US Army Corps
of Engineers
Seattle District

Weyerhaeuser Export Facility at DuPont

Final Environmental Impact Statement

Volume II

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A116181
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) Final environmental impact statement, Weyerhaeuser export facility at DuPont, Volume II.	5. TYPE OF REPORT & PERIOD COVERED Final
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS URS Company Fourth and Vine Bldg. Seattle, WA 98101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Weyerhaeuser Company - Corporate Headquarters 2525 South 236th Federal Way, WA 98003	12. REPORT DATE May 1982
	13. NUMBER OF PAGES 264
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) US Army Corps of Engineers, Seattle District P.O. Box C-3755/4735 E. Marginal Way South Seattle, WA 98124	15. SECURITY CLASS. (of this report) Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Volume I: Main Report
Volume III: Appendices R-T

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DUPONT	ENVIRONMENTAL IMPACT STATEMENTS	EXPORTS
NISQUALLY REACH	SHIPPING	
PUGET SOUND	DOCKS	
WASHINGTON (STATE)	FACILITIES	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Weyerhaeuser Company proposes to construct and operate a 250-acre export facility within the City of DuPont to ship forest products from manufacturing and wood operations in Western Washington to offshore markets. In 1976, Weyerhaeuser purchased a 3,200-acre site for this purpose. The E. I. DuPont de Nemours and Company used this site for the manufacture and ocean shipping of commercial explosives since 1909.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Construction and operation of the proposed export facility would have a variety of adverse and beneficial impacts. In general, impacts on the physical environment would be adverse, whereas impacts on the socioeconomic environment would be both beneficial and adverse. Many adverse impacts would be mitigated. Volume I contains Appendices A-Q.

Final Environmental Impact Statement

WEYERHAEUSER EXPORT FACILITY AT DUPONT

VOLUME II

SEATTLE DISTRICT, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY

1982

Table of Contents

VOLUME II

APPENDICES - CONTENTS

VOLUME III

APPENDICES - CONTENTS

APPENDIX A

PUBLIC NOTICES

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSOP-RF

23 January 1981

PUBLIC NOTICE

REVISED

Reference: 071-OYB-1-005087
Weyerhaeuser Company

A revised application has been received from the Weyerhaeuser Company, Northern Washington Region, Tacoma, Washington 98401 (ATTN: R. H. Lucas, telephone (206) 924-2289) for Department of the Army permit in accordance with Section 10 of the River and Harbor Act of March 3, 1899 for certain work described below and shown on the inclosed prints. This work was previously advertised three times under the same public notice number on 31 August 1978, 1 July and 4 September 1979. The revision consists of relocating the proposed pier south of the previously proposed location. The number of pier lights has been changed from seven to eight. The office and lunchroom will be located 477 feet 9 inches from the north end of the pier.

PROPOSED WORK:

a. Location: In Nisqually Reach, Puget Sound at Dupont, Washington.

b. Physical Character: Construct a pier. The applicant has requested 2 years to start and 5 years to complete construction.

c. Purpose (as explained by the applicant): Provide berthing facilities for loading ships with forest products.

The State of Washington is reviewing this work for consistency with the approved Washington Coastal Zone Management Program.

Preliminary review by the Seattle District indicates that the impacts resulting from this work will significantly affect the quality of the human environment. A Federal Environmental Impact Statement is required for this project and is being prepared. The Draft Federal Environmental Impact Statement is available for public review and comment. Copies are available for review at the U.S. Army Corps of Engineers, Seattle District, 4735 East Marginal Way South, Seattle, Washington 98134; the City of Dupont, P.O. Box 159, Dupont, Washington 98327; the Weyerhaeuser Company, Northern Washington Region, Tacoma, Washington 98401; Steilacoom Public Library, 1715 Lafayette Street, Steilacoom, Washington 98388; Pierce County Public Library, 2356 Tacoma Avenue South, Tacoma, Washington 98402.

071-OYB-1-005087

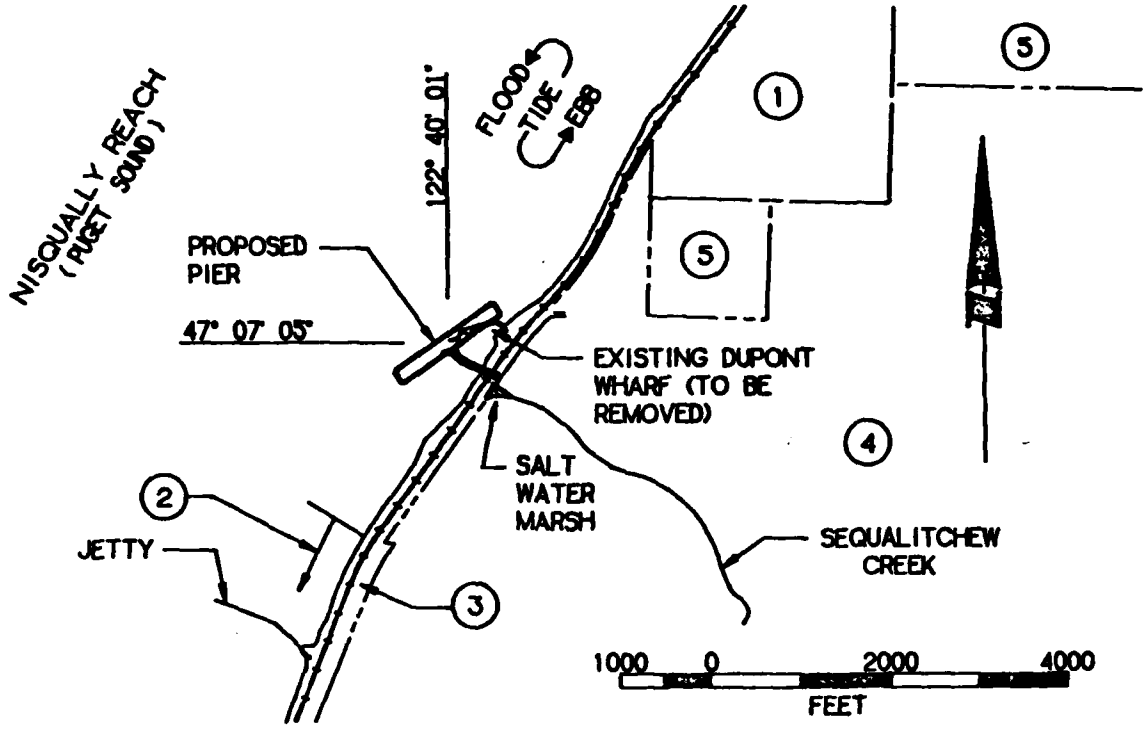
Formal consultation pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 844) has been completed. A biological assessment was conducted on the effects of the project on the bald eagle. The results of the biological assessment indicate the bald eagle will not be affected by the project. It has been determined that endangered species listed under the National Marine Fisheries jurisdiction are unlikely to be affected by the project.

Properties that are listed on the National Register of Historic Places have been identified within the affected area of the project. These and other known prehistoric and historic cultural resource sites may be impacted as a result of the proposed work.

The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economics, esthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people.

Comments on these factors will be accepted and made part of the record and will be considered in determining whether it would be in the best public interest to grant a permit. Comments should refer to the reference number shown above and reach this office, Attn: Permit Section, not later than 23 February 1981 to insure consideration.

1 Incl
Prints (4)

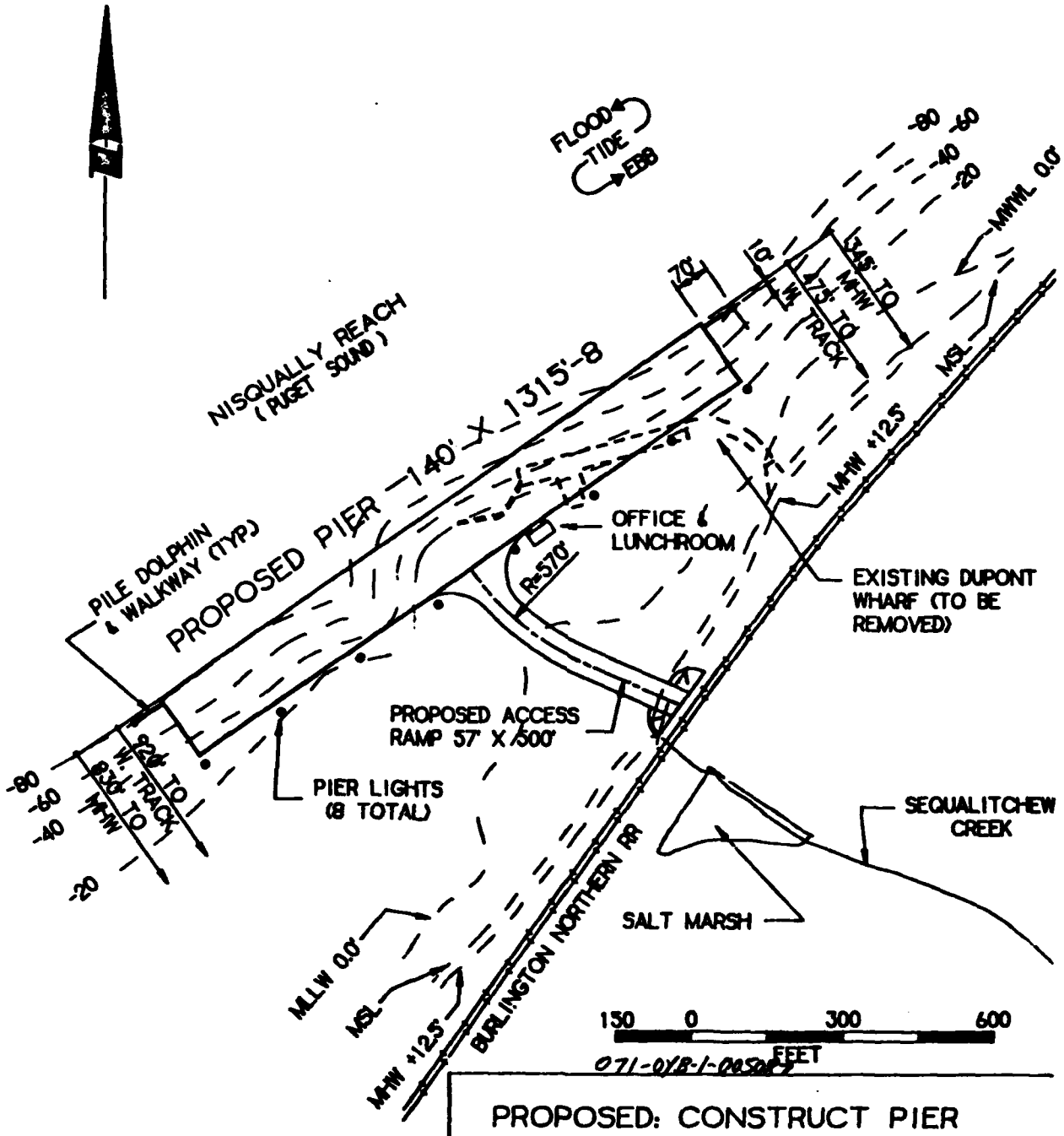


VICINITY MAP

1. PURPOSE: PROVIDE BERTHING FACILITIES FOR LOADING SHIPS WITH FOREST PRODUCTS.
2. DATUM: MEAN LOWER LOW WATER
3. ADJACENT PROPERTY OWNERS:
   - ① LONE STAR CORP. (FORMERLY PIONEER SAND & GRAVEL)
   - ② U.S. FISH & WILDLIFE SERVICE
   - ③ BURLINGTON NORTHERN RR
   - ④ WEYERHAEUSER CO. (WITHIN DUPONT CITY LIMITS)
   - ⑤ FORT LEWIS MILITARY RESERVATION
4. NO DREDGING OR FILLING PROPOSED FOR THIS PROJECT
5. PROJECT TO BE WITHIN CITY LIMITS OF DUPONT. POPULATION CENTER 2 MILES S.E.
6. NO ROADS IN IMMEDIATE VICINITY
7. SANITARY SEWAGE TO BE RETAINED IN [redacted] HOLDING TANKS & TRUCKED OR PUMPED TO UPLAND DEVELOPMENT AREA.
8. HOLDING TANK WITH OIL SEPARATOR & SOLIDS SETTLING TO BE CONSTRUCTED FOR PIER STORM WATER.
9. AFTER PERMIT ISSUANCE PERMITTED ACTIVITY IS PLANNED TO START WITHIN 2 YEARS & BE COMPLETED WITHIN 5 YEARS 071-0YB-1-005087
10. VICINITY MAP DATA FROM USGS NISQUALLY QUAD N4700 -W12237.5/7.5 1959 PH REV. 1968 & 1973

PROPOSED: CONSTRUCT PIER

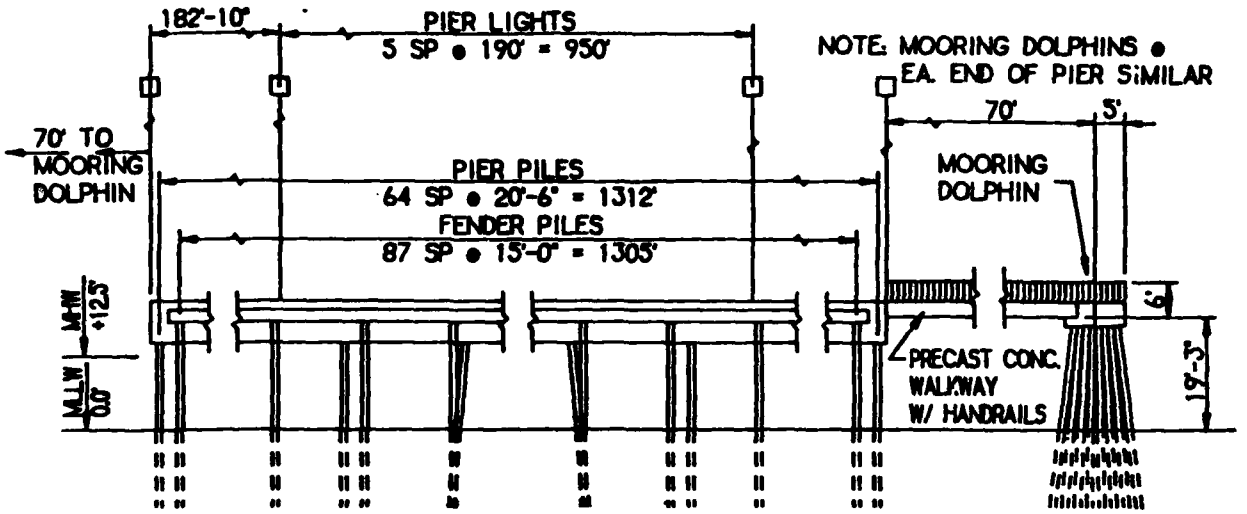
IN: NISQUALLY REACH PUGET SOUND
AT: DUPONT CO: PIERCE STATE: WASH.
APPLICANT: WEYERHAEUSER COMPANY
DATE: 1-5-81 SHEET 1 OF 4



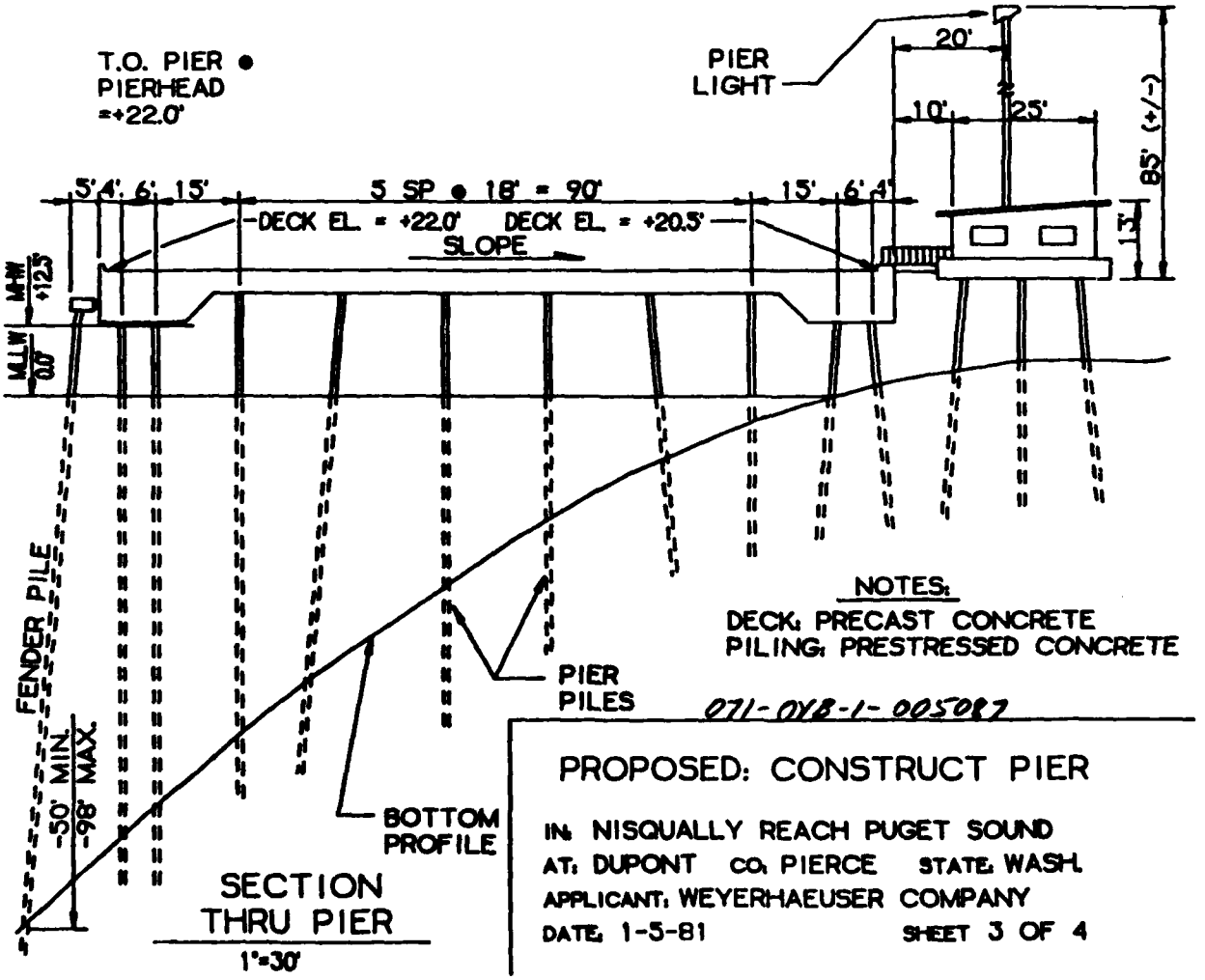
PLAN

PROPOSED: CONSTRUCT PIER

IN: NISQUALLY REACH PUGET SOUND
AT: DUPONT CO. PIERCE STATE: WASH.
APPLICANT: WEYERHAEUSER COMPANY
DATE: 1-5-81 SHEET 2 OF 4



WEST ELEVATION OF PIER 1"=30'



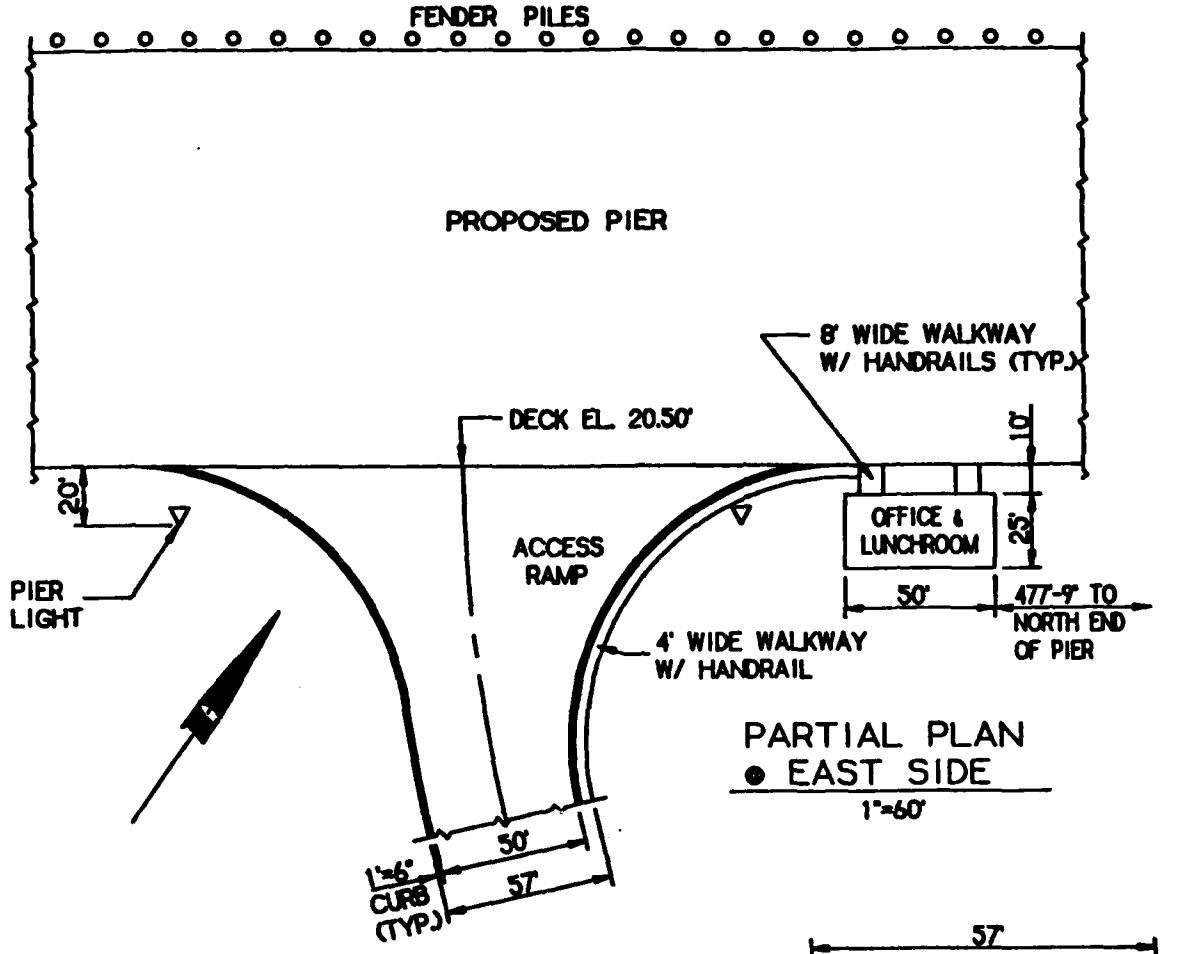
SECTION THRU PIER
1"=30'

NOTES:
DECK: PRECAST CONCRETE
PILING: PRESTRESSED CONCRETE

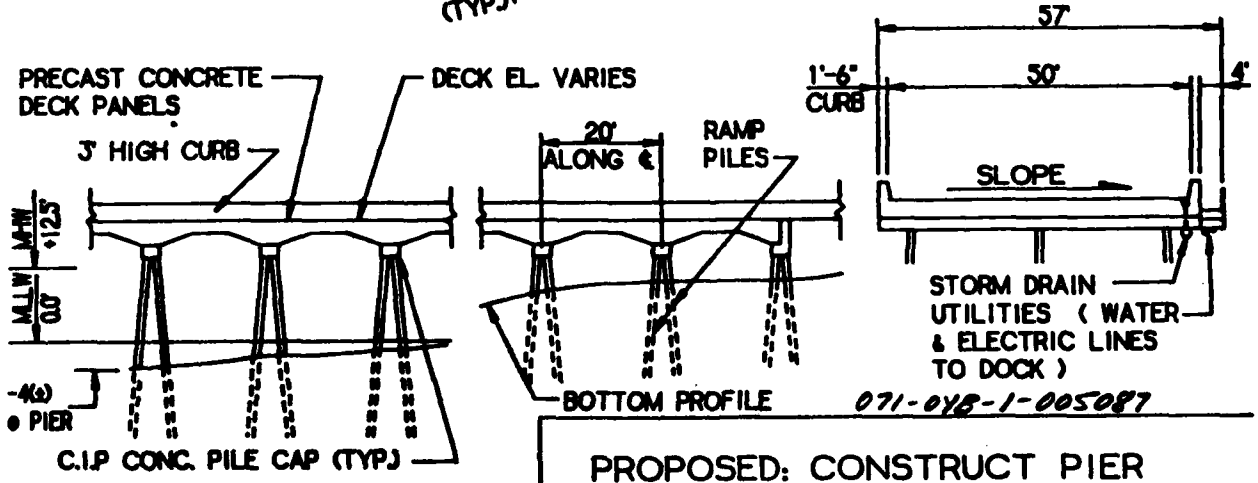
071-0YB-1-005087

PROPOSED: CONSTRUCT PIER

IN: NISQUALLY REACH PUGET SOUND
AT: DUPONT CO. PIERCE STATE: WASH.
APPLICANT: WEYERHAEUSER COMPANY
DATE: 1-5-81 SHEET 3 OF 4



PARTIAL PLAN
● EAST SIDE
1"=60'



071-078-1-005087

ACCESS RAMP DETAILS
1"=30'

PROPOSED: CONSTRUCT PIER

IN: NISQUALLY REACH PUGET SOUND
AT: DUPONT CO: PIERCE STATE: WASH.
APPLICANT: WEYERHAEUSER COMPANY
DATE: 1-5-81 SHEET 4 OF 4

STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800
Mail Stop PV-11

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

23 January 1981

Notice of Application for
Certification of Consistency with the
Washington Coastal Zone Management Program

Notice is hereby given that a request is being filed with the Department of Ecology for concurrence, as provided in Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended (P.L. 94-370; 90 Stat. 1013; 16 U.S.C. 1456(c)(3)), that the project described in the Corps of Engineers Public Notice No. 071-CYB-1-005087, will comply with the Washington Coastal Zone Management Program and that the project will be conducted in a manner consistent with that Program.

Any person desiring to present views on considerations pertaining to the project's compliance or consistency with the Washington Coastal Zone Management Program may do so by providing his views in writing to the Department of Ecology, ATTN: Interagency Operations Section, Olympia, Washington 98504, within 20 days of publication of this notice.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSOP-RF

4 September 1979

PUBLIC NOTICE

REVISED

Reference: 071-OYB-1-005087
Weyerhaeuser Company

A revised application has been received from the Weyerhaeuser Company, Northern Washington Region, Tacoma, Washington 98401 (ATTN: Mr. R. H. Lucas, telephone (206) 924-2289) for Department of the Army permit in accordance with Section 10 of the River and Harbor Act of March 3, 1899 for certain work described below and shown on the inclosed prints. This work was previously advertised twice under the same public notice number dated 31 August 1978 and 1 July 1979. The revision consists of increasing the width of the access ramp from 47 feet to 57 feet. The deck height of the proposed pier will be raised 2 feet and the office/-lunchroom building will be relocated 440 feet north of the southern end of the pier.

PROPOSED WORK:

a. Location: In Nisqually Reach, Puget Sound at Dupont, Washington.

b. Physical Character: Construct a pier. The applicant has requested 2 years to start and 5 years to complete construction.

c. Purpose (as explained by the applicant): Provide berthing facilities for loading ships with forest products.

The State of Washington is reviewing this work for consistency with the approved Washington Coastal Zone Management Program.

Preliminary review by the Seattle District indicates that the impacts resulting from this work will significantly affect the quality of the human environment. A Federal Environmental Impact Statement is required for this project and is being prepared. The Draft Federal Environmental Impact Statement is available for public review and comment. Copies are available for review at the U.S. Army Corps of Engineers, Seattle District, 4735 East Marginal Way South, Seattle,

Washington 98134; the City of Dupont, P.O. Box 159, Dupont, Washington 98327; the Weyerhaeuser Company, Northern Washington Region, Tacoma, Washington 98401; Steilacoom Public Library, 1715 Lafayette Street, Steilacoom, Washington 98388; Pierce County Public Library, 2356 Tacoma Avenue South, Tacoma, Washington 98402.

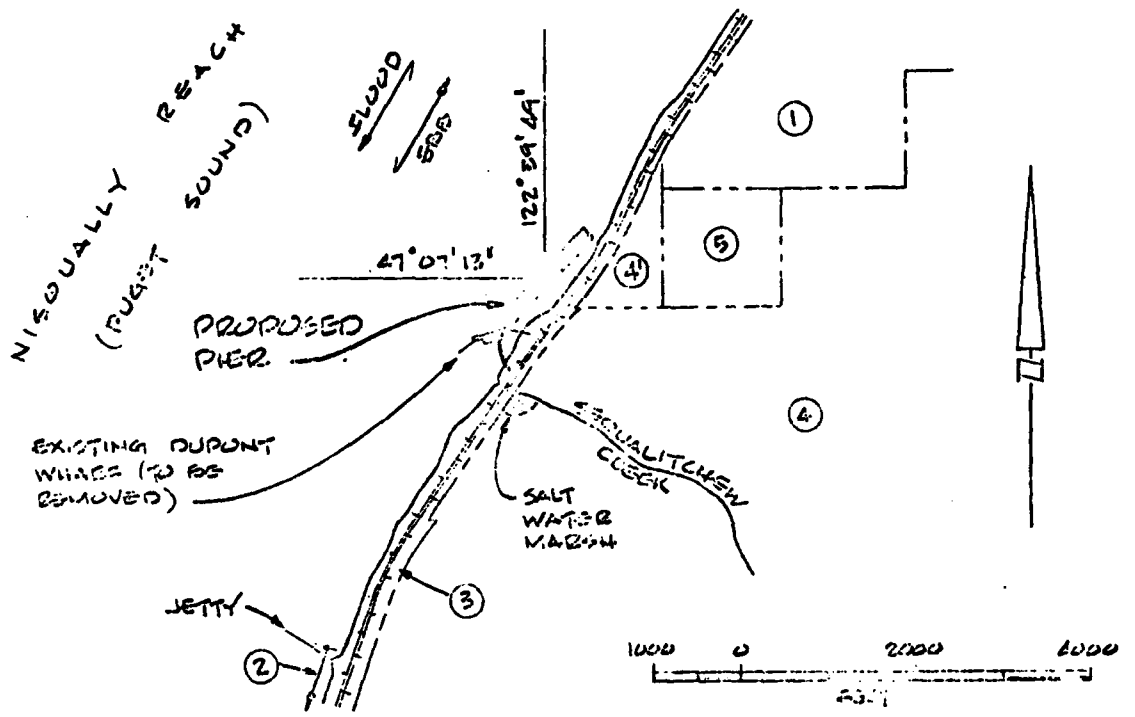
Preliminary determinations indicate that the proposed activity may affect endangered species, or their critical habitat, designated as endangered or threatened pursuant to the Endangered Species Act of 1973 (87 Stat. 844). Formal consultation pursuant to Section 7 of the Act with the Department of the Interior may be required for this proposed activity.

Presently unknown archeological, scientific, prehistorical or historical data may be lost or destroyed by work to be accomplished under the requested permit. The work is not located on a property registered in the National Register of Historic Places.

The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economics, esthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people.

Comments on these factors will be accepted and made part of the record and will be considered in determining whether it would be in the best public interest to grant a permit. Comments should refer to the reference number shown above and reach this office not later than 4 October 1979 to insure consideration.

1 Incl
Prints (4)



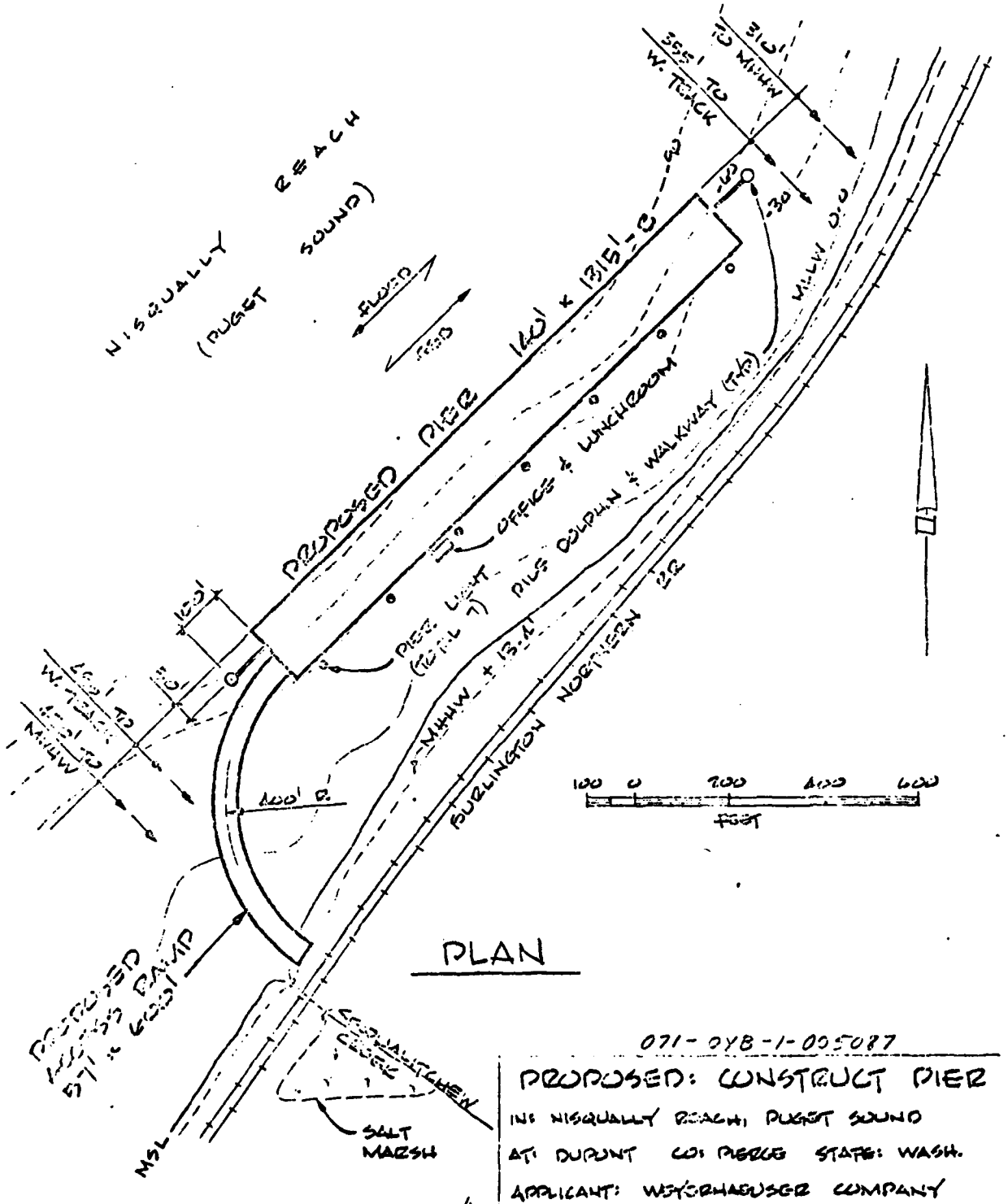
VICINITY MAP

1. PURPOSE: PROVIDE BERTHING FACILITIES FOR LOADING SHIPS WITH FOREST PRODUCTS.
2. DATUM: MEAN LOWER LOW WATER NGVD 1929
3. ADJACENT PROPERTY OWNERS:
   ① LONG STAR CORP (FORMERLY PIONEER SAND & GRAVEL)
   ② U.S. FISH & WILDLIFE SERVICE
   ③ BURLINGTON NORTHERN RR
   ④ WEYERHAEUSER CO. (WITHIN DUPONT CITY LIMITS)
   ⑤ WEYERHAEUSER CO. (ANNEXATION TO CITY OF DUPONT HAS BEEN PROPOSED)
   ⑥ FORT LEWIS MILITARY RESERVATION
4. NO DREDGING OR FILLING PROPOSED FOR THIS PROJECT.
5. PROJECT TO BE WITHIN CITY LIMITS OF DUPONT (ANNEXATION HAS BEEN PROPOSED). POPULATION CENTER 2 MILES SOUTHEAST.
6. NO ROADS IN IMMEDIATE VICINITY.
7. AFTER PERMIT ISSUANCE, PERMITTED ACTIVITY IS PLANNED TO START WITHIN 2 YEARS & BE COMPLETED WITHIN 5 YEARS.
8. VICINITY MAP DATA FROM USGS NISQUALLY QUAD N 4700 - W12237.5/7.5 1954 PH. REV 1968 & 1973

071-0[illegible]-1-005027

PROPOSED: CONSTRUCT PIER
IN: NISQUALLY REACH; PUGET SOUND
AT: DUPONT CO: PIERCE STATE: WASH.
APPLICANT: WEYERHAEUSER COMPANY
DATE: 8-18-75
REV: 8-13-79 SHEET 1 OF 4

3-



PLAN

071-0YB-1-005087

PROPOSED: CONSTRUCT PIER

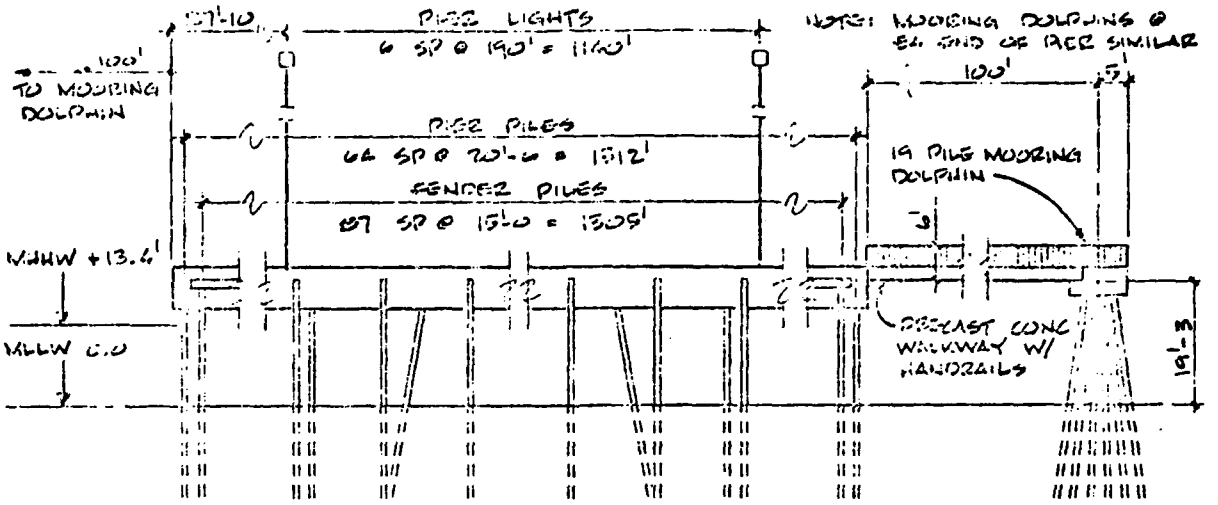
IN: NISQUALLY REACH, PUGET SOUND

AT: DUPONT CO: PIERCE STATE: WASH.

