATED. EAST BANK: SPORADIC TAR BALLS/LIGHT TO MOD 'OR' IN AN AREA 44M LONG X 1-9M WIDE FROM TOP OF OILED ZONE. A 146M LONG X 1-8M WIDE AREA OF BROKEN TARMAT/MOUSSE/OP/OR SEDIMENTS - MAINLY IN THE UITZ WITH SOME IN THE MITZ.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	09/13/90	"OILING NEARLY AS EXTENSIVE AS THE FIRST OILING BAT MAP INDICATED." MAP.
KNIGHT ISLAND, MARSHA MARSHA BAY	KN701 2263016840	B	05/05/91	TWO SEASONS OF TREATMENT HAVE GREATLY AIDED THE RECOVERY OF THIS ONCE HEAVILY OILED STREAM. DUE TO THE RELATIVELY STEEP SLOPE OF THE STREAM BANKS, THE TENDENCY OF THE OIL TO LIQUIFY AND FLOW TO THE STREAM AND THE PRESENCE OF OILED SEDIMENTS UP TO THE STREAM BED. AREA B OG MAP SITE 2 IS WHERE EXXON REP DUMPED BUCKETS OF OILED GRAVEL THAT HAD BEEN REMOVED FROM AREA B1 BY TOM & RICK. HE CLAIMED THEY WERE CLEAN (IN 1990). TWO SMALL PATCHED 'AP' LOCATED ON WEST BANK (SITE 3) NOT ON OG MAP. OILED AREA UPSTREAM, WEST BANK LARGER THAN DESCRIBED BY OG, IT IS MORE LIKE 1X6M, INSTEAD OF 1X3M.
KNIGHT ISLAND, MARSHA BAY	KN701 2263016840	B	05/05/91	ADDITION TO MAYSAP: OILING AREAS PER OG SKETCH. AREA A = 8X20M AP 10-15%. AREA B = 9X20M HSOR <10%. AREA B1 = 1X3M < 5% HSOR, AP. AREA C: .5X1M LSOR IN GRASS ROOT MAT. PITS IN AND NEAR AREAS A AND B12 SHOWED NO SUBSURFACE OILING.

KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	06/20/91	A CREW OF 10 LABORED FOR 7.5 HOURS ON THE STREAM BANK AREA, REMOVING 5 SUPER SACKS OF OILED SEDIMENTS & MOUSSE. OIL COVERAGE WAS MORE EXTENSIVE THAN INDICATED ON MAYSAP 1991. THE HSOR SEDIMENTS OF AREA B (OG SKETCH) WERE IN REALITY 'AP' TURNING INTO PURE MOUSSE IN THE M & LITZ. THIS 2-3CM LENS OF MOUSSE WAS COVERED BY 2-3CM OF CLEAN MATERIAL AS WELL AS SOME MUSSELS, BARNACLES AND GREEN ALGAE. AREA B1 WAS THOROUGHLY WORKED AND TILLED AT THE STREAMS EDGE. AREAS WORKED WERE LEFT "OPEN" TO FACILITATE FLUSHING OF RESIDUAL OILED SEDIMENTS. THE LARGER ROCKS CAN BE PLACED BACK ON THEM
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/02/91	AREA A H/MSOR MIXED WITH ORGANICS OVER OP TO HOR (AREA E), WEST BANK AREA HAS HOR BURIED OIL SEDIMENTS ALONG STREAM EDGE WHEN DISTURBED. ALONG EAST BANK OF STREAM (AREA C), SCATTERED AP/MS UNDER A CM OR SO OF CLEAN SEDIMENTS. AP/MS IN AREA D SPORADIC IN BOULDER/COBBLE FIELD. NO PINKS OBSERVED AT THE MOUTH, BUT PINKS OBSERVED IN MARSHA BAY. THIS STREAM SHOULD BE REASSESSED IN SPRING OF 1992. *SURVEY FOCUSED ON DOCUMENTED OILING TREATED IN 1991.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840	08/26/91	TAG VISIT / NO TREATMENT. AT MY REQUEST TAG AGREED TO 20 MINUTES OF MANUAL TILLING ON THE SITE WHILE WE WERE THERE. SUBSTRATE TILLED WAS MAINLY IN AREA C (POST ASSESSMENT 1991 MAP). OILING WAS SPORADIC OP LENSE IN THE LITZ AND MITZ, EAST STREAM BANK. COVERED BY 1-2CM OF CLEAN GRAVEL, THE LENSE WAS 1-2CM THICK. SOME TARMAT IN AREA D WAS ALSO BROKEN UP. TREATMENT WAS NOT THOROUGH, BUT OBVIOUS OILED AREAS WERE BROKEN UP. TILLING OCCURRED WITHOUT TIDE FLUSH. NO ATTEMPT WAS MADE TO COLLECT OR CONTAIN OIL. AREA WILL MOST LIKELY RELEASE A SHEEN FOR SEVERAL TIDE CYCLES. LIVE AND DEAD PINK SALMON PRESENT IN THE STREAM IN ABUNDANCE.
KNIGHT ISLAND, MARSHA BAY	KN701 B 2263016840		UNDATED, HANDWRITTEN NOTE. EAST BANK: SMALL PATCH OF OILED GRASS, 1X25M BAND OF OIL, 35X4M 5 CM THICK ASPHALT BAND, 20X2M BROKEN PAVEMENT. WEST BANK: 12X1M OILED GRASS, 15X15M BROKEN ASPHALT/TAR PATTIES.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016844	05/26/89	NO OIL SIGHTED.

KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016844	06/23/89	LIGHT OR NO OIL LISTED FOR SEGMENT. OCCASIONAL MOUSSE PATTIES. NO SKETCH.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016844	06/29/89	NO VISIBLE OIL.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016844	08/16/89	MAP #38, OILED ONLY IN PATCHES. 89TWC058V.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016844	04/11/90	RECOMMEND ANADSCAT. THE ENTIRE COVE AND MUCH OF THE STREAM & STREAMBED , BANKS, ETC. WERE COVERED WITH A THIN SHEET OF ICE PREVENTING A GOOD DETERMINATION OF OILING. SUGGEST RETURNING IN A WEEK OR TWO. OIL WAS FOUND HERE LAST AUGUST AND THIS IS AN EXTREMELY PROTECTED COVE. NEEDS TO BE U RESURVEYED, TWC 5/8/91.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016844	04/27/90	VERY LIGHT OILING. 3 TAR BALLS FOUND IN UITZ ON WEST SIDE OF STREAM.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016844 2263016850	08/04/89	VERY LIGHT OIL NEAR THE STREAM.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016850	04/26/89	SMALL SPLOTCHES (OF OIL) ON ROCKS THROUGHOUT THE INTERTIDAL AREA.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016850	05/26/89	A FEW STRAY SPLASHES OF MOUSSE NEAR IT.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016850	06/23/89	LIGHT OR NO OIL LISTED FOR SEGMENT. OCCASIONAL MOUSSE PATTIES. NO SKETCH.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016850	06/29/89	ONLY FEW MOUSSE SPLATTERS IN FLOOD PLAIN.
KNIGHT ISLAND, MARSHA BAY	KN704 A 2263016850	06/29/89	OIL IMMEDIATELY TO EAST OF ESTUARY AREA IN BAND.

MAINLAND, FOUL BAY	MA002	C	09/13/89	MUSSELS APPEAR DEAD IN MIDDLE TIDE POOL, SOUTH END (WAS IMPACTED WITH OIL). SE SIDE MODERATELY OILED, FUCUS DOES NOT LOOK HEALTHY (WHAT IS NOT DEAD). LIMPETS DEAD.
MAINLAND, FOUL BAY, ISLANDS (SUBSEGMENTS A-D)	MA002		05/22/89	ISLANDS IN BIGHT NORTH OF FOUL BAY RECEIVED MODERATE TO HEAVY OILING IN MITZ-UITZ. ISLAND 1: WEST SIDE HAS 14M WIDE OIL BAND WITH LIGHT TO MODERATE OIL AND MOUSSE CONCENTRATION. ISLAND 2: EAST SIDE HAS MODERATE TO HEAVY OILING > 30 CM PENETRATION. ISLAND 3: NORTH SIDE IS EXTENSIVELY OILED (WITH SOMEWHAT LESS OIL ON SOUTH SIDE) THROUGHOUT UITZ. ISLAND 4: MODERATELY TO HEAVILY OILED IN PORTIONS OF UITZ.
MAINLAND, FOUL BAY	MA002		07/31/91	HEAVY OIL-SATURATION TO 24". TREATMENT OCCURRING TO BEACH.
MAINLAND, FOUL BAY	MA003	A	05/24/89	LARGE SEGMENT. INFO TAKEN FROM SITE "P" DESCRIPTION (WHICH COVERS STREAM). LIGHT CONTINUOUS OIL COATING,
	2251015003			PENETRATION < 5CM MID TO HIGH INTERTIDAL. STORM BERM MODERATELY TO HEAVILY OILED WITH TAR AND MOUSSE AT DEPTH. WIDTH OF OILED BEACH IS 16M. HEAVIEST OILING CONSISTS OF MOUSSE AND TAR DEPOSITS IN CLUMPS UP TO 5M LONG.
MAINLAND, FOUL BAY	MA003	A	09/13/89	OILING N, VL, L. SUPRA- TO MID INTERTIDAL, MAX PENETRATION 15 CM. 15% OF WHOLE SEGMENT OILED. STREAM AREA WAS
	2251015003			NOT SURVEYED.
MAINLAND, FOUL BAY	MA003	A	10/10/89	ABOVE FOUL BAY, NE TIP OF MAINLAND, MODERATELY OILED AT THE HIGH TIDE MARK.
	2251015003			
MAINLAND, FOUL BAY	MA003 2251015003		01/05/90	"NO OILING VISIBLE". (SEGMENT IN LOG WAS MA001).
MAINLAND, FOUL BAY	MA003 2251015010		09/13/89	HEAD OF BAY, STREAM BLOCKED. INTERTIDAL SPAWNING, NO OIL EVIDENT. SOME BROWN SHEEN FLOATING IN FOUL BAY.

NAKED ISLAND, CABIN BAY	NA024 2224012960	08/15/89	SKETCH SHOWS "NO OIL NEAR STREAM". TRACE TO NO OIL. LIGHT OIL SHOWN SEGMENT IN GENERAL.
NAKED ISLAND, CABIN BAY	NA024 2224012960	09/11/89	STREAM ON HEAD OF BAY NOT OILED. BEACHES ON SOUTH SHORE OF CABIN BAY HAVE STAIN AT HIGH TIDE MARK.
NAKED ISLAND, CABIN BAY	NA024 2224012960	09/26/89	NO OIL RECORDED FOR STREAM AREA. LIGHT OR VERY LIGHT OIL RECORDED ELSEWHERE IN SEGMENT. SMALL PATCHES WITH HEAVIER OILING.
NAKED ISLAND, CABIN BAY	NA024	04/02/89	TRANSECT 3. NOT CLEAR WHETHER BY STREAM. "WHOLE SOUTH SHORELINE OF CABIN BAY OILED IN 90% ON 5' SLOPE".
NAKED ISLAND, OUTSIDE BAY	NA026 2224012950	08/15/89	PER SKETCH NEAREST OBSERVED OIL IS 2,000FT FROM STREAM.
NAKED ISLAND, OUTSIDE BAY	NA026 2224012950	09/11/89	NO MENTION OF OILING.
NAKED ISLAND, OUTSIDE BAY	NA026 2224012950	09/22/89	SAMPLE 89TWC256V, NO OIL, AREA H.
NAKED ISLAND, OUTSIDE BAY	NA026 2224012950	09/23/89	NO OILING DETERMINATION FOR STREAM AREA. VERY LIGHT OIL RECORDED FOR ADJACENT AREA.
NAKED ISLAND, OUTSIDE BAY	NA026 2224012950	04/26/90	NO OIL OR OILED DEBRIS NOTED. APPEARS TO HAVE SELF CLEANED OVER WINTER. NO OIL FOUND WITHIN ONE MILE OF STREAM.
MAINLAND, PADDY BAY	PA001 2262016010	07/19/89	NO OIL WAS SEEN ON THE BANKS OF EITHER FISH STREAM & THE ABSORBENT BOOM CROSSING BOTH STREAMS WERE FREE OF OIL. LIGHT OIL 1/3 MILE FROM STREAM - PER SKETCH.
MAINLAND, PADDY BAY,	PA001 2262016010	08/22/89	1-2" WIDE BATHTUB RING AROUND BOULDERS AT MOUTH OF BAY. BUT STREAM AT END OF BAY.

SQUIRREL ISLANDS	SL001	D	07/27/89	MODERATE OIL, VISIT TO SEGMENT - TREATMENT OCCURRING.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	08/01/89	NO APPARENT OIL WAS OBSERVED.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	09/25/89	HEAVY OIL - OILED BAND UITZ 6" PENETRATION (WAS WB003). COVE "A" BELOW CLAW PEAK CONTAINS HEAVY OIL. (VIDEO 960-1074). EGGS IN OILED SEDIMENT (VIDEO 89RLG009V, METER# 1074-1125). OILED BAND AT UPPER INTERTIDAL (1125-1156) CONTAINS OVERVIEW. 6" PENETRATION DOCUMENTED ON 1125-1226. SED SAMPLES 89TWC278V, VD.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	04/12/90	NO OIL. NOTE: THIS STREAM WAS LATER DISCOVERED TO HAVE AN OILED BAND OP 1M WIDE 20M LONG. OIL PRESENT UNDER SNOW AT TIME OF SURVEY. ADDENDUM WRITTEN TO WORK AREA.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	04/27/90	NO OIL. DETERMINATION MADE FROM PRE-ANADSCAT SURVEY.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	07/08/90	SKETCH SHOWS FORMER LOCATION OF AP BAND: 1.5X27M, 3-6CM THICK, ON WEST SIDE OF STREAM. EAST SIDE HAD INTERMITTENT AP BAND OF SIMILAR WIDTH. SPORADIC TAR PATTIES WERE PRESENT IN STREAM CHANNEL. OIL REMAINING INCLUDED LIGHT OR/OF RUNNING 27M LONG ON WEST SIDE AND SOME IN BOULDERS ON EAST SIDE.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	08/05/90	OILING CONSISTS OF COAT ON COBBLE/BOULDERS AND ROCK WITH SOME MODERATE SOR WHERE TAR MATS WERE REMOVED. OILING NONE TO LIGHT. SKETCH SHOWS 1-2X60M BAND OF SOR.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	08/08/90	OIL BAND OF GRAVEL IN UITZ. OIL SOAKED WALNUT SIZED GRAVEL OP/OR AND TARMAT. OIL OBSERVED ON STREAM BANKS AND IN STREAM BED. ANADROMOUS FISH OBSERVED AT MOUTH OF STREAM. SKETCH SHOWS 50 M LONG TAR MAT BAND ON EAST SIDE OF STREAM AND 40 M LONG AT WEST SIDE OF STREAM.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 2262016322	B	08/14/90	RECOMMENDS FOR REASSESSMENT IN 1991. SMALL AMOUNTS OF SOR AND HOR REMAIN. THIS STREAM HAD NOT BEEN SURVEYED ON ANADSCAT DUE TO SNOW COVER DURING PRE-ANADSCAT.

MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 C 2262016321	08/01/89	NO APPARENT OIL OBSERVED. DUCKS SIGHTED SOMEWHERE ON SEGMENT DURING SURVEY.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 C 2262016321	09/25/89	TOOK VIDEOS OF (AERIAL) INTERTIDAL (89RLG009V METER# 1267-1274). SAMPLE 89TWC279V. NO OIL FOUND.
MAINLAND, WHALE BAY, CLAW PEAK POINT	WH003 C 2262016321	04/12/90	NO OIL OBSERVED.
MAINLAND, WHALE BAY	WH003	01/05/90	"NO OILING VISIBLE" (SEGMENT# IN LOG WAS CH020).
(GENERAL)	N/A	04/04/89	FWS AERIAL SURVEY INDICATES LOONS, GREBES, HARLEQUINS AND MURRELETS LESS IMPACTED THAN GOLDENEYE, SCOOTERS, MERGANSERS, GULLS.
(GENERAL)	N/A	05/28/89	TERRY CAMPBELL (D&M) - SMOLT TRAPS IN HERRING BAY, SNUG HARBOR, PORT ETCHER, BAY OF ISLES, MCLEOD HARBOR, PRESENTED AT SCIENCE MEETING.

NOTE: This table documents oiling conditions at Harlequin habitat areas. It also reveals the vast amount of areial activity as almost every survey report was conducted by landing a helicopter at the mouth of a stream.

