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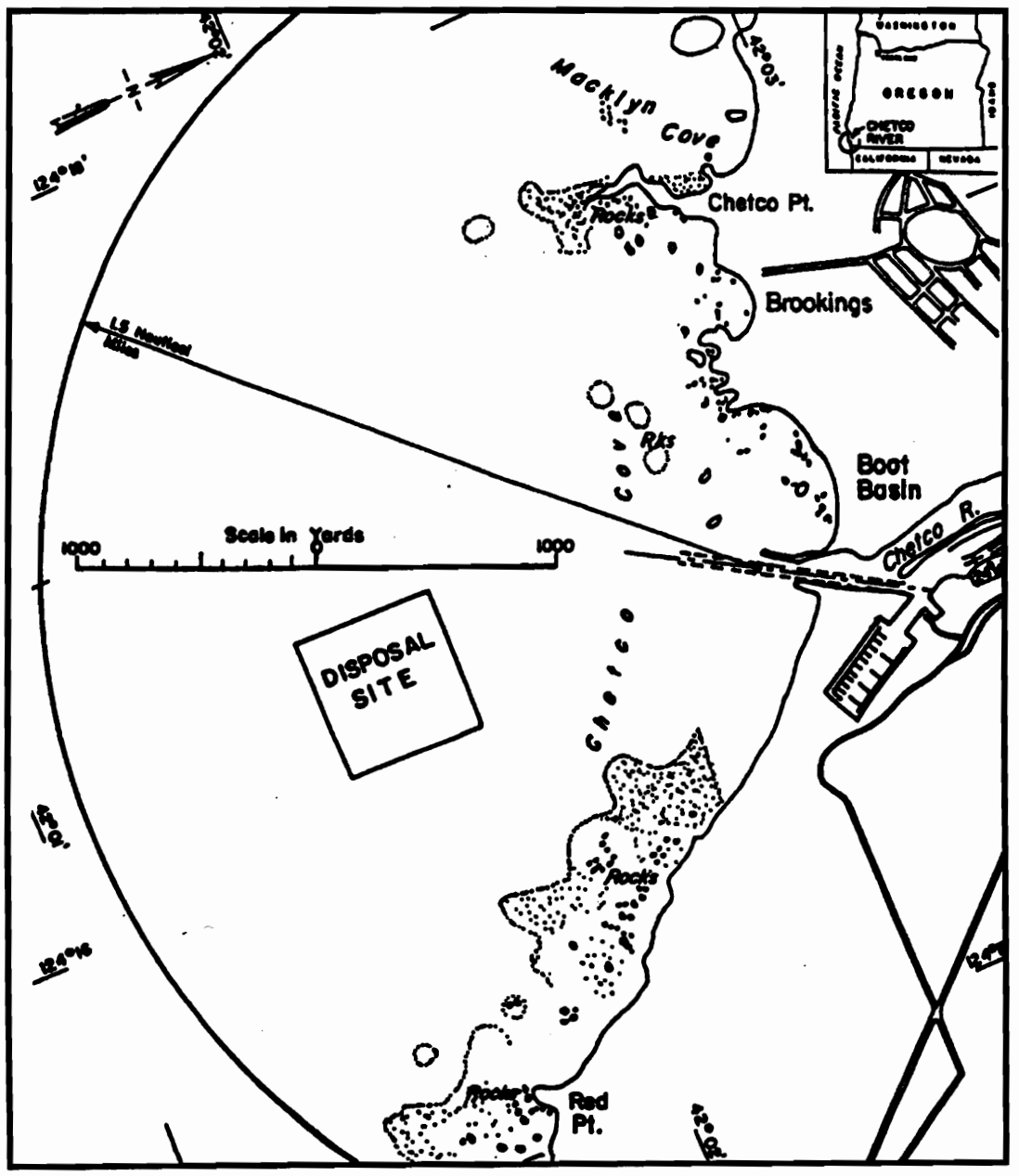
United States Environmental Protection Agency	Region 10 1200 Sixth Avenue Seattle WA 98101	Alaska Idaho Oregon Washington
Water Division	Water Resources Assessment	August 1991

EPA

Chetco, Oregon Dredged Material Disposal Site Designation

Final Environmental Impact Statement



FINAL

ENVIRONMENTAL IMPACT STATEMENT

CHETCO OCEAN DREDGED MATERIAL DISPOSAL SITE (ODMDS) DESIGNATION

Prepared by

U.S. ENVIRONMENTAL PROTECTION AGENCY (Region 10)

With Technical Assistance From

U.S. Army, Corps of Engineers
Portland District

August 1991

COVER SHEET

Final

ENVIRONMENTAL IMPACT STATEMENT

CHETCO OCEAN DREDGED MATERIAL DISPOSAL SITE (ODMDS) DESIGNATION

Lead Agency: U. S. Environmental Protection Agency, Region 10

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Abstract:

This final EIS provides information to support designation of an ocean dredged material disposal site (ODMDS) in the Pacific Ocean off the mouth of the Chetco River in the State of Oregon. The proposed ODMDS disposal site is the present interim site located approximately one nautical mile south of the Chetco River entrance. Site designation studies were conducted by the Portland District, Corps of Engineers, in consultation with Region 10 EPA. The final designation will allow for continued deposition of sediments dredged by the Corps of Engineers to maintain the federally-authorized navigation projects at the Chetco River, Oregon and other dredged materials authorized in accordance with Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA). No significant or long-term adverse environmental effects are predicted to result from the designation. Designation of an ODMDS does not constitute or imply approval of an actual disposal of material. Before any disposal may occur, a specific evaluation by the Corps must be made using EPA's ocean dumping criteria. EPA makes an independent evaluation of the proposal and has the right to disapprove the actual disposal.

Public Review and Comment Process:

The draft EIS was offered for review and comment to members of the public, special interest groups, and government agencies. No public hearings/meetings were scheduled. Comments received on this draft EIS have been addressed in this final document. Copies of this final EIS have been provided to those who received the draft. Additional copies may be obtained from and any comments or questions may be directed to:

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EXECUTIVE SUMMARY

Site Designation. Section 102 (c) of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 *et seq.* (MPRSA), gives the Administrator of the U. S. Environmental Protection Agency the authority to designate sites where ocean dumping may be permitted. On October 1, 1986, the Administrator delegated the authority to designate ocean dumping sites to the Regional Administrator of the Region in which the site is located. EPA has voluntarily committed to prepare EISs in connection with ocean dumping site designations (39 FR 16186, May 7, 1974).

This final environmental impact statement (EIS) was prepared by Region 10, EPA, with the cooperation of the Portland District, U. S. Army Corps of Engineers. This draft EIS provides documentation to support final designation of an ocean dredged material disposal site (ODMDS) for continuing use to be located off the mouth of the Chetco River, Oregon. This document evaluates the proposed Chetco ODMDS site based on criteria and factors set forth in 40 CFR 228.5 and 228.6. This EIS makes full use of existing information to discuss various criteria, supplemented by field data to describe environmental conditions within and adjacent to the site.

As a separate but concurrent action, EPA will publish a final rule in the **Federal Register** for formal designation of the Chetco ODMDS.

Major Conclusions and Findings. The preferred ODMDS for final designation is located one nautical mile south of the entrance to the Chetco River with dimensions of 1800 feet by 1800 feet and an average depth of 70 feet. The site occupies approximately 74 acres (0.08 sq. nautical mile). The site, which has served as the interim site since 1977 when designated, will continue to be used for disposal of sediments dredged by the Corps of Engineers to maintain federally authorized navigation projects at Chetco River, Oregon and for disposal of dredged materials authorized in accordance with Section 103 of the MPRSA. The ODMDS site proposed for designation has been determined to be suitable in terms of environmental and navigational safety factors.

Disposal of the dredged sediments is a necessary component of maintaining the navigation channel, the turning basin and the small boat access channel. An evaluation of disposal alternatives was conducted. No less environmentally damaging, economically feasible alternative to ocean disposal for material dredged from the entrance to the Chetco River navigation channel was identified. In addition, use of ocean disposal for other channel reaches and by other dredgers may be expected to increase as other disposal options are exhausted. Designation of an ODMDS is necessary to accommodate this need.

Two alternatives for ocean disposal were considered for the Chetco ODMDS:

(1) Termination of ocean disposal at Chetco;
(2) Designation of the existing interim ODMDS.

Based on the evaluation of need and an assessment of environmental impacts from historic dredged material disposal, termination of ocean disposal at Chetco was not considered prudent or reasonable. Evaluation focussed on the existing interim ODMDS, and consideration of an ODMDS beyond the continental shelf. Use of an ODMDS beyond the continental shelf provided no environmental advantages and incurred significant economic costs. The interim disposal site was evaluated considering each of the five general and eleven specific criteria as required in 40 CFR 228.5 and 228.6.

The Chetco ODMDS, or areas in the same vicinity, have been used by Portland District since 1963. To date, 749,000 cubic yards have been disposed at sea, 420,706 of which has been disposed of in the designated offshore site since 1977. The site was designated interim in 40 CFR 228.12 and was entitled "Chetco River Entrance" with the following coordinates (NAD 83):

	42° 01' 55" N.	124° 16' 37" W.
	42° 01' 55" N.	124° 16' 13" W.
	42° 01' 37" N.	124° 16' 13" W.
and	42° 01' 37" N.	124° 16' 37" W.

After applying the five general and eleven specific criteria, designation of the interim ODMDS was selected as the preferred action. Continued use of the interim site would not be expected to cause unacceptable adverse environmental effects.

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I. INTRODUCTION

This final Environmental Impact Statement (EIS) was prepared by Region 10, U. S. Environmental Protection Agency (EPA), with the cooperation of the Portland District, U. S. Army Corps of Engineers. Section 102 (c) of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 *et seq.* (MPRSA), gives the Administrator of the EPA the authority to designate sites where ocean dumping may be permitted. On October 1, 1986, the Administer delegated the authority to designate ocean dumping sites to the Regional Administrator of the Region in which the site is located. EPA has voluntarily committed to prepare EISs in connection with ocean dumping site designations (39 FR 16186, May 7, 1974).

Disposal site studies were designed and conducted by the Corps, in consultation with EPA, and a Site Evaluation Report was prepared and coordinated by the Corps. That Site Evaluation Report described conditions in the vicinity of the proposed ocean dredged material disposal site (ODMDS) at Chetco River, Oregon. The Chetco ODMDS received its interim designation from EPA in 1977 (40 CFR 228.12). The MPRSA requires that, for a site to receive a final ODMDS designation, the site must satisfy the general and specific disposal site criteria set forth in 40 CFR 228.6 and 228.5. The Corps Report proposed that a final ODMDS be designated for the existing interim ODMDS. The report also documented compliance of the proposed ODMDS with requirements of the following laws:

Endangered Species Act of 1973,
National Historic Preservation Act of 1966, and the
Coastal Zone Management Act of 1972, all as amended.

That document was submitted to EPA for review and processing for formal designation by the Regional Administrator, Region 10. The Corps' Site Evaluation Report was used as the basis of the draft EIS. Comments received during public review of the draft EIS have been responded to in this final document. Technical Appendices from the Corps' report are included as appendices to this EIS.

II. PURPOSE AND NEED

General. This EIS provides documentation to support final designation of an ocean dredged material disposal site (ODMDS) for continuing use to be located off the mouth of the Chetco River, Oregon. This document evaluates the proposed Chetco ODMDS based on criteria and factors set forth in 40 CFR 228.5 and 228.6 as required by the Ocean Dumping Regulations (ODR) promulgated in the **Federal Register** on January 11, 1977, in accordance with provisions set forth in Sections 102 and 103 of the MPRSA. This EIS makes full use of existing information to discuss various criteria, supplemented by field data to describe environmental conditions within and adjacent to the site. Comments received during public review of the draft EIS have been responded to and are included in section VI of this document.

The preferred ODMDS for final designation is the existing interim site located one nautical mile (nmi.) south of the mouth of the Chetco River. The site, when designated as the final ODMDS, will be used for disposal of materials dredged by the Corps of Engineers to maintain the federally authorized navigation project at the Chetco River, Oregon, and for disposal of dredged materials authorized in accordance with Section 103 of MPRSA. The ODMDS site proposed for designation is located in the area best suited for dredged material disposal in terms of environmental and navigational safety factors.

Location. The Chetco River enters the Pacific Ocean near the town of Brookings, Oregon approximately 300 miles south of the Columbia River (Figure 1). The estuary is fed mainly by Chetco River and its tributaries, which originate in the Klamath Mountains. Chetco River drains 365 square miles and is 58 miles from its mouth to headwaters.

Need. The Corps is responsible for the Chetco River project which is authorized for the following purposes:

- To decrease waiting times for vessels crossing the bar;
- To provide adequate channel dimensions for tugs, barges, and commercial fishing vessels;
- To provide mooring facilities for small boats which take advantage of project facilities;
- To permit barge and small boat traffic upstream to river mile 0.2; and
- To provide a harbor of refuge.

Maintenance of the navigation channel to authorized depths is critical to keeping the river and harbor open and sustaining these vital components of the local and state economy.

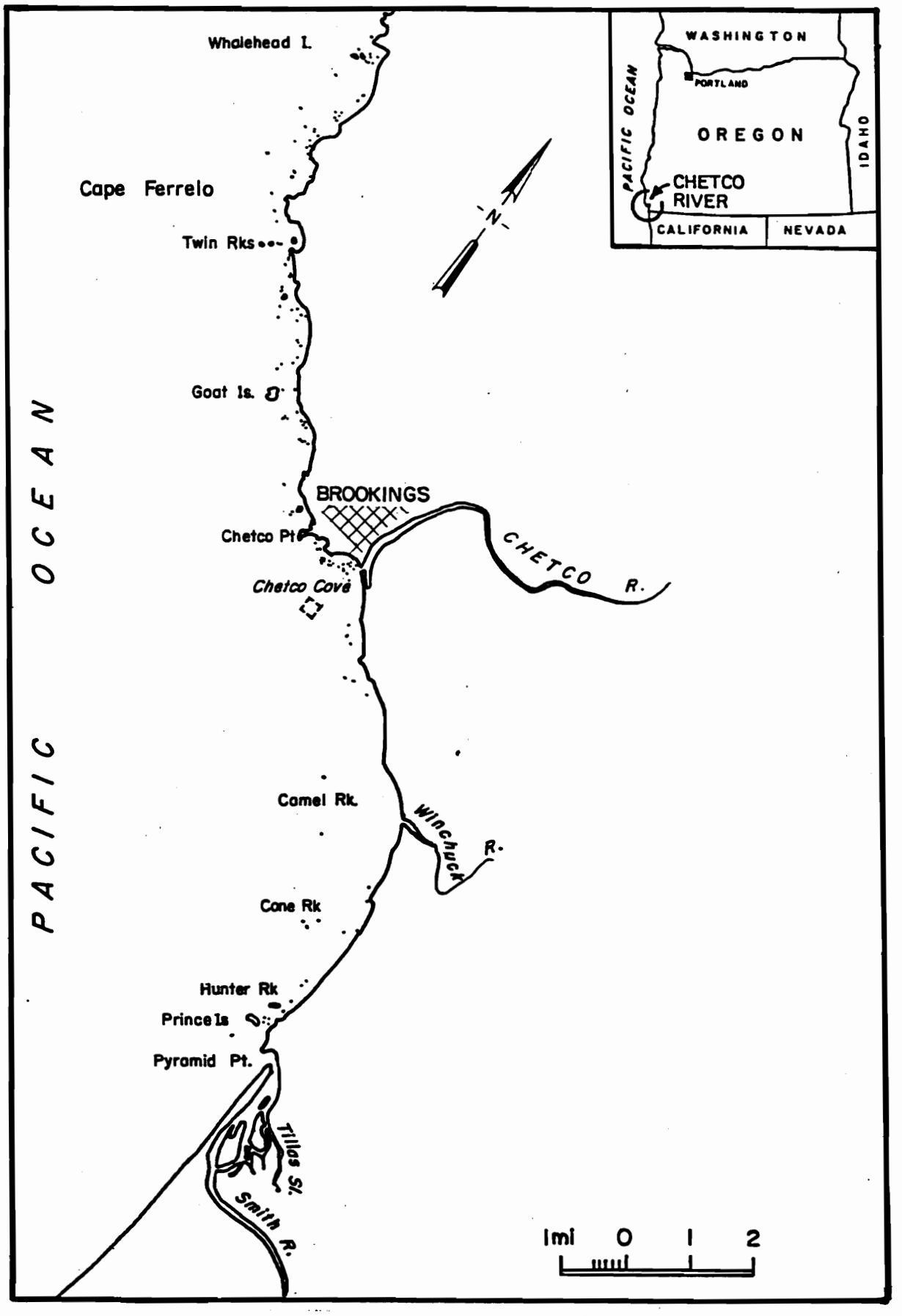

Figure 1
General Location of Chetco River

Portions of the authorized project considered in this EIS are:

- An entrance channel 14 feet deep and 120 feet wide;
- A barge turning basin 14 feet deep, 250 feet wide, and 650 feet long; and
- A small boat access channel 100 feet wide by 12 feet deep into the Cetco River Small Boat Harbor.

Disposal of dredged sediments is a necessary component of maintaining the authorized project. An evaluation of disposal alternatives was conducted and is contained in Section III Alternatives. No less environmentally damaging, economically feasible alternative to ocean disposal for material dredged from the entrance to the Chetco River was identified. In addition, use of ocean disposal for other channel reaches and by other dredgers may be expected to increase as other disposal options are exhausted. Designation of an ODMDS is necessary to accommodate this need.

Project History. The existing navigation project at Brookings was originally authorized in the River and Harbor Act of March 2, 1945, and was modified in the River and Harbor Act of October 27, 1965. Due to navigational needs, two rubble mound jetties were constructed at the mouth of the Chetco River in 1957, with the north jetty being extended by 450 feet in 1965. Construction of a channel, turning basin and protective dike, removal of rock pinnacles, and annual maintenance dredging were authorized as well.

The frequency of maintenance dredging depends upon the volume of sediments transported into the estuary and the frequency and severity of storms that move sediments into the channel, creating a bar. From 1982 to 1985, an average of 42,400 cubic yards (cy) of sediment were dredged from the entrance channel and the entrance to the boat basin. On a five-year average between 1985 and 1989, 32,817 cy of sediment were dredged and disposed at the ODMDS annually, with a maximum of 53,569 cy dredged and disposed in 1988. Shoaling occurs off the end of the north jetty and at the entrance of the boat basin. Grain size varies greatly, ranging from 0.3 mm to 7.0 mm. Gravel and cobbles are often dredged from the boat basin. In addition, silts are occasionally dredged from the boat basin.

Historical ODMDS Use. The interim site, or areas in the same vicinity, have been used by Portland District since 1963. In 1977 the proposed site was designated an interim site in 40 CFR 228.12. These interim designations were an attempt by EPA to document and establish coordinates for historically used Corps of Engineers disposal sites. Interim designations were to lead to final designations or termination of their use, within three years of the interim designation. Since the three-year period ended in 1980, extensions have been approved for continuing interim use of the sites, pending completion of required studies for final designation.

The "Chetco River Entrance" site proposed for final designation has the following coordinates (NAD 83):

	42°	01' 55" N.	124° 16' 37" W.
	42°	01' 55" N.	124° 16' 13" W.
	42°	01' 37" N.	124° 16' 13" W.
and	42°	01' 37" N.	124° 16' 37" W.

The approximate location of this site is one nmi. from the Chetco River entrance, with dimensions of 1,800 feet by 1,800 feet and average depth of 70 feet. The site occupies an area of about 74 acres.

Maintenance operations in the entrance channel have been performed by hopper dredge or hopper barge, and in the interior by hopper dredge, channel flusher, or, on a limited basis, by clamshell dredge. During summer months, the small shoal buildup in the inner portion of the project has been removed by hopper dredges, *Pacific* and *Yaquina*, and placed in the EPA approved interim site. The sand flusher, *Sandwick*, has also been used to remove the shoals. To date, 749,000 cy have been disposed at sea, 420,706 of which has been disposed of in the designated interim site since 1977. On a five-year average (1985-1989) there was 32,817 cy of sediment dredged with a maximum of 53,569 cy dredged and disposed in 1988.

III. ALTERNATIVES

General. Under the MPRSA, designation of ocean dumping sites follow specific requirements. In conjunction with the MPRSA, the Ocean Dumping Regulations, as well as related EPA and Corps of Engineers policies, must be followed. Guidance for the evaluation process has been provided by the joint EPA/Corps workbook (1984). This process generally involved three major phases. Phase I includes delineation of the general area or Zone of Siting Feasibility (ZSF), i.e. disposal is economically and technically feasible. The ZSF is determined by establishing the reasonable haul distance, considering factors such as available dredging equipment, energy use constraints, costs, and safety concerns. Existing information on resources, uses, and environmental concerns are reviewed and critical resources and areas of incompatibility identified. Phase II involves identification of candidate sites within the ZSF based on information evaluated in Phase I. Additional studies can be conducted to further evaluate environmental and other factors, such as disposal site management considerations. Phase III consists of evaluation of candidate sites and selection of preferred sites(s) for formal designation by EPA. Preparation of this EIS and the designation rule is part of Phase III (Figure 2).

Constraints. Dredging of coastal ports along the northeastern Pacific Ocean is limited to a season from April through October. That limit is imposed by the weather and sea conditions that predominate in the Northwest. The size of the ZSF is controlled by the capability of available dredging equipment as allocated among the nine Oregon, one Washington, and four California coastal projects, and the hauling distance from the Chetco dredging site. The limited operating time available for completing the maintenance dredging along the Oregon coast, therefore, requires a combination of government and private dredges which operate on the Pacific coast. In a typical year, the Chetco project requires equipment which will permit production of 6,000 cy per day for approximately 8 days of work. Longer hauling distances of dredged material increase vessel operating costs and the time required for completion of the work. Loss of production time due to adverse weather conditions must also be anticipated. Based on these factors, the extreme practical limit of the Chetco ZSF was calculated by the Corps at 1.5 nmi.

Resource Considerations. The natural and cultural resources of the area within the ZSF were identified from information obtained through review of literature, interviews with resource agencies and local users, and through site specific studies. Critical information was evaluated and mapped to identify areas of resource conflict. The selection of resources to use for this determination was dependent on whether the resource was considered limited. A coast-wide resource, i.e., a flatfish spawning area, was not considered a limited resource and was not included in the overlay evaluation technique.

Equipment Considerations. For much of the Corps maintenance work, a hopper dredge must be used because the rough seas encountered at the entrance are not suitable for safe operation of a pipeline dredge. In recent years, use of mechanical dredges in combination with ocean-going tugs and barges has increased. This has somewhat

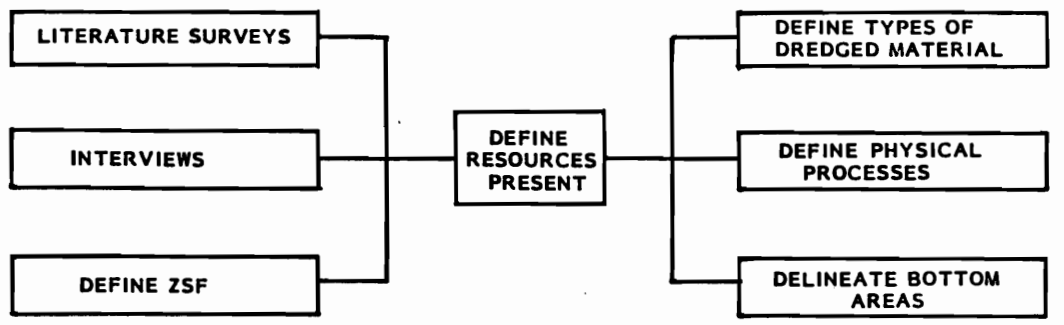

Figure 2
Overall Process for ODMDS Evaluation

enhanced flexibility for scheduling of dredging activities along the Pacific coast; however, limited availability of equipment remains a controlling factor.

With both a hopper dredge or barge, dredged material disposal would normally occur at an in-water site. There are no suitable sites in the estuary because of its narrowness and shallowness. Disposal of entrance material inside the estuary would have greater adverse environmental impacts than ocean disposal because estuarine habitats are generally more productive and far less extensive than are nearshore oceanic habitats. Disposal of the material inside the estuary would also increase the risk of the material eroding and reshoaling in the channel, potentially increasing dredging requirements.

Consideration of Upland Disposal Options. Upland disposal of entrance channel material typically is not feasible for economic and environmental reasons. Upland sites with large capacities seldom exist at such locations. More distant upland sites incur substantially greater costs for rehandling and transportation of the material, and alteration of the sites normally involves some environmental impacts. Pipeline dredging of entrance reaches is usually unsafe. Because of the use of hopper dredges or clamshell dredge and barge, it would be necessary to rehandle materials to use upland sites. Creation of an in-water sump in the estuary would require one to be dredged and material bottom-dumped into it, then pumped ashore with a pipeline suction dredge. Creation of a dewatering and rehandling area also may be necessary which could further alter marine or estuarine habitats. This would be very costly and also would increase adverse environmental impacts of the project. Another adverse impact of upland disposal is that naturally occurring sediments would be removed from the littoral system and could cause erosion of nearby shorelines over the long term.

Upland disposal was evaluated as a general alternative to designation of an ODMDS. Potential upland sites in the vicinity of the Chetco project were available but their use would involve rehandling and transportation as described above. The cost and environmental effects associated with developing a rehandling area was judged to be prohibitive. Therefore, ocean disposal would appear to be the most practicable and least environmentally damaging disposal alternative if the authorized channel is to be maintained. Upland disposal will also continue to be evaluated as a potential alternative for specific disposal actions.

Ocean Disposal Options. Two alternatives for ocean disposal were considered for the Chetco ODMDS:

(1) Termination of ocean disposal at Chetco;
(2) Designation of the existing interim ODMDS.

Based on the evaluation of need and an assessment of environmental impacts from historic dredged material disposal, termination of ocean disposal at Chetco is not considered prudent or reasonable. Identification and evaluation of alternative ODMDS in the vicinity of the interim site is not considered necessary as the interim site meets all but one of the general criteria. Accordingly, evaluation focussed on the existing interim ODMDS site and consideration of an ODMDS beyond the continental shelf. The procedures used to evaluate these options consisted of evaluating each of the five general and eleven specific criteria as required in 40 CFR 228.5 and 228.6.

Application of General Criteria. Potential ODMDS sites were evaluated in terms of the following general criteria (Table 1).

Table 1
General Criteria for the Selection of Ocean Disposal Sites

The dumping of material into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.

Locations and boundaries of disposal sites will be chosen so that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet criteria for site selection set forth in Sections 228.5 - 228.6, the use of such sites will be terminated as soon as suitable alternative disposal sites can be designated.

The sizes of ocean disposal sites will be limited in order to localize, for identification and control, any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse, long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.

EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.

Minimal Interference with Other Activities. The first of the five criteria require that a determination be made as to whether the site will minimize interference of the proposed disposal operations with other uses of the marine environment. This determination was made by overlaying several individual maps presented in the Technical Appendices onto a base map, giving bathymetry and location of the interim disposal site, and ZSF. The selection of figures to use for this determination was dependent on whether the resource was considered limited. A coast-wide resource, i.e. flat fish spawning area, was not considered a limited resource and was not included in the overlay evaluation technique. The following features, depicting spatial distribution of specific resources, were included in the evaluation of resources of limited distribution.

- Navigation Hazards Area/Other Recreation Areas
- Shellfish Areas
- Critical Aquatic Resource
- Commercial and Sport Fishing Areas
- Geological Features
- Cultural, Historically Significant Areas

Figure 3 is a composite of all of the above features and demonstrates, by various line densities, areas to avoid when placing a disposal site. The denser the grid of lines, the more critical the area, as more interactions between various limited resources, are taking place. As the figure shows, the existing site is within a minimal conflict area in the ZSF, with the exception of the chinook salmon fishing area. This area is fished summer and

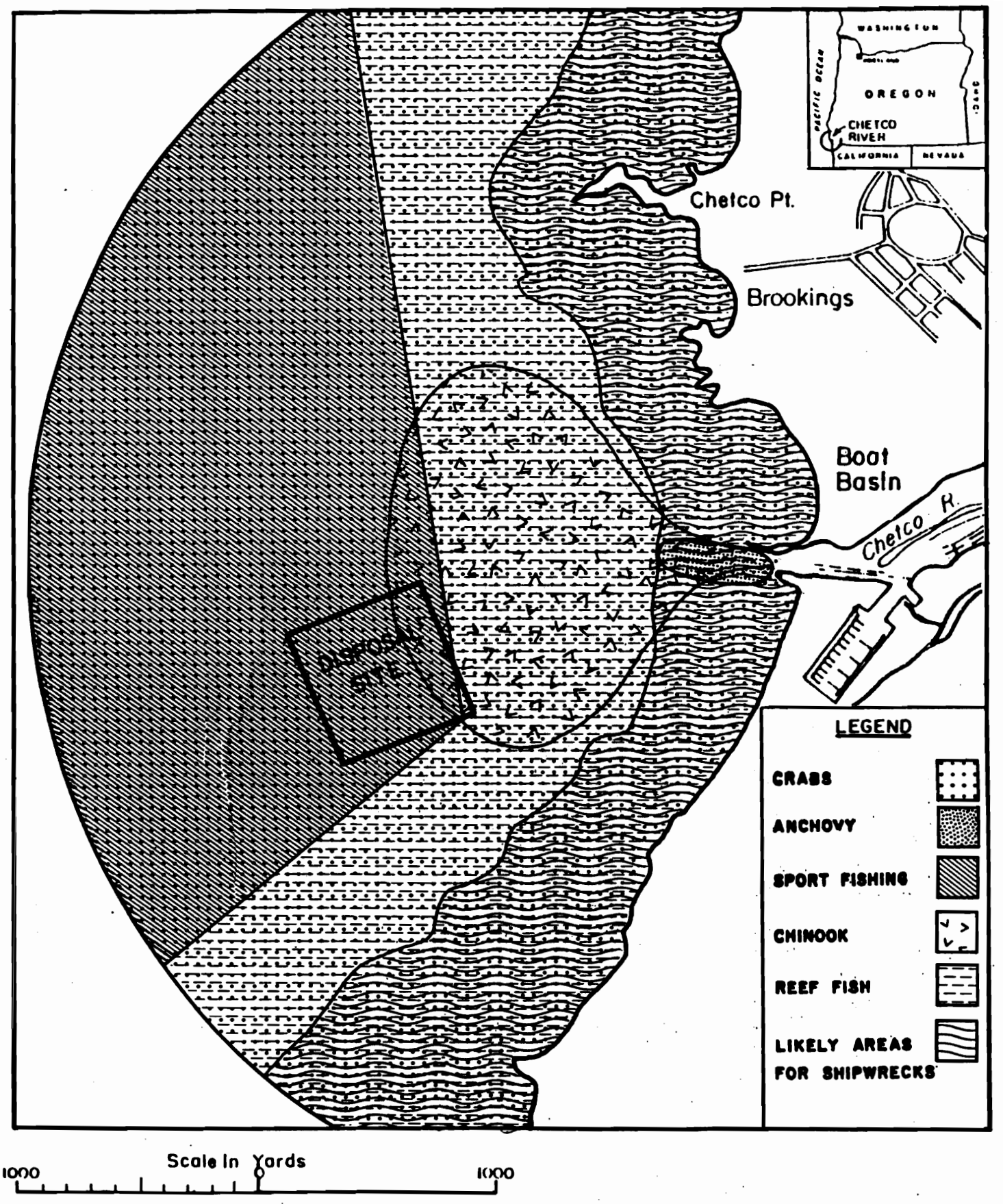

Figure 3
Overlay Evaluation of Individual Resources

fall of each year (actual length of the fishing season is set annually by Pacific Fisheries Management Council). Disposal operations can take place from May through October of each year. While this represents a temporal overlap, communications with ODFW personnel (Appendix A) indicate no observable conflicts between the two uses of the area. The remaining lighter area of salmonid fishery is not concentrated in one location or time of year, and there have been no observable conflicts between fishermen and disposal operations. Appendix A contains a discussion of all potential conflicts within the ZSF with living resources, and concludes that there have been no major conflicts in the past or predictable conflicts in the near future.

Minimizes Changes in Water Quality. The second of the five general criteria required changes to ambient seawater quality levels occurring outside the disposal site be within water quality standards and that no detectable contaminants reach beaches, shoreline, sanctuaries, or geographically limited fisheries or shellfisheries. Figure 3 was utilized to determine the potential for effects on items mentioned above. The nature of material from the entrance channel has already been discussed as clean sand; because of this no significant contaminant or suspended solids releases are expected. Dredged material other than entrance channel material would need to be evaluated for suitability and found to comply with this criteria as part of the approval process for discharge at the ODMDS. There should be no water quality perturbations to be concerned with that could move toward a limited resource. Bottom movement of deposited material is discussed in Appendix B and in general shows a net offshore movement for the finer fractions. Coarser fractions stay in the same general area.

Interim Sites Which Do Not Meet Criteria. Evaluation by the Corps and EPA indicates that the interim disposal site would meet the criteria and factors established in 40 CFR 228.5 and 228.6. A arguable exception is that the site is not located off of the continental shelf. No reported problems or complaints have been received by the Corps or EPA on use of this site. The site is environmentally acceptable for the types and quantities of dredged material it presently receives. (See evaluation of Sites off the Continental Shelf following.)

Size of Sites. The fourth general criterion requires that the size, configuration and location of the site be evaluated as part of the study. The Chetco River interim ODMDS is a square 1,800 feet by 1,800 feet, occupying approximately 74 acres of area. The Chetco ODMDS is similar in areal size and location to other Oregon ODMDS sites. This disposal site is dispersive and is of adequate size to accommodate the annual volumes of material it presently receives. Although volumes of material going to Oregon ODMDS are expected to increase slightly in the future as alternative disposal options are exhausted, this increase is not expected to seriously impact site capacity or resources outside the ODMDS. All Oregon ODMDS are jointly managed and periodically monitored by the Corps and EPA. Development of mounds has been observed at other Oregon ODMDS. Should similar mounding develop at Chetco, disposal practices could be altered or site boundaries adjusted if warranted. Public notices issued for ocean disposal operations, as required by MPRSA, have not generated concerns about significant impacts from their use. Also, no comments have been received about the size, shape, or location of the interim disposal sites. The Chetco site is located close enough to shore and harbor facilities that monitoring and surveillance programs, as required, can easily be accomplished.

Sites off the Continental Shelf. Any possible disposal sites off the continental shelf near Oregon are at least 20 nautical miles offshore. The ZSF for Chetco was defined after determining the economic haul distance (1.5 nautical miles) from shore. While there may be some flexibility in operations that could increase the haul distance somewhat, the minimum 20 nautical mile haul to utilize a continental slope disposal site is economically prohibitive. The cost involved would make the federally authorized Chetco River project infeasible. Further, very little is known of the ecology of benthic communities on the continental slope, and disposal in this area could cause impacts of unknown severity. Identification of potential off-continental shelf sites would require extensive sampling and evaluation. Such baseline studies, compliance monitoring, as well as post-disposal monitoring would be more difficult and would be substantially more expensive due to distance from shore and depth of water. The purpose of the off-continental shelf site preference is to minimize environmental impacts from ocean dumping. In this instance, evaluation of historic ocean dumping of dredged material at the interim site did not reveal actual or potential resource conflicts or unacceptable adverse environmental effects due to ocean dumping that would argue for use of another site. In summary, use of an ODMDS off the continental shelf did not offer any environmental advantages over a site located closer to the shore but did involve substantially greater economic disadvantages.

Application of Specific Criteria. The Chetco ODMDS has been evaluated in terms of the following specific criteria (Table 2).

Table 2
Eleven Specific Factors for Ocean Disposal Site Selection

Geographical position, depth of water, bottom topography, and distance from coast.
Location in relation to breeding, spawning, nursery, feeding or passage areas of living resources in adult or juvenile phases.
Location in relation to beaches or other amenity areas.
Types and quantities of waste proposed to be disposed of and proposed methods of release, including methods of packaging the waste, if any.
Feasibility of surveillance and monitoring.
Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current velocity, if any.
Existence and effects of present or previous discharges and dumping in the area (including cumulative effects).
Interference with shipping, fishing, recreation, mineral extraction, desalination, shellfish culture, areas of special scientific importance and other legitimate uses of the ocean.
Existing water quality and ecology of the site, as determined by available data or by trend assessment or baseline surveys.
Potential for the development or recruitment of nuisance species within the disposal site.
Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.

Geographic Location. Figure 4 indicates the location of Chetco interim ODMDS and bottom contours. The site lies in 50 to 70 feet of water, approximately one nmi. offshore of the entrance to the Chetco River. Coordinates were presented in the Purpose and Need Section of this report. The site's center line is on a 270 degree azimuth. Bottom topography within the site is varied and is presented in detail in Appendix B.

Distance From Important Living Resources. Aquatic resources of the ZSF site are described in detail in Appendix A. The existing disposal site is located in the nearshore area and many nearshore pelagic organisms occur in the water column over the site. These include zooplankton (copepods, euphausiids, pteropods, and chaetognaths) and meroplankton (fish, crab and other invertebrate larvae). These organisms generally display seasonal changes in abundance. Since they are present over most of the coast, those from Chetco are not critical to the overall coastal population. Based on evidence from previous zooplankton and larval fish studies, it appears that there will be no impacts to organisms in the water column (Sullivan and Hancock, 1978). The site is also adjacent to the neritic reefs and haystack rocks described in detail in Appendix A. These reefs are unusual features along the coast and support a variety of aquatic organisms, including bull kelp (*Nerocystis lutkeana*) and its associated fish and invertebrate community. Recently, the Oregon Department of Fish and Wildlife (ODFW) has begun studying squid resources, and a spawning area offshore of the disposal site has been identified.