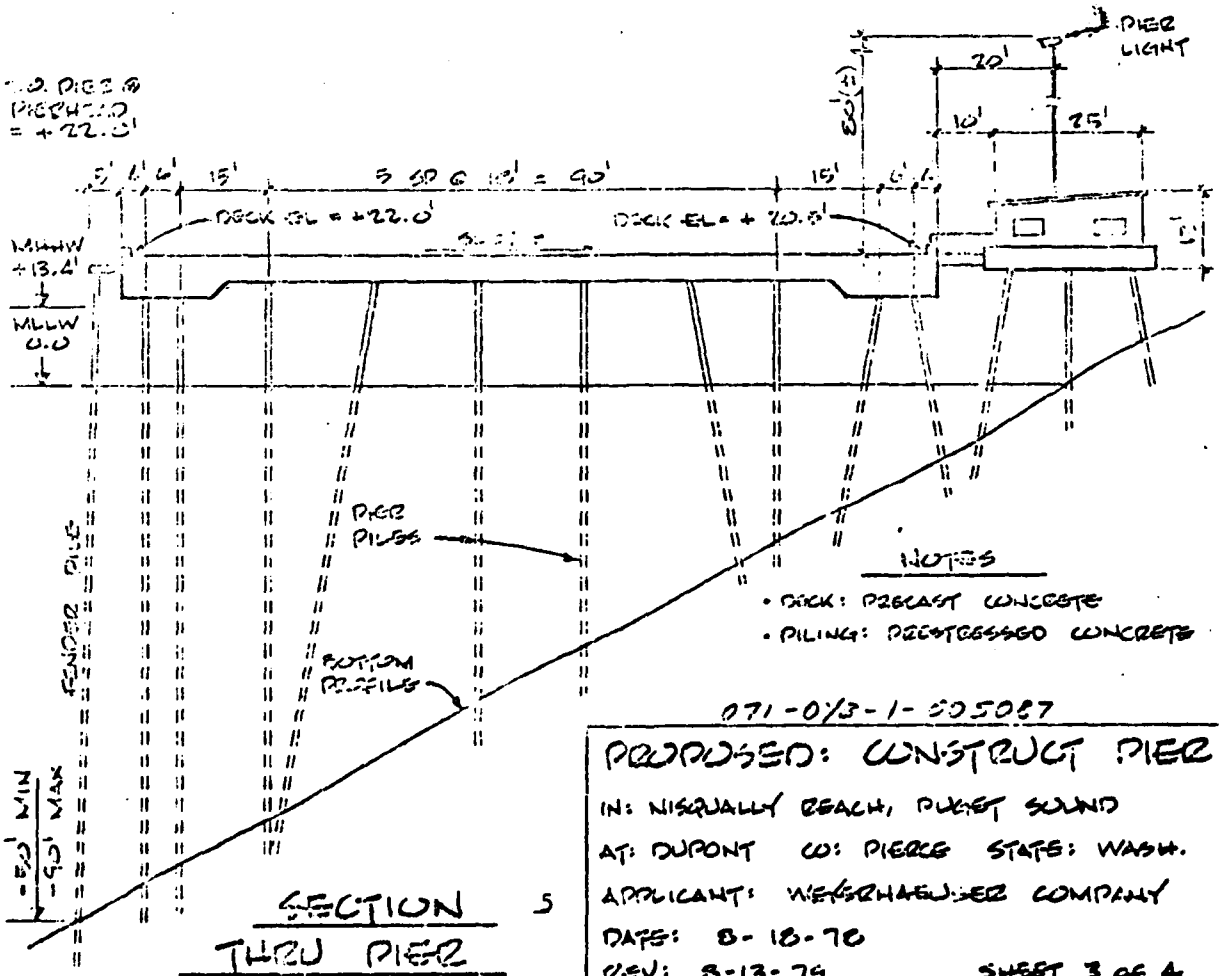
APPLICANT: WEYERHAEUSER COMPANY

DATE: 8-10-78

REV: 8-13-79 SHEET 2 OF 4



WEST ELEVATION OF PIER 1" = 30'



SECTION THRU PIER 1" = 30'

NOTES

- DECK: PRECAST CONCRETE
- PILING: PRESTRESSED CONCRETE

071-073-1-005087

PROPOSED: CONSTRUCT PIER

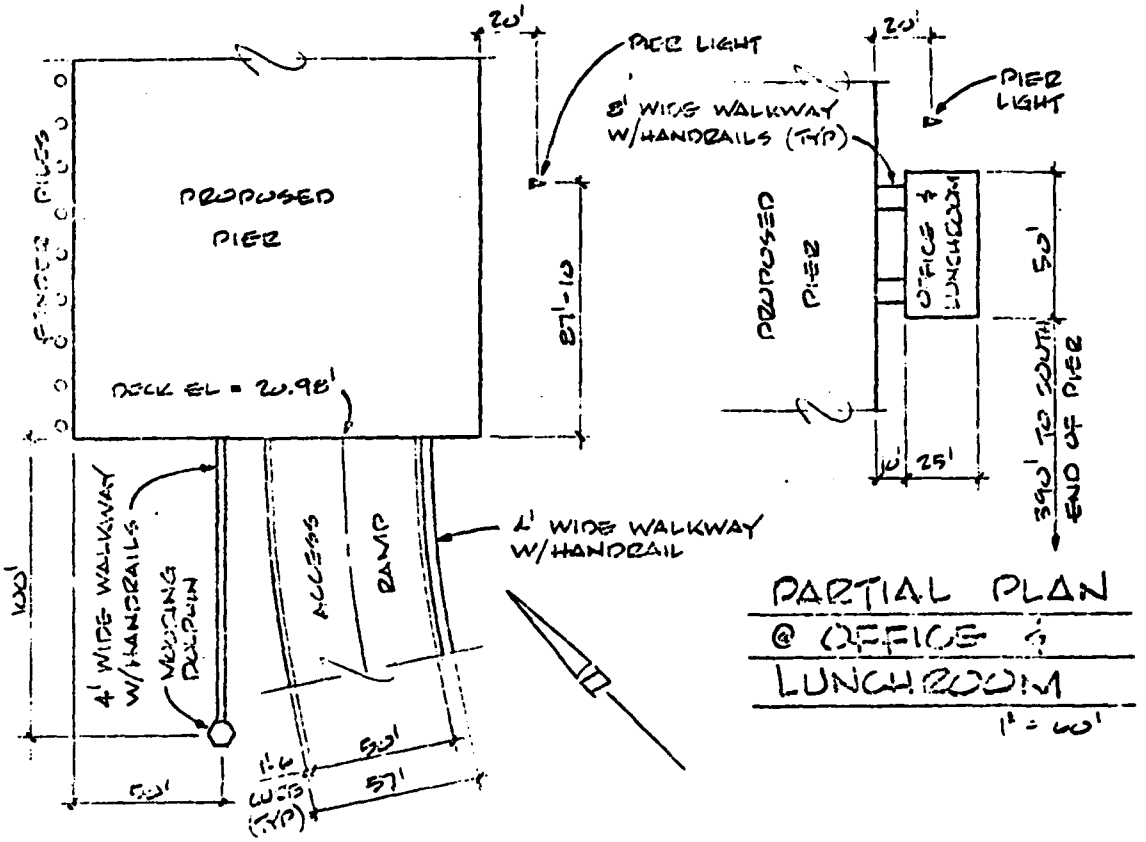
IN: NISQUALLY REACH, PUGET SOUND

AT: DUPONT CO: PIERCE STATE: WASH.

APPLICANT: WEYERHAEUSER COMPANY

DATE: 8-18-78

REV: 8-13-79 SHEET 3 OF 4

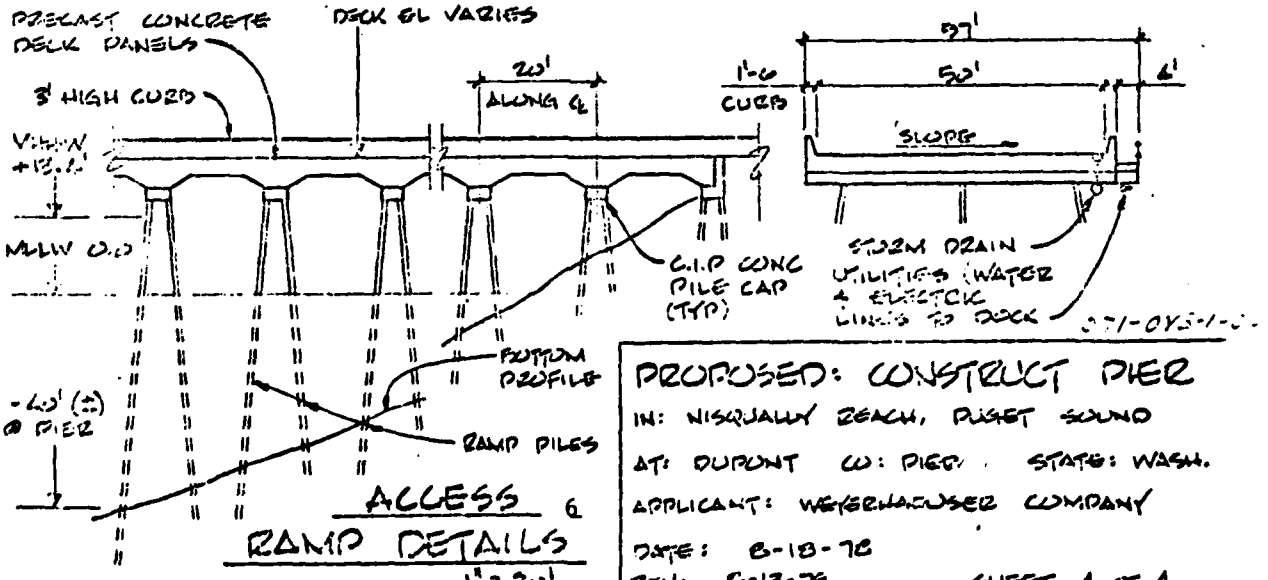


PARTIAL PLAN @ SOUTH END

1" = 60'

PARTIAL PLAN @ OFFICE & LUNCHROOM

1" = 60'



ACCESS & RAMP DETAILS

1" = 30'

PROPOSED: CONSTRUCT PIER

IN: NISQUALLY REACH, PUGET SOUND

AT: DUPONT CO: PIERCE STATE: WASH.

APPLICANT: WEYERHAEUSER COMPANY

DATE: 8-18-78

REV: 8-13-79 SHEET 4 OF 4

STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800
Mail Stop PV-11

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

4 September 1979

Notice of Application for
Certification of Consistency with the
Washington Coastal Zone Management Program

Notice is hereby given that a request is being filed with the Department of Ecology for concurrence, as provided in Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended (P.L. 94-370; 90 Stat. 1013; 16 U.S.C. 1456(c)(3)), that the project described in the Corps of Engineers Public Notice No. 071-078-1-005087, will comply with the Washington Coastal Zone Management Program and that the project will be conducted in a manner consistent with that Program.

Any person desiring to present views on considerations pertaining to the project's compliance or consistency with the Washington Coastal Zone Management Program may do so by providing his views in writing to the Department of Ecology, ATTN: Interagency Operations Section, Olympia, Washington 98504, within 20 days of publication of this notice.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSOP-RF

1 July 1979

PUBLIC NOTICE

REVISED

Reference: 071-OYB-1-005087
Weyerhaeuser Company

Application has been received from the Weyerhaeuser Company, Northern Washington Region, Tacoma, Washington 98401 (ATTN: Mr. R. H. Lucas, telephone (206) 924-2289) for Department of the Army permit in accordance with Section 10 of the River and Harbor Act of March 3, 1899 for certain work described below and shown on the inclosed prints. This work was previously advertised under the same public notice number dated 31 August 1978. The revision consists of clarifying the purpose of the proposed work as stated below.

PROPOSED WORK:

a. Location: In Nisqually Reach, Puget Sound at Dupont, Washington.

b. Physical Character: Construct a pier. The applicant has requested two years to start and five years to complete construction.

c. Purpose (as explained by the applicant): Provide berthing facilities for loading ships with forest products.

The State of Washington is reviewing this work for consistency with the approved Washington Coastal Zone Management Program.

Preliminary review by the Seattle District indicates that the impacts resulting from this work will significantly affect the quality of the human environment. A Federal Environmental Impact Statement is required for this project and is being prepared. The Draft Federal Environmental Impact Statement will be available for public review and comment approximately 30 July 1979. Copies will be available for review at the U.S. Army Corps of Engineers, Seattle District, 4735 East Marginal Way South, Seattle, Washington 98134; the City of Dupont, P.O. Box 159, Dupont, Washington 98327; the Weyerhaeuser Company, Northern Washington Region, Tacoma, Washington 98401; Steilacoom Public Library, 1715 Lafayette Street, Steilacoom, Washington 98388; Pierce County Public Library, 2356 Tacoma Avenue South, Tacoma, Washington 98402

071-OYB-1-005087

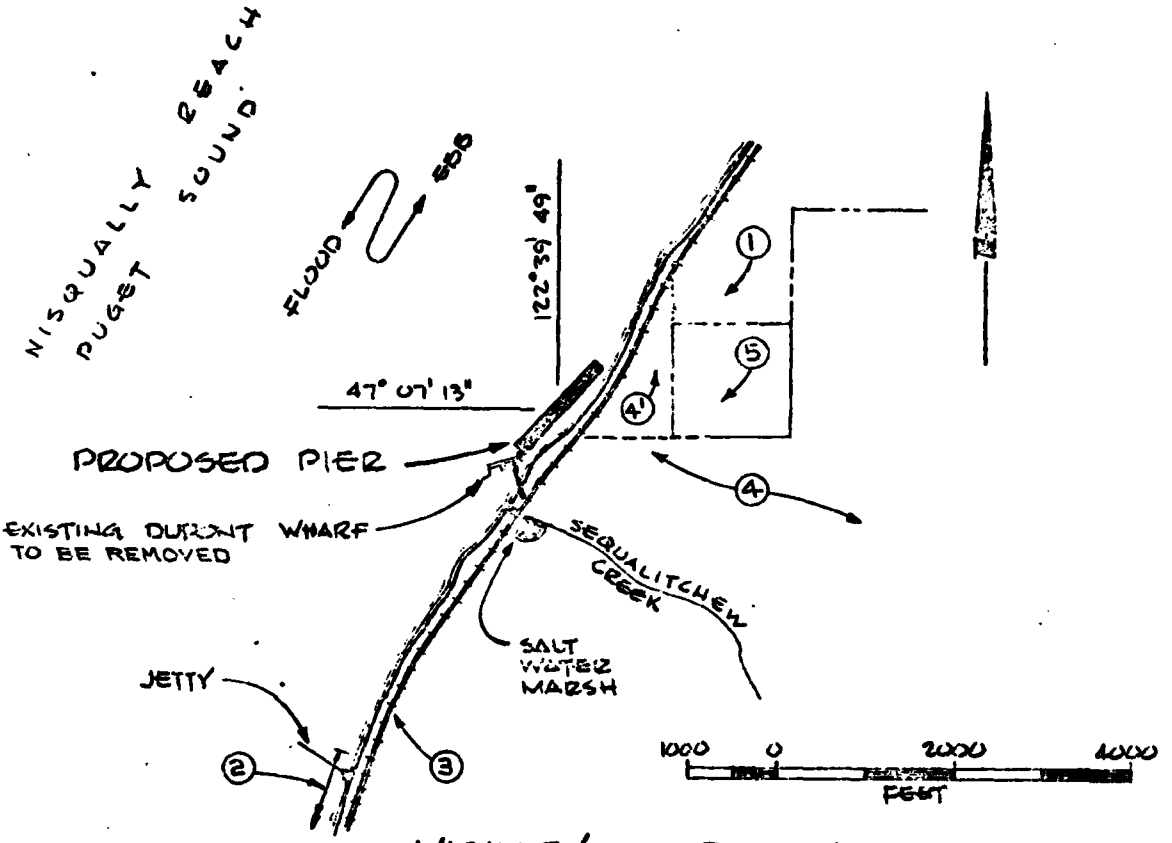
Preliminary determinations indicate that the proposed activity may affect endangered species, or their critical habitat, designated as endangered or threatened pursuant to the Endangered Species Act of 1973 (87 Stat. 844). Formal consultation pursuant to Section 7 of the Act with the Department of the Interior may be required for this proposed activity.

Presently unknown archeological, scientific, prehistorical or historical data may be lost or destroyed by work to be accomplished under the requested permit. The work is not located on a property registered in the National Register of Historic Places.

The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economics, esthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people.

Comments on these factors will be accepted and made part of the record and will be considered in determining whether it would be in the best public interest to grant a permit. Comments should refer to the reference number shown above and reach this office not later than 31 July 1979 to insure consideration.

1 Incl
Prints (4)



VICINITY MAP

1. PURPOSE: PROVIDE BERTHING FACILITIES FOR LOADING SHIPS WITH FOREST PRODUCTS
2. DATUM: MEAN LOWER LOW WATER, NGVD - 1929 • 0.0'
3. ADJACENT PROPERTY OWNERS ARE: ① LONE STAR CORP. (FORMELY PIONEER SAND & GRAVEL) ② US. FISH AND WILDLIFE SERVICE. ③ BURLINGTON NORTHERN R.R. ④ WEYERHAEUSER CO. ④' WEYERHAEUSER CO; ANNEXATION TO CITY OF DUPONT WILL BE PROPOSED. ⑤ FORT LEWIS MIL. RES.
4. NO DREDGING OR FILLING PROPOSED FOR THIS PROJECT.
5. PROJECT TO BE WITHIN CITY LIMITS OF DUPONT (ANNEXATION WILL BE PROPOSED) POPULATION CENTER 2 MI. S.E.
6. NO ROADS IN IMMEDIATE VICINITY.
7. AFTER PERMIT ISSUANCE, PERMITTED ACTIVITY IS PLANNED TO START WITHIN TWO YEARS & BE COMPLETED WITHIN FIVE YEARS.
8. VICINITY MAP DATA FROM: USGS NISQUALLY QUADRANGLE N4700 - W12237.5/7.5 1959 PH. REV 1968 & 1973

071-0YB-1-005087

PROPOSED: CONSTRUCT PIER

IN: NISQUALLY REACH PUGET SOUND AT: DUPONT

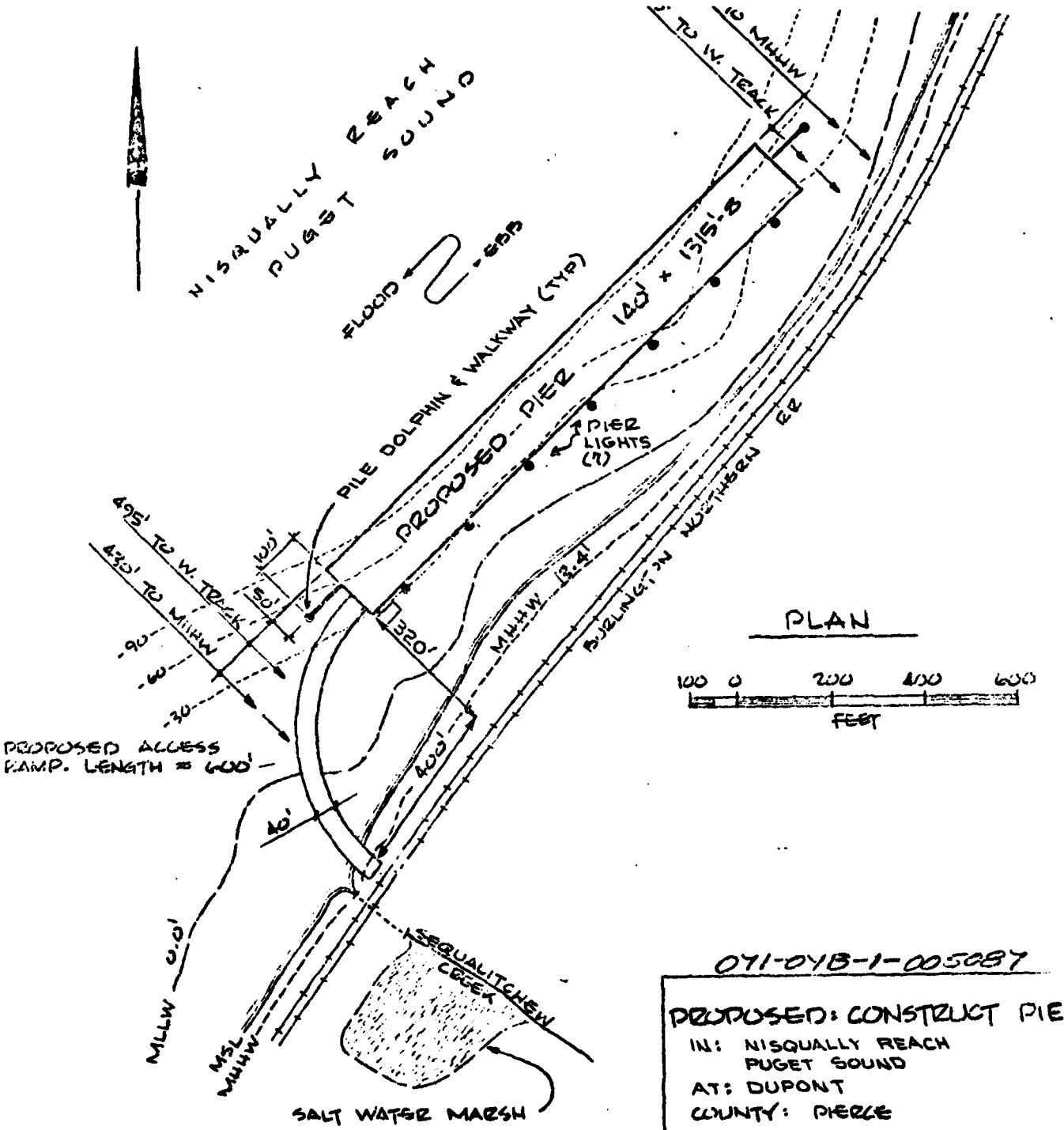
COUNTY: PIERCE STATE: WASH.

APPLICANT: WEYERHAEUSER COMPANY

DATE: 8-18-78 SHEET 1 OF 4

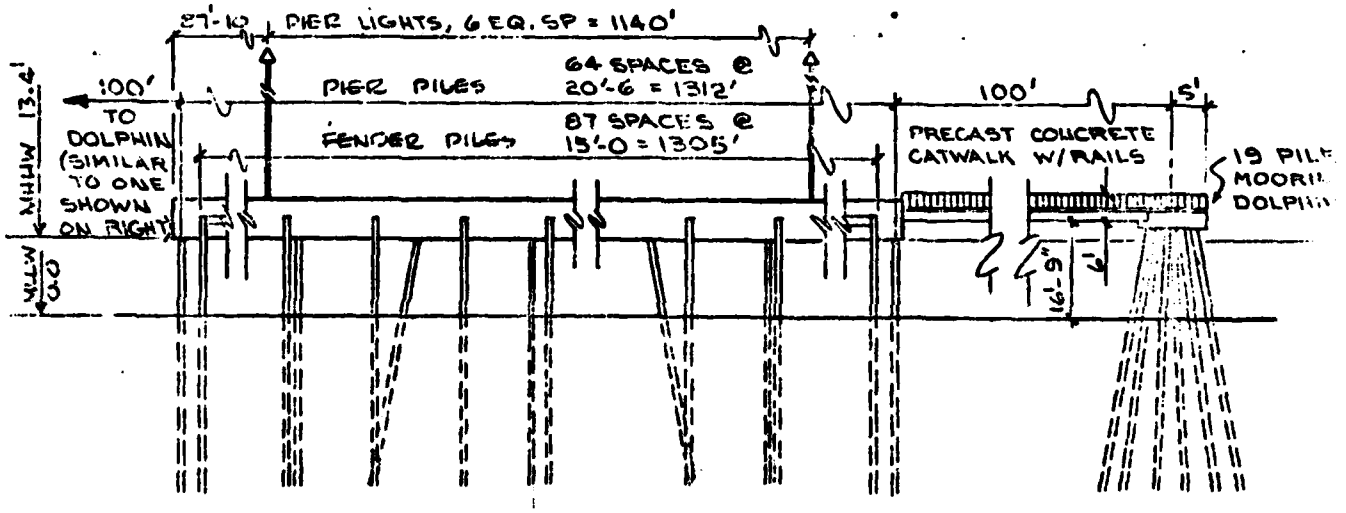
REV 6-13-79

A-17



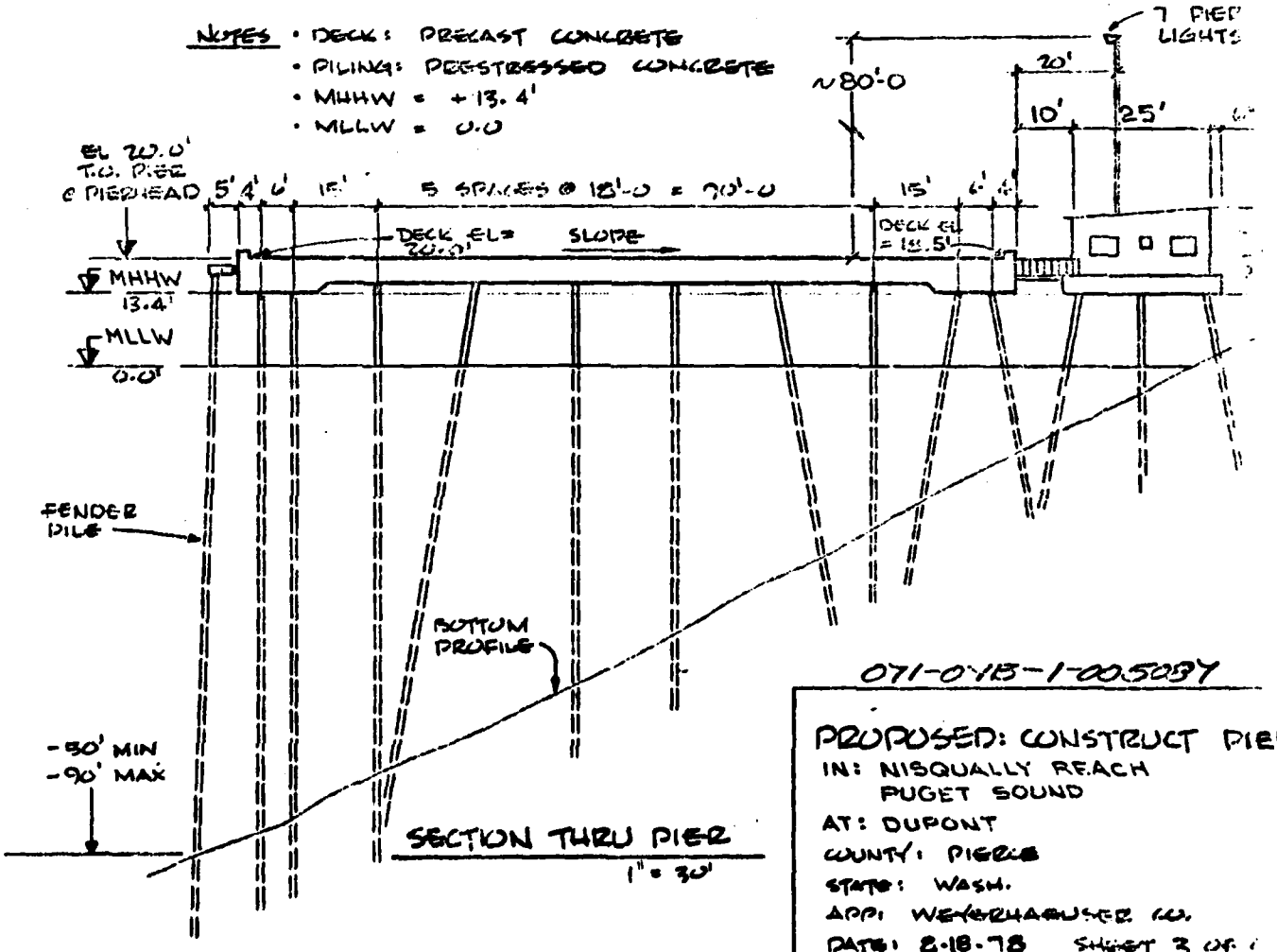
071-01B-1-00508?

PROPOSED: CONSTRUCT PIER
IN: NISQUALLY REACH
PUGET SOUND
AT: DUPONT
COUNTY: PIERCE
STATE: WASH.
APP: WEYERHAEUSER CO.
DATE: 8-18-78 SHEET 2 OF
REV 6-13-79



WEST ELEVATION OF PIER 1" = 30'

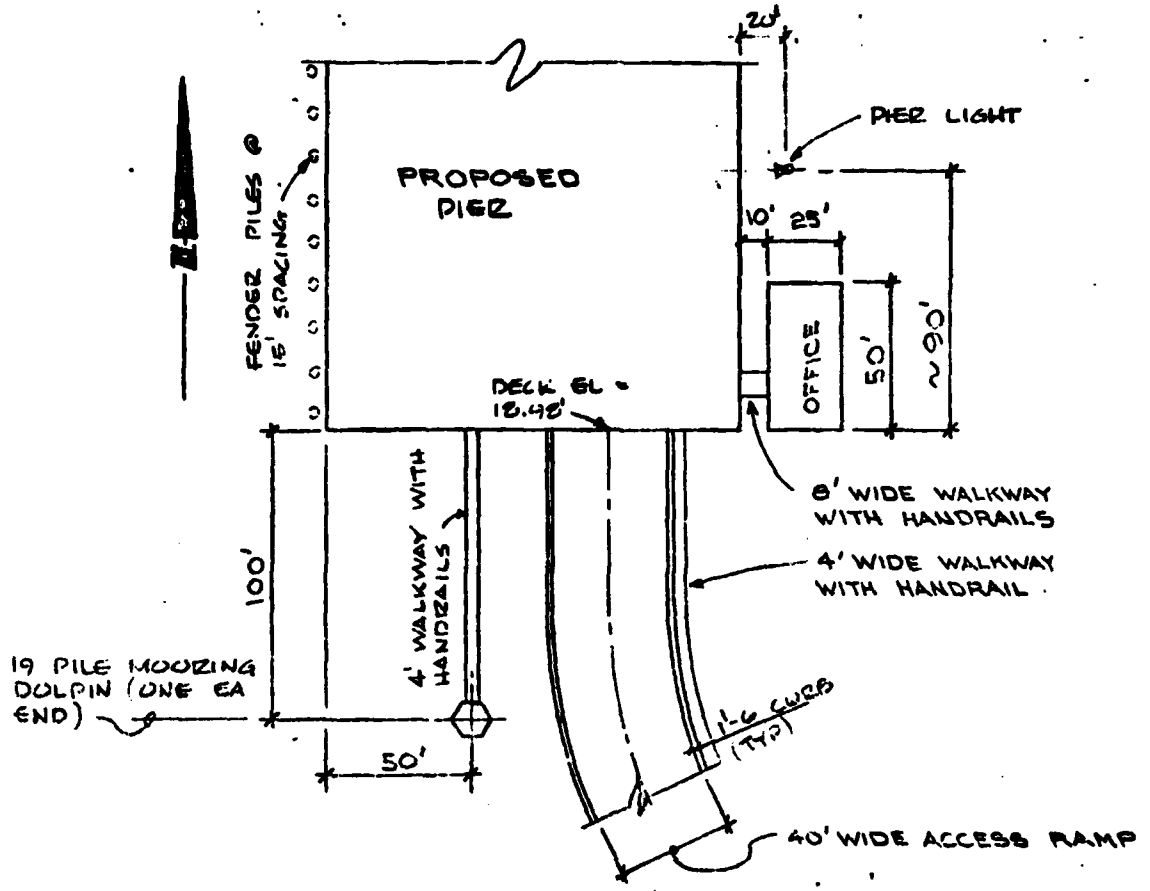
NOTES
- DECK: PRECAST CONCRETE
- PILING: PRESTRESSED CONCRETE
- MHHW = +13.4'
- MLLW = 0.0



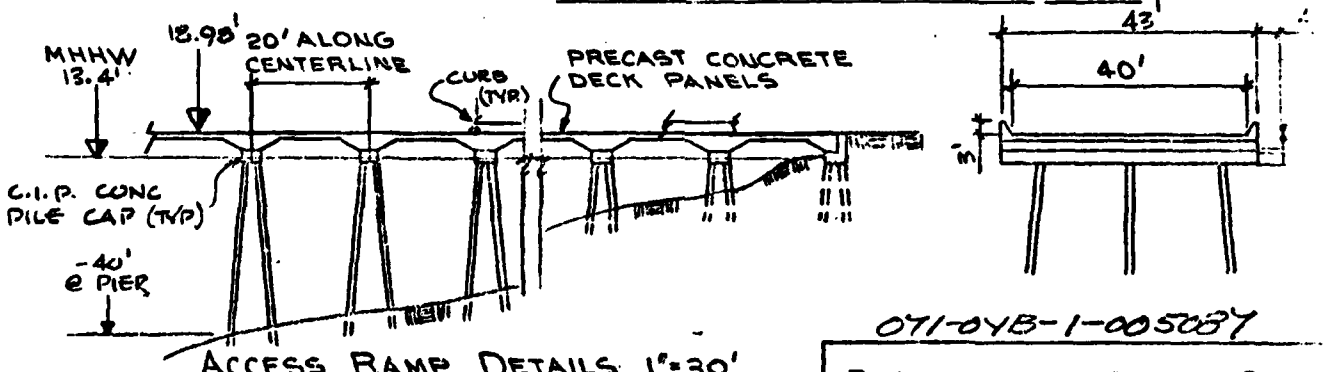
SECTION THRU PIER 1" = 30'

071-015-1-005037

PROPOSED: CONSTRUCT PIER
IN: NISQUALLY REACH
PUGET SOUND
AT: DUPONT
COUNTY: PIERCE
STATE: WASH.
APP: WEYERHAEUSER CO.
DATE: 8-18-78 SHEET 3 OF
REV 6-13-79



PARTIAL PLAN SOUTH END 1"=60'



ACCESS RAMP DETAILS 1"=30'

071-0YB-1-005087

PROPOSED: CONSTRUCT PIER

IN: NISQUALLY REACH, PUGET SOUND

AT: DUPONT

COUNTY: PIERCE

STATE: WASH

APP: WEYERHAEUSER CO.

DATE: 8-18-78 SHEET 4 OF

REV 6-13-79

STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800
Mail Stop PV-11

1 JULY 1979

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Notice of Application for
Certification of Consistency with the
Washington Coastal Zone Management Program

Notice is hereby given that a request is being filed with the Department of Ecology for concurrence, as provided in Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended (P.L. 94-370; 90 Stat. 1013; 16 U.S.C. 1456(c)(3)), that the project described in the Corps of Engineers Public Notice No. 071-0YB-1-005089, will comply with the Washington Coastal Zone Management Program and that the project will be conducted in a manner consistent with that Program.