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TABLE 8a

Table 8a

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE
SUMMER SEASON
PRINCE WILLIAM SOUND

HABITAT: OFFSHORE ROCKS

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	MANDAYS TOTAL	TREAT TYPE	TREAT DAYS	EQUIPMENT
AGULIAK	AG001	Y	Y	JULY	171	171	WASH	16	LCM\MAXI\OMNI\ HIPRESS H20\ SKIMMER
CHENEGA	CH011	Y	Y	JULY	7	7	HAND	1	HAND
CRAFTON	CR004	Y	Y	AUG	N\A	N\A	WASH	13	FLD\LCM\HIPRESS H20\ INCOMPLETE DATA
EVANS	EV010	Y	Y	JULY	13	13	HAND	1	HAND
PLEIADES	PL001	Y	Y	AUG	29	29	WASH	7	LCM\OMNI\HAND\FLD\SKIMMER\ HIPRESS H20
PERRY	PR002	Y	Y	AUG	565	565	WASH	51	LCM\MAXI\OMNIFLD\SKIMMER\
SQUIRREL	SL001	Y	Y	JULY	170	170	WASH	19	LCM\OMNI\MAXIFLD\SKIMMER\ HIPRESS H20\HAND
				GRAND	TOTAL	955		108	N\A=NOT AVAILABLE

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE

HABITAT: MUSSEL BEDS — SUMMER SEASON

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
BAINBRIDGE	BA004	Y	Y	AUG	23	HAND	2	LCM\HAND
TOTAL:					23		2	

HABITAT: MUSSEL BEDS — SUMMER SEASON

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
EVANS	EV015	Y	Y	JULY	39	WASH	4	LCM\MAXI\SKIMMER\FLD\HAND\HIPRESS H20
EVANS	EV015	Y	Y	AUG	56	WASH	14	LCM\MAXI\SKIMMER\FLD\HAND\HIPRESS H20
TOTAL:					95		18	

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE
SUMMER SEASON

HABITAT: BAYS&LAGOONS\POSS.UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
DISK	DI059	Y	Y	JUNE	236	WASH	31	LCM\OMNI\SKIMMER\FLD\HAND\HIPRESS H20\
DISK	DI059	Y	Y	JULY	154	WASH	15	LCM\OMNI\SKIMMER\FLD\HAND\HIPRESS H20
TOTAL:					390		46	

SUMMER SEASON

HABITAT: BAYS&LAGOONS\POSS. UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
KNIGHT	KN500	Y	Y	JULY	508	WASH	62	LCM\MAXI\OMNI\FLD\HAND\SKIMMER HIPRESS H20
TOTAL:					508		62	

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE

SUMMER SEASON

HABITAT: BAYS&LAGOONS\POSS.UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
KNIGHT	KN211	Y	Y	JUNE	26	HAND	2	LCM\SKIMMER\HAND
KNIGHT	KN211	Y	Y	AUG	235	WASH	27	LCM\MAXI\OMNI\HAND\SKIMMER\FLD\HI-PRESS H20
TOTAL:					261		29	

SUMMER SEASON

HABITAT: STREAMS

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
ELEANOR	EL052	Y	Y	JUNE	662	WASH	73	LCM\MAXI\HAND\FLD\SKIMMER
TOTAL:					662		73	

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE

SUMMER SEASON

HABITAT: STREAMS

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
KNIGHT	KN401	Y	Y	AUG	76	HAND	1	LCM\HAND
TOTAL:					76		1	

SPRING SEASON

HABITAT: STREAMS

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TREAT	TREAT DAYS	EQUIPMENT
ELEANOR	EL052	Y	Y	MAY	267	WASH	18	LCM\MAXI\FLD\HAND\HIPRESS H20
TOTAL:					267		18	

FALL SEASON

HABITAT: BAYS&LAGOONS\POSS.UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
KNIGHT	KN211	Y	Y	SEPT	526	WASH	50	LCM\MAXI\OMNI\SKIM\FLD\HAND\HIPRESS H20
TOTAL:					526		50	

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE
FALL SEASON

HABITAT: OFFSHORE ROCKS

ISLAND	SEGMENT	OILED Y\N	TREAT Y\N	MONTH	MANDAYS	TREAT TYPE	TREAT DAYS	EQUIPMENT
PLEIADES	PL001	Y	Y	SEPT	18	WASH	10	LCM\OMNI\FLD\SKIMMER\HIPRESS H20
TOTAL:					18		10	

DEFINITION OF TERMS:
LCM.....LANDING CRAFT MEN
FLD.....WATER FLOOD SYSTEM(USUALLY SET UP IN SUPRA TIDAL ZONE TO RAISE WATER TABLE OF BEACH AND FLOAT OIL
HAND.....SCRUBBING OILED ROCKS WITH POM POM OR ABSORBANT, POLICING AREA FOR OILED DEBRIS
MAXI.....NAME GIVEN TO BARGE EQUIPPED WITH PRESSURE PUMPS,BOILERS,CHERRY PICKER CRANES,LONG LENGTHS OF PRESSURE HOSE,EXTENSIVE BOOMS, AND A SMALL FLOTILLA OF SKIFFS AND ATTENDANT WATER CRAFT
OMNI.....SELFPROPELLED BARGE EQUIPPED WITH MULTIPLE BOILERS, WATER PRESSURE PUMPS,AND A LONG JOINTED HYDRAULIC ARM WHICH FEEDS A MULTIPLE SPRAYER HEAD WITH HOT HIPRESSURE WATER WHICH CAN ARTICULATE UP AND DOWN THE OILED BEACH. ALSO CONTAINS BOOMS AND SMALL SKIFFS
HIPRESS.....THIS IS A PRESSURIZED WATER DELIVERY SYSTEM WHICH CAN BE CARRIED
H20 ON A VARIETY OF CRAFT FROM LCM'S TO BARGES. IT DELIVERS PRESSURIZED WATER VIA MULTIPLE HOSES TO HAND HELD NOZZLES FOR WASHING THE BEACH.
SKIN.....A SKIMMER CAN BE A NUMBER OF DIFFERENT UNITS, EACH OF WHICH IS CAPABLE OF PICKING UP OIL FROM THE OCEANS SURFACE, SERPERATING THE OIL FROM THE WATER AND STORING IT IN A RESERVOIR.

DEFINITION OF TERMS: (CONT'D)

MANDAYS.....ONE MAN WORKING AN 8 HOUR DAY
TREATMENTDAYS.....THE SUMMATION OF ALL THE INDIVIDUAL PIECES OF EQUIP-
MENT DAYS (OMNI DAY WOULD BE ONE 8 HOUR DAY OF WORK FOR
THE OMNI BARGE)
POSS.....STANDS FOR POSSIBLE

ALL OF THE DATA PRESENTED IN THE PRECEEDING TABLES CAME FROM THE USCG SEGMENT FILES AT THE FEDERAL ONSCENE COORDINATORS OFFICE 4TH FLOOR KEY BANK BUILDING ANCHORAGE ALASKA.

TABLE 8b

Table 8b

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
BAINBRIDGE	BA006	MUSSEL BEDS	Y	N						
CHENEGA	CH010	MUSSEL BEDS	Y	Y	SUMMER	295	295	WASH HAND	29	HAND\MAXI\SKIM\PRESS H20\FLD\OMNI
DICK	DI067	MUSSEL BEDS	Y	Y	SUMMER	559	559	WASH	55	MAXI\SKIM\OMNI\LCM\FLD\PRESS H20
ELEANOR	EL013	MUSSEL BEDS	Y	Y	SPRING	282	282	WASH	12	FLD\PRESS H20\OMNI\SKIM
ELEANOR	EL010	MUSSEL BEDS	Y	Y	SUMMER	770	770	HAND WASH	84	FLD\PRESS H20\HAND\MAXI\OMNI\SKIM\ LCM
ELEANOR	EL015	MUSSEL BEDS	Y	Y	SUMMER	12	12	HAND	2	HAND\LCM
ELRINGTON	ER020	MUSSEL BEDS	Y	Y	SUMMER	59	59	HAND	6	HAND\LCM
ELRINGTON	ER020	MUSSEL BEDS	Y	Y	SUMMER	466	466	HAND WASH	59	HAND\LCM\OMNI\SKIM\PRESS H20\FLD
EVANS	EV070	MUSSEL BEDS	Y	N						
FLEMING	FL004	MUSSEL BEDS	Y	Y	SUMMER	466	466	HAND WASH	39	HAND\FLD\SKIM\MAXI\OMNI\LCM PRESS H20
KNIGHT	KN113	MUSSEL BEDS	Y	Y	SUMMER	791	791	WASH	61	LCM\MAXI\OMNI\SKIM\FLD\PRESS H20
KNIGHT	KN106	MUSSEL BEDS	Y	Y	SUMMER	8	8	HAND	2	HAND\LCM
KNIGHT	KN300	MUSSEL BEDS	Y	N						
LATOUCHE	LA015	MUSSEL BEDS	Y	Y	SUMMER	2219	2219	HAND WASH	198	LCM\OMNI\MAXI\SKIM\HAND\FLD\PRESS H20
LATOUCHE	LA015	MUSSEL BEDS	Y	Y	FALL	852	852	HAND WASH	91	LCM\MAXI\OMNI\SKIM\HAND\FLD\ PRESS H20
MAINLAND	MA002	MUSSEL BEDS	Y	N						
					TOTAL	8971		TOTAL	699	
APPLEGATE	AE005	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						

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1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
ESHAMY BAY	ED009	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
GREEN	GR015	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLLUENCE	Y	N						
GREEN	GR300	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
LATOUCHE	LA010	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SUMMER	353	353	HAND MECH. WASH	56	BACKHOE\FRONTEND LOADER\LCM\ MANI\SKIM\OMNI\FLD\PRESS H20
					TOTAL	353		TOTAL	56	

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
NAKED	NA024	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
NAKED	NA028	BAYS&LAGOON POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
PERRY	PR003	BAYS&LAGOON POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
APPLEGATE	AE004	OFFSHORE ROCKS	Y	N						
AGULIAK	AG000	OFFSHORE ROCKS	Y	N						
DELENIA	DE001	OFFSHORE ROCKS	Y	N						
FLEMING	FL003	OFFSHORE ROCKS	Y	N						
GREEN	GR004	OFFSHORE ROCKS	Y	N						
GREEN	GR101	OFFSHORE ROCKS	Y	N						
KNIGHT	KN020	OFFSHORE ROCKS	Y	Y	SPRING	0	0	HAND	2	HAND\LCM
KNIGHT	KN022	OFFSHORE ROCKS	Y	N						
KNIGHT	KN141	OFFSHORE ROCKS	Y	Y	SUMMER	N\A	N\A	WASH	3	FLD\PRESS H20\LCM
MUMMY	MU000	OFFSHORE ROCKS	Y	Y	SUMMER	N\A	N\A	WASH	2	PRESS H20\LCM
WHALE BAY	WH003	OFFSHORE ROCKS	Y	N						
					TOTAL	0		TOTAL	7	
CHENEGA	CH017	STREAM	Y	N						
EVANS	EV006	STREAM	Y	Y	SUMMER	0	0	HAND	2	HAND\LCM
					TOTAL	0		TOTAL	2	

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1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
KNIGHT	KN010	STREAM	Y	Y	SUMMER	8	8	HAND	2	HAND\LCM
KNIGHT	KN102	STREAM	Y	Y	SUMMER	1749	1749	HAND WASH	127	PRE89 H20\FLD\SKIM\MAXI\LCM\HAND
KNIGHT	KN201	STREAM	Y	Y	SUMMER	2	2	HAND	2	HAND\LCM
KNIGHT	KN575	STREAM	Y	N						
PADDY BAY	PA001	STREAM	N	N						
WHALE BAY	WH502	STREAM	N	N						
WHALE BAY	WH504	STREAM	N	N						
					TOTAL	1759		TOTAL	131	

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:FINITION OF TERMS:

:M.....LANDING CRAFT MEN
LD.....WATER FLOOD SYSTEM (USUALLY SET UP IN THE SUPRA TIDAL ZONE TO RAISE THE WATER TABLE WHICH FLOATS THE OIL AS THE BEACH IS WASHED.
WD.....SCRUBBING OILED ROCKS WITH POM POM OR ABSORBANT, POLICING THE AREA FOR OILED DEBRIS.
MI.....NAME GIVEN TO BARGE EQUIPPED WITH PRESSURE PUMPS,BOILERS,CHERRY PICKER CRANES,LONG LENGTHS OF PRESSURE HOSE, EXTENSIVE BOOMS, AND A SMALL FLOTILLA OF SKIFFS AND ATTENDANT WATER CRAFT.
MNI.....SELFPROPELLED BARGE EQUIPPED WITH MULTIPLE BOILERS, WATER PRESSURE PUMPS, AND A LONG JOINTED HYDRAULIC ARM WHICH CAN ARTICULATE UP AND DOWN THE OILED BEACH. IT ALSO CONTAINS BOOMS AND SMALL SKIFFS.
IPRESS W20.....THIS IS A PRESSURIZED WATER DELIVERY SYSTEM WHICH CAN BE CARRIED ON A VARIETY OF CRAFT FROM LCM'S TO BARGES. IT DELIVERS PRESSURIZED WATER VIA MULTIPLE HOSES TO HAND HELD NOZZLES FOR WASHING THE BEACH.
KIM.....A SKIMMER CAN BE A NUMBER OF DIFFERENT UNITS, EACH OF WHICH IS CAPABLE OF PICKING UP OIL FROM THE OCEANS SURFACE, SEPERATING THE OIL FROM THE WATER, AND STORING OIL IN A RESERVOIR.
ANUTL.....TILLING, SPADING, OR RAKING BY HAND THE OILED SURFACE OF A BEACH TO EXPOSE OIL.
POTWASH.....WASHING SPECIFIC SMALLER AREAS WITH A STEAM SPRAYER UNIT.
ITACHI.....TILLING OR PULLING DOWN STORM BERMS WITH A TRACKED BACKHOE.
WHEELER.....4 WHEEL DRIVE HONDA TYPE MOTOR BIKE PULLING CARTS USED TO HAUL BUCKETS OF OILED GRAVEL TO LCM'S.
ATTILL.....TILLING OF A BEACH WITH THE RIPPER TEETH BEHIND A CATEPILLAR TRACTOR.
CHARGE.....USED TO LAND HITACHI ON A BEACH
ELO.....A HELICOPTER WHICH CARRIED A SMALL CLEANUP CREW TO WORKSITES NOT NEEDING LARGE CREWS.
ANDAYS.....ONE MAN WORKING AN 8 HOUR DAY.
REATMENTDAYS.....THE SUMMATION OF ALL THE INDIVIDUAL PIECES OF EQUIPMENT DAYS (OMNIDAY WOULD BE ONE 8 HOUR DAY OF WORK FOR THE OMNI BARGE)
'OSS.....STANDS FOR POSSIBLE
!\A.....NOT AVAILABLE
'REAT.....TREATMENT
'REAT TYPE.....GENERALIZED BREAKDOWN OF TREATMENTS INTO WASH, HAND (MANUAL), AND MECHANICAL

LL OF THE DATA PRESENTED IN THE PRECEEDING TABLES CAME FROM THE USCG FOSC SEGMENT FILES IN ANCHORAGE, THE DEPT. OF ENVIRONMENTAL CONSERVATION OIL SPILL RESPONSE OFFICE SEGMENT FILES, OR THE ALASKA DEPT. OF FISH AND GAME HABITAT EVOS LIBRARY FILES IN ANCHORAGE.

