alevin suffocation, or indirectly, by loss of invertebrate food supplies. Because salmonid reproduction and rearing is often much more dense in the smaller streams than in mainstream rivers, and because the larger streams usually have a greater dilution capability, the greatest sediment impacts can be expected in smaller streams. (Pfeifer, p. 10).

27. The amount of damaging sedimentation caused by trenching in streams cannot be known with certainty without analysis of ambient suspended sediments, existing gravel quality, stream geohydraulics, and game fish utilization. (Pfeifer, p. 10).

28. On the Yakima River, any remaining suspended sediment will settle out 42 miles downstream in the Roza Dam reservoir. A decrease in the numbers of trout and whitefish between the Yakima pipeline crossing and Roza Dam could occur. (Eldred, p. 15).

29. Riparian vegetation is an essential component of fish habitat, contributing to bank stabilization and erosion control, water temperature control, instream cover, stream flow velocity control, and fish food supplies. (Pfeifer, p. 12).

30. Improperly installed culverts under roads create obstructions to fish movement. Stream channels may be de-

watered, blocking fish movement, if low water fords are used for construction traffic. (Eldred, 18, 19, Kay).

Other Construction Impacts

31. The most damaging construction disturbances will likely occur in the canyons, and in the channeled scablands. Because of rock and shallow soils, excavation will require extensive blasting, longer construction periods and more intensive noise and vibration. (Friesz p. 32). Where blasting is necessary, a large volume of rock debris will be created. If the ditch to be dug is 76 inches deep, at least 60 inches of bedrock will be displaced. Of this, only 18 inches will be returned to the ditch. Over a one mile segment, almost 100,000 cubic feet of rock would require disposal, creating revegetation and disposal problems. (Benson (2), p. 7). Rock will be encountered along significant portions of the pipeline route in eastern Washington (Vol. 214 p. 40370-40371).

32. Construction equipment operation will destroy vegetation and compact soils. Only partial replacement will occur during project life. (Pineo p. 11).

33. There will be habitat impacts from construction-related activity outside the right-of-way.

34. Indirect impacts, those occurring in areas adjacent to the NTP corridor, are mostly associated with road and related activities along the corridor.

35. The new forest "edge" created by the NTP corridor would have some positive impacts. If the corridor cuts through large expanses of a uniform forest, the induced edge would benefit species that require grass, brush, and forest. The desirability and benefit of induced edge and corridor openings depend on differences in plant communities; their size, shape, relationship to other openings or edges; and the amount of these features currently available to wildlife in the area. (Perry p. 46). The use of herbicides and mechanical cutting to control vegetative growth on the pipeline corridor will negate some benefits that may otherwise result from the creation of edge. For some species, cleared right-of-way would cause loss of habitat. Routing along an existing corridor could lessen impacts for such species. (Stendal p. 8, 9).

Game Animals

36. Riparian-aquatic furbearers would be affected by direct loss of habitat and by siltation. Problems would include oiled fur, contaminated food, and altered feeding habits. (Leschner p. 41, 42).

Waterfowl

37. The NTPC corridor bisects the Skagit - Port Susan waterfowl area. This salt marsh is one of the most important coastal waterfowl habitats in Oregon and Washington, with substantial recreational use. The pipeline will pass through the most productive part. (Jeffrey p. 3, 4).

38. Waterfowl production is significant in western Spokane County near the proposed centerline. (Pineo p. 5; Oliver (1) p. 17).

39. The release of oil into the environment is the most serious threat to waterfowl and habitats presented by either construction or operation of the pipeline. (Jeffrey p. 10).

40. Considering habitat losses and disturbance during construction operations, and the threat of oil spills, significant impacts from NTP on some waterfowl habitat are likely. (Oliver (1) p. 16).

Marine Mammals

41. Twenty-one species of marine mammals are reported in the waters of Puget Sound, the San Juan Islands, and the Strait of Juan de Fuca. These nine species occur yearly as breeding residents or seasonal migrants: river otter, California

sea lion, Northern sea lion, harbor seal, gray whale, minke whale, killer whale, harbor porpoise, and Dall porpoise. (Everitt, p. 5, 6).

42. Direct impacts of oil on marine mammals or their feeding habits are not known. The effect of oil pollution on harbor seals is not well documented. (Everitt p. 17).

43. Disruption of harbor seal hauling areas can lead to abandonment of some areas, changes in hauling behavior, and increased abandonment and mortality of pups. (Everitt p. 17, 18) Two of the three most productive breeding areas in northern Puget Sound - the Dungeness area and Protection Island - are within the proposed pipeline corridor. (Everitt p. 26).

Uncommon Species

44. Many uncommon species of fauna and flora occur along the corridor. (Leschner p. 15, 17). (Friesz Attachment 2).

45. The bald eagle is a federally-listed, threatened species in Washington. Thirteen known nests are located in or near the corridor. The most critical nests are at Protection Island, Polnell Point, and Utsalady. Northern Puget Sound regularly attracts a large wintering eagle population. (Leschner p. 17, 18, 19) The Green Point bald eagle nest is located along

the perimeter of the proposed onshore storage site and is part of an active nesting territory. (Leschner p. 18).

46. Harassment near bald eagle territories during the breeding season will cause nest abandonment. Disturbances will also reduce the time and efficiency of attention and care for the young. (Leschner p. 20, 21).

47. The peregrine falcon, included on the federal endangered species list, is found in the Skagit flats and in the Dungeness-Protection Island area. (Leschner p. 23, 24).

Wetlands

48. Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. For purposes of classification, wetlands must have one or more of the following attributes: (1) at least periodically, the land supports predominantly hydrophytes (water plants); (2) the substrate is predominantly undrained hydric soil; or (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season. (Stendal p. 5).

49. Wetlands can include freshwater marsh, saltwater marsh, bogs and freshwater swamps. (TR 36556.) They support diverse species, recharge aquifers, and trap sediment and pollutants. Many Puget Sound wetlands have been lost or severely modified. Partial wetland loss can cause substantial habitat and water purification impacts. (TR 36317, 36319, 36326, Ex. 716) (Wetland Narrative and Slides, Snohomish County). Disturbances to wetlands are likely to cause disruption to wildlife within 150 feet of the pipeline centerline (greater distance in marshes). (TR 36564).

50. Wetland areas are located at Grays Marsh near Dungeness, Davis Slough and West Pass along the Skagit HMA, and many smaller areas along the corridor from Stanwood to North Bend. Wetlands along the pipeline corridor in eastern Washington are found in the Rocky Ford Creek, Gloyd Seeps, and east of Sprague Lake. (Friesz p. 25, p. 28, Leschner, p. 6).

51. Altering ground water movement and drainage patterns may result in destruction of some eastern Washington wetlands. The pipeline trench may intersect and drain the shallow aquifers upon which many scabrock marshes, ponds, and subirrigated wetlands depend. If vernal ponds or marshes then fail to hold water, or drain more quickly than they do now, vegetative associations would change. Wildlife species depend-

ing on existing wetland and riparian vegetation could be lost, and productivity would be reduced. (Pineo, p. 10).

52. Major estuaries within or adjacent to the proposed corridor include the Dungeness, Skagit, Stillaguamish, and Snohomish Rivers. The Dungeness estuary, along with wetlands associated with Sequim, Discovery Bay and Protection Island, is an important Olympic Peninsula habitat. The Skagit-Stillaguamish area supports about 200 wintering bald eagles and has the largest known concentration of wintering peregrine falcons in Washington. (Leschner p. 6, 8, 9, 10).

53. The best way to protect wetlands is to avoid them.

54. The applicant did not sufficiently map or otherwise identify wetlands and riparian habitats and dependent species. As an example, over 47 wetlands have been identified within the Snohomish County corridor. Twenty of these are on or within approximately 150 feet of the centerline; NTPC identified nine, omitting major wetlands. (TR 36328, 36329; Ex. 719; TR 36498-36509.)

55. Eight to ten of the 20 wetlands which Snohomish County identified as being within 150 feet of the centerline are five acres or larger. (TR 36551-36552.) NTPC utilized a

criterion of five acres or more for identifying wetlands. Northern Tier underestimated the impacts of this project on wetlands. (TR 36336, 36341).

56. Davis Slough, part of a larger wetland complex, includes mud flats, fresh and saltwater marshes, ponds and sloughs. Significant bird species are found here.

57. A more accurate assessment of wetlands, and important riparian and forest habitats would be desirable, including accurate mapping, habitat evaluation and mitigation planning. Realignment feasibility studies for all wetlands crossed or immediately adjacent to the centerline should be undertaken. (TR 36509-36510). Northern Tier's centerline location would cause a direct loss of wetland vegetation and associated riparian habitats. (TR 36566-36567).

58. In Snohomish County, wetland habitats of 11 rare, threatened or endangered species have been documented. (TR 36341, 36343, Ex. 711; 712; 714; TR 36499). Data of similar quality do not exist in other counties.

59. A permanent easement creates a potential for increased public access and more disturbance to wetlands. (TR 36570).

Fauna Impacts at the Marine Terminal

60. Impacts on marine mammals and water birds from construction of the berths will generally be temporary and local. The 75-acre site will be lost to water birds but is of minor importance to other marine fauna. The extent and period of disturbance during construction will not eliminate use of the harbor by most marine mammal or water bird species, but may for some. (TR 9406-08 Reed). The loss of eelgrass (1.5 acres) along a small portion of Ediz Hook and increased sedimentation may cause some loss of herring and crab habitats. Construction of the unloading pipelines will destroy benthic (bottom-dwelling) fauna within the pipeline trench and the disposal area. Dredging activities will destroy about 14 (out of 766) acres of hardshell clam habitat and about 25 (out of about 3,145) acres of geoduck habitat. Juvenile fish may also be at risk near Green Point due to dredging activities. Construction activities are not expected to affect zooplankton populations significantly. (TR 9438-42 Yuill; TR 33603-04 Mills; TR 33613-14 R. Johnson).

61. Impacts on terrestrial fauna from construction of the tank farm include loss of about 140 acres of woodland habitat, potential disturbance of a bald eagle roosting and nesting location, and short-term displacement and stress because of noise and increased human activity. Any displacement or loss of forest-dwelling mammalian species would not be of

regional significance. (TR 9485 Reyes-French; TR 9407-08 Reed; TR 31324-25 Leschner).

62. Ship traffic, berthing, and other activities in the harbor will cause some minor disturbance to water birds and will decrease the availability of undisturbed nesting and feeding habitats. (TR 9406-07 Reed). (TR 9439-40 Yuill).

63. If all operational discharges meet conditions specified in an NPDES permit, no significant impacts on fauna are expected. (Applic. III, Sec. 2.5.3.2.)

64. Dredging and pipeline trenching may increase the mortality rate of demersal fish eggs* or juvenile fish in eelgrass areas. Juvenile salmon could be affected by increased sediment loads in areas immediately adjacent to dredging. (TR 9452-53 Yuill; TR 33603 Mills; TR 33613 R. Johnson). There is a potential for the release of toxic substances from bottom sediments into the water column by dredging, and for reduction of oxygen. This could affect adult or larval fauna and the plankton upon which they feed. (TR 33603, TR 3614 R. Johnson; TR 33908 Westley).

*Eggs which settle on the sea bottom

Flora Impacts at the Marine Terminal

65. Eelgrass, bullwhip kelp, and salt marshes occur in places between the berthing site and the Dungeness River. (Applic. III, Sec. 1.4.2.1; TR 9428-29 Yuill). Phytoplankton in the Strait of Juan de Fuca and Port Angeles Harbor consist of primarily of centric diatoms.* Freshwater phytoplankton occur in the harbor. Phytoplankton abundances show low densities during late winter and higher densities during the spring. Freshwater flora along Siebert Creek are limited primarily to shoreline periphyton (small aquatic plants and animals). (Applic. III, Sec. 1.4.2.1; TR 9428-29 Yuill).