Any person desiring to present views on considerations pertaining to the project's compliance or consistency with the Washington Coastal Zone Management Program may do so by providing his views in writing to the Department of Ecology, ATTN: Interagency Operations Section, Olympia, Washington 98504, within 20 days of publication of this notice.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSOP-RF

31 August 1978

PUBLIC NOTICE

Reference: 071-OYB-1-005087
Weyerhaeuser Company

Application has been received from Weyerhaeuser Company, Northern Washington Region, Tacoma, Washington 98401 (ATTN: R. H. Lucas, telephone (206) 924-2289) for Department of the Army permit in accordance with Section 10 of the River and Harbor Act of March 3, 1899 for certain work described below and shown on the inclosed prints.

Proposed Work:

a. Location: In Nisqually Reach, Puget Sound at Du Pont, Washington.

b. Physical Character: Construct pier. The applicant has requested two (2) years to start and five (5) years to complete construction.

c. Purpose (as explained by the applicant): Provide berthing facilities for ocean vessels.

Preliminary review by Seattle District indicates that the impacts resulting from this work will significantly affect the quality of the human environment. A Federal Environmental Impact Statement is required for this project and is being prepared.

Preliminary determinations indicate that the proposed activity will not affect endangered species, or their critical habitat, designated as endangered or threatened pursuant to the Endangered Species Act of 1973 (87 Stat. 844). Formal consultation pursuant to Section 7 of the Act with the Department of the Interior is not required for this proposed activity.

Presently unknown archeological, scientific, prehistorical or historical data may be lost or destroyed by work to be accomplished under the requested permit. The work is not located on a property registered in the National Register of Historic Places.

The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected

071-OYB-1-005087

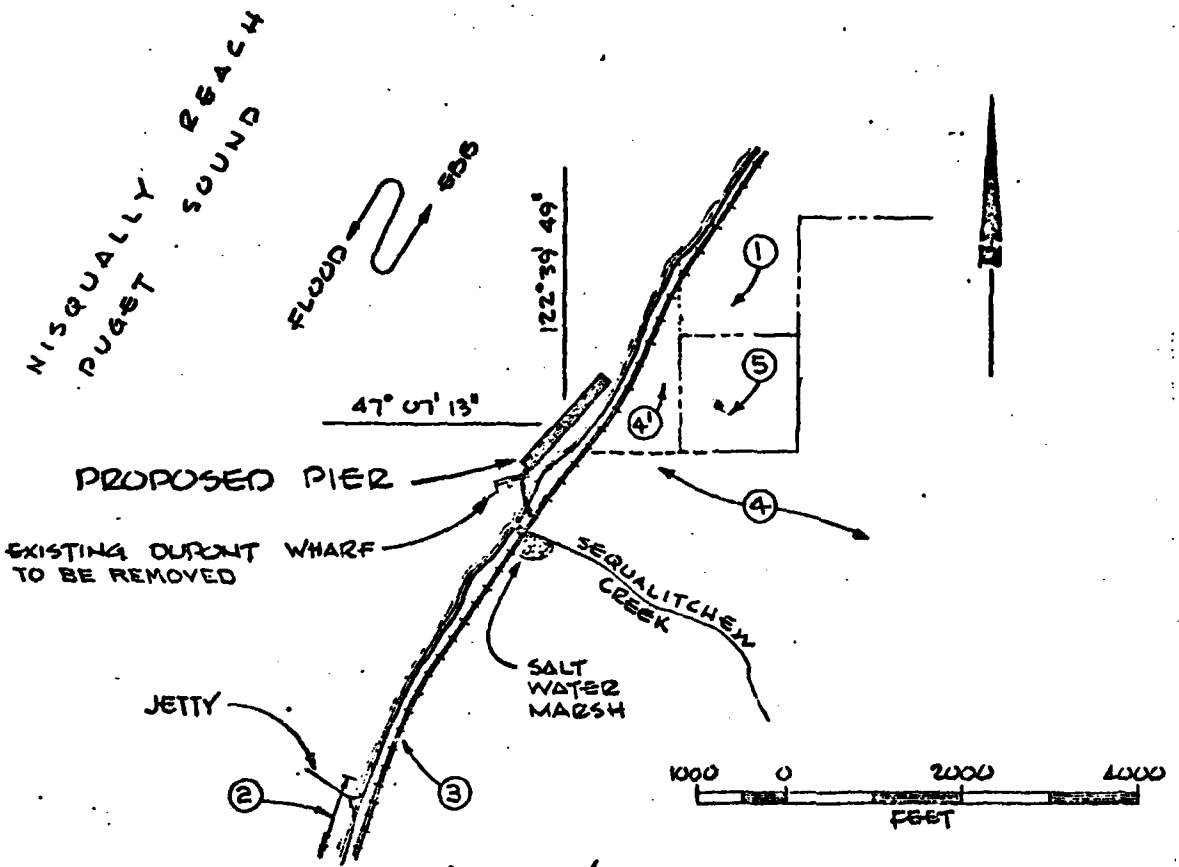
to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered; among those are conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people.

Comments on these factors will be accepted and made part of the record and will be considered in determining whether it would be in the best public interest to grant a permit. Comments should refer to the reference number shown above and reach this office not later than 2 October 1978 to insure consideration.

Gerald A Keller

1 Incl
Prints (4)

GERALD A. KELLER
Permit Section



VICINITY MAP

1. PURPOSE: PROVIDE BERTHING FACILITIES FOR OCEAN VESSELS
2. DATUM: MEAN LOWER LOW WATER, NGVD - 1929 = 0.0'
3. ADJACENT PROPERTY OWNERS ARE: ① LONE STAR CORP. (FORMELY PIONEER SAND & GRAVEL) ② U.S. FISH AND WILDLIFE SERVICE. ③ BURLINGTON NORTHERN R.R. ④ WEYERHAEUSER CO. ④' WEYERHAEUSER CO; ANNEXATION TO CITY OF DUPONT WILL BE PROPOSED. ⑤ FORT LEWIS MIL. RES.
4. NO DREDGING OR FILLING PROPOSED FOR THIS PROJECT.
5. PROJECT TO BE WITHIN CITY LIMITS OF DUPONT (ANNEXATION WILL BE PROPOSED). POPULATION CENTER 2 MI. S.E.
6. NO ROADS IN IMMEDIATE VICINITY.
7. AFTER PERMIT ISSUANCE, PERMITTED ACTIVITY IS PLANNED TO START WITHIN TWO YEARS & BE COMPLETED WITHIN FIVE YEARS.
8. VICINITY MAP DATA FROM: USGS NISQUALLY QUADRANGLE N4700 - W12237.5/7.5 1959 PH. REV 1968 & 1973

071-0YB-1-005087

PROPOSED: CONSTRUCT PIER

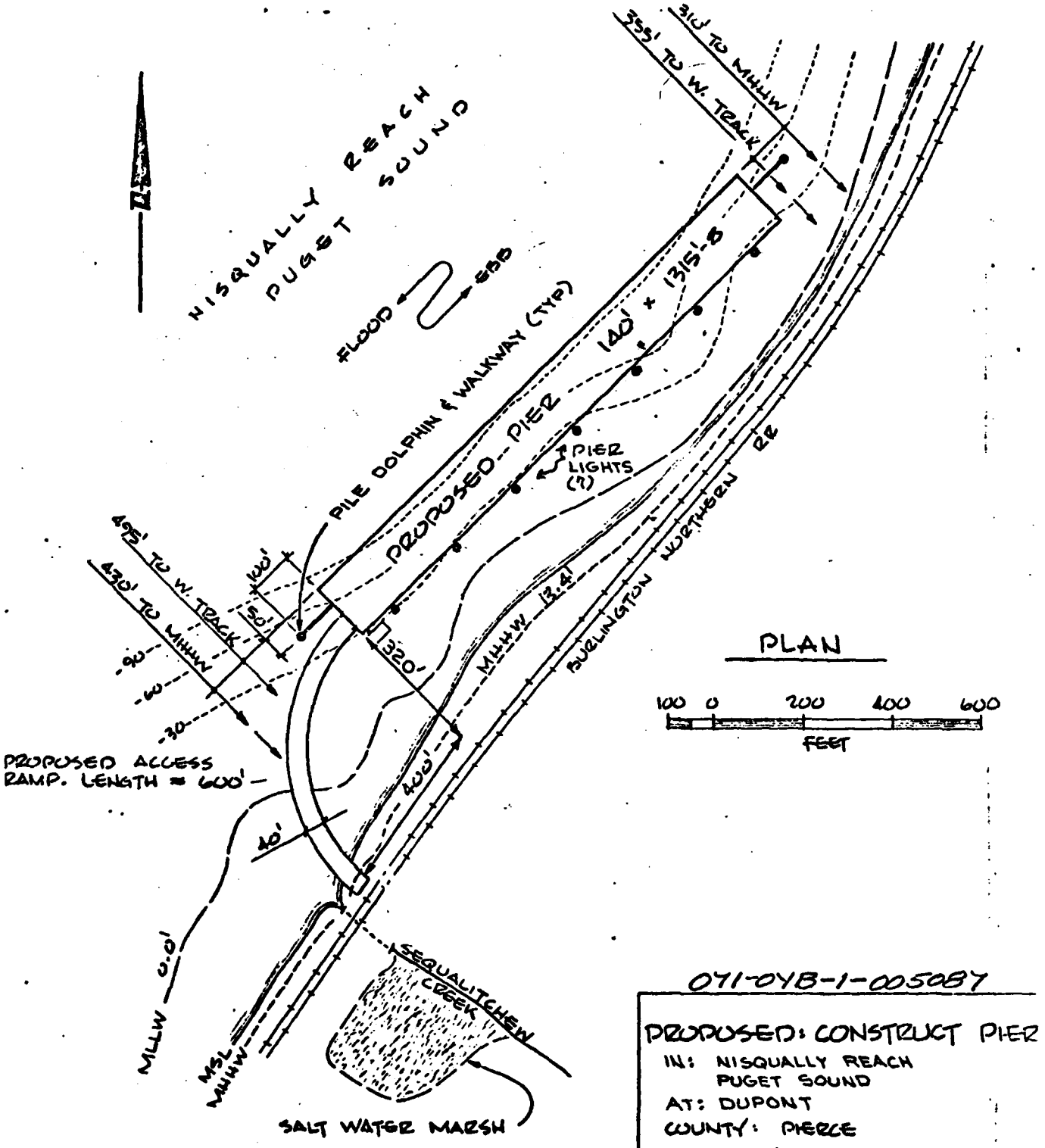
IN: NISQUALLY REACH PUGET SOUND AT: DUPONT

COUNTY: PIERCE STATE: WASH.

APPLICANT: WEYERHAEUSER COMPANY

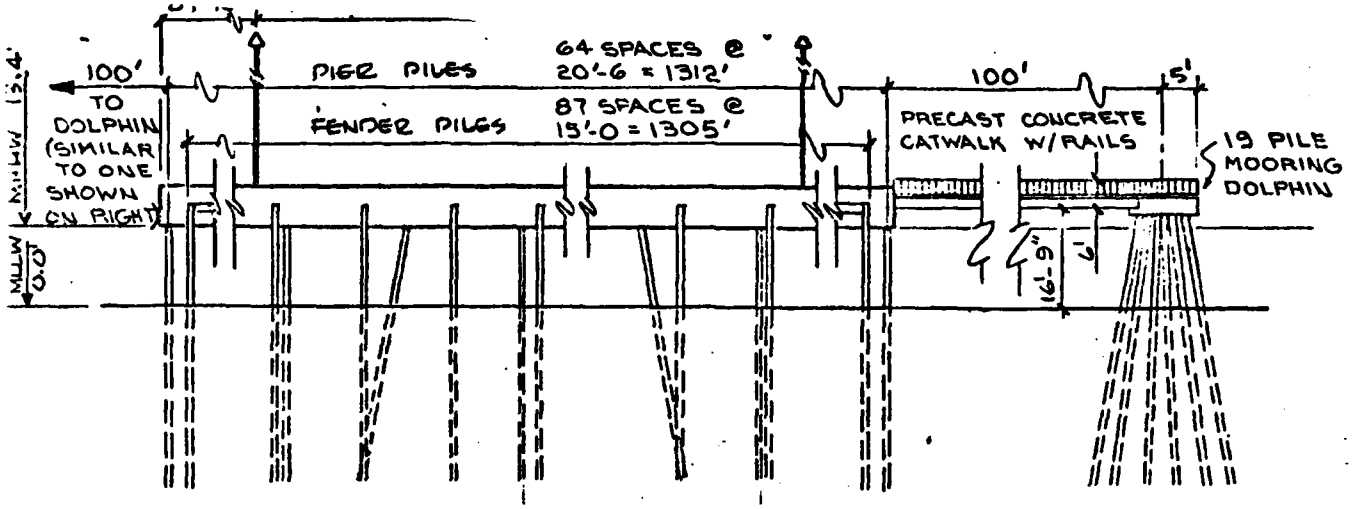
DATE: 8-18-78 SHEET 1 OF 4

A-24



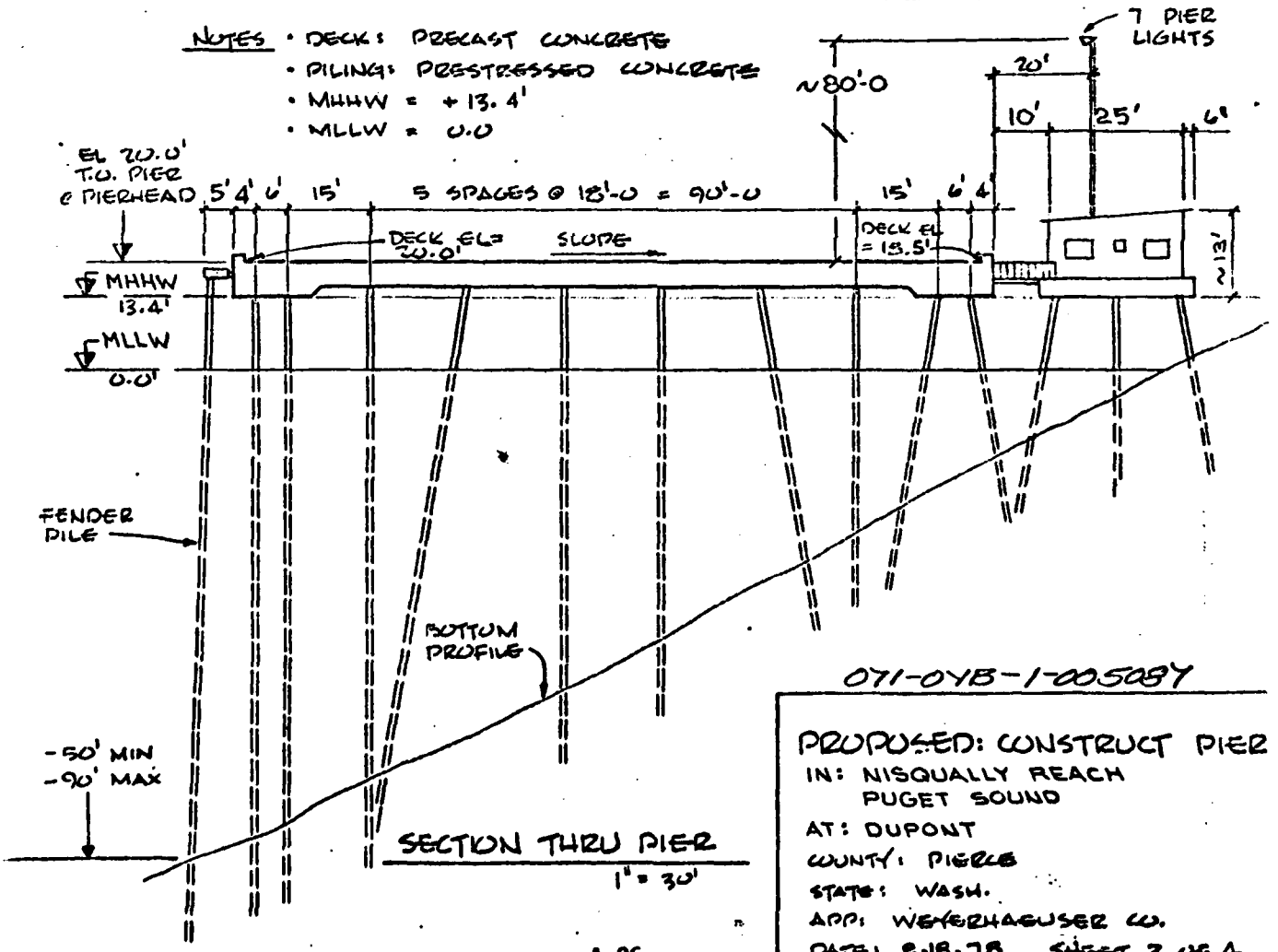
071-0YB-1-005087

PROPOSED: CONSTRUCT PIER
IN: NISQUALLY REACH
PUGET SOUND
AT: DUPONT
COUNTY: PIERCE
STATE: WASH.
APP: WEYERHAEUSER CO.
DATE: 8-18-78 SHEET 2 OF 4



WEST ELEVATION OF PIER 1" = 30'

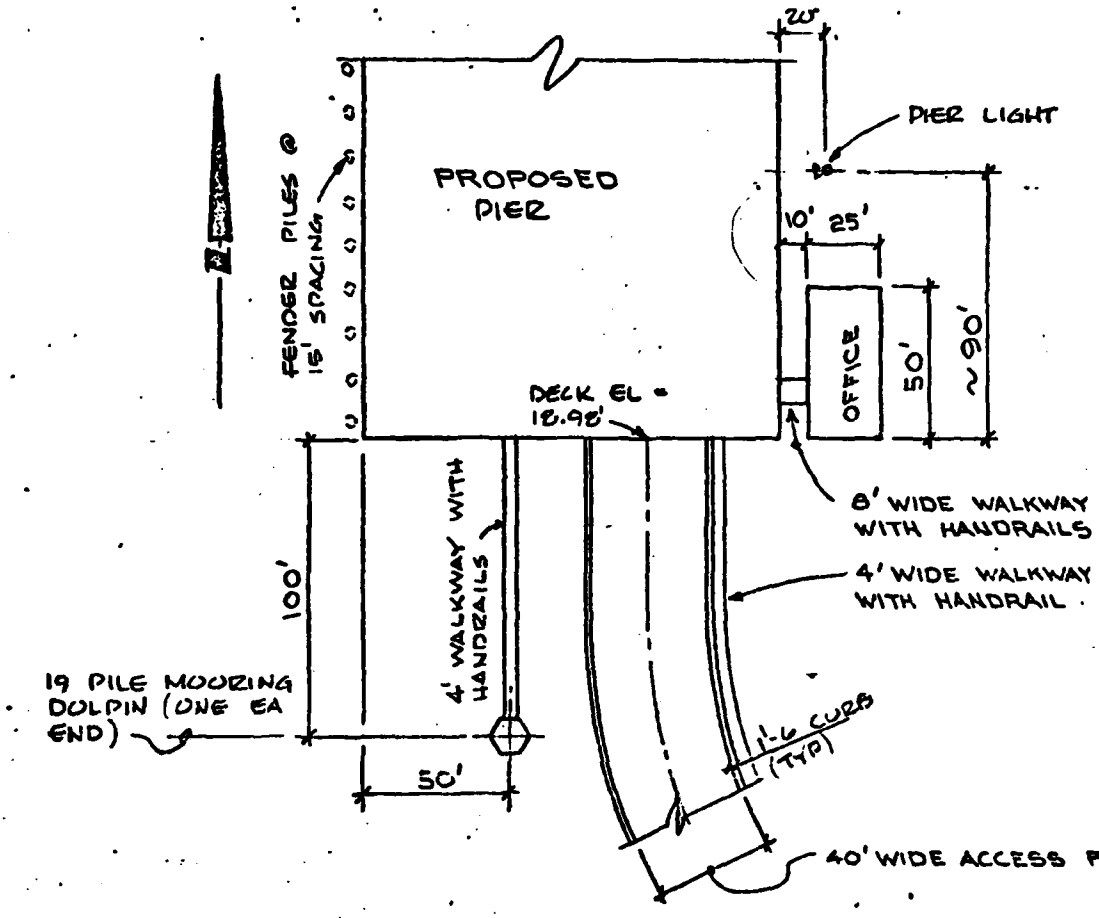
NOTES
- DECK: PRECAST CONCRETE
- PILING: PRESTRESSED CONCRETE
- MHHW = +13.4'
- MLLW = 0.0



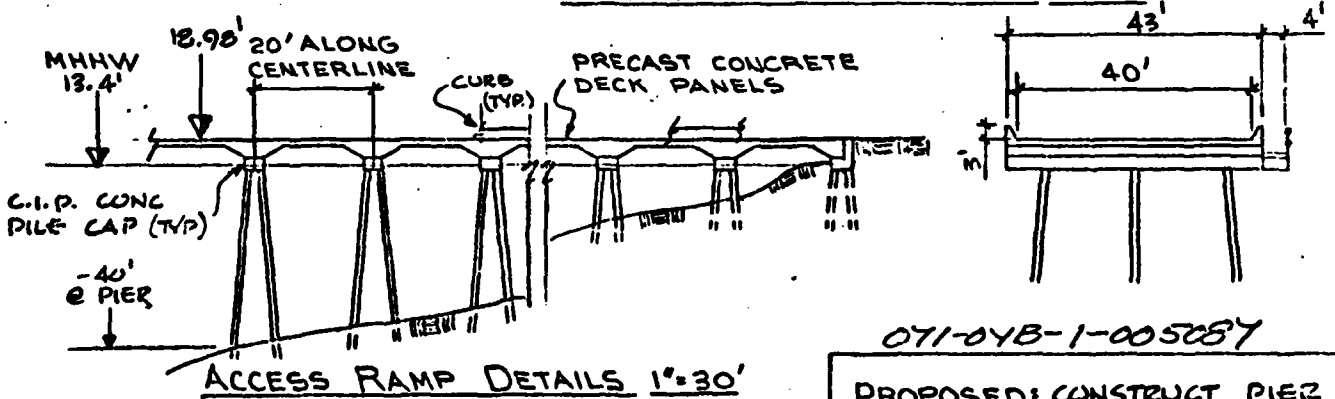
SECTION THRU PIER 1" = 30'

071-0YB-1-005087

PROPOSED: CONSTRUCT PIER
IN: NISQUALLY REACH
PUGET SOUND
AT: DUPONT
COUNTY: PIERCE
STATE: WASH.
APP: WEYERHAEUSER CO.
DATE: 8-18-78 SHEET 3 OF 4



PARTIAL PLAN SOUTH END 1"=60'



ACCESS RAMP DETAILS 1"=30'

071-04B-1-00587

PROPOSED: CONSTRUCT PIER

IN: NISQUALLY REACH, PUGET SOUND

AT: DUPONT

COUNTY: PIERCE

STATE: WASH

APP: WEYERHAEUSER CO.

DATE: 8-18-78 SHEET 4 OF 4

APPENDIX B

WEYERHAEUSER EXPLANATORY DOCUMENTS

Mailed 10/18/78

October 12, 1978

Major General Richard E. Cavazos
Commanding General
9th Infantry Division & Fort Lewis
Fort Lewis WA 98433

Dear General Cavazos:

As you know, the City of DuPont and the Corps of Engineers are working on environmental impact statements covering our current plans for a dock and export facility for the transshipment of forest products. These statements, covering all aspects of the project, are based upon two years of intensive scientific study, at a cost of $2 million.

The products to be shipped from our DuPont facility will be produced at other Weyerhaeuser manufacturing operations in the Pacific Northwest. We do not currently have any plans for construction of manufacturing plants at DuPont.

However, as we have said since our purchase of the DuPont property, it is possible that in the future Weyerhaeuser might propose construction and operation of additional facilities at DuPont. Any such facilities would be constructed and operated in compliance with environmental quality regulations, and would be subject to environmental permit processes then in force. In appropriate ways, and at appropriate times, we would expect Fort Lewis, other agencies, and the public-at-large to be included in those processes.

No facilities will be constructed at the DuPont site, now or in the future, which do not meet applicable local, state or Federal regulations as they relate to geology, soils, climate, air quality, hydrology, water quality, aquatic and terrestrial biota, noise, socioeconomic concerns, aesthetics, archaeological and historic resources, and land-use.

If we are allowed to proceed with the current project -- the export facility -- the DEIS indicates that air quality will not be significantly affected by the initial installation or any later expansions of the export facility, nor will water quality or noise levels vary appreciably from present ranges, as established by the Washington State Department of Ecology.

During the facility's construction and operation, Weyerhaeusor would immediately respond to any environmentally damaging occurence caused by us, whether it is at the facility or a nearby location. Restrictions and standard operating procedures will be developed to avoid adverse environmental conditions, and any violations of local, state or Federal regulations will be reported by Weyerhaeuser to the proper regulatory agency. Measures also will be taken to avoid or mitigate any observed or reported adverse environmental impacts emanating from the proposed facility or any later additions.

Weyerhaeuser will also act as an environmental overseer for customers and suppliers while they are using the facility. In the absence of an immediate response by the customer or supplier to an environmentally adverse occurrence, such as a spill, Weyerhaeuser would itself initiate abatement or mitigation procedures.

In summary, then: 1) We fully intend to build and operate our proposed export facility in an environmentally sound and proper manner. 2) We have no current plans for any type of manufacturing facility at DuPont. 3) If such plans are developed, Weyerhaeuser Company will maintain its commitment to being a compatible and unobtrusive neighbor with Fort Lewis and other nearby landowners, as well as the residents of DuPont and the Nisqually Delta.

I hope this letter answers any concerns the command of Fort Lewis may have about the construction or operation of our new export facility at DuPont. If we can be of any further assistance, please do not hesitate to contact my office.

Very truly yours,

George H. Weyerhaeuser

GHW

bcc: R. H. Lucas
D. D. Ruckelshaus

STATEMENT OF WEYERHAEUSER COMPANY INTENTIONS REGARDING FUTURE USE OF ITS DUPONT SITE

Weyerhaeuser Company plans to build a forest products export center occupying approximately 250 acres of the 3,200 acre site it owns at DuPont, Washington. The Company has no plans or proposals for the remainder of the site.

In its own self interest, Weyerhaeuser must assure that its activities are compatible with a broad range of environmental, social and economic values. Weyerhaeuser strives to deserve and maintain its reputation as a company that is sensitive to environmental and social concerns, while producing socially valuable goods and services at reasonable costs.

As a part of its written corporate policy, Weyerhaeuser has a stated commitment to:

> ". . . perform in concert and harmony with nature and the public interest by: exercising the highest level of responsible stewardship of natural and environmental resources, practicing wise use of all resources throughout its activities, responding positively to opportunities for environmental, ecological and social problem solving, and encouraging others toward the same commitments."

As mentioned, Weyerhaeuser has no plans for the DuPont property other than the proposed export facility. And, any future use of the DuPont property by the Company (whether for industrial or other purposes) would, like the present proposal, be fully consistent with the overall policy quoted above.

Of course, any future development at DuPont would comply with all applicable laws and regulations - federal, state and local. Beyond this, Weyerhaeuser has made extraordinary efforts to insure additional public and government involvement in the planning of its export center and in extensive baseline studies. These not only will be used to evaluate the export center project, but would also be used to assist in planning any future activities that might be proposed for the site. We believe that these baseline studies constitute the most thorough and comprehensive set of baseline data available for any privately owned industrial sites in the Northwest.

A particular focus of these studies, and of the Company's planning for the proposed export facility, has been the nearby Nisqually Delta and the wildlife refuge it contains. From the outset of DuPont project planning, Weyerhaeuser has publicly pledged to do nothing that would harm the Delta, or the fish and wildlife resources nurtured by its productive waters, or the quality of experience of those who turn to the Delta for education, recreation and aesthetic enjoyment. Weyerhaeuser is aware of, and appreciates, the attributes of the Delta, which properly belong to all the people of this nation. For that reason, as this proposed development has been, any future development also would be so designed and operated as to protect the Delta and its varied resource values.

While the entire DuPont site is currently zoned "Industrial," the City of DuPont (in cooperation with other interested agencies and with extensive involvement) is expected in the near future to review and refine its land use plan, policies and regulations. Weyerhaeuser will cooperate fully with these efforts. We will provide all information then available about the property.

The fact that the Company now owns 3,200 acres does not mean that any or all of them necessarily will be used for any of the Company's current lines of business. As explained in Appendix A to the SEPA EIS, the Company normally considers a wide range of sites for any particular manufacturing facility that it decides to build. DuPont undoubtedly will become a "candidate site" for projects that Weyerhaeuser may consider in Western Washington. This is true whether or not the export center is constructed.

If the export center is constructed, Weyerhaeuser probably would hold the surrounding lands for possible future industrial use and for buffers. Historically, Weyerhaeuser has kept substantial acreages in agricultural or similar uses around its major facilities (Longview, Springfield, etc.).

Recognizing the great public sensitivity and concern for protecting the values of the Nisqually Delta and nearby waters, much of the Company's rationale for siting the proposed export terminal, road and rail access, and dock, has been to buffer the Delta and the waters of Puget Sound from any effects of such industrial development - or, indeed, from any conceivable pattern of potential future developments. The Company has embarked on discussions with the US Fish and Wildlife Service, and other agencies, to ensure that this buffering takes into account the requirements of the key management agencies for the Delta and its wildlife refuge. As a further safeguard, we have pledged that any future proposal made by the Company for the DuPont site would reconsider the appropriate buffering of the Delta, and would again involve open planning and discussions with appropriate agencies.

If the export center is not built, the site would be surplus to our current plans. The Company's options at that time would be to: sell or lease the entire site; sell "acreage" to speculators; develop the property as an industrial park or planned community; or hold the property for future use or sale. Neither the parent company nor its subsidiaries have any contingency plans for alternate uses of the property if the export center is not built.

Any future development, of course, would require a complete, new, independent review by all applicable government agencies, based on the regulations and policies in effect at that time. Any future proposals also would be judged not in isolation, but in light of the then existing conditions. Thus, the cummulative impacts of the export center and any such future proposals would be considered. As mentioned, Weyerhaeuser has provided very detailed baseline information which can be used for this purpose.

Weyerhaeuser is not seeking any advance approval for future developments or any action which would compromise the ability of any agency to deny any permits that otherwise would be required for future projects.

Weyerhaeuser has made extensive efforts to involve all interested agencies and the public in every stage for the planning of the proposed export center. We have pledged to approach any future projects with the same commitments to careful study, openness, and flexibility to respond to all reasonable public concerns.

And finally, the Company also pledges that any future projects will be planned, designed, constructed and operated in ways that include all appropriate measures to minimize and mitigate any significant environmental effects, and to safeguard against any accidental environmental damage - on the site itself and on nearby areas, including the Nisqually Delta and its waters.

WEYERHAEUSER'S CORPORATE PLANNING PROCESS SUMMARY AND HOW IT RELATES TO THE DUPONT EXPORT FACILITY

presented by Weyerhaeuser Company

INTRODUCTION

The DuPont Environmental Impact Statement addresses the expected impact of an export facility. Although decisions for future development of the site have not yet been made, it is felt that sufficient public uncertainty exists to warrant some discussion of the matter. The intent of this summary is to address the issue by explaining how decisions concerning the site will be made in a general sense. The key point is that mere ownership of the site does not necessarily mean that there are specific plans for other industrial facilities on the site, recognizing that the purchase of a $12 million site does not drive facility decisions which could involve hundreds of millions of dollars.

Additional development of the DuPont site beyond the construction of the planned export facility is not known at this time. Any decisions to build other industrial facilities on the site will be made not in isolation, but within the framework of the overall Weyerhaeuser corporate planning process. In order to better explain how decisions which may affect the DuPont site will be made, it will be helpful to briefly explain the Weyerhaeuser corporate planning process.

WEYERHAEUSER CORPORATE PLANNING PROCESS

The corporate planning process will be discussed in terms of the four stages of the process, which are classified according to the decision period which the stage addresses. The four planning stages are the High Yield Forest Plan (50-75 years), the Long Term Plan (10-15 years), the Mid-Term Plan (5-7 years), and the Short Term Plan (3 months - 2 years). These plans are proprietary information of the Weyerhaeuser Company.

High Yield Forest Plan

Weyerhaeuser Company has made a basic business decision to be in the forest products industry. Part of its long term business strategy includes a commitment to fee ownership of timberland. This commitment dictates that ultimately corporate planning be based on forest growth. Decisions regarding forest regeneration and planting which are made today will ultimately affect the raw material which will be available for conversion and sale at the end of the timber growth cycle. The average growth cycle for our Western timber

is approximately 50 to 75 years. For this reason, Weyerhaeuser's long-range raw material planning covers at least this 50 to 75 year time frame. The High Yield Forest Plan strongly impacts the raw material availability, which becomes a key input to the next planning phase, the Long-Term Plan. The Company's present forest land holdings are large enough to at least continue stable raw materials production until 2000. Following the year 2000, high yield forests developed in the 1940s will be approaching harvest. This will allow Weyerhaeuser to increase domestic and foreign exports of forest products if the market demand exists.

Long-Term Plan

The Long-Term Plan (LTP) is Weyerhaeuser's strategic plan, governing a time frame of the next 10 to 15 years. The goal of the LTP is to develop overall goals, policies, and resource allocation. This strategic planning is based upon an understanding of shareholder expectations, industry and competitive environment and resource strengths and weaknesses. Strategic planning is performed at two levels: the Business (marketing) level and the Corporate level.

At the Business level, the goal of the LTP is to develop a projection of market opportunities, and resources to meet those opportunities, for the 10 to 15 year period covered by the LTP. The process includes developing an understanding of the existing Business system, the markets, and an assessment of Business strengths.

At the Corporate level, the goal of the LTP is the development of strategy alternatives. These strategy alternatives must be based upon a perception of macroeconomic assumptions, historic strategy, Weyerhaeuser strengths and weaknesses, external considerations, and overall management and shareholder objectives.

The LTP process yields a portfolio of business opportunities for Weyerhaeuser. When matched against corporate strategic direction and capital availability, these opportunities result in a Long-Term Plan which includes a Business Plan, a Financial Plan, and a Support Plan. Again, these are proprietary information of the Weyerhaeuser Company.

Mid-Term Plan

Whereas the LTP may be considered as a strategic plan, the Mid-Term Plan (MTP) may be termed a facility plan. It translates the LTP into a specific facility set which is needed to accomplish the LTP objectives. The mid-term planning horizon covers a period of 5 to 7 years - the time required to plan and to construct a set of facilities.

The goal of the MTP is to match resources and business opportunities consistent with long-term strategies, as resources allow. The MTP performs an allocation of such scarce resources as raw material, capital, technology, and personnel. The MTP leads to a specific set of facility and logistics plans expected to be developed and implemented within the planning horizon.

Short-Term Plan

The Short-Term Plan, which may cover a period of 3 months to 2 years, is a tactical plan. Its purpose is to determine how to best operate the facilities which are already in existence. The Short-Term Plan is a consolidation of operating plans for marketing, manufacturing, raw materials, and logistics.

RELATION OF DUPONT DECISIONS TO PLANNING PROCESS

As stated above, any decisions to build additional facilities on the DuPont site will be made within the framework of the overall corporate planning process. The original decision to purchase the DuPont site was made as the result of corporate strategic direction developed in the Long-Term Plan. One of Weyerhaeuser's specific long term strategies is to compete actively in export markets. The DuPont site was purchased because it is ideally located for an export facility, and has potential capability for other industrial facilities.

When we move to the question of what development might take place at DuPont, we move to the Mid-Term Plan phase. In this phase, a matching of scarce resources with business opportunities and long term strategies takes place. The DuPont site becomes one of the potential sites for any new facilities we might plan to build. The key point is that the decision to build a particular type of facility precedes, and is independent, of the selection of a site. Mere ownership of a specific site does not drive these decisions, which are affected in the longer term by overall business strategies and objectives, raw material and capital availability, market opportunities, and external considerations.

WEYERHAEUSER COMPANY INTENTIONS FOR FUTURE USE OF DUPONT SITE

Weyerhaeuser Company plans to build an export center occupying approximately 250 acres of the 3200 acre site it owns at DuPont, Washington. The company has no present plans for the remainder of the site.

In its own self-interest, Weyerhaeuser must assure that its activities are compatible with a broad range of environmental, social and economic values. Weyerhaeuser strives to deserve and maintain its reputation as a company that is sensitive to environmental and social concerns, while producing socially valuable goods and services at reasonable costs. Any future use of the property (whether for industrial or other purposes) by the company would be consistent with this overall policy.

More specifically, Weyerhaeuser has stated a commitment to:

> "...perform in concert and harmony with nature and public interest by: exercising the highest level of responsible stewardship of natural and environmental resources, practicing wise use of all resources throughout its activities, responding positively to opportunities for environmental, ecological and social problem solving, and encouraging others toward the same commitments."

Any future development will, of course, comply with all applicable laws and regulations - federal, state and local. Beyond this, Weyerhaeuser has made extraordinary efforts to insure additional public and government involvement in the planning of its export center and in the extensive baseline studies which will be used not only to evaluate the export center project but to assist in planning any future activities that might be proposed for the site. We believe that these baseline studies constitute the most thorough and comprehensive set of baseline data available for any privately owned industrial sites in the Northwest.