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TABLE 8c

TABLE 8c

1989 MECHANICAL\MANUAL TREATMENT DISTURBANCE

SUMMER

HABITAT: BAYS&LAGOONS\POSS.UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT	MONTH	MANDAYS	TREATMENT TYPE	TREATMENT DAYS	EQUIPMENT
KNIGHT	KN115	JUNE	2322	WASH	181	LCM\MAXI\SKIM\L FLD\HIPRESS H20
KNIGHT	KN115	JULY	1082	WASH	85	LCM\MAXI\SKIM\ FLD\HIPRESS H20
TOTAL			3404		266	

TABLE 8d

Table 8d

1990 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
BAINBRIDGE	BA004A	MUSSEL BED	Y	N						
BAINBRIDGE	BA006C	MUSSEL BED\OFFSHORE RKS.	Y	Y	SUMMER	24	24	HAND	6	LCM\HAND\4WHEELER
CHENEGA	CH010B	MUSSEL BED	Y	Y	SUMMER	6	6	HAND	3	HAND\4WHEELER\LCM
CHENEGA	CH010A	MUSSEL BED	Y	Y	SUMMER	32	32	HAND	6	HAND\LCM\4WHEELER\HANDTILL
CHENEGA	CH010C	MUSSEL BED	Y	Y	SUMMER	16	16	HAND	6	HAND\LCM\4WHEELER\HANDTILL
DICK	DI007A	MUSSEL BED	Y	Y	SPRING	16	16	HAND	6	HAND\4WHEELER\LCM
ELEANOR	EL010A	MUSSEL BED	Y	Y	FALL	8	8	HAND	3	HAND\4WHEELER\LCM
ELEANOR	EL010A	MUSSEL BED	Y	Y	SPRING	16	16	HAND	6	HAND\4WHEELER\LCM
ELEANOR	EL010A	MUSSEL BED	Y	Y	SUMMER	8	8	HAND	3	HAND\4WHEELER\LCM
ELRINGTON	ER020D	MUSSEL BED	Y	Y	SPRING	48	48	HAND	16	HAND\4WHEELER\LCM
EVANS	EV010A	MUSSEL BED	Y	Y	SUMMER	8	8	HAND	3	HAND\4WHEELER\LCM
EVANS	EV070E	MUSSEL BED	Y	Y	SUMMER	16	16	HAND	6	HAND\4WHEELER\LCM
EVANS	EV070F	MUSSEL BED	Y	Y	SUMMER	8	8	HANDTL	2	LCM\HANDTILL
EVANS	EV070F	MUSSEL BED	Y	Y	FALL	8	8	HANDTL	2	LCM\HANDTILL
FLEMING	FL004A	MUSSEL BED	Y	Y	SUMMER	16	16	HAND	6	LCM\HAND\4WHEELER
KNIGHT	KN113B	MUSSEL BED	Y	N						
KNIGHT	KN136A	MUSSEL BED	Y	Y	SPRING	8	8	HAND	3	HAND\4WHEELER\LCM
KNIGHT	KN136A	MUSSEL BED	Y	Y	SUMMER	232	232	HAND WASH	96	HAND\LCM\4WHEELER\PRESS H20\SPOT WASH
KNIGHT	KN136A	MUSSEL BED	Y	Y	FALL	8	8	HAND	3	HAND\4WHEELER\LCM
KNIGHT	KN306A	MUSSEL BED	Y	Y	SPRING	21	21	HAND	6	HAND\4WHEELER\LCM
KNIGHT	KN306A	MUSSEL BED	Y	Y	SUMMER	8	8	HANDTL	1	LCM\HANDTILL
LATOUCHE	LA019E	MUSSEL BED	Y	Y	SUMMER	8	8	HAND	3	HAND\4WHEELER\LCM
MAINLAND	MA002A	MUSSEL BED	Y	N	TOTAL	917		TOTAL	166	

1990 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OIL Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
APPLEGATE	AE005A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SPRING	56	56	HAND	21	HAND\4WHEELER\LCM
APPLEGATE	AE005A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	16	16	HAND WASH	7	HAND\4WHEELER\LCM\SPOTWASH
APPLEGATE	AE005A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	FALL	8	8	HANDTL	2	HANDTILL\LCM
APPLEGATE	AE005A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	32	32	HANDTL	10	HAND\4WHEELER\LCM\HANDTILL
APPLEGATE	AE005A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	8	8	HAND	3	HAND\4WHEELER\LCM
BISK	BI050	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SPRING	8	8	HAND	3	HAND\4WHEELER\LCM
ECHAMY BAY	EB009A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	N						
GREEN	GR010A	BAYS&LAGOONS\UNTRPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	8	8	HAND	2	HANDTILL\LCM
GREEN	GR300A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	8	8	HAND	3	HAND\4WHEELER\LCM
KNIGHT	KN211B	BAYS&LAGOONS\UNTRAPPED STREAM INFLLUENCE POSSIBLE	Y	N						
KNIGHT	KN211E	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	16	16	HAND MECH.	3	HAND\4WHEELER\LCM\HITACHI
KNIGHT	KN500A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	16	16	HAND	6	HAND\4WHEELER\LCM
KNIGHT	KN500B	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	72	72	HAND MECH.	23	HAND\4WHEELER\LCM\HANDTILL\CATTILL
LATOUCHE	LA019A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	120	120	HAND MECH.	45	HAND\4WHEELER\LCM\HITACHI
LATOUCHE	LA019A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	FALL	8	8	HAND MECH.	3	HAND\4WHEELER\LCM\CATTILL
NAKED	NA024A	BAYS&LAGOONS\UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	8	8	HAND	3	HAND\4WHEELER\LCM
					TOTAL	384		TOTAL	134	

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1990 MECHANICAL\MANUAL TREAMTMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
NAKED	NA020F	BAYS&LAGOONS UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	16	16	HAND	8	HAND\4WHEELER\LCM
NAKED	NA020D	BAYS&LAGOONS UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	1	1	HAND	1	HAND\4WHEELER\LCM
PERRY	PR003A	BAYS&LAGOONS UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	16	16	HANDTL	8	HAND\4WHEELER\LCM\HANDTILL
PERRY	PR003B	BAYS&LAGOONS UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	32	32	HANDTL	16	HAND\4WHEELER\LCM\HANDTILL
PERRY	PR003B	BAYS&LAGOONS UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	FALL	16	16	HANDTL	8	HAND\4WHEELER\LCM\HANDTILL
PERRY	PR003C	BAYS&LAGOONS UNTRAPPED STREAM INFLUENCE POSSIBLE	Y	Y	SUMMER	6	6	HAND	3	HAND\4WHEELER\LCM
					TOTAL	88		TOTAL	36	

1990 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OIL Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTAL	TREAT TYPE	TREAT DAYS	EQUIPMENT
APPLEGATE	AE004A	OFFSHORE ROCKS	Y	Y	SUMMER	56	56	HAND	21	HAND\4WHEELER\LCM
APPLEGATE	AE004B	OFFSHORE ROCKS	Y	Y	SUMMER	40	40	HAND	15	HAND\4WHEELER\LCM
AGULIAK	AG001A	OFFSHORE ROCKS	Y	Y	SPRING	3	3	HAND	1	HAND\HELO
AGULIAK	AG001A	OFFSHORE ROCKS	Y	Y	SUMMER	6	6	HANDTL	2	HANDTILL\LCM
AGULIAK	AG009A	OFFSHORE ROCKS	Y	Y	SPRING	9	9	HAND	3	HAND\4WHEELER\LCM
AGULIAK	AG009A	OFFSHORE ROCKS	Y	Y	SUMMER	8	8	HAND HANDTL	4	HAND\4WHEELER\LCM\HANDTILL
AGULIAK	AG009B	OFFSHORE ROCKS	Y	Y	SPRING	9	9	HAND	3	HAND\4WHEELER\LCM
CHENEGA	CH011A	OFFSHORE ROCKS	Y	Y	SUMMER	6	6	HANDTL	2	HANDTILL\LCM
CRAFTON	CR004A,B,C	OFFSHORE ROCKS	Y	N						
DELENIA	DE001A	OFFSHORE ROCKS	Y	N						
EVANS	EV010A	OFFSHORE ROCKS	Y	Y	SUMMER	18	18	HAND	6	HAND\4WHEELER\LCM
EVANS	EV010B	OFFSHORE ROCKS	Y	Y	SUMMER	9	9	HAND	3	HAND\4WHEELER\LCM
FLEMING	FL003	OFFSHORE ROCKS	Y	N						
GREEN	GR004A	OFFSHORE ROCKS	Y	N						
GREEN	GR101A	OFFSHORE ROCKS	Y	Y	SUMMER	6	6	HAND	2	HAND\4WHEELER\LCM
GREEN	GR101B	OFFSHORE ROCKS	Y	Y	SUMMER	9	9	HAND	3	HAND\4WHEELER\LCM
KNIGHT	KN020	OFFSHORE ROCKS	Y	N						
KNIGHT	KN022	OFFSHORE ROCKS	Y	N						
KNIGHT	KN141A	OFFSHORE ROCKS	Y	Y	SPRING	9	9	HAND	3	HAND\4WHEELER\LCM
KNIGHT	KN141A	OFFSHORE ROCKS	Y	Y	SUMMER	6	6	HANDTL	2	HANDTILL\LCM
MUMMY	MU000	OFFSHORE ROCKS	Y	Y	SUMMER	6	6	HANDTL	2	HANDTILL\LCM
PLEASANT	PL001	OFFSHORE ROCKS	Y	N						
					TOTAL	203		TOTAL	72	

1990 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
PERRY	PR002A	OFFSHORE ROCKS	Y	Y	SUMMER	50	56	HAND HANDTL	20	HAND\4WHEELER\LCM\HANDTILL
PERRY	PR002A	OFFSHORE ROCKS	Y	Y	FALL	16	16	HAND HANDTL	7	HAND\4WHEELER\LCM\HANDTILL
SQUIRREL	SL001C	OFFSHORE ROCKS	Y	Y	SUMMER	0	0	HAND	3	HAND\4WHEELER\LCM
SQUIRREL	SL001D	OFFSHORE ROCKS	Y	Y	SUMMER	0	0	HANDTL	2	HANDTILL\LCM
MAINLAND WHALE BAY	WH003B	OFFSHORE ROCKS	Y	Y	SUMMER	0	0	HAND	3	HAND\4WHEELER\LCM
					TOTAL	290		TOTAL	107	

THIS IS THE TOTAL FOR ALL OFFSHORE RKS. SEGMENTS

1990 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
CHENEGA	CH017	STREAMS	Y	N						
ELEANOR	EL052A	STREAMS	Y	Y	SPRING	9	9	HAND	9	HAND\4WHEELER\LCM
ELEANOR	EL0520	STREAMS	Y	Y	SUMMER	16	16	HANDTL	4	HANDTILL\LCM
ELEANOR	EL0520	STREAMS	Y	Y	SPRING	9	9	HAND	9	HAND\4WHEELER\LCM
EVANS	EV009B	STREAMS	Y	Y	SUMMER	9	9	HAND	9	HAND\4WHEELER\LCM
KNIGHT	KN010	STREAMS	Y	N						
KNIGHT	KN1328	STREAMS	Y	Y	SPRING	48	48	HAND	8	HAND\4WHEELER\LCM
KNIGHT	KN201A	STREAMS	Y	Y	SPRING	8	8	HAND	2	HAND\4WHEELER\LCM
KNIGHT	KN201A	STREAMS	Y	Y	SUMMER	24	24	HAND	9	HAND\4WHEELER\LCM
KNIGHT	KN401B	STREAMS	Y	Y	SPRING	6	6	HAND	4	HAND\HELICOPTER
KNIGHT	KN401B	STREAMS	Y	Y	SUMMER	32	32	HANDTL	11	HAND\4WHEELER\LCM\HANDTILL
KNIGHT	KN401B	STREAMS	Y	Y	FALL	24	24	HANDTL	8	HAND\4WHEELER\LCM\HANDTILL
KNIGHT	KN576	STREAMS	Y	N						
WHALE BAY	WH502	STREAMS	N	N						
WHALE BAY	WH504	STREAMS	N	N						
MAINLAND PADDY BAY	PA001	STREAMS	N	N						
					TOTAL	174		TOTAL	56	

DEFINITION OF TERMS:

LCM.....LANDING CRAFT MEN
FLD.....WATER FLOOD SYSTEM (USUALLY SET UP IN THE SUPRA TIDAL ZONE TO RAISE THE WATER TABLE WHICH FLOATS THE OIL AS THE BEACH IS WASHED.
HAND.....SCRUBBING OILED ROCKS WITH POM POM OR ABSORBANT, POLICING THE AREA FOR OILED DEBRIS.
MAXI.....NAME GIVEN TO BARGE EQUIPPED WITH PRESSURE PUMPS,BOILERS,CHERRY PICKER CRANES,LONG LENGTHS OF PRESSURE HOSE, EXTENSIVE BOOMS, AND A SMALL FLOTILLA OF SKIFFS AND ATTENDANT WATER CRAFT.
OMNI.....SELFPROPELLED BARGE EQUIPPED WITH MULTIPLE BOILERS, WATER PRESSURE PUMPS, AND A LONG JOINTED HYDRAULIC ARM WHICH CAN ARTICULATE UP AND DOWN THE OILED BEACH. IT ALSO CONTAINS BOOMS AND SMALL SKIFFS.
HIPRESS H2O.....THIS IS A PRESSURIZED WATER DELIVERY SYSTEM WHICH CAN BE CARRIED ON A VARIETY OF CRAFT FROM LCM'S TO BARGES. IT DELIVERS PRESSURIZED WATER VIA MULTIPLE HOSES TO HAND HELD NOZZLES FOR WASHING THE BEACH.
SKIM.....A SKIMMER CAN BE A NUMBER OF DIFFERENT UNITS, EACH OF WHICH IS CAPABLE OF PICKING UP OIL FROM THE OCEANS SURFACE, SEPERATING THE OIL FROM THE WATER, AND STORING OIL IN A RESERVOIR.
HANDTL.....TILLING, SPADING, OR RAKING BY HAND THE OILED SURFACE OF A BEACH TO EXPOSE OIL.
SPOTWASH.....WASHING SPECIFIC SMALLER AREAS WITH A STEAM SPRAYER UNIT.
HITACHI.....TILLING OR PULLING DOWN STORM BERMS WITH A TRACKED BACKHOE.
4WHEELER.....4 WHEEL DRIVE HONDA TYPE MOTOR BIKE PULLING CARTS USED TO HAUL BUCKETS OF OILED GRAVEL TO LCM'S.
CATTILL.....TILLING OF A BEACH WITH THE RIPPER TEETH BEHIND A CATEPILLAR TRACTOR.
LCDARGE.....USED TO LAND HITACHI ON A BEACH
HELO.....A HELICOPTER WHICH CARRIED A SMALL CLEANUP CREW TO WORKSITES NOT NEEDING LARGE CREWS.
MANDAYS.....ONE MAN WORKING AN 8 HOUR DAY.
TREATMENTDAYS.....THE SUMMATION OF ALL THE INDIVIDUAL PIECES OF EQUIPMENT DAYS (OMNIDAY WOULD BE ONE 8 HOUR DAY OF WORK FOR THE OMNI BARGE)
POSS.....STANDS FOR POSSIBLE
N\A.....NOT AVAILABLE
TREAT.....TREATMENT
TREAT TYPE.....GENERALIZED BREAKDOWN OF TREATMENTS INTO WASH, HAND (MANUAL), AND MECHANICAL

ALL OF THE DATA PRESENTED IN THE PRECEEDING TABLES CAME FROM THE USCG FOSC SEGMENT FILES IN ANCHORAGE, THE DEPT. OF ENVIRONMENTAL CONSERVATION OIL SPILL RESPONSE OFFICE SEGMENT FILES, OR THE ALASKA DEPT. OF FISH AND GAME HABITAT EVOS LIBRARY FILES IN ANCHORAGE.