Benthic samples were collected at the locations shown in Figure 4 and are discussed in detail in Appendix A. Based on the analysis of benthic samples collected from the Chetco disposal site and adjacent areas to the north and south, the disposal site contains a benthic fauna characteristic of nearshore, sandy, wave-influenced regions common along the coasts of the Pacific Northwest. The abundance and density of the infaunal community was found to be low at the disposal site, typical of shallow, nearshore, high energy habitats. The fauna is dominated by polychaete annelids (marine worms), small crustaceans (amphipods and cumaceans), molluscs (clams and snails), and echinoderms (sand dollars). The particular species identified from the disposal site are adapted to high energy environments and are able to withstand large sediment fluxes.

The ODMDS is in an area where concentrations of common murres, gulls and other marine foraging species occur. Large concentrations have been observed shoreward of the interim site extending to and within the confines of the jetties. Concentrations undoubtedly occur at the site periodically. Concentrations of shorebirds, gulls, waterfowl, and other species occur in the Chetco estuary or on adjacent beaches.

Portland District requested an endangered species listing for the ODMDS from U. S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) as part of their coordination of the Site Evaluation Report. At that time only the brown pelican and the gray whale were listed. Based on previous biological assessments conducted along the Oregon coast regarding impacts to the brown pelican and the gray whale, it was concluded that no impact to either species is anticipated from the proposed designation and use. This information was presented in the draft EIS.

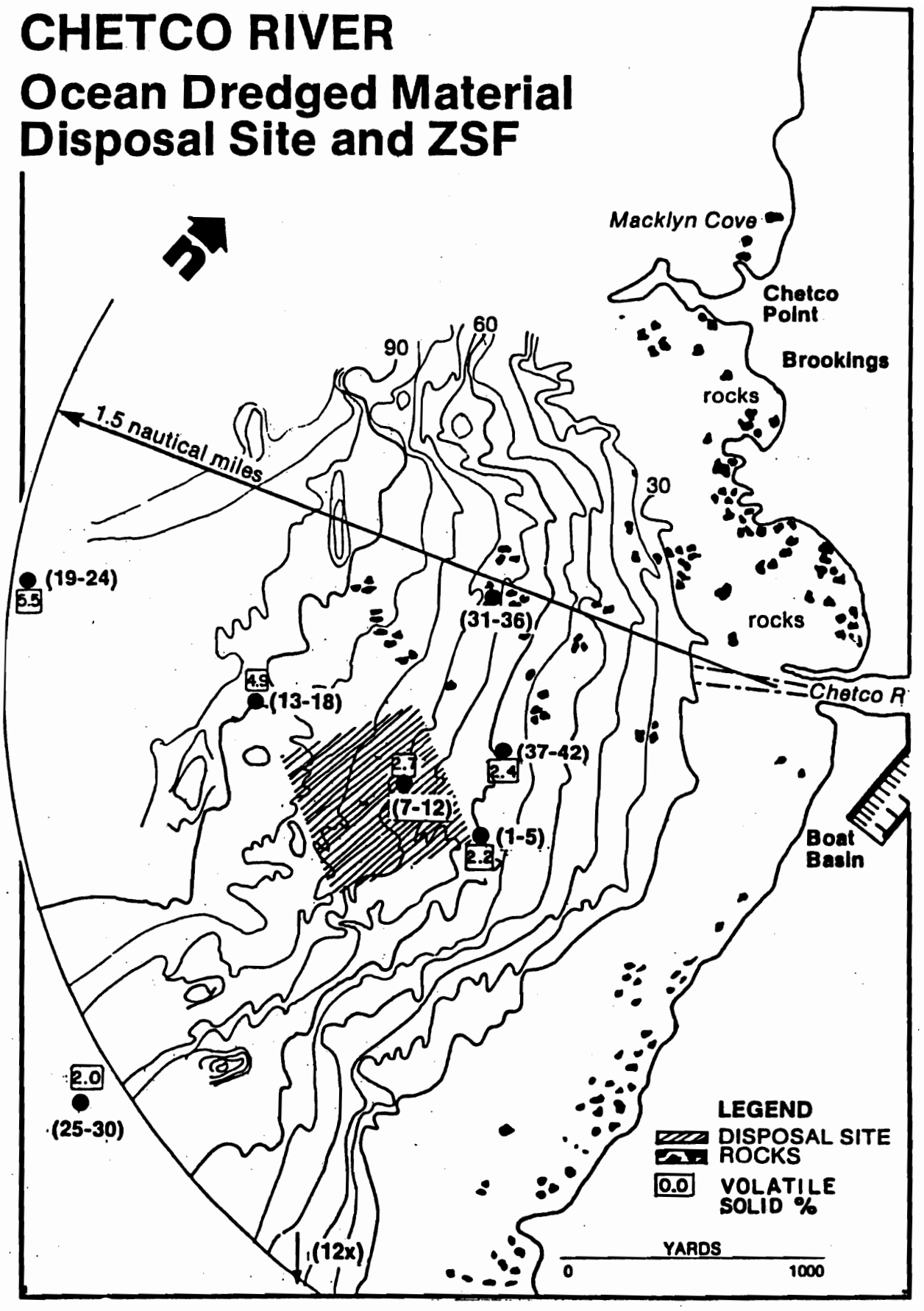

Figure 4
Chetco River ODMDS and ZSF

Subsequently, the Corps was informed by the NMFS that they had revised their list of threatened/endangered species. Species listed by the NMFS included the gray, humpback, blue, fin, sei, right, and sperm whales; northern (Steller) sea lions; leatherback sea turtles, and Sacramento River winter run chinook salmon. A biological assessment was prepared addressing the newly listed species and revising previous biological assessment on the gray whale. The assessment concluded that no impact to any of the species is anticipated by designation and use of the Chetco ODMDS. This information is presented in appendix F, including a letter of concurrance from NMFS.

In summary, the proposed ODMDS contains living resources that could be affected by disposal activities. Evaluation of past disposal activities do not indicate that unacceptable adverse effects to these resources have occurred. In the absence of any indication that the resources in proximity to the interim site have been impacted, this site is considered acceptable for final ODMDS designation.

Distance from Beaches and Other Amenities. Summer wave conditions may transport some sediment from the site shoreward and south, but the limiting depth for this movement is probably -40 to -50 feet mean lower low water (MLLW). The majority of material is disposed deeper than -50 feet MLLW, so little shoreward transport of dredged material is likely. Due to depth of disposal operations and the presence of the south reef, there is little possibility of beach nourishment by natural onshore movement of dredged material from the existing site.

Types and Quantities of Material to be Deposited at the Site. The interim disposal site will receive dredged materials transported by either government or private contractor hopper dredges or ocean-going barges. The current hopper dredges available for use at Chetco have hopper capacities from 800 to 1,500 cy. Barges have a greater capacity, up to 4,000 cy, but have not been routinely used at this project. This would be the range in volumes of dredged material disposed of in any one dredging/disposal cycle. The approximately 48,000 cubic yards estimated to be removed annually from Chetco can be placed at the site in one dredging season by any combination of private and government plants (see discussion under ZSF). The dredges would be under power and moving while disposing. This allows the ship to maintain steerage.

The material to be dredged consists of medium to fine grain marine sands and coarser materials, including gravels and cobbles (Appendix C, Figures C-5, C-6, and C-7). These materials are predominant in the project reach (RM 0 to 2.0) and upstream to RM 3.0. Appendix C contains results of analyses performed on these materials. The sediments contain no excess concentrations of contaminants of concern (Tables C-1 and C-2), and are excluded from further biological and chemical testing as discussed in 40 CFR 227.13(b). The materials are also very similar to bottom materials at the interim disposal site and the entire nearshore area. Appendix B provides detailed grain size information for the disposal area and the dredged area.

The Corps and EPA recently completed a report, *Characterization of Sediments from the Chetco River Mouth and Small Boat Basin* (May 1991). The report concludes that the risk of sediment contamination in the Chetco project area is low and confined to the small boat basins. Additional testing of material dredged from the boat basins would be

needed to determine suitability for ocean disposal. Material from the entance channel is sand and gravels and was considered suitable for ocean disposal at this time.

Feasibility of Surveillance and Monitoring. The proximity of the interim disposal site to shore facilities creates an ideal situation for shore-based monitoring of disposal activities. There is, routinely, a Coast Guard vessel patrolling entrance and nearshore areas, so surveillance can also be accomplished by surface vessel.

Following formal designation of an ODMDS for Chetco, EPA and the Corps will develop a site management plan which will address post-disposal monitoring. All Oregon ODMDS are periodically monitored jointly by the Corps and EPA already. Several research groups are available in the area to perform any required work. The work could be performed from small surface research vessels at a reasonable cost.

Disposal, Horizontal Transport, and Vertical Mixing Characteristics of the Area. The sediments dredged from the Chetco River entrance are predominantly marine sands and fluvial gravels. These are generally similar to sediments at the disposal site. Under winter wave conditions common to this part of the Pacific Coast, the sand component is highly mobile to a depth of 90-120 feet. Summer wave conditions commonly mobilize sands to a depth of 40-60 feet. Studies at Coos Bay show wave-generated currents can move this size sediment over 60 percent of the time during summer and winter and over 50 percent of the time during spring and fall (Appendix B). While waves are responsible for resuspending bottom sediments, including dredged materials, it is the long-term mean current that determines the extent and direction of dispersal. While some winter storms would move gravels at the disposal site, these coarse sediments do not migrate very far away from the site and probably stay in the general area where they have been disposed.

The nearshore mean circulation is alongshore, closely paralleling the bathymetric contours, with a lesser onshore-offshore component. Circulation patterns are variable with season and weather conditions. In winter, the general shelf circulation is to the north, although short periods of southerly flow occur. Coos Bay studies suggest that offshore flow is more common in winter. This would indicate a tendency for sediment in the disposal site to move north and west under winter circulation conditions. During the remainder of the year, flow is southerly with lower current velocities than in winter. Periodic changes in summer wind direction lead to episodes of upwelling in which near-shore ocean water transport causes a compensating near-bottom onshore flow. These upwelling events occur between April and July and continue for several days at a time. Near-bottom flow in the vicinity of the disposal site during summer should be generally southerly with onshore/offshore flow varying due to local wind conditions.

Effects of Previous Disposal. Appendix B, Table B-1 gives annual volumes of materials disposed for the last 10 years. On the average, 48,000 cubic yards have been disposed of annually. Future volumes are expected to be approximately the same. This volume has been required for the Corps to maintain the channel to its authorized depths (see discussion under ZSF).

The sidescan sonar map of the disposal site and adjacent areas (Appendix B, Figure B-5) shows an area of coarse sand/gravel covering about half of the site and extending

north and west of the site up to 1200 feet, both offshore and toward the river entrance. This is most likely an accumulation of the coarser dredged material fractions that have remained in the same general area since disposal. There are no bathymetric anomalies associated with this deposit (e.g., no mounding). The feature will persist as long as coarse sediments are disposed in this area. This has not caused adverse impacts on habitat, however, since the overall area is characterized by a wide range of bottom types.

Literature and information searches revealed no information on the site prior to disposal. ODFW biologists (personal communication) indicated that they felt that, beyond the yearly site-specific impacts from disposal, there had been no significant cumulative impacts to the resources, and they recommended that the site be left at its present location (see discussion, Appendix A).

No pre- or post-disposal water or sediment quality monitoring has been performed at the ODMDS. Based on information presented in Appendix C, there should be no historical or future chemical impacts on the marine environment surrounding the disposal site. Sediments disposed in the past have been physically the same as samples collected in close proximity to the disposal site (Appendix B). No chemical contaminants are present in concentrations of concern (Tables C-1 and C-2). The elutriate analysis discussed in Appendix C also showed minimal contaminant releases during this simulated disposal operation with receiving water from the interim disposal site.

As previously noted, the Corps and EPA have recently completed a report, *Characterization of Sediments from the Chetco River Mouth and Small Boat Basin* (May 1991). The report concludes that the risk of sediment contamination in the Chetco project area is low and confined to the small boat basins. Additional testing of material dredged from the boat basins would be needed to determine suitability for ocean disposal. Material from the entrance channel is sand and gravels and was considered suitable for ocean disposal at this time.

Sediments proposed for disposal at the Chetco ODMDS will require evaluation following the tiered testing guidance described in the joint EPA/Corps national framework, *Evaluation of Dredged Material Proposed for Ocean Disposal: Testing Manual* (February 1991). Sediment characterization, including chemical and biological testing as needed, has been a standard practice for several years in this region.

Interference with Other Uses of the Ocean.

Commercial Fishing: Two active commercial fisheries occur in the inshore area, salmon trolling and Dungeness crab fishing (Appendix A). The length of the salmon fishing season varies each year depending upon the established quota; however, it normally extends from July to September. During this period, the potential exists for conflicts between the dredge and fishing boats. The Coast Guard and ODFW indicated that they were unaware that this had ever been a problem. The Dungeness crab season is from December 1 to August 15; however, most of the fishing is done prior to June and usually ends early because of the increase in soft shell crabs in the catch which are not marketable. As a result, most crab fishing is done outside of the normal dredging season and it is unlikely that a conflict would result. ODFW feels a potential squid

fishery may exist offshore from the existing site (see Appendix A). No fishery exists at present, but stocks may be sufficient to support a fishery if a market develops. There are no existing commercial fish or shellfish aquaculture operations that would be impacted by continued use of the existing disposal site.

Recreational Fishing: Recreational fishing opportunities are extensive and varied in the Chetco area (Figure 5 and Appendix D). Primary activities include fishing, camping, and sightseeing. The small boat harbor is used extensively in the summer by recreational fishermen. Private party and charter boat recreational fishing for both salmon and rock and reef fish occur in nearshore areas. The salmon fishing season coincides with the commercial season and extends from early summer until the quota for the area is reached. Recreational fishing boats have a potential for conflicting with dredging operations; however, none has been reported to date. It is unlikely that any significant conflict will develop in the near future.

Offshore Mining Operations: All considerations for offshore mining and oil/gas leases are in the development stages. The disposal site is not expected to interfere with any of the proposed operations, as most exploration programs are scheduled for the outer continental shelf.

Navigation: No conflicts with commercial navigation traffic have been reported and none are expected, due to the light traffic in the Chetco River area. This situation is not expected to change substantially. Rock pinnacles that are navigation hazards occur nearshore and in the southern part of the ZSF. These submerged and emergent pinnacles should be avoided when considering final position of the ODMDS.

Scientific: There are no known transects or other scientific study locations that could be impacted by the disposal site.

Coastal Zone Management: Local comprehensive land use plans for the Chetco area have been acknowledged and approved by the State of Oregon. These plans discuss ocean disposal and recognize the need to provide for suitable offshore sites for disposal of dredged materials. In addition, this site evaluation document establishes that no significant effects on ocean, estuarine, or shoreland resources are anticipated, as Goal 19 of the Oregon Statewide Planning Goals and Guidelines requires.

During coordination of the Site Evaluation Report, the Corps made a determination of consistency with Coastal Zone Management plans. A letter of concurrance with that finding was provided by the Oregon Department of Land Conservation and Development, the state coastal zone management office. Their letter of concurrance is included in appendix F. EPA also concludes that designation of the proposed site is consistent to the maximum extent practicable with the state coastal management program.

Existing Water Quality and Ecology. Water and sediment quality analyses conducted at several Oregon ODMDS are discussed in Appendix C. These studies have not shown persistent adverse water quality impacts from ocean disposal of entrance shoal sands. Such impacts are not expected from dredged material disposal at the Chetco ODMDS.

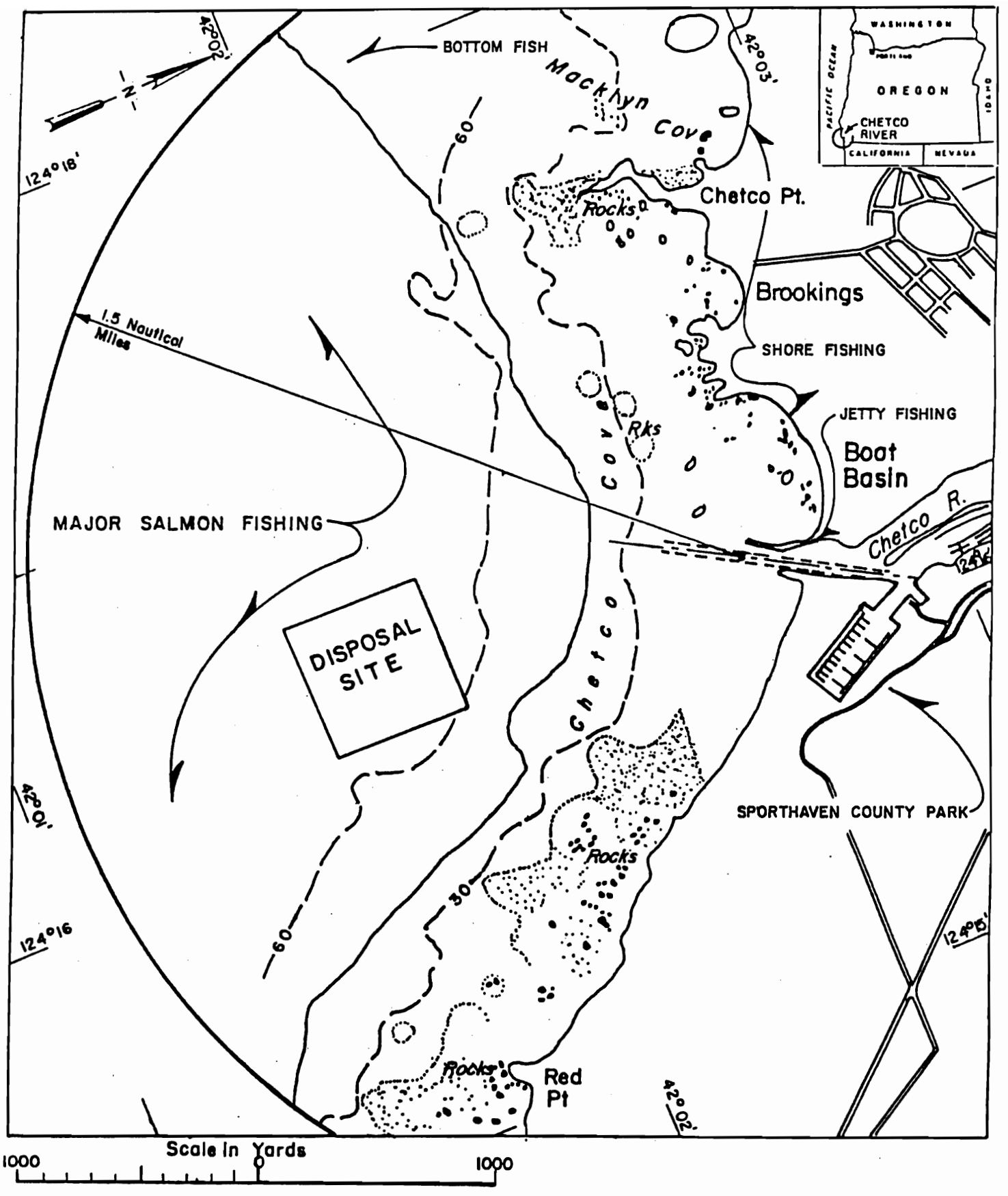

Figure 5
Recreational Resources

The ecology of the area can be discussed in general terms based on information presented in Appendix A. From available information, the offshore area within and adjacent to the ODMDS is a typical northwest Pacific mobile sand community, shifting to the north and southeast to a neritic reef system, also described in Appendix A. This determination is based mainly on fisheries, shellfish, and geophysics data. These sand communities are ubiquitous to nearshore ocean habitats off Oregon; disposal at the Chetco ODMDS is not expected to impact these communities. The site is sufficiently removed from rock and kelp habitats so that they also will not be impacted by ocean disposal.

Potential for Recruitment of Nuisance Species. It is highly unlikely that any nuisance species could be established at the disposal site as a result of dredging and disposal activities.

Existence of Significant Natural or Cultural Features. Neritic reefs, common off the southern Oregon coast, comprise a unique ecological feature. They support a wide variety of invertebrates and fish species unique to rocky areas, as well as bull whip kelp communities. These areas are sheltered from wave action and, when receiving nutrients from both the ocean and the estuaries as they do within the ZSF, are unusually highly productive. The ODMDS is removed from these areas.

The cultural resource literature search of the Chetco River study area, described in Appendix E, did not document any wrecked vessels in the project area. This is consistent with the fact that the Chetco River historically has not been a major shipping point on the coast. Most export commodities, especially timber products, have been transported by rail and barge rather than by lumber schooner or ship.

Wrecks could have occurred in the area that have not yet been discovered. However, based on previous investigations in other Oregon coastal settings (Yaquina Bay, Coquille, Columbia River Mouth), beaches, surf zones, neritic reefs, and shallow waters are the most likely areas for shipwreck occurrence. The ODMDS is removed from these areas. Also, there were no indications of wrecks from the side scan sonar survey completed during geophysical investigations within the ZSF (appendix E).

It has been determined, based on the considerations in Appendix E, that there will be no cultural resources impacts from designation of the Chetco ODMDS. Appendix E, along with supplementary side scan sonar data, has been reviewed by the Oregon State Historic Preservation Officer (SHPO). The SHPO letter of concurrance is reproduced in appendix F.

Selection of the Preferred Alternative. Based upon the information contained in this EIS, designation of an ODMDS off the Chetco River, Oregon, is considered necessary. In applying the specific and general site selection criteria to the proposed disposal site, a conflict matrix analysis was completed. Portland District developed the matrix format to simplify the general and specific site criteria review process and has used the matrix for several ODMDS studies. Each area of consideration on the conflict matrix addresses at least one general and specific criteria. Table 3 contains comments pertinent to the criteria for the proposed site. In addition to the conflict matrix, operational constraints and cost were considered for the site. After applying the five general and eleven specific criteria to the available options, designation of the interim ODMDS was selected as the preferred action. Continued use of the interim ODMDS would not be expected to cause unacceptable adverse environmental effects.

Table 3
Chetco Ocean Dredged Material Disposal Area Conflict Matrix for Evaluating Potential for Conflict with Required Considerations of the Marine Protection Research and Sanctuaries Act

Area of Consideration	Conflict	Potential Conflict	No Conflict	Beneficial Use	Comments	Relevant General Criteria (From Table 1 & 40CRF 228.5)	Relevant Specific Factors (From Table 2 & 40CRF 228.6)
1. Usual Topography			X			a	1, 6, 8, 11
2. Physical Sediment Compatibility			X		Material to be dredged is rock, cobbles, and sand. Variation of material to be dredges is matched by disposal site material.	b, c, d	3, 4, 9
3. Chemical Sediment Compatibility			X			a, b, c, d	3, 4, 7, 9
4. Influence of Past Disposal			X		No mounding-dumping on similar materials. Some evidence of "short dumping" adjacent to east boundary of site.	a, b, d	5, 7, 9, 10
5. Living Resources of Limited Distribution of Benthos			X			a, b, d	2, 3, 6, 8, 11
6. Commercial Fisheries		X			Salmon trolling, bottom trawling throughout area. No known areas of concentrated effort in ZSF.	a, b	2, 8
7. Recreational Fisheries		X			Salmon, bottom fishery. No evidence of problem currently.	a, b	2, 8
8. Breeding/Spawning Areas			X			a, b	2, 8
9. Nursery Areas		X			Juvenile flatfish nursery area.	a, b	2, 8
10. Feeding Areas			X		Pelagic birds; marine mammals.	a, b	2, 8
11. Migration Routes		X			Adult and juvenile salmonids; many pelagic birds, and marine mammals.	a, b	2, 8
12. Critical Habitats of Threatened or Endangered Species			X		T&E species present: brown pelican, 5+ species of whale. No critical habitat designated in area.	a, b	2, 8
13. Spatial Distribution			X			a, b	2, 8, 10
14. Marine Mammals			X		Present.	a, b	2, 8
15. Mineral Deposits			X			a, b, e	1, 8
16. Navigation Hazard		X			Potential for collisions with troll fishing vessels in fog conditions; has not been a problem historically.	a, b, d	1, 8
17. Other Uses of Ocean (cables, pipelines, etc.)			X			a, b, d	8
18. Degraded Areas			X			a, b, d	4, 6, 7
19. Water Col. Chem./Phys. Characteristics			X			a, b, d	4, 6, 9
20. Recreational Uses			X			a, b, c, d	2, 8, 11
21. Cultural/Historic Sites			X			b	11
22. Physical Oceanography: Waves/Circulation			X			a, b, d	1, 3, 6, 7
23. Direction of Transport/Potential for Settlement			X			a, b, d	1, 3, 6, 7
24. Monitoring			X			c	5
25. Shape/Size of Site (orientation)			X			d	1, 4, 7
26. Size of Buffer Zone		X			Potential for material loss to rock pinnacles inshore; no documented problem.	b, d	2, 3, 4, 7, 11
27. Potential for Cumulative Effects			X			c, d	4, 7

IV. AFFECTED ENVIRONMENT

General. A brief summary of existing conditions within the ZSF or specifically at the interim ODMDS is presented below and is the basis for evaluating the suitability of the site for ocean disposal. More detailed information on the affected environment is presented in the appendices which were reproduced from the Corps' Site Evaluation Report. Information regarding the nature and frequency of the sediments dredged from the Chetco navigation channel entrance is also provided.

Physical Environment.

General. The topography of the seabed in the vicinity of the proposed disposal site is highly irregular, from areas which are relatively smooth to clusters of rock pinnacles. The contours generally form an embayment sloping to the southwest. Depths at the site range from 60 to 85 feet. Previous disposal operations have not created a noticeable mound. Bathymetric surveys made in 1984 and 1985 showed no change in topography.

Bottom sediments range from fine sand to rock outcroppings. About half of the site consists of scattered rock exposures while the remainder consists of sand, coarse sand and gravel. Finer sediments are carried in suspension and are quickly removed from the site by longshore and offshore currents. Coarser sediments remain at the site for longer periods but are eventually removed offshore by currents. The zone of active sediment movement in the area extends to a depth of about -150 feet. The thinness of the sediment layer indicates that there is no long term accumulation of sediment offshore from the Chetco River estuary.

The materials dredged from the mouth of the Chetco River are medium to coarse sands with occasional gravels similar in range to the existing nearshore sediments. Dredging volumes for the past 10 years range from 8,000 to 80,000 cubic yards, averaging 48,000 cubic yards per year.

Geology. The Chetco River and its tributaries flow through bedrock containing mineralized zones, and has several reaches containing gold placer deposits. Despite this, no large concentrations of black sands have been identified close to the mouth of the river. The closest deposit is seven miles to the north and has a heavy mineral concentration of 10-30 percent (Grey and Kulm, 1985). Minerals of primary interest in black sands are gold, platinum, and chromite, but the sands also contain numerous other heavy minerals (Ramp, 1973). The offshore deposits north of the Chetco are not currently being mined. Offshore gravel deposits elsewhere along the Oregon Coast have been considered as potential sources of aggregate. While individual samples of gravel were found within the ZSF, no large deposits have been found close to the mouth of the Chetco River. While there have been several attempts to find oil and gas along the Oregon Coast, no test well has turned up more than traces of either. No test well off the Oregon Coast had been drilled south of Cape Blanco as of 1985.

Circulation and Currents. The nearshore mean circulation is alongshore, closely paralleling the bathymetric contours, with a lesser onshore-offshore component. Circulation patterns are variable with season and weather conditions. Coastal circulation near the Chetco ZSF is directly influenced by large-scale regional currents and weather patterns in the northwestern Pacific Ocean. Seasonal and short period currents due to regional weather patterns are more important at Chetco than farther north. Strub et al. (1987) describe a transition in oceanographic regimes near the latitude of Chetco. During winter, strong low pressure systems with winds and waves predominantly from the southwest contribute to strong northward currents. During the summer, high pressure systems dominate and waves and winds are commonly from the north. In both seasons, there are fluctuations related to local wind, tidal and bathymetric effects. The configuration of the coastline minimizes the effects of southerly waves in the summer at Chetco. Along the southern Oregon Coast, this southerly wind in summer creates a mass transport of water offshore which results in upwelling of bottom water nearshore. Figure B-6 in appendix B illustrates these influences.

Water and Sediment Quality. Water and sediment quality throughout the ZSF is expected to be typical of seawater of the Pacific Northwest with no known source of pollutants. Water and sediment quality effects associated with disposal of sands and silts at Oregon ODMDS have been studied in detail at the Mouth of the Columbia River (MCR) and Coos Bay. In general, results of studies and monitoring surveys at ODMDS in these locations should be applicable to anticipate effects at Chetco. (See appendix C.)

Biological Environment.

General. The disposal site is located in the nearshore environment and the overlying waters contain many nearshore pelagic organisms. These include zooplankton (copepods and euphausiids) and meroplankton (fish, crabs, and other invertebrate larvae). These organisms generally display seasonal changes in abundance with maximum abundance occurring from February to July.

Benthic. Benthic sampling in the vicinity of the disposal site indicates variation of species with the sediment type. The sand cobble community is characterized by the scale worm, barnacles, and archiannelids, in addition to the more typical polychaetes, cumaceans, and amphipods. Juvenile Dungeness crabs are also found in high densities. The sand environments are characterized by polychaete annelids and numerous species of cumaceans, gammarid amphipods, molluscs, and snails. The species inhabiting the sandy environments are generally more mobile types which tolerate or require high sediment flux. Juvenile crabs are also abundant in this environment. Commercially and recreationally important macroinvertebrates such as shellfish and Dungeness crabs occur in the Chetco vicinity. Most of these species are found in shallower habitats than the disposal site.

Fishes. The nearshore area off the Chetco River supports a variety of pelagic and demersal fish species. Pelagic species include anadromous salmon, steelhead, cutthroat trout, striped bass and shad that migrate through the spawning areas. Other pelagic species include the Pacific herring, anchovy, surf smelt, and sea perch. Surf smelt in particular occur in nearshore areas in the estuary in large numbers during the

summer. Although migratory species are present throughout the year, individual species are only present during certain times of the year.

Demersal species present in the inshore area include a number of flatfish, which occur primarily over the sandflats. English sole, sanddab, and starry flounder spawn in the inshore coastal area in the summer and juveniles of these as well as other marine species likely rear in the estuary.

Pelagic species that are associated with neritic reefs to the south of the estuary and jetties include both resident and non-resident species.

Wildlife. Numerous species of birds and mammals occur in the pelagic, nearshore, and shoreline habitats in and surrounding the proposed disposal site. Principal species found offshore are gulls, cormorants, auklets, pigeon, guillemots, tufted puffins, and harbor seals.

Endangered Species. A threatened/endangered species list was requested of the U. S. Fish and Wildlife Service and the National Marine Fisheries Service and is included in appendix F. Species listed by U.S. Fish and Wildlife Service include the ~~bald eagle, peregrine falcon, and~~ **brown pelican.** Species listed by National Marine Fisheries Service include gray, humpback, blue, fin, sei, right, and sperm whales; northern (Steller) sea lions; leatherback sea turtles, and Sacramento River winter-run chinook salmon.

May 1, 1989 letter lists only brown pelican

Socioeconomic Environment.

General. The Chetco River enters the Pacific Ocean at the City of Brookings, Oregon, and navigation on the river is critical to the local economy. The City of Brookings has a population of 3,470, while Curry County's population is 17,000.

Natural Resource Harvesting (Commercial). The offshore area supports a moderate commercial fishery, primarily for salmon, rockfish, and sole. Dungeness crab are also commercially harvested in the estuary and offshore areas. The fishing and tourist industries are the primary sources of income to the local economy.

Lumber and other wood products have been barged from Brookings Harbor in the past and are a significant component of the local economy. No significant mineral or petroleum deposits are known to exist in the vicinity of the disposal site.

Recreation. The Chetco Bay area is popular with recreationists because of the spectacular coastal scenery and excellent fishing opportunities both offshore and in the Chetco River. The area is increasing in popularity as a small boat harbor and has excellent facilities for the thousands of anglers who fish here annually.

Cultural Resources. Cultural resource investigations indicate that no significant archeological or historic resources exist in the vicinity of the disposal site.

V. ENVIRONMENTAL CONSEQUENCES

General. The proposed action is the designation of a site to be available for ocean disposal of dredged material. Designation of the site itself is an administrative action that would not have any direct environmental effects; however, it would subject the site to use as an ocean disposal area. Although no significant impacts are predicted by this designation action, EPA has voluntarily committed to preparing and circulating EISs as part of the designation process. This EIS addresses the likely effects of disposal at either the interim or the adjusted ODMDS based upon the Corps' current operation and maintenance dredging program for the Chetco River navigation project. A separate evaluation of the suitability of dredged material and disposal impacts will be conducted for each proposed disposal action by the Corps as required under Section 103 of the MPRSA. EPA independently reviews all proposed ocean disposal of dredged material.

Physical Effects. Disposal of the expected dredged material at the proposed disposal site would not have a significant effect on the physical environment. The material ranges in size from fine sand to gravel. This is comparable to the variation in sediment size found in or near the disposal site. Some rocky bottom habitat might be buried by sand deposited on it. The dredged material would disperse from the site in the littoral drift system with movement expected to be to the north and offshore during the winter and lesser movement to the south in summer. No mounding is expected to occur. The physical placement of dredged material would be expected to have short-term effects on the rocky habitats. These effects would be more severe than those that would occur if the material was placed on sandy areas; however, they are not judged to be significant.

The material dredged from the river entrance channel consists of clean sand. It is not expected to contain significant levels of contaminants of concern and would meet the exclusion criteria in 40 CFR 227.13(b). Disposal of this material would not introduce contaminants to the sediments at the disposal site or degrade water quality. Short term turbidity effects are anticipated. A separate evaluation of the suitability of dredged material and disposal impacts will be conducted for each proposed disposal action by the Corps as required under Section 103 of the MPRSA. EPA will independently review all proposed ocean disposals of dredged material.

No mineral resources are expected to be affected by disposal.

Biological Effects. The proposed ODMDS is located in the nearshore area, and contains an abundance of aquatic life characteristic of nearshore, sandy, wave-influenced regions common along the coasts of the Pacific Northwest. These include zooplankton such as copepods, euphausiids, and meroplankton (fish, crab, and other invertebrate larvae). These organisms generally display seasonal changes in abundance and are present over most of the coast. Based on evidence from various zooplankton and larval fish studies, it appears that there will not be any impacts to organisms in the water column (Sullivan and Hancock, 1977). Impacts to the biological environment would be primarily to the benthic community. Some mortality could occur as a result of smothering. Most of the benthic species present are motile and adapted to a high energy environment with shifting sands. Therefore, many would likely survive the effects

of disposal. In addition, some recolonization would occur from surrounding areas since the sediments would be compatible. The rate of recolonization would be affected by disposal frequency. Impacts could be greater in the rocky portion where more species are found and many of them are sessile or encrusting forms which are susceptible to smothering.

Larger, more motile organisms such as fish, birds, and marine mammal species would likely avoid the disposal activity or move out once it has begun. They would be exposed to short term turbidity at most. Therefore, impacts are expected to be limited to disturbance rather than injury or mortality.

Biological assessments addressing impacts to threatened/endangered species have been prepared and it was determined that no significant impact to threatened/endangered species is anticipated from the designation or use of the ocean disposal site. (See appendix F.)

Socioeconomic Effects. The designation of an ocean disposal site for dredged material off the mouth of the Chetco River would allow the continued maintenance and possible improvement of the navigation channel. This would result in waterborne commerce remaining an important component of the local economy. If a site is not designated, maintenance dredging may ultimately cease for lack of adequate disposal sites, or other, potentially more environmentally sensitive habitats (e.g., wetlands) would be used. If maintenance dredging of the channel ceases, the channel would shoal in and become unsafe or unusable. Shipping and fishing traffic would have to be directed through other ports and the local economy would suffer.

No known mineral or economic resources would be impacted by disposal at the proposed site.

The proposed ODMDS is located outside of major recreation use areas. As a result, few impacts to recreation are expected to occur. Recreational fishery resources would be temporarily displaced during disposal operations. Time delays for recreational boaters caused by the passing of the dredge or an increase in navigation hazards during congested periods could occur. Conflicts such as these can be considered an inconvenience rather than a threat to recreational activity.

There would be a short-term reduction in aesthetics at the disposal site as a result of turbidity following disposal. The material would settle rapidly and not affect any areas outside of the disposal area. No impacts would occur on the beach or adjacent recreation areas.

It is unlikely that any cultural resources are present in the proposed disposal site. Therefore, designation or use of the site is not expected to have any impact on cultural resources.

Coastal Zone Management. In reviewing proposed ocean disposal sites for consistency with the Coastal Zone Management (CZM) plan, they are evaluated against Oregon's Statewide Goal 19 (Ocean Resources). Local jurisdiction does not extend beyond the baseline for territorial seas and, therefore, local plans do not address offshore sites.

Goal 19 requires that agencies determine the impact of proposed projects or actions. Paragraph 2.g of Goal 19 specifically addresses dredged material disposal. It states that agencies shall "provide for suitable sites and practices for the open sea discharge of dredged material which do not substantially interfere with or detract from the use of the continental shelf for fishing, navigation, or recreation, or from the long-term protection of renewable resources." Decisions to take an action, such as designating an ocean disposal site, are to be preceded by an inventory and based on sound information and on an understanding of the resources and potential impacts. In addition, there should be a contingency plan and emergency procedures to be followed in the event that the operation results in conditions which threaten to damage the environment.

Ocean disposal sites for dredged material are designated following guidelines prepared by the EPA (Ocean Dumping Regulations). Site selection is to be based on studies and an evaluation of the potential impacts (40 CFR Part 228.4 [e]). This meets the requirements of State Goal 19 for decisions to be based on inventory and a sound understanding of impacts. The five general and eleven specific criteria for the designation of a site presented in 40 CFR 228.5 and 228.6 outline the type of studies to be conducted and the resources to be considered. According to 40 CFR Part 228.5(a), ocean disposal will only be allowed at sites "selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation." Monitoring is to be conducted at ocean disposal sites. If adverse effects are observed, use of the site may be modified or terminated. The requirements of the ocean dumping regulations are broad enough to meet the need of Goal 19. Therefore, the designation of this site for ocean disposal of dredged material following the ocean dumping regulations would be consistent with Goal 19 and the State of Oregon's Coastal Zone Management Plan.