While the entire site is currently zoned "Industrial," the City of DuPont (in cooperation with other interested agencies and with extensive involvement) is expected to review and refine its land-use plans, policies and regulations. Weyerhaeuser will cooperate fully with these efforts. We will provide all information then available about the property.

The fact that the company now owns 3200 acres does not mean that any or all of them necessarily will be used for any of the company's current lines of business. As explained above, the company will consider a wide range of sites for any particular manufacturing facility that it decides to build. DuPont undoubtedly will be a "candidate site" for any major projects that Weyerhaeuser considers in Western Washington. This is true whether or not the export center is constructed.

If the export center is constructed, Weyerhaeuser probably would hold the surrounding lands for possible future industrial use and for buffers. Historically Weyerhaeuser has kept substantial acreages in agricultural or similar uses around its major facilities (Longview, Springfield, etc.).

If the export center is not built, the site would be surplus to our current plans. The company's options at that time would be to sell or lease the entire site, sell "acreage" to speculators, develop the property as an industrial park or planned community, or hold the property for future use or sale. Neither the parent company nor its subsidiaries has any contingency plans for alternate uses of the property if the export center is not built.

Any future development will require a complete, new, independent review by all applicable government agencies, based on the regulations and policies in effect at that time. Any future proposals will be judged not in isolation but in light of the then existing conditions; thus, the cummulative impacts of the export center and any future proposals will be considered. As mentioned, Weyerhaeuser has provided very detailed baseline information which can be used for this purpose.

Weyerhaeuser is not seeking any advance approval for future developments or any action which would compromise the ability of any agency to deny any permits that otherwise would be required for future projects.

Weyerhaeuser has made extensive efforts to involve all interested agencies and the public in every stage for the planning of the proposed export center. We have pledged to approach any future projects with the same commitments to careful study, openness and flexibility to respond to all

reasonable public concerns. And finally, the company also pledges that any future projects will be planned, designed, constructed and operated in ways that include all appropriate measures to minimize and mitigate any significant environmental effects and to safeguard against any accidental environmental damage.

NEED FOR THE EXPORT FACILITY

Weyerhaeuser has developed a statement which identifies the importance of an export facility to their company. The report is presented as follows:

"The need for a high technology export facility at DuPont is based on existing market forces, and their projected development.

"Northwest forest products have always been shipped outside the region. Traditionally, the major population centers of the East Coast and Midwest have been the main markets. But the Northwest's share of these markets has been declining in the face of increased competiton from Canada and the South. In the Northeast, for example, what was once a 50% market share for Northwest wood products had dropped to 30% by 1964, and to less than 5% by 1978.

"To replace that loss of competitiveness domestically and thus to remain viable as industries, Pacific Northwest producers of forest products increasingly must look offshore, to the "fiber-short" regions of the world: Japan and Europe. Weyerhauser has already begun a major effort to serve world forest products markets. In fact, approximately half of the company's annual tonnage output from the State of Washington now goes offshore.

"This existing trade is split about evenly between finished products (pulp, paper, lumber, plywood, etc.) and forest raw materials (logs and wood chips).

"With regard to logs, a number of agencies with international expertise - such as the U.S. Forest Service, Japan Forestry Agency and the consulting firm of Data Resources Incorported - have predicted level or declining export markets for U.S. softwood logs over the remainder of this century. Weyerhaeuser's own projections generally agree, and we also expect our own log export volumes to follow this flat or declining trend.

"These flows, we believe, will be replaced over time by export trade in manufactured products. Exactly which products will be sold and from which of Weyerhaeuser's mills, cannot be forecast definitively. Broadly, however, we can begin to see market changes on the horizon. Particularly with regard to our trade with Japan, economic forces are already in place and working that will eventually move export flows away from raw materials and toward manufactured forest products.

"This long-range trend is based on three key factors:

- First is the fact that Japan has little room for industrial expansion. Partly because of land base, and partly because of immense difficulties in controlling cumulative pollution impacts, we think Japan will increasingly be forced to look offshore for its manufacturing capability.

- Energy is a second consideration. Of all the industrial nations, Japan is the most dependent on imported, petroleum-based sources of

production energy. This dependency, again, moves Japan toward the import of manufactured goods.

- The third factor is transportation and distribution efficiency. This is particularly important in forest products, where size and bulk mean very high unit transportation costs.

"We believe we are already seeing some of these trends at work in the pulp and paper segment of our business. For example, Weyerhaeuser is involved in a joint venture with Jujo Paper Company, to construct a newsprint mill at Longview, with half the output going offshore. When that mill was first discussed some years ago, it was planned for construction in Japan--and the U.S. would have been exporting wood chips instead of paper.

"A similar shift from raw materials to converted products, we believe, will also occur in the solid wood business--but we think it will occur more slowly. Because the technologies involved are old, lumber manufacture is less a global than a national (or even local) process. Nations have their own unique lumber sizes and construction methods--often built around traditions that are centuries older than our own. This means that market change is far more political, and proceeds more slowly.

"Those briefly, are the factors that have led us to propose the DuPont Export Center as a marketing tool, for creation of future trade flows. To that end, we have designed the DuPont Center to be a modern, highly efficient, export facility - central to our forest and mill operations in Western Washington; geared toward rapid "one-stop" shipment of a variety of forest products to a number of growing world markets; and designed with enough flexibility to handle 21st century forest products and markets that may not even be envisioned today, against increasingly tough competition from other nations.

"The competitive aspect is a critical one. When we speak of being competitive in international forest products trade, we are not just talking about competing against a neighboring mill down the road. World trade in forest products involves Russia-Canada, Scandinavia, New Zealand -- competing as nations, backed by sharp, savvy trade policy. (For example, British Columbia recently announced plans to construct a forest products export facility at Nanaimo. It is similar in concept to the DuPont proposal, but much larger in scope -- and it is based on cooperative efforts between the government and private industry.)

"To compete successfully in world markets, then, requires logistics facilities and systems that are innovative, and fully cost-effective. Thus, the concept behind DuPont is quite different from a traditional approach to shipping forest products offshore.

"Today, most of our exports go through more or less traditional terminals. Our ships will stop at several ports to pick up cargo, and also at several ports of destination. These ships generally spend up to half their time loading, unloading, or going from port to port. The rest of the time is productive time...that is, time spent going between the producer and the customer.

"This traditional pattern--which has been the basis for most waterborne trade since the time of the Phoenicians--will continue to predominate in forest products shipments from the Northwest. And, as studies have shown, there is existing port capacity for such trade.

"The DuPont project, however, is not designed to fit into this parttern, and is not suited to existing port capacity. What we envision at DuPont is a modern export system that can take larger vessels, put together large shipments of multiple types of forest products for rapid loading, and involve a single loading point.

"Under this system, instead of spending half its time going from port to port, our ship could spend as much as 90% of its time moving between us and the customer. This results in potential savings in delivered cost, and an increased competitive ability to capture world markets for products made in Washington State, by Washington workers.

"We expect this sytem to handle up to 20% of Weyerhaeuser's exports --the 20% suitable for single, one-stop shiploads of multiple product lines.

"And, we believe this system will not just make us ready for growth we foresee in product exports -- it will let us create that growth.

"We do not, at this point, know precise volumes of specific products, or the exact mill origins of our future trade through DuPont. What we do know is that today's markets produce the capital, and anticipation of tomorrow's markets provide the incentive for long-term reinvestment in mills and forest management. Thus to the extent that the economic advantages of the DuPont facility improve our competitive ability in international markets, DuPont will also enhance our capability and motivation to invest in mill operations and intensive forest management in Washington State.

"These investments are the key to future timber supply for our business continuity and expansion, and therefore to the number of jobs that we, as a company can support. They are therefore important to long-range timber supply, and timber-related jobs, in all areas of Washington where Weyerhaeuser Company operates."

DUPONT PORT CALL ANALYSIS

Weyerhaeuser's Marine Transportation Department has reviewed and updated its projections of most likely vessel call frequencies to DuPont. The purpose of the review was to analyze the effect of changed circumstances on the expected rate of transition from the current vessel fleet, product mix and volumes to those for which the DuPont facility is being designed.

Any analysis of this kind is frought with uncertainty due to the difficulty of projecting both export volumes and the timing of future vessel configurations. We expect substantial increases in total export shipments from the Northwest, and changes in product mix toward more finished products. We are less confident in our ability to predict vessel configurations, which are impacted by shipbuilding costs, energy efficiency, loading and packaging technology, and the associated feeder systems. Because of increased uncertainties in the world economic situation, both volumes and vessel configurations are less predictable than formerly believed.

Nevertheless, the general trend within the maritime industry still confirms the use of increasingly large vessels over time, although timing is less certain. The predictability of alternative vessel systems is fundamental to port call analysis. Larger vessels obviously imply fewer port calls. The number of port calls is expected to decline as average vessel size should increase faster than the tonnage shipped. The inference here is a diminishing risk of vessel casualties and oil spills over time.

The attached graph depicts alternative scenarios over four time frames. The variation in port calls within each time frame reflects the impacts of alternative vessel configurations. For each time frame we projected the number of port calls based upon increasingly larger vessel types and mixes.

The other factors are projected volume and projected product mix. The projections are based on a start-up volume of 1,660 short tons per year, the volume currently being shipped from our Tacoma export yard. The subsequent time frames depict design volume of 2,000,000 short tons per year in mixtures of logs and finished products, with increasing percentages of converted products. Since converted products generally require more cubic ship space per ton, increasing proportions of finished products require slightly more annual vessel capacity. Hence the number of port calls does not decline as fast as the same vessel configurations would imply for a constant product mix.

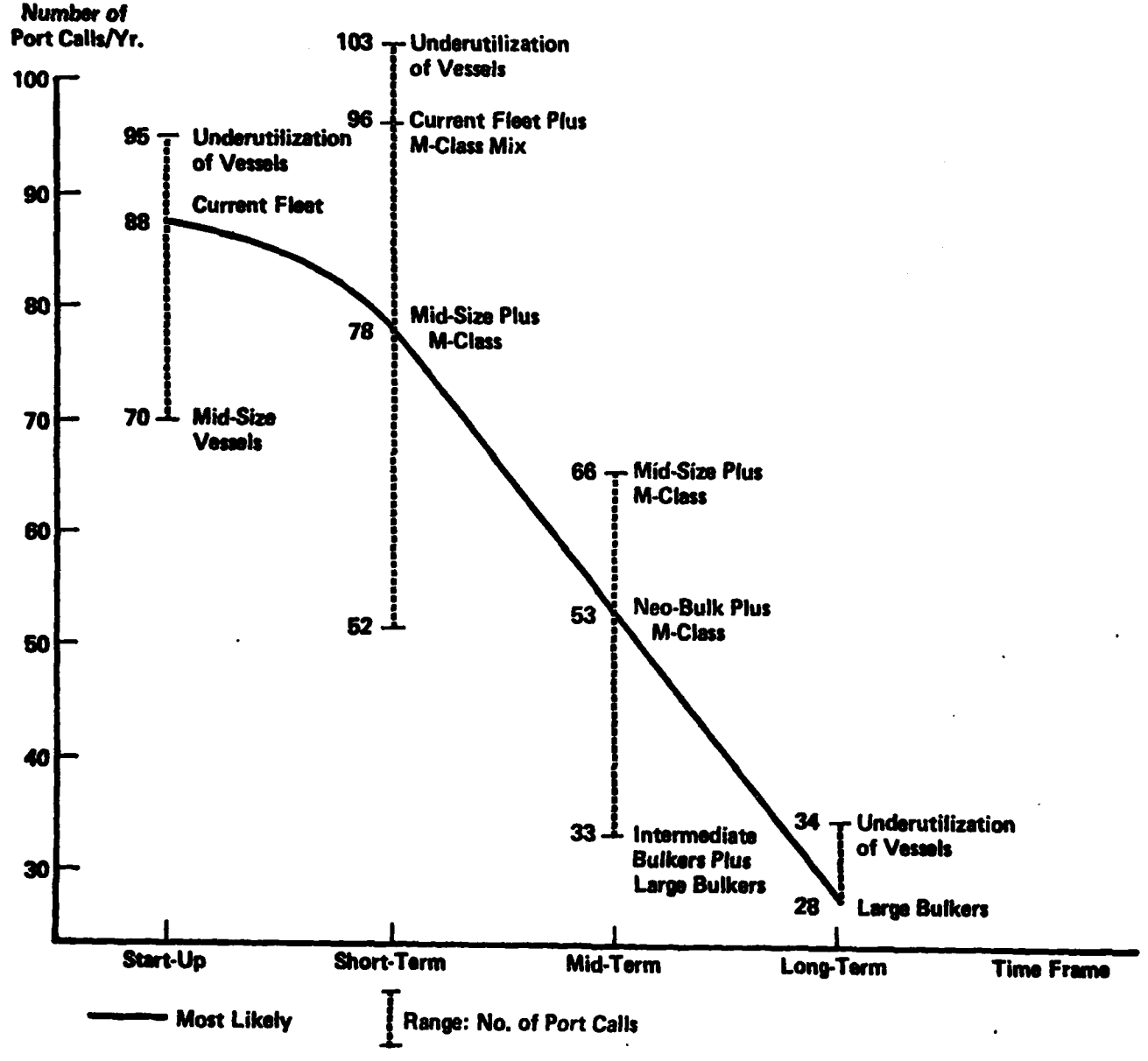
The vessel descriptions refer to ships of the following deadweight tonnages: "current vessels" 26,000 dwt; "mid-size vessels" 28,000 dwt; "M-class" 44,000 dwt; "neo-bulk class" 44,000 dwt; "intermediate bulk carrier" 50,000 dwt; "large bulk carrier" 80,000 dwt. These are hypothetical figures based on worldwide shipping trends rather than any specific ship designs or specific plans for future ship orders.

The graph visually depicts the trend line impacts of these changes over time. The ranges for each time frame underscore the element of uncertainty in projecting the implementation of future vessel configurations. The ranges reflect probabilities based on current outlooks for the evolution of future operations.

Implementation of new (larger) vessels necessarily implies transition phases. There would be gradual changes in the number of port calls at DuPont in any given year, as new vessels gradually replaced smaller ones in the total vessel mix.

jw15/59/e1

DUPONT PORT CALL APPROXIMATIONS
RANGES FOR FUTURE VESSEL CONFIGURATIONS



APPENDIX C

AIR QUALITY

TABLE C-1

MONTHLY AND YEARLY TEMPERATURE
AND PRECIPITATION AT TACOMA

Month	mean temperature* (°F)	monthly precipitation (inches)		
		normal	1976	% of normal*
January	39.9	5.57	5.81	104
February	43.6	4.02	4.03	100
March	45.2	3.50	2.96	85
April	50.0	2.43	2.03	84
May	55.9	1.44	1.94	125
June	60.5	1.32	.41	31
July	64.8	0.70	1.27	181
August	64.2	1.02	3.02	296
September	60.1	1.80	.93	52
October	53.0	3.75	1.83	49
November	45.9	5.55	1.20	22
December	41.1	5.67	2.27	40
The year	52.1	36.88	27.70	75

*Period of Record: 1941-1970
Source: U.S. Department of Commerce, 1973

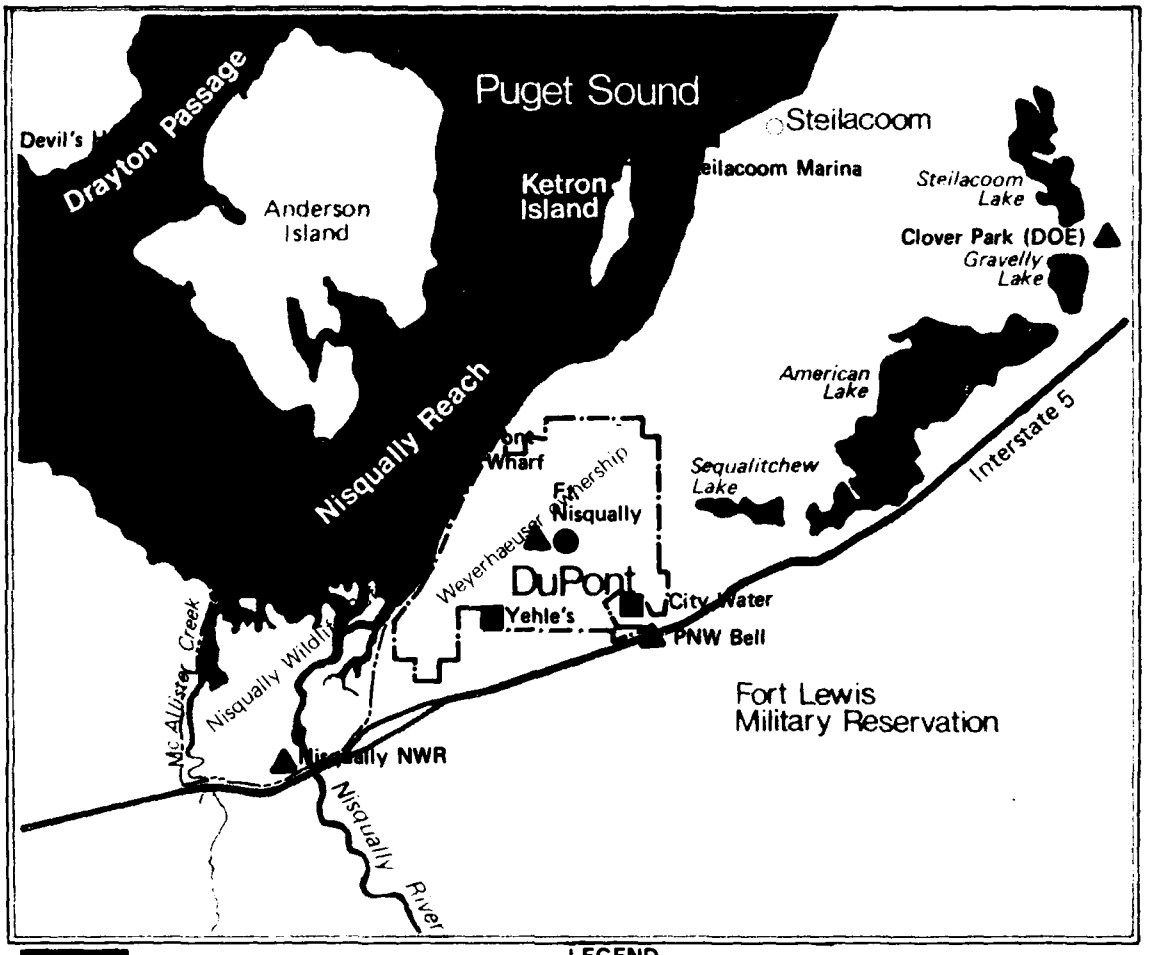


FIGURE C-1
AEROMETRIC EQUIPMENT
SITES

TABLE C-2

DUPONT SITE AEROMETRIC INSTRUMENTATION

Instrument Type	Location	Parameters Monitored
Air Quality Trailer	Pacific Northwest Bell Repeater Bldg., DuPont (near I-5) 6-18-77 to 2-6-78; Nisqually Delta National Wildlife Refuge 2-9-78 to 6-19-78	SO_2, CO, NO_x, COH, HC, Suspended Particulate, Wind Speed, Wind Direction
Air Quality Trailer	Second Old Ft. Nisqually DuPont	SO_2, CO, NO_x, COH, NO_2 HC, Suspended Particulates
60 m Meteorological Tower	Second Old Ft. Nisqually DuPont	Wind Speed and Direction at 10 m and 60 m, Temp.
High-Volume Particulate Sampler (Hi-Vol)	City Water Supply Pump House, DuPont	Suspended Particulates
"	Yehle's Residence, DuPont	Suspended Particulates
"	Steilacoom Marine, Steilacoom	Suspended Particulates
Air Quality Trailer (DOE)	Clover Park, Lakewood	SO_2, O_3, COH, Suspended Particulates, Wind Speed and Direction, Temp., Dew Pt.
Portable Wind Stations (Supplemental)	DuPont Wharf	Wind Speed and Direction, Temp., RH. Precip, Solar Radiation
"	Ketron Island	Wind Speed and Direction
"	Johnson's Point	Wind Speed and Direction
"	Various	Wind Speed and Direction

TABLE C-3

AMBIENT AIR QUALITY STANDARDS

	Primary	National Secondary		Washington State		Puget Sound Region	
	ug/m^3	ug/m^3	Notes	ug/m^3	Notes	ug/m^3	Notes
SULFUR DIOXIDE							
Annual Average	80		a	52	a	52	a
30-day Average						105	a
24-hour Average	365		b	262	b	262	a
3-hour Average		1300	b				
1-hour Average				655	c	655	c
1-hour Average				1048	b	1048	a
5-min. Average						2619	d
SUSPENDED PARTICULATES							
Annual Geom. Mean	75	60	a	60	a	60	a
24-hour Average	260	150	b	150	b	150	b
CARBON MONOXIDE							
8-hour Average	10,000	same	b	same		same	
1-hour Average	40,000		b				
PHOTOCHEMICAL OXIDANTS				same but			
1-hour Average	240	same	b	applies only 10 a.m.- 4 p.m. 4/1 thru 10/31		160	
NITROGEN DIOXIDE							
Annual Average	100	same	a	same		same	
PARTICLE FALLOUT				grams/m^2/mo.			
Industrial Area				10			
Commercial-Residential Areas				5			
HYDROCARBONS (Less Methane)			b	same but applies only		same as National	
3-hour Average	160	same	e	4/1 thru 10/31			

a Never to be exceeded
b Not to be exceeded more than once per year
c Not to be exceeded more than twice in seven days
d Not to be exceeded more than once in eight hours
e Applies to 3-hour period 6 to 9 a.m. daily

Source: PSAPCA, 1977

TABLE C-4
ALLOWABLE AIR POLLUTION INCREMENTS FOR THE
PREVENTION OF SIGNIFICANT DETERIORATION

Class	Pollutant	Averaging Period	Max. Increase Above Baseline ug/m^3
I	Particulate	Annual Geometric Mean	5
		24-Hr	10
	SO_2	Annual Arithmetic Mean	2
		24-Hr	25
		3-Hr	25
II	Particulate	Annual Geometric Mean	19
		24-Hr	37
	SO_2	Annual Arithmetic Mean	20
		24-Hr	91
		3-Hr	512
III	Particulate	Annual Geometric Mean	37
		24-Hr	75
	SO_2	Annual Arithmetic Mean	40
		24-Hr	182
		3-Hr	700

Notes: Increments + baseline must not exceed national or local standards.

Annual standards and increments may never be exceeded; other standards may be exceeded once per year.

TABLE C-5

DUPONT EMISSIONS

Period	Source	Pollutant Part.	SO_2	CO	NMHC	NO_2
Hourly (emissions = kg/hr)	Trucks	0.4	0.6	4.4	0.9	5.5
	Ships	0.3	0.8	0.9	0.6	0.9
	R R Engines	0.1	0.3	1.9	0.7	2.4
	Stevedore Fugitive Dust	312	---	---	---	---
	Total	212.8	1.7	7.2	2.2	8.8
	Construction	160	---	---	---	---
Daily (emissions = kg/day)	Trucks	5.7	8.5	58.8	11.9	72.5
	Ships	7.5	19.5	20.8	14.5	22.7
	R R Engines	2.0	4.6	30.0	11.3	39.2
	Stevedore Fugitive Dust	1248	---	---	---	---
	Total	1263	32.6	109.6	37.7	134.4
	Construction	1281	---	---	---	---
Yearly (emissions = t/yr)	Trucks	1.42	2.13	14.70	2.98	18.13
	Ships	1.13	2.93	3.12	2.18	3.41
	R R Engines	0.52	1.16	7.48	2.81	9.80
	Stevedore Fugitive Dust:					
	a. no rain	249.60	---	---	---	---
	b. normal rain	149.76	---	---	---	---
	c. low rain	174.72	---	---	---	---
	Total (with b)	152.83	6.22	25.30	7.97	31.34
	Total	3.07	6.22	25.30	7.97	31.34
Pierce County, 1976 (t/yr)		11,700	103,800	145,700	27,700	22,700
Project % of County		0.03	0.01	0.02	0.03	0.14

Source: Ward, 1978; Puget Sound Air Pollution Control Authority, 1977

APPENDIX D

WATER QUALITY

TABLE D - 1

STATE OF WASHINGTON WATER QUALITY STANDARDS FOR VARIOUS WATER CLASSES

Water Quality Parameter	Class AA Waters	Class A Waters	Lake Class Waters
Fecal Coliform Organisms MPN/100 ml)	Median value not to exceed 50 (freshwater) or 14 (Marine waters); less than 10% of samples over 100.	Median value not to exceed 100 (Freshwater) or 14 (Marine water); less than 10% of samples over 200 (43 for Marine water).	Median value not to exceed 50; less than 10% of samples over 100.
Dissolved Oxygen (mg/l)	Greater than 9.5 (7.0, Marine waters).	Greater than 8.0 (6.0, Marine waters).	No measurable change from natural conditions.
Total Dissolved Gas	Not more than 110% of saturation due to non-natural causes.	Same as AA	Same as AA.
Temperature	Not to exceed 16.0|C (Freshwater) or 13.0|C (Marine waters) due to human activities; increases not to exceed t=23/(T+5) (freshwater) or t=8/(T-4) (marine water); except no increase greater than 0.3|C when natural conditions exceed 16| or 13|C.	Not to exceed 18| C (Freshwater) or 16|C (Marine waters) due to human activities; increases not to exceed t=28/(T+7) (freshwater) or t=12/(T-2) (marine); except no increase greater than 0.3|C when natural conditions exceed 18| or 16|C.	No measurable change from natural conditions.
pH	6.5 to 9.5 (Freshwater) or 7 to 8.5 (Marine waters) with induced variation less than 0.2.	6.5 to 8.5 (Freshwater) or 7 to 8.5 (Marine waters) with induced variation less than 0.5.	No measurable change from natural conditions.
Turbidity (Nephelometric Turbidity Units)	Not to exceed 5 NTU over natural conditions when background less than 50 NTU; otherwise, less than 10% increase.	Same as AA.	Not to exceed 5 NTU over background conditions.
Toxic, Radioactive or Deleterious Materials Concentrations	Less than the concentration affecting public health, the natural aquatic environment, or the desirability for any characteristic water use.	Same as AA.	Same as AA.
Aesthetic Values	Not impared by materials or effects, excluding natural causes, which offend sight, smell, touch, or taste.	Same as AA.	Same as AA.

Source: Washington State Dept. of Ecology, Dec, 1977

TABLE D - 2

DUPONT SITE WELLS - 1977

	Well No. 1	Well No. 3	Well No. 4	Well No. 5
Temperature (°C)	12.0 - 12.5	12.0 - 12.5	10.5	12.5 - 14.5
pH	4.2 - 4.7	4.6 - 6.2	6.1	-
Total Alkalinity (mg/l)	2.3 - 5	1.5 - 21.3	33.0	60
Spec. Cond. (μmhos/cm$_2$)	.255 - .407	.192 - .265	0.094	0.195
Hardness (mg/l as $CaCO_3$)	58.6 - 97	56.8 - 97	-	57 - 60
Color (APHA units)	0 - 11	0 - 11	4	4.7 - 8
Nitrate-N (mg/l)	9.75 - 22.4	7.51 - 21.7	0.52	.25 - .31
Ammonia-N (mg/l)	<.01 - .048	<.01 - .074	0.040	<.01 - .015
Kjeldahl-N (mg/l)	.046 - .65	.024 - .51	0.157	.43
Chloride (mg/l)	2.96 - 4.20	2.66 - 5.18	3.63	2.3 - 10.2
Sulfate (mg/l)	13.4 - 170	8.4 - 65.6	6.6	
Iron (mg/l)	.13 - .91	.02 - .045	-	57 - 60
Managnese (mg/l)	.204 - .413	.14 - .424	-	.005 - .01
Sodium (mg/l)	9.6 - 11.8	8.5 - 9.5	-	5.4 - 5.7
Total Coliform (no./100ml)	<1	<1	39	<0
Fecal Coliform (no./100ml)	<1	<1	0	<1
Fecal Strep. (no./100ml)	<1	<1	0	-

Appendix Table D-3

Trace Metal Concentrations in Marine Sediments

(ug/g)

	Transect 1*			Transect 2			Transect 3		Transect 4			Transect 5
	MHW	MLLW	-15m	MHW	MLLW	-15m	MLLW	-15m	MHW	MLLW	-15m	-15m
Arsenic	0.78,	0.76	2.1	0.52,	0.50	1.9	0.59	3.4	0.43,	0.88	1.1	1.1
Cadmium	<0.1,	<0.1	0.44	<0.1,	<0.1	0.48	<0.1	0.44	<0.1,	<0.1		0.28
Chromium	5.6,	8.5	30	5.2,	4.5	31	6.0	40	6.4,	6.8	32	28
Copper	7.7,	8.3	14.6	8.5,	7.9	22	8.1	19.2	8.7,	10	11.6	12.6
Lead	4.7,	4.8	5.7	3.7,	3.2	14	6.8	15	2.6,	3.5	0.4	0.1
Mercury	<0.01,	0.06	0.022	<0.01,	0.01	0.026	0.16	0.014	<0.01,	0.02	0.007	0.005
Zinc	18,	20	34	17,	14	46	19	38	18,	18	26	23

For Transect locations, see Figure 24.
The -15m samples were collected August, 1977, the other samples were collected April, 1980.
*The MHW and MLLW samples were collected at Solo Point, 0.5 miles to the north of Transect 1.

APPENDIX E

BIOLOGICAL ASSESSMENTS

NPSEN-PL-ER

24 OCT 1980.

Bert Larkins, Regional Director
National Marine Fisheries Service
1700 Westlake Avenue North
Seattle, Washington 98109

Dear Mr. Larkins:

In the process of reviewing the draft final environmental impact statement (EIS) for the Weyerhaeuser export facility at DuPont, Washington, it came to our attention that our office had not initiated consultation with your office as required by Section 7(a) of the Endangered Species Act of 1973, as amended (Public Law 69-159). This letter requests initiation of formal consultation and provides biological assessments on two marine mammals: the gray whale (Eschrichtius robustus) and the humpback whale (Megaptera novaeangliae). Other marine animals on the endangered species list (blue whale (Balaenoptera musculus), fin whale (B. physalus), sei whale (B. borealis), right whale (Balaena glacialis), sperm whale (Physeter macrocephalus), and leatherback sea turtle (Dermochelys coriacea)) rarely occur in Puget Sound and are not expected to be impacted by the proposed export facility. Likewise, no anadromous fish are expected to be impacted by the proposed project. Based on the following biological assessments, we also feel the gray and humpback whales will not be impacted by either construction or operation of the proposed facility.

The gray whale is a fairly common visitor to Puget Sound and adjacent waters. In 1978 and 1979, 17 observations were documented in a report prepared by an office of the National Marine Fisheries Service (1980)[1/] (inclosure 1). The EIS for the proposed export facility (section 2.6.5) indicates that a juvenile gray whale was sighted from the existing DuPont wharf on 25 April 1977 (inclosure 2).

Despite the observation frequency of gray whales in Puget Sound, it appears that these whales that enter the sound are wanderers and do not appear to enter these waters for either food or protection from stormy weather. In any event, their length of stay is almost always short. According to section 4.11 and appendix I of the EIS (attached as inclosures 3 and 4, respectively), the risk of an oil spill of 2.4 barrels or greater as a result of

1/National Marine Mammal Laboratory Northwest and Alaska Fisheries Center, 7600 Sandpoint Way Northeast, Building 32, Seattle, Washington, 98115, February 19, 1980.

the export facility operations is very low, only once every 103 years on the average. Also, the EIS states that traffic of large ships would not increase overall in Puget Sound as a result of the export facility. Rather, traffic would be redistributed such that ships now loading at existing ports would instead load at the export facility dock. This probably would mean an increase in southern Puget Sound ship traffic.

Based on past occasional sightings of gray whales in Puget Sound and on the prediction of minimal impacts on the Puget Sound environment from operation of the export facility, it is our opinion that the proposed Weyerhaeuser log export facility at DuPont, Washington, would not impact gray whales or their habitat.

Data and arguments concerning humpback whales are much the same as for gray whales. This species now occurs less frequently in inside waters than does the gray whale, although it was often sighted in the early part of this century (inclosure 1). There are apparently no recent documented sightings near the export facility site (inclosure 2). Again, since impacts to Puget Sound fish and wildlife and water quality from operation of the export facility are expected to be minimal and since ship traffic is not expected to interfere with the small number of humpback whales that may wander into the sound, we believe that neither humpback whales nor their habitat would be impacted by the proposed Weyerhaeuser log export facility at DuPont, Washington.

The above discussions and attachments comprise our biological assessments for the endangered gray whale and humpback whale relative to the proposed DuPont export facility. I would appreciate it if you would inform us at the earliest possible date of any listed species we might have overlooked. (We have consulted with the U.S. Fish and Wildlife Service on terrestrial species.)

Please let us know of your concurrence or nonconcurrence with our opinions above as soon as possible, so as not to cause significant delays in the permitting process. If you have any questions on this matter, please contact either Messrs. Steve Martin at FTS 399-3624 or Ken Brunner at FTS 399-3625.

Sincerely,

LEON K. MORASKI
Colonel Corps of Engineers
District Engineer

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
1700 Westlake Avenue North
Seattle, Washington 98109

OCT 31 1980

Colonel Leon K. Moraski
District Engineer
Seattle District Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Moraski:

In response to your letter of October 24, 1980, concerning possible impacts to endangered and threatened species by the Weyerhaeuser export facility at DuPont, Washington, we do not require formal consultation.

We concur with your assessment that species listed under National Marine Fisheries Service jurisdiction are unlikely to be affected by the proposed project. Unless new information should indicate otherwise, no further consultation is required.

Sincerely,

Thomas E. Kruse

for H. A. Larkins
Regional Director

NPSEN-PL-ER 14 March 1979

Mr. R. Kahler Martinson
Regional Director
U.S. Fish and Wildlife Service
500 N.E. Multnomah Street
Portland, Oregon 97232

Dear Mr. Martinson:

This is a request for consultation concerning endangered and threatened species as provided for under Section 7 of the Endangered Species Act Amendments.

The Seattle District of the U.S. Army Corps of Engineers is the lead agency for preparation of an environmental impact statement (EIS) for the proposed Weyerhaeuser Export Facility at DuPont, Washington. The purposes of the facility are to provide for the receiving and storage of forest products and to allow for the export of those products using ocean-going ships. The proposed facility would include a new dock, a terminal area, rail access, and access roads. It would affect 250 acres of the 3,200-acre site. The attached public notice (inclosure 1) and site diagram (inclosure 2) provide information relative to the project location, design, and layout.

Accordingly, we request information concerning any species which is listed or proposed to be listed which may be present in the area of the proposed project. The results of this consultation will be part of our environmental evaluation of the proposed Weyerhaeuser export facility.

Sincerely yours,

JOHN A. POTEAT
Colonel, Corps of Engineers
District Engineer

United States Department of the Interior

FISH AND WILDLIFE SERVICE
LLOYD 500 BUILDING, SUITE 1692
500 N.E. MULTNOMAH STREET
PORTLAND, OREGON 97232

APR 19 1979

In reply refer to:
AFA-SE

Colonel John A. Poteat
Seattle District
Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Poteat:

As requested by your letter of March 14, 1979, you will find attached a list of the proposed and listed endangered and threatened species that may be present in the area of the proposed Weyerhaeuser Export Facility at DuPont, Washington.

It is intended to fulfill the requirement of the Fish and Wildlife Service to provide a list of species under Section 7(c) of the Endangered Species Act, as amended.

As you are aware, the 1978 amendments to the Act require Federal agencies that are planning construction projects to conduct a biological assessment for the purpose of identifying any proposed and/or listed endangered and threatened species which is/are likely to be affected by their proposal. This process is initiated by the construction agency in requesting a list of proposed and listed endangered and threatened species. The assessment should be completed within 180 days after receipt of the list (or within such a time period as is mutually agreed to by our two agencies) and before any contract for construction is entered into and before construction is begun.

Also for your assistance, we have included a list of species that are candidate species. These species are presently being reviewed by this Service for consideration to propose and list as endangered or threatened. It should be noted that the candidate species have no protection under the Endangered Species Act and are included for your information only.

With regard to the biological assessment, should you determine that a listed species is likely to be affected (adversely or beneficially), then your agency should request formal Section 7 consultation through

this office. If there are both listed and proposed species (or candidate species, if included in the assessment) that may be affected, then, if requested, we will informally consult on the proposed and candidate species during the formal consultation. However, should the assessment reveal only proposed species (or candidate species) may be affected, then you should consider informal consultation with this office.

One of the benefits of informal consultation to the consulting office is to provide necessary planning alternatives should a proposed (or candidate) species become listed before completion of a project. For example, Aster curtus, a candidate species (see attached list), is a very high priority species for listing and will be recommended for Endangered status soon.

Should you have any additional questions regarding your responsibilities under the Act, please contact Wayne White at FTS-429-6131. We thank you for your interest in endangered species, and we await your assessment.