66. The installation of the submarine unloading pipelines will cause temporary loss of about ten acres of bullwhip kelp beds in the sublittoral zone near Green Point. (Applic. III, Sec.2.4.2.1; TR 9429-31 Yuill). The addition of pilings on Ediz Hook will provide additional substrate for algae and habitat for certain worms and small crustaceans. (TR 9431 Yuill).

67. Phytoplankton in the vicinity of the proposed submarine pipeline route consist primarily of centric diatoms. Major floral communities occur along the submarine portion. Dredging operations will remove some eelgrass and intertidal macro-algae beds and diminish floral productivity by increasing

*Round-shaped, single-celled organisms with plant and animal characteristics, used as food by fish and small animals

water turbidity and thereby decreasing photosynthesis. (TR 9448-49 Yuill).

68. There are no terrestrial flora at the tanker unloading site on Ediz Hook. At the onshore storage site, there are mixed coniferous/deciduous woodlands and deciduous woodlands. There are no known threatened or endangered plant species at the Green Point site. (Applic. III, Sec. 1.4.3.1; TR 9477-79 Reyes-French).

69. The normal operation of the onshore storage facilities will have no other significant impacts on terrestrial vegetation. (TR 9479 Reyes-French).

Terrestrial Flora

70. In terrestrial areas, aquatic flora predominating in streams to be crossed are probably periphytic diatoms.* Aquatic macrophytes** are also present in some streams. (TR 9455-56 Yuill).

71. In the Cascade Mountain region (North Bend to Yakima River crossing), the terrestrial flora consist of mixed deciduous and coniferous forest at low levels and coniferous forest at higher levels. This region east of the Cascade crest

*Fresh water organisms attached to the substrate

**Water plants large enough to be seen without a microscope

has been extensively logged and, in places, cleared for transmission line rights-of-way. (TR 9491-93 Reyes-French). In the eastern Washington region (Yakima River crossing to Idaho border), the dominant terrestrial flora are bunchgrasses and low shrubs. The predominant land cover and land use in eastern Washington is dryland crop and range land.

72. The pipeline segment between the Colockum Pass Road and the east side of the Columbia River intercepts populations of several rare species. One is proposed endangered, and one is proposed threatened. At present, none of these species is protected by federal or state regulations. Construction of the pipeline may result in the loss of individuals of some of these species. The extremely specific habitat requirements of these species suggest that only the hedgehog cactus would likely reestablish itself on the rights-of-way.

73. Vegetation on pipeline rights-of-way should be controlled. A control program should favor grass and shrub species on the centerline sufficient to permit visual observation of oil spills from overflights. Permanent rights-of-way would be maintained by mowing, cutting, and herbicides as needed. There are also negative effects from using herbicides.

74. Vegetation may be damaged by vehicular traffic on the right-of-way. Northern Tier traffic would be limited to

necessary inspection and repair activities. Unauthorized traffic would be limited by constructing berms, planting screens and erecting gates where necessary, practicable, and permitted by private landowners. (TR 9502-03 Reyes-French).

III. I. FOSSIL FUEL AND STEEL REQUIREMENTS

1. The major fossil fuel types that will be required by the project are: gasoline, diesel fuel, bunker fuel, and propane. (TR 11721-22 Meyers).

2. Western Washington refined products required for construction would be supplied primarily by an intrastate marine and pipeline transportation system. Eastern Washington refined products required for construction would be supplied primarily by out-of-state petroleum products pipelines originating in Montana and Utah, and by barges and trucks from western Washington and Oregon. (Applic. III, Sec. 1.16.1.1).

3. The primary energy products required for construction will be gasoline and diesel fuel for equipment, barges, and motor vehicles. Fuels should be available for these construction activities. (Applic. III, Secs. 2.16.2.1 and 2.16.3.1; TR 11723-24 Meyers). Northern Tier will promote energy conservation by endeavoring to coordinate construction activities, to transport and deliver materials and supplies efficiently, and to minimize construction worker travel distances. (TR 11726, 12757 Meyers).

4. Construction of the Washington portion of the System will require 253,058 tons of steel.

5. During operation of the marine terminal facilities, substantial amounts of bunker fuel will be required to supply the crude oil tankers. Bunker fuel requirements are expected to average 11,000 barrels per day. An estimated 1,000 barrels per day of low sulfur bunker fuel will also be required to power all tankers when they are in port to ensure compliance with air quality standards. (Applic. III, Sec. 2.16.2.2). Bunker fuels are currently being imported to the Puget Sound area from California refineries.

III. J. CONSTRUCTION TIMING IMPACTS

1. There is no time during the year when pipeline construction can be scheduled to totally preclude impacts on all resources. Construction timing must take into consideration factors besides impacts on living resources.

Saltwater Areas

2. The saltwater areas in which the submarine pipelines are proposed contain abundant and economically-important populations of fish and shellfish which sustain recreational and commercial fisheries.

3. Juvenile salmon from the entire Puget Sound area and southern British Columbia outmigrate through the Strait of Juan de Fuca. Juvenile salmonids, particularly pink and chum, use intertidal and shallow sublittoral areas of Puget Sound for rearing and migration. The period of pink and chum peak abundance in the nearshore waters extends from March 15 to June 15. Juvenile pink and chum have been documented at Saratoga Passage, Sequim Bay, Port Angeles Harbor, Davis Slough and West Pass.

4. Dredging and nearshore construction activities can have adverse effects on juvenile salmonids such as physical entrainment in suction-type dredges. Dredging and construction activities can cause water quality changes (turbidity, dissolved oxygen, pollutants) which may cause losses due to lethal and sublethal effects, increased predation, interference with growth and subsequent inability to survive in marine waters.

5. Recreational salmon fishing occurs year-round in the region of Ediz Hook.

6. Port Angeles Harbor supports a commercially and recreationally harvestable Pandalid shrimp population. This is the only area of Puget Sound other than Hood Canal where such a harvest occurs. These shrimp appear to be an isolated population depending on recruitment from within the harbor. Crabs are also harvested there. Larval and juvenile shrimp and crab are abundant in April, May and June.

7. Lingcod and rockfish habitats are located between Port Williams and Partridge Point. Lingcod spawn in the shallower waters (less than 100 feet deep) between October and May. Prior to spawning, Pacific cod concentrate south and west of Protection Island from December through March. Various species of flatfish use essentially the entire area through which the submarine pipelines are proposed in Port Angeles Harbor,

Admiralty Inlet and Saratoga Passage. Surf smelt spawning from May 15 to October 15 has been documented in Saratoga Passage at the landfall on Camano Island. Herring school in a prespawning holding area south of Protection Island from December to February. Dredging and pipelaying operations can disrupt these fish populations.

8. Marine organisms would be directly damaged by pipeline construction in the following ways: (a) killing of sessile organisms directly in the dredge path; (b) killing of sessile organisms in areas closely adjacent to dredging or in the disposal area through smothering by deposited spoils; and (c) killing of mobile benthic organisms that are in the path of the dredge by crushing or entrainment. (Westley, PFT 3; Mills, PFT 4-5). There are potential indirect effects to marine organisms as a result of pipeline construction. Depending upon the composition of the substrate material, considerable amounts of turbidity could be produced during construction. Potential adverse effects of turbidity are blockage of light and subsequent reduction in photosynthetic activity; mechanical abrasion or plugging of gills; release of toxic substances; release of substances having a high biochemical oxygen demand (especially during the naturally low dissolved oxygen period from July through October); excessive phytoplankton growth; and eutrophication. These indirect effects would have greatest impact on adult and larval hardshell clams, geoducks, shrimp and crab, because of relative immobility.

9. The following is a summary of critical periods for certain marine fisheries resources potentially impacted by construction of the proposed facility:

Species or Factor	Period
Juvenile salmon	March 15-June 15
Shrimp and crab larvae and juveniles (P.A.)	April-June
Crab abundance higher (Saratoga Passage)	April-January
Lingcod spawning (Admiralty Inlet)	October-May
Pacific cod aggregation (Protection Island)	December-May
Smelt spawning (Camano Island)	May 15-October 15
Herring holding (Protection Is.)	December-February
Low dissolved oxygen in Strait	July-October
Geoduck and clams	Year around
Flatfish	Year around

Freshwater Areas

10. The applicant has not committed to construction of any of the stream crossings, other than the major crossings, during the June 15 through September 15 proposed fish window.* (36773 Somers; 10035 Yuill.) The applicant has not determined

*Optimal construction time when there will be least damaging effects to fish

that it is feasible to accomplish all of the smaller stream crossings within such a 90 day period. As an example, 56 streams are crossed between Stanwood and Snoqualmie Pass. (10035 Yuill.) To the extent that the applicant's construction activities on the smaller streams extend outside the proposed fish window, sedimentation impacts on the fishery on such streams will be increased accordingly.

11. The applicant suggests that if construction of the major stream crossings occurs between June 15 and September 15, the impacts of construction activities and sedimentation upon the anadromous fishery and its habitat will be minimized. (9465, 10012 Yuill.)

12. There will be impacts upon the fishery from construction during the fish window. (36432 Somers.) Juvenile rearing of anadromous salmonid species occurs on a year-round basis in the streams and rivers the applicant proposes to cross.

13. Summer steelhead spawn February through June; winter steelhead spawn from December through June. Chum spawn during December and January. Pinks spawn during September and October. Coho spawn from October through January. Summer and fall chinooks spawn during September-November. Spring chinooks spawn during August-October. There is only a short period during the year when spawning is not actually occurring in the streams

Northern Tier proposes to cross. Vital activities other than spawning occur throughout the summer. For example, spring chinook migrate upstream from May-August, and summer and fall chinook migrate upstream from July-October. Coho migrate upstream from July-December. Pinks migrate upstream from July-October. Chum migrate upstream from August-January. Summer steelhead migrate upstream from August-October. Winter steelhead migrate upstream from November to June. (36432-3, 36433 Somers)

14. If spawning occurs before water flows can adequately cleanse siltation from streams, fishery losses may occur due to the presence of fines (small-grained sediments). (10010, 10032 Yuill.) Flows sufficient to flush construction fines from streams may not occur in drier years. (10032 Yuill.)

15. A few days' delay in upstream migration has been known to reduce the productivity of some runs. In addition to delays caused by avoidance of high turbidity and suspended sediment concentrations, (36801 Somers) some fish would likely be delayed by actual in-stream construction activity. (36801 Somers.)

16. Intra-gravel development of eggs, alevin, and fry occur throughout the year. (36433 Somers.)

17. Since suitability of gravel for spawning, survival of incubating eggs, and emergent ability of salmon fry all depend on the percentage of fines in stream gravels, and since many of these streams are already impacted from sediment loads from other sources, the marginal impact from additional sediments contributed by construction and/or erosion may in some cases render habitat unusable or reduce its suitability for use.

Wildlife

18. Adverse wildlife impacts can be reduced by timing and locating construction to avoid critical habitat and critical periods of nesting, reproduction or winter stress. (Stendal p.8)

19. Important marine mammal reproductive periods occur from May through August. (Everitt p. 27) Sea lions would be most vulnerable to construction impacts in the winter. (Everitt p. 22) The time of greatest vulnerability for cetaceans (e.g., whales, porpoises, dolphins) is probably in late spring and summer. (Everitt p. 20)

20. Winter months are most critical for whistling and trumpeter swans. (Leschner p. 30)

21. The timing of the proposed construction activities on the onshore storage site and the pipeline route could be scheduled to reduce interference with critical activities of eagles. (Leschner p. 22)

22. Peak elk use of the Colockum extends from October through June. Fewer elk use the Colockum in summer. Deer are year-round residents on most of the Colockum HMA. (Perry p. 51) See Section III.H. Habitat-Habitat Management Areas, for further discussion on the Colockum HMA.