During coordination of the Site Evaluation Report, the Corps made a determination of consistency with Coastal Zone Management plans. A letter of concurrance was provided by the Oregon Department of Land Conservation and Development, the state coastal zone management office (appendix F). EPA also concludes that designation of the proposed site is consistent to the maximum extent practicable with the state coastal management program.

Unavoidable Adverse Impacts. Designation of an ODMDS would allow continued dredging and disposal of dredged material from the Chetco River entrance channel with attendant effects.

Relationship Between Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity. Disposal of dredged material at the adjusted ODMDS would have a unquantifiable, but apparently minor short- and long-term effect of the productivity of the ocean environment. Use of the ODMDS would have a long-term beneficial effect on the economy of the city of Brookings and Curry County.

Irreversible and Irretrievable Commitments of Resources. Permanent designation of the adjusted ODMDS for disposal would commit the site and its resources primarily to that use. Other uses such as oil and gas explorations, and to varying degrees, mining, fishing, and use by certain aquatic species, would be constrained or precluded.

VI. COORDINATION

Coordination by the Corps of Engineers. Procedures used in this evaluation and the proposed continued use of the interim site were discussed with the following State and federal agencies by the Portland District Corps of Engineers, to support the site designation studies and preparation of their Site Evaluation Report:

- U. S. Coast Guard (Newport Station)
- U. S. Fish and Wildlife Service
- National Marine Fisheries Service
- U. S. Environmental Protection Agency
- Oregon Department of Fish and Wildlife
- Oregon Department of Environmental Quality
- Oregon Department of Land Conservation and Development
- Oregon Division of State Lands

These agencies were briefed on the proposed technique from the task force workbook and existing information was requested of them. Copies of the draft Site Evaluation Report were provided to them by the Corps and their comments on the draft were formally requested. Letters received are included in Appendix F.

This proposed federal action requires concurrence or consistency for three federal laws from the responsible agencies as indicated below.

- Endangered Species Act of 1973, as amended -- U. S. Fish & Wildlife Service and/or National Marine Fisheries Service

- National Historic Preservation Act of 1966, as amended -- State Historic Preservation Officer

- Coastal Zone Management Act of 1972, as amended -- Oregon Department of Land Conservation and Development

Consistency or concurrence letters from the above listed agencies are included in Appendix F. State water quality certification, required by Section 401 of the Clean Water Act, will be obtained for individual dredging actions as part of the normal permitting of federal project approval process.

Coordination by EPA. Coordination with the Portland District was maintained throughout the site designation studies and during preparation of their Site Evaluation Report. A copy of that report was reviewed by EPA. EPA has voluntarily committed to prepare and circulate EISs for the site designation actions. A Notice of Intent to Prepare an Environmental Impact Statement on the final designation of an ODMDS site off Chetco River, Oregon, was published in the **Federal Register** on Wednesday, November 16, 1988. The Site Evaluation Report submitted to Region 10, EPA, by the Corps was used as the basis for preparation of the draft EIS. The notice of availability

for the draft EIS appearred Friday, April 13, 1990. A formal 45-day public review period was allowed for comments to be received from all State and local agencies, and private groups and individuals on the proposed designation by EPA. A list of those who received the draft EIS for comment may be requested. Many of the same agencies that reviewed the Corps' Site Evaluation Report also received the draft EIS.

As a separate but concurrent action, EPA published a proposed rule in the **Federal Register** for formal designation of the adjusted Chetco ODMDS which appeared on Tuesday, April 10, 1990 (55 FR 13289). There was a 45-day public review period for the draft rule also. It was planned that the public review periods for the draft EIS and proposed rule overlap. Comments were accepted on either the draft EIS or proposed rule until the end of the latest 45-day period, which was May 29, 1990.

Comments on the Draft EIS. Two letters were received on the draft EIS and proposed rule. The letters are printed in their entirety following this section. Responses to comments appear alongside each comment.

Final EIS and Rule. Copies of this final EIS are being provided to agencies, groups, and individuals who received the draft EIS. As a separate but concurrent action, EPA will publish a final rule in the **Federal Register** to formally designate the Chetco ODMDS. The designation will become effective 30-days after the appearance of the final rule.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of the Chief Scientist
Washington, D.C. 20230

May 22, 1990

RECEIVED
MAY 24 1990
WRAS/404 REVIEW
EPA/REGION 10

Mr. John Malek
Ocean Dumping Coordinator
Environmental Protection Agency
1200 Sixth Avenue, WD-138
Seattle, Washington 98101

Dear Mr. Malek:

Enclosed are comments to your Draft Environmental Impact Statements on the Dredged Material Site Designation, Chetco, Oregon. We hope our comments will assist you. Thank you for giving us an opportunity to review the document.

Sincerely,

David Cottingham
Director
Ecology and Environmental
Conservation Office

Enclosure

Response: Thank you.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF CHARTING AND GEODETIC SERVICES
ROCKVILLE, MARYLAND 20852

MAY 16 1990

MEMORANDUM FOR: David Cottingham
Ecology and Environmental Conservation Office
Office of the Chief Scientist

FROM: Rear Admiral Wesley V. Hull, NOAA
Director, Charting and Geodetic Services

SUBJECT: DEIS 9004.01 - Dredged Material Site Designation, Chetco, Oregon

The subject statement has been reviewed within the areas of Charting and Geodetic Services' (C&GS) responsibility and expertise and in terms of the impact of the proposed actions on C&GS activities and projects. Since safety of navigation is one of C&GS' primary missions, navigational projects such as the maintenance of channels and turning basins are extremely important.

From a navigation point of view, it is never desirable to place materials into the ocean in the vicinity of ports, harbors, and channels. Sites on shore or in deep water are preferable from the C&GS perspective. However, considering all alternatives, designation of the interim site appears to be a reasonable alternative. This site is already shown on NOS nautical charts 18602 and 18600, and will continue to be shown on these charts in its present position with reference to 40 CFR, Parts 200-229. 1.

C&GS also notes that nautical chart 18602 has been converted to the new horizontal datum "North American Datum 1983," while the positions provided in the DEIS are assumed to be based upon the North American Datum 1927. To avoid confusion, C&GS suggests that the reference datum be included with any geographic positions mentioned in the future. Questions about the conversion from NAD 27 to NAD 83 should be directed to the National Geodetic Survey Division, N/CGx1, National Ocean Service, NOAA, Rockville, Maryland 20852, telephone 301-443-8531. Questions about the navigation aspects of this response should be directed to the Nautical Charting Division, N/CG22x2, National Ocean Service, NOAA, Rockville, Maryland 20852, telephone 301-443-8742. 2.

cc:
N/CG1x21 - Riggers
N/CG17 - Spencer
N/CG22x2 - Frey

MAY 22 1990
RECEIVED
EC

NOAA

1. Response: Noted.

2. Response: Reference datum has been converted to the NAD 1983 for the final EIS.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Affairs
1002 NE Holladay Street, Suite 354
Portland, Oregon 97232-4181

ER 90/344

June 7, 1990

RECEIVED
JUN 11 1990
WRAS/404 REVIEW
EPA/REGION 10

John Malek
Ocean Dumping Coordinator
Environmental Protection Agency
1200 Sixth Avenue, WD-138
Seattle, Washington 98101

Dear Mr. Malek:

The Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (Draft Statement) for the Chetco Dredged Disposal Site Designation, Oregon. The following comments are offered for your use and consideration when preparing the final documents.

GENERAL COMMENTS

After reviewing the Draft Statement, the Mineral Management Service's Pacific Outer Continental Shelf Region (Pacific Region) has concluded that the proposed project would not affect future oil and gas operations on the outer continental shelf. However, the Pacific Region believes that the Draft Statement does not adequately consider project alternatives. 1.

The Draft Statement only identifies two alternatives: (1) termination of ocean disposal and (2) designation of an interim site. The first alternative is dismissed in a single sentence on page 8 of the Draft Statement. Regulations of the Council on Environmental Quality provide guidance that environmental impacts of the proposal and alternatives be compared to define the issues and provide a basis for selecting a preferred alternative among potential options. The Draft Statement should follow that procedure.

The second alternative consists of two "options": (1) an interim site and (2) a disposal site beyond the continental shelf. Sites beyond the continental shelf were determined to be those sites which are at least 20 nautical miles offshore, but the Draft Statement does not provide any analysis or justification to support establishment of this minimum distance. In addition, those sites which are located beyond 20 miles, were dismissed solely on the basis of a statement that established the economic haul distance of 1.5 miles from shore. The Draft Statement does not provide an analysis to support that statement or consider any other environmental effects in arriving at that conclusion. Furthermore, the Draft Statement does not provide support for the claim made on page 11 that in regard to the environmental impacts of dumping 2.

1. Response: Your conclusion that designation and use of the Chetco ODMDS would not affect future oil and gas operations on the outer continental shelf is noted. We disagree that the EIS does not adequately consider alternatives associated with designation of ODMDS.

2. Response: The study process used for the Chetco ODMDS (as well as for other ODMDS in Region 10) is described in the EPA and Corps workbook entitled *General Approach to Designation studies for Ocean Dredged Material Disposal Sites* (EPA/Corps 1984). This process was developed by the EPA and Corps as a efficient and logical stepwise approach to identifying, evaluating, and selecting dredged material disposal sites. This process, and the approach taken in preparing this EIS, tends to be analytic.

EPA regulations (40 CFR 228) provide general and specific criteria for designation of acceptable ocean dumping sites. The interim sites designated by EPA in 1977 were usually ones which had been used historically for disposal and which were thought to already meet these criteria. Typically, additional information was needed to confirm that the interim sites met the criteria and studies were undertaken by the Corps of Engineers, EPA, or the two agencies in cooperation. Where interim sites are found to meet the criteria, they are considered acceptable sites and designated. Where interim sites were found to not meet the criteria, alternative or "adjusted" ODMDS are identified and evaluated. The intent of application of the general and specific criteria is to identify and designate ODMDS for which there are no significant adverse effects. Applying the "threshold" criteria of the National Environmental Policy Act (NEPA), preparation of an EIS would not be required. However, as a matter of policy, EPA committed to preparing EISs to support designation of ODMDS.

at the interim site, there are no environmental advantages to using a site on the continental shelf.

The Draft Statement states that information on specific environmental resources are lacking or are extremely limited (for example, see page A-14, paragraph 1.42; and page 1-21, paragraph 1.43). The Council on Environmental Quality amended the CEQ Regulations in May 1986 to provide a specific procedure for cases where environmental information is unavailable or incomplete. This draft document should comply with that procedure. 3.

The U.S. National Park Service recommends referencing the Cultural Resource Study, located in Appendix E, in the text of the final document. In addition, the final document should summarize the results of the side scan sonar investigation for historic shipwrecks in the final document. The final document should also include an explanation why the off shore occurrence of prehistoric resources was not considered in the Draft Statement. 4.

We appreciate the opportunity to comment on the Draft Statement.

Sincerely,

Charles S. Polityka
Regional Environmental Officer

The two options cited for Ocean Disposal were developed based on EPA regulations and consideration of the constraints, resource considerations, equipment considerations, and consideration of upland disposal which preceeded the paragraph on Ocean Disposal Options. Those preceeding evaluations defined the constraints and issues associated with designation of an ODMDS. The need for the federal navigation channel at Chetco River and the need to regulate disposal of wastes (or in this case, dredged material) into the ocean are not at issue here and their assessment is beyond the scope of this evaluation and proposed action.

One of the general criteria is that preferance should be given to sites off of the continental shelf (see Table 2, item e). No interim site beyond the continental shelf was designated. Investigations needed to identify potential sites beyond the shelf were acknowledged to be extremely costly. Consideration of the constraints described early in the chapter indicated that such a haul would be beyond the economic viability of the project to support. Hence, an ODMDS located that far away probably would not be used. Undertaking the expense to identify and study such a site merely as an alternative to a site which otherwise meets the general and specific criteria and that monitoring data indicate is performing acceptably and without adverse environmental consequences was considered inappropriate. Merely dumping material into a "deeper" hole that is "farther offshore does not necessarily make that action less environmentally impacting.

3. Response: The terms are relative. In the instances cited, while information on these resources is not encyclopedic, it is judged adequate to evaluate whether the actions proposed could result in significant adverse effects to those resources. Accordingly the information is not considered "unavailable" or "incomplete" in the context of NEPA. Significant adverst effects to shorebirds amd marine mammals are not predicted. With regard to threatened and endangered species, biological assessments were prepared and concurrance letters provided by the Department of Commerce, National Marine Fisheries Service (see appendix F).

4. Response: Referencing of appendix E in the main text has been added. The results of the side scan sonar investigation is provided in appendix E. Designation and continued use of the Chetco ODMDS were not expected to adversely affect any off shore prehistoric resources.

VII. LIST OF PREPARERS

Disposal site studies were designed and conducted by the Corps, in consultation with EPA, and a Site Evaluation Report was prepared by the Portland District, Corps of engineers. That document was submitted to EPA for review and processing for formal designation by the Regional Administrator, Region 10. The Corps' Site Evaluation Report was used by EPA as the basis of this draft EIS. The Technical Appendices from the Site Evaluation Report are reproduced as appendices to the EIS.

Preparation of draft and/or final EIS:

U. S. Environmental Protection Agency:

John Malek	Ocean Dumping Coordinator and Project Officer

U. S. Army Corps of Engineers, Portland District:

Mark Siipola	Ocean Dumping Coordinator
Nancy Yun	Civil Engineer

Jones & Stokes Associates, Inc.:

David DesVoigne, Ph.D.	Environmental Scientist
Murray Schuh	Environmental Specialist

Preparation of Site Evaluation Report and Technical Appendices:

U. S. Army Corps of Engineers, Portland District:

Michael F. Kidby, P.E.	Civil Engineer
A. Rudder Turner, Jr.	Oceanographer
Danil R. Hancock	Oceanographer
David R. Felstul	Environmental Specialist
Stephan A. Chesser	Oceanographer
William B. Fletcher	Hydrologist
Kim Larson	Fishery Biologist
Geoffrey L. Dorsey	Wildlife Biologist
Steven J. Stevens	Landscape Architect
Michael A. Martin	Archeologist
L. Jerome Simpson	CE Technician

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APPENDIX A

APPENDIX A

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APPENDIX A

LIVING RESOURCES

Introduction

1.1 Information on aquatic resources was obtained from a field sampling program conducted in July 1985. In addition, a thorough utilization of a variety of published and unpublished reports, theses, and personal communications with the Oregon Department of Fish and Wildlife (ODFW) Marine Resources Division biologists have been utilized in the preparation of this technical appendix. Critical resources were determined primarily by whether the resource was unique to the area or was in limited abundance along the Oregon coast. In 1978, the Portland District issued a report entitled "Technical Report, Chetco River Hopper Dredge Scheduling Analysis." The study included a cursory analysis of the physical and biological conditions of the offshore disposal site and a series of bottom photographs which clearly illustrate the coarse material in a portion of the site.

1.2 To determine the extent of these gravel/cobble beds and the suitability of the general area for fish trawling, the Portland District conducted an underwater video survey of the Chetco disposal site during August of 1984. These video tapes confirmed the gravel/cobble deposits and rocky outcrops existing in the area and precluded fisheries trawling in the area.

Plankton and Fish Larvae

1.3 Distribution and abundance of inshore planktonic species vary depending upon nearshore oceanographic conditions. In the summer when the wind is from the northwest, surface water is moving south and away from the shore. Colder, more saline, nutrient-rich water then moves up from depth into the shore. This upwelling phenomenon can extend up to 10 km offshore and last from days to weeks depending upon the strength and duration of the wind. Zooplankton taxa during this time are predominantly those from subarctic water masses.

1.4 For the general Oregon Coast, winter winds are primarily out of the west and southwest and surface waters are transported inshore. The zooplankton community during this time consists of species from the transitional or Central Pacific water masses.

1.5 Very little specific information has been collected from the nearshore waters off the southern Oregon Coast. Oregon State University studied a hydrographic line off Brookings which extended from 5 to 165 n miles offshore. These studies provide a basis for understanding the general characteristics of the oceanic water masses of the Southern Oregon Coast. Since water masses between the central and southern Oregon coasts are similar, the pelagic fauna should exhibit a high degree of correspondence.

1.6 Lee (1971) discussed the copepods in a 1963 collection from the southern Oregon coast and Peterson and Miller (1976) and Peterson et al. (1979) provide a fairly comprehensive account of the zooplankton community off the central Oregon Coast (Newport, OR). The central Oregon study's summer and winter species are given below (Table A-1). In general, winter species are less abundant than summer species.

Table A-1

Seasonal Species Usage (Dominant Copepod Species) in Decreasing Order of Abundance

Winter Species	Summer Species
Pseudocalanus sp.	Pseudocalanus sp.
Oithona similis	Acartia clausii
Paracalanus parvus	Acartia longiremis
Acartia longiremis	Calanus marshallae
Centrophages abdominalis	Oithona similis

1.7 Other taxa collected were of minor importance as compared to the copepod abundance except for a few organisms during parts of the year. A list of the other taxa collected is given in Tables A-2 and A-3.

1.8 The other plankton species of importance is the megalops larval stage of the Dungeness crab (Cancer magister). Lough (1976) has reported that megalops occur inshore from January to May and are apparently retained there by the strong longshore and onshore components of the surface currents in the winter. After May, the megalops metamorphoses into juvenile crabs and settle out of the plankton, moving into rearing areas in the estuary.

1.9 Fish larvae are a transient but important member of the inshore coastal plankton community. Their abundance and distribution has been described by Richardson (1973), Richardson and Pearcy (1977), and Richardson et al. (1980).

1.10 Three species assemblages have been described off the Oregon coast; coastal, transitional, and offshore. In general, the species in the coastal and offshore assemblages never overlapped while the transitional species overlapped both the coastal and offshore groups. The break between the coastal and offshore groups occurred at the continental slope.

1.11 The coastal group is dominated by smelts (Osmeridae) making up over 50 percent of the larvae collected. Other dominant species included the English sole (Parophrys vetulus), sanddab (Isopsetta isolepis), starry flounder (Platichthys stellatus), and tom cod (Microgadus proximus). Maximum abundance occurred from February to July when greater than 90 percent of the larvae were collected. Two peaks of abundance were present during this period, one in February and March (24 percent of the larvae) an one in May to July (68 percent of the larvae) following upwelling. Dominant species during each peak are shown in Table A-4.

Table A-2
Other Taxa Collected

TAXA	TOTAL RELATIVE DENSITY			FREQUENCY		
	1969	1970	1971	69	70	71
Calanus nauplii	119.5	695.5	172.7	21	40	28
Other Copepod nauplii	43.1	68.1	52.3	10	20	20
Amphipods	8.5	18.5	15.7	5	15	14
Euphausiid nauplii	46.3	85.9	84.0	5	26	18
Euphausiid calyptopis	13.3	14.5	17.2	4	17	11
Euphausiid furcilia	30.2	13.6	17.7	14	20	10
Thysanoessa spinifera	35.4	4.0	87.3	2	7	11
Evadne nordmanni	73.7	58.9	9.8	17	26	2
Podon leukarti	2.8	115.3	5.2	2	12	1
Pteropods	10.2	24.6	60.6	11	22	35
Chaetognaths	89.4	50.3	30.8	25	33	34
Oikopleura	69.2	85.7	66.5	11	15	21
Ctenophores	6.0	2.5	34.9	7	5	19
Scyphomedusae	22.9	70.9	22.8	13	28	22
decapod shrimp mysis	142.7	52.6	45.3	16	24	22
barnacle nauplii	59.3	168.3	231.4	8	32	28
barnacle cypris	4.4	64.0	8.3	2	19	10
polychaete post-trochophores	16.2	20.1	21.4	5	23	15
bivalve veligers	170.5	258.9	68.3	20	40	27
gastropod veligers	28.9	79.2	42.2	16	33	23
hydromedusae	6.1	3.2	10.3	2	2	11
unidentified annelid without parapodia	8.2	23.1	35.8	3	3	16
pluteus	0.0	16.0	117.6	0	5	11
large round eggs (fish)	36.8	25.0	17.8	11	13	12
Calanus eggs	870.1[a]	168.7	226.1	10	28	25
euphausiid eggs, early	55.0	686.1	449.6	11	29	24
euphausiid eggs, late	70.0	57.5	39.6	2	16	14
other fish eggs	19.1	35.1	34.3	12	18	18

a = biased by a single observation of 760 individuals/m^3.

The following taxa were found in less than five samples: radiolarians, foraminifera, siphonophores, planula larva, trochophores, *Tomopteris*, heteropods, *Clione*, phoronid larva, ascidian larva, salps, auricularia larva, imm starfish, decapod protozoeas, unusual barnacle nauplii, *Stylocheiron abbreviatum*, anchovy eggs, and four miscellaneous unidentified meroplanktonic taxa.

Total relative density and frequency of occurrence of other holoplanktonic taxa and meroplankton taken within 18 km of the coast during 1969, 1970 and 1971 upwelling seasons. Table entries are sums of average abundances at each of four stations.

Table A-3
Other Taxa Collected

TAXA	TOTAL RELATIVE DENSITY			FREQUENCY		
	1969-70	1970-71	1971-72	69-70	70-71	71-72
Calanus nauplii	1188.7a	165.9	35.1	10	15	15
Other Copepod nauplii	29.1	122.5a	20.2	11	13	12
Amphipods	5.9	4.8	5.0	12	4	10
Euphausiid nauplii	2.8	108.4a	3.4	4	5	4
Euphausiid calyptopis	6.4	56.1a	14.5	13	4	8
Euphausiid furcilia	3.1	0.4	7.6	7	2	5
Evadne nordmanni	5.8	24.1	4.8	2	2	4
Podon leukarti	126.3a	27.3	116.4a	4	2	4
Pteropods (*Limacina*)	66.0	88.0	14.2	17	15	13
Chaetognaths	62.9	47.4	22.4	20	19	13
Oikopleura spp.	551.9	101.2	75.6	22	16	15
Ctenophores	7.0	6.2	10.3	8	8	9
Scyphomedusae	10.0	94.3	16.6	5	6	10
Salps	0.9b	***	***	9	0	0
Isopods	0.5	0.7	***	2	3	0
Mysids	0.2	3.3	2.1	2	1	2
decapod shrimp mysis	3.1	21.4	5.6	7	10	11
barnacle nauplii	309.1	192.7	77.9	11	6	12
barnacle cypris	8.7	188.1a	16.8	4	4	12
polychaete post-trochophores	41.5	13.5	70.8	12	8	11
bivalve veligers	87.8	98.2	118.4	20	18	15
gastropod veligers, assorted	31.3	27.6	37.2	19	18	15
gastropod A	***	1.0	***	0	6	0
hydromedusae	9.2	1.8	3.3	4	2	3
annelids lacking parapodia	40.0	74.9	21.9	5	4	11
echinoderm pluteus	41.7	0.8	22.1	5	2	4
large round eggs (fish)	9.0	5.5	4.9	6	11	8
Calanus eggs	36.5	36.7	4.7	10	11	4
euphausiid eggs	***	274.7a	2.8	0	6	3

a = high value the result of one station or sampling date
b = a value of 34.3/m^3 on 29 October 1969 was omitted from the summation

The following taxa were found in less than five samples: The euphausiids *Thysanoessa spinifera* and *Euphausia pacifica*, amphipod larvae and eggs, ostracods, cumaceans, siphonophores, *Sagitta scrippsii*, *S. bierii*, *S. minima*, *Lepas* nauplii, other unidentified barnacle nauplii, echinoderm bipinnaria, imm. starfish, imm. sea urchins, planula larvae, trochophores, foraminifera, radiolarians, *Tomopteris*, cyphonautes larvae, other fish eggs, and six miscellaneous unidentified meroplanktonic taxa.

Total relative density and frequency of occurrence of other holoplanktonic and meroplanktonic taxa taken within 18 km of the coast during three winters. Table entries are sums of relative densities at each of four stations.[1]

Table A-4
Dominant Fish Larval Species
During the Two Peaks of Abundance

	February to March	May to July
Smelt (Osmeridae)	1.51*	4.12
English sole (Parophrys vetulus)	4.09	
Sandlance (Ammodytes hexapterus)	1.76	
Sanddab (Isopsetta isolepis)	1.73	2.21
Tom cod (Microgadus proximus)		2.03
Slender sole (Lyopsetta exilis)	1.07	

* Biological index - Ranking method that averages abundance and frequency of occurrence in samples. 5 to 1 in decreasing order.

Benthic Invertebrates

1.12 Benthic invertebrates play an important role in secondary productivity of nearshore marine systems. They are not only a direct source of food for many demersal fishes, but play an active part in the shredding and breakdown of organic material and in the reworking of sediment.

1.13 Knowledge of the benthic communities off the nearshore central Oregon coast is increasing due, in large measure, to studies done with the offshore disposal site investigations conducted by Portland District.

1.14 Previous investigations of the Oregon coast include an evaluation of offshore disposal sites near the mouth of the Columbia River by Richardson et al. 1973, a quantitative study of the meiobenthos at Moolach Beach north of Yaquina Bay entrance (Hogue 1982) and an outfall study for an International Paper Company outfall near Gardiner, Oregon. (Unpublished, n.d.). Site-specific information is now available in final reports for Coos Bay (Hancock et al., 1981, Nelson et al., 1983, and Sollitt et al., 1984) and for Yaquina Bay (USACOE, 1985). Similar benthic studies have been conducted at seven other ocean disposal sites along the Oregon coast and the data is being analyzed for final site designation. These comprise the total benthic infaunal data base available for the Oregon Coast.

1.15 To provide site-specific benthic information to supplement the existing data and characterize the Chetco interim disposal site, the Portland District COE collected and analyzed thirty-five benthic infaunal samples from seven stations located as shown in Figure A-1. Six replicate bottom samples were taken from each of the seven stations using a modified Gray-O'Hara box corer which sampled a .096 m area of the bottom.

1.16 One sediment sample from each station was sent to the North Pacific Division's Materials Testing Laboratory for determination of grain size and organic content. The remaining five box-core samples were sieved through a 0.5 mm mesh screen; organisms

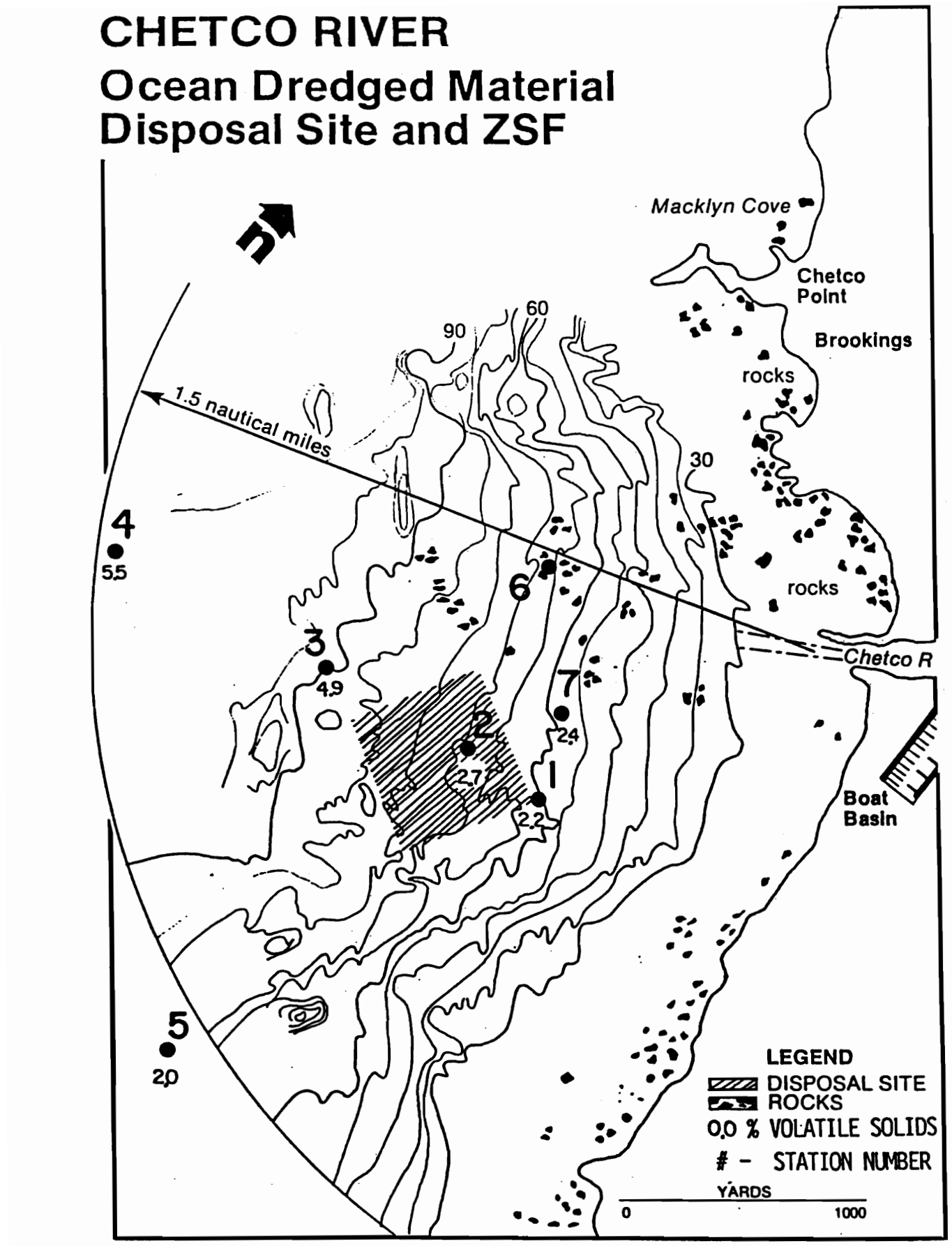

Figure A-1
Chetco River Sample Stations

retained on the screen were preserved in 10 percent buffered formalin. Infaunal organisms were then picked from the sediment, counted and identified to the lowest taxon practicable by Marine Taxonomic Services.

Results

1.17 The stations sampled in the region of the Chetco River Interim Disposal Site (Figure A-1) were found to vary widely in substrate texture (Table B-3). The NW portion of the site contained medium to large (>30 cm) smoothly rounded cobble stones, while the easterly margin of the site was a mixture of sand with interspersed rocks. It has not been determined if the large cobbles were previously transported to the site by the hopper dredges or result from natural causes. They extend slightly shoreward of the disposal site. The deeper western portion of the interim disposal site contains a fine grained sand substrate typical of the many high energy nearshore coastal environments found along the Oregon Coast. Based on the sediments, the Chetco Interim Disposal site is unique from all other disposal sites studied.

1.18 The organic content of the sediments as measured by percent volatile solids is very low--as would be expected based on the coarse sediments and high energy. Volatile solids are shown in Table C-1.

1.19 The benthos of the Chetco offshore disposal site was found to consist of two bottom types, sandy (which is typical of nearshore high energy environments), and sand mixed with cobbles which is not commonly encountered. The latter type was found only at station 1 and 2 which lie in the northeast corner of the interim disposal site. Station 1 had the highest amount of cobbles and the mixed sediment type resulted in the highest number of species represented in the sampling of the Chetco disposal site.

1.20 The community is represented by the psammnitic (sand-dwelling) fauna and the epizoic and encrusting fauna. The sand-cobble community is characterized by the scale worm Hesionura coineaui difficilis (1156/sq. m), barnacles (200/sq.m), Archiannelida (390/m), as well as the more typical psammnitic polychaetes, cumaceans, and gammarid amphipods.

1.21 The sandy bottom stations located offshore and the stations located to the north and south of the interim disposal site are characterized by polychaete annelids such as Magelona sacculata, Chaetozone setosa, or Spiophanes bombyx, and numerous species of cumaceans, gammarid amphipods, molluscs and snails. The species inhabiting the sandy stations are generally the more motile psammnitic forms which tolerate or require high sediment flux. Juvenile Dungeness crab (Cancer magister) were found at all stations sampled.

1.22 Figure A-2 compares mean infaunal densities (for five replicate box core samples) at the four stations within the site and the north and south reference stations. General levels of density ranged between 1210 and 3377 /m in the interim site, and from 947-3010 for the reference sites. These values are slightly above those sampled at other disposal sites along the Oregon coast.

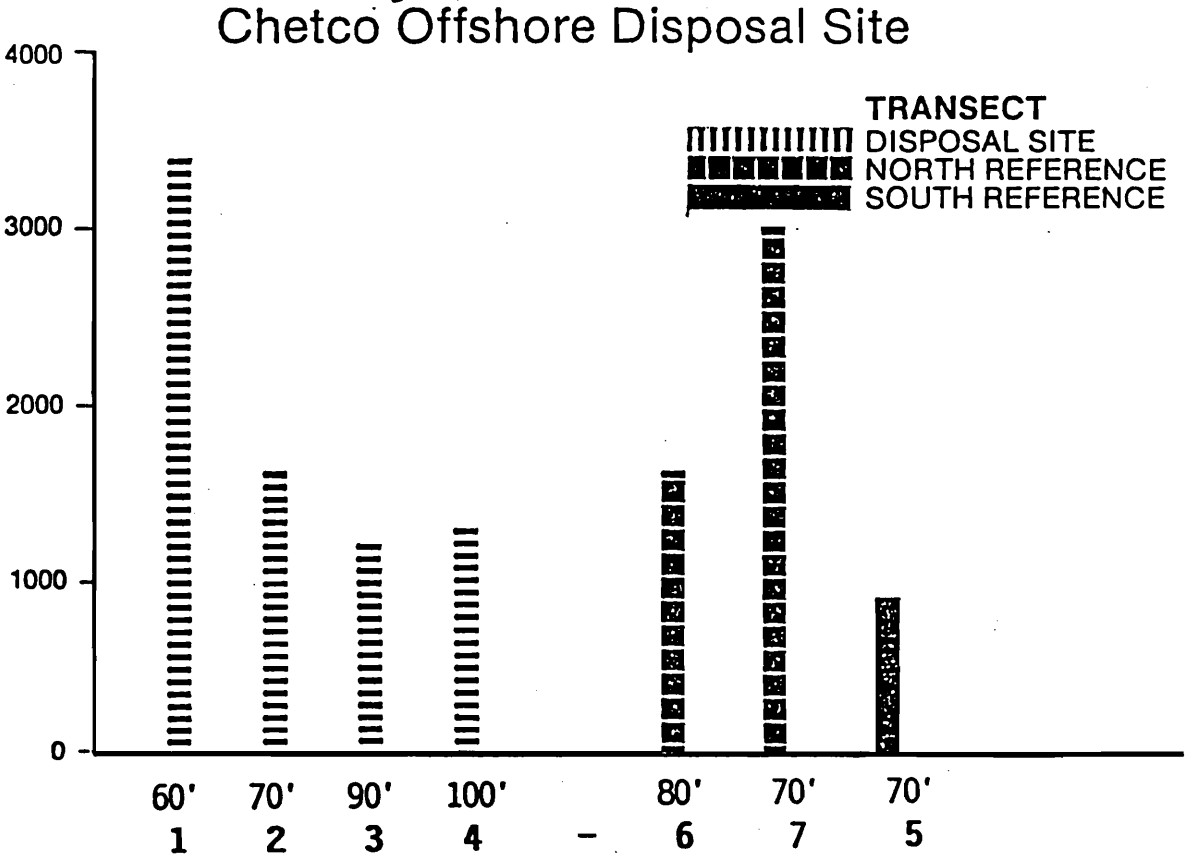

Figure A-2
Density of Benthic Infauna

1.23 Mean densities (#/sq. m) decrease with increasing water depth at both the interim and reference sites. Juvenile Dungeness crabs had a density of $35/m^2$ (Figure A-3). Mean density for the other major taxonomic groups are shown in Figures A-4 and A-5.

1.24 Figure A-6 compares diversity, species richness and equitability of benthic infauna by depth for the Chetco offshore disposal site and for the reference stations to the north and south. The values for each of these factors were found to be very similar for each station in the study area. Due to factors such as seasonality and sediment patchiness which produce large between-sample variation, little significance can be placed on the observed trend.

1.25 Based on the data on benthic invertebrate abundance, density, and diversity from the study area and the reference areas to the north and south of the Chetco interim disposal site, no impact from past disposal activities was observed.

Macroinvertebrates

1.26 The dominant commercially and recreationally important macroinvertebrate species in the inshore coastal area are shellfish and Dungeness crabs. Shellfish distribution is shown in Figure A-7. Clam beds are located north of Chetco Point and Macklyn Cove. Dungeness crab adults occur on sandflat habitat throughout the nearshore area. The presence of Dungeness crab near the Chetco River is typical of conditions along the entire Oregon coast. They spawn in offshore areas and the juveniles rear in estuaries.

Fisheries

1.27 The nearshore area off the Chetco River mouth also supports a variety of pelagic and demersal fish species. Coho and chinook salmon, steelhead and searun cutthroat trout, migrate through the estuary to upriver spawning areas.

1.28 Urfperch, starry flounder, lingcod, black rockfish and cabezon all inhabit the lower estuary. Anchovies and smelt can be found at the entrance to the bay.

1.29 Various rocky reef species are found associated with the jetties.

1.30 Demersal species present in the nearshore area are mostly residents, demonstrating little coastwise movement. However, species such as sablefish, petrale sole and English sole do undertake extensive coastal migrations.

1.31 Distribution and abundance varies with species, season, depth, and in the case of bottom fish, sediment type. Resident lingcod and rockfish species inhabit the many rock outcroppings and reefs to the north and east of the disposal site.

1.32 English, Dover, and petrale sole move from deep offshore waters in winter to shallow nearshore waters in summer. Shallow inshore waters are important nursery areas for juvenile English sole (Krygier and Pearcy, 1986). Most of the flatfish species occur over sandy bottom types.