Sincerely yours,

Lawrence W. De Bates

Acting Regional Director
Lawrence W. De Bates

Attachment

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, AND CANDIDATE SPECIES THAT MAY OCCUR WITHIN THE AREA OF THE PROPOSED WEYERHAEUSER EXPORT FACILITY AT DUPONT, WASHINGTON

LISTED SPECIES

Bald eagle, *Haliaeetus leucocephalus*

PROPOSED SPECIES

None

CANDIDATE SPECIES (Plants)

Erythronium oregonum

Tauschia stricklandii ✓

Castilleja cryptantha ✓

Aster curtus

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSEN-PL-ER

24 MAY 1979

Robert Anderson, Manager
Planning Environmental Affairs Department
Weyerhaeuser Company
Tacoma, Washington 98401

Dear Mr. Anderson:

As required by Section 7(c) of the Endangered Species Act (ESA), as amended, we have initiated correspondence with the U.S. Fish and Wildlife Service by requesting a list of the proposed and listed endangered and threatened species that may be present in the vicinity of your proposed export facility at Dupont, Washington (inclosure 1). They have provided our office with such a list (inclosure 2).

The 1978 ESA amendments require us to conduct a biological assessment to identify if there are any proposed and/or listed endangered and threatened species which is/are likely to be affected by your proposal. We would prefer this assessment be included in the Draft Environmental Impact Statement (DEIS), however, we recognize that perhaps the assessment may not be completed by the time the DEIS is ready for submittal to our office. Nevertheless, we would expect that all pertinent information collected and analyzed prior to DEIS submission be included.

For expeditious preparation of this assessment, we recommend you provide us with the following information: (1) results from a comprehensive survey of the Dupont site relative to the listed species (the bald eagle), and the candidate plant species with high priority status for listing (Aster curtus); (2) summaries of studies undertaken to determine impacts on these species; (3) cumulative effects of the proposed project on these species and their habitat; (4) methods utilized and difficulties encountered in obtaining data, and (5) other relevant information as necessary. We assume that you will be able to perform this endangered and threatened species assessment through your approved third party consultant. Please confirm your intentions on this matter.

NPSEN-PL-ER
Robert Anderson, Manager

If there is clarification required on this matter, please feel free to call me at 764-3692, or Dr. Steven F. Dice, Chief, Environmental Resources Section, at 764-3624.

Sincerely,

MAXEY B. CARPENTER, JR.
Lt. Colonel, Corps of Engineers
Acting District Engineer

2 Incl
As stated

Copy furnished:
Mr. Steve Fusco
URS Company
Fourth and Vine Building
Seattle, Washington 98121

URS COMPANY
FOURTH AND VINE BUILDING
SEATTLE, WASHINGTON 98121
TEL: (206) 623-6000

May 24, 1979

Steven F. Dice, Chief
Environmental Resources Section
Seattle District
Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Mr. Dice:

We are presently responding to your requirement that an endangered species biological assessment be conducted at the site of the proposed Weyerhaeuser export facility.

Under the Endangered Species Act Amendments of 1978, all listed or proposed species which are threatened or endangered are subject to a biological assessment. The Fish & Wildlife Service has stated that the only species meeting those requirements which might occur on the site is the bald eagle, Haliaeetus leucocephalus. It is likely that a plant species, Aster curtus will soon be proposed by FWS. For this reason, an assessment has been recommended and will be done on this species as well.

As you know, the assessment requirements under the Endangered Species Act are separate from those under NEPA and both must be met to obtain a permit. Although there is no requirement that the endangered species biological assessment be included in an EIS, the Seattle District, Corps of Engineers has encouraged public review in the process and has requested that the biological assessments for these two species be incorporated into the DEIS to the maximum extent possible.

The bald eagle survey is being conducted at the present time by a wildlife biologist approved by your staff. This assessment will be complete for your review in June and a summary of it will be included in the DEIS.

The Aster curtus survey will be conducted during the bloom period in August by a botanist approved by your staff. The results of this survey will be included in the FEIS after review by your office. This entire process will be described in the DEIS. If the results of any formal and/or informal consultation between

your office and USFWS are available during final EIS preparation, such results will be included in the FEIS.

Please contact Steve Fusco or myself if you have any questions or comments on these procedures.

Sincerely,

Grant Bailey

Grant Bailey
Environmental Scientist

GB/dl

ASSESSMENT OF BALD EAGLE UTILIZATION OF THE WEYERHAEUSER-DUPONT SITE AND SURROUNDING AREA

PREPARED FOR

SEATTLE DISTRICT

CORPS OF ENGINEERS

BY

DENNIS J. MARTIN, Ph.D.

ASSISTANT PROFESSOR, BIOLOGY

PACIFIC LUTHERAN UNIVERSITY

TACOMA, WASHINGTON 98447

REVIEW OF BALD EAGLES IN THE NORTHWEST

The distribution of the Bald Eagle (Haliaeetus leucocephalus) is restricted to North America (A.O.U. 1957, Grossman and Hamlet 1964, Snow 1973). Throughout this range, the Bald Eagle is found primarily in association with coastlines, lakes and rivers. Within Washington State, the northern subspecies (H. l. alascanus) is a "common permanent resident on the west side of the Cascades" (Jewett et al. 1953:176; also Larrison and Schultz 1968). Two up-to-date and complete accounts of Bald Eagle natural history and behavior are reports by Snow (1973) and the Nature Conservancy (1976).

Throughout its range and within Washington State, the preferred food of the Bald Eagle is fish (Bent, 1937, Jewett et al., 1953, Servheen, 1975, Snow, 1973). However, eagles in the northwest will and do also eat carrion of sheep (Edwards, 1969), rabbits (Retfalvi, 1970), and other mammals. Because of these dietary habits and the general structure of the habitat within the Puget Trough, Bald Eagles are common year-round in the area.

Bald Eagles are considered resident within their range, but those residing in more northern regions, particularly immature and subadult birds, tend to move south during the winter. Because of the high density of Bald Eagles in Alaska and Canada, Washington State is an important area for many wintering birds (Snow 1973). Within the state, the highest concentrations of wintering eagles are found in the Puget Trough and west slope area of the Cascades (Knight and Friesz, 1979). Mid-winter counts of eagles coordinated by the Washington State Department of Game indicate that as many as 414 Bald Eagles may winter in the Puget Trough and another 446 on the western slope and crest of the Cascades (Knight and Freisz, 1979). The Thurston-Pierce County area surrounding the Weyerhaeuser-DuPont Site and Nisqually Refuge may harbor as many as 31 Bald Eagles (Knight and Freisz, 1979). Thus, it must be considered an important habitat region for wintering eagles. Throughout the year and particularly in the winter months Bald Eagles are commonly seen in the area (Tables 1 and 2).

Table 1. Yearly sighting records of Bald Eagles in the immediate vicinity of the Weyerhaeuser-DuPont Site (Pierce, Thurston and Mason counties) compiled from the Data Storage and Retrieval System, Washington Department of Game, Nongame Program. 1979 sightings are as of June 1, 1979.

County	Year	Total Sightings	General Location
Pierce	1979	18	Nisqually River, Nisqually Delta, American Lake, Anderson Island, Muck Creek, Point Defiance Park, Alder Lake, Carbon River, Purdy, Eatonville
Pierce	1978	18	McNeil Island, Nisqually River, Dash Point, Spanaway Lake, Point Defiance Park, Orting, Muck Creek, American Lake, Tacoma City

Table 1. (Continued)

County	Year	Total Sightings	General Location
Pierce	1977	18	Chambers Creek, McNeil Island, Gertrude Island, American Lake, Steilacoom City
Pierce	1976	6	DuPont, Anderson Island, McNeil Island, Gertrude Island, Point Defiance Park
Pierce	1975	8	Nisqually River, American Lake, Tacoma City, Anderson Island, Gertrude Island, McNeil Island, McChord AFB
Thurston	1979	15	Nisqually Delta, Olympia City, Hicks Lake, Black Lake, Mud Bay, Ward Lake, Olympia Airport
Thurston	1978	21	Nisqually Delta, Ward Lake, Lake Sinclair, Lacey, Capitol Lake, Henderson Inlet, Johnson's Point, Offut Lake, Patterson Lake, Lora Lake, Lawrence Lake, Long Lake
Thurston	1977	9	Nisqually Delta, Yelm City, Chambers Lake, Hicks Lake, Priest Point Park
Thurston[1]	1976	9	Nisqually Delta, Tumwater
Thurston	1975	2	Nisqually Delta
Mason	1979	10	Scattered
Mason	1978	9	Scattered

1 1976, Tony Ursic, Plant Manager of DuPont indicates there was an active Bald Eagle nest at Old Fort Lake, DuPont Site which is now deserted.

Table 2. Sightings of Bald Eagles in Pierce County during 1 January - 1 June 1979. Data from Washington State Department of Game, Non-Game Program and personal interviews.

Date	Location	Observer
1/1	Eatonville	Kildahl
1/5	Purdy	Wilterwood
1/6	Nisqually Delta	Jarmon
1/8	Nisqually River	Jarmon
1/13	Muck Creek	Peregrin
1/17	Totsolo Point	Main
1/25	Nisqually Delta	Martin
2/18	Nisqually River	Jarmon
2/20	Nisqually River	Jarmon
2/25	Carbon River	Kildahl
3/11	Alder Lake	Kildahl
3/11	Nisqually River	Jarmon
4/7	Anderson Island	Beecher
5/30	Spanaway Lake	Creso
Jan - June (many)	American Lake	Wilkins

Breeding Bald Eagles are also common in Washington State (Grubb, 1976). Within the western-coastal region, over 100 pairs of Bald Eagles have been reported breeding in recent years (Grubb, 1976). Of this number, there are approximately 22 active nests on the coast, seven on the Straits of Juan de Fuca, four along Hood Canal, seven in the southern Sound area, 40 in the San Juan Islands, and 11 in the greater northern Sound region (Washington State Department of Game, Nongame Program Data Storage and Retrieval System as of 1 June, 1979; Grubb, 1976). Within the general area of the Weyerhaeuser-DuPont Site in the southern Sound there are six active nests, two inactive nests, and four reported, but unsubstantiated nests (Figure 1).

Nests of Bald Eagles inhabiting the coastal area of the northwest may be used year after year. Douglas fir and Sitka spruce are the most common tree species used as nesting sites (Corr, 1969; Grubb, 1976; pers. obser.).

Bald Eagles tend to choose the largest tree in a stand and one with a commanding view of the surrounding area. Proximity to a body of water appears to be a primary requisite (Whitfield et al., 1974), as most nests are within one half mile of water. Corr (1969) has listed five categories of nest situations: 1) nest in upper whorl of branches after top of tree was damaged, 2) nest in the crotch of a U-shaped branch, 3) nest located in a whorl of branches with remaining top of tree dead, 4) nest hidden by foliage in a normal tree, 5) nest in a dead non-foliage bearing tree. Corr found that 57% of the nests conformed to the type 4 category.

Grubb (1976), studying the nesting of 114 pairs of Bald Eagles in western Washington, found that those parameters most commonly associated with active nests were: 1) close proximity to open water, large trees with sturdy branching at sufficient height, 2) land was privately owned, 3) nest within 200 yards of shore, 4) nests located on an irregular saltwater coastline, 5) nests in conifers, and 6) nests located in trees with 40% or more crown density.

Although freedom from human disturbance is important to nesting Bald Eagles, reports concerning its role determining good nesting sites have been variable (Robards and King, 1966; Retfalvi, 1965; Corr, 1969; Hensel and Troyer, 1964; Murphy, 1965). The U.S. Fish and Wildlife Service in its "Bald Eagle Management Guidelines" suggests no human activities should occur within 330 feet of nests, and that during the critical period (from time of adults arrival at nests until three weeks after young fledge) this zone should be expanded to 660 feet.

Besides the availability of food and nest sites, another critical component of Bald Eagle habitat is suitable perching and roosting sites. The most commonly used day-time perching sites are large trees with snags close to the shoreline. These afford a commanding view of the aquatic feeding area (Snow, 1973; Stalmaster, 1976; R. Knight, pers. comm.). Winter roosting sites, for overnight use by many individuals, tend to be large "open" trees such as cottonwoods and bigleaf maples, or dead conifers that are far removed from human disturbance (Stalmaster, 1976).

Data from various studies of Bald Eagle behavior indicate that "heavy vehicular traffic, bridges crossing the river and high recreational activity encroaching on eagle flight distances are factors...which are not tolerated by most eagles" (Stalmaster, 1976:53-54). However, moderate use such as intermittent sport fishing and even logging activities, if separated from eagles by a small buffer zone, seem to be tolerated by a large portion of the wintering eagle population. The critical factor, then, in the Bald Eagle's ability to tolerate human noise and disturbance is visual contact. If visual contact is lacking, eagles are tolerant (Stalmaster, 1975; Stalmaster and Newman, 1978). It should be noted that in most areas of contact between eagles and humans, many eagles appear to tolerate human activity if it is kept at a distance of at least 300 meters (Edwards, 1969; Stalmaster and Newman, 1978).

BALD EAGLE USE OF WEYERHAEUSER-DUPONT SITE

To the best of my knowledge and that of others (R. Knight, G. Alcorn, J. Loran, all pers. comm.), there are no active or inactive Bald Eagle nests on the proposed project site scheduled for developement, or anywhere else within the confines of the entire 3,200 acre Weyerhaeuser land holdings at the DuPont Site.

Historically there was a pair of nesting Bald Eagles at the north end of Old Fort Lake (J. Myer and T. Loran, pers. comm.; Washington State Department of Game, Non-game Data Storage and Retrieval System). See Figure 2. However, at some time between 1972 and 1976, the top of the tree containing the nest and

the nest itself was destroyed, presumably by wind gusts (J. Myer and T. Loran, pers. comm.). Inspection of the tree and surrounding area revealed no evidence of a nest or nesting activities. It is suspected that the pair which inhabited this site either left the area or relocated their nesting efforts on Anderson Island where there are presently two pairs of Bald Eagles nesting (R. Knight, pers. comm.) as shown in Figure 1.

Present Bald Eagle use of the area proposed for development appears to be restricted to fly-overs. Most of the trees on this site are rather young and afford no commanding view of the shoreline. With regard to the entire 3,200 acres, eagles use its air space for fly-overs as they move between the Nisqually Delta, Nisqually River, American Lake, Anderson Island, Sequalitchew Lake, etc. P. Miller, A. Melchiors, J. Kyer, and T. Loran (all pers. comm.) have seen Bald Eagles flying over the area. Also, on 31 May, 1979, A. Melchiors and myself observed four Bald Eagles (surely three were mature) in the vicinity of the site. Three of these individuals used air space above Weyerhaeuser's 3,200 acre tract.

POTENTIAL USE OF THE AREA BY BALD EAGLES

Because most of the property is populated by young-growth Douglas fir and does not afford a view of the beach from most areas, the majority of the 3,200 acres is not considered prime habitat for nesting Bald Eagles. Most of this land is likewise not particularly suitable for roosting or perching by eagles. This does not, however, preclude the fact that portions of the site are undoubtedly used for perching on an irregular basis (R. Knight, pers. comm.). The area overlooking the Sound (bluff proper) is predominantly young-growth Douglas fir, madrone, alder and bigleaf maple. It has few adequate sites for perching or communal roosting (D. J. Martin, pers. opinion). Gordon Alcorn (pers. comm.) also knows of no Bald Eagles nesting on the area and believes there are few if any good snags for roosting. Active railroad tracks at the base of the bluff, which would disturb perching or roosting eagles, further detract from the site's suitability for use by Bald Eagles.

The possibility exists, however, that Bald Eagles may attempt to use the Weyerhaeuser-DuPont Site for nesting in the future. This follows from the facts that it was used in the past and that little habitat modification has occurred since that time. Actually, since that time the forest has matured further and human activity has decreased (at least momentarily). But, habitat in areas adjacent to and near the site are more suitable for use by Bald Eagles.

Any future nesting use of the Weyerhaeuser-DuPont land would probably be centered about Old Fort Lake where Bald Eagles reportedly nested in the past. This area is removed by at least 600 meters from those areas of proposed development and, therefore, activity associated with the proposed development would have minimal impact on future nesting attempts at Old Fort Lake. The best available sites for eagles to perch are at the top of the bluff (barred area in Figure 1). But even this region is not prime habitat because it does not afford a commanding view of the shore and is separated from the

shore by and disturbed often by railroad tracks at its base. This perching area is at least one fourth mile from areas of proposed development and activity. Thus, they may be far enough removed so that activities would not greatly impact perching birds.

METHODS

A Biological Assessment of the past, present and potential future use of the site of the proposed Weyerhaeuser Export Facility at DuPont by Bald Eagles was performed between 22 May and 7 June, 1979. Interviews were conducted with personnel of the U.S. Fish and Wildlife Service in the Rare and Endangered Species Program, Washington State Department of Game and Non-game Program, Department of Biology faculty and Pacific Lutheran University, the Evergreen State College, Puget Sound Museum of Natural History, ex-DuPont employees, Weyerhaeuser biologists, and local people with knowledge of south Puget Sound natural history. An on-site inspection of the Weyerhaeuser-DuPont land was performed with the aid of M. Anthony Melchiors on 31 May, 1979. Aerial overflights of the area were made on 7 June, 1979. A review of the salient scientific literature dealing with Bald Eagle natural history in Washington State and the Puget Trough was performed.

EASE OF OBTAINING DATA

All persons contacted were helpful and willing to divulge any and all information they possessed regarding the past and present use (or potential use) of the Weyerhaeuser-DuPont Site by Bald Eagles. All state and federal agencies cooperated to the best of their ability in furnishing both data and contacts.

Literature search, data concerning active and inactive nests, sightings of Bald Eagles and information concerning Bald Eagle natural history in the state and Puget Trough was easily gathered via the Washington State Department of Game, Non-game Program's Data Storage and Retrieval System located at the Evergreen State College, Olympia, Washington.

LITERATURE CITED

American Ornithologists' Union. 1957. Checklist of North American Birds. Fifth ed. Am. Ornithol. Union, Baltimore.

Bent, A. C. 1937. Life Histories of North American Birds of Prey. Part 1. U.S. Natl. Mus. Bull. 167, Washington, D.C.

Corr. P. O. 1969. Bald Eagle nesting ecology. Federal Aid in Fish and Wildlife Restoration. Alaska W-17-R-1, Work Plan B, Job No. 9.

Edwards, C. C. 1969. Winter behavior and population dynamics of American eagles in Utah. Ph.D. Dissertation. Brigham Young University, Provo.

Grier, J. W. 1969. Bald Eagle behavior and productivity responses to climbing to nests. J. Wildl. Manage. 33:961-966.

Grossman, M. L., and J. Hamlet. 1964. Birds of Prey of the World. Clarkson N. Potter, Inc., N.Y.

Grubb, T. G. 1976. A survey and analysis of Bald Eagles nesting in western Washington. M. S. Thesis, University of Washington, Seattle.

Hensel, R. J., and W. A. Troyer. 1964. Nesting studies of the Bald Eagle in Alaska. Condor 66:282-286.

Jewett, S. G., W. P. Taylor, W. T. Shaw, and J. D. Aldrich. 1953. Birds of Washington State. University of Washington Press, Seattle.

Knight, R. L., and R. C. Friesz. 1979. A summary of the mid-winter Bald Eagle survey in Washington. Washington Dept. of Game, Olympia.

Larrison, E. J., and K. G. Sonnenburg. 1968. Washington Birds - Their Location and Identification. Seattle Audobon Society, Seattle.

Murphy, J. R. 1962. Agressive behavior of a Bald Eagle. Auk 79:712-713.

Nature Conservancy, The. 1976. Skagit Eagles, a management program for the Skagit River Bald Eagle Natural Area. The Nature Conservancy, Portland.

Retfalvi, L. I. 1965. Breeding behavior and feeding habits of the Bald Eagle (Haliaeetus leucocephalus) on San Juan Island, Washington. M.S. Thesis. University of Washington, Seattle.

Retfalvi, L. I. 1970. Food of nesting Bald Eagles on San Juan Island, Washington. Condor 72:358:361.

Robards, F. C., and J. G. King. 1966. Nesting and productivity of Bald Eagles, Southeastern Alaska - 1966. U.S. Department of Int., Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Juneau.

Servheen, C. W. 1975. Ecology of the wintering Bald Eagles on the Skagit River, Washington. M.S. Thesis, University of Washington, Seattle.

Stalmaster, M. V. 1976. Winter ecology and effects of human activity on Bald Eagles in the Nooksack River Valley, Washington. M.S. Thesis, W. Wash. St. Coll., Bellingham.

Stalmaster, M. V., and J. R. Newman. 1978. Behavioral respponses of wintering Bald Eagles to human activity. J. Wildlife Manage. 42:506-513.

Snow, C. 1973. Habitat management series for endangered species, Technical Note 6601, U. S. Department of Inter., BLM, Report No. 5.

U. S. Fish and Wildlife Service, Bald Eagle Management Guidelines, Dept. of Inter., Portland.

Whitfield, D. W. A., J. M. Gerrad, and D. W. Davis. 1974. Bald Eagle nesting habitat, density and reproduction in central Saskatchewan and Manitoba. Can. Field-Nat. 88:399-407.

PERSONAL COMMUNICATIONS

Alcorn, G. 23 May, 1979. Puget Sound Museum of Natural History. Univ. of Puget Sound, Tacoma.

Herman, S. 1 June, 1979. Biology Division, The Evergreen State College, Olympia.

Knight, R. L. April and May, 1979. Washington State Department of Game, Non-game Program, Olympia.

Loran, T. 1 June, 1979. Ex-DuPont employee, Weyerhaeuser-DuPont Site, DuPont.

Main, J. 25 May, 1979. Deptartment of Biology, Pacific Lutheran University, Tacoma.

McGinnis, R. F. May-June. Department of Biology, Pacific Lutheran University, Tacoma.

Melchiors, M. A. 31 May, 1979. Wildlife Biologist, Weyerhaeuser, Centralia.

Miller, P. A. 4 June, 1979. U. S. Fish and Wildlife Service, Olympia.

Myer, J. 5 June, 1979. Ex-DuPont Employee, Weyerhaeuser, DuPont.

FIGURE 1.

"X" indicates approximate location of Douglas fir tree alleged to have contained the nest of a pair of Bald Eagles.

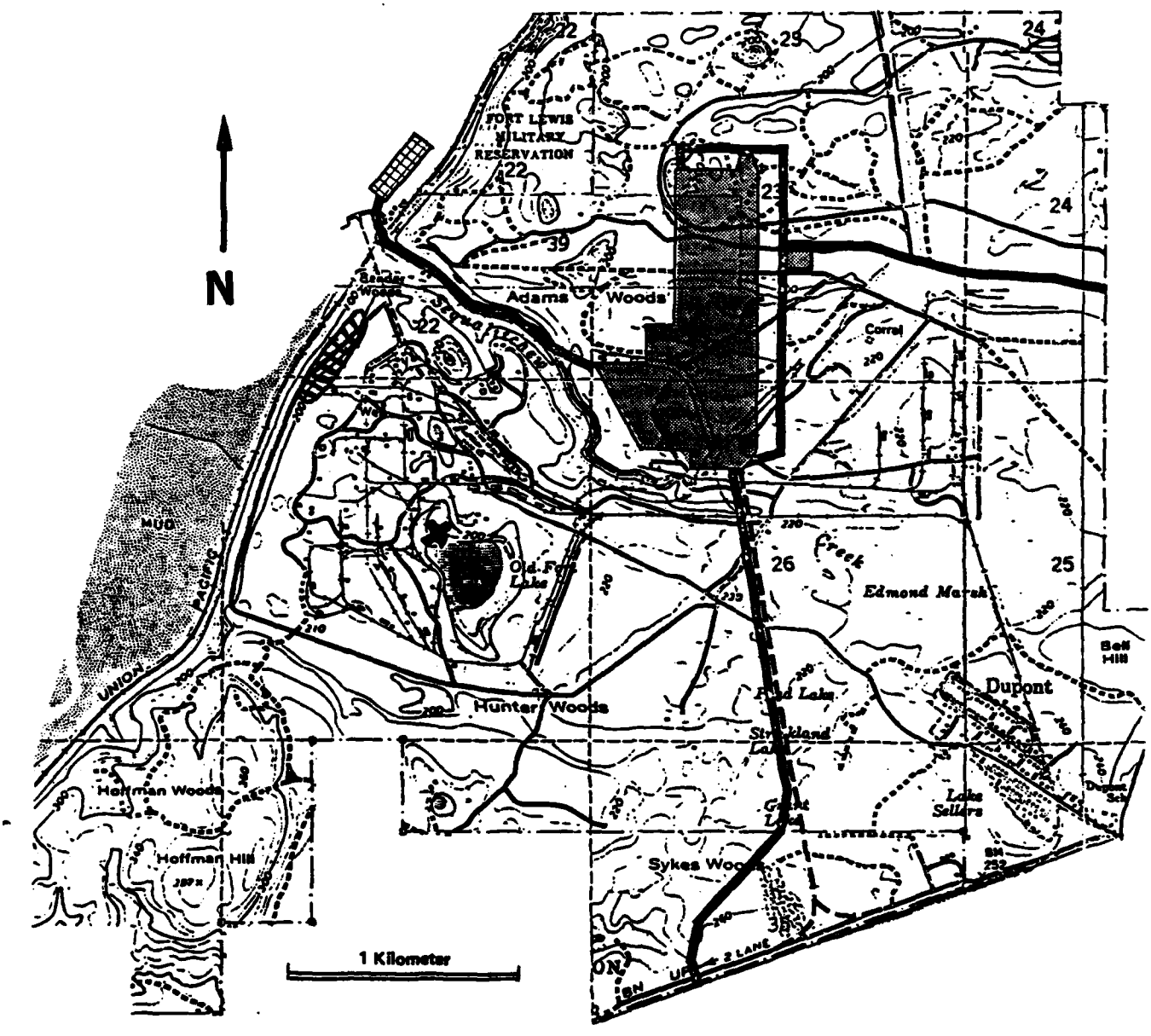
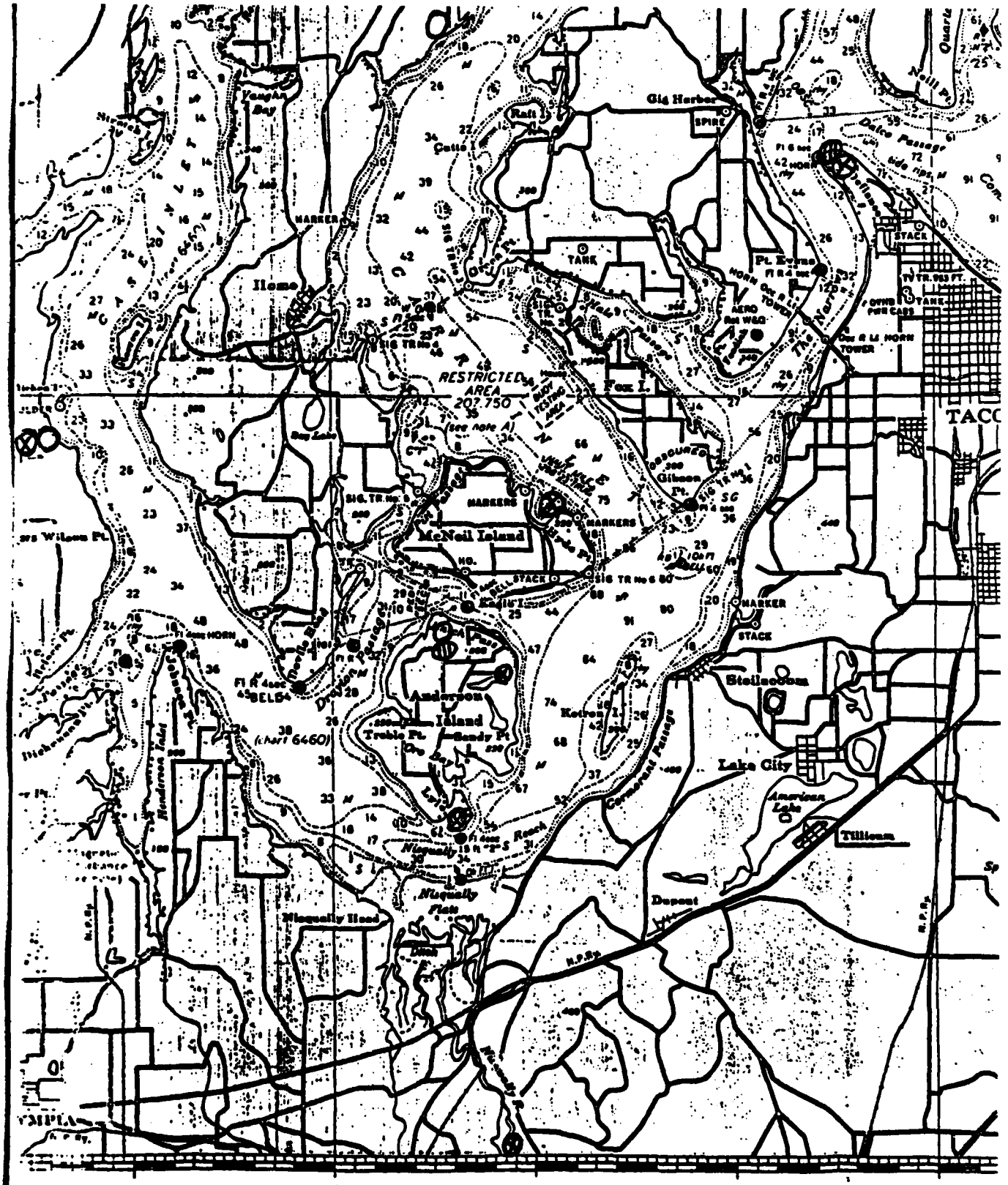

N
FORT LEWIS MILITARY RESERVATION
Adams Woods
Hunter Woods
Hoffman Woods
Hoffman Hill
Old Fort Lake
Edmond Marsh
Dupont
Bell Hill
Lake Sellars
Sykes Woods
MUD
UNION
PACIFIC
1 Kilometer
Handling area
Roads
Railroad access
Dock

FIGURE 2.

Approximate locations of nest-sites of Bald Eagles that are: Inactive ⊛ , Avtive ⊗ , and Reported ○ in the area near the Weyerhaeuser-DuPont Site. Exact latitude and longitude fixes may be obtained from the Washington State Department of Game.



Published at Washington, D.C.
U.S. DEPARTMENT OF COMMERCE
NMENTAL SCIENCE SERVICES ADMINISTRATION
COAST AND GEODETIC SURVEY

AN APPRAISAL OF THE STATUS OF *ASTER CURTUS* CRONQ. ON THE WEYERHAEUSER DUPONT SITE AND OTHER PRAIRIE AREAS IN WESTERN WASHINGTON

SEPTEMBER 1979

RUFUS W. KISER
CENTRALIA WA 98531

LITERATURE REVIEW

Aster curtus Cronq. 1834

1884. Gray, Asa. Synoptical flora of North America
Vol. I. Part 2.
-Aster oreganus Nutt. - Washington Territory

1906. Piper, Chas V. Flora of the State of Washington
-Seriocarpus rigidus
-Seriocarpus oregonensis Nutt. 1840

1955. Hitchcock, Cronquist, Ownby, and Thompson. Vascular plants of the Pacific Northwest. Vol V, p. 80.
-Aster curtus Cronq. 1834 Nom. Nov.
-Seriocarpus rigidus Lindl. in Hook. Fl. Bor. Am. 2:14, 1834 (Scouler, Columbia River lectotype) not Aster rigidus L. 1753
-Seriocarpus rigidus var. Laevicaulis Nutt. Trans. Am. Phil. Soc. II 7:302, 1840 (Nuttal, Fort Vancouver)
-"Prairies of Western Washington", in the Puget Trough; also in the Klamath Region of S.W. Oregon

1974. Larrison, Patrick, Baker, and Yaich. Washington Wildflowers. Seattle Audubon Society.

The type locality for Aster curtus Cronq. is near Fort Vancouver, Washington, where Dr. John Scouler, a companion of the botanist, David Douglas, found the species in 1825. The species was subsequently described as Seriocarpus rigidus Lindl. in Hook. Fl. Bor. Am. 2:14, 1834.

Aster curtus Cronq., syn. Seriocarpus rigidus, is listed by C.V. Piper (1906) in Flora of the State of Washington as occurring in the gravelly prairies of western Washington. Flett (1898), Henderson (1888), and recently, Matia (1979) have reported its presence on the Fort Lewis Military Reservation in Pierce County, Washington. Matia also observed Aster curtus in Thurston County in the Mima Mound area, 4 miles south of Olympia, and the Scatter Creek public hunting range.

Aster curtus Cronq. is also listed as occurring on the prairies of western Washington in Vascular Plants of the Pacific Northwest (Hitchcock et al., 1955).

HERBARIUM RECORDS

Herbarium records of Aster curtus Cronq. 1834.
University of Washington, courtesy of Melinda Denton

Seriocarpus rigidus Lindl.
C.V. Piper
Yelm Prairie Aug. 8, 1888

Seriocarpus rigidus Lindl.
Gardner, N.L.
Whidby Island Aug. 10, 1897

Seriocarpus rigidus Lindl.
Wilhelm Suksdorf
Skamania County Aug. 25, 1920

Seriocarpus rigidus Lindl.
Henderson, L.F.
Dry Prairies Pierce and Thurston Counties
Vicinity of McAlister Lake. July 20, 1888

Seriocarpus rigidus Lindl.
Flett, J.B.
Tacoma Aug. 19, 1898

A number of specimens collected in this study were given to the University of Washington Herbarium and the Centralia College Herbarium.

DESCRIPTION OF ASTER CURTUS CRONQ.

Growth Form

Aster curtus Cronq., the white top aster, is a low plant usually from 4 to 6 inches in height. A few flowering plants may reach 8 to 12 inches. Most populations contain small plants, 2-3 inches tall, that would probably not bloom until the following year. Growing from a long, slender and tough rhizome, the single, unbranched stems have alternate leaves that are oblanceolate in form with an acute apex and a ciliolate margin. Trinerved leaves taper to a sessile base. In August, leaves from midstem to the ground are brown, dry and curled, and drop off. The plants occur in colonies ranging from a few hundred plants to over several thousand plants.

The flower heads, usually 3-4 in number, are narrow, about 1/4 inches wide by about 1/2 inch high. The bracts are imbricated and have a slightly greenish tinge to their tips. Ray flowers have 2-3 petals and do not extend outward like those of a daisy. Instead, they remain erect and are exceeded in length by the pappus. When the flower first blooms, anthers appear bright purple. Later, they fade to a dull brown.

In the study area, blooming lasted about 2 weeks. The first flowers were observed on August 10, 1979. On August 25th, after a period of sporadic rain commencing on August 25th, few flowering plants were found. The plants had only a small tuft of leaves remaining at the top of the stem.

Aster curtus is an obscure plant, and, when the grasses are green and blooming, it may be easily overlooked. However, when grasses are brown and dry, it is more conspicuous.

Habitat

Aster curtus Cronq. is found in prairie associations where the soil is too poor, or too dry, to support competing vegetation. It prefers this dry soil and can withstand competition from mosses, lichens, and scattered low plants. It does not tolerate heavy shade and is not found in densely turfed areas or in competition with tall grasses (24 to 30 inches high). Although it cannot compete with tall Scotch broom, Cytisus scoparius, it may be found in areas where Scotch broom is low, not in excess of 14-15 inches, and where Scotch broom's density averages about one plant per square meter.

Aster curtus has not been observed on disturbed land sites where introduced weedy invaders proliferate. It is not found on land that has been grazed or that is under cultivation. Old abandoned fields do not contain the plant, perhaps because of intense competition from invading grasses and weeds. Corners in farms or rocky mounds where soil cannot be tilled may harbor colonies of Aster curtus.

Probably, Aster curtus Cronq. was part of the pristine vegetation of the old prairies that extended north from the Columbia River through the Puget trough as far as the San Juan Islands. The prairies have largely disappeared through alternative land uses such as agriculture, grazing, and construction of highways and cities. The introduction of weed species that invade areas and crowd out native species and the encroachment into the prairies by forest during wet cycles have also influenced the extent of present prairies. It is, indeed, hard to find much of this old pristine vegetation remaining.

Immediate Associates

Aster curtus seems to get along with a sparse growth of Kentucky blue grass (Poa pratensis), but when this grass closes in to form a turf, the aster is eliminated. The hairy cat's ear (Hypochaeris radicata) forms small rosettes around three inches in diameter. Other grasses not of the turf forming type, Holcus lanatus, Anthoxanthum, and Festuca, if scattered, do not seem to hinder the development of the aster colonies. The upland yellow violet (viola nuttali) is also found on the prairies. The plantain, Plantago lanceolata, is often found in close association with Aster curtus. Other species occasionally found with the aster are prairie lupine (Lupinus lepidus), northwest balsamroot (Balsamorhiza deltoidea), stickly cockle (Silene noctiflora), and completely dried up Camissa and Potentilla. A list of weeds that compete with Aster curtus is given in Table 1.