23. Pipeline construction during the hunting season (mid-October to mid-January) would isolate the parking lot of the Skagit HMA at Davis Slough from the adjacent public hunting area on Skagit Bay. To reduce adverse impacts on waterfowl and visitors, construction near the Skagit HMA would best be scheduled from June through August . (Jeffrey, p. 12)

24. Waterfowl use in the Skagit-Port Susan area is greatest during fall and winter. Snow geese are most numerous in January (Jeffrey PFT p. 4, 5).

25. The critical nesting period for raptors in eastern Washington extends from March through June (Pineo PFT p. 19).

III. K. RIVERS AND STREAMS

Impacts on Fish*

1. All of the rivers and streams crossed by the proposed Northern Tier pipeline in western Washington support important anadromous fish runs and other fish stocks. Coho salmon are found in each stream. Some of the streams also contain other species of salmon such as chinook, pink and chum, as well as trout.

2. Two rivers on the route in eastern Washington, the Yakima and the Columbia, have economically important salmon runs. The Yakima River supports runs of spring and fall chinook and coho salmon. The Columbia River and its tributaries above the confluence of the Yakima support runs of spring, summer and fall chinook, coho and sockeye salmon. Current production from the Yakima and Columbia River (catch plus escapement) is severely reduced. Natural production in tributaries accounts for the entire sockeye salmon run. The depressed state of Columbia River salmon stocks since development of the river make the remaining fish more critical than most prices would indicate.

*See also Section III.H. Habitat, and Section III.J. Construction Timing Impacts.

3. There are five environmental conditions essential for the survival of anadromous fish: (1) access to and from the sea, (2) an adequate supply of good-quality water, (3) a sufficient amount of suitable gravel for spawning and egg incubation, (4) an ample supply of food, and (5) sufficient shelter.

4. The applicant applied for a corridor, first two miles wide, then half a mile wide. The applicant had an obligation to generally describe physical and biological circumstances across the width of the corridor. The applicant did not meet this obligation. The applicant's failure to describe the corridor prevents specific quantification of impacts reasonably anticipated from construction because important factors often change dramatically within the corridor. This is true of the factors affecting quantities of sediment to be produced; expected zones of impact; assessment of the fisheries resource and habitat; and habitat use within expected zones of impact. (36427-29; 36821 Somers; 36214-16 Norman).

5. Anadromous fish spawn in intermittent streams the applicant proposes to cross. (10016 Yuill; 36741 Somers). The applicant did not identify such streams. (10016-18 Yuill).

6. Organic soil sediments from stream crossings which settle in gravels may decompose, creating a high oxygen

demand that can be lethal to invertebrates and developing fish embryos during spawning and rearing. (36423 Somers).

7. An analysis performed at the centerline of the proposed corridor for the Armstrong Creek crossing estimates the amount of sediment to be introduced into Armstrong Creek from trench excavation at 65 cubic yards. (36227-8 -36227-9 Norman). The introduction of this amount of material into the creek will cause substantial damage to fishery habitat and fish which use that stream. (36430 Somers). Because of moderate fine levels, the Armstrong Creek sediment estimate may be low compared to other streams. (36430-31 Somers).

8. Salmon and other fish species use rivers and streams year-round for spawning, intra-gravel development, rearing, feeding and transport. Salmon and other fish species can be adversely affected by suspended and settleable solids. Direct effects include suffocation of embryos or alevins; mechanical injury of eggs or fish; damage to gills; egg and fry loss through streambed erosion; feeding difficulties; delay of upstream adult migration; and adverse impacts on spawning success. Some indirect effects would be decreased cover, phytoplankton and insects; and increased water temperature, siltation and turbidity.

9. The development stage from egg to fry is especially vulnerable to environmental perturbations. Impacts on early stages (eggs and alevins) from in-stream construction can be mitigated, in part, by the timing of construction activities. The extent of intra-gravel deposition of fine material resulting from sediment released during construction is a crucial factor affecting future pre-emergent survival. As the percentage of fine material deposited increases, survival to emergence decreases. A five percent increase in fine sediment can cause a 19 percent decrease in survival to emergence of coho salmon fry. For a deposition of 16.1 percent fine material (material of less than 0.8 mm), pre-emergent fry survival approaches zero. If the sediment comprises 50 percent of the bottom material, survival to emergency decreases by 70 percent. (Eldred, p. 12, 21).

10. Coho and some chinook fry reside in streams a year after emerging from spawning gravel. Coho use shallow, low flow streams for spawning and rearing. Sediment deposited in spawning gravel of the smaller streams may not be easily washed out by higher water flows because of the limited capacity of these streams. Where sedimentation is washed out of the original deposit area, it can be redeposited in downstream spawning or rearing areas. (Sommers, PFT, p. 55)

11. Losses of spawned eggs resulting from erosion were observed in Washington after construction of the El Paso natural gas pipeline. During construction of the Trans Alaska Pipeline System, studies indicated that sedimentation associated with pipeline construction affected both spawning downstream (Sommers, PFT, p. 42-44) and the food chain. (Sommers, PFT, p. 45-46). Fishery resource impacts occurred from these projects despite environmental controls.

Cumulative Impacts on Fish

12. The applicant's environmental analysis does not address the existence or extent of background stresses to fish. (34302 Kay; 36453-54 Somers). The applicant's analysis did not evaluate the cumulative impacts to the fishery and habitat that would result from construction, and did not combine analysis of construction and background stress. (34302 Kay; 36453-56 Somers). The cumulative impacts to the fishery and fishery habitat from construction as proposed by Northern Tier could range from mild to severe.

Applicant's Pipeline Construction Methodology

13. The information, analysis and commitments given by the applicant do not provide a sufficient basis to ensure that adverse effects to the aquatic resources of the state will

be minimized by pipeline construction near or in rivers or streams.

14. Northern Tier proposes to use the buried pipeline construction method for river and stream crossings in western Washington. This method involves excavation of a trench in the bottom of each river and stream to below the scour depth, installation of the pipeline in the trench, and backfilling.

15. At each crossing site there will be right-of-way clearing. Such clearing involves removal of vegetative cover for at least the width of the right-of-way area. (Somers 36785)

16. A reasonable minimum design/construction criterion for all river and stream crossings in Washington is that the pipe be sufficiently protected to avoid exposure from a 100 year flood.(Garland PFT 3/1-3). In order to achieve this level of safety, the applicant proposes to bury the top of the pipeline four feet below the estimated maximum scour depth calculated for a 100-year flood condition. (Koloski PFT 5/27/29, p. 7/1-9).

17. Another important minimum design/construction criterion is that this maximum subchannel burial depth be continued a sufficient distance on either side of every stream to prevent exposure of pipe due to lateral channel migration or

avulsion. (Garland PFT 11/16-12/14; Koloski PFT 11/4-7, 15-28).

18. Northern Tier's consultants used three methods to calculate maximum scour depths: the measurement of the elevation of the deepest pool which could migrate downstream; the depth of embedment of the largest free-moving object transported downstream by bedload transport process; and a calculation of one-third the difference between water surface elevation of a river at ordinary low water and at the 100-year flood level. (Koloski PFT 6/14-29).

These methods are not adequate in every case and, in some cases, may underestimate scour potential by several feet (Garland PFT 5/5-7/11, 10/11-11/12). Some of the deficiencies inherent in these methods are as follows:

(a) Deepest pool method. The bottoms of pools often scour during floods. A measurement of the bottom of a pool taken during low flow is not a reliable measure of the depth that the pool may attain during a flood. Pools are also more likely to migrate laterally than downstream.

(b) Embedment of largest free-moving object. Objects visible in a stream bed may have been transported as a result of earlier floods, or they may not. Objects which are

true indicators of deeper scour levels may not be visible on the surface.

(c) One-third rule. No data on western Washington rivers for the one-third ratio were provided. Data from rivers elsewhere in the United States suggest scour depths ranging from .16 to 1.75 times the elevation difference. Data from streams in the southwestern United States (which are similar to some streams in eastern Washington) suggest scour depths of up to four times the elevation difference.

The one-third method also leaves out major variables such as sediment load, channel configuration, and bottom roughness and composition. All of these variables may influence scour depth and should be verified from one river to another if the one-third ratio is applied uniformly.

19. Other, more precise methods for calculating scour are available and should be used. One of these is the "tractive force method," already tested by Northern Tier in Idaho and Montana (37026/16-37027/12). To solve the equations used in this calculation, it is necessary to have more data than have been provided by the applicant on channel configuration, the nature of the bottom materials, velocities, time periods, and sediment load during an expected flood event.

20. Design flood parameters used for the TransAlaska Pipeline, the proposed Northwest Alaska Gas Pipeline, and the (now defunct) Canadian Arctic Gas Pipeline were considerably higher than those proposed by Northern Tier. The design floods presented by applicant are not conservative. (TR 36010-11, 36142-43).

21. Insuring riprap protection only over the area disturbed plus 50 feet, as NTPC proposes, may not be adequate to prevent outflanking on the west bank of the South Fork Stillaguamish River. (TR 36008)

22. No design criteria exist to assure that alignment will be based upon locations least stressful to fisheries or least likely to create erosion control problems. (TR 36478).

23. The applicant did not use on-site soil sampling for its siltation estimates. Instead, bottom and bank soils were estimated from soil maps and well logs. The usefulness of well logs depends upon the similarity between well alluvium and conditions at the crossing site. Soil maps yield only crude estimates of erodability; percentages of erodable material out of total volume may be misjudged by 20% or 30% (36206-07 Norman). The applicant has significantly underestimated the actual sediment loads that will be produced from construction at the major river crossings. (36211-14 Norman).

24. The distinction between major and minor rivers made by NTPC does not refer to environmental significance or degree of potential impact; it refers only to physical size. Rivers approximately 100 feet wide are called major rivers. (TR 6481 Sandmeyer).

Drainage Structures

25. Crossing rivers and streams with heavy construction equipment will require bridges, culverts, or other drainage structures. Unless designed and placed carefully, such structures can serve as barriers to fish passage, will act to channelize a stream and, if their capacity is exceeded, will contribute to road washout, with resultant erosion and siltation. Poorly designed or placed drainage structures can induce hydrogeologic changes, such as increases in stream velocity. Velocity increases cause abnormal cutting of banks and channel migration, increasing sedimentation and filling or scouring of spawning and rearing areas. Stream bed excavation associated with culvert installation and ford construction can cause excessive siltation. Approaches to such structures may involve cutting down the stream banks, which causes sedimentation. Fill material around culverts can slump, causing siltation and blockage of the culvert. (Sommers, PFT, p. 65-66).

26. The applicant did not analyze impacts associated with various types of drainage structures. Most smaller streams on the route do not have a recorded history of flow conditions or drainage structures. On TAPS, the use of empirical formulae to calculate drainage information resulted in significant underestimates. This, in turn, resulted in the use of drainage structures which were undersized and sometimes inadequate to pass even normal high water flows (Sommers, PFT, p. 65-66).

Tulalip Tribes' River and Stream Concerns*

27. The Tulalip Tribes have an active interest in all projects that will damage, or have the potential for damaging, the treaty fishery. (36388 Somers). The proposed pipeline crosses usual and accustomed areas of the Tulalip Tribes, and may affect fish migrating to and from those areas. The proposed pipeline would cross approximately 56 streams within the Stillaguamish, Snohomish, Snoqualmie, and Skykomish River systems between Stanwood and Snoqualmie Pass. All these streams are important to the Tulalip fishery. Approximately 35 contain anadromous fish runs. The remainder are tributaries of streams which contain anadromous fish runs. Approximately 80-90% of the fish the Tulalips harvest are generated by these streams. (36388, 36407-08 Somers; Ex. 717 Table 1, Figure 4).