Density of Major Taxonomic Groups
Chetco Offshore Disposal Site (July 1985)

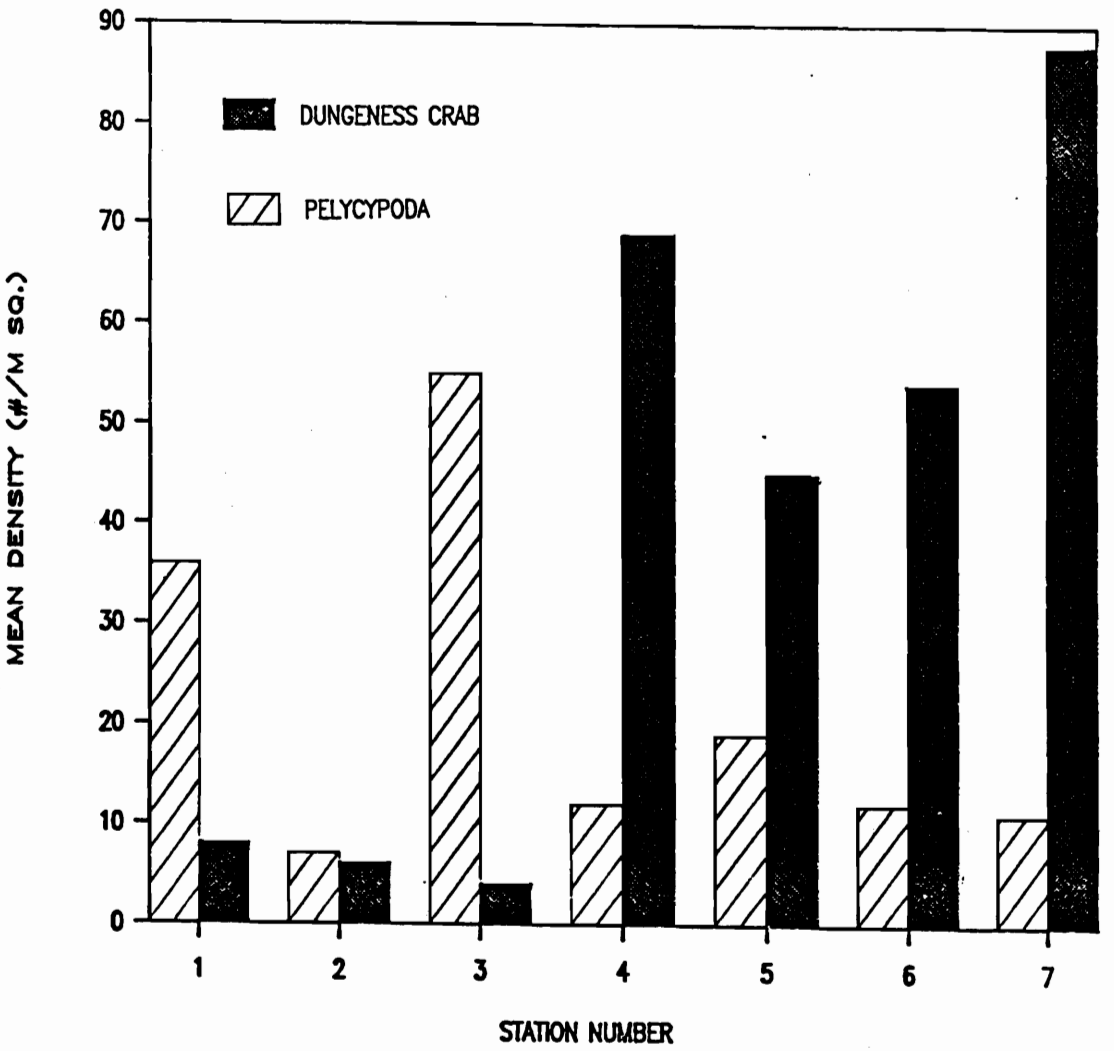

Figure A-3
Density of Major Taxonomic Groups (Dungeness Crab & Pelecypoda)

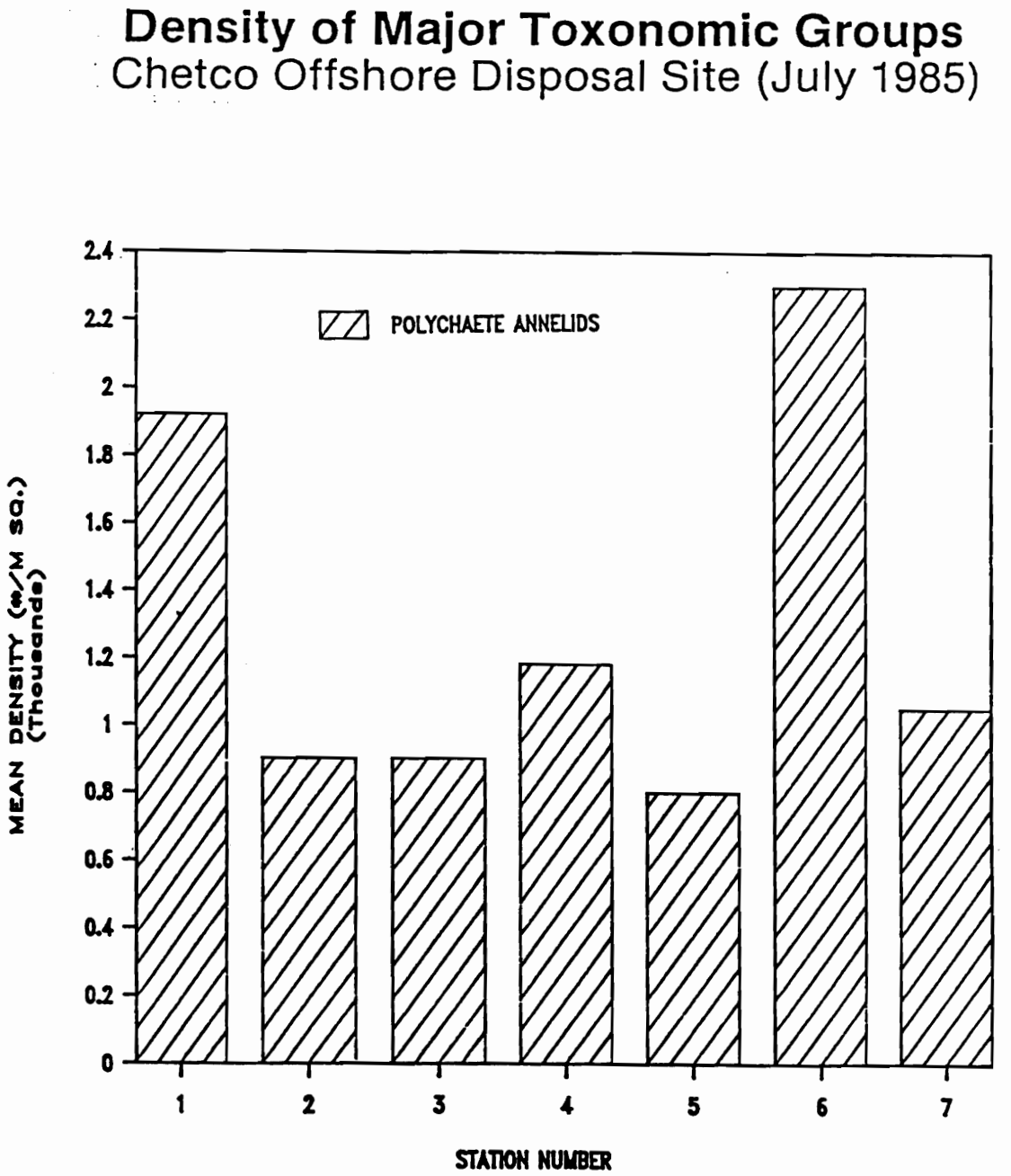

Figure A-4
Density of Major Taxonomic Groups (Polychaete Annelids)

Density of Major Taxonomic Groups
Chetco Offshore Disposal Site (July 1985)

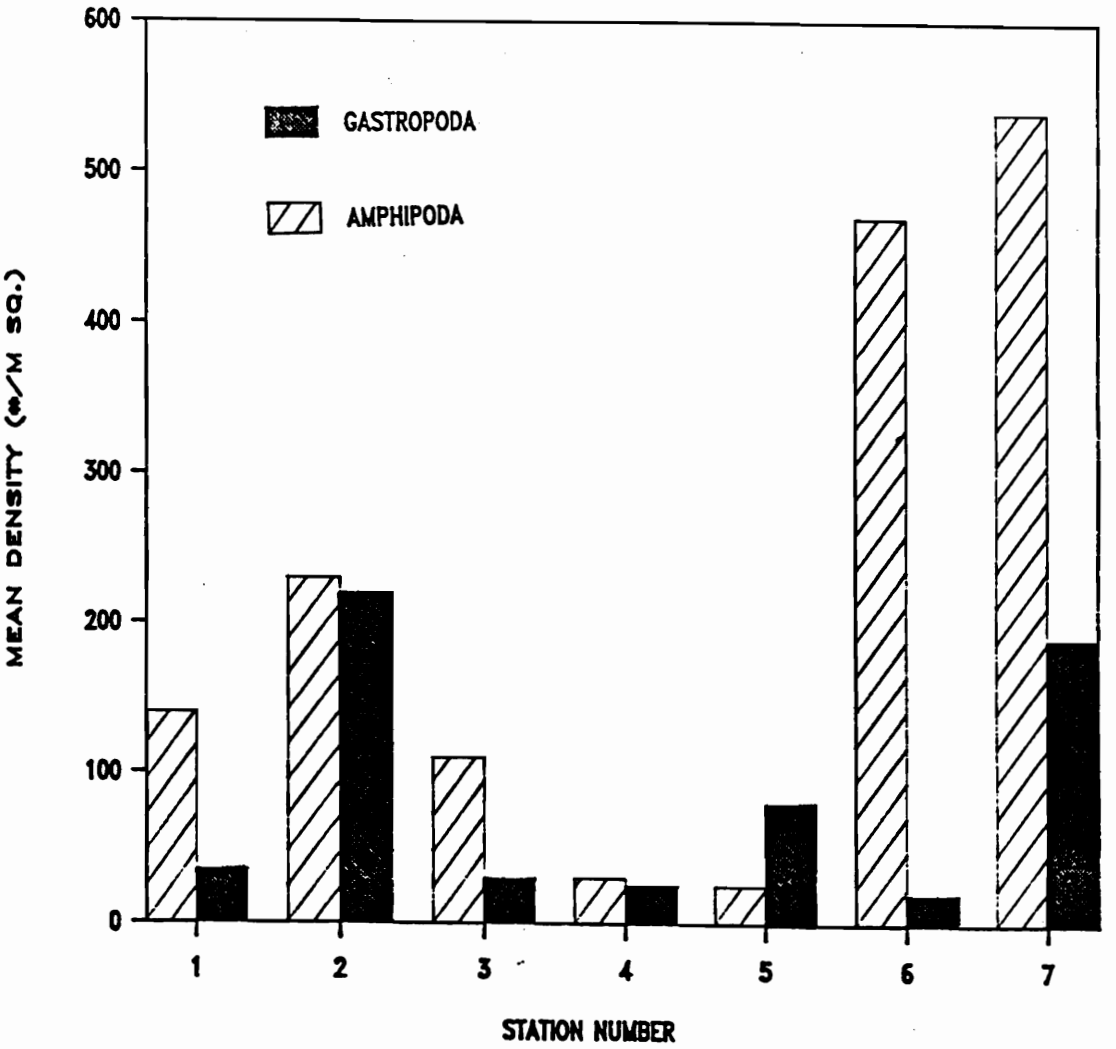

Figure A-5
Density of Major Taxonomic Groups (Amphipoda & Gastropoda)

Species Richness and Equitability of Benthic Infauna

Chetco Offshore Disposal Site

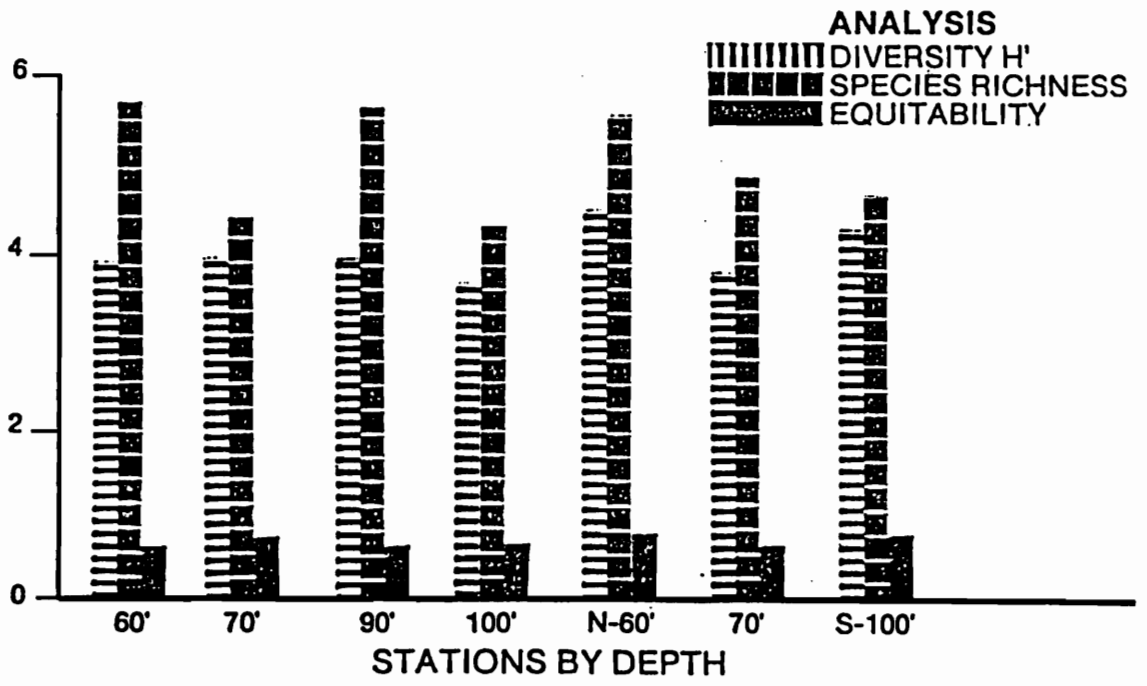

Figure A-6
Species Richness and Equitability of Benthic Infauna

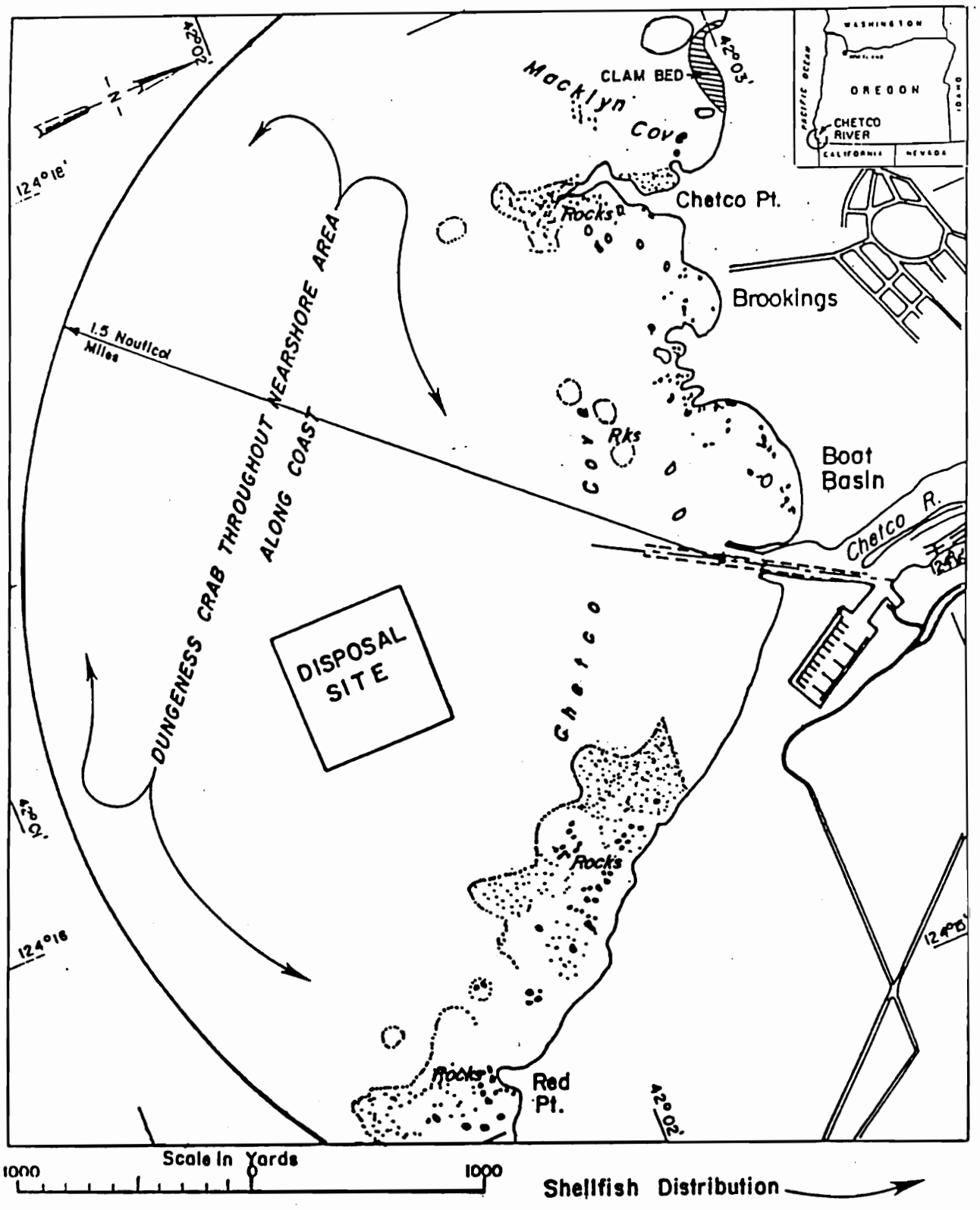

Figure A-7
Shellfish Distribution

1.33 Littleneck clams are common in gravel pockets northwest of the bay entrance. Abalone are found along the reefs and rock outcroppings to the north and east of the disposal site and octopi occur in nearshore areas.

1.34 Dungeness crab occur in and around the disposal site, off the bar, and in the bay.

1.35 Market squid schools can be found all along the Oregon coast. They spawn over sandy bottoms in nearshore, shallow waters. The egg cases fall to the bottom where they anchor themselves by secreting a glue-like resin onto sand particles. Although ODFW has not conducted spawning surveys along the southern Oregon coast, crab fishermen have reported egg clusters attached to crab pots in and around the disposal site (personal communication from ODFW).

Commercial and Recreational Fisheries

1.36 The near shore area around Chetco supports both commercial and recreational fisheries. The nearshore area around the disposal site is where the bulk of the recreational salmon fishery occurs, as well as some commercial troll fishing. Salmon seasons for both fisheries usually begin in June, and are subject to closure when quotas are met.

1.37 Recent (1980-1985) commercial harvests of Coho salmon recorded at Brookings have ranged from 0 pounds in 1984 to 184,288 in 1981. Chinook landings over the same period ranged from 4962 pounds in 1985 to 694,386 in 1981 (ODFW Annual Reports).

1.38 Commercial rockfish landings from 1980 to 1985 ranged from 1,345,114 pounds (1983) to 2,638,706 (1982). Sablefish landings have increased from 123,428 pounds landed in 1981, to 544,523 pounds in 1984.

1.39 Over one million pounds of Dover sole were commercially harvested in 1984. English, rex and petrale sole are taken in moderate quantities from nearshore areas.

1.40 Commercial and recreational Dungeness crab harvest sites surround the disposal site. Dungeness are commercially taken from December through September. Commercial landings between 1980 to 1985 ranged from 583,248 pounds (1983) to 2,913,893 (1980).

1.41 The nearshore area supports a small commercial octopus and squid fishery.

Wildlife

1.42 Numerous species of birds (Table A-5) and marine mammals (Table A-6) occur in the pelagic, nearshore, and shoreline habitats in and surrounding the proposed disposal site. Information on distribution and abundance of bird species is from the Seabird Colony Catalog (Varoujean, 1979) and Pacific Coast Ecological Inventory (USFWS 1981), except as indicated. Information on most species of shorebirds is lacking. Therefore, their abundance and distribution can only be addressed in general terms. They occur along much of the coast primarily as migrants and/or winter residents.

Table A-5
Bird Species in Vicinity of Disposal Site

CATEGORY/SPECIES	HABITAT USE			
	BREEDING	WINTERING	MIGRANTS	SUMMER NON-BREEDERS
SHOREBIRDS				
black oystercather	X	X		
snowy plover	X	X		
greater yellowlegs			X	
black turnstone		X	X	
northern phalarope			X	
western gull	X	X		
Heermann's gull		X		
glaucous-winged gull		X		
killdeer	X	X		
spotted sandpiper	X	X		
surfbird		X		
wandering tattler			X	
semipalmated plover			X	
least sandpiper		X	X	
dunlin		X		X
western sandpiper		X	X	
sanderling		X	X	
California gull		X		
ring-billed gull		X		
mew gull		X		
Bonaparte's gull		X		
Sabine's gull			X	
long-billed dowitcher			X	
black turnstone		X	X	
SEABIRDS				
fork-tailed storm petrel	X	X		
Leach's storm petrel	X	X		
double-crested cormorant	X	X		
Brandt's cormorant	X	X		
pelagic cormorant	X	X		

[1] From Gabrielson and Jewett (1970) and Bertrand and Scott (1973).

Table A-5 - cont'd

CATEGORY/SPECIES	HABITAT USE			
	BREEDING	WINTERING	MIGRANTS	SUMMER NON-BREEDERS
SEABIRDS (con't)				
common murre	X	X		
pigeon guillemot	X	X		
marbled murrelet	X	X		
Cassin's auklet	X	X		
rhinoceros auklet		X		
tufted puffin	X	X		
fulmar		X		
pink-footed shearwater			X	
sooty shearwater			X	
WATERFOWL				
common loon	X	X		
arctic loon		X		
red-throated loon		X		
western grebe	X	X		
red-necked grebe	X	X		
horned grebe	X	X		
pied-billed grebe	X	X		
Canada goose		X		
black brandt		X		
mallard	X	X		
pintail		X		
American wigeon		X		X
green-winged teal		X		
redhead		X		X
canvasback		X		
ring-necked duck		X		
greater scaup		X		
lesser scaup		X		
common goldeneye		X		
Borrow's goldeneye		X		
bufflehead		X		
harlequin		X		
black scoter	X	X		
white-winged scoter	X	X		

Table A-5 - cont'd

CATEGORY/SPECIES	HABITAT USE			
	BREEDING	WINTERING	MIGRANTS	SUMMER NON-BREEDERS
WATERFOWL (con't)				
surf scoter	X	X		
ruddy duck		X		
common merganser		X		
red-breasted merganser		X		
great blue heron	X	X		
American coot	X	X		
brown pelican				X
OTHER				
bald eagle	X	X		
peregrine falcon		X	X	

Table A-6
Marine Species in Vicinity of Disposal Site

CATEGORY/SPECIES	HABITAT USE		
	BREEDING	WINTERING	MIGRANTS
SEALS AND SEA LIONS			
harbor seal	X	X	
northern elephant seal		X	X
stellar sea lion	X	X	X
California sea lion		X	X
WHALES			
northern right whale		Along Oregon coast in winter.	
gray whale		Along Oregon coast during Feb. to May while migrating to and from breeding and feeding grounds. Estimated total population 11000-15000. Some may be staying in Oregon water during winter. (R. Brown, pers. commun.)	
blue whale		Off Oregon coast from late May to June and August to October.	
fin whale		Occur off Oregon Coast during May to September	
sei whale		Summer to early fall	
minke whale		Late summer to early fall	
humpback whale		April to October	
sperm whale		Late summer to fall	
giant bottlenose whale		Uncommon, June to October	
short-finned pilot whale		Winter	
grampus		Uncommon, spring to summer	
killer whale		Winter	

Table A-6 - cont'd

	HABITAT USE		
CATEGORY/SPECIES	BREEDING	WINTERING	MIGRANTS
WHALES			
false killer whale		Uncommon	
common dolphin		Uncommon, spring to summer	
northern right whale dolphin		Rare, spring to summer	
Dall's porpoise		Common, throughout year	
harbor porpoise		Common, throughout year	
Pacific white-sided dolphin		Common, throughout year	

A few species of shorebirds--including western snowy plover, black oystercatcher, killdeer, and spotted sandpiper--nest along the coast. Several species of special concern, the bald eagle, peregrine falcon, and brown pelican, occasionally occur along the coast and may use the ZSF or the surrounding areas. Pelicans and peregrine falcons are often associated with headlands, ocean beaches, spits and offshore rocks. Pelagic birds (e.g. scoters, petrels) probably use the ZSF and adjacent waters for foraging.

1.43 Data on marine animals is from the Natural History of Oregon Coast Mammals, Maser et al. (1981), Pearson and Verts (1970), and the Pacific Coast Ecological Inventory (USFWS 1981), except as indicated. Except for seals and sea lions, information on marine mammals is extremely limited. Whales are known to occur throughout coastal waters, primarily during migrations, but population estimates and information on areas of special use generally are not available.

1.44 A number of species of shorebirds and waterfowl (Table A-5) use the shoreline habitats at the mouth of the Chetco River. Outside the ZSF, several important species and wildlife habitats occur and could be affected. Whalehead Island is an important nesting and congregating area for seabirds, including approximately 1/10 of Oregon's breeding population of Leach's storm petrels, 1/3 of Oregon's pigeon guillemots, and 1/5 of Oregon's tufted puffins. Gulls, cormorants, common murres, and Cassin's auklets also nest on Whalehead Island. House Rock and Twin Rock have nesting populations of comorants. Approximately 1/2 of Oregon's population of Leach's storm petrels nest on Goat Island, as do about 1/4 of the Brandt's cormorants, about 1/4 of the western gulls, 1/4 of the pigeon guillemots, and 1/3 of the tufted puffins. Common murres and Cassin's auklets also nest on Goat Island. Cone Rock is a nesting area for western gulls, pelagic cormorants, and pigeon guillemots. Black oystercatchers, western gulls, Brandt's cormorants, pelagic cormorants and pigeon guillemots nest on Hunter Rock and Prince Island. Leach's storm petrels, double-crested cormorants, rhinoceros auklets, and tufted puffins also nest on Prince Island. Impacts to those species foraging in the vicinity of the ODMDS may occur during disposal events. These impacts are expected to be ephemeral and very localized and would be associated with the sediment plume. Contaminants are not expected to be introduced to the site and therefore should not pose a problem.

1.45 Portland District requested an endangered species listing for the site from U. S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) as part of their coordination of the Site Evaluation Report. At that time only the brown pelican and the gray whale were listed. Based on previous biological assessments conducted along the Oregon coast regarding impacts to the brown pelican and the gray whale, it was concluded that no impact to either species is anticipated from the proposed designation and use. This information was presented in the draft EIS. The Corps was informed by the NMFS that they had revised their list of threatened/endangered species. Species listed by the NMFS included the gray, humpback, blue, fin, sei, right, and sperm whales; northern (Steller) sea lions; leatherback sea turtles, and Sacramento River winter run chinook salmon. A biological assessment was prepared addressing the newly listed species and revising previous biological assessment on the gray whale. The assessment concluded that no impact to any of the species is anticipated by designation and use of the Chetco ODMDS. This information is presented in appendix F, including a letter of concurrance from NMFS.

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APPENDIX B

APPENDIX B

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APPENDIX B

GEOLOGIC RESOURCE, OCEANOGRAPHIC PROCESSES, AND SEDIMENT TRANSPORT OF THE CHETCO ZSF

GEOLOGICAL RESOURCES

Regional Setting

1.1 The Chetco River empties into the Pacific Ocean about 300 miles south of the mouth of the Columbia River. It lies within the Cape Ferrelo littoral cell, which extends for approximately 40 km from Cape Ferrelo in the north to Point St. George in the south (Figure B-1). The Chetco River has one of the smallest estuaries on the Oregon coast (Percy et al. 1974). The watershed lies entirely within the Klamath Mountains. Immediately north of the mouth of the Chetco are cliffs and sea stacks. To the north of the river mouth, the coastline is elevated with rugged bluffs rising above narrow beaches, with numerous islands and stacks. To the south, broad beaches rise rapidly to raised marine terraces and low inland hills. No sand dunes of consequence are found in this area. From the mouth of the river to about river mile eight (RM 8), the valley consists of an alluvial plain varying between 1/2 and 1/4 mile wide (USACE 1975). The continental shelf extends about 25 km out from the mouth of the Chetco. The shelf and slope are characterized by a series of flat terraces or benches (Byrne 1963). Sand covers the bottom for a distance of about 2 km out from the shore. After a thin zone of mixed sand and mud, the bed is blanketed by a thin layer of mud. This mud layer is usually less than 10 cm thick off the Rogue river to the north (Kulm 1977).

1.1.1 The Chetco ZSF is within the Brookings subcell of the Crook Pt. littoral cell. The coastline bordering the littoral cell consists of about 6 miles of rugged cliffs and pocket beaches from Cape Ferrelo down to Brookings, 8 miles of broad beaches fronting raised marine terraces to the mouth of the Smith River, and 12 miles of prograding shoreline south to Pt. St. George (Beaulieu et al. 1974, Peterson, pers. com. 1986).

Regional Geology

1.2 The Chetco River is, after the Rogue, the major stream draining the western Klamath Mountains in Oregon. The Klamaths are made of Mesozoic marine sediments and igneous rocks that have been folded, faulted and subjected to varying degrees of metamorphism, and Tertiary igneous intrusives. The tectonic history of the Klamath mountains is complex, with several episodes of folding and faulting, which have continued up to the present. Parts of the Klamaths have been subjected to tectonic events since the late Jurassic. The late Cretaceous and early Cenozoic was a time of quiescence, but since the end of the Eocene, faulting and uplift have affected the area (Baldwin 1981, Baldwin and Beaulieu 1973, Dott 1971).

1.2.1 The Chetco River flows mainly through rocks of the Dothan Formation, which consists of rhythmically bedded sandstone, siltstone, some conglomerates and bedded

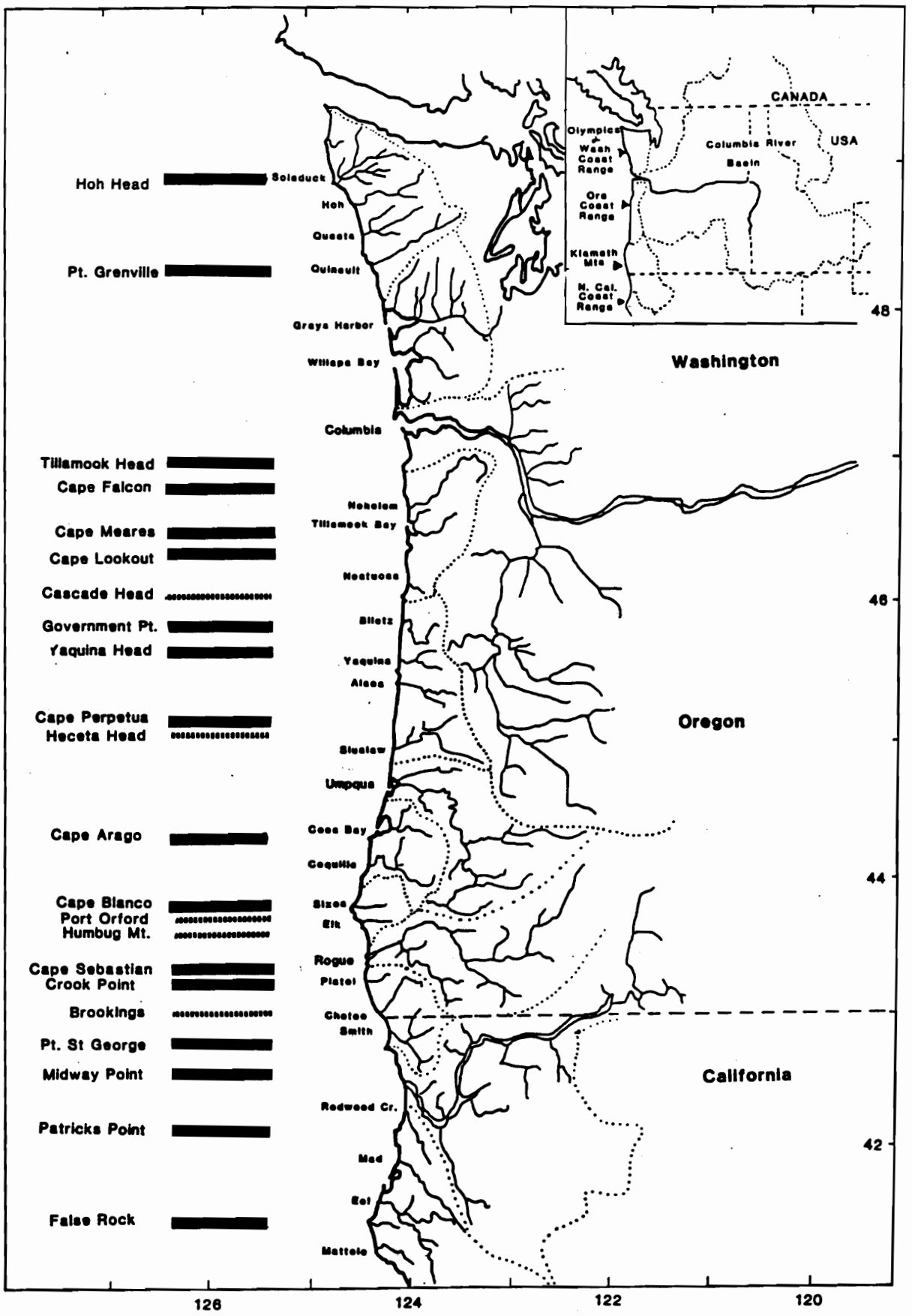


Figure B-1
Littoral Cell Location Map

cherts, and volcanics (Figure B-2). The Dothan formation was deposited along the continental margin during the late Jurassic (Baldwin and Beaulieu 1973). Other formations within the Chetco's drainage basin are the Colebrook Schist, Gneissic rocks, peridotite and serpentinite of Jurassic age, and dacitic intrusions from the Tertiary. The coastline, from just north of the California border up to about Whalehead Island, is bordered by the Dothan formation. The next five miles are made of the Jurassic Otter Point Formation, with the final distance up to Crook Point consisting of the Cretaceous Hunter Cove Formation and some Quaternary deposits. Southward from the California border to the southern terminus of the cell the shoreline is a prograding beach (Dott 1971).

1.2.2 The region is currently undergoing tectonic uplift, but that has been surpassed by the post Pleistocene rise in sea level. During the Pleistocene glaciations, the massive amount of water stored in the glaciers caused a drop in sea level. The end of the Ice Age and the melting of the glaciers resulted in a global sea level rise of 125 m (Curry 1965). Fluctuating sea level, in conjunction with tectonic uplift of the Klamaths, led to the formation of several raised marine terraces as well as the incision of valleys to below the present sea level. Near Brookings, the raised terraces are about 80 m above sea level. The rise in sea level "drowned" the river and stream valleys that had been incised in the Coast Range and coastal plain. This produced the large coastal estuaries and allowed the development of the alluvial plains bordering the lower reaches of the Chetco River.

1.2.3 The sand deposits that cover the nearshore sea bed were delivered by streams that eroded rocks in the coastal mountains, and by the sea attacking both bedrock and marine deposits left over from previous high stands of the sea. An undetermined amount of bedload material is currently escaping through the estuaries and eroding from the shoreline. Fine silts and clays supplied by these sources are removed or prevented from settling out in the nearshore zone by the high wave energy, leaving fine sand covering the sea bed for a distance of several kilometers offshore.

Economic Geology

1.3 The Chetco River and its tributaries flow through bedrock containing mineralized zones, and has several reaches containing gold placer deposits. Despite this, no large concentrations of black sands have been identified close to the mouth of the river. The closest deposit is seven miles to the north and has a heavy mineral concentration of 10-30 percent (Grey and Kulm 1985). Minerals of primary interest in black sands are gold, platinum, and chromite, but the sands also contain numerous other heavy minerals (Ramp 1973). The offshore deposits north of the Chetco are not currently being mined. Offshore gravel deposits elsewhere along the Oregon coast have been considered as potential sources of aggregate. While individual samples of gravel were found within the ZSF, no large deposits have been found close to the mouth of the Chetco river. While there have been several attempts to find oil and gas along the Oregon coast, no test well has turned up more than traces of either. No test well off the Oregon coast had been drilled south of Cape Blanco as of 1985.