TABLE 8e

Table

1991 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
APPLEGATE	AE009A	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SPRING	0	0	HAND	2	HAND\LCM
APPLEGATE	AE009A	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SUMMER	31	31	HAND	0	HAND\LCM
BICK	BI009	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
EGHAMY BAY	EB009A	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
GREEN	GR01S	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
GREEN	GR009A	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
KNIGHT	KN211E	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SUMMER	8	8	HAND	2	HAND\LCM
KNIGHT	KN009A	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SUMMER	8	8	HANDTL	3	HANDTILL\LCM\HAND
KNIGHT	KN009B	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
KNIGHT	KN009B	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SUMMER	26	26	HAND MECH.	7	HAND\LCM\HITACHI
LATOUCHE	LA010A	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SPRING	8	8	HAND	1	HAND\LCM
LATOUCHE	LA010A	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SUMMER	103	103	HAND MECH.	20.8	HAND\LCM\HITACHI
NAKED	NA034AQF	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
NAKED	NA026B	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	N						
PERRY	PR003C	BAYS&LAGOONS POSSIBLE UNTRAPPED STREAM INFLUENCE	Y	Y	SUMMER	0	0	HAND	2	HAND\LCM
					TOTAL	203		TOTAL	47.8	

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1991 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
APPLEGATE	AE004A	OFFSHORE ROCKS	Y	Y	SPRING	6	6	HAND	2	HAND\LCM
APPLEGATE	AE004A	OFFSHORE ROCKS	Y	Y	SUMMER	6	6	HAND	2	HAND\LCM
APPLEGATE	AE004B	OFFSHORE ROCKS	Y	N						
AGULIAK	AG001A	OFFSHORE ROCKS	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
AGULIAK	AG003A	OFFSHORE ROCKS	Y	Y	SPRING	12	12	HAND	2	HAND\LCM
AGULIAK	AG003A	OFFSHORE ROCKS	Y	Y	SUMMER	24	24	HANDTL	4	HANDTILL\LCM\HAND
CHENEGA	CH011	OFFSHORE ROCKS	Y	N						
CRAFTON	CR004A	OFFSHORE ROCKS	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
CRAFTON	CR004B	OFFSHORE ROCKS	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
CRAFTON	CR004C	OFFSHORE ROCKS	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
DELENIA	DE001A	OFFSHORE ROCKS	Y	Y	SPRING	14	14	HAND	8	HAND\LCM\HELO.
DELENIA	DE001A	OFFSHORE ROCKS	Y	Y	SUMMER	23	23	HAND	2	HAND\LCM
EVANS	EV010	OFFSHORE ROCKS	Y	N						
FLEMING	FL003	OFFSHORE ROCKS	Y	N						
GREEN	GR004A	OFFSHORE ROCKS	Y	N						
GREEN	GR101	OFFSHORE ROCKS	Y	N						
KNIGHT	KN20	OFFSHORE ROCKS	Y	N						
KNIGHT	KN022	OFFSHORE ROCKS	Y	N						
KNIGHT	KN101	OFFSHORE ROCKS	Y	N						
MUMMY	MU900	OFFSHORE ROCKS	Y	N						
PLEIADES	PL001	OFFSHORE ROCKS	Y	N						
PERRY	PR002A	OFFSHORE ROCKS	Y	Y	SUMMER	6	6	HAND	2	HAND\LCM
SQUIRREL	SL001	OFFSHORE ROCKS	Y	N						
WHALE BAY	WH003B	OFFSHORE ROCKS	Y	N						
					TOTAL	110		TOTAL	25	

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1991 MECHANICAL\MANUAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
CHENEGA	CH017	STREAM	Y	N						
ELEANOR	EL052A	STREAM	Y	N						
ELEANOR	EL052B	STREAM	Y	Y	SPRING	2	2	HANDTL	2	HANDTILL\LCM\HELO.
EVANS	EV008B	STREAM	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
KNIGHT	KN018	STREAM	Y	N						
KNIGHT	KN132B	STREAM	Y	N						
KNIGHT	KN201	STREAM	Y	N						
KNIGHT	KN401B	STREAM	Y	Y	SPRING	6	5	HAND	5	HAND\HELO.
KNIGHT	KN575	STREAM	Y	N						
PADDY BAY	PA001	STREAM	N	N						
WHALE BAY	WH002	STREAM	N	N						
WHALE BAY	WH004	STREAM	N	N						
					TOTAL	11		TOTAL	9	

DEFINITION OF TERMS:

LCM	LANDING CRAFT MEN
FLD	WATER FLOOD SYSTEM (USUALLY SET UP IN THE SUPRA TIDAL ZONE TO RAISE THE WATER TABLE WHICH FLOATS THE OIL AS THE BEACH IS WASHED.
HAND	SCRUBBING OILED ROCKS WITH POM POM OR ABSORBANT, POLICING THE AREA FOR OILED DEBRIS.
MAXI	NAME GIVEN TO BARGE EQUIPPED WITH PRESSURE PUMPS,BOILERS,CHERRY PICKER CRANES,LONG LENGTHS OF PRESSURE HOSE, EXTENSIVE BOOMS, AND A SMALL FLOTILLA OF SKIFFS AND ATTENDANT WATER CRAFT.
OMNI	SELFPROPELLED BARGE EQUIPPED WITH MULTIPLE BOILERS, WATER PRESSURE PUMPS, AND A LONG JOINTED HYDRAULIC ARM WHICH CAN ARTICULATE UP AND DOWN THE OILED BEACH. IT ALSO CONTAINS BOOMS AND SMALL SKIFFS.
HIPRESS H2O	THIS IS A PRESSURIZED WATER DELIVERY SYSTEM WHICH CAN BE CARRIED ON A VARIETY OF CRAFT FROM LCM'S TO BARGES. IT DELIVERS PRESSURIZED WATER VIA MULTIPLE HOSES TO HAND HELD NOZZLES FOR WASHING THE BEACH.
SKIM	A SKIMMER CAN BE A NUMBER OF DIFFERENT UNITS, EACH OF WHICH IS CAPABLE OF PICKING UP OIL FROM THE OCEANS SURFACE, SEPERATING THE OIL FROM THE WATER, AND STORING OIL IN A RESERVOIR.
HANDTL	TILLING, SPADING, OR RAKING BY HAND THE OILED SURFACE OF A BEACH TO EXPOSE OIL.
SPOTWASH	WASHING SPECIFIC SMALLER AREAS WITH A STEAM SPRAYER UNIT.
HITACHI	TILLING OR PULLING DOWN STORM BERMS WITH A TRACKED BACKHOE.
4WHEELER	4 WHEEL DRIVE HONDA TYPE MOTOR BIKE PULLING CARTS USED TO HAUL BUCKETS OF OILED GRAVEL TO LCM'S.
CATTILL	TILLING OF A BEACH WITH THE RIPPER TEETH BEHIND A CATEPILLAR TRACTOR.
LCBARGE	USED TO LAND HITACHI ON A BEACH
HELO	A HELICOPTER WHICH CARRIED A SMALL CLEANUP CREW TO WORKSITES NOT NEEDING LARGE CREWS.
MANDAYS	ONE MAN WORKING AN 8 HOUR DAY.
TREATMENTDAYS	THE SUMMATION OF ALL THE INDIVIDUAL PIECES OF EQUIPMENT DAYS (OMNIDAY WOULD BE ONE 8 HOUR DAY OF WORK FOR THE OMNI BARGE)
POSS	STANDS FOR POSSIBLE
N\A	NOT AVAILABLE
TREAT	TREATMENT
TREAT TYPE	GENERALIZED BREAKDOWN OF TREATMENTS INTO WASH, HAND (MANUAL), AND MECHANICAL

ALL OF THE DATA PRESENTED IN THE PRECEEDING TABLES CAME FROM THE USCG FOSC SEGMENT FILES IN ANCHORAGE, THE DEPT. OF ENVIRONMENTAL CONSERVATION OIL SPILL RESPONSE OFFICE SEGMENT FILES, OR THE ALASKA DEPT. OF FISH AND GAME HABITAT EVOS LIBRARY FILES IN ANCHORAGE.

TABLE 8f

Table 8f

1991 MANUAL\MECHANICAL TREATMENT DISTURBANCE IN PRINCE WILLIAM SOUND

ISLAND	SEGMENT SUBSEGMENT	HABITAT TYPE	OILED Y\N	TREAT Y\N	SEASON	MANDAYS	MANDAYS TOTL	TREAT TYPE	TREAT DAYS	EQUIPMENT
BAINBRIDGE	BA004A	MUSSEL BED	Y	N						
BAINBRIDGE	BA006C	MUSSEL BED OFFSHORE RKS	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
BAINBRIDGE	BA006C	MUSSEL BED OFFSHORE RKS	Y	Y	SUMMER	16	16	HAND	4	HAND\LCM
CHENEGA	CH010A	MUSSEL BED	Y	Y	SPRING	11	11	HAND	2	HAND\LCM
CHENEGA	CH010B	MUSSEL BED	Y	Y	SPRING	21	21	HAND	5	HAND\LCM\HELO.
CHENEGA	CH010B	MUSSEL BED	Y	Y	SPRING	11	11	HAND	2	HAND\LCM
DICK	DI007A	MUSSEL BED	Y	N						
ELEANOR	EL019A	MUSSEL BED	Y	N						
ELEANOR	EL015A	MUSSEL BED	Y	Y	SPRING	9	9	HANDTL	3	HAND\LCM\HANDTILL
ELEANOR	EL015A	MUSSEL BED	Y	Y	SUMMER	9	9	HANDTL	3	HAND\LCM\HANDTILL
ELRINGTON	ER020B	MUSSEL BED	Y	Y	SUMMER	28	28	HAND MECH.	7	HAND\LCM\HITACHI
EVANS	EV015	MUSSEL BED	Y	N						
EVANS	EV070F	MUSSEL BED	Y	Y	SPRING	3	3	HAND	2	HAND\LCM
FLEMING	FL004A	MUSSEL BED	Y	Y	SPRING	7	7	HAND	1	HAND\LCM
FLEMING	FL004A	MUSSEL BED	Y	Y	SUMMER	2	2	HAND	2	HAND\HELO.
KNIGHT	KN113B	MUSSEL BED	Y	Y	SPRING	16	16	HAND	2	HAND\LCM
KNIGHT	KN136A	MUSSEL BED	Y	Y	SUMMER	88	44	HAND	12	HAND\LCM
KNIGHT	KN300A	MUSSEL BED	Y	Y	SUMMER	45	45	HANDTL MECH.	15	HAND\LCM\HANDTILL HITACHI
LATOUCHE	LA015E	MUSSEL BED	Y	Y	SPRING	9	9	HAND	1	HAND\HELO.
LATOUCHE	LA015E	MUSSEL BED	Y	Y	SUMMER	191	191	HAND MECH.	28	HAND\LCM\HITACHI
MAINLAND	MA002A	MUSSEL BED	Y	Y	SPRING	8	8	HAND	2	HAND\LCM
MAINLAND	MA002A	MUSSEL BED	Y	Y	SUMMER	18	18	HAND	2	HAND\LCM
					TOTAL	467		TOTAL	86	

TRT91.RLG

DEFINITION OF TERMS:

LCM.....LANDING CRAFT MEN
FLD.....WATER FLOOD SYSTEM (USUALLY SET UP IN THE SUPRA TIDAL ZONE TO RAISE THE WATER TABLE WHICH FLOATS THE OIL AS THE BEACH IS WASHED.
HAND.....SCRUBBING OILED ROCKS WITH POM POM OR ABSORBANT, POLICING THE AREA FOR OILED DEBRIS.
MAXI.....NAME GIVEN TO BARGE EQUIPPED WITH PRESSURE PUMPS,BOILERS,CHERRY PICKER CRANES,LONG LENGTHS OF PRESSURE HOSE, EXTENSIVE BOOMS, AND A SMALL FLOTILLA OF SKIFFS AND ATTENDANT WATER CRAFT.
OMNI.....SELFPROPELLED BARGE EQUIPPED WITH MULTIPLE BOILERS, WATER PRESSURE PUMPS, AND A LONG JOINTED HYDRAULIC ARM WHICH CAN ARTICULATE UP AND DOWN THE OILED BEACH. IT ALSO CONTAINS BOOMS AND SMALL SKIFFS.
MIPRESS H20.....THIS IS A PRESSURIZED WATER DELIVERY SYSTEM WHICH CAN BE CARRIED ON A VARIETY OF CRAFT FROM LCM'S TO BARGES. IT DELIVERS PRESSURIZED WATER VIA MULTIPLE HOSES TO HAND HELD NOZZLES FOR WASHING THE BEACH.
SKIM.....A SKIMMER CAN BE A NUMBER OF DIFFERENT UNITS, EACH OF WHICH IS CAPABLE OF PICKING UP OIL FROM THE OCEANS SURFACE, SEPERATING THE OIL FROM THE WATER, AND STORING OIL IN A RESERVOIR.
MANDTL.....TILLING, SPADING, OR RAKING BY HAND THE OILED SURFACE OF A BEACH TO EXPOSE OIL.
SPOTWASH.....WASHING SPECIFIC SMALLER AREAS WITH A STEAM SPRAYER UNIT.
HITACHI.....TILLING OR PULLING DOWN STORM BERMS WITH A TRACKED BACKHOE.
4WHEELER.....4 WHEEL DRIVE HONDA TYPE MOTOR BIKE PULLING CARTS USED TO HAUL BUCKETS OF OILED GRAVEL TO LCM'S.
CATTILL.....TILLING OF A BEACH WITH THE RIPPER TEETH BEHIND A CATEPILLAR TRACTOR.
LCBARGE.....USED TO LAND HITACHI ON A BEACH
HELO.....A HELICOPTER WHICH CARRIED A SMALL CLEANUP CREW TO WORKSITES NOT NEEDING LARGE CREWS.
MANDAYS.....ONE MAN WORKING AN 8 HOUR DAY.
TREATMENTDAYS.....THE SUMMATION OF ALL THE INDIVIDUAL PIECES OF EQUIPMENT DAYS (OMNIDAY WOULD BE ONE 8 HOUR DAY OF WORK FOR THE OMNI BARGE)
POSS.....STANDS FOR POSSIBLE
N\A.....NOT AVAILABLE
TREAT.....TREATMENT
TREAT TYPE.....GENERALIZED BREAKDOWN OF TREATMENTS INTO WASH, HAND (MANUAL), AND MECHANICAL

ALL OF THE DATA PRESENTED IN THE PRECEEDING TABLES CAME FROM THE USCG FOSC SEGMENT FILES IN ANCHORAGE, THE DEPT. OF ENVIRONMENTAL CONSERVATION OIL SPILL RESPONSE OFFICE SEGMENT FILES, OR THE ALASKA DEPT. OF FISH AND GAME HABITAT EVOS LIBRARY FILES IN ANCHORAGE.

TABLE 9a

Tabl

1989 BIOREMEDIATION DAILY SUMMARY OF IMPORTANT NADU HABITAT SITES

INIPOL (EAP 22) INIPOL GRANULAR

ISLAND	SEGMENT	DATE	AVE.LN. FEET	AVE.WDH FEET	GALS. USED	SEGMENT	AVE.LN. FEET	AVE.WD FEET	LBS. USED	SEASON HABITAT SITE
APPLEGATE	AE004	AUG 29	2349	47	715					SUMMER\OFFSHORE ROCKS
APPLEGATE	AE004	AUG 29	825	24	145					SUMMER\OFFSHORE ROCKS
APPLEGATE	AE005	AUG 29	30	0	2					SUMMER\ BAYS & LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
BAINBRIDGE	BA000	AUG 19								SUMMER\ OFFSHORE RK\MUSSEL BED FOSC\IOCC AUTHORIZED DIO\NO DATA AVAIL.
BAINBRIDGE	BA004	AUG 19								SUMMER\ MUSSEL BED\FOSC & IOCC AUTHORIZED DIO\NO DATA AVAIL.
CHEMEGA	CH010	AUG 20	2103	10	171					SUMMER\ MUSSEL BED
CHEMEGA	CH011	AUG 20	2139	11	170					SUMMER\ OFFSHORE ROCKS
CRAFTON	CR004	AUG 20	1197	31	247					SUMMER\OFFSHORE ROCKS
ELEANOR	EL013	AUG 31	231	10	21	EL013	231	10	35	SUMMER\MUSSEL BED
ELEANOR	EL015	AUG 31	138	12	11	EL015	138	12	18	SUMMER\MUSSEL BED
ELEANOR	EL052	AUG 21	2580	20	520					SUMMER\STREAM
EVANS	EV070	AUG 10	441	9	33					SUMMER\MUSSEL BED
FLEMING	FL004	AUG 19	200	10	18					SUMMER\MUSSEL BED
GREEN	GR101	AUG 00	600	120	531					SUMMER\OFFSHORE ROCKS
GREEN	GR101	AUG 00	1950	42	650					SUMMER\OFFSHORE ROCKS
GREEN	GR101	AUG 11	1947	33	404					SUMMER\OFFSHORE ROCKS
KNIGHT	KN113	AUG 30	909	17	110					SUMMER\MUSSEL BED
KNIGHT	KN113	AUG 31	1119	22	180					SUMMER\MUSSEL BED
KNIGHT	KN115	AUG 30	120	42	40	KN115	120	42	25	SUMMER\KN115 MANDAYS DATA SHOWING SEVERE DISTURBANCE
KNIGHT	KN116	AUG 31	2184	13	230					SUMMER\KN115 MANDAYS DATA SHOWING SEVERE DISTURBANCE
KNIGHT	KN900	AUG 29	8571	14	910	KN900	8571	14	900	SUMMER\MUSSEL BED
KNIGHT	KN500	AUG 31	1507	27	300					SUMMER\BAYS&LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
MAINLAND	MA002	AUG 20	1263	51	408					SUMMER\MUSSEL BED
				TOTAL GALS.	5804			TOTAL LBS.	975	

AVE.LN.IN FEET.....AVERAGE LENGTH OF OIL BAND
AVE.WDH.IN FEET.....AVERAGE WIDTH OF OIL BAND

TABLE 9b

Table 9b

Inipol Video Tapes at OSPIC Library, Anchorage

The following is a listing of some of the video tapes regarding inipol application on Green Island 1989. Also listed is the video tape showing the KN115 site where the Notice of Violation occurred for misapplication of Inipol on August 31, 1989.