*See also Section III.E. Tribal Concerns

28. The rivers and streams within, or which serve fish migrating through, the Tulalip Tribes' usual and accustomed fishing areas, have experienced environmental degradation and habitat deterioration. Natural fish runs have declined in these river systems. Both the Stillaguamish and Snohomish River systems are producing fish far below prior capacities. Several degraded areas are downstream from proposed Northern Tier crossing sites. Northern Tier impacts could contribute, cumulatively, to a worsening of water quality problems. Fewer fish may then be available to a larger number of tribal members. (36384 Somers).

29. Fish harvest management biologists set escapement levels for anadromous runs at a level necessary to sustain present habitat capacity. If further decreases in production occur, they are perpetuated within the system. The present escapement levels allowed are insufficient to provide for "extra" fish to revive a depleted area. (36385, 36749-50 Somers). While the Snohomish and Stillaguamish River systems are considered to be at present habitat-carrying capacity for coho, they are far below present habitat-carrying capacity for chum and pink salmon. (36750 Somers). These systems are presently managed for natural production. There are no major hatchery facilities on either river. It would be extremely difficult, if not impossible, to rehabilitate any destroyed runs using native stocks.

30. A major portion of the chum and pink salmon spawning grounds on the Little Pilchuck, North and South Forks of the Stillaguamish, the Skykomish River, and the Snoqualmie River is located downstream of the proposed Northern Tier pipeline. (36385-86 Somers).

31. The Tulalip Tribes are involved in efforts to enhance native anadromous fish stocks supported by the Snohomish and Stillaguamish River systems. (36750 Somers). Hatchery fish are less desirable and more expensive than native fish. (36752 Somers).

32. The marine harvest must take place at a rate which protects natural fish runs by assuring adequate natural escapement. Any decrease in natural production forces a decline in hatchery harvest. (36454-55 Somers).

King County

33. Using Northern Tier's methodology, all river and stream crossings in King County, except the South Fork Snoqualmie, have a potentially high sensitivity to sedimentation. (TR 37668).

III. L. SOCIOECONOMIC IMPACTS

1. The total employment for the ten counties along the proposed route in 1977 was 830,500. The unemployment rate in the ten-county region as a whole was 8.4% in 1977. (Applic. III, Sec. 1.22.3.1) The 1976 average wage in the ten county region was $11,819. (Applic. III, Sec. 1.22.3.1) Assuming average land values and an average permanent pipeline corridor width of 75 feet, the 1978 assessed valuation of the proposed route is approximately $2.7 million (1978 dollars). (Applic. III, Sec. 1.22.3.1) Total employment in the ten county region may increase to 1,053,097 in 1995. (Applic. III, Sec. 1.22.3.1)

Clallam County and Port Angeles

2. Manufacturing, tourism, and fishing are the basis of the Clallam County economy. Forest products, tourism and commercial fishing provided either direct or indirect employment for an estimated 10,640 to 11,280 persons in 1976. (Applic. III, Sec. 1.22.2.1) The 1975 per capita income in Clallam County was $5,650. (Applic. III, Sec. 1.22.2.1)

3. Total Clallam County employment was 16,450 in 1977. Unemployment in the County is seasonal and is highest during winter months. The variation reflects the County's dependence on the forest products industry, fisheries and tour-

ism. At present, Clallam County unemployment is high (up to 20%) due to a slow-down in the forest products industry. Future employment in the County will likely continue to vary seasonally. (TR 26304 Cleland;) (Applic. III, Sec. 1.22.2.1)

4. The County's total employment has been estimated at 18,002 in 1982 and 21,084 in 1995. The average employment growth rate between 1976 and 1995 is estimated to be 2.0% (Applic. III, Sec. 1.22.2.1-2)

5. The site of the proposed tanker unloading facilities is currently not assessed for property taxes because it is public property. The tidelands and harbor areas to be used by Northern Tier are currently either leased by the Department of Natural Resources to Crown Zellerbach and Peninsula Plywood or not leased at all. The 1.5 acre area on Ediz Hook proposed for project parking and security facilities is owned by the federal government, leased to Port Angeles, and subleased to Crown Zellerbach, which pays leasehold excise tax. (Applic. III, Sec. 1.22.2.1)

6. The Green Point site owned by Northern Tier and proposed for the onshore storage facilities had an assessed valuation of $210,972 and a tax liability of $3,215 in 1978. (Applic. III, Sec. 1.22.2.1)

7. Construction activities will involve an expenditure by Northern Tier of $167.6 million in this county (1978 dollars). This expenditure will confer some positive economic benefits, primarily in the form of increased jobs, income, and taxes. (TR 11665 Moriyama)

8. Construction activities will result in approximately 600 primary jobs in Clallam County during the 22 month period. 500 additional secondary jobs would be created in Clallam County during this period. At the peak of construction, the total number of direct and indirect jobs in the county is estimated to be 750. (TR 11665-66 Moriyama)

9. Primary construction wage payments for work performed in Clallam County will total $25.4 million based on 1978 wage scales. Secondary employment opportunities resulting from construction activities in Clallam County will generate an additional $14.9 million in wage payments statewide, $8 million of which will be associated with secondary jobs in Clallam County. (TR 11666 Moriyama) It is estimated that Clallam County expenditures by all workers during the construction period would total about $11.2 million, or approximately 33% of total wages received. (TR 11667-68 Moriyama)

10. A potential negative impact from construction is that some existing employers (industries in the county) may

lose certain skilled workers to the project because of the project's competitive salaries.

11. Other potential impacts include loss of some log storage, the disruption of log storage operations in Port Angeles Harbor, permanent loss of timber land due to clearing the site of the onshore storage facilities and potential decreases in residential land values directly adjacent to the tank farm.

12. Based on 1978 tax data, approximately $7.7 million will be paid in state and local sales taxes during the construction period. The state will receive approximately $6,930,000 of the total revenue. Clallam County will receive $710,000, while Port Angeles will receive $57,800. (TR 11668 Moriyama)

13. During construction of the marine terminal and submarine pipeline, applicant will pay an annual leasehold excise tax on all leases of public property. The onshore storage facilities and the on-land pipeline will not be subject to this tax. The annual revenue to be derived from the leasehold excise tax will depend on the price in the lease agreement to be negotiated between the applicant and the governmental entity involved. (TR 11668-69 Moriyama)

14. During construction, the applicant's property tax liability will increase as each of the project components is completed. (TR 11669-70 Moriyama)

15. A total of 124 primary and secondary jobs will be created in the county as a result of the marine terminal operations. Yearly operations will generate close to $3.9 million (1978 dollars) in wages paid directly to Northern Tier employees and resident tanker crew members and indirectly to the secondary work force. Approximately $1.9 million (1978 dollars) of these wages will be paid to residents of Clallam County. (TR 11672-73 Moriyama) Should Northern Tier locate its national headquarters at Port Angeles, approximately 40 additional jobs with a payroll of approximately $1,000,000 per year can be anticipated.

16. In 1978 dollars, supply purchases for the marine terminal will be about $220,000 annually and will generate $9,900 in sales tax revenues for the State. Local governments will receive an additional $1,100 each year from the sales tax. Further local sales tax revenues will be generated by employees' expenditures. (TR 11673-74 Moriyama)

17. Northern Tier would be required to pay an annual 1.8% public utility tax to the state on gross income derived from pipeline operations. (TR 11674 Moriyama)

18. Assuming 1978 tax rates, the project components would generate approximately $2.4 million in property taxes. (This estimated property tax liability does not take into account the effect of the special school funding limitation which was imposed in response to Washington's Basic Education Act of 1977.) (TR 11674-75 Moriyama)

19. Normal marine terminal operations should have little measurable effect on the commercial fishing industry, on most of the marine resources on which the industry depends, or on agriculture or forestry uses. (TR 11676 Moriyama)

20. Normal operation of the marine terminal and pipeline in Clallam County should not materially affect local land values, with the possible exception of land near the on-shore storage facilities site. Shoreline property should be unaffected by normal operations. The only expected adverse effect on shoreline property values would be from a major oil spill. (TR 11676-77 Moriyama)

Jefferson, Island, Snohomish
King and Kittitas Counties

21. Based on 1978 costs (exclusive of state and local taxes), activities outside Clallam County will involve an estimated expenditure of over $313 million by Northern Tier.

(TR 12693-94 Moriyama) Construction activities will create an estimated total of nearly 1,100 primary jobs. During the peak period of construction, the total number of primary and secondary jobs is estimated to be around 2,650. (TR 12694 Moriyama) Construction wage payments are expected to total $42 million (1978 dollars). Secondary jobs are expected to generate an additional $23.6 million in wage payments. (TR 12695 Moriyama) Approximately $14.7 million (1978 dollars) should be paid in state and local sales taxes during the construction period; the state will receive approximately 90% of the total revenue, and the counties 10%. (TR 12696 Moriyama; Applic. III, Sec. 2.22.3.1)

22. On the basis of the assessed valuation, an estimated $295 million, the pipeline will generate approximately $4 million (1978 dollars) in property taxes outside Clallam County during its first year of operation. (TR 12701-03 Moriyama)

23. The construction may create certain adverse economic impacts. A temporary diversion of tourist expenditures in Island and Jefferson Counties may occur. Other adverse impacts include the permanent loss of timber land and the potential loss of fish and shellfish.

24. Operation of the pipeline outside Clallam County will create nine new jobs. Nine employees will staff the Spokane

District Office. Direct employment opportunities will create indirect jobs in the region. (TR 12700 Moriyama)

III. M. TRANSPORTATION

1. Heavy industrial and logging activities in Port Angeles and its environs result in a high proportion of truck traffic on area roads. (Applic. III, Sec. 1.14.2.4)

2. During peak tourist season, considerable congestion occurs on U.S. 101 along Lincoln, First, and Front Streets, and in the downtown area near Laurel and Oak Streets. A major traffic problem is Marine Drive which passes through a narrow restricted opening between Crown Zellerbach plant buildings, crosses numerous railroad tracks, and carries heavy intraplant traffic. It is the only land access to Ediz Hook. (Applic. III, Sec. 1.14.2.6)

3. The only rail service in Port Angeles runs from east to west along the shoreline, providing access to industries. (Applic. III, Sec. 1.14.2.7)

4. Road access to Green Point and the tank farm site is by an east-west county road connecting to U.S. 101. The other significant roadway is the Old Olympic Highway, a two-lane road that originates at U.S. 101 and proceeds northeasterly toward Green Point before turning east toward Agnew. There are a number of narrow collector and local roadways from the Agnew cutoff that provide limited access to Green Point.

The Agnew cutoff is occasionally subject to icing in winter months. (Applic. III, Sec. 1.14.3.1)

5. No serious traffic congestion problems occur on Clallam County highways outside the city of Port Angeles. (Applic. III, Sec. 1.14.3.3, 1.14.3.4)

6. Construction of the Northern Tier terminal on Ediz Hook will create substantial land transportation impacts on the City of Port Angeles. These will include construction worker travel; heavy use of access and haul routes (forty one-way truck trips per day minimum); and traffic controls at intersections throughout the City. This will result in the need to upgrade, maintain and restore the Ediz Hook road. (Pittis, TR 26117-21)

7. Northern Tier has proposed certain measures to diminish these impacts, such as timing of shifts and traffic, carpooling, and the use of rail and barge for transporting materials. An agreement reached between the City of Port Angeles and Northern Tier contains certain transportation mitigation measures including a provision requiring Northern Tier to restore the Ediz Hook Road.