Field Methods

In the Puget trough of Washington, Aster curtus Cronq. has been reported only from old prairie environments. These prairies are grasslands that occur on well-drained, gravelly soils derived from glacial outwash materials. Low summer precipitation and burning are probably important in their origin and maintenance (Franklin and Dyrness, 1973).

Fieldwork, therefore, involved searches for Aster curtus in:

(1) areas where Aster curtus has been reported in the literature;

(2) nearby prairie areas in Thurston, Pierce, and Lewis counties, as designated on maps;

(3) remnants of old prairies not being cultivated or grazed;

(4) areas of the Weyerhaeuser-Dupont site not covered by forest; and,

(5) railroad rights-of-way, roadsides, abandoned farms, parts of old farms inaccessible to cultivation, and old cemeteries.

Traverses along a grid pattern were made about 100 feet apart through the searched areas. When it was found that Aster curtus did not occur where grass was tall, matted, or where it formed a turf, close examination was limited to dry, open sites free from competing vegetation where the plant was more likely to be found. Field information concerning the growth form,

Table 1. Introduced weeds that compete with *Aster curtus*

1.	*Achillea millifolium*	Introduced from Europe
2.	*Anaphalis margaritacea*	In old World
3.	*Anthemis cotula*	Native of Europe
4.	*Anthozanthum odoratum*	Introduced from Europe
5.	*Bromus tectorum*	Introduced from Europe
6.	*Campanula persicifolia*	Introduced from Europe
7.	*Chenopodium album*	Naturalized from Europe
8.	*Chrysanthemum leucanthemum*	Native of Europe
9.	*Cirsium arvensis*	Introduced from Europe
10.	*Cirsium vulgare*	Introduced from Europe
11.	*Dactylus glomeratus*	Introduced from Europe
12	*Daucus carota*	Introduced from Europe
13.	*Dianthus aremeria*	Native of Europe
14.	*Holcus lanatus*	Introduced from Europe
15.	*Hypericum perforaturm*	Introduced from Europe
16	*Hypochaeris radicata*	Adventive of Europe
17.	*Lactuca serriola*	Introduced from Europe
18.	*Linaria dalmantica*	Introduced from Europe
19.	*Matricaria matricariodies*	Also in Europe
20.	*Malva rotundifolia*	Native of Europe
21.	*Nepeta cataria*	Introduced from Europe
22.	*Phalaris arundinacea*	In the Old world
23.	*Phleum pratense*	Native of Europe
24.	*Plantago lanceolata*	Introduced from Europe
25.	*Rumex acetosella*	Native of Europe
26.	*Saponaria officinalis*	Introduced from Europe
27.	*Senecio jacobaea*	Native of Europe
28.	*Silene noctiflora*	Native of Europe
29.	*Sisymbrium officinale*	Native of Europe
30.	*Solanum nigrum*	Native of South America
31.	*Sonchus asper*	Native of Europe
32.	*Taraxacum officinale*	Native of Europe
33.	*Tragopogon pratensis*	Introduced from Europe
34.	*Trifolium pratense*	Introduced from Europe
35.	*Trifolium repens*	Introduced from Europe
36.	*Trifolium subterraneum*	Introduced from Europe
37.	*Vicia crassa*	Introduced from Europe
38.	*Verbascum thapsus*	Native of Europe

Table 2. Summary of abundance of *Aster curtus* on the Weyerhaeuser DuPont Site.

Location	Number Colonies	Approximate Number Plants
1	2	2,000 1,500
2	2	10,000 200
3	1	312
4	1	6
5	1	200
6	1	1,000
7	1	1,000
8	1	1,750
9	6	250 10 5 40 200 50
10	1	100
Total	17	18,623

appearance, soil preference, tolerance to shade, and prairie plants associated with Aster curtus was used to identify sites where the plant might occur.

Aster curtus characteristically forms large colonies that spread by rhizomes. Estimates of the abundance of individual plants were made by first measuring the area occupied by the colony, and then using a square meter quadrant count to obtain the total plants per colony.

The old prairies listed on topographical maps are so fragmented by farms, buildings, roads, and powerline rights-of-way that remnants are hard to find. In this study, over 110 such species of plants were identified, including shrub and tree species around the borders of the prairies in 42 different locations in Pierce, Thurston, and Lewis Counties. This information is available from the author upon request.

RESULTS OF SEARCHES

Weyerhaeuser-DuPont Site

Aster curtus was found in the Weyerhaeuser-DuPont site only in the Scotch broom prairie. Scattered in this prairie are groves of Garry oak (Quercus garryana). Where the shade from the leafy canopy of the oak trees inhibits the growth of the Scotch broom, Aster curtus forms semicircular or crescent-shaped colonies out to where the Scotch broom increases in size and density. In other places where the Scotch broom is low and scattered, colonies of Aster curtus thrive. See Figure 1 for ten locations on the Weyerhaeuser-DuPont site where colonies were found.

The number of plants of Aster curtus found on the DuPont site, and specifically in the Scotch broom prairie, was estimated to be between 15,000 and 20,000. Table 2 contains estimates for each colony found on the site.

A number of other areas on the Weyerhaeuser-DuPont site were checked for the presence of Aster curtus. A description of these areas is contained in Table 3. Over 50 species of plants were recorded from these areas, but no Aster curtus was found. Although these areas were once part of the old prairie, many years of use for cultivation and grazing have resulted in the replacement of the original vegetation.

Table 3. Areas Examined on Weyerhauser-DuPont Site with no Aster curtus

August 13, 1979	- pastures in the Oak Savannah
	- pasture SE of the Oak Savannah
	- Oak Savannah near Edmond marsh
	- area around Old Fort Lake
	- pasture near Sequalitchew Creek
	- area along old railroad tracks

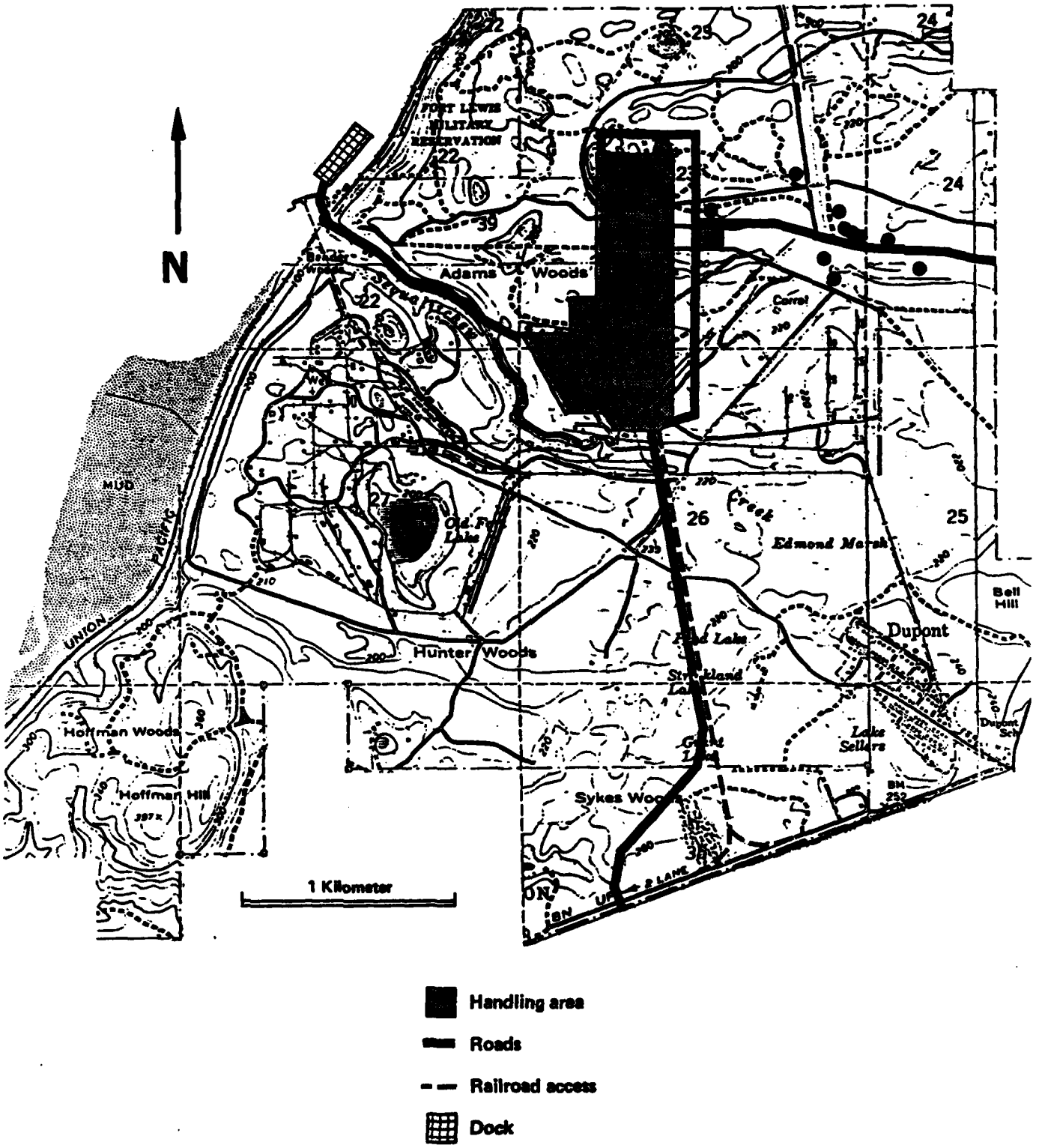


Figure 1. Locations of sites with colonies of Aster curtus on the Weyerhaeuser DuPont Site (see Table 1).

August 14-15, 1979 - areas of Scotch broom prairie where Scotch broom was tall
- area adjacent to the forest north and west of Army land-fill

Off-site Searches

Aster curtus Cronq. has been found on all of the prairie areas searched in Thurston County. It is especially abundant in the very extensive Mima Mound area, the Scatter Creek prairies, the Grand Mound prairies, and areas north of Rochester, Washington. It can form large colonies of an acre or more, and can have a density of 250-300 plants per square meter in these areas. The results of the search for Aster curtus in Lewis and Thurston Counties are summarized in Tables 4 and 5, and the locations for the Thurston County Colonies are indicated on Figure 2.

No undisturbed sites of prairie lands in Lewis County were located. This land has been farmed and grazed over a long period of time. Spraying waste land with weed killers in Lewis County for tansy ragwort has also eliminated many of the other broadleaved plants.

Table 4. Prairie Areas Examined with Aster curtus Cronq.

Thurston County

1. 8/10/79 - Scatter Creek Game Department public hunting area. The White top Aster grew in both small colonies of 50-100 plants to colonies of several thousand. They extend for a mile on an east-west line about the middle of the area.

2. 8/11/79 - Along the Rochester Little Rock road. Two miles north of Rochester in the prairie area.

3. 8/11/79 - Mima Mounds. 5 miles north of highway on the Gate Road across from the Weyerhaeuser forest nursery. On mounds on right-hand side of road.

4. 8/11/79 - Rochester. In prairies remnant on right-hand side of highway at the intersection with the Girls Training School road (overpass).

5. 8/15/79 - Mima Mounds. 4 miles south of the Olympia Airport, heading south, turn off at the Offut Lake sign. Along railroad tracks about 400 feet from tracks about 1/2 - 3/4 mile down tracks. A very large colony.

6. 8/17/79 - Grand Mound at intersection of highway and Interstate 5. Lake Tenino exist and stop opposite a truck turnout 200 yards for I-5. Small colony.

7. 8/17/79 - Mima Mound prairie. 3 miles south of Tenino, across from Agnew horse farm. Large colony.

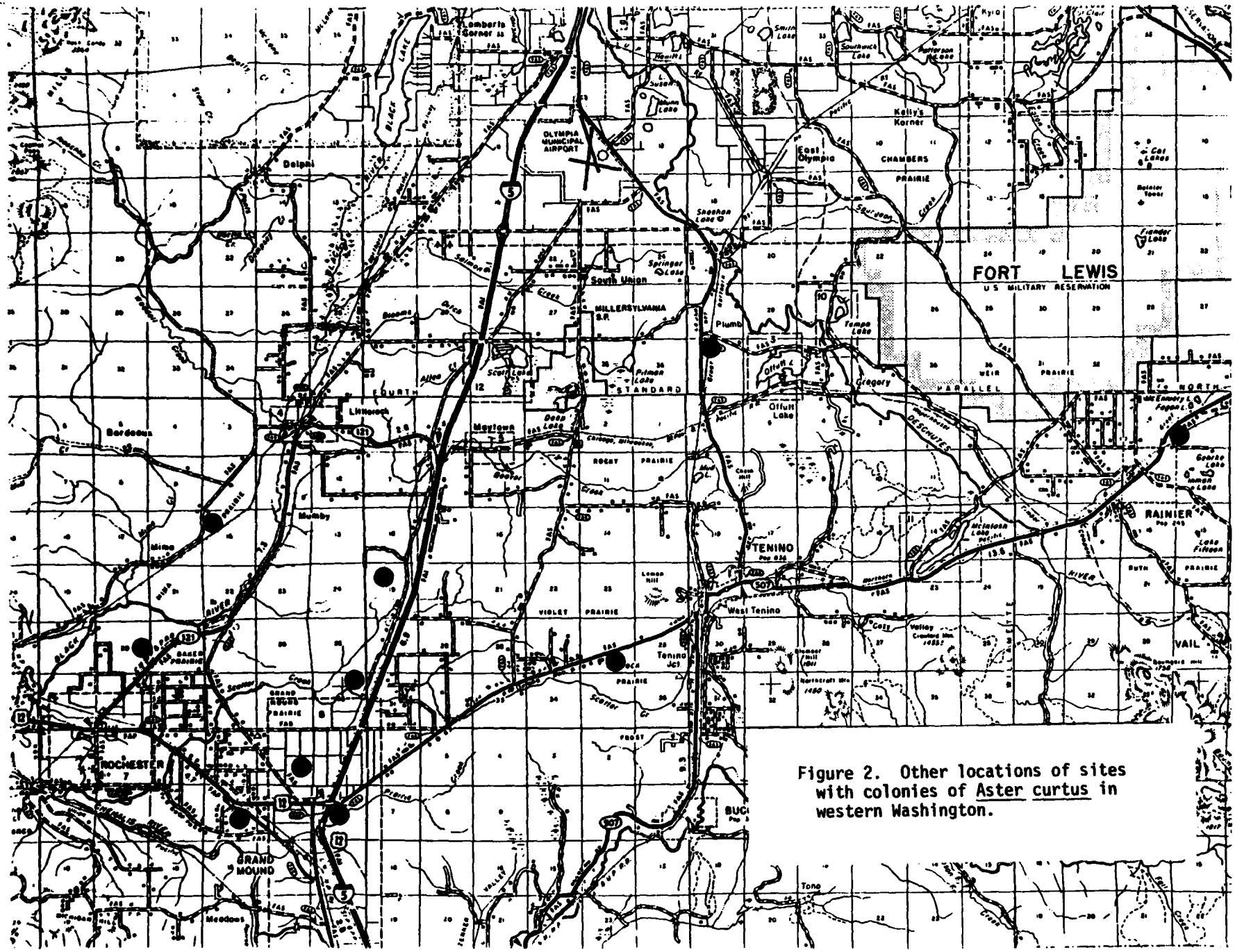


Figure 2. Other locations of sites with colonies of Aster curtus in western Washington.

8. 8/22/79 - Rainier Washington. On highway north toward Yelm past the Milwaukee railroad track overpass, 200 yards, on right of road. Small colony.

9. 9/18/79 - On Department of Game area 2 miles north of the Scatter Creek game access area.

10. 9/18/79 - Grand Mound prairie. 2 miles south of the Township Road.

Table 5. Prairie Areas Examined with no Aster curtus

Lewis County, Washington

1. 8/12/79 - Fords prairie. Along railroad tracks near intersection with I-5. Very few dominants of the old prairie found.

2. 8/18/79 - Jackson Prairie. One mile east of Matilda Jackson Park. No old prairie dominants found.

3. 8/22/79 - Jackson Prairie. Abandoned field adjacent (across road from Matilda Jackson Park). Few old dominants found that survived the competition from invading plants.

4. 8/22/79 - Lacamas Prairie. South of L.C. Park; old field.

5. 8/22/79 - Lacamas Prairie. East of 1st old field and on left of road heavily grassed in.

6. 8/22/79 - Field east of Toledo Airport fence row held a few old prairie dominants.

7. 8/22/79 - Toledo Airport. Heavily grassed except for some disturbed areas cleared along runway.

ASSESSMENT OF IMPACTS

At the present time I do not feel that the plant is endangered or even threatened. It is undoubtedly common on the Fort Lewis Military Reservation (Matia, 1979), and the results of the present survey indicate many locations where the plant is found in Thurston County. The species has been reported from the Klamath region of Oregon (Hitchcock et al., 1955). I am sure that intensive collections and observations will turn up many more localities where Aster curtus may be found in large numbers.

A word of caution, however, should be noted. Aster curtus is associated with remnants of old prairie habitat. Because of the suitability of this habitat for human activity, it has been heavily used for farming, grazing, and other development. Once the habitat is disturbed, it appears that Aster curtus is eliminated from the community through competition with non-native herbaceous plants. Therefore, it seems that these old prairie remnants represent critical habitats for Aster curtus.

The proposed Weyerhaeuser project on the DuPont site should have little or no impact on the existing colonies of Aster curtus. The locations of colonies on the site are outside the actual proposed development site, although an access road is shown in Figure 3 to run through the area colonized by Aster curtus. Care should be taken in the construction of the project to avoid disturbing the colonies, perhaps by routing the access road around the areas indicated in Figure 3.

EASE OF OBTAINING DATA

No significant difficulties were encountered in carrying out the survey or in obtaining data about Aster curtus Cronq.

References

Abrams, Leroy. 1940. Illustrated flora of the Pacific states Vol. 4. Stanford Univ. Press. (Seriocarpus rigidus) Lindl., p. 310.

Franklin, J.F., and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. U.S. Forest Service General Technical Report PNW-8. Portland, Oregon: Pacific Northwest Forest and Range Experiment Station.

Gilky, Helen. 1951. Handbook of Northwest flowering plants. Metropolitan Press. (A. curtus not listed).

Gray, Asa. 1887. The elements of botany for beginners and schools. (Seriocarpus p. 228).

Hitchcock, C. Leo, Arthur Cronquist, Marion Ownbey and J.W. Thompson. 1955. Vascular Plants of the Pacific Northwest p. 80 (Aster curtus).

Jones, George N. 1936. Botanical survey of the Olympic Pennisula, Washington (Aster curtus not listed).

Larrison, Earl, Grace W. Patrick, William Baker and James Yaich. 1974. Washington Wildflowers pub. by Seattle Audubon Soc.(Aster curtus not listed).

Lyons, C.P. 1956. Trees shrubs and flowers to know in Washington published by J.M. Dent and Sons (Aster curtus not listed).

Matia, Walter. September, 1979. Personal communication. Washington Natural Heritage Program. Olympia, Wa.

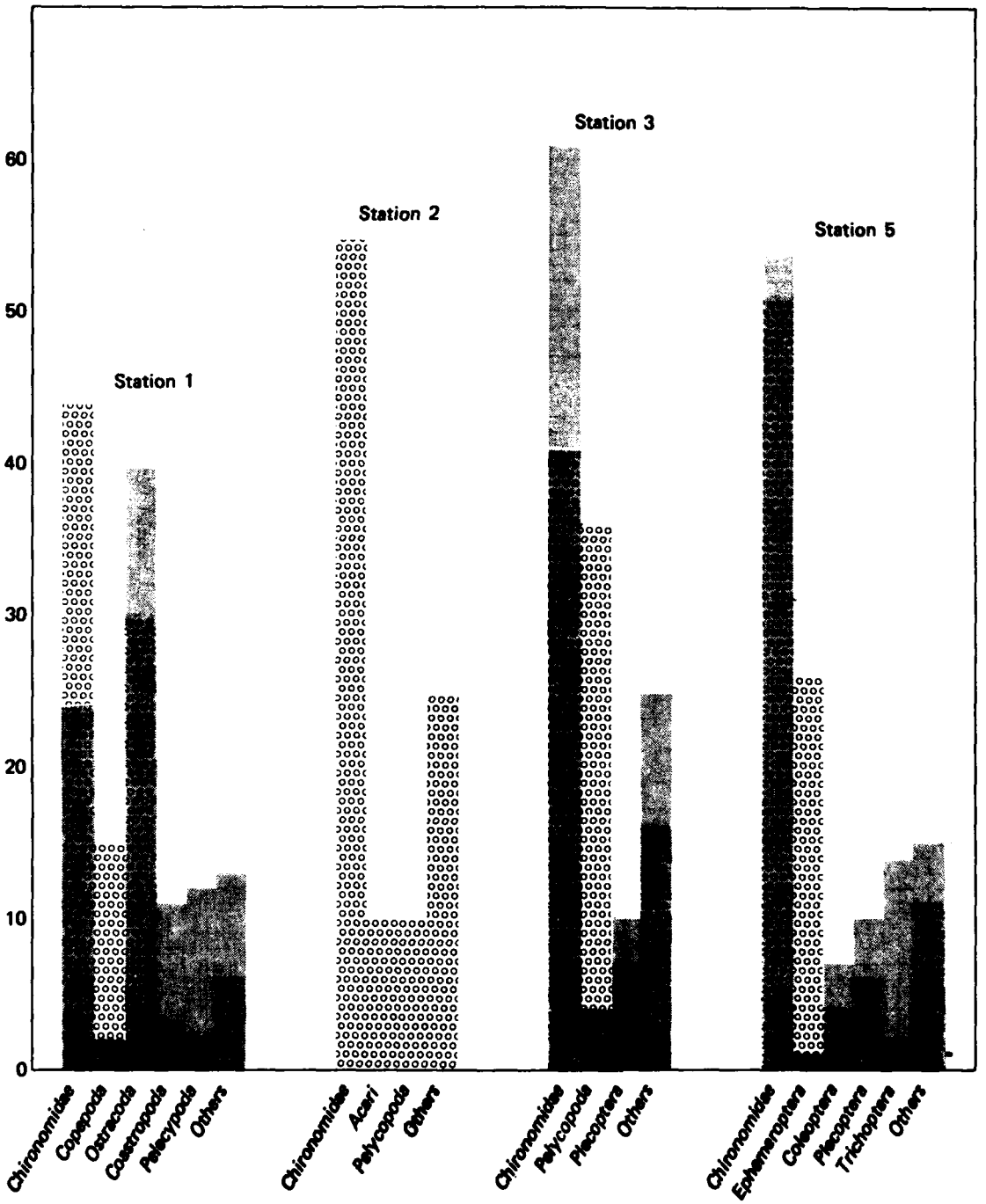
Peck, Morton E. 1961. Manual of the higher plants of Oregon. Binfords and Mort, Publ. p. 781 (Seriocarpus).

Piper, Charles V. 1906. Flora of the State of Washington, Wash. Gov. Print. Office. p. 569 (Seriocarpus rigidus).

St. John, Harold. 1937. Flora of Southeastern Washington. Pub. by Students Book Corporation, Pullman, Washington (Aster curtus not listed).

APPENDIX F

FAUNA



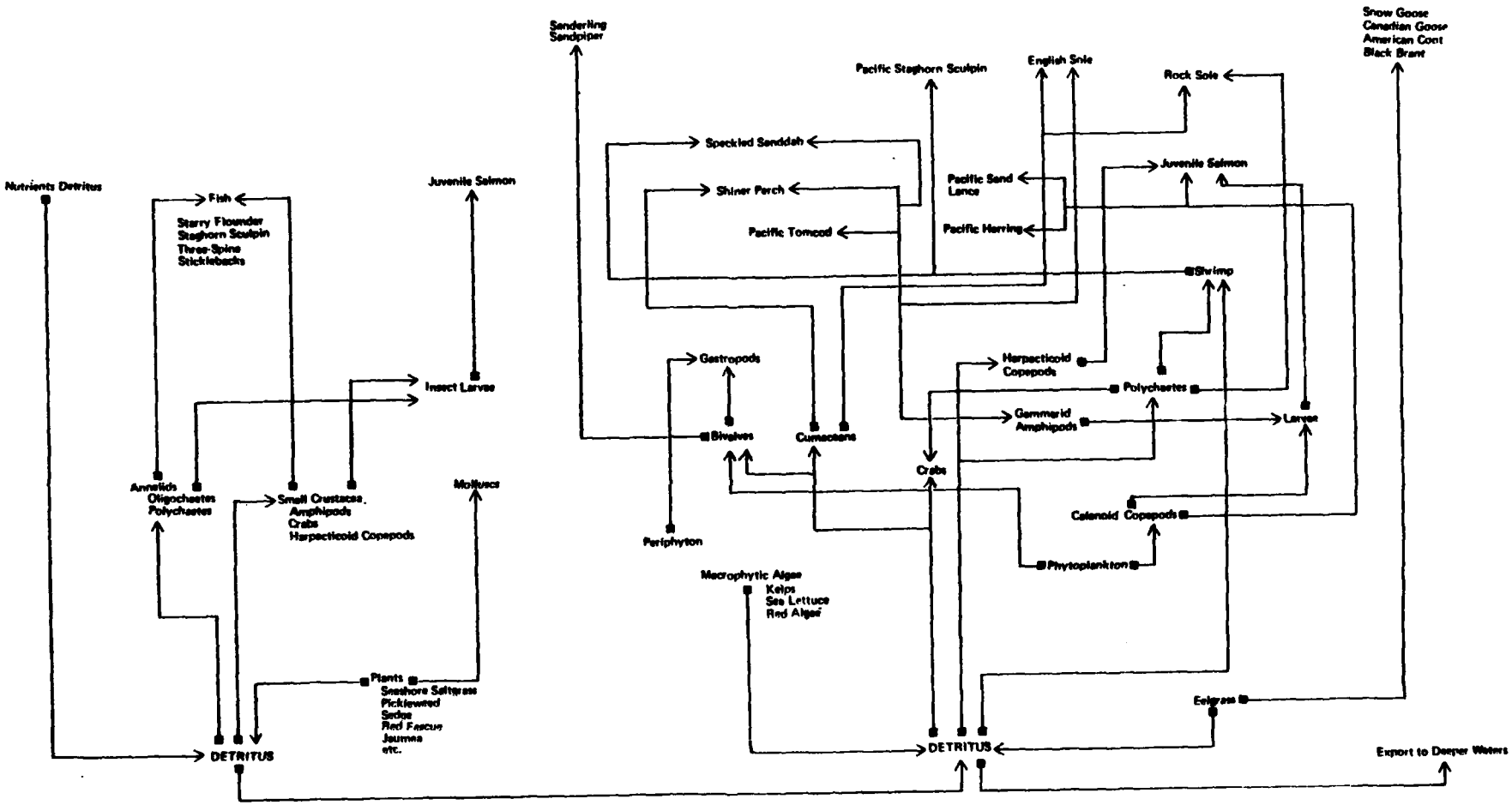
Legend:

Sampled June 6, 1977

Sampled September 19, 1977

Raw data from Thut et al, 1977.

FIGURE F-1
PERCENT OF TOTAL
NUMBERS OF INVERTEBRATE
TAXA COLLECTED IN
SEQUALITCHEW CREEK



RIVER SALTMARSH MUDFLATS/NEARSHORE AREA*

*Source: Simenstad et al (1979)

FIGURE F-2
FOOD WEB

TABLE F-1

COMMON AND ABUNDANT BIRD SPECIES OBSERVED IN UPLAND HABITATS
ON THE DUPONT SITE, MARCH 1977 - FEBRUARY 1978

	Closed Conifer Forest	Closed Mixed Forest	Open Conifer Forest	Oak Savannah	Field	Fresh Marsh
Chestnut-backed Chickadee	x	x	x	x	x	x
American Robin	x	x	x	x	x	x
Dark-eyed Junco	x	x	x	x	x	
White-crowned Sparrow	x	x	x	x	x	
Common Flicker	x	x	x	x	x	
Winter Wren	x	x	x	x	x	
Golden-crowned Kinglet	x	x	x	x		x
Song Sparrow	x	x	x		x	x
Steller's Jay		x	x	x	x	x
Red-breasted Nuthatch	x	x	x	x		
Pine Siskin	x	x	x	x		
Chipping Sparrow	x		x	x	x	
Rufous-sided Towhee		x	x			x
Wilson's Warbler		x	x			x
Willow Flycatcher			x	x	x	
Barn Swallow				x	x	x
Varied Thrush	x	x				
Crow	x			x		
Black-capped Chickadee		x				x
Starling				x	x	
Tree Swallow					x	x
Blue Grouse	x					
Brown Creeper	x					
Savannah Sparrow					x	
Bewick's Wren					x	
Great Blue Heron						x
Mallard						x
Yellow Warbler						x
Red-winged Blackbird						x
Long-billed Marsh Wren						x

Source: Melchoirs and Motobu, 1978

TABLE F-2
LARGE AND MEDIUM-SIZED MAMMALS
OF THE DUPONT SITE, 1977-8

Mammal	Size[2]	Status[3]
Raccoon	M	F,G
Longtail Weasel	M	F
Striped Skunk	M	NP,F
Coyote	L	NP,F
Harbor Seal	L	P
Western Gray Squirrel	M	P
Beaver	M	F
Muskrat	M	F
Porcupine	M	NP
Snowshoe Hare	M	G
Eastern Cottontail	M	G
Blacktail Deer	L	G
Gray Whale	L	P

[1] Source: Melchiors and Motobu, 1978

[2] M - medium, L - large

[3] F - furbearer, G - game animal, NP - not protected,
P - protected

TABLE F-3

SMALL MAMMALS OF THE DUPONT SITE, 1977 - 1978 -- THEIR HABITAT PREFERENCES AND FEEDING BEHAVIOR[1]

Mammal	Habitat Preference	Feeding Behavior[2]
Masked Shrew	Any moist habitat prefers forested areas	L - I
Trowbridge Shrew	Prefers forested areas	L - I
Vagrant Shrew	Any habitat, prefers moist areas	L - I
Dusky Shrew	Moist areas	L - I
Pacific Water Shrew	Wet wooded areas, along streams	L - I
Shrew-mile	Moist forested areas	S,L - I
Towsend Mole	Moist fields, relatively dry marshes	S - O
Townsend Chipmunk	Semi-open forests with dense understory	G,U - H
Chickaree	Anywhere conifers are present	G,U,C - H
Deer Mouse	Dry-land habitat, prefers forested areas	G - O
Townsend Vole	Prefers moist fields, marshes	G - H
Oregon Vole	Dry forest, brush, grassy areas	L,G - H
House Mouse	Any habitat, prefers buildings	G - O
Pacific Jumping Mouse	Moist grassy areas	G - H

Source: Melchiors and Motobu, 1978.

Foraging stratum: S - soil, L - litter, G - ground, U - understory and shrub, C - canopy.

Consumer Role: H - herbivor, I - insectivor, O - omnivore

References; (Martin, et al 1951, Burt and Grossenheider 1964, Ingles 1965, and Larrison 1970)

TABLE F-4

WDF SALMON ENHANCEMENT PROJECTS IN NISQUALLY REACH

Status	Enhancement Project	1980 Release (Number)	Projected Annual Release (Pounds)
Ongoing	Sequalitchew Lake		
	Coho	2.9 million planted	-----
June 1981 Completion	Schorno Springs		
	Chinook	650,000	38,000
	Chum	-----	38,000
May 1981 Completion	McAllister Springs		
	Chinook	-----	40,000
	Chum	-----	62,500
August 1980 Completion	Allison Springs		
	Chinook	120,000	
	Chum	2 million	
June 1980 Completion	Case Inlet (Coulter Creek)		
	Chinook		20,000
	Chum		50,000
Ongoing	Percival Cove		
	Chinook		130,000

Source: WDF, 1980b

TABLE F-5

NISQUALLY TRIBE ENHANCEMENT PROJECTS(1)

Species	Enhancement Project	Projected Annual Release (Number of Fish)
Chinook	Nisqually River Hatchery	960,000 on-station Up to 1.3 million off-station
Pink	Seeding of natural spawning areas with native fed fry	As needed to maintain native stock
Chum	Seeding of natural spawning areas with native fed fry	As needed to maintain native stock

(1) Capacity of the hatchery facility is 4.8 million fish.

Source: Nisqually Tribe, undated document. Nisqually River Drainage Management Plan. Provided to URS Company by Frank Haw, WDF.

TABLE F-6

FAUNA OBSERVED ON THE DUPONT SITE*
MARCH 1977 - MARCH 1978

BIRDS

Common Loon
Red-throated Loon
Red-necked Grebe
Horned Grebe
Western Grebe
Pied-billed Grebe
Double-crested Cormorant
Great Blue Heron
Green Heron
Mallard
Gadwall
Pintail
Green-winged Teal
Blue-winged Teal
American Wigeon
Northern Shoveler
Wood Duck
Ring-necked Duck
Canvasback
Greater Scaup
Lesser Scaup
Common Goldeneye
Bufflehead
White-winged Scoter
Surf Scoter
Black Scoter
Ruddy Duck
Red-breasted Merganser
Turkey Vulture
Sharp-shinned Hawk
Cooper's Hawk
Red-tailed Hawk
Bald Eagle
Osprey
American Kestrel
Blue Grouse
Ruffed Grouse
California Quail
Ring-necked Pheasant
Virginia Rail
American Coot
Killdeer
Common Snipe
Spotted Sandpiper
Greater Yellowlegs
Least Sandpiper
Western Sandpiper
Parasitic Jaeger
Glaucous-winged Gull
Herring Gull
California Gull
Ring-billed Gull
Mew Gull
Bonaparte's Gull
Common Tern
Common Murre
Pigeon Guillemot
Marbled Murrelet
Cassin's Auklet
Rhinoceros Auklet
Band-tailed Pigeon
Rock Dove
Mourning Dove
Barn Owl
Great Horned Owl
Short-eared Owl
Common Nighthawk
Rufous Hummingbird
Belted Kingfisher
Common Flicker
Pileated Woodpecker
Yellow-bellied Sapsucker
Hairy Woodpecker
Downy Woodpecker
Willow Flycatcher
Western Flycatcher
Western Wood Pewee
Olive-sided Flycatcher
Violet-green Swallow
Tree Swallow
Rough-winged Swallow
Barn Swallow
Cliff Swallow
Purple Martin
Gray Jay
Steller's Jay
Common Crow
Northwestern Crow
Black-capped Chickadee
Chestnut-backed Chickadee

TABLE F-6 (Continued)

Bushtit
Red-Breasted Nuthatch
Brown Creeper
Dipper
House Wren
Winter Wren
Bewick's Wren
Long-billed Marsh Wren
American Robin
Varied Thrush
Hermit Thrush
Swainson's Thrush
Townsend's Solitaire
Golden-crowned Kinglet
Ruby crowned Kinglet
Water Pipit
Cedar Waxwing
Northern Shrike
Starling
Solitary Vireo
Warbling Vireo
Yellow Warbler
Yellow-rumped Warbler
MacGillivray's Warbler
Common Yellowthroat
Wilson's Warbler
Western Meadowlark
Yellow-headed Blackbird
Brewer's Blackbird
Red-winged Blackbird
Brewer's Blackbird
Brown-headed Cowbird
Western Tanager
Black-headed Grosbeak
Purple Fince
House Finch
Pine Siskin
American Goldfinch
Red Cross bill
Rufous-sided Towhee
Savannah Sparrow
Vesper Sparrow
Dark-eyed Junco
Chipping Sparrow
White-crowned Sparrow
Fox Sparrow
Song Sparrow

MAMMALS

Masked Shrew
Towbridge Shrew
Vagrant Shrew
Dusky Shrew
Pacific Water Shrew
Shrew-mole
Townsend Mole
Pacific Mole
Bat
Raccoon
Longtail Weasel
Striped Skunk
Coyote
Harbor Seal
Townsend Chipmunk
Western Gray Squirrel
Chickaree
Beaver
Deer Mouse
Townsend Vole
Oregon Vole
Muskrat
House Mouse
Pacific Jumping Mouse
Porcupine
Snowshoe Hare
Eastern Cottontail
Blacktail Deer
Gray Whale

REPTILES AND AMPHIBIANS

Brown Salamander
Northern Rough-skinned Newt
Western Red-backed Salamander
Oregon Salamander
Boreal Toad
Pacific Treefrog
Norther Red-legged Frog
Bullfrog
Northwestern Fence Lizard
Northern Alligator Lizard
Pacific Rubber Boa
Puget Sound Red-sided Garter Snake
Wandering Garter Snake

*For scientific names, please see Melchiors and Motobu, 1978.