Tape # 0249
Notice of Violation KN115 Inipol 89

Tape # 0071\vid#00110
application on Green Island, aerial and ground videos with some interviews.

Tape # 0074\vid#00113
Before and after video footage regarding Green Island with Inipol

Tape # 0069\vid#00108
Subject: Bob Mastracchio (Exxon) Tech. Mgr.
Topic: when it should be used as well as where and under what circumstances.

Tape # 0081
Video of oiled sediment sampling at CH002 August 13, 1989 the study that ADF&G Habitat Division conducted.

Some of these tapes are still being entered into the OSPIC library file system, but the videos should be available for viewing. We believe copies could be obtained if desired.
An additional video tape of interest is a tape of sheening from October of 1989. This demonstrates bleeding oil from beaches from the air at sites near Harlequin habitat areas.

Tape # 0251
October 14,1989 bleeding oil beaches... Chenega, Evans, Latouche, and Knight Islands.

TABLE 9c

Tab1

1989 BIOREMEDIATION DAILY SUMMARY OF IMPORTANT HADU HABITAT SITES

INIPOL (EAP 22) INIPOL GRANULAR

ISLAND	SEGMENT	DATE	AVE.LN. FEET	AVE.WDH FEET	GALS. USED	SEGMENT	AVE.LN. FEET	AVE.WD FEET	LBS. USED	SEASON HABITAT SITE
CHENEGA	CH016	SEPT 1	66	6	3					FALL\MUSSEL BED
DISK	DI059	SEPT 6	240	15	30	DI059	240	15	25	FALL\BAYS&LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
DISK	DI067	SEPT 2	1800	9	120	DI059	1866	9	6	FALL\MUSSEL BED
EVANS	EV015	SEPT 8	420	20	53	EV015	420	20	70	FALL\MUSSEL BED
EVANS	EV070	SEPT 8	420	36.9	110	EV070	420	36.9	25	FALL\MUSSEL BED
KNIGHT	KN141	SEPT 2								TOTAL BIO AMTS. FOR THIS DAY NOT BROKEN INTO AMTS.\SEGMENT
KNIGHT	KN401	SEPT 6	3833	5	80	KN401	3833	5	150	FALL\STREAMS
KNIGHT	KN401	SEPT 7	3833	19.8	85					FALL\STREAMS
KNIGHT	KN402	SEPT 8				KN402	195	8	20	THIS SEGMENT IS IMMEDIATELY ADJACENT TO KN401 IN A CONFINED POCKET COVE
KNIGHT	KN402	SEPT 7	195	6	25					THIS SEGMENT IS IMMEDIATELY ADJACENT TO KN401 IN A CONFINED POCKET COVE
NAKED	NA024	SEPT 10	399	40	125	NA024	399	39.9	100	FALL\BAYS&LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
NAKED	NA024	SEPT 10				NA024	1170	10.5	75	FALL\BAYS&LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
NAKED	NA028	SEPT 10	2340	11	125	NA028	2340	10.8	150	FALL\BAYS&LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
NAKED	NA028	SEPT 10				NA028	300	20	50	FALL\BAYS&LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
PERRY	PR002	SEPT 4	996	41.7	200	PR002	996	41.7	230	FALL\OFFSHORE ROCKS
PERRY	PR003	SEPT 5	225	9.9	25					FALL\BAYS&LAGOONS\POSSIBLE ENTRAPPED STREAM INFLUENCE
SQUIRREL	SL001	SEPT 3	1452	20	215					FALL\OFFSHORE ROCKS
SQUIRREL	SL001	SEPT 4	825	28.8	281					FALL\OFFSHORE ROCKS
LATOUCHE	LA015									PART OF SEGMENT WAS RETASIDE\MUCH MANUAL-MECH. WORK HOWEVER NO DOCUMENTATION FOR BIOREMEDIATION
KNIGHT	KN132 KN211									THESE SEGMENTS WERE BOTH APPROVED FOR INIPOL BY THE ISCC AND FOSC 9\10\89 BUT NO RECORD OF THEIR TREATMENT EXISTS
				TOTAL	1477			TOTAL	885	

BIOSEPT.WK1

TABLE 9d

TABLE 9d

OLEOPHILIC FERTILIZER DELIVERY SCHEDULE

METRIC TONS DELIVERED FROM FRANCE
((SHIPPING TIME FROM MANUFACTURER TO FIELD IN ALASKA 4 TO 5 DAYS)

DATE	DATE DELIVERED IN FRANCE	TOTAL TONS FERT.
JULY 24,1989	40MTONS	40MTONS
JULY 28,1989	30MTONS	70MTONS
JULY 31,1989	110MTONS	180MTONS
AUGUST 7,1989	100MTONS	280MTONS
AUGUST 10,1989	30MTONS	310MTONS
AUGUST 15,1989	30MTONS	340MTONS
AUGUST 19,1989	20MTONS	360MTONS
AUGUST 25,1989	100MTONS	460MTONS
AUGUST 28,1989	40MTONS	500MTONS

SHIPPING TIME FROM THE MANUFACTURER TO THE FIELD WILL TAKE 4 TO 5 DAYS.(FRANCE TO ALASKA)

APPROXIMATELY 7 METRIC TONS IS REQUIRED PER MILE OF BEACH.

TABLE 9e

Tab1

1990 BIOREMEDIATION DAILY SUMMARY OF IMPORTANT HABU HABITAT SITES

				INIPOL (EAP22)				GRANULAR			
ISLAND	SEGMENT REGMENT	DATE SEASON	MANDAYS	AVG LNG METERS	AVG WDH METERS	GALS	SEGMENT SUBSEGMENT	AVE LNG METERS	AVE WDH METERS	LBS	HABITAT TYPE
BAINBRIDGE	BA006C	7\25 SUMMER	0				BA006C			75	MUSSEL BEDS
BAINBRIDGE	BA006C	7\26 SUMMER	0				BA006C	50	7.5	75	MUSSEL BEDS
BAINBRIDGE	BA006C	7\27 SUMMER	0				BA006C	25	7.5	35	MUSSEL BEDS
BAINBRIDGE	BA006C	8\11 SUMMER	0				BA006C			77	MUSSEL BEDS
CHENEGA	CH010B	8\19 SUMMER	0				CH010B			25	MUSSEL BEDS
CHENEGA	CH010B	7\3 SUMMER	0			32	CH010B			132	MUSSEL BEDS
CHENEGA	CH010B	8\7 SUMMER	0			5	CH010B			102	MUSSEL BEDS
DI007A ON DISK ISLAND WAS A BIOREMEDIATION PRODUCTS TEST SITE JULY (1,5,9,13,25,30)											
ELEANOR	EL013A	8\7 SUMMER	0			9	EL013A			21	MUSSEL BEDS
ELEANOR	EL013A	8\29 SUMMER	0			5	EL013A			87	MUSSEL BEDS
ELEANOR	EL015A	8\27 SUMMER	0			17	EL015A			38	MUSSELL BEDS
ELEANOR	EL015A	8\29 SUMMER	0			5	EL015A			2.5	MUSSEL BEDS
ER0200 ON ELRINGTON WAS A LIQUID FERTILIZER TEST SITE (JUNE 20) (JULY 1,2,3,6,7,11,12,15,16,)											
ELRINGTON	ER030B	8\12 SUMMER	0			3.5	ER020B			1.5	MUSSEL BEDS
EVANS	EV015A	8\6 SUMMER	0			5	EV015A			2.5	MUSSEL BEDS
EVANS	EV015A	8\31 SUMMER	0			3	EV015A			1.5	MUSSEL BEDS
EVANS	EV070E	8\12 SUMMER	0				EV070E	13	37	40.5	MUSSEL BEDS

1

ISLAND	SEGMENT SEGMENT	DATE SEASON	MANDAYS	AVG LNG METERS	AVG WDH METERS	GALS	SEGMENT SUBSEGMENT	AVE LNG METERS	AVE WDH METERS	LBS	HABITAT TYPE
EVANS	EV070E	9\1 FALL	0				EV070E			10	MUSSEL BEDS
EVANS	EV070F	8\12 SUMMER	0				EV070F			49	MUSSEL BEDS
EVANS	EV070F	9\1 FALL	0				EV070F			31	MUSSEL BEDS
FLEMING	FL004A	8\29 SUMMER	0			42.5	FL004A			104	MUSSEL BEDS
FLEMING	FL004A	8\30 SUMMER	0			19	FL004A			21	MUSSEL BEDS
FLEMING	FL004A	8\11 SUMMER	0			47.5	FL004A			125	MUSSEL BEDS
FLEMING	FL004A	8\2 FALL	0			126	FL004A			253	MUSSEL BEDS
KNIGHT	KN113B	7\19 SUMMER	0				KN113B	50	0	93	MUSSEL BEDS
KNIGHT	KN136A	7\6 SUMMER	0			142	KN136A			85	MUSSEL BEDS
KNIGHT	KN136A	8\2 SUMMER	0				KN136A	101	20	64	MUSSEL BEDS
KNIGHT	KN136A	8\3 SUMMER	0	101	20	100	KN136A	17	0	27	MUSSEL BEDS
KNIGHT	KN136A	9\6 FALL	0	101	20	100	KN136A	110	30	81	MUSSEL BEDS
KNIGHT	KN300	7\11 SUMMER	0			49.5	KN300A			574	MUSSEL BEDS
KNIGHT	KN300	8\14 SUMMER	0			82.5	KN300			595	MUSSEL BEDS
MAINLAND	MA002A	8\7 SUMMER	0			2	MA002A	32	79	84.3	MUSSEL BEDS
MAINLAND	MA002A	8\20 SUMMER	0				MA002A			50	MUSSEL BEDS
		TOTAL MANDAY	160		TOTAL GAL.	845			TOTAL LBS.	2993	MUSSEL BEDS
APPLEGATE	AE005A	8\14 SUMMER	0	105	41.5	104	AE005A	299	41.0	49	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005A	8\10 SUMMER	0			12	AE005A			32	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT SEGMENT	DATE SEASON	MANDAYS	AVG LNG METERS	AVG WDH METERS	GALS	SEGMENT SUBSEGMENT	AVE LNG METERS	AVE WDH METERS	LBS	HABITAT TYPE
APPLEGATE	AE005A	6\17 SUMMER	0			104	AE005A			49	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005A	8\2 SUMMER	0			126	AE005A			288	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005A	9\10 FALL	0			79	AE005A			230	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005B	7\8 SUMMER	0			18	AE005B			12	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005B	8\20 SUMMER	0			9	AE005B			12	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005C	6\15 SUMMER	0	24	20	18	AE005C	24	20	36	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
DICK	DI050	5\27 SPRING	0			15	DI050			71	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
DICK	DI059	8\4 SUMMER	0				DI059			38	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
DICK	DI060	9\1 FALL	0			5.5	DI060			418	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
GREEN	GR015A	7\15 SUMMER	0	133	8.4	23.5	GR015A	133	82.2	434	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
GREEN	GR015A	8\16 SUMMER	0			18	GR015A				BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN211C	9\8 FALL	0	285	79	222	KN211C				BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500A	7\5 SUMMER	0				KN500A			100	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500A	8\24 SUMMER	0			9	KN500A			135	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500A	9\11 FALL	0				KN500A			76	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500B	7\8 SUMMER	0				KN500B			25	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500B	7\7 SUMMER	0				KN500B	100	13	100	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500B	7\20 SUMMER	0	215	92	614	KN500B	246	99	354	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500B	7\22 SUMMER	0	33	4.0	6.7	KN500B	146	10.5	131	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT SEGMENT	DATE SEASON	MANDAYS	AVG LNG METERS	AVG WDH METERS	GALS	SEGMENT SUBSEGMENT	AVE LNG METERS	AVE WDH METERS	LBS	HABITAT TYPE
KNIGHT	KN500B	8\24 SUMMER	0				KN500B			1110	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500B	9\11 FALL	0				KN500B			560	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	7\17 SUMMER	0			200	LA010A			95	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	8\25 SUMMER	0			200	LA010A			95	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	8\25 SUMMER	0				LA010A			476	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	9\9 FALL	0				LA010A	150	4	60	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
NAKED	NA024F	7\18 SUMMER	0				NA024F	9	10	5	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
PERRY	PR003A	7\6 SUMMER	0			30	PR003A			54	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
PERRY	PR003A	8\1 SUMMER	0				PR003A			54	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
PERRY	PR003A	9\10 FALL	0				PR003A			54	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
PERRY	PR003B	7\6 SUMMER	0			19	PR003B			7.6	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
PERRY	PR003B	8\2 FALL	0				PR003B			2	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
PERRY	PR003C	7\6 SUMMER	0				PR003C			197	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
PERRY	PR003D	7\6 SUMMER	0				PR003D			1.8	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
		TOTAL MANDAY	280		TOTAL GAL.	1760			TOTAL LBS.	5367	
APPLEGATE	AE004A	6\10 SUMMER	0	4	1	0.3	AE004A	82	9	83	OFFSHORE ROCKS
APPLEGATE	AE004A	6\15 SUMMER	0				AE004A			1	OFFSHORE ROCKS
APPLEGATE	AE004A	8\2 SUMMER	0			41	AE004A			82	OFFSHORE ROCKS

ISLAND	SEGMENT SEGMENT	DATE SEASON	MANDAYS	AVG LNG METERS	AVG WDH METERS	GALS	SEGMENT SUBSEGMENT	AVE LNG METERS	AVE WDH METERS	LBS	HABITAT TYPE
APPLEGATE	AE004B	8\9 SUMMER	0	0.5	1.5	1.1	AE004B	1	1	3.3	OFFSHORE ROCKS
APPLEGATE	AE004B	8\10 SUMMER	0				AE004B	14	8	3.5	OFFSHORE ROCKS
APPLEGATE	AE004B	8\13 SUMMER	0	N\A			AE004B		N\A		OFFSHORE ROCKS
APPLEGATE	AE004B	8\14 SUMMER	0	4	3	0.95	AE004B			1	OFFSHORE ROCKS
APPLEGATE	AE004B	8\15 SUMMER	0			2.3	AE004B			69	OFFSHORE ROCKS
APPLEGATE	AE004B	8\2 SUMMER	0			46.5	AE004B			140	OFFSHORE ROCKS
AGULIAK	AG001A	7\15 SUMMER	0			18	AG001A			51	OFFSHORE ROCKS
AGULIAK	AG001A	8\10 SUMMER	0				AG001A			86	OFFSHORE ROCKS
AGULIAK	AG009A	8\13 SPRING	0				AG009A			1	OFFSHORE ROCKS
AGULIAK	AG009A	7\14 SUMMER	0				AG009A			123	OFFSHORE ROCKS
AGULIAK	AG009A	8\12 SUMMER	0				AG009A			63	OFFSHORE ROCKS
CHENEGA	CH011A	7\19 SUMMER	0				CH011A			27	OFFSHORE ROCKS
CHENEGA	CH011A	7\20 SUMMER	0	9	5	3.5	CH011A	43	15	95	OFFSHORE ROCKS
CHENEGA	CH011A	8\7 SUMMER	0			2.5	CH011A			104	OFFSHORE ROCKS
GREEN	GR101A	7\30 SUMMER	0	168	23	100	GR101A	270	30	200	OFFSHORE ROCKS
GREEN	GR101B	7\30 SUMMER	0	152	42	67.5	GR101B	242	N\A	88	OFFSHORE ROCKS
KNIGHT	KN141A	7\1 SUMMER	0			22.5	KN141A			98	OFFSHORE ROCKS
KNIGHT	KN141A	7\29 SUMMER	0			21.5	KN141A			93	OFFSHORE ROCKS
MUMMY	MU900	7\13 SUMMER	0				MU900			N\A	OFFSHORE ROCKS