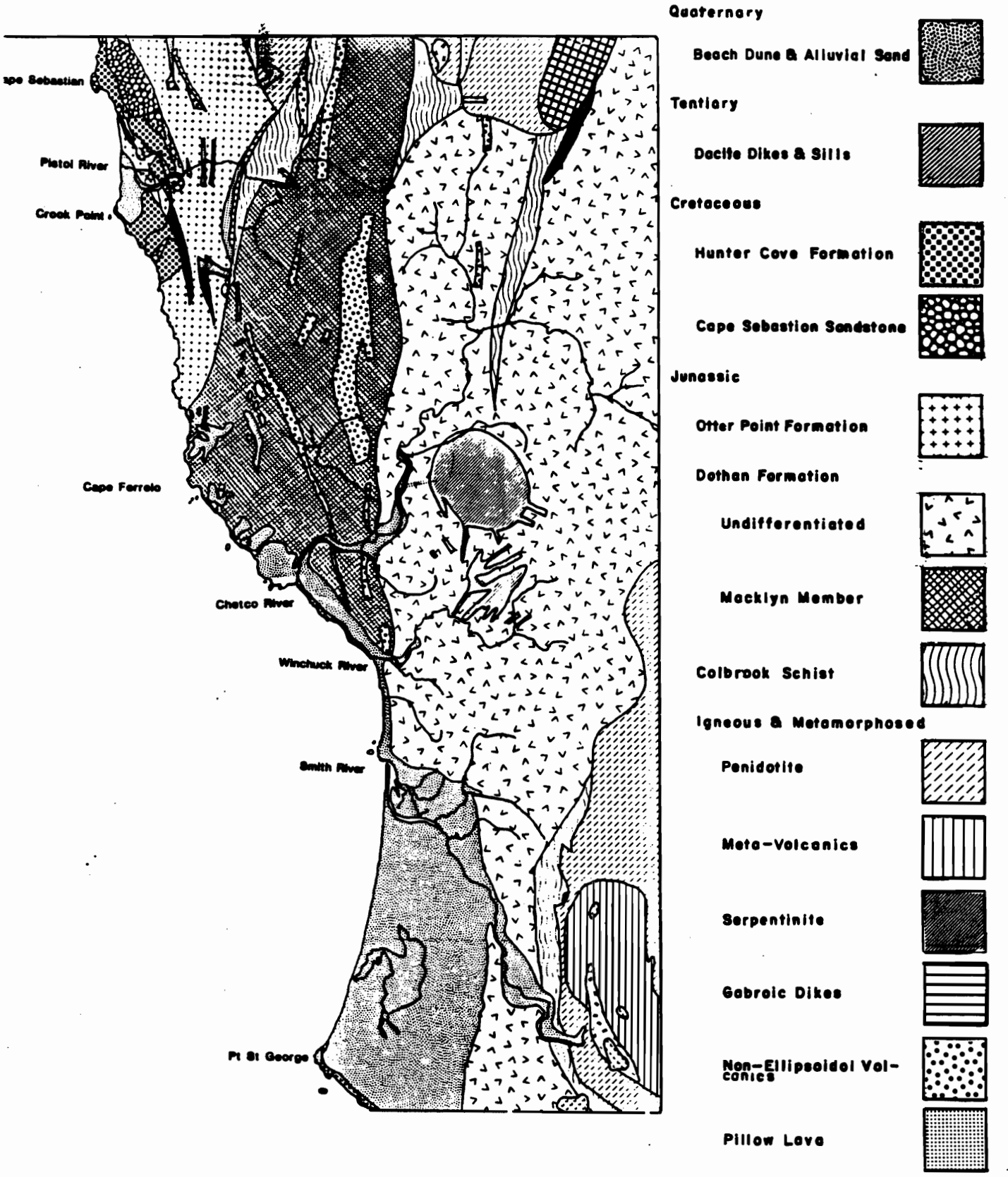


Figure B-2
Watershed Geology

Sediment Sources

1.4 There are three external sources for sediment in the littoral cell. These are input from fluvial sources, dredging, and coastal erosion.

1.4.1 The Chetco estuary has a hydrographic ratio (HR) of about 1. It is therefore very fluvially dominated and, thus, most of its bedload sediment will be transported into the ocean (Peterson, pers com 1986). The HR is discussed more fully under Local Processes.

1.4.2 Two other rivers enter the littoral cell, the Winchuck River, a few miles south of the Chetco, and the Smith River, which is in California. The Winchuck has a mean discharge of under 90 cfs, so is at best a very minor contributor of sediment. The Smith River, on the other hand, is larger than the Chetco and also has a HR of about 1. Mineralogical studies have shown that the Smith and Chetco Rivers are the major sediment sources for the littoral cell.

1.4.3 A second source of sediment is coastal erosion. Runge (1966) estimated 780,000 cy of material were added annually by erosion along the coast of Oregon. Studies providing information on specific rates of erosion and material contribution are not available. The National Shoreline Study (COE 1971) identified the coastline north of Brookings up to Cape Ferrelo as being subjected to critical erosion, and up to Crook Point to "non-critical erosion." The Beach and Dunes of the Oregon Coast report (USDA and OCCDC 1975) agrees in general with the shoreline survey, but shows little erosion between Cape Ferrelo and Crook Point. In neither study was any data given on erosion rates. The portion of the littoral cell experiencing critical erosion is prone to landsliding. The largest landslide is the Hooskanaden slide. These slides move slowly and intermittently, their rate increased by heavy rainfall and the removal of their toes by wave action. The slides are continuous sources of sediment for the littoral zone. South of Brookings, the beaches and terrace faces are stable, and may show some signs of progradation (Stembridge 1976). At best, this stretch of the coast has little effect on the sediment budget. The progradational beaches south of the Smith River mouth are a net sediment sink. They take a large, though undetermined, percentage of the material contributed by the Smith River.

1.4.4 In the Cape Ferrelo littoral cell, the only offshore disposal of dredged material occurs off the mouth of the Chetco River. The type of dredged material depends on both the location and hydrologic conditions. Dredging during or just after high flows is more likely to pick up fluvial sediments than dredging done during periods of low flow, when marine sediments have intruded into the mouth. The further upstream dredging is done, the more likely it is that fluvial sediments will be encountered. Since the Chetco River has a HR of less than 1, nearly all the sediment load should eventually be carried out into the ocean. This means that the net contribution of dredging to the sediment budget is much smaller than the amount of material disposed of offshore.

1.4.5 Dredging of the entrance of the Chetco River began in 1963. The current offshore disposal site was designated in 1977. Between 1976 and 1985, the average dredging volume was 47,800 cy, with maximum and minimum quantities of 76,300 and 7,800 cy, respectively (Table B-1).

Table B-1
Dredging Volumes at Chetco
(Includes both Corps and contract hopper dredging)

Year	Cubic Yards (C.Y.)
1976	60,100
1977	7,800
1978	56,750
1979	44,230
1980	54,300
1981	76,300
1982	52,556
1983	59,715
1984	31,874
1985	35,045
10-Year Average	47,792

The authorized project provides for an entrance channel 120 feet wide and 14 feet deep, a barge turning basin 250 feet wide, 650 feet long and 14 feed deep, and a small boat access channel 100 feet wide and 12 feet deep. Shoaling occurs off the end of the north jetty between RM 0 and RM-0.2, and at the entrance to the boat basin between RM 0.1 and RM 0.3 (Figure B-3). Dredging is done between April and October.

1.4.6 In determining the importance of the various potential sources, the mineral assemblages of the sediments and the sources can be useful. In the case of the Cape Ferrelo cell, three different mineral abundance ratios have been used to define the cell. The littoral sands have a high ratio of orthopyroxene to clinopyroxeen (2.5:1), a subequal ratio of pyroxene to amphibole (0.5:1), and a high ratio of metamorphic amphibole to hornblend (2:1). In addition, there are significant amounts of olivine (15 percent). The two major rivers (Chetco and Smith) that enter the littoral cell have heavy mineral assemblages that correlate with that of the littoral sands. This shows that the majority of the sediment is fluvially derived (Chesser and Peterson 1987, Peterson, pers. com. 1986).

1.4.7 The seabed in the ZSF is covered by a wide variety of material. The most recent sampling showed that mean grain size varies from as fine as 0.05 mm in deep water to 18.0 mm close to the nearshore side of the designated disposal site. The one sample taken within the designated disposal site had a mean grain size of 0.25 mm (Table B-2). A scarcity of samples and unsystematic placement of sampling sites prevents the determination of sediment distribution patterns from the samples.

1.4.8 There is also a wide variety of grain sizes in the sediments from shoals that are dredged in the Chetco River entrance. The entrance to the boat basin had the finest material sampled with a median grain size of 0.3 mm. The coarsest material (median grain size 7 mm) was found at the inner shoal, between the entrance to the boat basin and the end of the jetties, and is classified as silty, sandy gravel. The outer shoal is composed of coarse sand similar to that found on nearby beaches. Comparison of

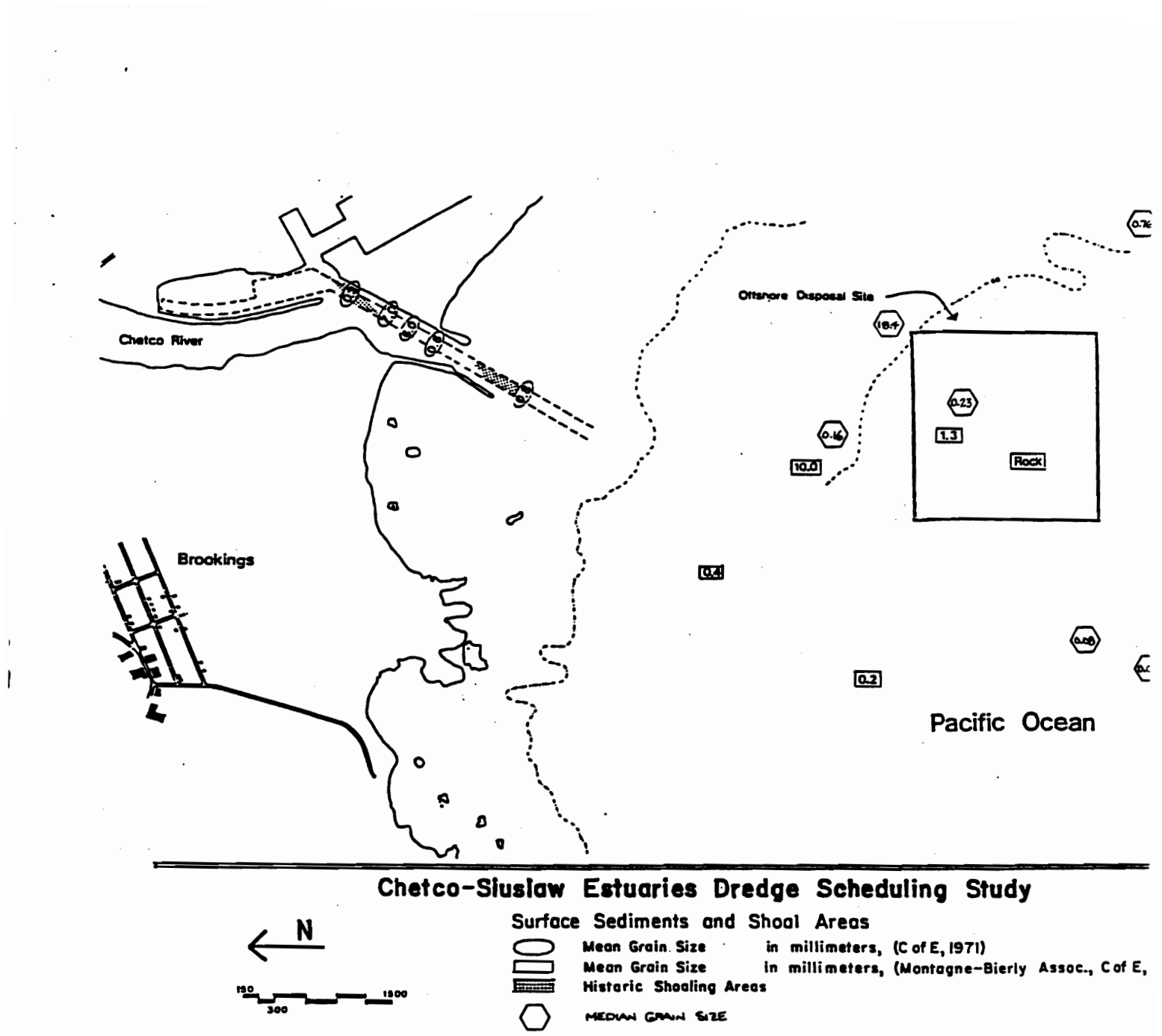


Figure B-3
Entrance Shoals and Offshore Sample Locations

Table B-2
Chetco Offshore Sediment Samples

Date	Sample	Mz (mm)	D50	D90	% fines	depth
8 May 1978	1-a	8.51	10	26	0	50
"	1-b	11.08	14	25	0	50
"	2-a	1.66	1.4	12	0	69
"	2-b	2.39	1.2	41	0	69
"	4-a	0.19	0.19	0.30	3	76
"	4-b	0.2	0.20	0.28	2	76
"	5-a	0.31	0.32	0.59	1	44
"	5-b	0.33	0.33	0.59	0	44
17 Aug 1984	002	7.46	8.88	22	2	74
"	005	0.28	0.26	0.35	0	20
"	006	0.18	0.17	0.32	2	45
"	008	0.11	0.125	0.17	12	105
16 July 1985	c-1	18.0	18.4	39.4	0	60
"	c-6	18.8	21.1	36.8	0	60
"	c-12	0.24	0.23	0.57	1	72
"	c-13	0.06	0.08	0.19	42	90
"	c-24	0.05	0.08	0.14	41	96
"	c-30	0.77	0.76	4.76	1	102
"	c-37	0.15	0.16	0.26	7	72
"	c-38	0.14	0.14	0.25	9	54

Note: Mean grain size (Mz) calculated using Folk and Ward's (1954) parameters. Grain size given in millimeters.

samples taken in 1974 and in 1981 showed consistency in median grain size for each shoal, but distribution of sizes within each sample varied considerably, as shown by the differences in mean grain size (Table B-3). The difference was most extreme for the inner shoal, which had a large percentage of fines in 1981 but not in 1974. The outer shoal was more poorly sorted in 1974 than 1981, and had slightly more coarse material. Without more sampling, it is not possible to evaluate how close the samples are to the average or extremes of the dredged sediments. The sediments of the inner shoal appear to be primarily fluvial in origin, transported during winter and spring freshets. The outer shoal is made of littoral sand, perhaps including sand that had been transported beyond the jetties and injected into the littoral system. The extent of intrusion of littoral sediments into the estuary and ejection of fluvial sediments out of the river mouth is controlled by the river discharge. High discharge pushes fluvial sediments out, while low discharge allows littoral sands to move upstream.

Table B-3
Chetco River Entrance Samples

Sample	Location	D50	Mz	D90	% fines
	1971				
1	St.12	0.295	0.27	0.64	2
2	St. 9	0.84	0.80	10.4	2
	1972				
1	Out. shoal	6.0	4.23	10.9	1
	1974				
1	Buoy 9	6.9	5.66	23.0	0
2	End N jetty	0.74	0.84	6.4	1
	1976				
1	Buoy 9	0.60	0.77	10.0	4
	1981				
1	Buoy 9	6.0	1.74	23.0	20
2	End N jetty	0.71	0.69	1.5	0

Note: Grain size given in millimeters.

Conditions in the ZSF

1.5 The headlands, cliffs, stacks and the rocky, submarine outcrops in the Chetco Cove area are part of the Dothan Formation of Late Jurassic time. The Dothan Formation consists of thin to thick, hard, bedded sandstone and mudstone with minor amounts of volcanic rock (greenstone), chert and conglomerate. These were deposited in continental slope and deep ocean floor environments shoreward of the island arc that is represented by the Otter Point Formation (Beaulieu and Hughes 1976). The Dothan

formation is separated from the more highly deformed Otter Point Formation to the west by the Carpenterville shear Zone (Dott 1971). The Carpenterville Shear Zone is a zone of thrusting, along which the Otter Point Formation moved relatively eastward beneath the Dothan Formation in Late Jurassic or Cretaceous time. This shear zone lies at least two miles west of the Chetco study area and is considered to be inactive (Beaulieu and other 1976). Very little is known about the bedrock structure adjacent to the Chetco study area. No faults have been mapped or projected into the study area (USACE 1986).

1.5.1 The topography of the sea bed in the ZSF is highly irregular. There are rock pinnacles both in the northwest part of the surveyed area and along the east and southern sides of the designated disposal site, as well as scattered outcrops throughout the area. The bed directly west of the Chetco river mouth is relatively smooth down to a depth of at least 78 feet. The slope there is about 15.6/1000, but such regularity is the exception within the ZSF. In general, the contours arc, forming an embayment opening toward the southwest.

1.5.2 The quantities of material disposed at the designated disposal site have not created a noticeable mound. Bathymetric surveys made in 1984 and 1985 showed no change in the bed topography. However, in the northeastern part of the site, the border between the zones designated in the seismic survey as "sand/silt" and "scattered rock exposures" is marked by higher ground on the "sand/silt" side. This indicates a somewhat thicker sediment layer in the "sand/silt" zone.

1.5.3 Though the bathymetric surveys are unable to give a detailed picture of the surface of the disposal site, inspection by divers in 1978 gave some idea of the small scale topography of the bed both within and outside the site. Shortly after a dump, the bed was found to be covered with rolling, non-oriented mounds with a relief of about one to two feet, and an unstable substrate. In areas unaffected by dredging, the sandy bottom appeared to be flat with ripples one to three inches apart. Where no sediment covered the bed, the rolling, rocky substrate featured shelves and ledges two to four feet high, crevices and depressions (USACE 1978). No followup survey was done to see how the mounds of disposal material were modified through time.

1.5.4 Figure B-4 shows the results of the July 1985 sidescan sonar survey of the Chetco ZSF. The ZSF contains a wide variety of bottom conditions and materials. Generally, this area can be segregated into scattered rock exposures and massive rock outcrops in the south, east and northeast, and more or less continuous sediment covering the north, center and southwest. What was interpreted as "sand-silt" covered all of the latter section except for a portion of the center where there is "coarse sand or gravel." Bottom sampling confirmed the "coarse sand or gravel" as being that, while the "sand/silt" fell clearly into the range of sand.

1.5.5 Three subsurface seismic profiles were made in an east west direction (see Figure B-5). They show the unconsolidated sediment cover ranging from 4 to 46 feet thick, with exposed or near surface rock in places. Profile 1 is in the south. It begins in the east with very thin sediment cover and exposed mounds of bedrock. From mark 216 westward, the sediment layer gradually increases to a maximum thickness of 46 feet. Profile 2 transects the disposal site. It goes from exposed rock in the east through a

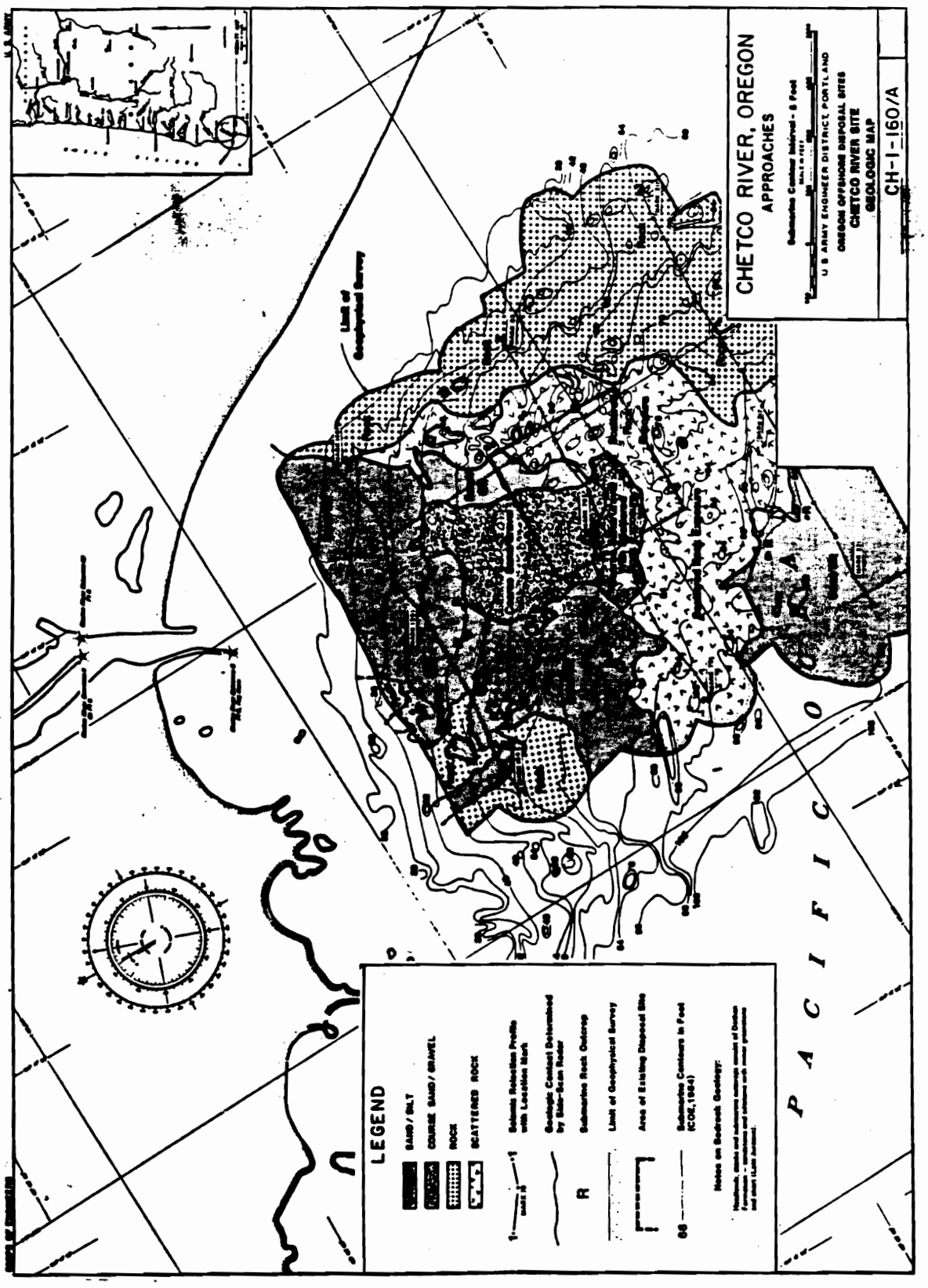
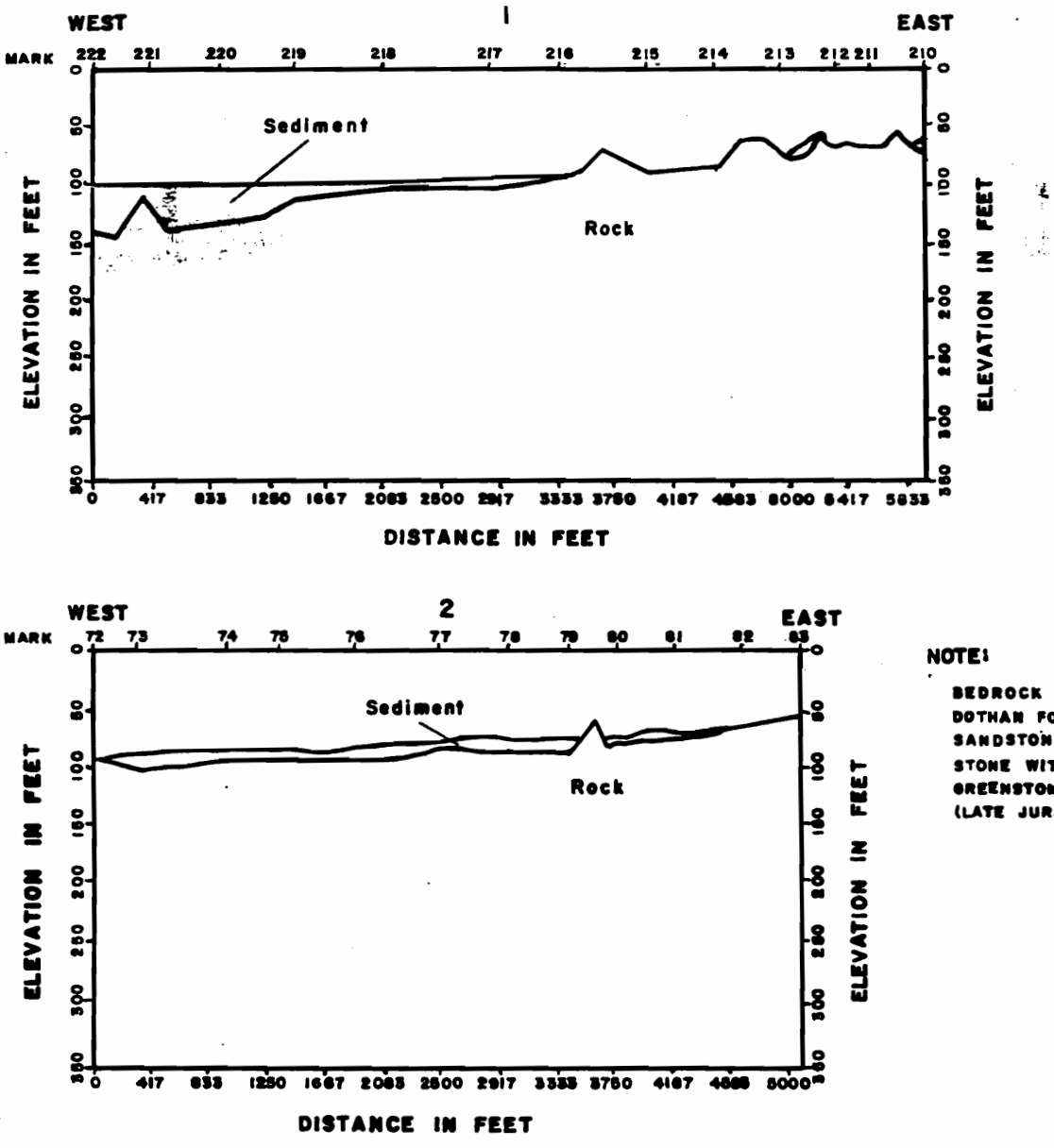
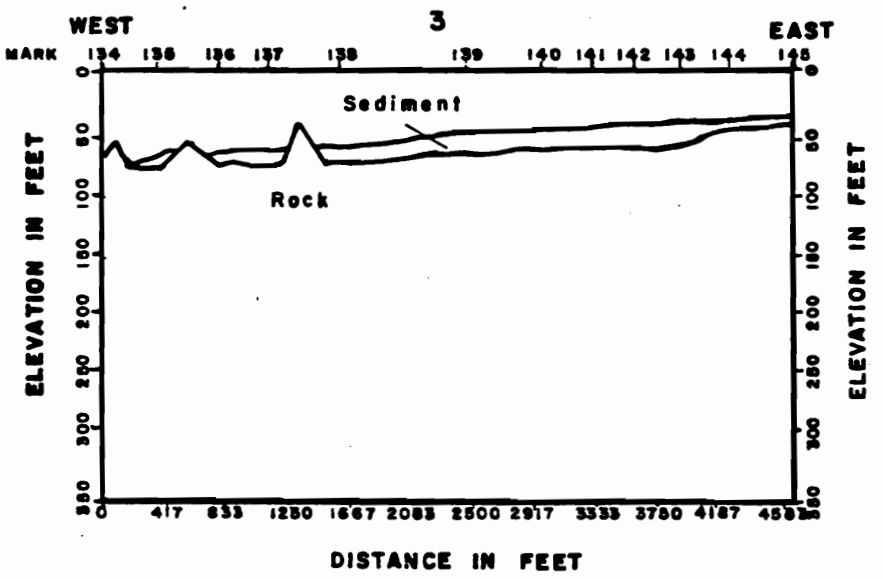


Figure B-4
Sidescan Sonar Survey



NOTE:

BEDROCK CONSISTS OF DOTHAN FORMATION — SANDSTONE AND SILTSTONE WITH MINOR GREENSTONE AND CHERT (LATE JURASSIC).



CHETCO RIVER PROFILE

ELEVATION DATUM IS MLLW FROM FATHOMETER RECORDINGS.

LOCATION BY PORTLAND DISTRICT, COE.

Figure B-5
Seismic Profiles

wedge of sediment that thickens to about 15 feet, which is maintained through the disposal area until abruptly pinching out at the west end. The third profile shows 15 to 25 feet of sediment for 2/3 of the way from east to west, with rocks poking up in several places in the western third. The bedrock surface is irregular with pinnacles protruding through the covering in numerous places.

OCEANOGRAPHIC PROCESSES

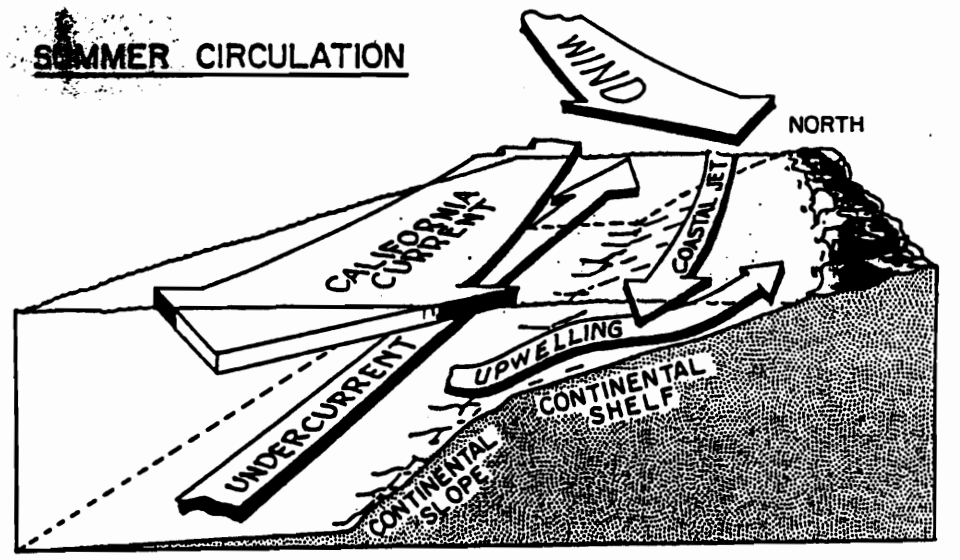
Coastal Circulation

2.1 Coastal circulation near the Chetco ZSF is directly influenced by large-scale regional currents and weather patterns in the northwestern Pacific Ocean. Seasonal and short period currents due to regional weather patterns are more important at Chetco than farther north. Strub et al. (1987) describe a transition in oceanographic regimes near the latitude of Chetco. During winter, strong low pressure systems with winds and waves predominantly from the southwest contribute to strong northward currents. During the summer, high pressure systems dominate and waves and winds are commonly from the north. In both seasons, there are fluctuations related to local wind, tidal and bathymetric effects. The configuration of the coastline minimizes the effects of southerly waves in the summer at Chetco. Along the southern Oregon coast, this southerly wind in summer creates a mass transport of water offshore which results in upwelling of bottom water nearshore. Figure B-6 illustrates these influences at Chetco.

Ocean Waves and Tide

2.2 Ocean waves arriving at Chetco are generated by distant storms and by local winds. Distant storms produce waves that arrive at the coast as swells which are fairly uniform in height, period and direction. Local winds produce seas which contain a mixture of wave heights, periods and directions. Generally, local seas have higher waves and shorter periods than incoming swell. Waves generated by local winds, i.e., seas, generally approach the coastline from the SW to S sectors during autumn and winter, but from the N to NW sectors in spring and summer. The longer period swells generated by more distant storms approach generally from the NW to W or W to SW sectors. Local storms are considered to generate higher waves than swell with the highest waves always occurring during the winter and approaching from the SW to S sectors. The shortest sea and swell periods occur during the summer. Longest period swell generally occurs during autumn while longest period seas occur during winter. Figure B-7 illustrates the variability in monthly significant wave height. Wave hindcasts, (WES), are plotted in Figure B-7 for comparison with the Yaquina ten-year monthly average and Coquille 1985 monthly average. Chetco 1985 monitoring data are plotted as an average in Figure B-7 and in detail on Figure B-10.

2.2.1 Superimposed upon the slowly-varying regional or seasonal circulation are periodic currents due to the tides, which are very important nearshore. Tidal currents are rotary currents that change direction following the period of the tide. Thus, the tidal currents generally flood and ebb twice daily. Direction and speed of nearshore tidal currents is highly variable. Tidal current speeds have been measured at lightships along the Pacific coast and reported by NOAA (1986). Hancock et al. (1984), Nelson et al. (1984) and Sollitt et al. (1984) summarize current meter data offshore from Coos Bay between May 1979 and March 1983. These reports substantiate the influence of tides on nearshore bottom currents. Bottom current records were found to be dominated by tidal influence with the maximum velocities associated with tides, including spring tide effects.



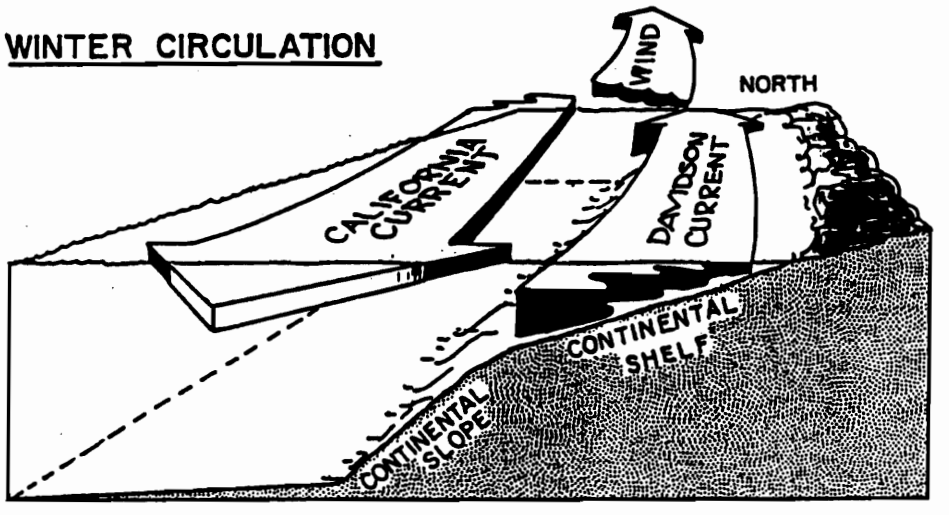


Figure B-6
Oregon Coastal Circulation

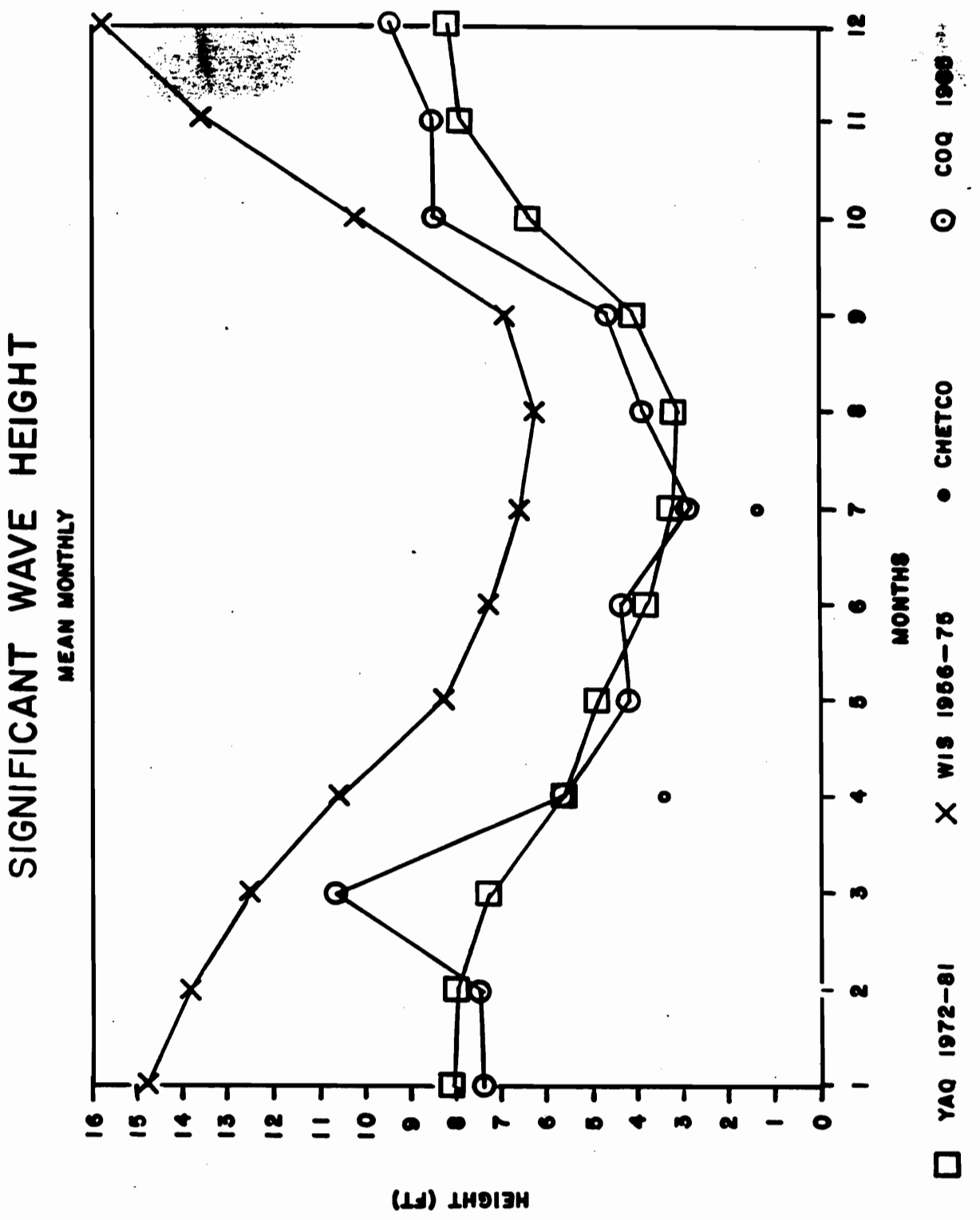


Figure B-7
Seasonal Wave Climate

These tidal influences were additive to currents produced by surface waves and winds. One station closest to the estuary was noticeably affected by the ebb current.

Local Processes

2.3 The Chetco ocean disposal site is within 1 mile of the estuary entrance. Boggs and Jones (1976) work on the Sixes estuary illustrates the varying influence of tidal and river forces. The Chetco is similar to the Sixes in that both are strongly influenced by river discharge, especially in winter months when net transport is seaward under high riverflow. By contrast, during summer, low riverflow net transport is into the estuary. This constant, but seasonally varying, river outflow combines with tidal flows to produce a highly variable influence on the nearshore circulation. In the estuarine part of the river, the ebbing tide adds to the normal river discharge to produce a net ebb dominance. The Sixes shows little or no longterm accumulation of fine sediments in the estuary and net bypassing of sand-size sediments into the ocean. This should also be true of the Chetco. Figure B-8 illustrates these local processes.