TABLE F-7

MEAN SALMON CATCH 1977 - 1979

Commercial

	Nisqually Reach	Nisqually River
Chinook	538	506
Coho	20,256	4,781
Chum	6,170	20,381
Pink	22	180

Sports Catch

	S. Puget Sound, South of Tacoma Narrows	Nisqually River
Chinook	29,017	12
Coho	14,404	18
Chum	152	0
Pink	481	0

Source: Washington Department of Fisheries, 1980

APPENDIX G

NOISE

NOISE CRITERIA

A variety of criteria have been established to evaluate or control environmental noise. Most are based on physiological data and community complaint and annoyance data and are expressed as a noise level, L_n, that is exceeded n percent of the time. L_{90} is generally considered to be the ambient noise level. Other parameters used are L_{eq}, a hypothetical steady A-weighted sound level that would contain the same amount of sound energy as the time-varying noise over a given period of time; L_{dn}, the day/night equivalent sound level, a parameter similar to L_{eq} except that noise occurring between 10 P.M. and 7 A.M. is deemed to be 10 dB louder than it actually is; and L_{np}, the noise pollution level, a parameter derived from L_{eq} by adding a variability term whose valve varies with the standard deviation of the time-varying A-weighted sound level.

Federal Guidelines

Environmental Protection Agency

The "Noise Control Act of 1972" directed the Environmental-Protection Agency (EPA) to publish information describing the effects of noise exposure, and to publish information requisite to protect the public health and welfare with an adequate margin of safety. Regulation of fixed site noise emission was left as a state and local responsibility with federal involvement limited to product labelling and interstate commerce.

The Office of Noise Abatement and Control of EPA, (EPA, 1974) identified sound levels consistent with protection of public health and welfare (shown in Table G -1. These levels were clarified in their "Draft Strategy for a National Noise Abatement Program" (EPA-1976) to mean abatement to L_{dn} = 75 dBA immediately with future reduction to L_{dn} = 65 dBA. EPA recommends that new programs aim to achieve L_{dn} = 55 dBA.

The Department of Housing and Urban Development (HUD) has adopted guidelines criteria for site selection of new residential housing based on social surveys (Schultz, 1971). In the HUD policy circular, the guideline criteria are expressed in terms of the A-Weighted sound levels not to be exceeded for more than so-many minutes per 8-hour or 24-hour period. When the HUD criteria are converted to statistical sound levels, the acceptability limits are those shown in Figure G - 1.

The requirements of Washington Administrative Code (WAC) 173-60 are the only regulations presently applicable to industrial noise emissions on the DuPont site. WAC 173-60 sets forth limits on the A-Weighted sound levels at the boundaries of various land use classes. By definition, land used for industrial purposes would be designated Class C EDNA (Environmental Designation for Noise Abatement) while land used for human habitation would be designated Class A EDNA. The limits of WAC-173-60-040 for a Class C noise

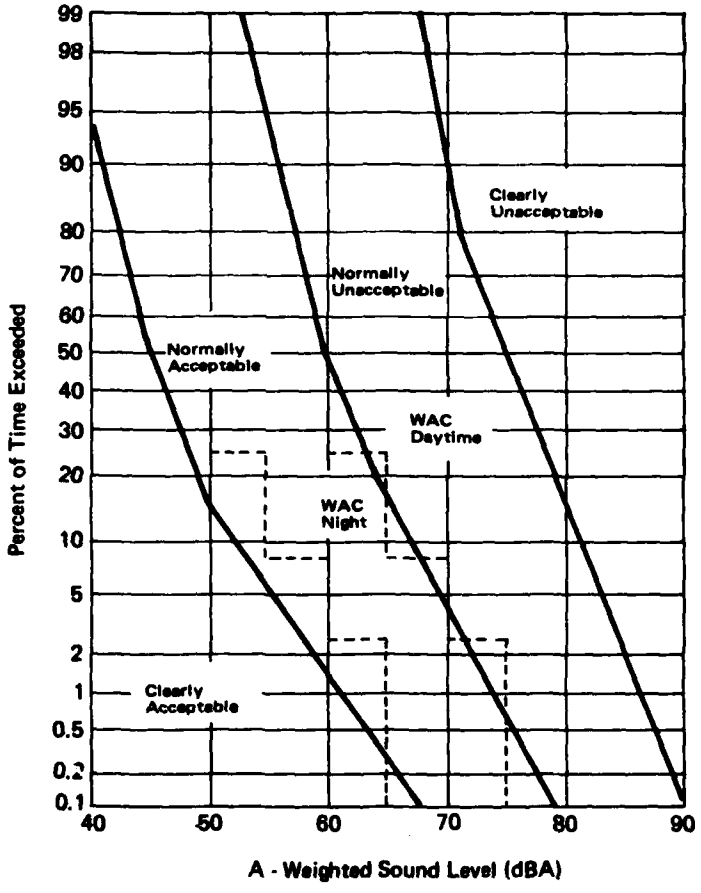


FIGURE G-1
HUD ACCEPTABILITY CRITERIA FOR NEW CONSTRUCTION SITES

TABLE G - 1

SUMMARY OF SOUND LEVELS IDENTIFIED AS REQUISITE TO PROTECT PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY (EPA-1974)

EFFECT	LEVEL	AREA
Hearing Loss	$L_{eq(24)}$<70 dB	All areas.
Outdoor activity interference and annoyance	L_{dn}<55 dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq(24)}$<55dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	L_{dn}<45 dB	Indoor residential areas
	$L_{eq(24)}$<45dB	Other indoor areas with human activities such as schools, etc.

source and Class A receiving environment permit continuous sound levels of 60 dBA during the daytime hours (0700-2200) and 50 dBA at night (2200-0700), with increases of not more than

a) 5 dBA for 15 minutes per hour
b) 10 dBA for 5 minutes per hour
c) 15 dBA for 1.5 minutes per hour

The never exceed limit is therefore 75 dBA daytime and 65 dBA nighttime. The measurement point for enforcement of these limits is anywhere within the receiving environment.

A number of exemptions to the regulation are listed in WAC 173-60-050. Those exemptions with potential applicability to the planned facility include the following:

Daytime exemption only (0700-2200)

a) Sounds originating from temporary construction sites as a result of construction activity.

b) Sounds originating from forest harvesting and silvicultural activity.

Continuous Exemption

a) Sounds created by surface carriers engaged in interstate commerce by railroad.

b) Sounds created by watercraft.

c) Sounds created by warning devices not operating continuously more than 5 minutes.

d) Sounds created by safety and protective devices where noise suppression would defeat the intent of the device or if economically infeasible.

In a hypothetical example of a Class C EDNA noise source impacting a Class A EDNA receiving environment, which just meets the daytime and nighttime limits of WAC 173-60, the following comparisons (Table G-2) can be made with the EPA and HUD guidelines.

NOISE LEVELS IN THE DUPONT FACILITY

Calculations and measurements have determined existing noise levels in the DuPont vicinity. Table G-3 shows calculated noise levels for roads in the vicinity. In Table G-4, measurements of noise levels are summarized.

To assess the probable impact of the proposed facility, maps of predicted noise contours were constructed. Assumptions used to derive these contours are given in Crain (1978). Figure G-2 shows L_{eq} contours; L_{dn} contours for 24-hour loading operations (the worst case, which is unlikely) are given in Figure G-3.

TABLE G - 2

COMPARISON OF WAC 173-60 LIMITS TO FEDERAL GUIDELINES

		STATISTICAL LEVELS					
	HOURLY						
	L_{dn}	L_{eq}	L_{25}	$L_{8.3}$	$L_{2.5}$	L_{max}	L_{np}
WAC 173-60 DAY	64	62	65	70	75	75	-
NIGHT		54	55	60	65	65	
HUD CRITERIA	62	62	63	67	70	NONE	74
EPA GUIDELINES	55	55	-	-	-	NONE	-
		45					

In terms of the day-night equivalent sound level (L_{dn}), the EPA guideline is considerably more restrictive than the Washington regulation. The HUD criteria and WAC daytime limits are about the same; WAC nighttime limits are more restrictive.

TABLE G-3
CALCULATED NOISE LEVELS FOR ROADS IN THE DUPONT VICINITY
(1976)

	Peak-Hour Traffic Volume[a]	Noise Levels (dBA) 100 ft.		500 ft.		1000 ft.	
		L_{50}	L_{10}	L_{50}	L_{10}	L_{50}	L_{10}
Interstate 5 east of State 510	4,235	70	78	60	64	55	60
Interstate 5 near the Town of DuPont	5,310	72	79	62	65	57	59
Interstate 5 at Fort Lewis Interchange	6,651	74	80	64	67	53	60
State Route 512	1,070	57	--	--	--	--	--
State Route 101	2,290	65	--	--	--	--	--

[a] From URS, 1978

TABLE G-4
SUMMARY OF HOURLY MEASUREMENTS BY LOCATION

		RANGE OF HOURLY DATA, dBA		STATISTICAL LEVELS						
		LOW	HIGH	L_{90}	L_{50}	L_{10}	L_{eq}	L_{np}		L_{dn}
A1	72	29-50	56-86	39-53	41-56	46-60	43-66	49-84	8	57-59
A2	72	31-47	46-72	35-51	36-54	42-56	38-55	45-68	3	51-55
A3	72	29-47	49-78	32-49	35-51	38-56	37-57	44-71	5	50-53
A4	72	23-45	46-78	33-48	36-50	38-55	36-54	42-72	4	51-55
B1	80	24-44	45-74	32-47	34-49	39-54	36-50	42-65	0	47-51
B2	23	46-51	69-85	50-55	53-57	56-63	54-63	61-74	18	-
C1	96	23-43	45-80	31-46	34-49	40-58	36-54	45-72	2	49-53
C2	72	22-42	42-75	28-46	32-49	38-55	36-53	41-74	3	51-52
D1	48	20-39	40-74	25-44	27-49	35-59	32-54	43-76	1	50-55
D2	48	22-49	44-78	39-52	31-55	31-55	36-55	39-78	4	51-55

* Letters refer to areas shown in Figure 2-23; for details on location see Crawford, 1977.

TABLE G-5

COMPARISON OF CRITICAL EXISTING* AND PREDICTED LEVELS

Location	Condition	A-weighted sound levels, dB				
			Nighttime ave. levels			
		L_{dn}	L_{eq}	L_{max}	L_b	L_{pk}, dB
1. Anderson Island, Nisqually Reach, western Nisqually Wildlife Refuge	Existing	52	43	59	31	91**
	Predicted, 6 dB/dd	55	49	54	46	76
	Increase	3	6	0	15	0
	Predicted, reinforcement	62	60	65	56	88
	Increase	10	17	6	25	0
2. Eastern Nisqually Wildlife Refuge, area closest to dock	Existing	52	44	57	38	-
	Predicted, 6 dB/dd	63	57	62	54	85
	Increase	11	13	5	16	-
	Predicted, reinforcement	65	61	66	58	90
	Increase	13	17	9	20	-

* Existing levels were the averages of two days data for Anderson Island and three days data for the wildlife refuge.

** Fort Lewis single blast July 21, 1980.

Source: TRC, 1980

A REVIEW OF NOISE EFFECTS ON WILDLIFE

Prepared by

URS COMPANY

Introduction

With a growing human population and increased industrial development, the intrusion of noise associated with human activities has been altering more and more previously undisturbed wildlife habitat. Certainly, changes in noise levels modify the physical environment in such a way that wildlife must compensate. Little really is known about the responses of wildlife to human-generated noise.

It is true that some habitats occupied by wildlife are naturally noisy. For example, the area around a waterfall may be chronically exposed to high sound levels. In shallow coastal waters where the bottom is rocky, background noise of 80 dB may be generated largely by barnacles. This permanent background noise does not seem to disturb any species, invertebrate or vertebrate (Busnel, 1978). Also, sound levels in flocks of social birds often reach high sound levels. Rainfall, too, in forests and on water, can cause significant increases in ambient sound levels. Thus, it is apparent that the natural ambience of an environment is not necessarily a quiet one.

Intrusion, however, of sound from human activity can alter the natural sound environment. For some wildlife, it is likely that simply the detection of sounds associated with humans is sufficient to cause abandonment of an area. High sound levels may not be necessary to evoke such a response. Such species can be described as noise-sensitive. Other noise-tolerant species may become habituated to human sounds or noises with repeated exposure and carry on a separate coexistence without habitat abandonment.

Exposure to Noise

For human exposure to noise, levels should be described in terms of energy-averaged equivalent sound level (L_{eq}) and the day-night average sound level (L_{dn}), a variant of Leq that imposes a 10 dB nighttime penalty for sounds emitted between 10 pm and 7 am (EPA, 1974). Single event noise such as explosions that last a brief period of time also require description. EPA also suggests that for human exposure, sound levels should be in the A-weighted scale (dBA). This A-weighted scale emphasizes sounds in the human range of hearing (20 - 20,000 Hz) since noises in this range are presumably most intrusive to humans.

Although the auditory ranges of most birds and reptiles is within the auditory range of humans, many mammals, including dogs, rodents, bats, and marine mammals, possess hearing sensitivities to frequencies far outside the human range (EPA, 1971; Lee and Griffith, 1978; Janssen, 1978). Table 1 compares the human hearing range with those of a variety of animals.

Important communications certainly occur intraspecifically, as well as interspecifically, within ranges audible by humans, as well as outside the human range of hearing. Noise description using the A-weighted scale will not accurately represent the perception of the wide variety of wildlife responses. The appropriateness, therefore, of a single description for insects, bats, humans and birds is questionable.

Published reports of noise effects on wildlife often do not sufficiently characterize the sound, making comparative analyses difficult, if not impossible. Noise should be characterized by its frequencies, intensity, and duration.

TABLE 1

Hearing Abilities (Frequencies) of
Various Animals as Compared with Man

Species	Lower Limit (Hz)	Maximum Sensitivity (Hz)	Upper Limit (Hz)
Man (Homo sapiens)	16	4,000	20,000
		Invertebrates	
Tiger moths 1/ (Arctiidae)	3,000	--	20,000
Noctuid moth 1/ Prodenia evidania	3,000	15,000-60,000	240,000
Butterflies (38 species) 1/ Lepidoptera	--	40,000-80,000	--
Long-horned grasshoppers 1/ (Tettigoniidae)	800-1,000	10,000-60,000	90,000
Field cricket 1/ (Gryllus)	300	--	8,000
Mosquitoe 2/ (Anopheles subpictus)	150	380	550
Male Midges 2/ (Tendipedidae)		80-800 with peaks at 125 and 250	
		Amphibians	
Bullfrog (Rana catesbeiana)	<10	<1,800	3,000-4,000
		Birds	
Starling (Sturnus vulgaris)	<100	2,000	15,000
House sparrow (Passer domesticus)	--	--	18,000
Crow (Corvus brachyrhynchos)	<300	1,000-2,000	<8,000

TABLE 1 (Cont)

Hearing Abilities (Frequencies) of
Various Animals as Compared with Man

Species	Lower Limit (Hz)	Maximum Sensitivity (Hz)	Upper Limit (Hz)
Kestrel (Sparrow Hawk) (Falco sparverius)	300	2,000	<10,000
Long eared owl (Asio otus)	<100	6,000	18,000
Mallard duck Anas platyrhynchos	300	2,000-3,000	>8,000
		Mammals	
Bats (Chiroptera)	<1,000	30,000-100,000	150,000
Rodents (Rodentia)	<1,000	5,000-18,000, and 40,000-60,000	100,000
Cats (Felidae)	--	--	70,000
Opossum (Didelphus virginiana	<500	--	<60,000

1/ Frequencies of continuous tones that stimulate the tympanal organs.
2/ Frequency reponse of Johnston's Organ which are located at the base of the antennae.

Source: Lee and Griffith, 1978

Response to Noise

Effects of noise on wildlife can be viewed with regard to primary and secondary effects (Janssen, 1978). Primary effects include hearing impairment, masking of communications signals, and physiological stress. Secondary effects are the range of consequences of primary effects. Noises that interfere with communication signals may interfere with mating calls, territorial boundary songs, and alarm calls, thereby affecting the productivity or mortality of a wildlife species. Physiological effects may result in changes in reproductive success or changes in stress levels and subsequent changes in abilities to withstand further stress. Behavioral avoidance of a noisy environment may result in losses of feeding opportunities and finding shelter.

Effects of Noise

Noise produces, in general, similar effects on animals to those it produces in humans (NRC, 1977; EPA, 1973; EPA, 1971). Hearing loss or damage to auditory structures, masking of communications signals, behavioral changes, and physiological changes have all been attributed to noise in animals, as well as in humans. Much of the research has been carried out on laboratory animals in studies attempting to understand human hearing. Other research has gone on to study the reactions of farm animals to such environmentally intrusive noises as sonic booms. Little documentation exists concerning chronic relatively low noise levels on wildlife in their natural environments.

Masking of Communications Signals --

In humans noise interference with speech is well known. Noise can change the perceived quality of an acoustic signal, shift its apparent

location or loudness, and make an acoustic signal inaudible (EPA, 1973). Noise can similarly interfere with communication signals in animals, which are essential to convey necessary information such as danger, distress, warnings about territorial boundaries, and recognition of a mate or young.

Interference with such signals could drastically affect a nocturnal predator's success, if that predator relies on acoustic information to locate prey. If noise interfered with mating signals, reproductive success could be affected. Detection of warning calls could be hindered, again significantly affecting survival (EPA, 1971).

Potential interference of noise with communications signals depends on the frequency characteristics of the noise as well as the frequency characteristics of the signal. Greatest interference occurs where noise frequency characteristics overlaps those of the animal's signals.

The common canary has its greatest auditory sensitivity to the range of frequencies from 2,000 to 4,000 Hz, which is also the range of frequencies that is most characteristic of their songs. If this correspondence is characteristic of other species, then it may be possible to predict which species would be most likely to be affected by a particular noise (EPA, 1971). Further studies are required to determine if this is so.

Male Japanese quails, isolated from their mates, increased the frequency of their "separation calls" when ambient noise levels were increased from 36 dBA to 63 dBA. Compensation in this manner increases the signal to noise ratio (S/N), presumably making detection and recognition easier for the isolated mate. Ultimately, the significance of this compensatory strategy lies in the mate's detection and location of its mate before a predator does (Potash, 1972).

In studies to determine effects of audible noise (AN) generated by high voltage electrical transmission lines on songbird distributions, Lee and Griffith (1978) found that their ability to detect unseen songbirds was impaired by increases in noise levels 15 to 200 dBA above background levels where maximum noise levels near the transmission right-of-way were 48 dBA. AN from the transmission lines was masking the songbirds call to some extent. During a rainstorm when AN of 64 dBA and 69 dB for the 125 H2 frequency were measured, these same authors observed a golden eagle (Aquila chrysaetos) and a red-tailed hawk (Buteo jamaicensis) perched on transmission towers. A raven (Corvus corax) nest containing four fully feathered young was observed on a tower during the study.

Nests of hawks, ravens, golden eagles have also been observed by Griffith and Lee in transmission towers in western Oregon, Washington, and Idaho where AN on the ground below the towers is typically 46 dBA and probably louder in the tower itself. Although rain would be relatively infrequent during the nesting season in eastern Washington, eastern Oregon, and Idaho, AN levels reach levels of 76 dBA during rain. These observations of wildlife use of the transmission towers and right-of-way during periods of high AN indicates "...that AN was not causing birds and some other species to completely avoid the right-of-way". (Griffith and Lee, 1978.) It should be noted that the effects of chronic noise levels of 46 dBA or more, and occasional levels up to 76 dBA, on the productivity of these nests is unknown.

Whether or not AN from these transmission lines affected songbird distributions was not demonstrated. It was concluded that AN-biased sampling could account for some differences between use of the right-of-way and a quieter, similar control area.

Communications between marine animals also can be affected by increases in ambient noise levels.

The most important region of sound detection in most fishes lies between about 40 and 100 Hz, while that some region in pinnipeds (seals, sea lions) is located between 500 Hz and 30 to 45 Hz. In the odontocetes (porpoises, dolphins, killer whales), this region lies between 8 KHz and 120 to 145 KHz (Myrberg, 1978).

In a review of the hearing abilities of marine fishes and their relationships to environmental noise, Myberg (1978) shows that traffic and industrial noise can increase the sound levels in frequency regions most critical for the hearing of many marine fishes. Although detailed knowledge about the biological significance of sound production in fishes is scant, Myberg suggests that masking could interfere with intra-specific communications involving courtship and reproduction, and with sounds important for prey detection, such as in sharks which use their hearing sense for that purpose. Masking by increased ambient sounds could thus affect survival of some species.

The maximum detection-distance for harbor seals in a relatively calm sea is estimated at 1000 meters. Although noise from shipping and industrial sources affects reception, the effect is small when compared to the reduction in sensitivity during periods of rain. During such conditions, detection-distance is decreased to a few 10's of meters (Myberg, 1978). Hearing by odontocetes such as dolphins and killer whales may also be affected by environmental noise. Maximum echolocating distance, estimated to be around 650 meters for the bottlenose dolphin (Tursiops truncatus), is reduced by

about one-half in areas of high biological background sources such as snapping shrimp (Myberg, 1978). Much odontocete communication occurs, however, occurs in frequency ranges above those of environmental noise.

Behavioral Changes

Acoustic stimuli may affect the behavior of animals. Many animals show adaptive reactions to intrusive sounds (habituation). They may also display different behaviors depending on their biological condition.

Hares and partridges generally take to flight when sudden noises occur. In early June, however, when partridges are hatching and hares' young are being born, these species flatten against the ground in their fear reaction rather than fly or run away (Bushnel, 1978).

Underwater projections of killer-whale sounds caused migrating gray whales to reverse their direction of movement. Similar recordings were also used to prevent movement of white whales into an Alaskan River during a time that red salmon fingerlings were migrating to the ocean (EPA, 1971). Rabbits, deer, and some bird species have been repelled by a noise generator producing 2 signals with frequencies of 2,000 and 4,000 HZ. Birds, too, have been repelled effectively by high-intensity recordings of the species' distress calls, although if these calls are presented continuously, rapid habituation occurs (EPA, 1971). These techniques have been used in attempts to disperse roosting starlings. A noise level at the bird's ear of 85 dB SPL (sound pressure level) was required to scare birds. Observers have noted that no birds were flushed and no disturbances were observed when sound pressure levels of 96.5 dB occurred during a fluover of the Big Cypress Swamp by a jet at 500 feet altitude (EPA, 1971).

High-intensity sounds have been used to repel rodents from grain-storage facilities. Ultra-sonic pulses produced aversive behavior in wild Norway rats and house mice (EPA, 1974). Andrieu et al. (1978) was unsuccessful in using high sound intensities (up to 180 dB SPL) as a deinsectization procedure, although moths have shown aversive behavior and reduced longevity during ultrasonic pulses at 65 dB SPL.

Sonic booms did not cause abnormal behavior that would result in decreased productivity in eastern wild turkeys (Lynch and Speake, 1978). On the other hand adult condors abandoned their nests when disturbed by blasting, sonic booms, and traffic noise (EPA, 1974).

Minor auditory disturbances alone do not seriously disturb bald eagles (FWS, 1978). Gunshots, however, usually cause eagles to leave an area (Stalmaster, 1976). Chainsaw activity 1.2 km from a Wisconsin roost may have driven bald eagles from the roost for the remainder of a winter season (FWS, 1978). Eagles generally are less disturbed by automobile traffic than pedestrian and motorboats. Visual disturbances as well as auditory are probably operative. Airplanes flying at altitudes of 30 to 90 meters above wintering sites rarely disturb eagles (FWS, 1978).

Disturbances of harbor seal hauling areas by human activities can lead to abandonment of some areas, a change in hauling behavior, and/or increased pup mortality due to abandonment by mothers (Everitt et al., 1979). While these disturbances include visual elements, noise probably is important in 50 to 81 percent of the disturbances (Calambokidis et al., 1978). Characteristics of these disturbing noises are not, however, known.

Some animals may be attracted by human-generated noises. Busnel (1978) cites some examples: mosquitoes attracted to engine noise, mole-crickets attracted to a mechanical piano and a motor-pump. In these two cases, the noise spectra contained a frequency modulation similar to the mating signals of the females of the species. In Norway and Sweden, steam engine noises attracted elk. At sea, porpoises and dolphins may be attracted to the noise of boats and ships.

Physiological Effects

Noise can induce physiological changes in animals. Typically, the physiological response follows the general pattern of response to stress (EPA, 1974). Sensitivity to noise as a stressor is variable among animal species and the individuals within a species. Wildlife are probably more sensitive to noise as a stressor than domestic and semi-domestic animals such as pigeons, squirrels, rabbits, rats, and raccoons that generally may be described as noise and human-tolerant (Janssen, 1978).

Much of the work done describing physiological responses has involved acute responses of laboratory animals to relatively short, high-intensity sound levels, often as high as 160 dB, and usually higher than 100 dB. Extrapolation of these responses to field conditions for wildlife is difficult.

EPA (1971 and 1973) has reviewed some relevant laboratory findings. Laboratory rats responded to a 120 Hz tone at 100 dB SPL for intervals of 5 minutes per day for 15 days with increases in the weights of adrenal glands and increased blood ascorbic acid levels and lower blood glutathione levels. Others found that white rats repeatedly subjected to 95 dB noise levels developed increased uremic catecholamines, increased free fatty

acids in blood plasma, and increased adrenal gland size. In rats and rabbits exposed continously to white noise at 102 dB SPL for 3 and 10 weeks, respectively, few differences were noted in the rats, while the rabbits showed significantly more aortic atherosclerosis and a higher cholesterol content. Fat metabolism was apparently affected by the auditory stress.

Effects on reproductive systems of laboratory animals have been variable. Ovary enlargement, persistent estrus, follicle hematoma, reduced fertility, and embryo malformations are among the effects that have been observed in various tests. Exposure levels, frequencies, and durations typically were high (above 100 dB).

Rats, mice, and guinea pigs have been found to adapt successfully to fairly high levels of sound, but when noise stress occurred in combination with another stress, such as restriction of food, the animals life span could decrease. These findings, along with those which show changes in animals' ability to handle fat, could provide important implications for wildlife, especially during late winter when fat reserves are low and food may be scarce (EPA, 1973).

Physiological effects on noise on non-laboratory animals have been studied by Ames (1978). Sound intensity, as well as frequency, was important in determining effects. The results suggest that acclimation of physiological responses to sound may occur. The results also showed similar physiological responses in sheep as those found in laboratory animals. Growth and reproduction were affected.

Damage to the auditory structures is the most well documented effect of high noise levels on hearing organisms (EPA, 1973). Noise-induced hearing loss depends on sound characteristics such as the intensity, frequency, and duration, as well as the exposure pattern and individual susceptibility.

It is unlikely that wildlife will be subjected to noises intense enough or of sufficient duration to induce hearing loss. Wild animals are usually mobile enough that they can move away from areas experiencing such loud sounds. It is possible, however, that chronic exposure to moderate sound levels could cause some hearing impairment, but studies dealing with this are lacking.

Implications for Wildlife

The intrusion of noise into wildlife habitats can have several primary effects--masking of communications signals, loss of hearing ability, and/or physiological effects. If hearing ability is reduced, whether by structural damage to the organ of hearing or by increased ambient noise levels masking animal communications, the consequences may be biologically significant. An animal that locates it prey using auditory cues may not find food if background noise masks the sounds of its prey. On the other hand, prey that relies on its ears to detect predators may be more easily captured with consequent changes in predatory-prey relations. Reproductive success could be affected if an animal could not hear mating signals. Not hearing distress cries and warning signals could result in increased mortality of young or decreased survival rates. The biological significance, however, of signal masking is not known from case studies, so the actual effects on wildlife survival and distribution are only speculative.

If reports of effects of noise exposure on laboratory animals can be generated to wildlife, then physiological changes in testes and ovaries and other reproductive functions could certainly affect a species' reproductive success in a particular area.

Increased stress due to noise could affect survival of some species, especially if interactions between stressors as have been reported in laboratory animals are true also for wildlife. The cumulative effects of physiological stress along with other consequences of noise intrusion into a habitat could limit an individual's success as well as that of the species. That many physiological responses to noise stress are subject to acclimation probably is important in the coping responses of noise-tolerant species.

Behavioral avoidance and abandonment of a noisy habitat could restrict feeding opportunities and finding shelter, adversely affecting a species' survival. Relocation of individuals to adjacent habitats would increase the density of a species above the carrying capacity of the environment. Eventually, during the first critical period, the population would decline to the approximate level of the carrying capacity with the loss of some individuals.

Displacement of noise-sensitive wildlife from areas affected by noise and human disturbances would probably result in opportunities for other noise and human tolerant species to colonize the area. Populations of species such as sparrows, crows, pigeons, starlings, squirrels, rabbits, and raccoons could increase in these areas. Unfortunately, no lists exist that characterize sensitivities of wildlife species to noise and

human activity. These sensitivities cannot accurately be assessed, however, except on a case by case basis, since wildlife species vary so much in their behavioral responses. Even with knowledge of the levels of sound intrusion into an environment, insufficient information exists to accurately assess the responses of the wide variety of species that may be exposed. Further, the appropriateness of sound measurements referenced to human hearing ranges (the A-weighted scale) is questionable. More study is required before predictabili of noise impacts is possible.

Ames, D.R. 1978. Physiological Reponses to Auditory Stimuli. In Effects of Noise on Wildlife. Academic Press, N.Y., ed. by J.L. Fletcher and R.G. Busnel.

Andrien, A.J., F. Fleurat-Lessard, R.G. Busnel. 1978. Deinsectization of Stored Grain by High Powered Sound Waves. In Effects of Noise on Wildlife. Academic Press, N.Y., ed. by J.L. Fletcher and R.G. Busnel.

Busnel, R.G. 1978. Introduction In Effects of Noise on Wildlife. Academic Press, N.Y., ed. by J.L. Fletcher and R.G. Busnel.

Calambokidis, J., K. Bowman, S. Carter, J. Cubbage, P. Dawson, T. Fleischner, J. Schuett-Hames, J. Skidmore, and B. Taylor. 1978. Chlorinated hydrocarbon concentrations and the ecology and behavior of harbor seals in Washington State waters. Student originated study supported by the National Science Foundation, Evergreen State College, Olympia, WA, 98505. 121 p.

EPA. 1971. Effects of Noise on Wildlife and Other Animals. Prepared by Memphis State University. NTID 300.5.

EPA. 1973. Public Health and Welfare Criteria For Noise, July 27. PB-241-000.

EPA. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Everitt, R.D., C.H. Fiscus, and R.L. DeLong. 1979. Marine Mammals of Northern Puget Sound and the Strait of Juan de Fuca. NOAA Technical Memorandum, ERL MESA-41.

Janssen, R. 1978. Noise and Animals: Perspective of Government and Public Policy. In Effects of Noise on Wildlife. Academic Press, N.Y., ed. by J.L. Fletcher and R.G. Busnel.

Lee, J.M. and D.B. Griffith. 1978. Transmission Line Audible Noise and Wildlife. In Effects of Noise on Wildlife. Academic Press, N.Y., ed. by J.L. Fletcher and R.G. Busnel.

Myrberg, Arthur A., Jr. 1978. Ocean Noise and the Behavior of Marine Animals: Relationships and Implications. In Effects of Noise on Wildlife. Academic Press, N.Y., ed. by J.L. Fletcher and R.G. Busnel.

NRC (National Research Council). 1977. Guidelines for Preparing Environmental Impact Statements on Noise. National Academy of Sciences, Washington, D.C.

Potash, L.M. 1972. A Signal Detection Problem and Possible Solution in Japanese Quail. Animal Behavior 20.

(U.S.) FWS (U.S. Fish and Wildlife Service). 1978. Management of Wintering Bald Eagles. Department of the Interior. FWS/OBS - 78/79.

Woolf, N.K., J.L. Bixby, and R.R. Capranica. 1976. Prenatal Experience and Avian Development: Brief Auditory Stimulation Accelerates the Hatching of Japanese Quail. Science. 194(4268): 959-960.

APPENDIX H

CULTURAL RESOURCES

STATE OF WASHINGTON

Dixy Lee Ray
Governor

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
111 West Twenty-First Avenue, Olympia, Washington 98504 206/753-4011

May 12, 1978

MAY 16 1978

URS COMPANY

Mr. Grant Bailey
URS Company
4th and Vine
Seattle, Washington

Dear Mr. Bailey:

On May 1, 1978 I met with Mr. Rudy Thut of the Weyerhaeuser Company at the DuPont property for an on-site inspection of the railroad lines and road access proposed for the company's Dupont holdings. I have the following recommendations to make relative to the archaeological/historic resources, to determine mitigative measures necessary to protect any significant resources in the area.

I suggest that a series of auger tests be made paralleling the survey line in the Fort Nisqually area beginning at the crest of the hill overlooking the Fort site and continuing to the paved road outside the gates of the enclosure. The archaeologist hired should evaluate the results of the auger tests and determine necessary mitigative measures. Additionally, the area should be monitored during construction so that immediate action can be taken should human remains be exposed by construction activities. Because heavy ground cover precludes the discovery of prehistoric activity by surface examination, tests should also be conducted either side of Sequalitchew Creek in those areas that will be excavated and destroyed by the access construction.

Test pit should be excavated at both the railroad dump sites and the artifactual material recovered, carefully analysed and compared with historical data that relates to that period of industrialization.

At such time as the archaeological consultant has completed the auger testing of the Fort Nisqually area, I would appreciate knowing the results and have the opportunity to comment.

Sincerely,

Jeanne M Welch

Jeanne M. Welch, Deputy State
Historic Preservation Officer

sc

STATE OF WASHINGTON

Dixy Lee Ray
Governor

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION

111 West Twenty First Avenue, Olympia, Washington 98504 206 753-4011

Date: June 26, 1980

JUN 30 1980 In reply refer to: 149-F-COE-06

Paul Korsmo
URS Company
Fourth & Vine Building
Seattle, WA 98121

Re: Chenault Beach Site and Hawks Prairie Site for Weyerhaeuser

Dear Applicant:

We have reviewed the project materials forwarded to us for the above project and would like to make the following comments:

___*Insufficient information:* We will need: __a detailed narrative of the project elements; __a vicinity map; __a map of the project site and surrounding area showing topography, drainage, specific project boundaries, and indicating County, Section, Township, and Range; __line drawings of the project; __photographs of structures to be renovated or demolished.

XX *No resources known:* No properties are listed in the National or State Registers of Historic Places or the State Inventory of Historic Places which may be impacted by the project. Properties include archaeological and historic resources.

XX *Project area* __has/XXhas not been surveyed for cultural resources.

XX *Potential effects on unidentified resources:* There is reasonable probability that cultural resources exist in the project areas. XX A cultural resources survey/ ___monitoring of the project area is recommended as part of project construction.

___*Resources present:* __no effect/__effect uncertain; see below for comment.

___*No adverse effect/__Adverse effect* on National Register property. See below for comment.

XX In the event that cultural materials are disclosed during construction, work in the immediate vicinity should be discontinued and this office notified.

Sincerely,

JEANNE M. WELCH, Deputy State
Historic Preservation Officer

Sheila A. Stump, Archaeologist

md
Comments:

Form AHP R-5 (Rev 1/79)

JOHN SPELLMAN
Governor

JACOB THOMAS
Director

STATE OF WASHINGTON
OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
111 West Twenty-First Avenue, KL-11 • Olympia, Washington 98504 • (206) 753-4011

July 15, 1981

Col. Leon K. Moraski
District Engineer
Corps of Engineers
Seattle District
P.O. Box C-3755
Seattle, WA 98124

Log Reference: 63-F-COE-S-05

Re: Weyerhaeuser Export Facility
Dupont, Washington

Dear Colonel Moraski:

We are in receipt of your letter regarding the above referenced project. We concur that the project as proposed will have no effect on resources included in or eligible for inclusion in the National Register of Historic Places.

Sincerely,

Sheila A. Stump
Archaeologist

APPENDIX I

REGIONAL LAND USE POLICIES

TABLE I - 1

REGIONAL GROWTH POLICIES*

ACTIVITY CENTERS

1. Promote revitalization of the older and declining urban parts of the region.

2. New economic activities should be encouraged as a first order of preference to locate in existing centers, as a second order preference to group into new centers, rather than locate in dispersed, stripped or isolated areas.

3. New centers for economic activity should occur where it can be shown that:

   a. The locational requirements associated with a particular activity limit its location within existing centers.

   b. Major transportation, energy and environmental benefits, including a reduction in commuting time, can be derived from a new center located outside existing centers.

   c. It will be located near residential areas which include housing opportunities for persons expected to be employed in the new center.

   d. It will generate revenue adequate to pay for public costs, both direct and indirect, associated with the new center.

AGRICULTURE

1. It is recommended that all lands presently used for agriculture be zoned and designated in local comprehensive plans for continuation in that use, unless it can be clearly shown that such continuation would not be in the best public interest.

2. It is recommended that where geographic areas exhibiting a predominance of agricultural activity exist, such areas should be zoned and designated in local comprehensive plans as agricultural preserves.

ECONOMIC

1. Encourage the expansion or diversification of existing industries with opportunities for expanding markets.

2. Facilitate the location of new industries which would provide the region with a more stable base for the export of its goods and services.

3. Encourage the location and/or expansion of economic activities which exploit the region's locational advantages for serving national and international markets.

4. Establish and maintain the climate in which private initiative and private investment are encouraged.

5. Guide economic development with consideration for the existing geographic distribution of economic resources and activities, as well as their supportive public and private investments.