ISLAND	SEGMENT SEGMENT	DATE SEASON	MANDAYS	AVG LNG METERS	AVG WDH METERS	GALS	SEGMENT SUBSEGMENT	AVE LNG METERS	AVE WDH METERS	LBS	HABITAT TYPE
PERRY	PR002A	7\6 SUMMER	8			52.5	PR002A			25.9	OFFSHORE ROCKS
PERRY	PR002A	9\7 FALL	8				PR002A			18	OFFSHORE ROCKS
SQUIRREL	SL001B	7\14 SUMMER	8				SL001B			90	OFFSHORE ROCKS
SQUIRREL	SL001B	8\12 SUMMER	8				SL001B			257	OFFSHORE ROCKS
SQUIRREL	SL001C	8\24 SUMMER	8				SL001C			40.5	OFFSHORE ROCKS
SQUIRREL	SL001D	7\15 SUMMER	8			40	SL001D			276	OFFSHORE ROCKS
SQUIRREL	SL001D	8\12 SUMMER	8				SL001D			237	OFFSHORE ROCKS
SQUIRREL	SL001E	7\14 SUMMER	8				SL001D			20	OFFSHORE ROCKS
SQUIRREL	SL001E	9\12 SUMMER	8				SL001E			20	OFFSHORE ROCKS
WHALE BAY	WH003B	7\8 SUMMER	8				WH003B			5	OFFSHORE ROCKS
		TOTAL MANDAY	256		TOTAL GAL.	449			TOTAL LBS.	2420	
ELEANOR	EL052B	8\28 SUMMER	8			3.1	EL052B			65	STREAM
ELEANOR	EL052B	8\30 SUMMER	8				EL052B			31.5	STREAM
ELEANOR	EL052B	8\21 SUMMER	8				EL052B			192	STREAM
ELEANOR	EL052B	9\4 FALL	8				EL052B			32	STREAM
ELEANOR	EL052A	8\20 SUMMER	8			14	EL052A			101	STREAM
ELEANOR	EL052A	7\31 SUMMER	8				EL052A			121	STREAM
KN132B INIPOL TEST SITE APPLIED (7\1248\11) HELO SAMPLING (8\167\15)											
KNIGHT	KN132B	8\2 SUMMER	8	206	23.8	171	KN132B	206	23.8	102	STREAM

ISLAND	SEGMENT SEGMENT	DATE SEASON	MANDAYS	AVG LNG METERS	AVG WDH METERS	GALS	SEGMENT SUBSEGMENT	AVE LNG METERS	AVE WDH METERS	LBS	HABITAT TYPE
KNIGHT	KN132B	7\12 SUMMER	0	36	18	51	KN132B	96	10	24	STREAM
KNIGHT	KN132B	8\24 SUMMER	0			160	KN132B			80	STREAM
KNIGHT	KN201A	8\24 SUMMER	0			18.2	KN201A			9.1	STREAM
KNIGHT	KN201A	8\21 SUMMER	0			18.2	KN201A			9.1	STREAM
KNIGHT	KN201A	9\29 SUMMER	0				KN201A			14	STREAM
KNIGHT	KN201A	9\8 FALL	0				KN201A	70	2	14	STREAM
KNIGHT	KN401B	9\7 FALL	0				KN401B	13	17	12	STREAM
		TOTAL MANDAY	112		TOTAL GAL.	436			TOTAL LBS.	807	

DEFINITION OF TERMS:

N\A.....TREATMENT OCCURRED BUT DATA UNAVAILABE
AVG LNG.....AVERAGE LENGTH OF TREATED OIL BAND IN METERS
AVG WDH.....AVERAGE WIDTH OF TREATED OIL BAND IN METERS
LBS.....POUNDS OF CUSTOMBLEN GRANULAR FERTILIZER APPLIED
GALS.....GALLONS OF LIQUID INIPOL FERTILIZER APPLIED
MANDAYS.....ONE MAN WORKING AN EIGHT HOUR DAY

ALL OF THE DATA INCLUDED IN THE PRECEEDING TABLES WAS RESEARCHED FROM THE FOLLOWING SOURCES:

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION: OIL SPILL RESPONSE OFFICE 4241 B STREET SUITE 304 ANCHORAGE ALASKA 99503, PRINCE WILLIAM SOUND SEGMENT FILE ALPHABETICAL BY ISLAND

UNITED STATES COAST GUARD FOSC: (1989,1990,1991) PRINCE WILLIAM SOUND OIL SPILL SEGMENT FILES. ALPHABETICAL INDICATOR BY ISLAND. KEY BANK BLDG. 601 W. 5TH. AVE. 4TH FLOOR SUITE 401 ANCHORAGE ALASKA

TABLE 9f

Tab

1991 BIOREMEDIATION DAILY SUMMARY OF IMPORTANT HADU HABITAT SITES

				INIPOL (EAP22)					GRANULAR		
ISLAND	SEGMENT SUBSEGMENT	DATE SEASON	MANDAYS	AVE LNG METERS	AVE WDH METERS	GAL	SEGMENT SUBSEGMENT	AVE WDH METERS	AVE LNG METERS	LBS	HABITAT TYPE
BAINBRIDGE	BA006C	7\1 SUMMER	8	47	244	18	BA006C	47	244	7.8	MUSSEL BED
BAINBRIDGE	BA006C	7\28 SUMMER	8			18	BA006C			7.8	MUSSEL BED
BAINBRIDGE	BA006C	8\26 SUMMER	8			18	BA006C			7.8	MUSSEL BED
DISK	DI067A	6\21 SUMMER	8			6	DI067A				MUSSEL BED
DISK	DI067A	7\18 SUMMER	8			25	DI067A			3.5	MUSSEL BED
DISK	DI067A	8\15 SUMMER	8			N\A	DI067A			N\A	MUSSEL BED
ELRINGTON	ER020B	7\8 SUMMER	8	46	465	98	ER020B	45	465	17	MUSSEL BED
ELRINGTON	ER020B	8\10 SUMMER	8			N\A	ER020B			N\A	MUSSEL BED
EVANS	EV070E	7\2 SUMMER	8				EV070E			48	MUSSEL BED
EVANS	EV070E	7\27 SUMMER	8			9	EV070E			3.5	MUSSEL BED
EVANS	EV070E	8\27 SUMMER	8			5	EV070E			2	MUSSEL BED
FLEMING	FL004A	8\28 SUMMER	8				FL004A			20	MUSSEL BED
KNIGHT	KN135A	8\17 SUMMER	15	235	N\A	143	KN136A	235	N\A	53	MUSSEL BED
KNIGHT	KN136A	7\28 SUMMER	N\A			N\A	KN136A			N\A	MUSSEL BED
KNIGHT	KN136A	8\28 SUMMER	N\A			N\A	KN136A			N\A	MUSSEL BED
KNIGHT	KN300A	6\6 SUMMER	8				KN300A			25	MUSSEL BED
KNIGHT	KN300A	7\11 SUMMER	4			44	KN300A			67	MUSSEL BED

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ISLAND	SEGMENT SUBSEGMENT	DATE SEASON	MANDAYS	AVE LNG METERS	AVE WDH METERS	GAL	SEGMENT SUBSEGMENT	AVE WDH METERS	AVE LNG METERS	LBS	HABITAT TYPE
KNIGHT	KN300A	8\16 SUMMER	4			27	KN300A			15	MUSSEL BED
LATOUCHE	LA015E	7\7 SUMMER	16			202	LA015E			122	MUSSEL BED
LATOUCHE	LA015E	8\11 SUMMER	8			277	LA015E			126	MUSSEL BED
MAINLAND	MA002A	8\17 SUMMER	0				MA002A			N\A	MUSSEL BED
		TOTAL MANDAYS	101		TOTAL GAL	910			TOTAL LBS	535	
APPLEGATE	AE005A	5\2 SPRING	0				AE005A			N\A	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005A	6\1 SUMMER	0				AE005A			2.8	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005A	7\19 SUMMER	0			20	AE005A			8.8	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005A	8\18 SUMMER	0			42	AE005A			19	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005B	7\19 SUMMER	0			9.4	AE005B			6	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE005B	8\18 SUMMER	0			0	AE005B			18	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN600A	6\7 SUMMER	0				KN500A	35	N\A	103	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500A	8\28 SUMMER	0				KN500A			40	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
KNIGHT	KN500B	8\29 SUMMER	0			N\A	KN500B			N\A	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	6\20 SUMMER	24				LA010A			27	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	7\9 SUMMER	4			N\A	LA010A			N\A	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	7\29 SUMMER	0			1.4	LA010A			53	BAYS&LAGOONS\POSSIBLE UNTAPPED STREAM INFLUENCE
LATOUCHE	LA010A	7\30 SUMMER	0			N\A	LA010A			N\A	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
LATOUCHE	LA010A	8\27 SUMMER	0			N\A	LA010A			N\A	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE

ISLAND	SEGMENT SUBSEGMENT	DATE SEASON	MANDAYS	AVE LNG METERS	AVE WDH METERS	GAL	SEGMENT SUBSEGMENT	AVE WDH METERS	AVE LNG METERS	LBS	HABITAT TYPE
		TOTAL MANDAYS	124		TOTAL GAL	91			TOTAL LBS	350	BAYS&LAGOONS\POSSIBLE UNTRAPPED STREAM INFLUENCE
APPLEGATE	AE004A	6\1 SUMMER	10				AE004A			2.0	OFFSHORE ROCKS
AGULIAK	AG009A	7\10 SUMMER	17			N\A	AG009A			N\A	OFFSHORE ROCKS
		TOTAL MANDAYS	27		TOTAL GAL	N\A			TOTAL LBS	2.0	
KNIGHT	KN132B	6\4 SUMMER	10				KN132B			75	STREAMS
KNIGHT	KN132B	6\8 SUMMER	10				KN132B			10	STREAMS
KNIGHT	KN401	8\28 SPRING	8				KN401			10	STREAMS
		TOTAL MANDAYS	35		TOTAL GAL	N\A			TOTAL LBS	95	

DEFINITIONS OF TERMS:

N\A.....THIS INDICATES TREATMENT OCCURRED, BUT SPECIFIC DATA WAS NOT AVAILABLE.
TOTAL MANDAYS.....THE SUMMATION OF INDIVIDUAL MAN DAYS (MANDAY=ONE MAN WORKING AN 8 HOUR DAY) BY HABITAT TYPE
TOTAL GAL.....THE TOTAL NUMBER OF GALLONS OF INIPOL SPRAYED ON THAT SUBSEGMENT HABITAT SITE DURING 1991
TOTAL LBS.....THE TOTAL NUMBER OF POUNDS OF CUSTOMBLEN DRY FERTILIZER APPLIED TO THAT SUBSEGMENT DURING 1991
AVE LNG.....AVERAGE LENGTH OF THE TREATED OIL BAND IN METERS
AVE WDH.....AVERAGE WIDTH OF THE TREATED OIL BAND IN METERS

ALL THE DATA COMPILED FOR THESE TABLES CAME FROM THE FOLLOWING SOURCES:

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION: OIL SPILL RESPONSE OFFICE, 4241 B STREET SUITE 304 ANCHORAGE ALASKA 99503 (PRINCE WILLIAM SOUND SEGMENT FILE ALPHABETICAL BY ISLAND)

UNITED STATES COAST GUARD FOSC: (1989,1990,1991) PRINCE WILLIAM SOUND OIL SPILL SEGMENT FILE. ALPHABETICAL INDICATOR BY ISLAND. KEY BANK BLDG. 601 W 5TH. AVE. 4TH FLOOR SUITE 401 ANCHORAGE ALASKA

TABLE 10a

TABLE 10a

HELICOPTER DISTURBANCE DURING PRE-ANADSCAT STREAM SURVEYS 1990

SEGMENT	CATALOG #	LOCATION	DATE
CH001A	2262016280	Chenega Island, north tip	04/13/90
CH002B	2262016180	Chenega Island, north tip	04/13/90
EL015A	2261016906	Eleanor Island, Upper Passage	04/13/90
EL052B	2261016902	Eleanor Island, Northwest Bay	04/13/90
EV070G	2264016509	Evans Island, Guguak Cove	04/11/90
GR103A	2272017880	Green Island, Gibbon Anchorage	04/12/90
IN031A	2261016916	Ingot Island, Foul Passage	04/13/90
KN103A	2261016922	Knight Island, Louis Bay	04/12/90
14A	2263016865	Knight Island, Bay of Isles, South Arm	04/12/90
KN201A	2263016872	Knight Island, Bay of Isles, West Arm	04/12/90
KN205B	2263016860	Knight Island, Bay of Isles, South Arm	04/12/90
KN211E	2261016875	Knight Island, North From Bay of Isles	04/12/90
KN213B	2263016853	Knight Island, Rua Cove	04/12/90
KN401B	2263016820	Knight Island, Snug Harbor	04/12/90
KN500A	2261016992	Knight Island, northwest tip	04/12/90
KN500B	2261016992	Knight Island, northwest side	04/12/90
KN602B	2264016851	Knight Island, Mummy Bay	04/12/90
KN701A	2263016840	Knight Island, Marsha Bay	04/13/90
KN704A	2263016844	Knight Island, Marsha Bay	04/11/90
WH003B	2262016322	Mainland, Whale Bay, Claw Peak Point	04/12/90
WH003C	2262016321	Mainland, Whale Bay, Claw Peak Point	04/12/90

BLES\PREANAD2.TWC

TABLE 10b

TABLE 10b

HELICOPTER SURVEYS DURING ANADSCAT STREAM SURVEYS 1990
DISTURBANCE DATA

SEGMENT	CATALOGE #	LOCATION	DATE
CH001A	2262016280	Chenega Island, north tip	04/25/90
CH002B	2262016180	Chenega Island, north tip	04/26/90
EL015A	2261016906	Eleanor Island, Upper Passage	04/23/90
EL052B	2261016902	Eleanor Island, Northwest Bay	04/24/90
EV070G	2264016509	Evans Island, Guguak cove	04/21/90
GR103A	2272017880	Green Island, Gibbon Anchorage	04/23/90
IN031A	2261016916	Ingot Island, Foul Passage	04/24/90
KN103A	2261016922	Knight Island, Louis Bay	04/21/90
KN106E	2261016890	Knight Island, Louis Bay	04/27/90
KN132B	2261016982	Knight Island, Herring Bay, west side	04/21/90
KN134A	2263016865	Knight Island, Bay of Isles, south arm	04/22/90
KN201A	2263016872	Knight Island, Bay of Isles, west arm	04/22/90
KN205B	2263016860	Knight Island, Bay of Isles, south arm	04/27/90
KN211E	2261016875	Knight Island, North from Bay of Isles	04/22/90
KN213B	2263016853	Knight Island, Rua Cove	04/27/90
KN401B	2263016820	Knight Island, Snug Harbor	04/27/90
KN500A	2261016992	Knight Island, northwest tip	04/21/90
KN500B	2261016996	Knight Island, northwest side	04/24/90
KN602B	2264016851	Knight Island, Mummy Bay	04/27/90
KN701B	2263016840	Knight Island, Marsha Bay	04/27/90
KN704A	2263016844	Knight Island, Marsha Bay	04/27/90
NA026A	2224012950	Naked Island, Outside bay	04/26/90

BLES\ANADFNL.TWC

TABLE 10c

TABLE 10c

HELICOPTER DISTURBANCE DURING MAYSAP STREAM SURVEYS 1991

SEGMENT	CATALOG #	LOCATION	DATE
CH002B	2262016180	Chenega Island, north tip	05/05/91
EL052B	2261016902	Eleanor Island, Northwest Bay	04/27/91
GR103A	2272017880	Green Island, Gibbon Anchorage	04/26/91
KN103A	2261016922	Knight Island, Louis Bay,	05/01/91
KN132B	2261016982	Knight Island, Herring Bay, west side	05/01/91
KN134A	2263016865	Knight Island, Bay of Isles, South Arm	05/13/91
KN211E	2261016875	Knight Island, North from Bay of Isles	05/01/91
3B	2263016853	Knight Island, Rua cove	05/13/91
KN401B	2263016820	Knight Island, Snug Harbor	04/26/91
KN500A	2261016992	Knight Island, northwest tip	04/30/91
KN500B	2261016996	Knight Island, northwest side	04/30/91
KN701B	2263016840	Knight Island, Marsha Bay	05/05/91

NOTE: HELICOPTER DISTURBANCE OCCURED DURING A CRITICAL TIME PERIOD WHERE HARLEQUIN DUCKS ARE PAIRING AND PROSPECTING FOR NESTING AREAS.