8. Northern Tier has not provided sufficient information on sources of supplies and haul routes to assess land

transportation impacts. (Leach, TR 26136-37; 26217-8) Northern Tier has significantly underestimated the gravel requirements due to drainage and soil conditions at the proposed Green Point tank farm. (Leach, TR 26137)

9. The access routes to the tank farm are inadequate to handle the heavy truck traffic required to haul construction materials. (Leach, TR 26138-39) The Old Olympic Highway and Port Williams Road are narrow and without sufficient ballast to handle the anticipated sustained heavy loads from construction. (Leach, TR 26226) Both roads should be rebuilt to current design standards to avoid traffic disruption. (Leach, TR 26139-40)

10. There is inadequate sight distance at the place where Northern Tier proposes an intersection of its tank farm access road with the Old Olympic Highway. (Leach, TR 26140-41) Northern Tier truck and general construction traffic will require road redesign, upgrading, maintenance and restoration. Clallam County places conditions on permit holders for the development of log yards which require the holders to build or reconstruct county roads before construction of yards in order to accommodate the impacts of heavy equipment traffic. (Leach, TR 26204-05) Clallam County and Northern Tier have agreed on a procedure for studying and attempting to resolve land transportation problems.

11. The existing railroad will likely deliver some construction materials to Green Point. (TR 12349-50 Fitzroy)

12. Operational traffic to and from the project in general will, under normal conditions, have little impact.

13. All pipe for the submarine pipeline is to be shipped by tandem barge to the lay barge. No overland truck or rail transport should be required. The potential impact on marine traffic in Admiralty Inlet and Saratoga Passage is negligible. Traffic problems may occur at the entrance to Port Angeles Harbor. (Applic. III, Sec. 2.14.2.1)

14. During pipeline construction, traffic impacts in any local area will be less than might be indicated by the amount of time the peak work force is estimated to be in the county. This is because each work force will move along the route in a pipeline "spread," so that traffic impacts will occur at different places and times as work progresses. (TR 12811-12 Olender) In most cases, existing highways will be adequate to accommodate the additional traffic. For a few roadway segments, the increased construction traffic may cause a significant short-term impact. To lessen the impacts of the increased traffic volume during construction, Northern Tier will cooperate with state and local authorities. Efforts will include rerouting traffic, encouraging carpooling or vanpooling among

employees and contractors, and scheduling deliveries or shifts to avoid local peak periods. (TR 12812-13 Olender)

15. The major state highways (in terms of traffic volume) that will be crossed by the pipeline system include: S.R. 20 in Island County; I-5 (south of the junction with S.R. 532) and U.S. 2 (east of S.R.9) in Snohomish County; U.S. 10 (about three miles southeast of North Bend) and I-90 (near the entrance of Snoqualmie National Forest) in King County, in Kittitas County, and (about 2.5 miles west of Sprague) in Lincoln County. (TR 12361 Fitzroy) Crossing at all major highways and improved roads will be accomplished by boring underneath them. Unpaved roads will be traversed by using the cut and cover method of construction. Northern Tier is committed to several measures to expedite traffic flow in the affected areas. These measures include (1) ensuring that for those roadways where the cut and cover method is used at least half of the roadway will be kept open at all times and (2) advising local traffic enforcement agencies about construction and delivery schedules, especially in the event of overweight or oversized loads. (TR 12361 Fitzroy; TR 12810-12 Olender; TR 12817 Crutcher)

16. Northern Tier will cooperate with the Department of Transportation and local agencies to minimize construction-related traffic problems or damage to roadway surfaces. Prior to constructing a crossing of any county roadway, Northern Tier

will submit its plans to appropriate local agencies for review and comment and will cooperate with these agencies in developing appropriate techniques for mitigation of construction impacts.

17. The majority of Island County roads have limited lane width and narrow shoulders. Base and surfacing for these roads is for low-volume light traffic. There are few north-south trending roads. (TR 35439, 35440)

18. Pipeline construction traffic would effectively compress the equivalent of many years road usage into a few weeks. In freeze-thaw or wet conditions, this intense heavy usage has the potential for destroying roads. Usage during dry weather may result in appreciable wear on the roadway surfaces. (TR 35440) A typical mile of 30-foot-wide roadway with average daily traffic of 400 cars or less costs $150,000 to $200,000. (TR 35440)

19. S.R. 20 on Whidbey Island normally carries a heavy volume of tourist traffic in the summer.

20. Agreements referenced as follows in Section VI.-Stipulations of this Order contain substantial mitigation measures:

Finding 1(c) (Lincoln County)
Finding 1(d) (Spokane County)
Finding 1(e) (Adams County)
Finding 1(i) (Grant County)
Finding 1(l) (King County)
Finding 1(m) (Kittitas County)
Finding 1(r) (Clallam County)

III. N. POPULATION AND HOUSING

Clallam County

1. Clallam County had an estimated population of 46,000 in 1979. About 40% of the population resides in Port Angeles, and about 11% lives in the communities of Sequim and Forks. The remaining population lives in unincorporated sections of the county, primarily along the northern quarter between the Strait of Juan de Fuca and Olympic National Park. Since much land within the county is publicly owned, the effective average density of Clallam County is greater than it appears. (Applic. III, Sec. 1.12.2.1; TR 11632-33 Moriyama; Ex. 424)

2. Construction of the Northern Tier project in Clallam County will result in the in-migration of a new population consisting of primary and secondary workers and their families. (Hansen, TR 28124-25)

3. Northern Tier predictions and Urban Institute forecasts of construction-related population impacts on Clallam County use the same assumptions as to length of construction period, absence of delays or stoppages, and project costs and components. Northern Tier predicts a 910 person average increase and 1561 person peak increase. The Urban Institute forecasts a 1431 person average and 1891 person peak increase. Northern Tier's labor share estimates are less than half that experienced

by comparable projects; the Urban Institute forecasts are also significantly lower, though higher than Northern Tier's. (Beasley, Hansen, Moriyama) Both estimates leave out significant numbers of people who will work on the project, such as inspectors, project managers and engineers.

4. Various occurrences, including changes in project costs; unexpected construction difficulties; overlapping construction time periods; delays in the construction process; a higher percentage of non-local pipeline or construction workers; or a decision to add a third berth, additional storage tanks or other facilities in the first phase of the project; could result in higher average and peak populations. (Hansen, TR 28137-39; Moriyama, Ex. 131) (Beasley) Pre-construction estimates of total work force for other energy projects have been substantially exceeded in practice.

5. The risk of a low estimate falls on the local governments and agencies which must provide local services for the new population and project. The public services most sensitive to population changes are housing, police and fire services, park and recreational facilities, public utilities, medical facilities and schools. The expansion of most of these services requires considerable planning lead time. (Hansen, TR 28140-43) A 25% population increase over the Urban Institute forecast is reasonable for planning purposes.

6. Northern Tier predictions and Urban Institute forecasts differ on the Clallam County housing demand which would be created by a construction population influx, and on the ability of the area housing supply to accommodate that demand. There is historically a significant frictional component* in Clallam County. Northern Tier's prediction assumed no frictional component; the Urban Institute's forecast did. The Urban Institute's transient housing survey was later and more comprehensive than Northern Tier's. The Urban Institute's rental share of available housing was lower, as was its worker-per-unit prediction. The summer transient housing vacancy rate is historically 2.1%. Increases in non-local workers over levels expected would increase deficits. The Urban Institute's forecast is for a 402 unit year round deficit and a 601 unit peak deficit in Clallam County.

7. Adverse impacts from a housing shortage include an increase in the cost of all housing, especially low income housing, and competition between workers and tourists for transient housing.

8. Northern Tier did not study the marketplace's ability to respond to the housing demand by providing new housing.

*Units vacant but not available for occupancy, e.g. apartments being renovated

9. Requiring Northern Tier to provide new temporary housing in response to the anticipated average and peak demands would alleviate many but not all impacts.

10. During operations, Northern Tier-related housing demand would be small.

Island County

11. The U.S. Naval Air Station on Whidbey Island is currently undertaking a substantial housing renovation project involving the total rehabilitation of some 1,200 single-family housing units. This project will commence in October 1981 and is scheduled to continue through January, 1985. This project will involve an estimated seven percent of the 1980 housing stock on Whidbey Island. The renovation of approximately 300 housing units per year is anticipated, resulting in the need for the community to absorb naval families into the private housing sector. (TR 35783) Between 100 and 150 families will be seeking to locate in off-base housing by the summer of 1981. (TR 35783, 35784) It would be difficult for the community to absorb more than 250 new families into the private housing sector. (TR 35784)

12. Applicant has proposed to undertake its project on Northern Whidbey Island at the same time as the navy's

housing renovation. Applicant has not presented any substantive proposals to house its workers, their dependents, or any others attracted to the project. (TR 35785)

13. The applicant has indicated that the total direct and indirect population influx generated by the pipeline-related work force will be approximately 548 people during the summer peak. No information exists on how these people will be adequately housed. (TR 35786.) The pipeline-related population cannot be absorbed into the Island County community without significant social and economic impacts. Housing supply in particular, poses problems. (TR 35787)

King County

14. Using 1980 census data for household size, and Northern Tier and draft SEPA EIS data on population influx as a result of pipeline construction, between 300 and 350 additional King County households would be created as a result of pipeline construction. (TR 38029) In Bellevue and the Bellevue I-405 corridor, there are only about 200 to 280 units of temporary lodging, with substantially less available from June to October. (TR 38029-30). Due to the lack of vacancies in apartments and mobile home parks, pipeline construction workers may be expected to take over most temporary housing (motel/hotel) in the area. (TR 38031-32)

15. Pipeline construction would create the greatest housing impact on areas within 30 to 40 minutes driving time of the pipeline route, i.e., the area north of I-90 and east of Lake Washington. (TR 38028)

All Counties

16. Submarine pipeline construction, if conducted as described, would not produce a population impact.

17. The population of 14 counties would increase during construction periods. Some cities and towns would be adversely affected by population influx, but impacts will likely be short-term.

18. Applicant has committed to a preconstruction housing survey along the pipeline route in the state. Applicant has already studied 12 cities and towns it expects would experience 5% or greater worker-related population increases. In many areas, housing supply should exceed demand.

III. O. PUBLIC SERVICES AND UTILITIES (EXCLUDING ELECTRIC SUPPLY)

Clallam and Jefferson Counties - Law enforcement

1. The area to be impacted by the Northern Tier project is served by five local law enforcement agencies. These are the Port Angeles Police Department, the Port Townsend Police Department, the Sequim Police Department, the Clallam County Sheriff's Department and the Jefferson County Sheriff's Department. The Port Angeles Police Department and the Clallam County Sheriff's Department are understaffed in relation to national averages . (TR 11761 Meyers; Applic. III, Table III-2.15-1)

2. Construction-related population growth will increase adverse effects on law enforcement beyond any caused by existing staff shortages of the Port Angeles Police Department and the Clallam County Sheriff's Department. The construction population will also cause the police-to-resident ratio in Sequim to fall slightly below the national average for towns of similar size.

3. Major construction projects create a greater need for law enforcement services than would be indicated solely by the number of people attracted to areas by such projects. Traffic and related problems will be created, as may civil and

criminal disturbances. The number of workers employed will not remain constant during the construction period. The number of workers at their jobs will fluctuate during peak and slack periods and this may be reflected in law enforcement needs. It is expected that job-seekers will outnumber jobs.

4. Normal operation of the project would not cause significant population-induced demands on law enforcement. Abnormal incidents, such as fires, explosions, and spills, would create intense, but temporary demands for law enforcement services.