2.3.1 The Chetco estuary is very small, having a surface area of about 140 acres (Percy and others 1974). The mean diurnal tidal prism is 29 x 10^6 cu. ft. (Table B-4). The Chetco River is 58 miles long and drains an area of 359 sq. mi. Mean annual discharge is 1,685 cfs, with the greatest flow in February, averaging 4000 cfs, and low flow in September of about 130 cfs. The mean annual discharge for a 6-hour period is 3.67 x 10^7 cu. ft. Peterson et.al. (1984) use the hydrographic ratio (HR) to compare the tidal prism with the river discharge for the same six-hour period. The tidal prism is estimated as the volume of water brought into the estuary by each flood tide. The six-hour river discharge is estimated from the annual average discharge. The higher the HR, the more tidally dominated the estuary. During summer low riverflows, the HR for the Chetco is over 10. For the average annual riverflow, the HR is less than 1. On an annual basis, bedload sediment is probably discharged to the ocean at Chetco (Peterson, personal communication).

Table B-4
Important Characteristics of the Study Area

Project	Drainage Basin Area Sq. Miles (A)	Estuarine Tidal Prism Cu. Ft. 10^6 (P)	Avg. River Discharge Cu. Ft./Sec (D)	HR Hydro Ratio (P/6D)	Maximum Discharge
Chetco	359	29	1,700	<1	66000

Note: 6D is the volume of discharge for a 6-hour period; the numbers are from Percy et al. (1974) and Johnson (1972).

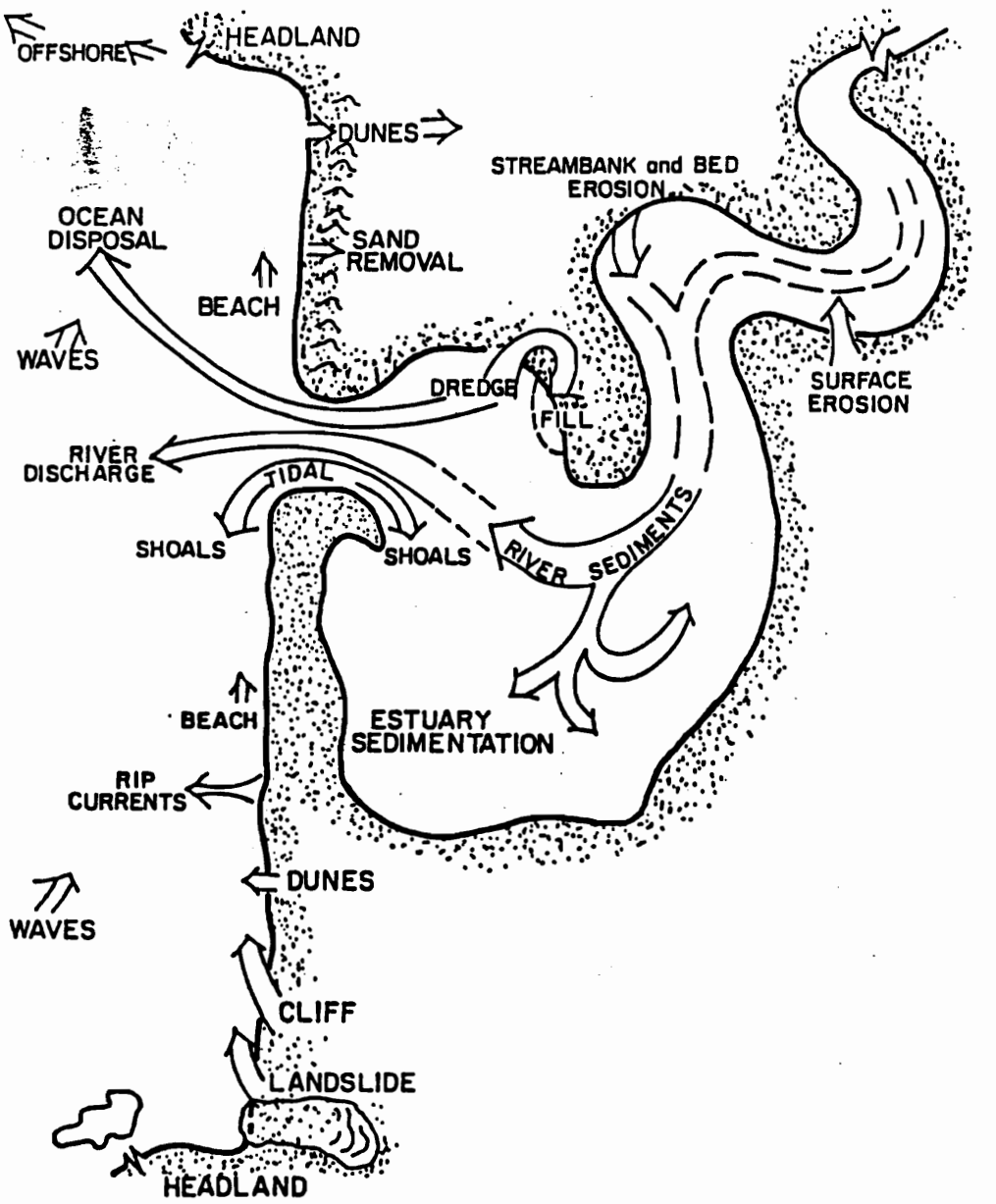


Figure B-8
Local Processes

Site Monitoring

2.4 Current meters were deployed near the Chetco ocean disposal site in 1985. The meters were attached to moorings at depths from 72 to 78 feet. Bottom current records were obtained from April 13-27 and from July 14-28, 1985. These periods were picked to represent typical winter and summer conditions. Figure B-9 illustrates the daily average bottom current speed and direction for the summer record. In this current rose, each bar represents the direction the current is moving. The length of the bar represents the percent of occurrence of the current in that direction and the width of the bar represents the range of velocity.

2.4.1 Wave records near the ocean disposal site were obtained from April 14-27 and from July 14-28, 1985. Significant wave heights were computed for these six-month periods as shown in Figure B-10. The short period records were analyzed for directional wave spectra as well as the period and significant height. The wave and current data with grain size and depth were used to compute a predicted sediment transport rate and direction for the period.

2.4.2 Detailed current measurements have been obtained from other similarly situated Oregon nearshore dredge material disposal sites. The most thorough study has been conducted at Coos Bay, Oregon. Seasonal measurements made over two-week periods showed currents at the 25-m-deep disposal site averaged between 20 and 30 cm/s at one-third the water depth during the summer and between 30 and 60 cm/s during the winter and spring. Near-bottom currents were generally between 10 and 20 cm/s with downslope flow components predominating over upslope components. Near-bottom waters exhibited downslope movement to depths in excess of 40 m during the summer and deeper than 70 m during the winter. Similar conditions are expected to exist at the interim Chetco disposal site since both sites are in similar depth regimes.

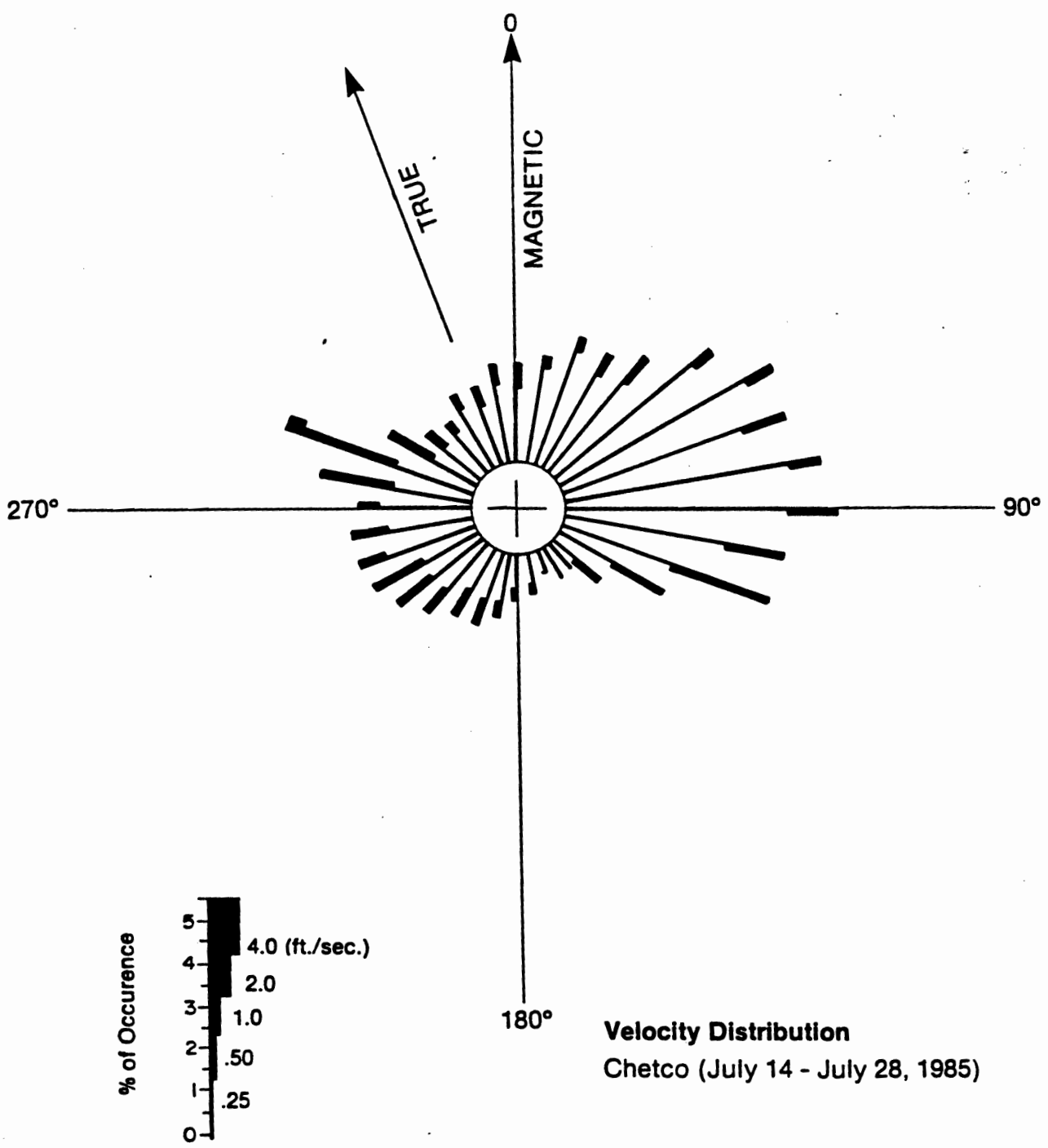


Figure B-9
Current Data at Chetco

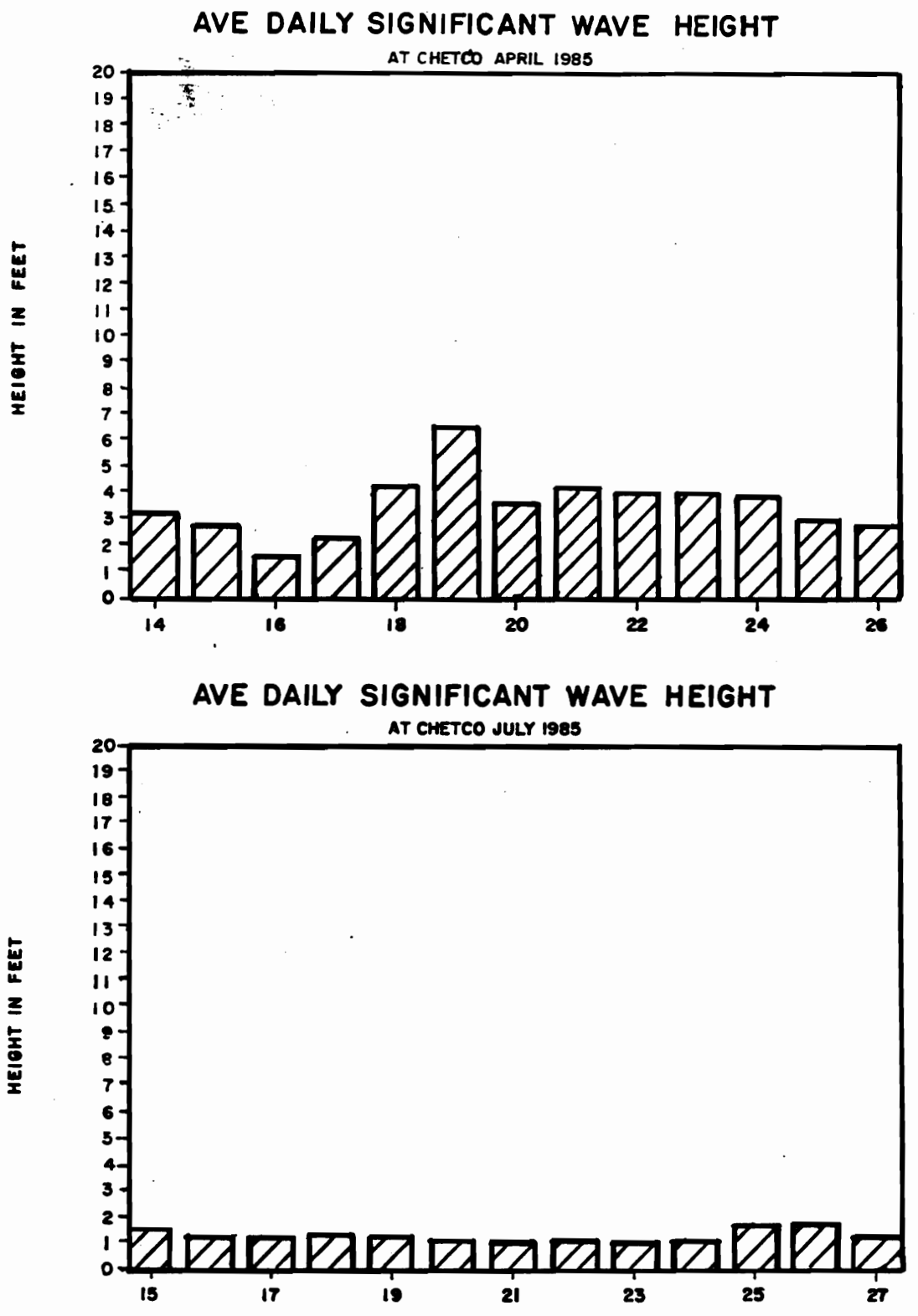


Figure B-10
Wave Data at Chetco

SEDIMENT TRANSPORT

The Littoral System

3.1 Introduction. At the Chetco dredging project, offshore disposal sites must be located to keep dredged material in the active littoral zone for downdrift beach nourishment and to prevent the dredged material from returning to the entrance channel. This requires knowledge of the direction and rate of longshore transport as well as offshore transport. Previous sections contained discussions of geologic factors and the oceanographic environment which affect sediment transport. This section will contain a discussion of this information as it applies to the littoral system and sediment movement at the Chetco disposal site.

3.1.1 Sediment movement in the littoral zone consists of two mechanisms depending upon the size of the sediment. Anything finer than sand size is carried in suspension in the water and is relatively quickly removed far offshore. The almost total lack of silts and clays within the Chetco ZSF attests to the efficiency of this mechanism. Sediments sand size or coarser may be occasionally suspended by wave action near the bottom, and are moved by bottom currents or directly as bedload. Tidal, wind and wave forces contribute to generating bottom currents which act in relation to the sediment grain size and water depth to produce sediment transport.

3.1.2 Hallermeier (1981) defined two zones of sand transport based on wave conditions. The inner littoral zone is the area of significant year-round alongshore and onshore-offshore transport by breaking waves. The outer shoal zone is affected by wave conditions regularly enough to cause significant onshore-offshore transport. Using Hallermeier (1981) and longterm wave data from Newport (Creech 1981), the following table was derived for sand transport off Oregon.

Table B-5
Surf/Shoal Zone Depths

	Littoral (Surf Zone)	Offshore (Shoal Zone)
Summer	0-28 Feet	28-83 Feet
Winter	0-51 Feet	51-268 Feet
Annual	0-44 Feet	44-142 Feet

Depth-Limited Transport

3.2 Hancock et al. (1984) calculated the probability for wave-induced current velocities at various depths off Coos Bay. From other studies, a critical velocity of 20 cm/sec has been shown necessary to erode sediment in the 0.2 mm sand size, common off Chetco and Coos Bay. In general, the probability of wave-induced sand movement is very small beyond a depth of about 150 feet. Various sedimentologic studies have

suggested an offshore limit of modern sand movement at the 60-foot depth, while others push this limit out to over 100 feet. Recent work suggests that this offshore limit can be better defined for specific areas. Work on this is in progress (Peterson, personal communication).

Chetco Littoral Cell

3.3 Figure B-2 shows the Cape Ferrelo Littoral Cell which extends approximately 40 km north from Point St. George to Cape Ferrelo and contains the Chetco, Winchuck and Smith Rivers. Sandy beaches extend over 20 km south from the Smith River and about 8 km south from the Chetco River. Seacliffs and terraces, with scattered pocket beaches, make up the remainder of the shoreline. Based on comparison of tidal and river discharge, it appears that both the Chetco and Smith Rivers are presently contributing sediments to the littoral cell. The quantity of sediment carried by the Smith River has resulted in a progradational shoreline. Heavy mineral assemblages of the rivers (Kulm et al. 1968) correlate with the littoral sand mineralogies within the littoral cell (Peterson, personal communication). This indicates that the primary source of sand within the cell is riverine. Less is known about shoreline source contributions, although the progradational nature of the Smith River area would indicate little shoreline retreat in this area. There are indications that little or no sediment is bypassed at the southern headland, while the northern boundary is less distinct (Peterson, personal communication).

Table B-6 identifies the possible sources and losses of littoral sediments in the littoral cell:

Table B-6
Sources and Losses of Littoral Sediments

Sources	Losses
1. Rivers Chetco Smith	1. Estuaries 2. Dune Growth 3. Headland Bypass
2. Erosion Dunes Terraces Seacliffs	4. Offshore Transport 5. Ocean Disposal
3. Headland Bypassing	
4. Onshore Transport	

Chetco Sediment Transport

3.4 As shown by Figure B-12, the rocky headlands north of the Chetco disposal site limits wave approach from the north and the seaward extension of Point St. George limits southerly waves. LEO observations support net nearshore transport to the south as does the extension of the shoreline between the Smith River and Point St. George. From previous studies, there is estimated to be a potential for up to 370,000 cubic yards of sand and gravel discharged by the Chetco annually, of which less than 100,000 cubic yards is sand sized. LEO data indicates most or all of this material is transported southward. The thinness of the sediment cover shown by geophysical mapping may support this.

3.4.1 Figure B-11 is a generalized description of seasonal sediment transport in the Chetco ZSF using available information. The bathymetry and sediments are complex offshore, influencing any theoretical predictions. From both Hallermeier (1981) and observed currents and sediment mineralogy, the zone of active bottom sediment movement probably extends to almost -150 feet. The area where longshore currents predominate is shoreward of about - 60 feet. The summer current records indicate southerly transport with both onshore and offshore components. During the winter storms, the Chetco River discharges sands and gravels in the nearshore. As riverflow drops, some of the gravels accumulate to form an inner channel shoal while the finer sands accumulate in the nearshore next to the south jetty. There is no longterm sediment accumulation offshore of Chetco as indicated by the thinness of the sediment layer. During the summer, there is a net southward transport of the sand-size sediment.

Ocean Disposal Site

3.5 Chetco Point on the north protects the disposal site somewhat from northwesterly storms. Offshore, there are large areas of bare rock or scattered rock exposures. There is a relatively thin and discontinuous layer of fine sand and gravel with no distinctive mounding or thickening related to river or disposal sediments. The highly irregular offshore bathymetry also affects the rate and direction of bottom sediment movement. There is no bathymetric evidence of past disposal. Disposing of 48,000 cubic yards annually, as in the past, should cause no mounding problems in the future.

3.5.1 Bottom photographs from 1978 seem to distinguish fresh disposal material from native sediments, but there is such a wide variety of bottom types and sediment types that sediment compatibility should be no problem. Due to the diversity of bottom sediment and small quantity of disposal, there is no need for a continuous monitoring program. If disposal operations change or a potential impact is identified, further bottom photography and sampling would be warranted.

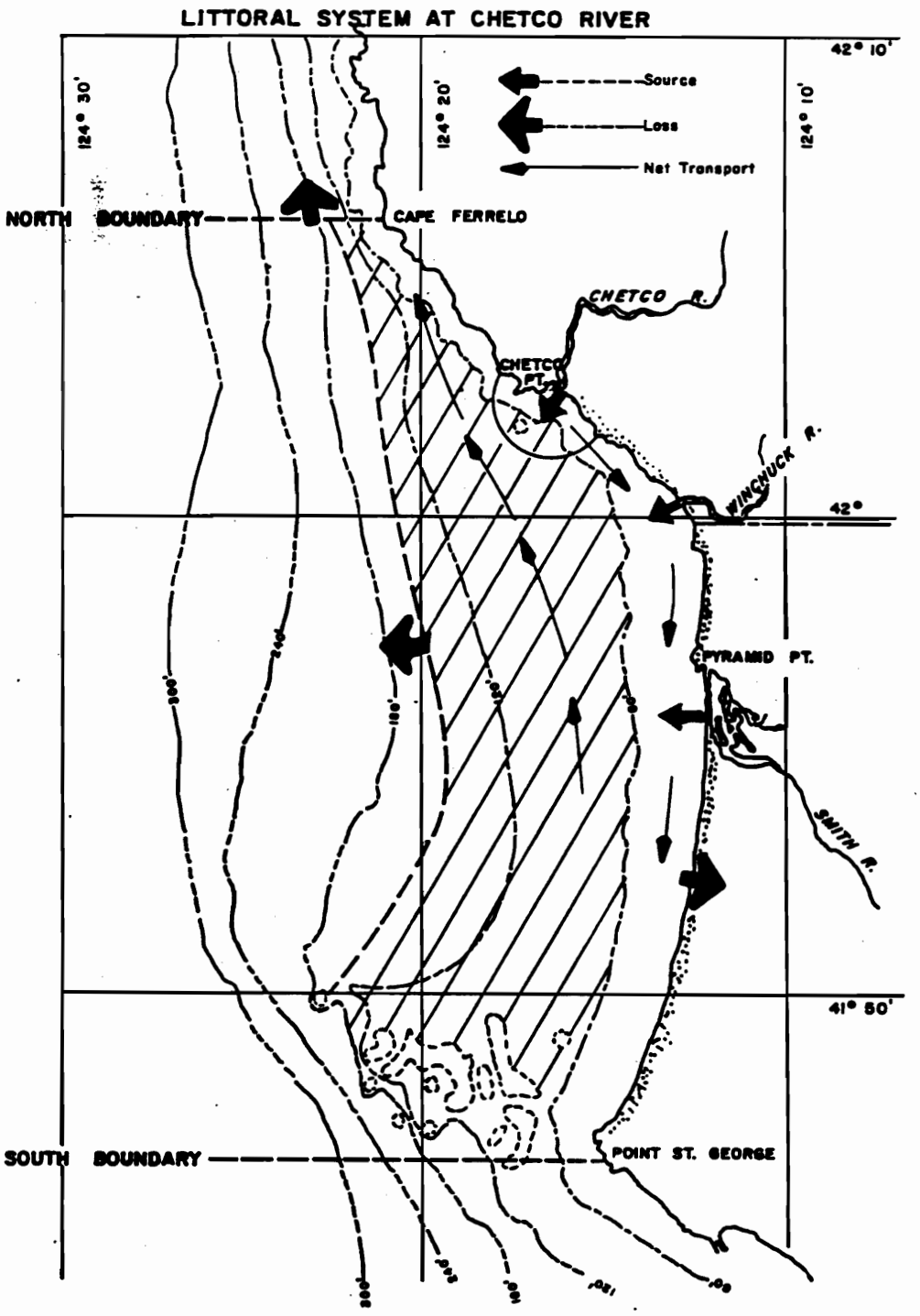


Figure B-11
Chetco Littoral System

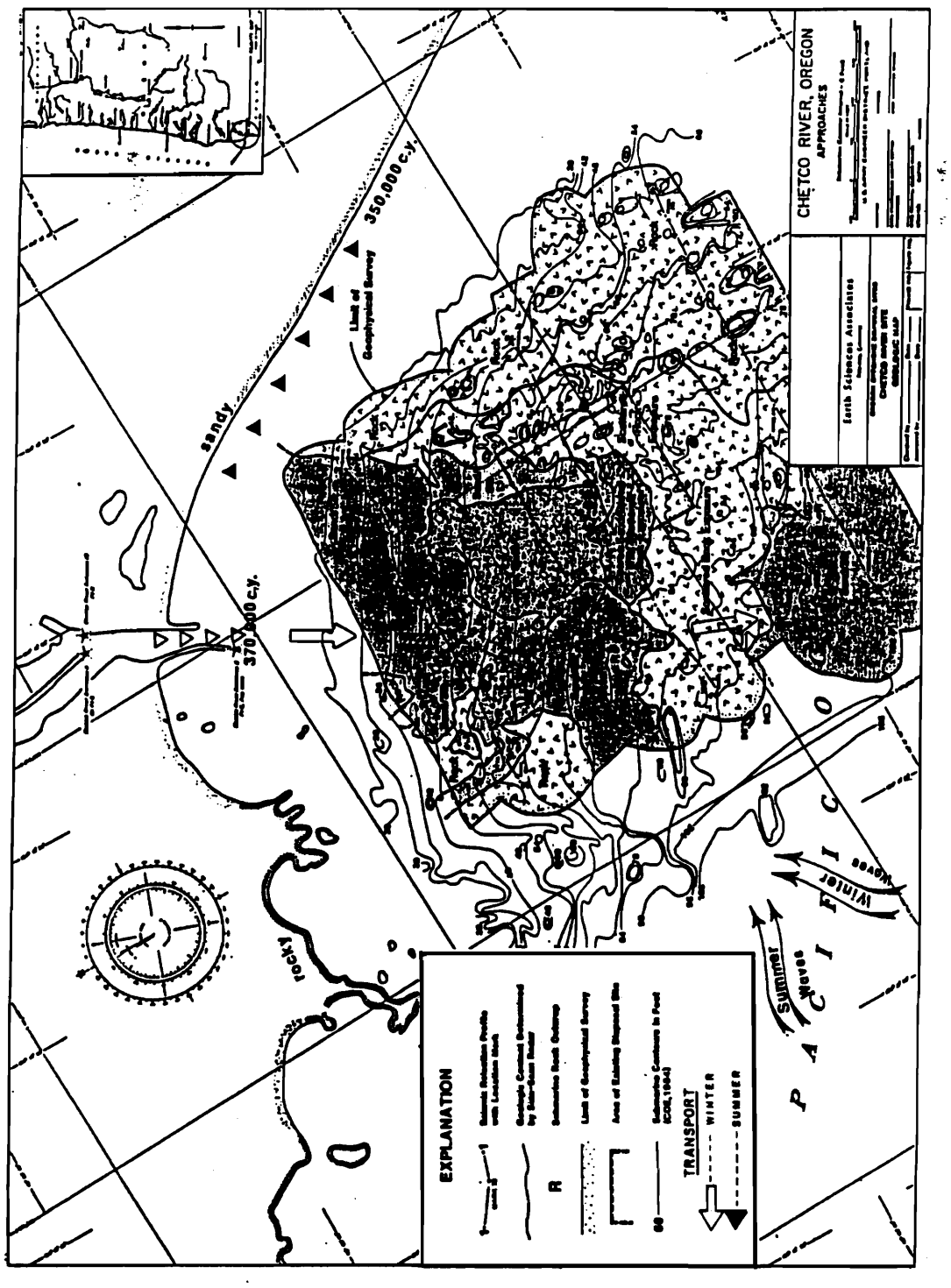


Figure B-12
Sediment Transport at Chetco

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APPENDIX C

APPENDIX C

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APPENDIX C

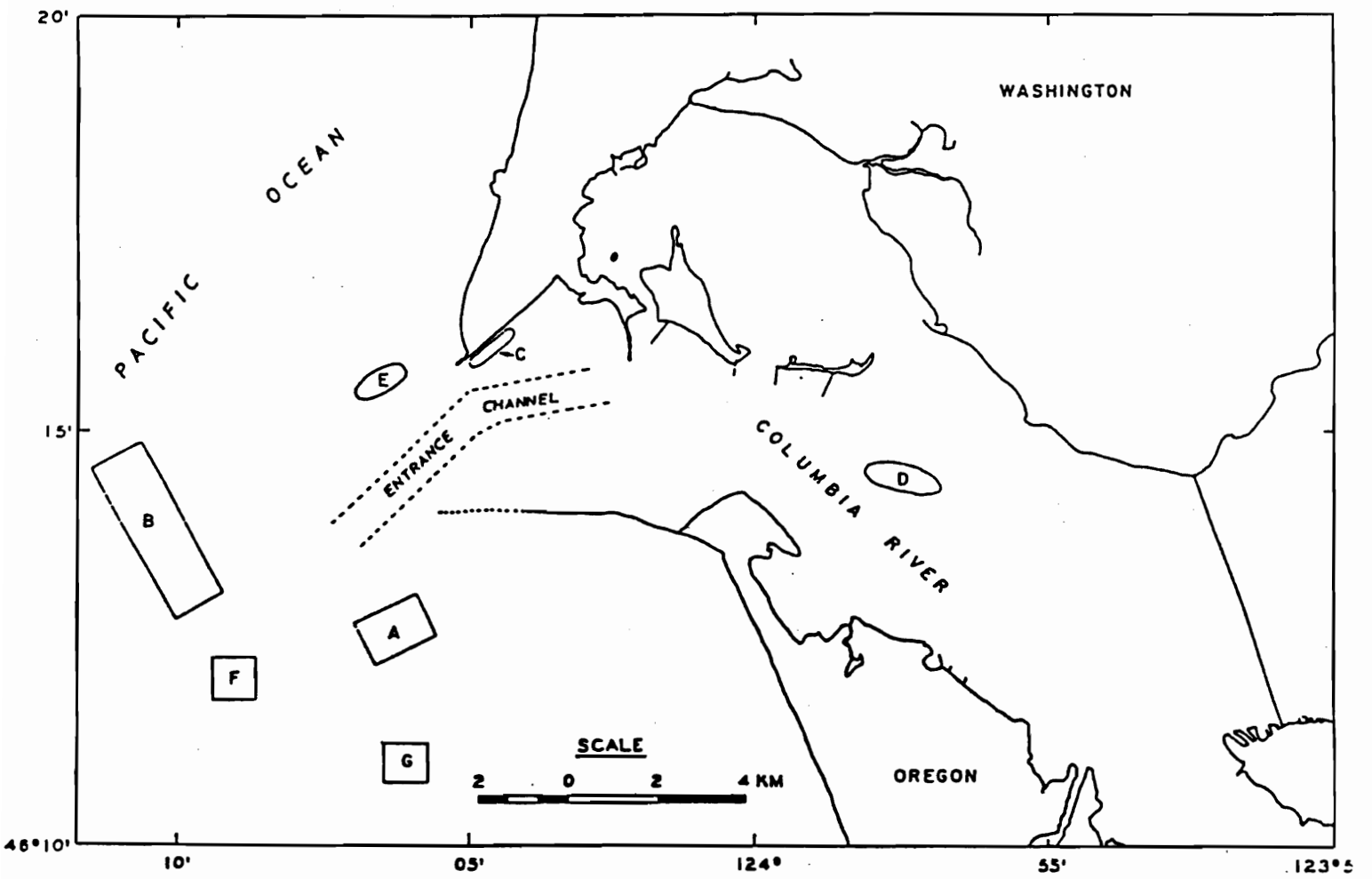
SEDIMENT AND WATER QUALITY

General

1.1 General criterion (b) and specific factors 4, 9, and 10 of 40 CFR 228.5 and 228.6 require sediment and water quality evaluations indicative of both the dredging areas and disposal sites. Dredged materials placed in interim-designated ODMDS along the Oregon coast usually consist of medium to fine sands taken from entrance bar shoals and deposited on slightly finer continental shelf sands. This is the case at Chetco with the exception that some coarser sediments, including gravels, make up some of the disposed sediments. Because of their coarse nature, similarity to ODMDS sediments, isolation from known existing or historical contaminant sources, and the presence of strong hydraulic regimes, the dredged materials are exempt from further testing according to provisions of 40 CFR 227.13(b). Consistent with this EPA regulation, therefore, analyses of Chetco sediments have been limited to physical variables. However, water and sediment quality impacts associated with disposal of sands and silts at Oregon ODMDS have been studied in detail at the two largest navigation projects, the Mouth of the Columbia River (MCR) and Coos Bay, as described below.

1.2 The MCR project was one of the Aquatic Disposal Field Investigations conducted as part of the Dredged Material Research Program (DMRP) in the mid-1970s (Boone et al. 1978, Holton et al. 1978). The DMRP was a nationwide program conducted by the Corps of Engineers to evaluate environmental impacts of dredging and dredged material disposal. The MCR studies included work at an experimental ODMDS, site G, located south of the MCR channel at an average depth of 85 feet (Figure C-1). Following baseline physical, chemical, and biological characterizations of the site, a test dumping operation disposed of 600,000 cubic yards of medium to fine sands (median grain diameter = 0.18 mm) during July - August 1975. Sediments at the disposal site were a fine to very fine sand (median grain diameter = 0.11 - 0.15 mm).

1.3 Monitoring results indicated a mound of slightly coarser sediment within the site that gradually mixed with ambient sediments and dissipated over several months. Water quality monitoring during disposal showed no elevation of toxic heavy metals, including Cu, Zn, Cd, and Pb, with some nontoxic elevation of Fe and Mn. Nutrient fluctuations were associated primarily with tidal variations, as were chlorophyll A and particulate organic carbon. Dissolved oxygen remained high throughout disposal operations. Sediment quality remained high, with slight but nontoxic increases in Pb (from 2 to 4 mg/kg) and Hg (from 0.008 to 0.05 mg/kg) recorded before and after disposal at area G.



Columbia River entrance channel and ODMDS
(From Boone et al. 1978).

Figure C-1
Columbia River Entrance Channel and ODMDS

Oil & grease values in the sediments decreased slightly after disposal, while there were no elevations in ammonia. The authors concluded that there were no adverse impacts in terms of water/sediment quality or toxicity from disposal of MCR sands at area G. They attributed fluctuations in tested variables primarily to sediment and suspended particulate input from the Columbia River, biological activity and processes, and laboratory difficulties associated with repeated measurements close to analytical detection limits.

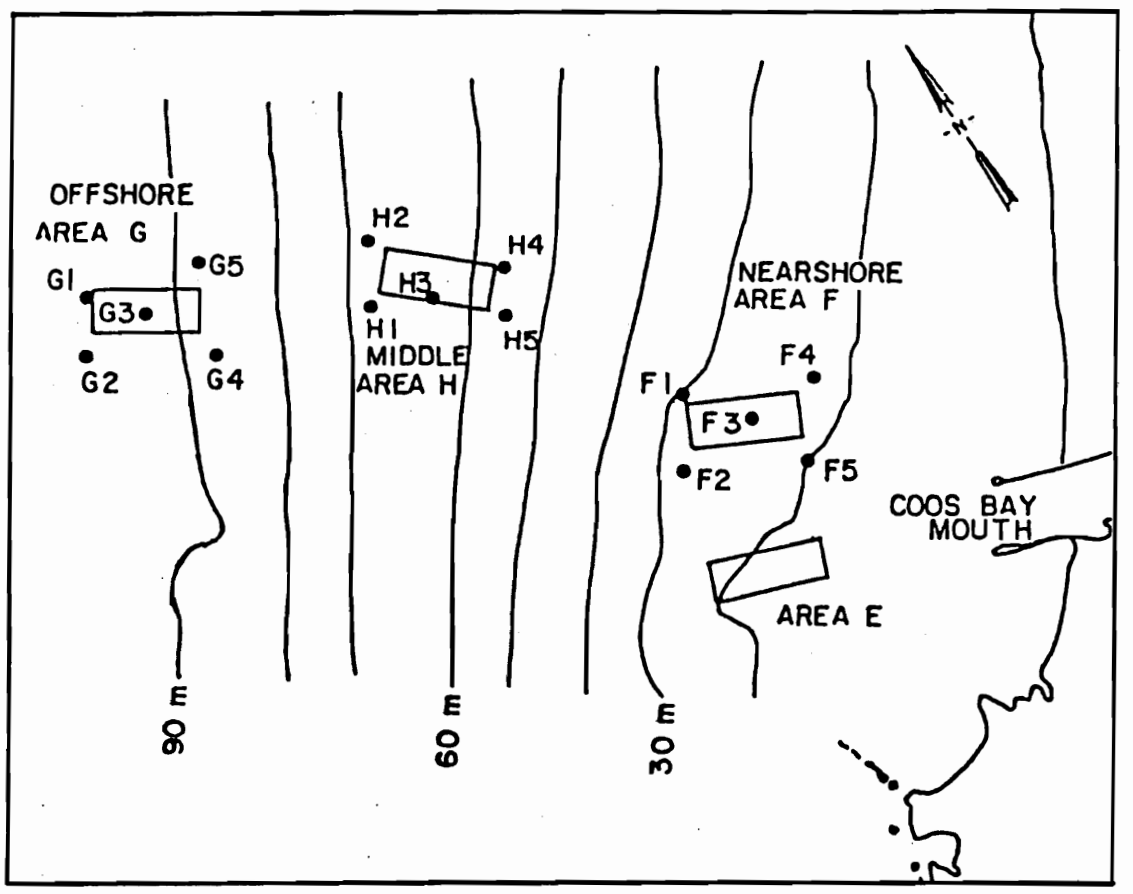
1.4 An evaluation of areas offshore from Coos Bay was conducted under Corps contract by Oregon State University researchers. This was done to designate a new ODMDS for fine grain sediments from upper Coos Bay and Isthmus Slough (Hancock et al. 1984, Nelson et al. 1984, Sollitt et al. 1984, U.S.A.C.E. Portland District 1984). The program, conducted in five phases during 1980 - 1984, included baseline physical, biological, and chemical surveys of offshore areas followed by selection of candidate sites and a test dump/monitoring study at proposed site H (Figure C-2). This site was subsequently designated by EPA as the final site for fine Coos Bay sediments (51 FR 29927 - 29931, dated 21 August 1986).