TABLES\MAYSAP.TWC

TABLE 10d

TABLE 10d

DISTURBANCE DATA
ADF&G HELICOPTER SALMON SURVEYS 1990

L :ON	SEGMENT	STREAM NO	DATES OF HELICOPTER LANDINGS
BATHTUB COVE	BA002A	226-40-17451	8/14, 8/21, 8/24, 8/27, 8/30
POINT COUNTESS	BP004	226-20-16392	7/23, 8/3, 8/8, 8/14, 8/16, 8/21, 8/26, 8/30
CHENEGA CREEK	CH001A	226-20-16280	7/23, 8/3, 8/8, 8/14, 8/16, 8/21, 8/26, 8/30
JUNCTION CREEK	CH002A	226-20-16180	8/2, 8/14, 8/16, 8/21, 8/24, 8/27, 8/30, 9/6
CHENEGA ISLAND	CH009A	226-20-16180	8/14, 8/21, 8/24, 8/27, 8/30, 9/6
CHENEGA COVE	CH014A	226-20-16255	8/14, 8/21, 8/24, 8/30
SOUTH CHENEGA	CH016A	226-20-16258	8/4, 8/21, 8/24, 8/30
SOUTH CHENEGA	CH020A	226-20-16260	8/21, 8/24, 9/2, 10/5
DANGEROUS PASS	CH900A	226-20-16200	8/8, 8/14, 8/21, 8/26, 8/30
CULROSS ISLAND	CU001B	225-10-12995	8/14, 8/15, 8/21, 8/30
CULROSS ISLAND	CU013	225-10-13030	8/14, 8/32, 8/26, 8/30
CULROSS ISLAND	CU014A	225-10-13036	8/14, 8/16, 8/21, 8/30, 9/4
CULROSS ISLAND	CU017	225-10-13030	8/14, 8/16, 8/30
ELRINGTON IS.	CR008A	226-50-16436	8/14, 8/21
ELRINGTON IS.	ER005A	226-50-16432	8/21, 8/29
ELRINGTON IS.	ER006A	226-50-16430	8/2, 8/15, 8/21, 8/29
ELRINGTON IS.	ER007A	226-50-16428	8/2, 8/15, 8/21, 8/29
ELEANOR ISLAND	EL052B	226-10-16902	8/14, 8/21, 8/24, 8/29, 8/30
SHELTER BAY	EV025A	226-49-16613	7/21, 7/29, 8/4, 8/14, 8/21, 8/24, 8/26 8/28, 9/6
SHELTER BAY	EV027A	226-40-16610	7/29, 8/4, 8/14, 8/21, 8/24, 8/26, 9/4, 9/6
EVANS ISLAND	EV017A	226-40-16630	7/21, 7/31, 8/5, 8/14, 8/21, 8/26, 8/29
E ISLAND	EV017A	226-40-16620	8/5, 8/14, 8/21, 8/26, 8/29
E ISLAND	EV014A	226-40-16640	7/21, 8/2, 8/14, 8/21, 8/26, 8/29
EVANS ISLAND	EV070H	226-40-16498	8/3, 8/24, 8/29
GUGUAK COVE	EV070G	226-40-16502	8/3, 8/24, 8/29, 9/4
EVANS ISLAND	EV070F	226-40-16509	8/14, 8/21, 8/24, 8/29
EVANS ISLAND	EV071B	226-40-16484	7/23, 8/2, 8/14, 8/21, 8/24, 8/29, 9/5
EVANS POINT	EV003A	226-40-16590	8/2, 9/4
EVANS ISLAND	EV012A	NONE	8/2, 8/4, 8/14, 8/16, 8/21, 8/26, 8/29
FLEMMING IS.	FL004A	226-40-16384	8/4, 9/4
GREEN ISLAND	GR007	NONE	8/15, 8/21, 8/30
GREEN ISLAND	GR103A	226-20-17880	7/21, 8/16, 8/21, 8/30
FOUL PASSAGE	IN031	226-10-16910	8/14, 8/21, 8/24, 8/30
LOG JAM BAY	KN211E	226-10-16875	8/14, 8/21, 8/24, 9/4 , 9/7, 9/8
HERRING BAY	KN115A	NONE	8/14, 8/21, 8/30
BAY OF ISLES	KN005B	NONE	8/14, 8/21, 8/30
WEST ARM	KN201A	226-30-16870	8/3, 8/4, 8/14, 8/21, 8/29
SOUTH ARM	KN205B	226-30-16860	8/3, 8/14, 8/21, 8/30
SNUG HARBOR	KN401B	226-30-16820	7/21, 7/30, 7/31, 8/15, 8/26, 8/28
MARSHA BAY	KN701B	226-30-16840	7/21, 7/27, 7/28, 7/31, 8/2, 8/3, 8/7 8/14, 8/16, 8/22, 8/26, 8/28, 9/6, 9/8
BAY OF ISLES	KN134	226-30-16865	7/22, 7/31, 8/3, 8/14, 8/21, 8/26, 8/30
HERRING POINT	KN500A&B	226-10-16996	7/23, 7/29, 8/3, 8/21, 8/22, 8/24, 8/28, 9/6, 9/7
LOWER PASSAGE	KN103A	226-10-16922	7/29, 8/14, 8/21, 8/30
HERRING BAY	KN129A&B	226-10-16975	8/3, 8/15, 8/21, 8/24, 8/30
CAMP CREEK	KN132B	226-10-17092	7/31, 8/3, 8/7, 8/24, 8/26
RUA COVE	KN213A	226-30-16853	8/2, 8/4, 8/7, 8/21, 8/24, 8/28
T BAY	KN604	226-40-16809	9/6, 9/7
I CHE IS.	LA015C	226-40-16782	7/22, 8/2, 8/14, 8/21, 8/24, 9/7
SLEEPY BAY	LA018A	226-40-16780	7/22, 7/29, 7/30, 8/14, 8/24, 8/29
LATOUCHE IS.	LA021A	226-40-16776	8/2, 8/14, 8/23, 8/21, 8/24, 8/29
WHALE BAY	WH003B	226-20-16322	8/15, 8/16, 8/21, 8/26, 8/30

TABLE.NEW/FISHCNT.TWC

TABLE 10e

TABLE 10e
AIRCRAFT DISTURBANCE
SPRING EAGLE NEST SURVEYS CONDUCTED BY HELICOPTER
IN PRINCE WILLIAM SOUND BY USFWS*

LOCATION	SEGMENT	DATE
APPLEGATE ISLAND	AE004A	6/1/91
APPLEGATE ISLAND	AE005A	6/1/91
APPLEGATE ISLAND	AE005B	6/1/91
APPLEGATE ISLAND	AE009A	6/2/91
APPLEGATE ISLAND	AE009B	6/2/91
BAINBRIDGE ISLAND	BA002A	6/8/91
BAINBRIDGE ISLAND	BA006C	6/8/91
BAINBRIDGE ISLAND	BA007A	6/8/91
BAINBRIDGE ISLAND	BA008A	6/8/91
BLOCK ISLAND	BL012A	6/1/91
POINT COUNTESS	BP004A	6/2/91
CHENEGA ISLAND	CH002B	6/8/91
CHENEGA ISLAND	CH010C	6/8/91
JUNCTION ISLAND	CH011A	6/8/91
CHENEGA ISLAND	CH012A	6/8/91
CHENEGA ISLAND	CH013A	6/8/91
CRAFTON ISLAND	CR004A	6/2/91
CRAFTON ISLAND	CR004B	6/2/91
CULROSS ISLAND	CU001A	6/5/91
CULROSS ISLAND	CU011A	6/1/91
CULROSS ISLAND	CU014A	6/1/91
DANGER ISLAND	DA001A	6/8/91
DELENIA ISLAND	DE001A	6/8/91
DISK ISLAND	DI062A	6/1/91
DISK ISLAND	DI067A	6/5/91
ESHAMY BAY	EB011A	6/1/91
ELEANOR ISLAND	EL010A	6/1/91
ELEANOR ISLAND	EL011A	6/1/91
ELEANOR ISLAND	EL013A	6/1/91
ELEANOR ISLAND	EL015A	6/5/91
NORTHWEST BAY	EL052B	6/5/91
NORTHWEST BAY	ELO53B	6/5/91
NORTHWEST BAY	EL054A	6/5/91
NORTHWEST BAY	EL057A	6/5/91
NORTHWEST BAY	EL058B&C	6/5/91
ELEANOR ISLAND	EL102B	6/1/91
ELEANOR ISLAND	EL106B&C	6/8/91
ELEANOR ISLAND	EL107B	6/8/91
ELEANOR ISLAND	EL109A	6/8/91
ELRINGTON ISLAND	ER002A	6/8/91
ELRINGTON ISLAND	ER007A	6/8/91
ELRINGTON ISLAND	ER009A	6/8/91
ELRINGTON ISLAND	ER011A	6/2/91
ELRINGTON ISLAND	ER012B	6/2/91
ELRINGTON ISLAND	ER020A,B&C	6/5/91

TABLE 10e cont.

LOCATION	SEGMENT	DATE
EVANS POINT	EV003A	6/8/91
EVANS ISLAND	EV012A	6/8/91
EVANS ISLAND	EV014A	6/8/91
SHELTER COVE	EV017A	6/8/91
SHELTER COVE	EV021A	6/1/91
SHELTER COVE	EV023A	6/1/91
SHELTER COVE	EV024A	6/1/91
SHELTER COVE	EV025A	6/1/91
EVANS ISLAND	EV037A	6/1/91
BISHOP ROCK	EV039A	6/1/91
EVANS ISLAND	EV050C	6/2/91
SAWMILL BAY	EV051A	6/2/91
BETTLES ISLAND	EV053B&D	6/8/91
BETTLES ISLAND	EV054A	6/8/91
SQUIRREL ISLAND	EV066A	6/2/91
GUGUAK COVE	EV070E	6/8/91
GUGUAK COVE	EV070G	6/8/91
EVANS ISLAND	EV071	6/2/91
FLEMMING ISLAND	FL004A&B	6/8/91
GREEN ISLAND	GR101B	6/2/91
GREEN ISLAND	GR103B&C	6/2/91
GREEN ISLAND	GR302A	6/2/91
INGOT ISLAND	IN022A&B	6/2/91
INGOT ISLAND	IN024B	6/1/91
FOUL PASSAGE	INO31B	6/1/91
FOUL PASSAGE	IN032A	6/8/91
FOUL PASSAGE	IN033A	6/1/91
BAY OF ISLES	KN004A	6/2/91
BAY OF ISLES	KN006A&B	6/8/91
BAY OF ISLES	KN015A	6/2/91
BAY OF ISLES	KN016A	6/8/91
SHORT ARM	KN024A	6/2/91
LOWER PASSAGE	KN104A	6/1/91
LOUIS BAY	KN107A	6/5/91
HERRING BAY	KN111A	6/5/91
HERRING BAY	KN113A	6/1/91
HERRING BAY	KN117A	6/5/91
HERRING BAY	KN123B	6/8/91
HERRING BAY	KN129A&B	6/1/91
HERRING BAY STREAM	KN132B	6/1/91
BAY OF ISLES STREAM	KN134A	6/2/91
BAY OF ISLES	KN135A&B	6/2/91
BAY OF ISLES LAGOON	KN136A	6/2/91
SHORT ARM	KN206A	6/8/91
LOWER PASSAGE	KN209A&D	6/1/91

TABLE 10e cont.

LOCATION	SEGMENT	DATE
LOGJAM BAY	KN211B&F	6/8/91
RUA COVE	KN213B&C	6/1/91
HERRING POINT	KN300A	6/1/91
SNUG HARBOR	KN400A	6/2/91
SNUG HARBOR STREAM	KN401A&B	6/1/91
SNUG HARBOR	KN403A	6/2/91
POINT HELEN	KN404A	6/8/91
POINT HELEN	KN405A	6/2/91
SNUG HARBOR	KN408A	6/8/91
HERRING POINT	KN500A&B	6/1/91 & 6/8/91
MARSHA BAY STREAM	KN701B&C	6/2/91 & 6/1/91
MARSHA BAY	KN702A&B	6/1/91
MARSHA BAY STREAM	KN703A	6/1/91
LATOUCHE ISLAND	LA015A,B,C,D,E	6/1/91
SLEEPY BAY	LA017A	6/1/91
SLEEPY BAY	LA018A	6/1/91
SLEEPY BAY	LA019A	6/1/91
SLEEPY BAY	LA020B,C&D	6/1/91
LATOUCHE ISLAND	LA021A	6/1/91
LATOUCHE ISLAND	LA023A	6/8/91
LATOUCHE ISLAND	LA024A	6/8/91
LATOUCHE ISLAND	LA025B	6/8/91
CHICKEN ISLAND	LA033A	6/5/91
HORSESHOE BAY	LA036A	6/1/91
MONTGOMERY BAY	LA039A	6/8/91
LONE ISLAND	LN006A	6/1/91
LITTLE SMITH ISLAND	LS060A	6/5/91
FOUL BAY	MA002A	6/8/91
MAIN BAY ENTRANCE	MA005A	6/8/91
MONTAGUE ISLAND	MN002A	6/8/91
MUMMY ISALAND	MU001B	6/8/91
PERRY ISLAND, DUCK PT.	PR002A	6/1/91
SOUTH BAY	PR003B&C	6/1/91
PERRY ISLAND	PROO5A,B&C	6/8/91
POINT MEARS	PR016A	6/1/91
SQUIRREL ISLAND	SL001B	6/8/91
SMITH ISLAND	SM006B	6/1/91

NOTE: This survey also took place in the spring of 1990 and included many more sites. Surveys were conducted by hovering a helicopter over Eagle Nests in order to observe eggs inside. Data for 1989 and 1990 Eagle surveys is unavailable. Many of these sites are also Harlequin Duck habitat.

TOM\TABLES\EAGLE.TWC

TABLE 11a

TABLE 11a

FRY DIGS CONDUCTED IN PRINCE WILLIAM SOUND OIL SPILL AREA 1989 & 1990

DATE	LOCATION	ALASKA CATALOG #	SEGMENT NO.	ID NO.	COMMENTS
3/31/89	TOTEMOFF CREEK CHENEGA ISLAND	226-20-16210	NO SEGMENT #	621	PROBABLE BREEDING AREA
4/16/89	"	"	"	"	"
10/2/89	"	"	"	"	"
3/22/90	"	"	"	"	"
9/28/90	"	"	"	"	"
3/31/89	ERB CREEK EWAN BAY	226-20-16040	EW001B	604	PROBABLE BREEDING AREA
4/16/89	"	"	"	"	"
10/2/89	"	"	"	"	"
3/22/90	"	"	"	"	"
10/29/90	"	"	"	"	"
4/1/89	CLAW CREEK WHALE BAY	226-20-16320	WH003	632	PROBABLE BREEDING & MOLTING AREA
4/17/89	"	"	"	"	"
10/4/89	"	"	"	"	"
3/28/90	"	"	"	"	"

DATE	LOCATION	ALASKA CATALOG #	SEGMENT NO.	ID NO.	COMMENTS
10/14/90	"	"	"	"	"
4/1/89	HAYDEN CREEK LA TOUCHE ISLAND	226-40-16770	LA035	677	PROBABLE BREEDING AREA
4/18/89	"	"	"	"	"
10/10/89	"	"	"	"	"
3/19/90	"	"	"	"	"
10/12/90	"	"	"	"	"
4/4/89	HOGAN CREEK HOBGAN BAY	226-30-16820	KN411	682	PROBABLE BREEDING AREA
4/21/89	"	"	"	"	"
10/11/89	"	"	"	"	"
3/27/90	"	"	"	"	"
10/13/90	"	"	"	"	"
4/3/89	SNUG HARBOR KNIGHT ISLAND	226-30-16820	KN201	682	PROBABLE BREEDING AREA & NET SITE
4/21/89	"	"	"	"	"
9/29/89	"	"	"	"	"
3/19/90	"	"	"	"	"
10/16/90	"	"	"	"	"

DATE	LOCATION	ALASKA CATALOG #	SEGMENT NO.	ID NO.	COMMENTS
4/3/89	HERRING CREEK HERRING BAY	226-20-16980	KN132	692	PROBABLE BREEDING AREA
4/19/89	"	"	"	"	"
3/30/89	"	"	"	"	"
9/30/90	"	"	"	"	"
4/4/89	MARSHA BAY	226-30-16840	KN701	684	PROBABLE BREEDING AREA
4/3/89	BAY OF ISLES	226-30-16870	KN201	687	PROBABLE BREEDING AREA & NET SITE
4/2/89	MACLEOD CREEK MONTEGUE ISAND	227-10-17070	NONE	707	PROBABLE BREEDING AREA
4/15/89	LOOMIS CREEK ESHAMY BAY	225-30-15060	EB002	506	PROBABLE BREEDING AREA
9/30/89	"	"	"	"	"
3/30/99	"	"	"	"	"
9/30/90	"	"	"	"	"
4/18/89	BRIZGALOFF CREEK CHENEGA ISLAND	226-20-16230	NONE	623	PROBABLE BREEDING AREA & NET SITE
10/3/89	"	"	"	"	"
4/11/90	"	"	"	"	"
9/27/90	"	"	"	"	"
4/16/89	BAINBRIDGE CREEK W.ARM WHALE BAY	226-20-16300	WH504	630	PROBABLE BREEDING AREA & NET SITE