Other Counties - Law enforcement

5. The law enforcement capabilities of communities along the route would be strained during construction. In most cases, these effects will be short term. Severe pressure will be put on Island County, in part because the sheriff's department is already understaffed. Pipeline operational impacts on law enforcement capability should be minimal under normal operating circumstances.

Clallam County - Other Public Services

6. The Northern Tier would have substantial impacts on water, sewer, and solid waste-related services in Clallam

County. Northern Tier has not specified solid waste disposal sites for dredge spoils or hazardous waste, and has not dealt with the disposal of effluent from its proposed septic and sewer systems. Under certain conditions, Local Utility District No. 1 may be able to serve the tank farm's permanent needs, obviating any requirement for development of a new source.

7. The telephone company appears able to accommodate expected growth.

8. Clallam County and the City of Port Angeles will not be able to provide adequate emergency service response to a Northern Tier-related spill, fire, or explosion.

9. Additional children would be added to the Port Angeles and Sequim school districts during construction of the proposed project. The state's Basic Education Act does not cover all the impacts. Portable classrooms do not provide as high quality an educational environment as do permanent facilities. Six months lead time for school facilities and personnel is required.

Medical Services

10. There is an existing and projected need for more Clallam County mental health, drug and alcohol addiction treatment facilities which may be aggravated by the project.

11. Mental health and counseling services in the project area are being used to capacity; service cutbacks are anticipated due to funding problems. The only comprehensive mental health clinic in the region is the Peninsula Counseling Center in Port Angeles which has six full time professionals. The center provides counseling and outpatient treatment for 800 to 900 patient visits per month. The Family Research Center deals with child abuse problems; the case load is currently at the center's capacity. Drug abuse problems are handled by the Community Counseling Center, the Peninsula Counseling Center, or the local hospital. Each of these is operating at maximum levels. The Phoenix House, a service organization to help solve alcohol related problems, is at capacity. (TR 11736-37 Meyers; TR 28359-60 Garlick)

12. In 1977, the number of primary care physicians in Clallam County was 1 per 1,840 residents. A sudden influx of people could strain existing primary care services. (TR Meyers; Applic. III, Sec. 1.15.2.5; TR 28193, 28236 Mather)

13. During construction there may be an increase in highway traffic accidents. (Applic. III, Sec. 2.18.2.1)

14. Six additional hospital beds would be needed in Clallam County as a result of construction. (Applic. III, Sec. 2.18.2.1; TR 28236 Mather) Increased demands on area

hospitals and primary health care and mental health facilities caused by Northern Tier-induced employment during project operation will be small. (Applic. III, Sec. 2.18.2.1)

15. Olympic Memorial Hospital, located on a bluff overlooking the proposed port site, is the only full service hospital in Clallam and Jefferson Counties. The Port Townsend (40 miles away) and Forks (70+ miles away) facilities are not comparable. The hospital is the only medical facility which could provide treatment to persons injured in fires, explosions or other accidents at the berth site.

16. Northern Tier construction and operation will cause a substantial increase in the demand for hospital services on a day-to-day basis.

17. Any evacuation of burn or other patients to Seattle hospitals would depend initially on Coast Guard capabilities. Coast Guard facilities are presently located on Ediz Hook adjacent to the proposed site.

18. Whether or not the Coast Guard facilities would be moved farther from the North Tier site is unknown. Movement of these facilities to a location outside Clallam County would adversely impact the county.

19. Any physical or mental health problems in any one community outside the Olympic Peninsula should be of short duration. (TR 12736 Meyers) All counties studied, except Island County, meet the primary care service standard of one doctor to every 3,500 residents. (Applic. III, Sec. 1.15.3.3) Increases in accidents or injuries and/or demands on health care and emergency room facilities will depend upon local variables. In any particular community along the route, these health impacts should last for less than three months. (Applic. III, Sec. 2.18.4.1)

III. P. ELECTRICAL ENERGY SUPPLY, DEMAND, AND ALTERNATIVES

1. The Northern Tier Pipeline Company proposes to use electricity to pump the crude oil through its entire 1,491-mile pipeline. Current forecasts predict a 99 percent certainty that resources in the region will be unable to meet the anticipated electrical energy load during the project's lifetime even without any consideration of additional demand from Northern Tier.

2. The region's principal supplier of natural gas, a viable alternate fuel for many pump stations, has been for several years unable to sell all the gas it has by contract made available to customers in the state.

3. Northern Tier proposes seven pump and one pressure-reducing stations in Washington, two pump stations in Idaho, and four pump stations in western Montana. All are located within the Bonneville Power Administration (BPA) service area. At 933,000 barrels per day throughput, the facility's average demand within the BPA service area would be approximately 186.9 megawatts. Supplying 186.9 megawatts average demand requires over 293 megawatts nameplate capacity.

4. If regional energy demand increases as anticipated, new resources, in addition to those scheduled to come on line, will have to be acquired to meet the Northern Tier demand. Completion of all generating facilities scheduled to come on line and carrying out of all planned conservation measures will not suffice. The Northwest Power Act, PL 96-501, requires that BPA meet its preference and investor-owned utility customers' demands, but it does not guarantee the availability of resources. Rather, it provides a mechanism for conservation and resource acquisition.

5. Predicted overall regional load growth during the next nine years will be substantially greater than any load increase caused by Northern Tier. However, the addition of Northern Tier demand would increase the probability and magnitude of actual shortfalls during project operation.

6. The current Washington State Energy Office curtailment plan treats a pipeline such as that proposed by Northern Tier as a priority user. The implication of the status accorded Northern Tier is that, should a shortfall occur, Northern Tier would receive its full energy requirements while utilities within the region cut back the amount of energy supplied to non-priority residential, commercial, and industrial customers. The curtailment suffered by non-priority customers in all classes would be greater by the amount needed to meet Northern Tier's demand.

7. The Northwest Power Act requires a determination by BPA that a substantial user of electrical energy is or is not a "new large load" (greater than 10 average megawatts). This determination could be made for the entire Northern Tier proposal or for each individual pump or pressure reduction station. No such determination has been made. "New large loads" are assessed higher rates for the purchase of energy than are other new loads. A new large load customer would pay essentially all capital costs incurred by required new generating capacity. Any portions of the Northern Tier project not designated "new large loads" would be supplied power at a lower melded rate. At such a rate, Northern Tier would pay only a portion of the capital costs incurred in constructing new generating capacity necessary to serve the Northern Tier demand. The balance of these capital costs would be passed to other residential, commercial, and industrial customers.

8. The Northern Tier project will supply 1.11 jobs per megawatt of demand. The statewide average for all industries is approximately 30 jobs per demand megawatt.

9. Northern Tier's demand would impact affected public and private utilities differently. Only Grant County Public Utility District will likely be able to increase its supply sufficiently. Difficulties would be posed for the rest. Perhaps the most seriously affected would be the Lincoln Electric

Cooperative (Odessa pump station), where Northern Tier's requirements would constitute an addition equal to 70% of present demand. Similarly affected would be Clallam County, the City of Port Angeles, and Inland Power and Light (Plaza pump station).

10. To the extent that the cost of supplying NTPC's demand is not met by NTPC rates, the impact will fall on other ratepayers. This impact varies depending on both the difference between incremental costs and rates charged NTPC, and the size of NTPC's consumption compared to total consumption by the utility. The Lincoln Electric Cooperative and other publicly-owned utilities will have to pay incremental costs if (as BPA predicts) BPA has insufficient resources to serve Lincoln's needs and the utilities themselves have to supply the necessary energy.

11. Neither Northern Tier nor anyone else has indicated a means by which individual utilities will be able to meet the company's electric energy requirements.

12. The following table provides basic information on NTPC Washington electric demand. Note that, in its PSD application, Northern Tier indicated that it might never ship as much as 700,000 barrels per day east of Arlington, but that its position before the Council is based on 933,000 barrels per day.

		ELECTRICAL DEMAND			
		Initial (709,000 bpd)		Ultimate (933,000 bpd)	
Pump Station	Utility	Average Load AMW	Peak Load (MW)	Average Load AMW	Peak Load (MW)
Marine	Port Angeles	3.8	15.6	4.9	15.6
Port Angeles	Clallam Co PUD	11.1	11.6	15.0	16.6
Arlington	Snohomish Co PUD	6.7	7.1	11.0	11.5
Carnation	PSP&L	7.4	7.8	11.6	12.3
Bandera	PSP&L	6.8	7.2	9.6	10.1
Ellensburg	PSP&L or Kittitas PUD	10.1	10.6	16.8	17.8
Quincy	Grant Co. PUD	0.3	0.3	0.3	0.3
Odessa	Lincoln Electrical Coop.	3.4	3.6	10.7	11.2
Plaza	Inland P&L	7.3	7.6	11.6	12.3
		56.9	71.4	92.2	107.7

III. Q. PRIVATE SECTOR ECONOMICS

1. The major private sector industries in the Port Angeles and Clallam County area are tourism, fishing (commercial, sport and food processing) and forest products.

Tourism

2. Tourism accounts for approximately 1/3 of the employment in Clallam County, employing over 5,000 people for the years 1977 through 1979. (Conradus, TR 28027-8.) Olympic National Park attracted 2,995,600 visitors in 1978. In 1978, Bogachiel State Park and Sequim Bay State Park, each located in Clallam County, had 109,400 and 865,200 visitors, respectively. Dungeness Spit is a National Wildlife Refuge attracting people for beachcombing and sightseeing. (Conradus, TR 29030-1.)

3. The M. V. Coho, a Blackball Transport Inc. ferry, transports some 500,000 passengers (most of them tourists) each year between Port Angeles and Victoria. Maintaining the ferry's scheduled runs is critical to the operation's well-being. The M. V. Coho is sufficiently maneuverable to avoid many potential delays. Delays, such as those which might be caused by harbor construction or significant tanker anchoring, could affect the ferry schedule. The Port Angeles harbor facility stipulation contains a provision which warns against adoption

of a harbor traffic management plan which would significantly impair the ability of the M.V. Coho or successor ships to meet existing schedules.

4. The influx of construction workers to eastern Clallam County may result in fewer transient accommodations being available for tourists, particularly during early summer when construction activity reaches a peak. The influx of construction workers together with construction-related noise and traffic, may decrease the attractiveness of certain local areas. Some diversion of tourist expenditures to other localities during construction may be expected. Local expenditures by construction workers may offset these effects on the local business community. (Applic. p.2.22-18, Vol. III).

5. The Thunderbird Boathouse and two public boat launch ramps are situated on Ediz Hook and would be displaced by the Northern Tier terminal. (Ingham, TR 28429-32; Conradus, TR 29056. Ingham, TR 28429.) There is no other equivalent location available for the Boathouse and the ramps. The principal advantage is the easy and safe access to fishing areas in Port Angeles Harbor and the Strait of Juan de Fuca. (Ingham, TR 28433.) Relocation of the Thunderbird Boathouse to any other part of the harbor might affect the business. (Ingham, TR 28433.)

6. A major oil spill in the Port Angeles area could substantially affect tourism and decrease recreational activities.

Fish Processing

7. Clallam County fish processors depend on local fisheries. A spill in or near Clallam County could lead to the economic failure of fisheries or processing companies.

Coast Guard Facility

8. A U. S. Coast Guard facility, including air and water operations and a group command, is presently located at the tip of Ediz Hook adjacent to the proposed Northern Tier site. The need to relocate the Coast Guard facility, and the scope, cost, or site of any relocation have not been discussed in the record of this case. Relocation outside Clallam County would have a major economic impact on the County.