1.5 The dump/monitoring program at site H consisted of disposal of 60,000 cubic yards of fine sediments from Isthmus Slough, accompanied by water quality and benthic monitoring during disposal operations and followed by post-disposal monitoring of the site and adjacent areas over the next 18 months. Elevations in ammonia, Cu, and Mn were observed during disposal and in some cases approached acute toxicity thresholds. However, these elevations were of short duration. No substantial elevations of other contaminants or changes in dissolved oxygen, oxy-redox potential, turbidity, or pH were observed. Sediments at the site showed elevated levels of volatile solids, fines, and heavy metals that gradually decreased over the 18-month monitoring period (Figure C-3). Total volatile solids level was found to be the most sensitive and reproducible indicator of contaminants levels and its use was recommended as a monitoring tool to utilize during further disposal operations at site H.

Current Study

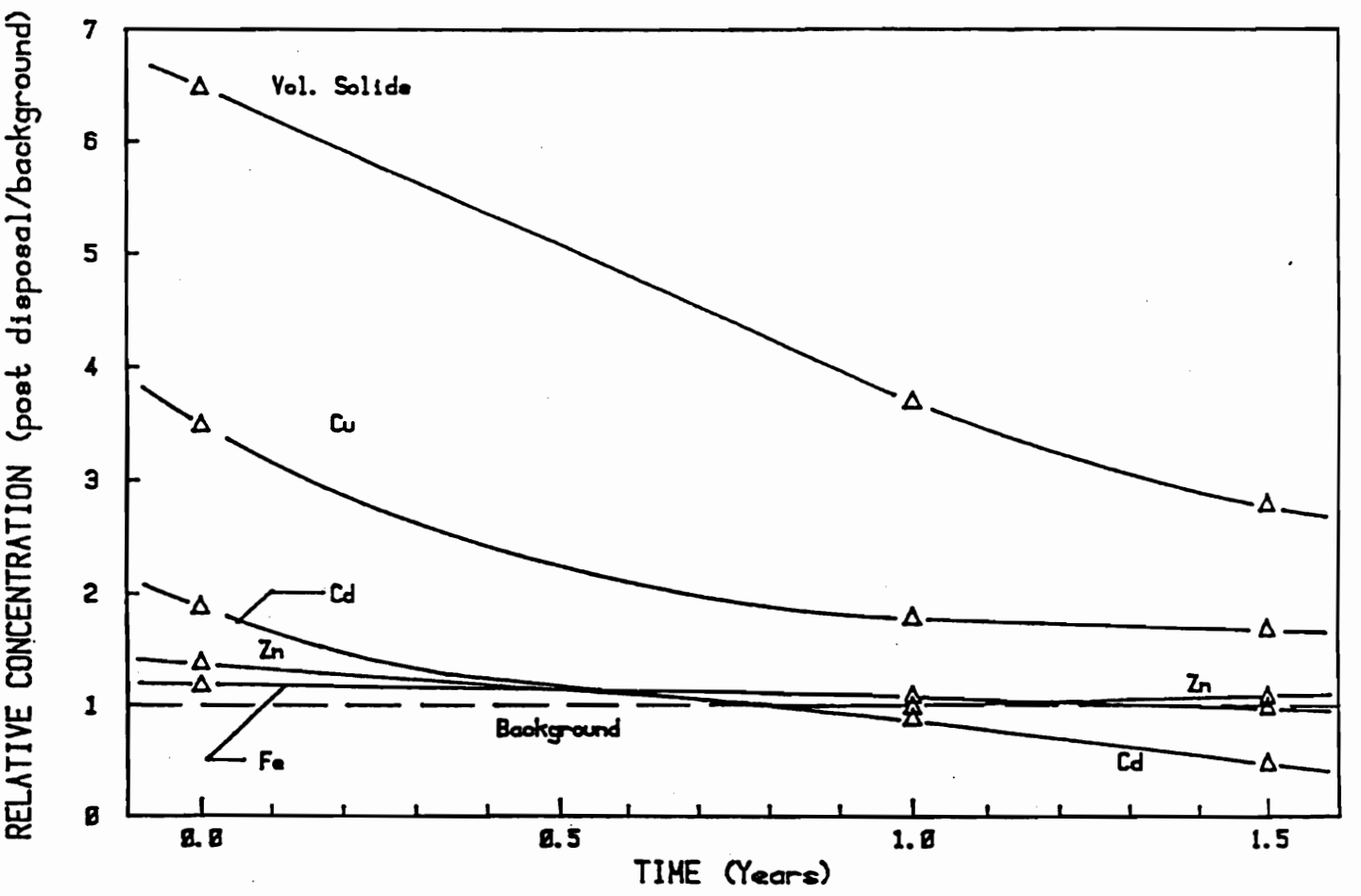
1.6 Sediment samples from the channel of the Chetco Federal navigation project were collected by COE, Portland District in June 1974 and February 1981. The Chetco offshore disposal site was sampled in August 1985. Locations of these sampling stations are shown in Figure C-4. Volatile solids in the channel sediments were slightly elevated over those at the disposal site (Table C-1).

1.7 The grain size distribution curves for Chetco channel sediments show poorly sorted sandy gravel in the portion of the channel that is actively dredged (Figures C-5 and C-6). The sample taken from the vicinity of Buoy 9 (RM 0.15) in 1981 was an



Coos Bay sample station locations for chemical, biological, and physical studies at interim-designated and candidate ODMDS (From U.S.A.C.E. Portland District 1984).

Figure C-2
Coos Bay Sample Station Locations



(From Sollitt et al. 1984).

Figure C-3
Coos Bay ODMDS: Recovery of Selected Sediment Chemical Parameters at Disposal Site-Samples Containing Dredged Material

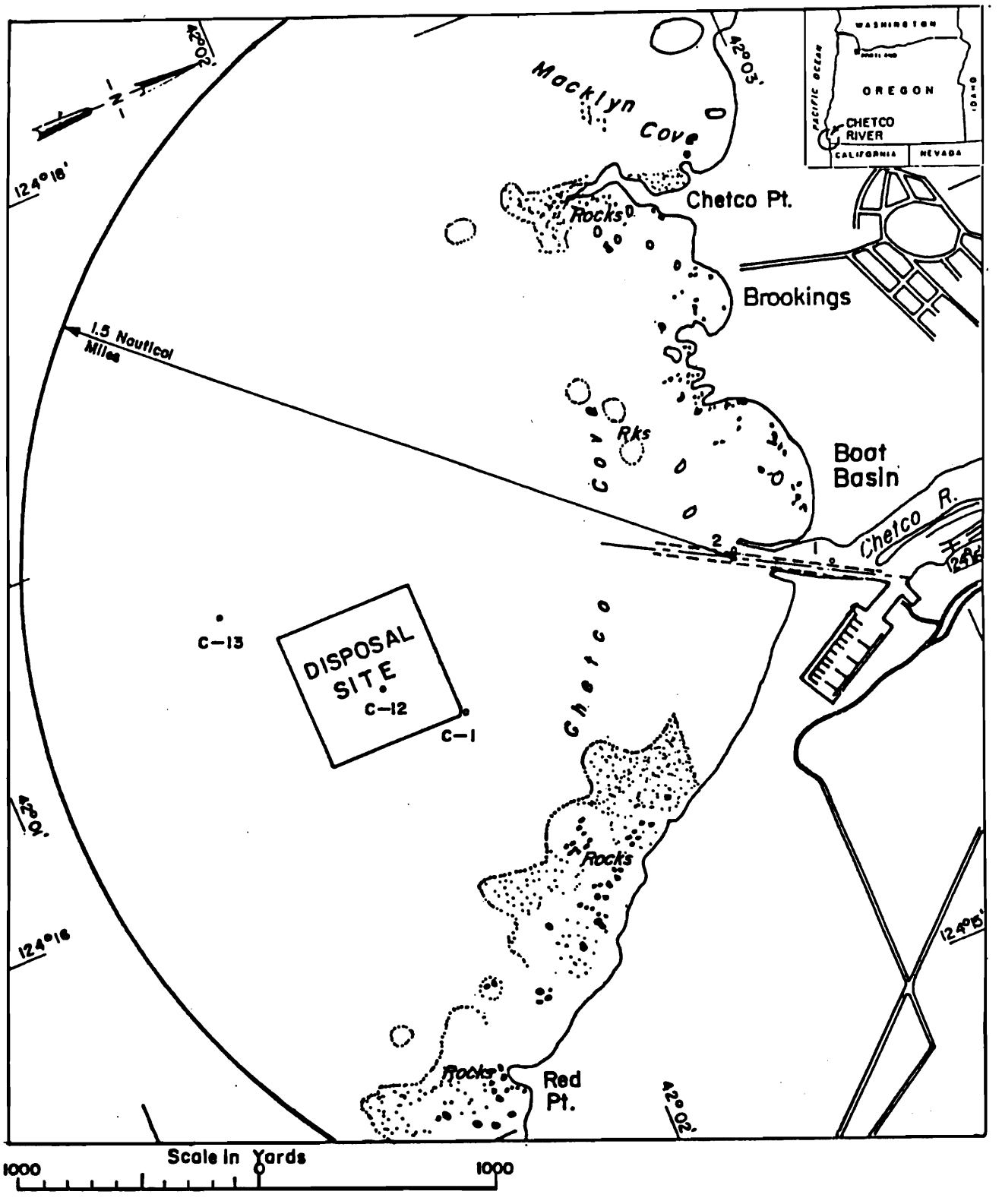


Figure C-4
Sediment Sampling Stations at the Chetco ODMDS and Dredging Site

Table C-1
Physical Analysis of Chetco River Sediments

Sample #	Site	Date	% silts	% volatile solids
1	end of north jetty	4 Jun 1974	0.0	2.24
2	near buoy #9	4 Jun 1974	0.0	2.13
1	end of north jetty	17 Feb 1981	0.0	1.29
2	near buoy #9	17 Feb 1981	20.0	7.19
C-1	E. corner disposal site	Jul 1985	0.0	2.2
C-12	middle disposal site	Jul 1985	0.0	2.7
C-13	W. of disposal site	Jul 1985	40.0	4.9

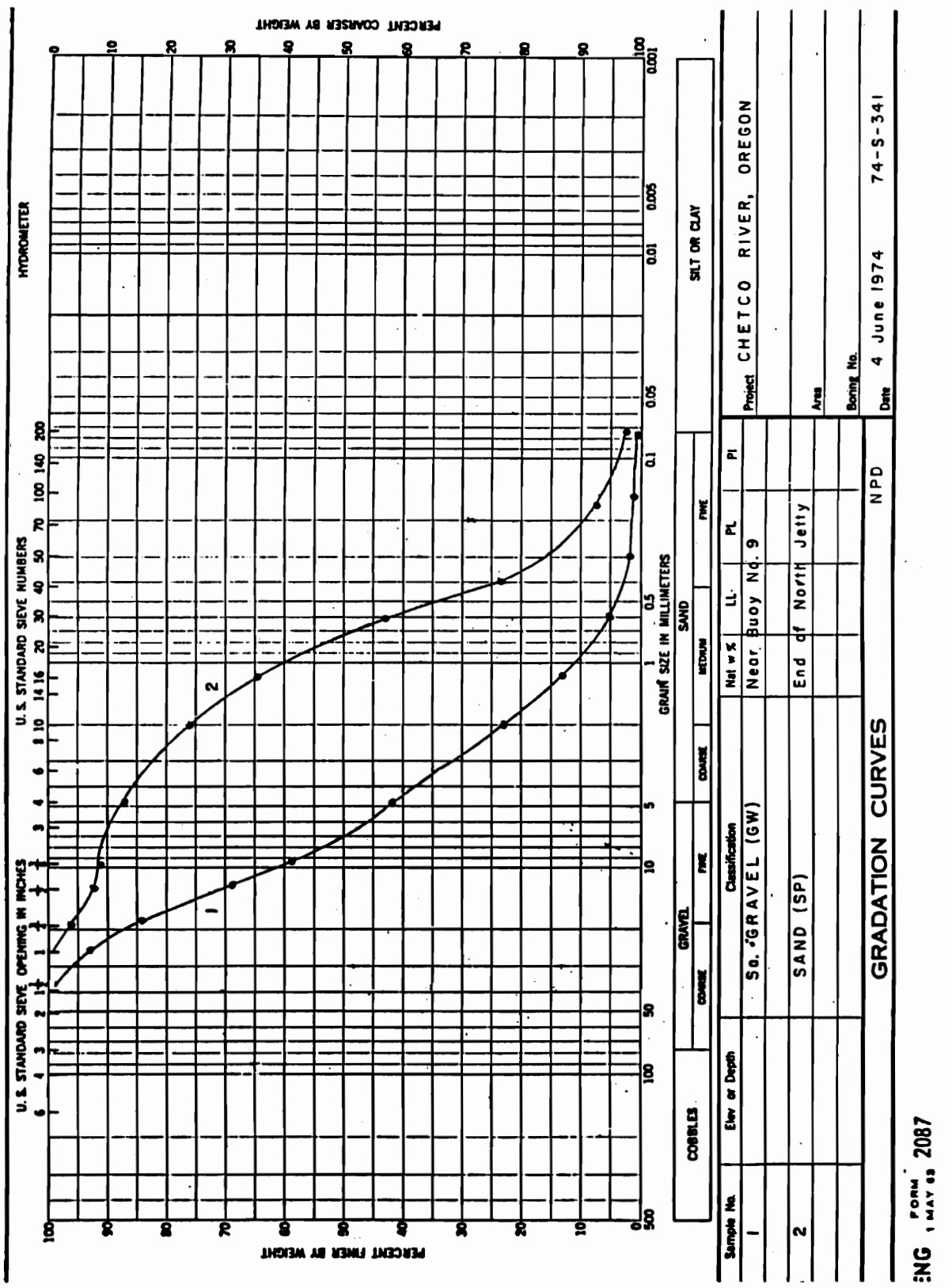


Figure C-5
Gradation Curves, Chetco River Entrance Channel, 1974

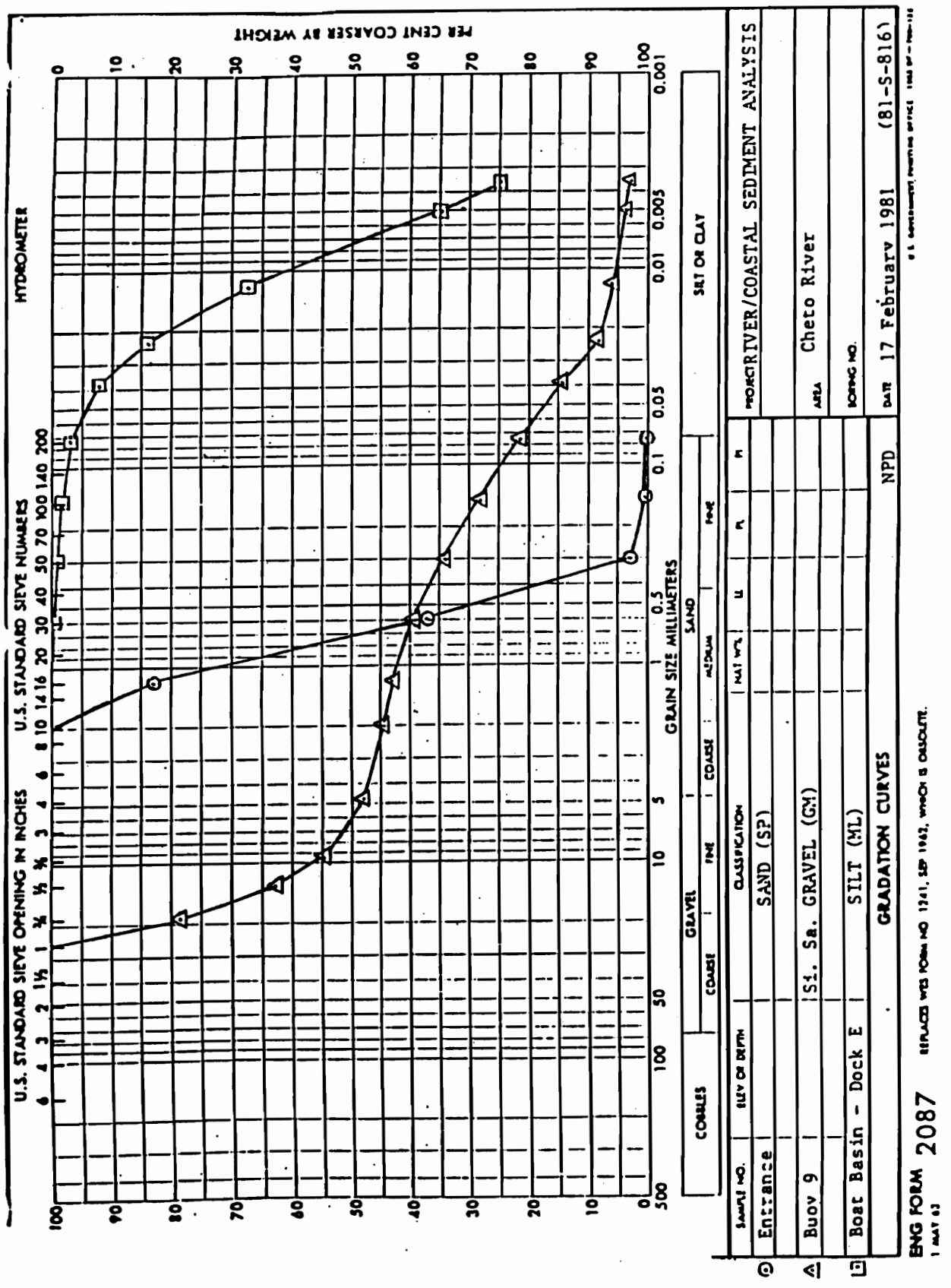


Figure C-6
Gradation Curves, Chetco River Entrance Channel, 1981

exception, showing about 20 percent siltpresent. This is the Tier I threshold value at which Portland District's tiered testing guidelines recommend chemical testing. However, there is no historical evidence of pollution and disposal site sediments (Figure C-7) generally have characteristics similar to those in the channel.

1.8 No chemical analysis of sediments that are presently ocean-disposed, or of sediments at the ODMDS, has been completed. The federal project at Chetco, however, does extend into the boat basin and chemical analyses have been performed on finer sediments there (Table C-2). Disposal of these materials at the ODMDS would require a separate evaluation, possibly including bioassay testing, according to 40 CFR 227.13(c) and 227.32. However, the COE has not dredged this part of the project since its construction and is unlikely to do so in the foreseeable future. It is appropriate, therefore, to designate the Chetco ODMDS based on projected disposal of main river entrance channel sediments only.

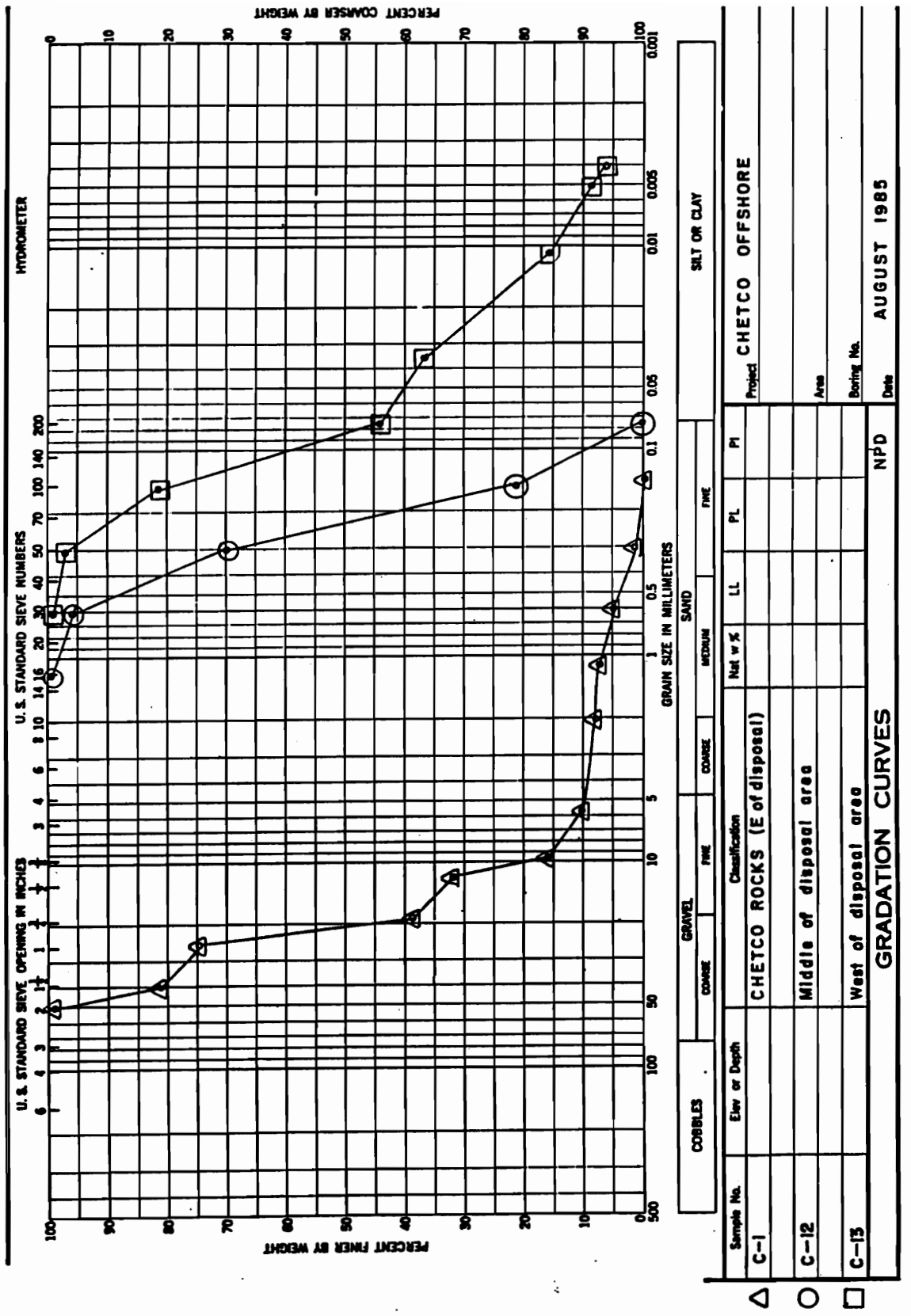


Figure C-7
Gradation Curves, Chetco ODMDS, 1985

Table C-2
Chemical Analysis of Chetco River Boat Basin Sediments

Sample #	Site	Date	% silts	% volatile solids
2	turning basin entrance	6 Apr 1982	89	not measured
4	upper end turning basin	6 Apr 1982	38	not measured

Sample #	As	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Zn	(in ppm)
2	9	3	10	37	9000	<10	300	0.14	41	
4	8	3	30	72	20000	20	220	0.15	85	

Sample #	Chlordane	DDD	DDE	Dieldrin	Lindane	Methoxychlor	PCBs	(in ppb)
2	B.D.	B.D.	0.1	B.D.	B.D.	B.D.	1	
4	2	0.1	B.D.	0.1	0.1	1.5	5	

(B.D. = Below Detection Limits)

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APPENDIX D

APPENDIX D

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APPENDIX D

RECREATIONAL USES

Recreational Use Areas

1.1 The Chetco Bay area is popular with recreationists because of the spectacular coastal scenery and excellent fishing opportunities both offshore and in the Chetco River. The area is increasing in popularity as a small boat harbor and has excellent facilities for the thousands of anglers who fish here annually. Figure D-1 identifies the recreational use areas located within the ZSF. Primary activities include fishing, camping and sightseeing.

1.2 Sporthaven County Park is the only public park located within the ZSF. This trailer park is located adjacent to the boat basin and is used primarily by fishermen. Harris Beach State Park is located approximately 2 miles north of Brookings. This facility is not within the ZSF but is close enough to the proposed site that it may experience some impacts from disposal operations.

1.3 Easy access and good fishing opportunities make this one of the most popular jetty fisheries along the Oregon Coast. The most popular season of use is April through October. Perch and rockfish are popular from spring through summer followed by salmon fishing beginning in the late summer and extending into early fall.

1.4 Some of the northwest coast's best offshore fishing is available off the mouth of the Chetco River. Charter boat services are available year-round but are most popular during salmon season from July through September. The remainder of the year, the charter boats fish the nearby coastal reefs for bottom fish.

1.5 The rocky coastline of southern Oregon offers some unique recreational opportunities not found along the northern beaches. Abalone are abundant around the rocks and can be harvested during extremely low tides. The proximity of the rocks to the shoreline also provide anglers the opportunity to fish for rockfish and bottom fish from the shore. In addition, the area has some gravel pockets along the beach which are reported to be good for digging littleneck clams.

Impacts of Disposal Operations

1.6 The disposal site identified on the map is located in a popular offshore fishing area. Few conflicts are expected to occur between fishermen and dredge operations because of the availability of alternate fishing sites. The displacement of fishing boats

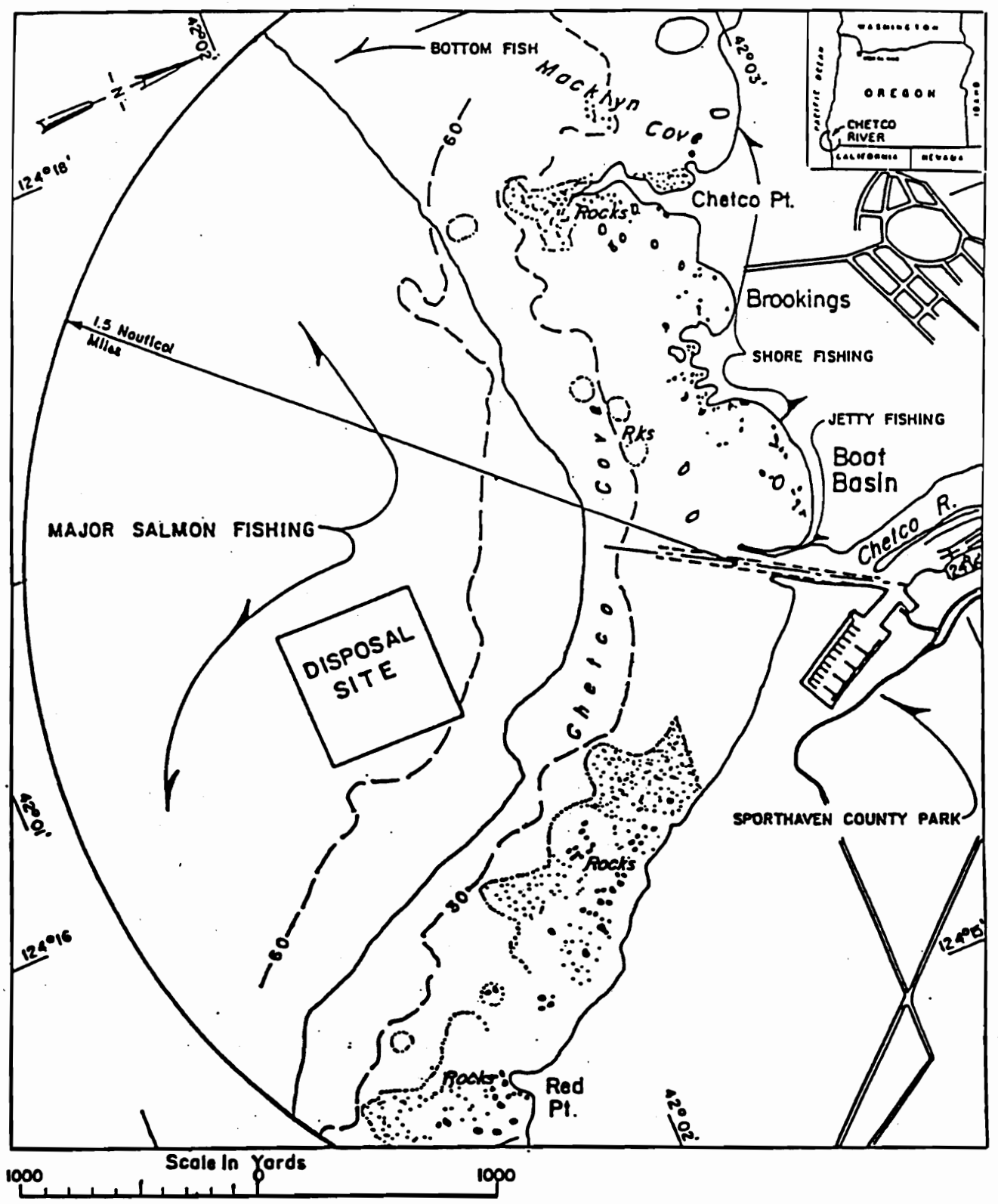

Figure D-1
Recreational Use Areas

from the dump site during disposal operations would be an inconvenience to fishermen but does not pose a threat to any recreational activity.

1.7 Additional conflicts between disposal operations and recreationists could occur as the dredging vessel is enroute to the disposal site. These conflicts could include time delays for recreational boaters caused by the passing of the dredge, an increase in navigation hazards during congested periods particularly at the mouth of the river, and disruption of fishing activity as the dredge passed through popular fishing areas. None of these conflicts pose a serious threat to recreational activity. The only serious threat is the potential for collisions between recreational boaters and dredge traffic. Confrontations of this nature are rare due to the slow speed at which the dredge moves. The potential for collisions can be expected to remain low unless there is a significant change in operating procedures.

1.8 When dredge material is deposited at the disposal site, the surrounding water conditions will deteriorate. This will result in a reduced visual quality of the area and could possibly disrupt the feeding patterns of sport fish. Both of these situations would be temporary and normal conditions would return as soon as the sediment had settled.

1.9 Sediment deposition along the beach is another possible consequence of disposal operations. If the slope of the beach is altered significantly, it could impact local clam beds. Another potential problem with beach nourishment is the accumulation of foreign material on the beaches. If the dredged material is a different color or texture than the existing material, the result could be a reduction in the visual quality of the area.

Conclusion

1.10 Continued use of the current disposal site should have little impact on existing recreation. Some inconveniences will be experienced by recreational boaters and fishermen, but disposal operations appear to pose no serious threat to recreation.

1.11 If future studies indicate that disposal operations are either detrimental to ocean fauna or are found to be disrupting sediment deposition along the coastline, further information should be collected to determine more specifically to what extent these impacts will affect recreation. Until any of these impacts are observed, future disposal of dredge material at the present site is not expected to have any substantial effects on recreation.

APPENDIX E

APPENDIX E

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APPENDIX E

CULTURAL RESOURCES

Prehistoric Cultural Resources

1.1 The earliest known inhabitants of the area in which the towns of Brookings and Harbor are now located were the Chetco Indians. The Chetco, who referred to themselves as the Cheti, are believed to have first settled in the area around 1,000-3,000 years ago. Considered one of the largest of the twelve coastal tribes, the Chetco inhabited nine villages in the vicinity of the Chetco River (1). Their territory included the land between Cape Ferrelo and the Winchuck River and to the east as far as the coast range (2).

1.2 The details of Chetco prehistory have not been defined (3). According to the Oregon State Historic Preservation Office records, only two archeological sites have been reported in the vicinity of the Chetco River mouth (4). These sites probably are the remains of historically reported Chetco Indians villages.

1.3 Little is known of the economy of the historic Chetco Indians (5). Their location at the mouth and lower reaches of the Chetco River suggests similarities with other coastal Indian groups. Consistent with this view, the most likely uses of the project areas would have been as a transportation route and a procurement area for fish or marine mammals, although historic evidence indicates that tidal zones, beaches, rocky shorelines, and estuaries were the primary areas within which marine resources were taken (6). If offshore areas were used during subsistence activities, it is unlikely that these activities or the artifacts of technology employed during subsistence would leave any significant cultural deposits within the study area.

Historical Overview

1.4 The first recorded white man to contact the Chetco Indians was Jedediah Smith. Smith led a party of eighteen fur trappers from the Great Salt Lake to California and then north along the Pacific coast. The party camped along the Chetco River on 24 June 1828 (7). In the early 1830s, following Smith's expedition, fur trappers began to travel northward along the Pacific coast over what developed as the California-Oregon Coast Route. When the travelers reached the Chetco River, they encountered a ferry operated by the Chetco Indians. It was not until 1853 that the first permanent settlers arrived in Chetco. The settlers, consisting of twelve white males, established their homesteads in the midst of the Chetco territory (8).

1.5 Relations between the Chetco Indians and the settlers were friendly until 1854. At this time, A. F. Miller, one of the original twelve settlers, burned down several dwellings in an Indian village. Miller, believing that newly discovered gold mines would attract more settlers to the Chetco area, selected the village site for further expansion

(9). These actions resulted in a war with the Chetco Indians. At the end of the war, the remaining Chetco Indians were placed on reservations.

1.6 By 1860, Chetco had established itself as a community which consisted mainly of farms. There was no formal town (10). The 1860 U.S. Census reveals that there were eleven family unit households in the Chetco region. The majority of the heads of households were either farmers or laborers. The family units were small, averaging two children apiece. The parents were relatively young, with husbands averaging 35 years of age and wives, 24 years (11).

1.7 The relationship of Chetco to regional markets is uncertain. Initially, the local economy focused on subsistence activities. Lack of export commodities inhibited the growth of a town and limited development of transportation routes. Supplies for the Chetco households were either taken upriver by boat or packed in over a rough trail (12). What goods and ties with the outside world the pioneering Chetco community required is not evident in the historic record. One compiler of shipwrecks records the loss of 2500 lbs. of freight brought to Chetco from Crescent City, California, in an open whaleboat (13). Shipments of goods in this small volume in open boats suggests that they were informally arranged, and occurred on an as-needed basis. Whaleboats, especially doublended ones, have a tradition of use for short-hauls in the coastal trade, especially in situations where freight is landed on exposed beaches (14). As export production increased through the later 1800s, steamers and coastal schooners carried the agricultural products of the Chetco valley to California markets (15).

1.8 Throughout the late nineteenth century, Chetco grew slowly. It was a struggle for survival instead of town development. In 1880, the census taker found thirty-seven households in the area. The average number of children per households rose from two to three, with the average age of the parents rising to 42 for males and 35 for females (16). The U.S. Censuses up to 1900 revealed farming as the main occupation, followed closely by laborers. By 1900, the Chetco community had taken on a more settled and diversified aspect. Although the statistics of families remained consistent with those of 1880, the variety of occupations grew. The 1900 census also revealed that dairy farming had become the prime agricultural activity in the Chetco area. (This information can be found on table E-1.) Butter and cheese were the main export of the area by 1895 (17). From this time on, dairy products remained an important element of the Chetco economy.

1.9 During the early 1900s, Judge John L. Childs operated a small water powered sawmill approximately 12 miles up the Chetco River. He floated cut lumber downstream and then loaded them by a cable system onto steamers in Chetco Cove (18). The sawmill closed in 1925, but logs continued to be transported on the Chetco River to load on Japanese ships until the 1930s.

1.10 In 1912, the Brookings Timber Company from west Minnesota bought land along the north side of Chetco River to develop a lumber mill. The development of the mill included the construction of a town, logging railroad, and ocean harbor facilities. This settlement named Brookings, began in 1913. Since steamers were unable to enter the Chetco River, all supplies and outgoing lumber were moved on a double track cable system between the shore and the vessel (19).

1.11 The California and Oregon Lumber Company (C&O) bought the Brookings Lumber Company soon after its construction. C&O built a 1,200 foot wharf from the shore into Chetco Cove. Over its lifetime, the wharf was used to load 400 million board feet of timber (20).

1.12 In the early 1920s, there was an attempt to develop port facilities in Brookings. The Corps of Engineers carried out a preliminary survey, but they did not recommend a project. In 1923, the mills exported $1,871,420 worth of wood and paper products from the harbor. The largest export in this classification was lumber cut from cedar trees (21). Before any attempts were made to improve Chetco Cove, the lumber industry began to decline. In 1924, a slump in the redwood market caused the C&O to close, ending ten years of business. After the mill's closure, Brookings became deserted except for a few landholders (22).

1.13 Despite the closure of the lumber mill, low-level freight traffic continued in Chetco. In 1923, shipments totaled $2,504,020 compared to $1,447,025 in 1925. After 1925, shipments declined rapidly. Between 1926 and 1934, only two years, 1927 and 1929, had any shipments recorded. No commerce, moreover, crossed the bar at Chetco Cove from 1943 and 1952 (23).

1.14 Brookings began to recover from the failure of the lumber market through the development of various new markets. Mining, flower bulb sales, and recreational attractions led to renewed growth of the area. As part of the new expansion, the Corps constructed two jetties at the mouth of the Chetco River in 1957. These structures stabilized the channel, benefitting commercial fishing and facilitating the development of an economy dependent on the natural resources of the region (24).

Historical Cultural Resources

1.15 The primary focus of the ODMDS cultural resource investigations has been a literature search to locate historic shipwrecks. Documenting the expected type of cultural resources responds in part to the requirements of historic preservation legislation for surveys to locate cultural resources, development of procedures to evaluate their significance, and determination of effects of project undertakings on those resources. When wrecks are located, this information is added to a shipwreck data base and used in the initial screening process to determine whether potential projects may impact shipwreck sites.

1.16 Many of the shipwrecks on the Oregon Coast are documented in the historic literature. However, the early historic record is frequently incomplete. There is the possibility that unidentified wrecks are present along the Oregon coastline, since many vessels operated without reporting their activities. In order to predict the likely locations of undocumented shipwrecks, wreck site data developed during the literature search for the ODMDS investigations is used as a basis for a general model of wreck distribution along the Oregon Coast. The model is used to identify likely areas within each project
site.