DATE	LOCATION	ALASKA CATALOG #	SEGMENT NO.	ID NO.	COMMENTS
10/3/89	"	"	"	"	"
4/11/90	"	"	"	"	"
10/14/90	"	"	"	"	"
4/17/89	POINT COUNTESS	226-20-16392	BP004	637	PROBABLE BREEDING AREA
10/4/89	"	"	"	"	"
3/21/90	"	"	"	"	"
10/3/90	"	"	"	"	"
10/5/89	HAVERSON CREEK	226-40-16561	EV007	656	PROBABLE BREEDING AREA
4/26/90	"	"	"	"	"
10/15/90	"	"	"	"	"
4/1/89	SHELTER BAY	226-40-16610	EV027	663	PROBABLE BREEDING AREA
10/9/89	"	"	"	"	"
3/27/90	"	"	"	"	"
10/13/90	"	"	"	"	"
10/9/89	SLEEPY BAY	226-40-16780	LA018	678	PROBABLE BREEDING AREA
3/19/90	"	"	"	"	"

DATE	LOCATION	ALASKA CATALOG #	SEGMENT NO.	ID NO.	COMMENTS
10/3/90	"	"	"	"	"
4/19/89	CATHEAD BAY DRIER BAY	226-20-16990	KN575	699	PROBABLE BREEDING AREA
10/1/89	"	"	"	"	"
3/30/90	"	"	"	"	"
10/1/90	"	"	"	"	"
4/19/89	PORT AUDRY DRIER BAY	226-20-16950	KN575	695	PROBABLE BREEDING AREA
10-1-89	"	"	"	"	"
3/29/90	"	"	"	"	"
9/29/90	"	"	"	"	"
4/19/89	JUNCTION CREEK OR JACKSON CREEK CHENEGA ISLAND	226-20-16180	CH002	618	PROBABLE BREEDING AREA
10/2/89	"	"	"	"	"
3/29/90	"	"	"	"	"
9/28/90	"	"	"	"	"
9/30/89	CHENEGA CREEK CHENEGA ISLAND	226-20-16280	CH001	628	PROBABLE BREEDING AREA
3/29/90	"		"	"	"
9/29/90	"	"	"	"	"

DATE	LOCATION	ALASKA CATALOG #	SEGMENT NO.	ID NO.	COMMENTS
4/18/89	FALLS CREEK LATOUCHE ISLAND	226-40-16730	LA039	673	PROBABLE BREEDING AREA
10/10/89	"	"	"	"	"
3/20/90	"	"	"	"	"
10/12/90	"	"	"	"	"
4/20/90	THUMB BAY KNIGHT ISLAND	226-40-16807	KN604	680	PROBABLE BREEDING AREA

TOM/PRINT.TWC/FRYDIG.TWC

TABLE 11b

Table 11b

AGENCY STREAM MONITORING ACTIVITIES

ADULT SALMON WEIR SITES IN OILED AREAS OF PRINCE WILLIAM SOUND

LOCATION	SEGMENT NO.	ID #	AK. STREAM CATATLOG #
HERRING CR.	KN132	692	ASC 226-10-16982
TOTEMOFF CR.	NONE	621	ASC 226-20-16210
CATHEAD CR.	KN575	699	ASC 226-20-16990
JACKPOT CR.	NONE	609	ASC 226-20-16080
ESHAMY BAY	NONE	511	ASC 225-30-15110
LOOMIS CR.	EB002	506	ASC 225-30-15060
GREEN ISLAND CREEK	GR103	788	ASC 227-20-17880

(Green Island Creek has both juvenile and adult salmon weirs with similar timing to above CF weirs but is sponsored by a completely different ADF&G sport fish study)

NOTE* a) Both adult and juvenile salmon weirs obstruct each stream area bank to bank in upper intertidal areas.

b) Juvenile salmon weirs operate from early April through mid-June. Adult salmon weirs operate from early June through late September. Exact operational dates for adult weirs are currently unavailable.

c) Crews of 2 to 6 people occupy each wier camp. Operation of outboards, generators, chainsaws etc. in the vicinity is a standard routine. Also each camp has a regular schedule of mail planes (on floats) and supply ships.

TABLE 11c

Table 11c

AGENCY STREAM MONITORING ACTIVITIES

WIER SITES FOR OUTMIGRANT JUVENILE SALMON CODED WIRE TAG STUDY IN OILED AREAS OF PRINCE WILLIAM SOUND 1990
POTENTIAL HARLEQUIN DUCK BREEDING STREAMS

LOCATION	DATES	SEGMENT	CATALOG NO.	ID
CATHEAD BAY, DRIER BAY	4/18 to 5/25	KN575	226-20-16990	699
O'BRIEN CREEK, SAWMILL BAY	4/22 to 5/26	EV500	226-40-16665	666
TOTEMOFF CREEK, CHENEGA ISLAND	4/17 to 5/24	NONE	226-20-16210	621
HAYDEN CREEK, WILSON BAY	4/13 to 6/3	LA035	226-40-16770	677
LOOMIS CREEK, ESHAMY BAY	4/18 to 6/1	EB002	225-30-15060	506
ESHAMY CREEK, ESHAMY BAY	4/4 to 6/25	NONE	225-30-15110	511
JACKPOT BAY	4/14 to 6/1	NONE	226-20-16080	608
HERRING CREEK, HERRING BAY	4/15 to 6/15	KN132	226-10-16982	692

TABLE 11d

Table 11d

AGENCY STREAM MONITORING ACTIVITIES

WALKING FISH COUNT SURVEYS CONDUCTED AT
POTENTIAL HARLEQUIN BREEDING STREAMS
IN CONJUNCTION WITH WEIR SITE OPERATIONS 1990

LOCATION	SEGMENT	ID #	AK. STREAM CATALOG
PADDY BAY	PA001	601	ASC 226-20-16010
EWAN BAY	EW001	602	ASC 226-20-16020
ERB CREEK	EW900	604	ASC 226-20-16040
JACKPOT BAY	NONE	606	ASC 226-20-16060
JACKPOT BAY	NONE	610	ASC 226-20-16100
JACKPOT BAY	NONE	613	ASC 226-20-16130
JACKPOT BAY	NONE	611	ASC 226-20-16110
JACKPOT BAY	NONE	612	ASC 226-20-16120
TOTEMOFF CR.	NONE	621	ASC 226-20-16210
BRIZGALOFF CR.	NONE	623	ASC 226-20-16230
PORT AUDRY	KN575	695	ASC 226-20-16950
CATHEAD BAY	KN575	699	ASC 226-20-16990
CHENEGA CREEK	CH001	628	ASC 226-20-16280
JUNCTION CREEK	CH002	618	ASC 226-20-16180
MALLARD BAY	KN575	698	ASC 226-20-16980
BARNES COVE	KN575	697	ASC 226-20-16970
LOUIS BAY	KN5002	689	ASC 226-10-16890
LOWER PASSAGE	KN103	692	ASC 226-10-16922
BAY OF ISLES	KN103	687	ASC 226-30-16870
HERRING BAY	KN129	697	ASC 226-10-16975
POINT COUNTESS	BP004	637	ASC 226-40-16392

NOTE: This list of streams surveyed is incomplete since 1991 data is not yet available. The streams listed were surveyed by ADF&G personnel employed at weir sites. Salmon counts were conducted regularly during the operation of the weir. The 1991 study plan included several new weir sites with ground surveys of many more anadromous streams planned in the oil spill area.

TABLE 12

Table 12

OIL CONTAMINATION IN PWS MUSSEL BEDS DOCUMENTED AND DESCRIBED IN JOINT AGENCY OIL SPILL CLEAN UP & RESPONSE SURVEYS

L[illegible]TION	SEGMENT	SURVEY	DATE	COMMENTS
APPLEGATE	AE001	SCAT	4/25/89	OILED MUSSEL BEDS
APPLEGATE	AE005	SCAT	5/3/89	OILED MUSSEL BEDS
APPLEGATE	AE004B	SSAT	4/21/90	DENSE OILED MUSSEL BEDS
APPLEGATE	AE005C	SSAT	5/3/90	OIL COVERED DENSE MUSSEL BEDS 7 HARLEQUINS SIGHTED
APPLEGATE	AE005B	ASAP	8/22/90	DENSE OILED MUSSEL BEDS
AGULIAK IS.	AG009A&B	SSAT	4/2/90	DENSE OILED MUSSEL BEDS
AGULIAK IS.	AG009A	MAYSAP	5/4/91	DENSE OILED MUSSEL BEDS
AGULIAK IS.	AG001A	MAYSAP	5/4/91	DENSE OILED MUSSEL BEDS
CHENEGA IS.	CH009	SCAT	7/8/89	OILED MUSSEL BEDS
CHENEGA IS.	CH007	SCAT	7/15/89	DENSE MUSSEL BEDS
CHENEGA IS.	CH010B	MAYSAP	5/1/91	OILED MUSSEL BEDS
C[illegible] ISLAND	CL001A	SSAT	4/23/90	DENSE OILED MUSSEL BEDS 3 HARLEQUINS SIGHTED
CULROSS IS.	CU001	SCAT	7/15/89	OILED DENSE MUSSEL BEDS
CULROSS IS.	CU005	SCAT	5/28/89	DENSE MUSSEL BEDS
CULROSS IS.	CU006	SCAT	8/21/89	DENSE MUSSEL BEDS
CULROSS IS.	CU011	SCAT	8/17/89	DENSE MUSSEL BEDS
CULROSS IS.	CU013	SCAT	8/18/89	DENSE MUSSEL BEDS
CULROSS IS.	CU014	SCAT	8/18/89	DENSE MUSSEL BEDS
ELEANOR IS.	EL011	SCAT	5/13/89	DENSE MUSSEL BEDS
ELEANOR IS.	EL013A	SCAT	6/3/89	TREATED OILED MUSSEL BED
ELEANOR IS.	EL013A	SSAT	4/8/90	DENSE OILED MUSSEL BEDS
ELRINGTON IS.	ER020B	MAYSAP	7/16/91	OILED MUSSEL BEDS
INGOT ISLAND	IN023	SCAT	4/16/89	OILED MUSSEL BEDS

Table 12 cont.

LOCATION	SEGMENT	SURVEY	DATE	COMMENTS
BAY OF ISLES	KN016	DSA/SCAT	5/7/89	OILED MUSSEL BEDS DISTURANCE OF N[illegible]NG OYSTERCATCHER
BAY OF ISLES	KN017	SCAT	5/9/89	TRAPPED OIL IN MUSSEL BEDS
BAY OF ISLES	KN021	SCAT	5/12/89	OILED MUSSEL BEDS
BAY OF ISLES	KN023	SCAT	5/12/89	OILED DENSE MUSSEL BEDS
HERRING BAY	KN141	SCAT	6/13/89	HEAVILY OILED MUSSEL BEDS 90% MORTALITY OF MUSSEL BEDS
HERRING BAY	KN141A&B	MAYSAP	5/19/91	DESCRIPTION OF OILED MUSSEL BEDS
HERRING BAY	KN145A	SCAT	6/13/89	DESCRIPTION OF OILED MUSSEL BEDS
MARSHA BAY	KN702	SCAT	7/6/89	OILED MUSSEL BEDS
FOUL BAY	MA002	DEC/FALL	9/13/89	DESCRIPTION OF OILED MUSSEL BEDS
FOUL BAY	MA003	DEC/FALL	9/13/89	DESCRIPTION OF OILED MUSSEL BEDS
MAIN BAY	MA005	SCAT	5/25/89	DESCRIPTION OF OILED MUSSEL BEDS
MUMMY IS.	MU900	SSAT	4/2/90	DENSE OILED MUSSEL BEDS

[illegible]	Shoreline Cleanup Assessment Team
SSAT	Spring Shoreline Asssessment Team
ASAP	August Shoreline Assessment Program
DEC/FALL	Department of Environmental Conservation Fall Walk-a-Thon survey.
MAYSAP	May Shoreline Assessment Program
DSA	DEC Daily Shoreline Assessment report

TABLE 13

Table 13

HARLEQUIN BROOD SURVEY 1991
Western PWS Oil Spill Area
and Pheriphery

location	seg#	ASC#	date	time	#HADU/brood
Goose Bay	(none)	224-30-14860	8/13	1530	-0-
Goose Bay	(none)	224-30-14850	8/13	1535	-0-
Long Bay	(none)	224-30-14760	8/13	1600	-0-
Culross Pass.	(none)	224-30-14800	8/13	1615	-0-
Lower pass.	KN103	226-10-16922	8/17	1630	-0-
Lower pass.	INO31	226-10-16906	8/17	1710	-0-
Northwest Bay	EL052	226-10-16902	8/18	1200	-0-
Block Island	EL015	226-10-16906	8/18	1215	-0-
Lower Herring	KN551	226-20-16846	8/18	1320	-0-
Lower Herring	KN551	226-20-16862	8/18	1330	-0-
Lower Herring	KN551	226-20-16868	8/18	1335	-0-
Lower Herring	KN551	226-20-16881	8/18	1340	-0-
Lower Herring	KN551	226-20-16895	8/18	1345	-0-
Mallard Bay	KN575	226-20-16980	8/18	1410	-0-
Barns Cove	KN575	226-20-16970	8/18	1415	-0-
Northeast Cove	KN575	226-20-16963	8/18	1420	-0-
Port Audry	KN575	226-20-16950	8/18	1430	-0-
Johnson Bay	KN554	(not cataloged)	8/18	1500	3 young
Johnson Bay	KN554	226-20-16940	8/18	1530	-0-
Kake Cove	CH017	226-20-16270	8/19	1130	-0-
Guguak Cove	EV070	226-40-16509	8/19	1230	-0-
Iktua Bay	EV007	226-40-16550	8/19	1235	-0-
Bainbridge	BA006	226-40-16269	8/19	1410	-0-
Bainbridge	BA006	226-40-16279	8/19	1415	-0-
Whale Bay	WH502	226-20-16362	8/19	1445	4 young w/hen
Whale Bay	WH502	226-20-16360	8/19	1500	-0-
Whale Bay	WH502	226-20-16340	8/19	1508	-0-
Whale Bay	WH003	226-20-16321	8/19	1529	-0-
Whale Bay	WH504	226-20-16300	8/19	1630	-0-
Brizgaloff Cr.	(none)	226-20-16230	8/19	1700	-0-
Masked Bay	(none)	226-20-16190	8/19	1730	-0-
Cabin Bay	NA024	222-40-12960	8/20	1130	-0-
Outside Bay	NA026	222-40-12950	8/20	1200	-0-
Log Jam Bay	KN211	226-10-16875	8/20	1330	-0-
Log Jam Bay	KN211	226-10-16880	8/20	1355	-0-
Snug Harbor	KN401	226-30-16820	8/20	1520	-0-
Rua Cove	KN213	226-30-16853	8/20	1550	-0-
Otter Cove	KN018	226-30-16880	8/20	1600	-0-
South Arm	KN205	226-30-16860	8/20	1610	-0-
Bay of Isles	KN134	226-30-16865	8/20	1620	-0-
West Arm	KN201	226-30-16870	8/20	1630	-0-

TABLE 13 cont.

HARLEQUIN BROOD SURVEY 1991

location	seg#	ASC#	date	time	#HADU/brood
Hanning Bay, Montague Island.	MN006	227-10-17110	8/21	1200	2 Broods; 4 young w/hen, 3 young w/hen.
Jackpot Bay	(none)	226-20-16130	8/22	1130	-0-
Jackpot Bay	(none)	226-20-16100	8/22	1200	-0-
Jackpot Bay	(none)	226-20-16110	8/22	1210	-0-
Jackpot Bay	(none)	226-20-16120	8/22	1215	-0-
Jackpot Bay	(none)	226-20-16090	8/22	1218	-0-
Jackpot Bay	(none)	226-20-16080	8/22	1220	-0-
Ewan Bay	EW001	226-20-16040	8/22	1320	-0-
Ewan Bay	EW001	226-20-16036	8/22	1325	-0-
Ewan Bay	EW001b	226-20-16030	8/22	1330	-0-
Paddy Bay	PA001	226-20-16010	8/22	1400	-0-
Loomis Creek	EB002a	226-10-16560	8/23	1030	-0-
Eshamy Bay	EB009	226-10-15160	8/23	1040	-0-
Eshamy Bay	EB009	226-10-15140	8/23	1045	-0-
Gunboat Creek	EB007	226-10-15070	8/23	1130	-0-
Eshamy Lagoon	(none)	226-10-15110	8/23	1230	-0-
Bay of Isles	KN023A	OFFSHORE IS.	9/5	6130	3 young w/hen