Possibilities of New Petroleum-Related Development in Clallam County

9. If the Northern Tier facility is constructed, petroleum-related development in the county is made more likely.

10. The key considerations in determining whether or not a crude oil refinery or a petrochemical facility could be constructed at a particular site are: existence of a supply of crude oil; demand for and marketability of the product; adequate utilities and public services to operate the facilities; transportation access (particularly by water) to the facility; land availability; consistency of the proposal with applicable regulations; and public acceptance. (Ex. 123; TR 29008 Conradus).

11. Clallam County has been considered as a potential site for refineries or petro-chemical facilities in studies by the United States Corps of Engineers, the Oceanographic Commission of Washington and the United States Department of Energy. (Conradus.)

12. In some respects, Clallam County is more favorably located for the development of an oil-related facility than other potential West Coast sites. Clallam County is closer to markets than Alaskan sites. It does not face environmental restrictions similar to those placed on petroleum related facilities in California. (Ex. 123; TR 29009-29011 Conradus). Two additional factors increasing the likelihood of petroleum-related development in Clallam County are the stated capability of the proposed Northern Tier line to carry refined products, and the Marine Mammal Protection Act prohibition against locat-

ing or expanding oil facilities east of Port Angeles unless the product is consumed within the state.

13. There are three principal constraints which may inhibit the development of either a crude oil refinery or a petrochemical plant at Port Angeles or in Clallam County. These are: (1) lack of water availability in certain areas; (2) air quality restrictions in the vicinity of the ITT plant; and (3) existing adopted ordinances and plans. None of these constraints is insurmountable. (Ex. 123).

14. There are no present plans which indicate that a crude oil refinery or a petrochemical plant is likely to be built along the terrestrial portion of the pipeline route. There are no expected long term private sector economic impacts outside Clallam County from the construction and operation of the proposed project.

Agriculture

15. Approximately 200 acres of agricultural land will be cleared in the rights-of-way in Clallam and Island Counties. Crop land could lose one season of productivity. Reclaimed pasture land may not be available to livestock for two years. About 98 acres of forest land will be removed from production. (TR 9496 Reyes-French).

III. R. NOISE, LIGHT AND GLARE

Noise

1. Noise generated by construction activities associated with the construction of the proposed project, either on land or at sea, is exempt from state noise standards, except to the extent that it affects Class A residential areas between 10 p.m. and 7 a.m. (WAC 173-60-050 (1)(c), (3) (a), WAC 173-70-050 (2)(e); TR 39128, 39131 Saunders)

2. Construction of the tanker unloading facilities will involve noise-producing equipment such as pile drivers and diesel-powered machinery. Because of the distance between the Ediz Hook site and Port Angeles, construction noise will be audible in Port Angeles, but not greatly annoying. (TR 13054-55 Earsy; Applic. III, Sec. 2.6.2.1)

3. During some portions of construction of the unloading pipelines, residents closest to the northwest corner of the Green Point storage site will experience some hearing interference and annoyance from noise. (TR 13056 Earsy) Construction of the storage tanks, support facilities and pump stations at the onshore storage site will affect approximately 10 to 15 households during daytime hours for various lengths of time over the construction period, but the maximum degree of impact will be confined to possible interference with speech

and some annoyance. (TR 13056-57 Earsy; Applic. III, Sec. 2.6.3.1)

4. Construction activities will generally be limited to daylight hours, when noise from other sources raises background noise levels. (TR 13045 Earsy)

5. The major sources of noise during operation of the berths will be the electric motor driven booster pump units and transformers. This noise will not be audible in Port Angeles and will be only slightly audible at the public parking area on Ediz Hook. (TR 13055-56 Earsy)

6. Noise during operation of the tank farm will be caused primarily by the electric motor-driven pump units at the pump station. During periods of low noise from natural sources, the pump units will be audible and may be annoying to the closest residents. (TR 13057-58 Earsy)

7. Construction of the underwater pipeline across the Port Angeles Harbor entrance, the Strait of Juan de Fuca, and Saratoga Passage, will involve the use of a laybarge containing diesel powered equipment. There will be no significant noise impacts from this equipment except at Ediz Hook because the barge will be situated at least 2500 feet from shore and

because few residences are close to the pipeline in shoreline areas. (TR 13068-69 Earsy; Applic. III, Sec. 2.6.4.1)

8. Construction of the terrestrial pipeline will require the use of noise-producing equipment, including diesel-powered machinery. At distances of about 200 feet from the pipeline route, peak noise level exposures of approximately 70 dBA may be experienced for a brief period (typically 3 to 10 days) during daytime hours. Drilling and blasting are not generally expected to be required along populated portions of the route. (TR 13069-71; Applic. III, Sec. 2.6.5.3)

9. Construction of the pump stations will affect residential areas approximately 1,500 to 2,000 feet from the station sites. Maximum noise levels will intermittently affect people outdoors and possibly cause minor interference with speech. (TR 13071 Earsy)

10. During operation of the pipeline, residents approximately 1,500 feet from the pump stations will hear some noise during periods of low background noise levels. There will also be noise from automobiles, light trucks and from inspection by low flying aircraft. Maintenance of the pipeline may occasionally involve the use of welding equipment and cranes. Inspection and maintenance operations should not result in significant noise impacts because of their expected brief duration. (TR 13071-73 Earsy)

Light and Glare

11. The tanker unloading facilities, unloading pipelines, and onshore storage facilities will all require some degree of lighting during construction and operation. Light and glare impacts on the community are expected to be minimized by directing the light to project areas. The facilities will be located at considerable distances or shielded by vegetation and topography from residential areas. (TR 13058-59; 13064 Earsy)

12. Some lighting will be needed for the construction of the underwater pipeline, but light and glare impacts will be small because of the general remoteness of the route from residences. (TR 13058-59 Earsy)

13. Construction of the pipeline and pump stations will be conducted almost entirely in daylight. Necessary security lighting will generally be confined to pump station construction sites. Welding glare along the pipeline will be shielded from passers-by. Topography and existing vegetation will also provide some natural screening for glare during construction. (TR 13074-75 Earsy)

14. Operation of the pipeline will not cause significant light or glare impacts. Lighting will be installed at

pump stations for security and maintenance purposes. Impact from that lighting will be minimal because of the fixture type, the plan to direct the light toward the center of the site, and the use of topography and vegetation to break the line of sight between the stations and surrounding residential areas. (TR 13075 Earsy)

III. S. AESTHETICS

1. A major aesthetic concern is the imposition of man-made structures on the natural environment.

2. The visual character of the proposed site for the tanker unloading facilities (berths) is presently dominated by several low structures. (Applic. III, Sec. 1.19.2.1) The site is clearly visible from a distance of about 1.5 miles, and many of the views from this distance are unobstructed. Sensitive public views from beyond three miles include those from the Olympic National Park Headquarters and Visitor Center, from points along the access road to Olympic National Park, and from the Hurricane Ridge viewpoint within the park.

3. The tank farm site is visible primarily from a small residential area to the south and west, from a larger agricultural area to the east, and from offshore. (Applic. III, Secs. 1.19.3 and 1.19.5)

4. During construction, views of the berth site will be dominated by the construction activity rather than the facilities. This activity will not significantly alter the visual character of Ediz Hook and Port Angeles Harbor. (TR 13185 Gillespie)

5. The most significant visual impact of construction of the tank farm will be the excavation of a vertical trench (for the unloading pipelines) in the shoreline bluff. Where the storage tanks will be located, the visual character will be dominated by large equipment and by the clearing, excavation, and grading of the heavily wooded land. The construction activity will be visible to some residents of a subdivision half a mile south of the site. (TR 13188-89 Gillespie)

6. During operation, the visual character of the berth site will be dominated by the tankers. The berths will not present a significant contrast to existing harbor structures. (TR 13186 Gillespie)

7. During operation of the tank farm, the proposed vegetation buffer will screen ground level activity from all offsite views except from the subdivision half a mile to the south. The upper portions of several storage tanks will be visible to marine traffic in the Strait and to viewers in the vicinity of Ediz Hook. The restored vertical slot in the bluff will be visible throughout operation. (TR 13190-91 Gillespie)

8. Northern Tier has committed to retaining a landscape architect to recommend design mitigation measures for above-ground facilities, including excavating a narrow slot in the Green Point sea cliff and backfilling that slot with mater-

ials that match the adjacent beach in color and reflective character; painting storage tanks to minimize visual impact; and maintaining a buffer zone of trees around the onshore storage site. (Applic. III, Sec. 5.3.19.1)

9. Visual characteristics of the Port Williams landfall are uncertain because the landfall location is uncertain.

10. At the Point Partridge landfall, an existing notch widening will cause a slight lowering of the horizon as viewed from offshore. Visual impacts from construction are expected to be minor and short-term. During operation, the only visible structure above ground will be the check valve. (TR 13196-98 Gillespie)

11. The pipeline trench excavation and laying operation at Polnell Point will be visible from the surrounding area and offshore. After construction, the beach will be restored to near its original appearance. There will be no long-term visual impacts. (TR 13198 Gillespie)

12. Visual impacts resulting from construction activity at Brown Point are similar to those described for Green Point. This activity will be visible from offshore and from onshore areas to the south and across Saratoga Passage. (TR 13199 Gillespie)

13. Northern Tier has committed to use a narrow slot excavation at Port Williams and Brown Point as described above for Green Point, to use backfill materials that match the adjacent beach, and to angle the Brown Point right-of-way through existing vegetation on top of the bluff so that the horizon will not be interrupted. (Applic. III, Sec. 5.3.19.1)

14. The existing visual character of the proposed terrestrial pipeline route varies according to terrain, vegetation and development. During construction, the visual character will be affected by the presence of equipment, piping, and activity. The presence of the pump and pressure reducing station sites will be the major visual consequence. The visual character of stations close to public viewing areas may be more important than that of other stations. (TR 13200-02 Gillespie)

15. Special design measures will be applied to reduce visibility or improve appearance for the pump and pressure reducing stations at Arlington, Bandera and Quincy. (TR 13202-03 Gillespie)

16. When it is necessary to use a right-of-way through a forest, various methods to reduce the visual impact of forest clearing will be used. Removal of trees from forest lands will be avoided to the extent possible. Areas where there may be particular visual impacts include: segments or portions

of Whidbey and Camano Islands; between Stanwood and Arlington; along the crest of two hills south and southeast of Monroe; the Snoqualmie River crossing to a point south of North Bend; and several locations along Snoqualmie Pass, and Gelbart Mountain. (TR 13203-04 Gillespie)

17. During operation, the major visual impact will be from maintenance of cleared right-of-way through previously heavily forested areas. Northern Tier will develop detailed vegetation clearing and restoration plans for visually sensitive areas. (TR 13204-05 Gillespie)

18. Construction of the pipeline crossings of some major rivers, including the Dungeness, the North and South Forks of the Stillaguamish, the Pilchuck, the Skykomish, the Tolt, the Snoqualmie, the South Fork of the Snoqualmie, and especially the Yakima and the Columbia, will cause visual impacts. These impacts will include the presence of staging areas, vegetation clearing and grading, and actual construction. After construction, the shorelines and staging areas will be restored, landscaped and redesigned. Applicant made no commitment to restore minor stream crossings. During operation, visual impacts will be limited to the presence of block valves and to the maintained pipeline right-of-way. At the Columbia River crossing, the block valve on the west side will remain highly visible throughout operation. (TR 13205-07 Gillespie)

19. Construction of the highway crossings may cause visual impacts at points where roads are subject to heavy traffic. Applicant will reduce long-term visual impacts at these points by careful design of the crossing, and by vegetation restoration and landscaping. (TR 13207-09 Gillespie)

20. Aerial crossing of rivers or streams would cause some visual impact.

III. T. ARCHAEOLOGY, CULTURAL AND HISTORIC RESOURCES

1. The Northern Tier pipeline and related facilities have the potential to affect cultural, archaeological and historical resources adversely.