Table E-1
Occupations Of All Working Individuals In Chetco Area
(1860 - 1900)

Occupations	Year			
	1860	1870	1880	1900
-Blacksmith	1	1	1	2
-Butter Maker				3
-Carpenter			5	1
-Clerk		1		
-Cook	1	1		
-Cooper	1	1	1	1
-Dairy Farmer			1	4
-Dairy Laborer			1	
-Farmer	10	11	5	39
-Farm Laborer	7	7	1	21
-Fisherman	2	2		
-Goat Herder			1	
-Hotel Keeper				1
-House Carpenter				1
-Laborer	7	2	24	11
-Lawyer	1	1	1	
-Machinist				1
-Mail Carrier			1	2
-Miner	4	4	2	
-Post Mistress				1
-Prospector				2
-Raising Stock	10	10	11	1
-Sailor			2	1
-Teacher				5
-Wood Chopper				1
-Total	44	41	57	98

*Compiled from the 1860, 1870, 1880, and 1900 U.S. Censuses

1.17 The shipwreck model operates on the following premises: (1) Wrecks are most likely to occur during particular seasons of the year; and (2) during these periods, wrecks are deposited in particular areas as determined primarily by current and wind patterns. Modeling the seasonality of wrecks and integrating the general area of wreck sites has produced the following wreck site distribution shown on Figure E-1. Relying on previous investigations of other coastal settings (Yaquina Bay, Coquille, Columbia River Mouth) (25), the beaches and former surf zones are the areas with the highest likelihood of historic wrecks. The next most likely areas are located in the shallow nearshore environments- for example, the present surf zones and in the vicinity of navigation hazards such as reefs, and areas of shoaling. The least likely areas are associated with depths in which ships can safely operate.

1.18 The model's reliability is conditioned by several factors. For example, a positive relationship exists between identified wreck sites and the probability of finding unidentified wrecks. In areas where high levels of ship traffic occur, wreck sites are more frequent. Conversely, in areas where ship traffic is low, wreck sites are infrequent. The frequency and timing of wrecks in an area may indicate trade activity over a long period of time. For instance, a long series of wrecks or early isolated wreck sites may indicate places where early trade with Native Americans occurred, as well as the places of early pioneer colonization. Finally, wreck sites resulting from seemingly random events, such as the beaching of Spanish galleons blown off trans- Pacific trade routes, or the stranding of Japanese junks damaged in their coastal waters and carried on major ocean currents to the coasts of North America.

1.19 Despite the fact that wrecks are most likely to occur within the shallow-nearshore environment, Historic Preservation Legislation requires evaluation of all project areas. In addition, the cultural resource values of shipwrecks may be inversely related to its association with areas of likely occurrence. That is, wrecks in deep offshore environments may have a higher research value than those in the high probability areas. This is because wrecks in deeper areas are more likely to survive intact, contain the highest density of artifacts and to be the least likely to have been the focus of salvors or removed as navigation hazards.

1.20 Identifying the likely areas of wreck sites can be a useful tool. As a planning tool, it will help reduce potential impacts to areas where unreported wrecks may be found. When there is flexibility in the planning process, project areas can be oriented away from high probability areas, reducing the likelihood of encountering a submerged wreck during underwater surveys. If project areas must include high probability locations, then site evaluations (as with any study area) will include determining whether evidence of shipwrecks is present.

Chetco Project Shipwrecks

1.21 Whether wreck sites in the Chetco vicinity conform to the general pattern of wreck distribution along the Oregon coastline can only be inferred. The number of shipwrecks in the Chetco vicinity is small. The literature search documented the occurence of only two wrecks within the study area. In 1855, a whaleboat transporting freight from Crescent City, California, capsized off the Chetco River. Forty years later, in 1895, the derelict steam auxiliary schooner, Maid of Oregon grounded at Chetco. She

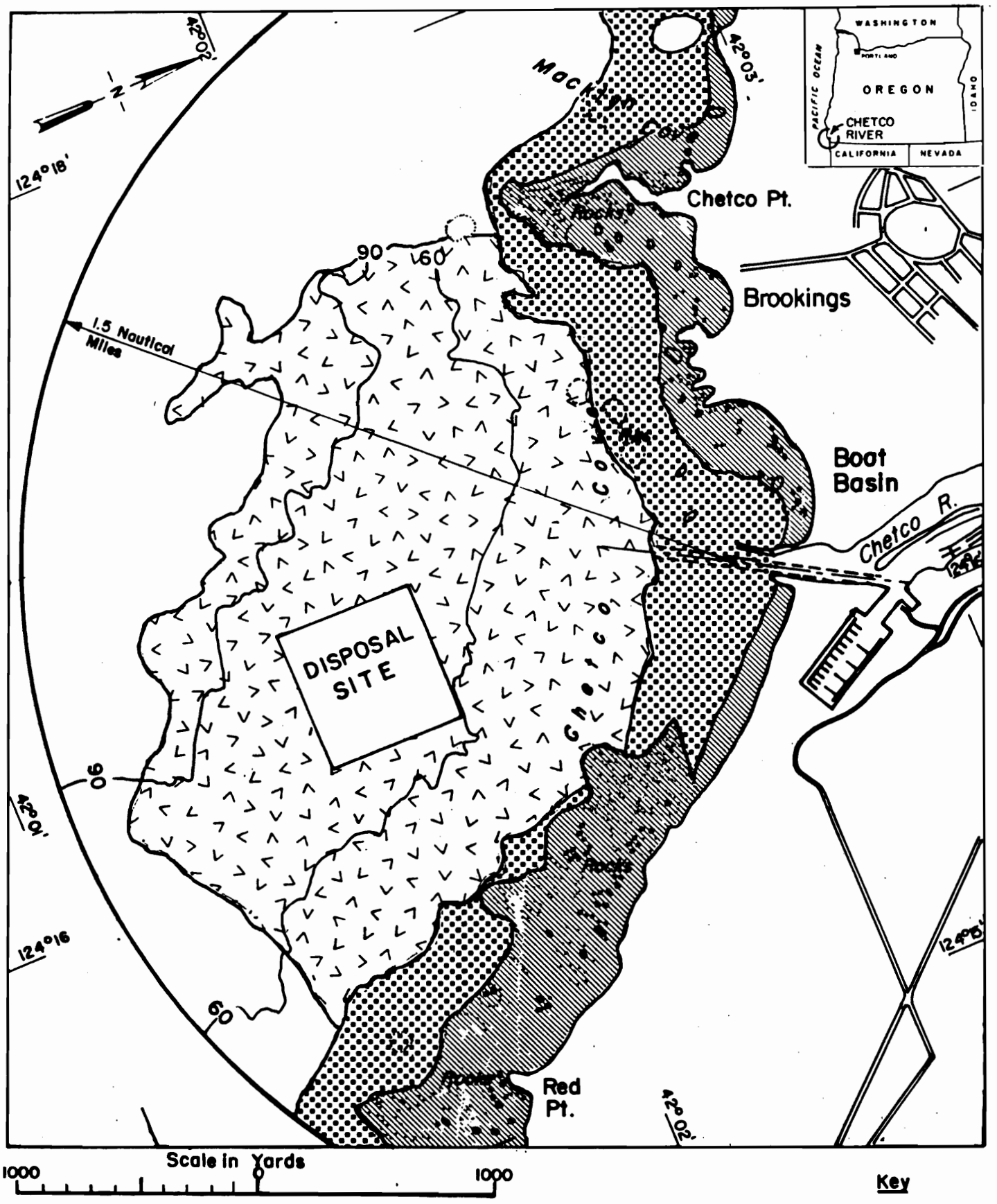

Figure E-1
Shipwreck Frequencies

had taken on water earlier in her voyage and had anchored off Chetco to seek aid; southeast gales drove her ashore (26).

1.22 The small number of wrecks is consistent with the general pattern of development in the Chetco vicinity. Historically, Chetco was never a major shipping point on the coast. Development of its major export commodity, timber, occurred in the early 1900s. This lumber was cable loaded onto ships bound for the Japanese market. In the 1920s, lumber production expanded with the construction of the mill and the town of Brookings. The lumber from the Brookings mill was transported to Crescent City by railroad rather than by lumber schooner, as was typical of the other lumber ports on the Oregon Coast.

1.23 The sea floor in the project area was investigated using a side scan sonar. Though this work was primarily undertaken in support of environmental and geomorphical purposes, side scan sonar images were also evaluated to determine if they indicated the presence of shipwrecks. Evidence of shipwrecks may include the presence of structural remains of ships, sediment mounding indicating the burial of vessels, or ballast or cargo remnants indicating the site of a decayed vessel. No shipwreck signatures or evidence of shipwrecks (such as piles of ballast stones) were located by the side scan sonar study of the Chetco study area (27).

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APPENDIX F

APPENDIX F

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LETTERS

Concurrence Letter from Oregon Department of Land Conservation and Development

Concurrence Letter from Oregon State Historic Preservation Office

Concurrence Letters from National Marine Fisheries Service and U.S.Fish and Wildlife Service

APPENDIX F

COMMENTS AND COORDINATION

Comments

1.1 The Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) requires that, for a site to receive a final ODMDS designation, the site must satisfy the specific and general disposal site criteria set forth in 40 CFR 228.6 and 228.5, respectively. The final designation procedures also require documentation of recommended disposal site compliance with MPRSA and with the following laws:

National Environmental Policy Act of 1969,
Endangered Species Act of 1973,
National Historic Preservation Act of 1966, and the
Coastal Zone Management Act of 1972, all as amended.

1.2 The data provided in this document was compiled to satisfy these laws and has been coordinated with appropriate and necessary State and Federal agencies.

Coordination

1.3 The procedures used in this ODMDS final designation study have been discussed with the following agencies:

Oregon Department of Fish and Wildlife
Oregon Department of Environmental Quality
Oregon Division of State Lands
U.S. Coast Guard
U.S. Fish and Wildlife Service
National Marine Fisheries Service, and
U.S. Environmental Protection Agency.

1.4 Statements of consistency or concurrence have been received regarding three State or Federal laws. The statutes and responsible agencies are:

Coastal Zone Management Act of 1972, as amended	Oregon Department of Land Conservation and Development
National Historic Preservation Act of 1966, as amended	Oregon State Historic Preservation Officer
Endangered Species Act of 1973, as amended	U.S. Fish and Wildlife Service National Marine Fisheries Service

1.5 Consistency or concurrence letters from these agencies follow. State water quality certifications, as required by Section 401 of the Clean Water Act, will be obtained for individual dredging actions.

1.6 A formal public involvement program designed to receive comments from all State and local agencies, private groups and individuals was accomplished by EPA as part of the public review process for this EIS.

NEIL GOLDSCHMIDT
GOVERNOR

Department of Land Conservation and Development

1175 COURT STREET NE, SALEM, OREGON 97310-0590 PHONE (503) 373-0050

July 12, 1988

A. J. Heineman
Chief, Planning Division
Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208-2946

RE: Chetco River Ocean Disposal Site Evaluation

Dear Mr. Heineman:

Thank you for the opportunity to review the draft Ocean Disposal Site Evaluation for the Chetco River Navigation Project. You have requested that the Department concur with the Corps' determination that the project is consistent with the Oregon Coastal Management Program (OCMP).

The site evaluation report includes findings against Statewide Planning Goal 19, Ocean Resources, which is the most applicable policy of the OCMP. The report does a commendable job of assessing the compatibility of continued dredged material disposal at the interim site with Goal 19 requirements and the criteria of the Marine Protection, Research, and Sanctuaries Act. The Department concurs that final designation of the interim disposal site is consistent with the OCMP.

The Department understands that EPA will carry out a formal public involvement program during the final site designation process. The Department may reexamine the consistency of the project with the OCMP during the EPA process if new information is available at that time.

Thank you for the opportunity to review the document for consistency with the OCMP. Please contact Patricia Snow of my staff if you have any questions.

Sincerely,

James F. Ross
Director

JFR:PS/sp
<per>

cc: Steve Stevens, COE
Glen Hale, DLCD

Department of Transportation
STATE HISTORIC PRESERVATION OFFICE
Parks and Recreation Division
525 TRADE STREET SE, SALEM, OREGON 97310

April 6, 1988

G. A. Newgard
Chief Regulatory and Resource Branch
Portland Corp of Engineers
PO Box 2946
Portland, OR 97208-2946

RE: Permanent Off-Shore Disposal Site
Chetco River and Bar
Curry County

Our staff archeologist has reviewed the report prepared by Michael Martin for the proposed permanent off-shore disposal site for materials dredged from the Chetco River and Bar. The area set up for disposal has been surveyed with a side-scan sonar and was negative. Our office concurs with the finding of "No Effect". If you have any questions you can contact Dr. Leland Gilsen at 378-5023.

Sincerely,

D. W. Powers, Deputy
State Historic Preservation Officer

DWP:jn
NEWGARD.LTR

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northwest Region
7600 Sand Point Way NE
BIN C15700, Bldg. 1
Seattle, Washington 98115

AUG 17 1987

F/NWR3:1514-04 js

Mr. Richard N. Duncan
Chief, Fish and Wildlife Branch
Department of the Army
Portland District Corps of Engineers
P.O. Box 2946
Portland, OR 97208

Dear Mr. Duncan:

This is in response to your August 3, 1987 letter to our Portland Office regarding an Endangered Species Act biological assessment for the gray whale at the Chetco Harbor Dredged Material Disposal Site Designation. We have reviewed the biological assessment and concur with your determination that populations of endangered/-threatened species (gray whales) under our purview are not likely to be adversely affected by the proposed action.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may adversely affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified or critical habitat determined that may be affected by the proposed activity. If you have any new information or questions concerning this consultation, please contact Joe Scordino at FTS 392-6110.

Sincerely,

Thomas E. Kruse

for Rolland A. Schmitten
Regional Director

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way NE BIN C15700
Seattle, Washington 98115

APR 16 1990

F/NWR3:1514-04 js

Mr. Richard N. Duncan
Chief, Fish and Wildlife Branch
Department of the Army
Portland District, Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208

Dear Mr. Duncan:

This is to advise you that the northern sea lion, Eumetopias jubatus, was listed as threatened under the Endangered Species Act (ESA) on April 5, 1990 (see enclosed Federal Register notice, 55 FR 12645). In addition, NMFS is conducting a status review of sockeye salmon (Oncorhynchus nerka) populations in the Snake River basin to determine if any populations should be proposed for listing under the ESA. The Snake River sockeye salmon therefore are to be considered as candidate species for ESA Section 7 consultations as described in 50 CFR 402.12(d).

We have revised our list of endangered/threatened species that may occur off Oregon and Washington and a copy is enclosed. Consultations should be initiated (or reinitiated if prior consultations were conducted) on activities that may affect northern sea lions.

You recently submitted two letters dated March 29, 1990 and March 30, 1990 regarding two ESA Section 7 biological assessments: one for a Coos Bay channel deepening and offshore disposal project; and one for a bank protection project at the mouth of the Coquille River. Because northern sea lions do occur in the area of both projects, we will need to receive revised assessments that include this recently listed species. In addition, the biological assessments do not include the most current information available on gray whales. The gray whale assessments for each project should include the applicable information and analyses described in my March 28, 1990 letter to you regarding the Tillamook Bay project.

We will reinitiate our consultation responsibilities under Section 7 of the ESA for these two projects upon receipt of revised biological assessments. If you have any questions concerning this consultation, please contact Joe Scordino at (206) 526-6140.

Sincerely,

for Rolland A. Schmitten
Regional Director

Enclosure
cc: F/PR2 - Pat Montanio
F/NWR5 - Merritt Tuttle

April 9, 1990

ENDANGERED AND/OR THREATENED SPECIES UNDER THE JURISDICTION OF NATIONAL MARINE FISHERIES SERVICE THAT MAY OCCUR OFF WASHINGTON AND OREGON

MARINE MAMMALS

Gray Whale	Eschrichtius robustus
Humpback Whale	Megaptera novaeangliae
Blue Whale	Balaenoptera musculus
Fin Whale	Balaenoptera physalus
Sei Whale	Balaenoptera borealis
Right Whale	Balaena glacialis
Sperm Whale	Physeter macrocephalus
Northern Sea Lion	Eumetopias jubatus

MARINE TURTLES

Leatherback Sea Turtle	Dermochelys coriacea

FISH

Sacramento River Winter-Run Chinook Salmon	Oncorhynchus tshawytscha

Candidate Species

Salmon River Basin Sockeye Salmon	Oncorhynchus nerka

December 3, 1990

Planning Division

Mr. Rolland Schmitten
Regional Director
National Marine Fisheries Service
7600 Sand Point Way, NE.
BIN C15700
Seattle, Washington 98115

Dear Mr. Schmitten:

Pursuant to the requirements of the Endangered Species Act of 1973, we are forwarding a biological assessment for threatened and endangered species which could potentially be impacted by designation and subsequent use of the Chetco Offshore Dredged Material Disposal Site near Brookings, Oregon.

We have concluded that this project will have "no effect" on any of the listed species.

Should you require any additional information, please contact Geoff Dorsey of my staff at (503) 326-6482.

Sincerely,

Robert E. Willis
Chief, Fish and Wildlife
Branch

Enclosure

CF.
MARK SIIPOLA
PL-CH

CF: MARK SIIPOLA, PL-CH

BIOLOGICAL ASSESSMENT

FOR

GREY, HUMPBACK, BLUE, FIN, SEI, RIGHT, AND SPERM WHALES;

LEATHERBACK SEA TURTLES;

NORTHERN SEA LIONS

AND

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON

AT

CHETCO RIVER ENTRANCE OCEAN DREDGED MATERIAL DISPOSAL SITE

BROOKINGS, OREGON

PROJECT DESCRIPTION

The Chetco Offshore Dredged Material Disposal Site (ODMDS) is situated approximately one mile south from the Chetco River entrance (Figure 1). The ODMDS has dimensions of 1800 feet by 1800 feet and is situated in an area with average water depth of 70 feet; depth range is 60-85 feet (Figure 4). Disposal site acreage is approximately 74.4 acres.

This ODMDS, or areas within the vicinity, has been used as a disposal site since 1963. It was designated as an interim site in 1977 (40 CFR 228.12) by EPA. Coordinates established for the interim site and which under the current action are proposed for final designation are:

42 deg. 01' 56" N.	124 deg. 16' 33" W.
42 deg. 01' 56" N.	124 deg. 16' 09" W.
42 deg. 01' 38" N.	124 deg. 16' 09" W.
42 deg. 01' 38" N.	124 deg. 16' 33" W.

Dredged materials destined for disposal at the ODMDS will originate from the federally authorized navigation project at the Chetco River, Oregon, and from disposal of materials dredged during other actions authorized in accordance with Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended. Frequency of maintenance dredging at Chetco River is dependent upon volume of sediments transported into the estuary and frequency and severity of storms that move sediments into the channel, creating a bar. An average of 42,400 cubic yards (range 8000-80,000 cy) of material were dredged from the entrance channel and entrance to the boat basin from 1982-1985. The long-term annual average for disposal is 48,000 cy. Coverage of bottom substrate at the ODMDS, assuming uniform distribution and no dispersion, would be 0.4 feet at 48,000 cy and 0.7 feet at

80,000 cy of disposal. Sandy material is expected to disperse from the site in the littoral drift. No mounding has occurred at the interim disposal site from past dredged material disposal operations.

Grain size varies greatly, ranging from 0.3 mm to 7.0 mm. Material to be dredged is classified as medium to fine grain marine sands and coarser materials, including gravels and cobbles. Silt is occasionally dredged from the boat basin. The sediments contain no excess concentrations of contaminants of concern and are generally similar to bottom materials at the interim disposal site and the entire nearshore area. Initial settlement of material is expected to be rapid. Turbidity associated with disposal will be of short duration.

Dredging of the entrance channel has previously been accomplished through use of hopper dredges or hopper barges. Interior portions of the channel have been maintained through the use of hopper dredges, channel flusher (agitation/propwash), or in limited instances by clamshell dredge. The interim ODMDS has received 420,706 cy of material since 1977. A total of 749,000 cy of material have been disposed of at sea to date.

Future dredging actions are anticipated to be accomplished primarily by hopper dredging because sea conditions at the entrance preclude pipeline dredging and the estuary and surrounding lands do not provide acceptable inwater and/or upland disposal locations.

Dredging (hopper) may occur from April through October although dredging actions primarily occur in May and June with followup work occurring later in the season. Disposal rate is approximately one load (825 cy) per hour. However, shoal depth, fog, sea conditions, and sediment type all influence production rates. Daily production has been estimated at 6000 cy or approximately 8 loads.

GRAY WHALES

Coastal waters of Oregon serve as a migrational corridor for gray whales moving to and from their breeding, calving, and assembly areas along Baja California, Mexico and their primary foraging areas in the northern Bering and southern Chukchi Seas (Darling 1984).

Southward migration occurs off Oregon between early December and mid-February, with pregnant females being the first to pass southward. (Herzing and Mate 1984). Southbound whales typically occur off Oregon in water less than 90 meters deep, with the majority of migrants occurring in water 40-60 m deep, located between 1.6 and 3.2 km offshore (Herzing and Mate 1984).

The northbound migration is comprised of two groups of whales migrating in two phases. The first phase begins migration between mid-February and April and consists of whales without calves. The second group consists largely of whales with calves, with migration beginning between late April and May (Herzing and

Mate 1984). Generally, whales comprising the first phase tend to migrate further offshore, with immatures showing a preference for migration closer to shore (Herzing and Mate 1984). Northward cow/calf migration typically occurs close to shore. Herzing and Mate (1984) observed that 90% of the whales migrating during the later phase, traveled within 800 m of the shore; during the final three weeks of migration, 90% traveled within 100 m of shore.

A portion of the eastern Pacific population of gray whales does not migrate to the northern seas; these whales spend summer offshore of California, Oregon, Washington and British Columbia. Mate estimated a summering population of 75 whales off the coast of Oregon in 1979 (Darling 1984). Current population estimates by Mate indicate an increase to 100-200 summering whales (B. Mate, pers. convers., 1990). Information regarding summering grey whale distribution off Oregon is patchy. It appears that most summering gray whales occur between Winchester Bay (Umpqua River) and Cascade Head, near Lincoln City (B. Mate, pers. comm., 1990). These summering gray whales occur in scattered, small groups or as individuals. There was reportedly a cow/calf pair summering off Coos Bay in 1990 (Jan Hodder, OIMB, pers. comm. 7-90). Three small groups have been reported elsewhere in Oregon during 1990 (Beverly Lund, pers. comm. 7-90); these include approximately 6 individuals between Boiler Bay and Yaquina Head, a group between the south Jetty of Yaquina Bay and Seal Rock, and a group at Gold Haven near Sea Lion Caves.

There are occassional reports of gray whales occurring in coastal estuaries including the Columbia River, Tillamook Bay, Yaquina Bay, Siuslaw River, and Coos Bay (B. Mate, pers. comm., 1990). Apparently it is not uncommon for gray whales to occur between the Highway 101 bridge and the jetties at Yaquina Bay; these observations include north and south bound migrants and summering gray whales. Summering gray whales have been observed in the mouth of the Siuslaw River between the jetties by Corps personnel and other observers have recorded them as far upriver as Mapleton on the Siuslaw. Operators of the charter boat Siggi-G out of Garibaldi reported a gray whale near buoy six, Tillamook Bay entrance channel, in late spring 1990; it is not known whether this represented a migrant or summering gray whale. A whale, species unknown, was observed just north of Tillamook Bay in June 1989 less than one-half mile offshore.

The most recent study of summering whales off Oregon was conducted by Sumich (1984). Summer sightings were defined as those which occurred between 1 June and 15 September. Sumich reported over 1200 gray whale sightings during a 1977-1980 study off coastal Oregon. A 100 km section of coastline from the Siuslaw River to Government Point just north of Depoe Bay, appeared to be relatively important to gray whales. In 1977, 60% of the 460 observations occurred within this 100 km section. Sumich reported a maximum observed occurrence of 0.2-0.3 whales/km over the 100 km study area during the 1977 and 1978 studies. It was not determined whether whales were more numerous

along this section, or simply easier to detect. Whale distribution within the 100 km section varied between 1977 and 1978; in 1977 whales were most commonly observed in the southern half of the study area, in contrast to 1978 when whales were more frequently observed in the northern half of the study area. Sumich noted that site specific use also varied daily; thus, a period of maximum occurrence was undetectable. Additionally, weather, sea state, observer effort, the presence or absence of strategic observation points, and the unreliability of aerial counts due to the predominant occurrence of gray whales in surf and foam lines (which makes them difficult to detect) also contribute to the large variation in observed abundance. Because of these factors, Sumich considered his abundance estimate of 0.2-0.3 whales/km to be conservative.

Sumich (1984) noted that the primary activity of summer gray whales off the Oregon coast appears to be feeding. Benthic infauna, primarily gammarid amphipods and polychaete worms are the principal food items of gray whales (Rice et al 1984). Migrating whales feed, to some extent, on benthic organisms at the mouths of rivers and estuaries (Nerini 1984). Pelagic foraging by grey whales is thought to be rare (Nerini 1984), though Sumich (1984), suggests that offshore sightings may be an indication of pelagic feeding.

Sumich noted that nearshore locations with silty sediments appear to be foraging areas for gray whales; presumably because of high amphipod populations in silty sediments (D. Hancock, USACE pers. comm., 1985). Gray whales also frequented surf or foam lines. A pod of whales summering near Boiler Bay, OR (1990), was reported to have been feeding in kelp beds (Beverly Lund, pers. comm. 1990).

Sumich (1984) postulates that whales which summer off Oregon may gain energetic benefit by shortening their migration. He further noted that the whales off Oregon consisted predominantly of immature or small mature individuals. Mate has also indicated that the majority of whales summering off Oregon appear to be immature (Beverly Lund pers. comm. 1990). Grey whales that summer off British Columbia have been documented to return to within 150 km of an established location, with some individuals reportedly having returned for up to 8 consecutive years (Darling 1984). As such, Darling argues that these whales are not cutting their migration short, but that they are intentionally seeking out and utilizing available "pockets" of habitat. Although a through investigation of the age structure of these whales has not been made, Darling (1984) believes that these populations may also be composed primarily of young individuals.

DISCUSSION

Typically, disposal operations at the ODMDS will occur during the latter part or after conclusion of Phase B of the northward migration of gray whales. Dredging and disposal would not occur during the southward migration. Should disposal

operations occur when whales are present, it is unlikely that gray whales would be impacted as disposal operations are intermittent in nature and confined to a limited area. We would anticipate some potential for avoidance of the immediate disposal area. As material to be disposed is not contaminated, we anticipate no impacts from contaminants on migrant or summering gray whales. Few summering whales apparently occur in this area of the Oregon coast. Further, the disposal area is offshore and not typical of areas used by foraging gray whales which summer off Oregon's coast.

CONCLUSION

We conclude that designation and subsequent use of the Chetco River Entrance ODMDS will have "no affect" on gray whales.

LITERATURE CITED

Darling, J. D. 1984. Gray whales off Vancouver Island, British Columbia. Pages 267-287 in M. L. Jones, S.L. Swartz, & S. Leatherwood, eds. The gray whale, "Eschrichtius robustus." Academic Press, Inc., Orlando, FL. 600pp.

Herzing D. L., & B. R. Mate. 1984. Gray whale migrations along the Oregon Coast, 1978-81. Pages 289-307 in M.L. Jones, S.L. Swartz, & S. Leatherwood, eds. The gray whale, "Eschrichtius robustus." Academic Press, Inc., Orlando, FL. 600pp.

Nerini, M. 1981. A review of gray whale feeding ecology. Pages 423-450 in M. L. Jones, S. L. Swartz, & S. Leatherwood, eds. The gray whale, 'Eschrichtius robustus'. Academic Press, Inc., Orlando, FL 600pp.

Rice, D. W., A. A. Wolman, & H. W. Braham. 1984. The gray whale, 'Eschrichtius robustus'. Mar. Fish Rev. 46(4):7-14.

Sumich, J. L. 1984. Grey whales along the Oregon Coast in summer, 1977-1980. The Murrelet. 65:33-40.

HUMPBACK, RIGHT, FIN, BLUE, SEI, AND SPERM WHALES

These species may occur in the project area but information on numbers, distribution, and feeding habits is lacking other than in a general sense. Occurrence of blue whales off the Oregon coast is primarily in May-June and August-October (Rice 1974 in Maser et al. 1981). Blue whales typically occur offshore as individuals or in small groups. Blue whales winter well south of Oregon as do fin whales (Maser et al. 1981). Fin whales do range off the Oregon Coast during summer. Whaling records indicate

that fin whales were primarily harvested off Oregon from May-September (Maser et al. 1981). Sei whales also winter south of Oregon. Based upon information from central California, Sei whales probably occur in southward migration off the Oregon coast in late summer - early fall (Maser et al. 1981). Based upon catch records, humpbacks primarily occur off the Oregon coast between April and October with peak numbers occurring during June, July, and August (Maser et al. 1981). Sperm whales occur as migrants and some may summer off the Oregon coast (Maser et al. 1981). Strandings have occurred along the Oregon coast. Right whales may occur off the Oregon coast during winter; summer distribution is in cool waters north of 50 degrees north latitude (Maser et al. 1981).

DISCUSSION

Discussions with Bruce Mate and other observers have indicated that these species of whales are rather infrequent visitors to the vicinity of coastal jetties, entrance channels and bays.

CONCLUSION

Given the nature of the project and whale use/occurrence in the project area, we have determined that there will be no effect to these whale species from use of the Chetco River Entrance ODMDS.

LITERATURE CITED

Maser, C., B.R. Mate, J.F. Franklin, and C.T. Dyrness. 1981. Natural history of Oregon coast mammals. PNW Forest and Range Exper. Stat., USDA, USFS, Gen. Tech. Rep. PNW-133.

Rice, D.W. 1974. Whales and whale research in the eastern North Pacific. Pages 170-194 in W. G. Scheville, ed. The whale problem: A status report. Harvard Univ. Press, Cambridge.

NORTHERN (STELLER) SEA LION

Northern sea lions breed along the west coast of north America from San Miguel in California's Channel Islands, to the U.S.S.R.'s Kurile Islands and the Okshotsk Sea in the western north Pacific Ocean. There is no evidence to indicate that there are separate populations throughout this range (NMFS 1990). The northern sea lion subpopulation which occurs off California has been declining since the 1920's, with a more rapid rate of decline since 1960 (Gentry and Winthrow 1986). The Alaskan population has undergone an 60% decline since 1985 (ODFW 1990),

prompting the emergency listing of the species throughout it's range.

Northern sea lions are year-round residents along the Oregon coast. The subpopulation off Oregon is second in size to the Alaskan subpopulation (Brown 1988). Northern sea lions are known to haul out at a minimum of ten sites off Oregon; two of these sites, Rogue and Orford Reefs, are rookeries. Other important haulout sites include Ecola State Park, Sea Lion Caves, Columbia River South Jetty, Three Arch Rock, Cape Arago, and Seal Rock. The south jetty of the Columbia River and Three Arch Rock appeared to be used primarily during the winter (Brown 1988).

In contrast to the Alaska and California subpopulations, statewide population counts for Oregon have remained fairly stable. In 1984 and 1985, year-round counts ranged from 769 to 2352. During this survey, peak counts (2352) were made on May 21 & 23, 1984 with haulout attendance greatest at Ecola State Park, Sea Lion Caves, Orford Reef and Rogue Reef (Brown 1988). Peak attendance at the two Oregon rookeries occurs during May, June and July. Sea lions begin to leave the rookeries in August. Males are the first to leave, followed by females within a few months (Gentry and Winthrow 1978). The number of sea lions using Orford Reef has declined since 1986. It is not certain, but the decline may be related to a rapidly growing sea urchin fishery in the area (ODFW 1990). Seasonal shifts in the use of haul out sites is common among northern sea lions. Northern sea lion numbers appear to be lower off Oregon in the winter than summer, though it is not known where these animals may be migrating to or wintering. Northern sea lions forage at river mouths and near-shore areas along the coast. Roffe and Mate (1984) studied the feeding habits of pinnipeds, including northern sea lions in the Rogue River estuary, Oregon in 1984. It was determined that the sea lions fed most heavily on Pacific lamprey. A variety of environmental correlations were studied with respect to feeding, and it was determined that the factor which most affected feeding habits was proximity to the mouth of the river. Although sea lions have been accused of damaging the commercial salmon fishery in several locations along the West Coast, studies have shown that sea lions generally consume less of these fish than thought, and in fact, that salmon comprise a relatively small proportion of their diet (Gentry and Winthrow 1978). Roffe and Mate (1984) determined that, of observed surface feeding, only 2% was on salmon. The main food items for northern sea lions in the Rogue River estuary appeared to be lamprey (26.8%) and non-salmonid fishes (32.4%) (Roffe and Mate 1984).

DISCUSSION

The nearest haulout area to Chetco River Entrance ODMDS for northern sea lions is Rogue Reef, which is well north of the ODMDS.

Foraging by this species would be expected to occur in the project vicinity although the extent of foraging activities at the immediate project site is unknown. It is unlikely that northern sea lions would be impacted as disposal operations are intermittent in nature and confined to a limited area. We would anticipate some potential for avoidance of the immediate disposal area. As material to be disposed is not contaminated, we anticipate no impacts from contaminants on northern sea lions.

CONCLUSION:

The project may result in some localized avoidance around the immediate construction site by northern sea lions. However, the project should have "no affect" on the status of the population nor should the survival of individuals be affected by the proposed action.

LITERATURE CITED

Brown, R.F., 1988. Assessment of Pinniped Populations in Oregon. Oregon Department of Fish and Wildlife report to National Marine Fisheries Service, Seattle, WA. 44 pp.

NMFS. 1990. Listing of Steller Sea Lions as Threatened and Endangered Species With Protective Regulations. Federal Register 50 CFR Part 227. pp 12645-12661.

Gentry and Winthrow, 1986. "Steller Sea Lion" in Marine Mammals Delphine Haley, ed. Pacific Search Press; Seattle, WA.pp. 186-194.

Roffe, T.J. and B.R. Mate, 1984. Abundances and Feeding Habits of Pinnipeds in the Rogue River, Oregon. J. Wildl. Manage. 48(4):1262-1274.

Oregon Department of Fish and Wildlife (ODFW), 1990. Northern (Steller) Sea Lion Garners Concern. Wild Flyer, vol. 1, no. 2, June 1990.

LEATHERBACK SEA TURTLE

Leatherback sea turtle occurrences off the Oregon Coast are associated with the appearance of albacore. Albacore occurrence, and very likely that of leatherback sea turtles, is strongly associated with the warm waters of the Japanese Current which tends to approach the Oregon Coast in late summer. Typically, warm water associated with the Japanese Current does not closely approach the Oregon Coast (i.e. 1-5 miles), generally occurring 30-60+ miles offshore. During El Nino events, warm water may occur much closer to the Oregon coast than usual.

Leatherback sea turtles generally occur well offshore from the project location with only occasional individuals occurring in nearshore, colder waters. It is expected that leatherback sea turtles would only be casual visitors to the project area. Therefore, we expect the project to have "no effect" on this species.

SACRAMENTO RIVER WINTER RUN CHINOOK SALMON

The Sacramento River winter-run chinook salmon is not expected to occur in significant numbers in the vicinity of the project. This species is thought to primarily occur offshore in deep water from Fort Bragg to Monterey, California (ECOS INC. 1990). Coded wire tag recovery information compiled by the Alaska Fisheries Science Center, National Marine Fisheries Service, indicates that tagged chinook salmon released in the Sacramento River drainage have been recovered from foreign and joint venture trawl fisheries off Oregon. These tagging programs involve fall chinook salmon and not winter run chinook salmon, though. It does serve as an indication that Sacramento River winter run chinook salmon may occur off the Oregon coast.

In addition to Sacramento River winter run chinook salmon, five salmonid species are listed as candidates for Federal classification as threatened and/or endangered species. Species proposed for listing are Salmon River Basin sockeye salmon, Snake River fall, summer, and spring chinook salmon, and lower Columbia River coho salmon.

Miller et al. (1983) noted that the largest catches of adult coho salmon of Columbia River origin in the ocean fishery have been off northern California to southern Oregon. They also indicated that spring chinook salmon of Columbia River origin apparently migrate north for rearing. Discussions with John Williams, NMFS, Seattle, indicate that available information indicates that Snake River chinook and sockeye stocks migrate north for rearing. Information is preliminary and not complete, however.

CONCLUSION

The limited extent of habitat affected by disposal operations, intermittent nature of disposal events, and lack of contaminants associated with disposal materials indicate that the project will have "no affect" on Sacramento River winter run chinook salmon or on the candidate stocks. Most fish from runs of concern, except lower Columbia River coho stocks, are probably absent from the area.

Literature Cited

Miller, D. R., J. G. Williams, and C. W. Sims. 1983. Distribution, abundance and growth of juvenile salmonids off the coast of Oregon and Washington. Fisheries Research 2(1983):1-7.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N. E.
BIN C 15700, Building 1
Seattle, Washington 98115

F/NWR3: 1514-04 jbn

JAN 7 1991

Robert E. Willis, Chief
Fish & Wildlife Branch
U. S. Army Corps of Engineers
Portland District
P. O. Box 2946
Portland, Oregon 97208-2946

Dear Mr. Willis:

This is in response to your December 3, 1990 letter regarding an Endangered Species Act (ESA) biological assessment for the proposed designation and subsequent use of the Chetco Offshore Dredged Material Disposal Site, near Brookings, Oregon. We have reviewed the biological assessment and have enclosed comments. We concur with your determination that populations of threatened/endangered species under our purview are not likely to be adversely affected by the proposed actions.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activities that may adversely affect listed species or aquatic organisms, the activity is subsequently modified, or a new species is listed or critical habitat determined that may be affected by the identified activity. If you have any new information or questions concerning this consultation, please contact Brent Norberg at (206) 526-6140.

Sincerely,

Rolland A. Schmitten
Regional Director

Enclosure

cc: F/PR2 - Pat Montanio
F/NWR5 - Merritt Tuttle

Comments on Biological Assessment for the
Proposed Designation and Use of the
Chetco Offshore Dredged Material Disposal Site
Brookings, Oregon

The 1987 Northern (Steller) sea lion status review, prepared by NMFS, indicates that northern sea lion pups are no longer born at San Miguel Island, off southern California. The southern most rookery for this species is now considered to be Año Nuevo Island, off central California. .

Correct spelling for co-author on cited document (Gentry and Winthrow 1986) is David E. Withrow.