2. In assembling its application, Northern Tier conducted a Phase I overview of cultural resources. The Phase I study did not constitute a thorough review of all recorded and informant sources. A cultural resources study for a project such as Northern Tier proposes should include a careful, complete review of all sources of information concerning the history, prehistory and culture of the project area.

3. Northern Tier also conducted a partial Phase II reconnaissance of cultural resources. The Phase II reconnaissance is of doubtful usefulness in establishing research strategies and survey needs for Northern Tier's proposed Phase III study.

4. No portion of the Phase III study has been undertaken. The Phase III study should result in the identification and evaluation of all cultural resources in the project area.

5. No portion of Phase IV, which consists of mitigation of adverse effects on cultural resources, has yet been accomplished. Cultural resources are known to be located within the project impact area. Northern Tier Pipeline Company has identified a number of known cultural resources within the proposed route of the pipeline. There are known to be 50 or 60 more recorded cultural resources within the proposed pipeline corridor. (Prefiled testimony page 2, lines 9-11 Onat and TR 32613-14 Onat). In addition, other cultural, archaeological or historical resources, as yet unidentified, may be present.

6. There is historical evidence of a 19th century sailing vessel (the AUGUSTA) sunk off the coast of Ediz Hook. Present construction plans should not disturb the possible site.

7. No prehistoric sites have been identified on Ediz Hook near the proposed terminal facilities. (TR 13305-06 Howry) No impacts on historic or prehistoric sites are presently expected at the marine terminal facilities.

8. Documentary and field research to date has identified no cultural resources on the Green Point storage facilities site. (TR 13306-07 Howry)

9. The most likely cultural resources along the cross-Sound underwater pipeline route are submerged historic

marine features. (Prefiled testimony page 9, lines 6-8 Howry). Examples of such features are the Yacht ELSIE and the scow ABC VIII, in the vicinity of the proposed route west of Point Partridge on Whidbey Island. Historical data and geotechnical studies have not identified their location along the route. (TR 13309-10 Howry; Exhibit 84).

10. Nationally significant, registered cultural resources occur at two locations in the terrestrial corridor. At the eastern edge of Whidbey Island, near Polnell Point, the right-of-way traverses a prehistoric site which extends inland for several hundred feet from the shoreline. The site would be disturbed by site clearing, ditch excavation and vehicle access. In eastern Washington, the right-of-way crosses several historic transportation routes. The most significant of these is the Mullan Military Road, which is listed as a National Historic Civic Engineering Landmark. (TR 13311-12 Howry; Ex. 155).

11. Numerous locations along the pipeline corridor have the potential to contain significant prehistoric resources. Areas of exceptionally high potential include river crossings, past river terraces, and wetlands and shorelines, particularly in areas adjacent to upland or "dry" sites. The Columbia, Skykomish, Stillaguamish, and Snoqualmie Rivers are examples of high resource potential areas. The applicant will conduct a site-specific examination of each river crossing as part of the

project's cultural resources program. Additional areas of resource potential include some high elevation terrain. (TR 13312 Howry; Ex. 152, 155; prefiled testimony page 4, lines 22-26 Onat and TR 32615 Onat).

12. The proposed pipeline crosses part of the central Whidbey Island Historic District (Ebey's Landing National Historic Reserve). Historically the area to be crossed by the pipeline has been used for agriculture. The total traversed distance within the District is approximately 5,700 feet. The affected area has not been identified as critical. The pipeline should not appreciably affect the property's historic or associated scenic values except during construction. The applicant has committed to right-of-way restoration conditions which will minimize change in the Historic District and present agricultural uses. (TR 13313-14 Howry; Ex. 153, 154)

13. Because of inadequate surface or subsurface visibility or other limiting factors, some cultural resources will be discovered only during the construction phases of the project. The applicant will develop a program for addressing the mitigation of impacts to cultural resources discovered during construction. (TR 13347-52 and 13365-77 Howry).

14. Analysis of recovered data and the preparation of standard professional reports are a part of an adequate

mitigation program. The applicant, through its cultural resource professionals, will prepare such reports. (TR 13361-62 Howry).

15. Mitigation of effects on cultural resources includes permanent curation of recovered data and materials in an acceptable facility. The applicant will contract only with those cultural resource consultants or organizations which can demonstrate the capability to provide for curation of recovered materials in a suitable facility. (TR 13360-61 Howry).

III. U. RECREATION

Clallam County and Port Angeles

1. Public recreational facilities within the Port Angeles Harbor include a boat launch, two boat havens, two public piers, and a city beach. The harbor is extensively used for recreational boating and fishing. (Applic. III, Sec. 1.20.2)

2. Port Angeles is the site of an extremely popular Salmon Derby held every year. The Salmon Derby brings many visitors to Port Angeles and is an important contribution to the local economy. Construction activity and tanker traffic could interfere with sport fishing held as part of the Derby. Northern Tier has proposed mitigation measures intended to minimize disruption to Derby activities including halting construction during the actual occurrence of the Derby.

3. No developed recreation areas exist near the site of the proposed onshore storage facilities at Green Point. (Applic. III, Sec. 1.20.3; TR 13158 Gillespie)

4. The City of Port Angeles owns and operates a swimming pool, sports fields for soccer, softball and football, a campground, day use parks, tennis and basketball courts, tracks,

foot trails, jogging paths and a gymnasium. Additional recreational facilities in the city include the boat launches on Ediz Hook, privately owned bowling alleys, a golf course and movie theaters. (Frizzell, TR 27653)

5. At the present time, most of the recreational facilities in the City of Port Angeles are being used at capacity. (Frizzell, TR 27653 and Ex. 406.) The City's facilities are used extensively by Clallam County residents because comparable facilities do not exist in the unincorporated area.

6. The major site-related recreation impact caused by the tanker unloading facilities would be the disruption of use and displacement of the Thunderbird Boathouse and adjacent public boat launch on Ediz Hook. This displacement will increase the demand on other already overcrowded boating facilities in Port Angeles Harbor. (TR 13153-54 Gillespie; Applic. III, Sec. 2.20.2.1) There is no other location which has the same parking and close proximity to fishing areas. (Frizzell, TR 27654) Automobile traffic congestion will increase on the access road to any usable public boating facilities on Ediz Hook. (TR 13155 Gillespie)

7. Clallam County has significant recreational opportunities including the Olympic Mountains, the Olympic National Forest, the Olympic National Park, the marine coastline

on the Strait of Juan de Fuca and the Pacific Coast. Marine recreational activities include sports fishing, shrimping, crabbing and oyster harvesting. (Jacobs.)

8. Clallam County operates the following parks: Salt Creek Recreation Area; Pillar Point Fishing Camp; Dungeness Recreation Area; and Camp David, Jr. (Jacobs, TR 27679-81.) Clallam County also operates two public boat launches in eastern Clallam County. Both launches receive heavy use from May through October 1. Clallam County's parks and launches are presently used at capacity during the summer season. (Jacobs, TR 27681-82)

9. Gray's Marsh Wildlife Refuge, near Sequim, is directly north of the corridor. Sequim Bay State Park is located approximately 3.5 miles south of the corridor and Dungeness Spit State Park is located approximately 4.0 miles north of the corridor in Clallam County. (Applic. III, Sec. 1.20.4.1)

10. The Port Angeles Comprehensive Plan includes a capital improvement schedule for the years 1975-2000 with an estimated cost of $168 million. (Frizzell, TR 27740.) Port Angeles has built a new $2 million municipal pier and is funding a convention center. (Frizzell, TR 27747; TR 27719.) The waterfront trails plan is also under way. (Frizzell, TR 27657-60.)

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9. Gray's Marsh Wildlife Refuge, near Sequim, is directly north of the corridor. Sequim Bay State Park is located approximately 3.5 miles south of the corridor and Dungeness Spit State Park is located approximately 4.0 miles north of the corridor in Clallam County. (Applic. III, Sec. 1.20.4.1)

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and turn zones, and could detract from the appearance of Ediz Hook beaches. (Applic. III, Sec. 2.20.2.2)

16. Operation of the Northern Tier project could result in oil spills which damage and cause the closing of parks and launches on the Strait. (Jacobs, TR 27688-91.)

Other Counties

17. Three state parks in Jefferson County are adjacent to waters crossed by the submarine pipeline. (Applic. III, Sec. 1.20.4.2)

18. Numerous recreational resources exist along the pipeline system, including city, town, county, and state parks, state and national forests, and state and national trails. The highest concentrations of public recreational facilities along the proposed route occur in Island County on Whidbey Island and in King County near North Bend. (Applic. III, Sec. 1.20.4, Sec. 1.20.5)

19. No direct impacts to any state parks are anticipated as a result of the construction of the underwater pipeline because of the distance of the parks from water areas to be disturbed. (TR 13164 Gillespie.)

20. Construction of the Port Partridge landfall on Whidbey Island will directly disrupt public access north along the beach from Libbey Beach County Park. It will disrupt private access to the beach from the Sierra Community Subdivision. Access to other portions of the beach will be available via Libbey Beach County Park. (TR 13165 Gillespie.)

21. Temporary interruption of beach access will occur at the Polnell Point landfall on Whidbey Island and at the Brown Point landfall on Camano Island. (TR 13165-66 Gillespie.)

22. The underwater pipeline in both the Strait and Saratoga Passage will pass through good sport fishing areas. Recreational boating and fishing in these local areas will be temporarily interrupted during construction. There are alternate resources available. (TR 13166 Gillespie.)

23. The planned but as yet undeveloped Three Forks Park near North Bend in King County may be traversed. Pipeline construction is not anticipated to severely affect future development of this park, but may constrain future park design and use.

24. The pipeline will pass through part of the Colockum HMA in Kittitas County and part of the Gloyd Seeps HMA

in Grant County. Hunting at both Colockum and Gloyd Seeps may be disrupted during construction and maintenance. (TR 13168-69 Gillespie.) The applicant has proposed to mitigate adverse recreational impacts on these areas by scheduling construction activities to avoid periods of peak recreational use insofar as is practical and consistent with other scheduling constraints upon the applicant. The applicant has not specified limits of practicability or any other such scheduling constraints.

25. The pipeline will cross the Snoqualmie National Forest and the Wenatchee National Forest. In the Snoqualmie National Forest, the pipeline will cross the Pacific Crest Trail near Snoqualmie Summit. Near the Asahel Curtis Natural Area, it will cross another trail. Other than these two trails, no developed recreational facilities will be encountered, though some proposed trail routes will be crossed. The anticipated impact will be impairment of recreational use of the pipeline corridor during construction. (TR 13168-70 Gillespie.)

26. There are twenty-five recreation areas within one mile of the centerline. Two areas are in Clallam County, nine in Island County, four in Snohomish County, six in King County, two in Kittitas County, and two in Grant County. Impacts on these areas will include visibility of clearing, construction equipment, traffic, and some disruption of access. (TR 13170 Gillespie.)

27. The main impacts on recreational resources at river and road crossings will be short-term disruption of recreational activity, and the visual impacts of clearing and construction activities. (TR 13175-76 Gillespie.)

28. Should an oil spill occur, there could be an interruption of use of, and a degradation of the value of, nearby parks or recreation areas. (Applic. III, Sec. 2.20.4.2)

29. Use of the pipeline right-of-way by off-road vehicles could disturb plant and animal habitats. (Applic. III, Sec. 2.20.4.2) (See Section III. H. Habitat)

III.V. LAND USE, SHORELINE MANAGEMENT, AND COASTAL ZONE

III. V. 1. Land Use

1. It is the obligation of the Council, upon the development of a site certification, to carry out the goals, policies, and rules of local land use regulations.

2. The Council adopts by reference the Findings and Conclusions of Council Orders Nos. 529, 550, 579.