AESTHETICS

1. The natural beauty and livability of this region shall be a primary consideration in the location, timing and quantity of growth.

    a. Natural amenities identified as important to the region's character and beauty shall be preserved or sensitively developed as a second choice.

    b. Patterns of development which minimize adverse impacts on these amenities shall be encouraged.

NATURAL ENVIRONMENT

1. All planning should recognize the need to conserve areas where critical natural processes would be endangered by development.

2. Assure that land use planning properly considers stream and marine fishing resources and their recreational/economic benefits.

3. Non-renewable natural resources must be conserved or prudently used. Urban development on or adjoining deposits of these resources that may be used in the future should be controlled to assure access to the resource without creating land use conflicts.

HISTORIC RESOURCES

1. Local jurisdictions are encouraged to adopt appropriate measures to designate, acquire, develop, interpret and/or preserve all sites of historic significance including those designated on the National Register of Historic Sites.

PUBLIC SERVICES

1. Existing public utilities, facilities, and services shall be used to their fullest prior to expansion.

2. Replacement and maintenance of existing urban services and facilities should take precedence over expansion unless analysis indicates significant public benefits.

3. The pattern of development which produces the least cost in new public utilities, facilities and services shall be encouraged within feasiable limits.

TRANSPORTATION

1. Support projects and programs to remove hazards and bottlenecks from the existing highway system, to protect and enhance its capacity through traffic flow management, and to improve existing links between activity centers.

2. Encourage transportation improvement programming that relates extension of facilities to local plans for accommodating new growth and for the orderly extension of other public facilities.

3. Encourage Port Commissions and general purpose government to plan jointly for any expansion of existing or construction of new marine facilities to assure the net impact is in the short and long-term interests of the community.

4. Encourage a careful assessment of transportation investments that may further increase the efficiency of present transportation facilities and services, taking account of energy, environment, community and fiscal implications.

5. Support the construction of new transportation facilities when up-to-date projections of demand show that present facilities, fully utilized, will not meet the demand.

* Source: Puget Sound Council of Governments, 1977

APPENDIX J

LETTER REGARDING ADOPTION OF DUPONT'S SHORELINE MASTER PROGRAM

June 11, 1975

State of Washington
Department of Ecology

Honorable Kenneth C. Karnes
Mayor, City of DuPont
209 Barksdale Ave.
DuPont, WA. 98327

Dear Mayor Karnes:

We have reviewed the revised shoreline master program dated June 3, 1975, for the City of DuPont and hereby approve the program. With the incorporation of the regulations, your program now contains the necessary administrative mechanism for succesful management of your City's shorelines.

While the program generally meets the requirements of the Shoreline Management Act, we still are concerned about the environment designations adjacent to the DuPont wharf on the Puget Sound shoreline and along Sequalitchew Creek. The Urban environment theoretically would allow intense industrial and commercial development. For this reason, we remain concerned about the potential impact on the Nisqually Estuary. Our primary interest is the preservation of Nisqually delta as a natural area consistent with its recognition as a National Wildlife Refuge and a National Landmark. Any activity which might have a negative effect on the delta would be contrary to the intent of the Act, which specifically identified the Nisqually delta as a shoreline of statewide significance to be preserved in its natural condition.

Thank you and the Citizen Advisory Committee, and particularly Mr. Henry Means, for your cooperation in preparing and revising the program. We are looking forward to working with you again in the future.

Sincerely,

John A. Biggs
Director

JAB:lja

cc: Mr. Henry Means, Chairman, Citizen Advisory Committee
Mr. Jerry Louthain, S.W. Regional Office - Department of Ecology
Mr. Joseph M. Shensky, Pierce County Planning Commission

Olympia, Washington 98504 Telephone (206) 753-2800

APPENDIX K

CITY OF DUPONT SUBSTANTIAL DEVELOPMENT PERMIT,
WDE - CITY OF DUPONT - WEYERHAEUSER CONDITIONS
OF AGREEMENT, AND WEYERHAEUSER - FWS MEMORANDUM
OF UNDERSTANDING

APPENDIX K

CONTENTS

SHORELINES MANAGEMENT ACT OF 1971

CITY OF DUPONT
DuPont, Washington 98327

PERMIT FOR SHORELINE MANAGEMENT SUBSTANTIAL DEVELOPMENT, CONDITIONAL USE OR VARIANCE

NOTE: This page for local government use only.

APPLICATION NO: 1

ADMINISTERING AGENCY: City of DuPont

DATE RECEIVED: January 5, 1981

APPROVED: X DENIED:

DATE: February 18, 1981

TYPE OF ACTION(S):

X SUBSTANTIAL DEVELOPMENT PERMIT

_____ CONDITIONAL USE PERMIT

_____ VARIANCE PERMIT

PURSUANT TO CHAPTER 90.58 RCW, A PERMIT IS HEREBY GRANTED TO THE WEYERHAEUSER COMPANY, TACOMA, WASHINGTON 98477, TO UNDERTAKE THE FOLLOWING DEVELOPMENT:

DOCK CONSTRUCTION ON THE CITY'S MARINE SHORELINE, UPLAND ROAD AND RAIL CROSSING OF SEQUALITCHEW CREEK, AND ROAD CONSTRUCTION IN SEQUALITCHEW CREEK CANYON, UPON THE FOLLOWING PROPERTY: DOCK - N.W. 1/4, N.E. 1/4; ROAD IN SEQUALITCHEW CREEK CANYON - S.W. 1/4, S.E. 1/4; ALL OF SEC. 22, T19N R1E. ROAD AND RAIL CROSSING OF SEQUALITCHEW CREEK - N.W. 1/4, SEC. 26, T19N, R1E, ALL WITHIN NISQUALLY REACH AND SEQUALITCHEW CREEK AND/OR THEIR ASSOCIATED WETLANDS.

THE PROJECT WILL BE, IN PART, WITHIN SHORELINES OF STATEWIDE SIGNIFICANCE. THE PROJECT WILL BE LOCATED WITHIN AN URBAN ENVIRONMENT DESIGNATION.

THE FOLLOWING MASTER PROGRAM PROVISIONS ARE APPLICABLE TO THIS DEVELOPMENT:

"SHORELINES OF STATEWIDE SIGNIFICANCE" Pgs. 84-85,
"ROADS AND RAILROADS" Pgs. 35-37,
"PORTS AND WATER RELATED INDUSTRIES" Pgs. 32-34.

DEVELOPMENT PURSUANT TO THIS PERMIT SHALL BE UNDERTAKEN PURSUANT TO THE TERMS AND CONDITIONS OF CITY OF DUPONT RESOLUTION NO. 73, EXHIBITS A,B, C AND D ANNEXED HERETO AND MADE A PART HEREOF.

THIS PERMIT IS GRANTED PURSUANT TO THE SHORELINE MANAGEMENT ACT OF 1971 AND NOTHING IN THIS PERMIT SHALL EXCUSE THE APPLICANT FROM COMPLIANCE WITH ANY OTHER FEDERAL, STATE OR LOCAL STATUTES, ORDINANCES OR REGULATIONS APPLICABLE TO THIS PROJECT, BUT NOT INCONSISTENT WITH THE SHORELINE MANAGEMENT ACT (CHAPTER 90.58 R.C.W.).

THIS PERMIT MAY BE RESCINDED PURSUANT TO R.C.W. 90.58.140(8) IN THE EVENT THE PERMITTEE FAILS TO COMPLY WITH THE TERMS OR CONDITIONS HEREOF.

CONSTRUCTION PURSUANT TO THIS PERMIT WILL NOT BEGIN AND IS NOT AUTHORIZED UNTIL THIRTY (30) DAYS FROM THE DATE OF FILING AS DEFINED IN R.C.W. 90.58.140(6) AND W.A.C. 173-40-090, OR UNTIL ALL REVIEW PROCEEDINGS INITIATED WITHIN THIRTY (30) DAYS FROM THE DATE OF SUCH FILING HAVE TERMINATED: EXCEPT AS PROVIDED IN R.C.W. 90.58.140 (5) (A) (B) (C).

Lacey A. Harris

MAYOR OF THE CITY OF DUPONT

February 18, 1981

DATE

CITY OF DUPONT

RESOLUTION NO. 73

A RESOLUTION OF THE CITY OF DUPONT REGARDING THE SHORELINE SUBSTANTIAL DEVELOPMENT PERMIT APPLICATION SUBMITTED BY THE WEYERHAEUSER COMPANY JANUARY 5TH, 1981.

WHEREAS, the City Council finds that:

1. On January 5th 1981, Weyerhaeuser Company applied for a substantial Development Permit for construction of an export center, portions of which would be located on shorelines within the City.

2. Notice of the permit application was given by publication to the Tacoma News Tribune on January 7th and January 14th 1981, by posting on January 6th 1981, in five places listed in an affidavit of Carl V. Powell dated January 6th 1981, by press release and by other means, in compliance with the Shoreline Management Act, CH. 90.58 R.C.W., the applicable DOE regulations, Ch. 173-14 WAC and the City's Shoreline Master Program.

3. Pursuant to SEPA the City issued a draft EIS on the proposed project on August 21st 1978, held a public hearing on that draft on September 20th and 21st 1978, received other public and agency comments, and published a final EIS on February 2nd, 1979.

4. The City transferred lead agency status to DOE on March 3rd, 1979. On June 4th 1979, DOE determined that the EIS was adequate for all state and local decisions relating to the proposed project.

5. On January 9th 1981, the City asked DOE to review again the adequacy of the EIS in light of relocation of the proposed dock and other new information obtained since the previous determination. On February 11th 1981, DOE again determined that the EIS was adequate. We concur with the DOE

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

determination that the EIS is adequate with respect to the City's decision on this permit application.

6. The EIS was held adequate by the Pierce County Superior Court on July 3rd 1980, Cause No. 281197. That decision has been appealed by the Nisqually Delta Association and the Washington Environmental Council. The City recognizes that there is an arithmetic error in the EIS on page 2-92, which erroneously states that the probable frequency of Weyerhaeuser ships and other companies' oil barges being simultaneously in the 8-mile Tacoma Narrows-Balch Passage area is once every 3,200 years rather than once every 3,200 hours (133 days). The Court did not consider this error significant, and neither do we.

7. All information made available since February 2nd 1979, including the draft Federal EIS issued June 30th 1979, the comments on it, and Weyerhaeuser's answers to those comments, has been reviewed by the City Council.

8. The City's decision on this permit application is governed by the following criteria:

(a) Weyerhaeuser has the burden of showing that the project, taken as a whole, is consistent with the City's shoreline master program and the Shoreline Management Act.

(b) The City has the authority and duty under the State Environmental Policy Act (SEPA) to impose any reasonable conditions that would reduce the environmental damage and risks of the project, and to deny the permit application of the environmental damages and risks that cannot be mitigated outweight the public benefits of the project.

(c) The project must be consistent with the applicable zoning and the City's land use policies.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

(c) The City shall consider regional impacts and the plans and policies of neighboring jurisdictions and the Puget Sound Council of Governments.

(e) It is the policy of the City to cooperate with the State in preserving the State's eligibility to participate in the Federal Costal Zone Management Program. This requires that the State and its political subdivisions generally comply with the national costal zone policies, including those set our in 16 USA 1452(A) through (I).

(f) Although only those portions located within shoreline areas are directly subject to the specific provisions of the master program, the project as a whole shall be considered a single project for purposes of this permit application. Therefore the City will consider the effects (both detrimental and beneficial) of the entire project and may attach permit conditions relating to any part of the project, including those parts outside the shoreline areas.

9. We have considered the entire record and the various public hearings held in connection with this project, including:

(a) The permit application.

(b) The Environmental Impact Statement dated February 2nd, 1979.

(c) The 14 baseline studies which provided data for that EIS.

(d) Written and oral testimony submitted at a public hearing held January 21st 1981, on the permit application.

(e) Written statements and transcripts of oral testimony presented at previous public hearings related to the proposed project, held by the City planning agency on June 25th and July 9th 1979, and by the City Council on June 27th and July

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

25th, 1979.

(f) Written comments and transcripts of oral testimony from a public hearing held September 20th and 21st 1978, on the draft EIS.

(g) Correspondence with various governmental agencies, members of the public and Weyerhaeuser Company on file at City Hall, including Weyerhaeuser's answers to public questions regarding the project.

10. In addition to this written record, each member of the Council is personally familiar with the site of the proposed project and surrounding land and waters.

11. In his preliminary report of January 1981, the City's Administrative Assistant recommended the permit conditions set out in Exhibit "A" to minimize and mitigate environmental risks.

12. The City Administrative Assistant has proposed additional conditions on noise, Exhibit "B", public access, Exhibit "C", and Indian fishing rights, Exhibit "D".

13. To further mitigate any remaining adverse effects of the project, Weyerhaeuser and the U.S. Fish and Wildlife Service have negotiated a Memorandum of Understanding, a copy of which is on file with the City.

AND WHEREAS, based on the record described above, we determine that:

14. The proposed dock and its access ramp, seaward of the ordinary high water mark, are located in a shoreline of statewide significance.

15. A portion of the dock access road and the incoming road and rail crossing of Sequalitchew Creek are in areas considered to be "shorelines" (not of statewide significance).

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4388

16. All of the shorelines on which portions of the project would be located are designated as "Urban Environment" under the City's shoreline master program, which was approved by the Department of Ecology on June 11th, 1975. The DOE Guidelines and the City's master program state that:

"The urban environment is an area of high intensity land use including residential, commercial and industrial development...particularly to water-dependent industrial and commercial uses requiring frontage on navigable waters".

When DOE approved this Urban designation, by letter of June 11th 1975, its director admonished the City to utilize the administrative mechanisms of the master program to assure that the delta, and particularly the wildlife refuge, are protected from the potential negative effects that could result from some of the intense industrial and commercial developments theoretically allowable under the Urban designation. We find that this project is consistent with recognition of the estuary as a National Wildlife Refuge and a National Landmark, would not have significant adverse effects contrary to the intent of the Act, and is responsive to the concerns expressed in the letter of June 11th, 1975.

17. The project consists of uses permitted, without a conditional use permit or variance, in the Urban environment, subject to the portions of the City master program on "Ports and Water Related Industries", on shorelines of statewide significance, the general provisions applicable to all developments, and (for the incoming road and rail lines) on "Roads and Railroads". The provisions on "Piers" do not apply as they were not intended to cover facilities serving ocean-going vessels, which are addressed under Ports and Water Related

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

Industry.

16. With respect to consistency with the master program Policies for Ports and Water related Industries, we find that:

(a) Weyerhaeuser has complied with the City's policy encouraging owners of port facilities to develop master plans disclosing future plans to utilize shoreline areas and serve long-range needs. Weyerhaeuser's plans include phased construction of warehouses and other structures in the terminal area, as described in the EIS, as export volume increases and the product mix shifts more toward finished products. The dock will be built to its full size initially. It will be designed to accommodate addition of cranes at some future time, but this would require a separate shoreline permit and a separate environmental review process. Weyerhaeuser has disclosed its short, medium and long-range expectations for use of the dock, which generally show the average ship size to increase and the frequency of ship calls to decrease.

(b) The Port of Tacoma indicates that it does not have land or facilities that could be made available for the purpose of this project. We are not aware of any existing public or private port facilities that could achieve these purposes.

(c) The proposed project is water dependent.

(d) The areas to be occupied by this project are physically suited for those uses. The proposed dock location is suited for open pile deep water dock facilities because of the proximity of deep water to shore, the ample turning radius and maneuvering room for large vessels, the absence of shoals or other obstructions or hazardous currents, and adequate tidal flushing to disperse or assimilate any pollution resulting from construction or operation of the facility or vessels.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

The terminal area is well suited for this purpose because it is screened from view and adequately buffered from the City's residential areas, the residential areas of neighboring communities (including Anderson Island), and the public resource areas of Nisqually Reach and the Wildlife Refuge. The project will not involve dredging, filling or bulkheading, or other major disturbance of the intertidal or subtidal areas, and will use construction techniques designed to minimize disturbance of Sequalitchew Creek Canyon.

(e) The facility will utilize existing off-site highway and rail networks, with new connections to the Burlington Northern rail line and I-5. This will avoid the congestion in and disturbance of the City's residential area which would result from use of the existing road and rail access routes, and prevent needless proliferation of space and energy consuming land uses.

(f) The facility will be capable of future expansion without supplanting residential or agricultural uses.

(g) The project is designed to minimize and mitigate negative external effects on adjacent communities.

(h) The dock location and design, per the application of January 5th 1981, best protects the local fishing industry of the alternatives considered. The open pile structure would have less adverse effect on fisheries resources that either a solid fill or floating structure. Although the Nisqually Reach is understood to be a usual and accustomed fishing ground of the Nisqually Indians, the City has no evidence that the project would impair the ability of any treaty Indians to obtain moderate standard of living from fishing or otherwise impair any treaty Indian fishing rights.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4188

(i) Weyerhaeuser has shown, to the satisfaction of this Council, that the value of the proposed project to the people of the State is greater than the tangible and intangible values which the public will be required to forfeit.

(j) The facility design employs multiple use concepts to the extent feasible by placing the road and rail access lines in a single corridor, rather separate corridors as used for the existing routes, and by minimizing adverse impacts on wildlife, water, air quality, aesthetic and other environmental values, by providing for fish and wildlife enhancement work under the FWS Memorandum of Understanding and by providing for public access to the extent compatible with FWS plans.

(k) The transportation corridors have been locates as far upland as possible to reduce use pressures on the water-front and shorelines, and are consistent with the master program provisions for roads and railroads. The project will require only minor modifications in existing utility systems, most of which will be outside the shoreline areas.

(l) The location and design of the proposed dock reflects careful planning to reduce the adverse impact of the facility on other water-dependent uses and shoreline resources. We have considered the ultimate impacts of uses which would be generated by construction of the facility, including increased ship traffic in Puget Sound and the possibility that manufacturing facilities might be induced to locate near the proposed export facility.

19. The applicant has demonstrated, as required by the master program, that:

(a) The proposed use is dependent on a shoreline location.

(b) The proposed development site is suited for port use,

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

and an EIS has been prepared.

(c) The project will not occur on Class II agricultural land as determined by the Soil Conservation Service.

(d) Adequate means will be employed for the safe handling of toxic materials and fuels to prevent them from entering the water, and that adequate means will be employed for any spills that do occur.

(e) The proposed new pier, storage and parking areas are required for purposes that cannot be accommodated through shared use of existing facilities.

(f) Consideration has been given to and plans made to mitigate negative external effects on adjacent communities, including but not limited to air, water and noise pollution, and loss of fish and wildlife habitat.

20. The sewage treatment facilities will be located where they do not interfere with and are compatible with recreational, residential and other public uses of the water and shorelines. No water reclamation, desalinization or power plants are proposed.

21. The proposed facility design and permit conditions protect the resources and amenities existing on the proposed site to the maximum extent practible.

22. No harbor lines or U.S. pierhead or bulkhead lines have been established in the area. Establishment of these lines is not a prerequisite to construction of this type of facility under the City's master program.

23. Although joint or shared use of piers is preferred over single purpose use, this is not mandatory under the City's master program and is not practicable in this case since no adjoining owner has an identified need to use the dock or access

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4366

rights to it. We note that Fort Lewis may condemn rights to use the dock in times of war or national emergency.

24. The proposed dock would not intrude into the water any more than necessary for the draft of the vessels expected to moor there; locating the dock closer to the shore would require dredging, possibly including periodic maintenance dredging.

25. The proposed road and rail facilities comply with the policies and regulations set out on pages 35-7 of the master program.

26. The project complies with the special policies for shorelines of statwide significance set out on pages 84 and 85 of the master program. As the master program states, the deep water a short distance from shore makes this site particularly suitable for ocean shipping facilities. The facilities are expected to help improve the competitive position of northwest forest products in foreign markets, and thus to be of long-term statewise benefit. The project has been designed to protect the natural character, resources and ecology of the shoreline by avoiding dredging, filling, bulkheading and water pollution problems traditionally associated with many port developments. It involves upgrading and redeveloping an area historically used for commercial shipping.

27. In the opinion of this Council, the project is consistent with the policies of the Shoreline Management Act and the intent of the DOE Guidelines.

28. In the opinion of this Council, the public benefits of the project outweigh its adverse environmental effects and its potential adverse environmental impacts have been minimized to the maximum extent feasible.

JAMES J. MASON
Attorney At Law
1000 South Yakima
Tacoma, Washington 98405
272-4288

29. The project is consistent with the City's Comprehensive Zoning Ordinance No. 108, as amended, which zones the area in question as "I-1 Industrial District".

30. The project will be of net benefit to the region although it will have some adverse effects on Anderson Island and some environmental risks for the Nisqually Delta Wildlife Refuge. The adverse effects have been minimized to the extent practicable by the design features and permit conditions. The elected officials of nearby local governmental units have not expressed opposition to the project.

31. The project is consistent with the National Costal Zone Management policies.

NOW THEREFORE, BE IT RESOLVED THAT a substantial development permit shall be issued to the Weyerhaeuser Company in accordance with its application of January 5th 1981, (as amended), subject to permit conditions attached as Exhibits "A", "B", "C" and "D".

DATED this 18th day of February, 1981.

MAYOR

CITY COUNCIL MEMBERS:

RESOLUTION - 11

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4388

EXHIBIT "A"

WEYERHAEUSER EXPORT FACILITY PROPOSAL
PERMIT CONDITIONS

A. Preconstruction Plans and Specifications: Prior to commencement of construction, Weyerhaeuser shall submit detailed plans and specifications for:

1. The dock and its access ramp, which shall include:

(a) Curbs and gutters to collect storm water.

(b) A storm water holding tank of at least 158,000 gallons.

(c) A skimming and separating system to separate oil and solids from storm water.

(d) Provision for disposal of sanitary sewage in upland drainfield (discharge of sanitary sewage into Nisqually Reach will not be permitted).

(e) Facilities for storage of petroleum or hazardous chemicals.

(f) A lighting system designed to avoid unnecessary light and glare on the surface of the water, the air space above the ship's tackle, the Nisqually Wildlife Refuge and Anderson Island.

The storm water facilities shall be designed to meet the DOE water quality standards for Nisqually Reach.

2. The access road down Sequalitchew Creek Canyon, which shall:

(a) Provide for drainage under or through the road.

(b) Prevent storm water from the road or roadside ditch entering Sequalitchew Creek or Nisqually Reach without skimming and separation of petroleum products and solids.

(c) Minimize disturbance of the side of Sequalitchew Creek Canyon both above and below the road.

3. A sanitary sewage drain field system to be located on the uplands at least 500 feet from Sequalitchew Creek. Plans for the upland sanitary drainfield shall be subject to review and approval of the Pierce County Health Department.

4. The entry road from the Mounts Road interchange to the

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4388

terminal area, and the new rail spur to the terminal area, which shall include:

(a) Arch culverts or other construction techniques for the crossing of Sequalitchew Creek not requiring disturbance or covering of the stream bed. The design of these crossings shall be subject to approval by the Departments of Fisheries and Game under R.C.W. 75.20.100.

(b) A crossing over I-5 and a connection to Mounts Road approved by the State Department of Transportation.

(c) Final alignment of the entry road and rail spur shall be subject to review by Fort Lewis and Pierce County. The alignment proposed by Weyerhaeuser on Sheet 1 of 6, Shoreline Management Application - Item 12 B, Vicinity Map, has been determined to minimize adverse impacts on the City of Dupont, archeological and historic sites, and the oak savannah habitat type. Any alignment adjustments requested by Fort Lewis shall be submitted to the City for comment with respect to these and other environmental values.

(d) Berms or evergreen plantings or other means to screen the village of Dupont from noise, light and glare.

5. Storm water disposal system for the terminal area, which shall include: percolation ponds, unlined ditches, drainfields or other means to assure percolation of storm water into the ground at least 500 feet from Sequalitchew Creek, with no entry of overland storm water flow from the terminal into the Creek during storm events of at least a 25-year frequency.

6. Other terminal area facilities, including the storage, staging and parking areas and the office and warehousing structures.

No work may commence on any such segment of the export facility until the City has approved the plans for the relevant portions within its jurisdiction.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4388

B. Construction Conditions:

1. Prior to construction of any segment of the project, Weyerhaeuser shall submit for review and approval by the City plans for:

(a) The work schedule, including estimated time of commencement and completion of construction and anticipated hours when construction activities will be undertaken. To the extent practicable the schedule shall be designed to minimize risk to fish, water quality, and other environmental values after consultation with the City and other interested agencies.

(b) Traffic routing patterns and expected traffic loads for both trucks and construction worker vehicles. To the extent practicable the traffic patterns shall be managed to minimize risks to public safety and traffic congestion.

(c) Control of dust from construction operations.

(d) Control of erosion during construction operations.

(e) Control and clean up any spills of oil or environmentally hazardous materials that may occur in connection with the dock construction, including equipment and training of personnel.

2. To protect archeological and historic resources, Weyerhaeuser shall assure that:

(a) All contracts for construction work that could disturb any known or unknown archeological artifacts contain clauses requiring the contractor to participate in briefing and training sessions with the State Historic Preservation Officer ("SHPO"), to immediately stop work and notify SHPO and Weyerhaeuser if any archeological artifacts are discovered, and to suspend all work in the area of such artifacts until completion of consultation with SHPO.

(b) All such contractors be briefed before commencement of work on the location of all known and suspected archeological sites. SHPO and the Nisqually Indian Tribe will be invited to participate in these briefings.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

(c) If any archeological artifacts are discovered, Weyerhaeuser will consult with SHPO and the Nisqually Indian Tribe about the most appropriate measures to record, recover, and preserve the artifacts. Where practical the project will be redesigned or relocated to avoid disturbance of any artifacts that cannot be adequately recorded, recovered and protected through professional archeological excavation techniques.

3. The dock shall be constructed in a manner not requiring any dredging, filling or bulkheading below the ordinary high water mark.

4. Unless specifically approved by the City, no heavy trucks or construction traffic equipment may use Barkadale Avenue, Louviers Avenue, Brandywind Avenue, or Dupont Avenue.

5. Weyerhaeuser will reimburse the City for any costs reasonably incurred for control of construction traffic along the Dupont-Steilacoom Road, and any other public roads used within the City of Dupont.

C. <u>Post Construction Conditions:</u>

1. No ship shall be fueled at the dock.

2. No sewage or dirty ballast water shall be discharged from ships into Nisqually Reach.

3. The path down the bluff shall be improved and maintained to the extent the City determines this reasonably necessary to minimize erosion, and maximize access for fire fighting personnel and equipment.

4. For one year after completion of construction, Weyerhaeuser shall periodically monitor the quality of ground and surface waters in its wells, in Sequalitchew Creek and in Nisqually Reach, in accordance with a monitoring plan satisfactory to DOE, and promptly take all steps necessary to prevent continuation of any violation of DOE water quality standards.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

5. Before the first commercial shipment from the dock, Weyerhaeuser shall prepare for review and approval by the City a plan for control and cleanup of any spills of oil or environmentally hazardous materials that may occur in connection with use of the dock, including equipment and training of personnel.

6. Weyerhaeuser will take all reasonable steps requested by the City to operate the facility in ways which minimize noise, light and glare impacts on the City's existing residential area, Anderson Island and the Nisqually Wildlife Refuge.

7. Weyerhaeuser will maintain the storm drainage facilities so that they continue to function at their design capacity.

8. Weyerhaeuser will follow the National Fire Protection Association Guidelines (NFPA 46 and 46B), or other fire protection procedures approved by the City, and will periodically review with the City its plans for prevention and suppression of fires.

D. Miscellaneous:

1. Weyerhaeuser will reimburse the City for all costs reasonably incurred for review of the plans and specifications required by this permit.

2. Weyerhaeuser will reimburse the City for all costs reasonably incurred in any appeals or litigation regarding this permit.

3. Nothing in this permit excuses the need for compliance with the building and zoning codes or other City ordinances.

4. If necessary to respond to circumstances beyond its control or material unexpected changes in circumstances, Weyerhaeuser may request that these conditions be modified. Any such requests shall be submitted in writing early enough

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

for the City to consult with other interested agencies. If necessary to respond to unanticipated environmental problems, after notice to and consultation with Weyerhaeuser, the City may impose reasonable additional conditions on construction activities.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

EXHIBIT "B"

WEYERHAEUSER EXPORT FACILITY PROPOSAL
ADDITIONAL CONDITION RE NOISE

Unless specifically approved by the City, no pile driving or other noisy construction work may be conducted in the night-time hours from 10:00 P.M. to 7:00 A.M. at the dock, within 500 feet of Nisqually Reach, or within 1,500 feet of any residence.

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4286

EXHIBIT "C"

WEYERHAEUSER EXPORT FACILITY PROPOSAL
CONDITION RE PUBLIC RECREATIONAL ACCESS

Weyerhaeuser shall cooperate with the City in development of plans for public recreation as part of the City's comprehensive planning process. Until completion and implementation of such a public recreation plan by the City, Weyerhaeuser shall allow public recreational use of:

1. Its tidelands, and

2. The longshoremen's trail to the beach (including the tunnel under the BN railroad tracks), the parking area associated with it, and the access road to the parking area.

Except to the extent such public recreation is incompatible with:

Ongoing construction; requests made by the Fish and Wildlife Service to control public access to protect the wildlife refuge; requests made by the Washington State Department of Game or Fisheries to protect wildlife; demands by Burlington Northern, Inc., to prevent or control public use of its railroad right of way; all laws, regulations and ordinances relating to hunting, fishing, fire safety, etc.; and any directives from the City of Dupont.

RESOLUTION - 19

JAMES J. MASON
Attorney At Law
1008 South Yakima
Tacoma, Washington 98405
272-4288

EXHIBIT "D"

WEYERHAEUSER EXPORT FACILITY PROPOSAL
CONDITION RE INDIAN FISHING RIGHTS

The City has no evidence that the project would impair the ability of any treaty Indians to obtain a moderate standard of living from fishing, or otherwise violate Indian treaty rights. Weyerhaeuser is requested to cooperate with the Nisqually Indian Tribe to determine the likely effects, if any, of the export facility on Indian treaty fishing and to use its best efforts to seek agreement on measures to mitigate any anticipated impairment of their treaty rights.

RESOLUTION - 20.

JAMES J. MASON
Attorney At Law
1808 South Yakima
Tacoma, Washington 98405
272-4388

Weyerhaeuser Company

Tacoma, Washington 98477
(206) 924-2345

July 7, 1981

Colonel Leon K. Moraski
District Engineer
Corps of Engineers
Seattle District
P. O. Box C-3755
Seattle, Wa., 98124

re: Weyerhaeuser Company Export Facility at DuPont, Washington

Dear Col. Moraski,

Recently, a three party agreement was concluded which resolved all issues related to the Export Facility Shorelines Permit raised by the Department of Ecology before the State Shorelines Hearings Board. This agreement involves the Department of Ecology, City of DuPont and Weyerhaeuser Company. This agreement was filed on July 1, 1981 with the Shorelines Hearings Board.

Enclosed are copies of the letter of filing, the stipulation between the parties, and the signed agreement. You will note that the proposed "Memorandum of Understanding" between the Fish and Wildlife Service and Weyerhaeuser Company, as yet unsigned, is binding with this filing under paragraph 8, page 4, of the Agreement.

We anticipate that you will want to include these documents in the Final Federal EIS. Copies are, as well, being provided to the EIS consultant.

Sincerely,

Bob Anderson

Robert A. Anderson, Manager
Environmental & Regulatory Affairs

RAA/cb

attachments

cc: Joe Blum - Fish and Wildlife Service - w/attach
Steve Fusco, URS - w/attach

OFFICE OF THE ATTORNEY GENERAL
Ken Eikenberry, Attorney General
Temple of Justice, Olympia, Washington 98504

JUL 06 1981

July 1, 1981

Mr. Nat W. Washington
Chairman
Shorelines Hearings Board
405 Golf Club Road
Rowe Six - Building 2
Lacey, Washington 98504

Re: SHB No. 81-8
Nisqually Delta Ass'n v. City of DuPont

Dear Mr. Washington:

Enclosed for filing in the above-referenced cause is a Stipulation, together with attachments, reached between three of the parties--the City of DuPont, Weyerhaeuser Company and the Department of Ecology. Several documents are included:

(1) A "Stipulation Between Respondents and Intervenors" (the Stipulation), signed by counsel, dated June 19, 1981;

(2) An "Agreement Between Washington State Department of Ecology, City of DuPont, and Weyerhaeuser Company" (the Agreement), signed by Mayor Andre, Mr. Lucas and Mr. Moos, dated May 29, 1981. This Agreement is referenced in paragraph 1 of the Stipulation.

(3) The "Final Environmental Impact Statement--Weyerhaeuser Export Facility at DuPont", dated February, 1979. This is an attachment to the Agreement, referenced in the first recital on page 1 of the Agreement.

(4) A proposed "Memorandum of Understanding" between the United States Department of Interior, Fish and Wildlife Service and Weyerhaeuser Company, together with exhibits A, A-1, B, B-1, C, C-1, D, D-1 and E thereto. Although this memorandum is proposed (and unsigned) as between the Fish and Wildlife Service and Weyerhaeuser Company, it is binding under paragraph 8, page 4, of the Agreement.

I believe these documents are generally self-explanatory. All of the parties to the Stipulation stand ready to answer any questions the Board may have concerning these documents.

Very truly yours,

Charles W. Lean
Assistant Attorney General

CWL:sac

Enclosures

cc: Pola A. Andre
Richard H. Lucas
Donald W. Moos
James J. Mason
Glenn J. Amster
Theodore P. Hunter
Jan Pauw

ACKNOWLEDGMENT OF SERVICE — CLERK'S STAMP

BEFORE THE SHORELINES HEARINGS BOARD

STATE OF WASHINGTON

IN THE MATTER OF A SHORELINE SUBSTANTIAL DEVELOPMENT PERMIT ISSUED BY THE CITY OF DUPONT TO WEYERHAEUSER COMPANY NISQUALLY DELTA ASSOCIATION and THE WASHINGTON ENVIRONMENTAL COUNCIL, Appellants, v. CITY OF DUPONT and THE WEYERHAEUSER COMPANY, Respondents. STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY, Intervenor.	SHB No. 81-8 STIPULATION BETWEEN RESPONDENTS AND INTERVENOR

The State of Wasington, Department of Ecology, the City of DuPont, and the Weyerhaeuser Company, by their attorneys undersigned, stipulate and agree as follows:

I.

All parties to this stipulation will comply with the attached "Agreement Between Washington State Department of Ecology, City of DuPont, and Weyerhaeuser Company," which together with the attachments thereto is by this reference incorporated herein.

KENNETH O. EIKENBERRY, ATTORNEY GENERAL
Charles W. Lean
Assistant Attorney General

Temple of Justice
Olympia, Wa. 753-2359

II.

The State of Washington, Department of Ecology, withdraws its Pleading in Intervention and Motion for Summary Judgment previously filed in this cause, and acknowledges the attached Agreement as fully resolving all issues raised in its pleadings. The State of Washington, Department of Ecology, will remain a party to this cause for the sole purpose of explaining the Agreement and securing its rights thereunder.

III.

The Shorelines Hearings Board may consider the attached Agreement in its review of the substantial development permit at issue in this cause, and may incorporate its terms in any order approving the substantial development permit.

DATED this 19th day of June, 1981.

CHARLES W. LEAN
Assistant Attorney General
Counsel for State of Washington,
Department of Ecology

JAMES J. MASON
City Attorney
City of DuPont

JEROME L. HILLIS

GLENN J. AMSTER
Hillis, Phillips, Cairncross,
Clark & Martin
Attorneys for Weyerhaeuser Company

AGREEMENT BETWEEN
WASHINGTON STATE DEPARTMENT OF ECOLOGY,
CITY OF DUPONT, AND
WEYERHAEUSER COMPANY

WHEREAS, the City of DuPont has issued a substantial development permit for the Weyerhaeuser Export Facility described in an Environmental Impact Statement issued February, 1979 (a copy of which is attached hereto);

WHEREAS, the Washington State Department of Ecology is responsible for reviewing said permit for compliance with the City of DuPont Shoreline Master Program, and the Shoreline Management Act (Chapter 90.58 RCW);

WHEREAS, the Department of Ecology may appeal said permit if it finds the permitted project is not consistent with the Shoreline Master Program, the Guidelines, or the Shoreline Management Act;

WHEREAS, the Department of Ecology has appeared before the Shorelines Hearings Board and has filed a pleading in intervention to assure that its concerns are taken into account;

WHEREAS, the permit issued by the City of DuPont to the Weyerhaeuser Company is for a substantial development on shorelines of statewide significance;

WHEREAS, the Shoreline Management Act provides in RCW 90.58.340 that in the development of comprehensive land use plans and zoning ordinances, local governments shall "review administrative and management policies, regulations, plans, and ordinances relative to lands under their respective jurisdictions adjacent to the shorelines of the state so as the (to) achieve a use policy on said land consistent with the policy of this chapter, the guidelines, and the master programs for the shorelines of the state;"

WHEREAS, the Department of Ecology recognizes the existence of a proposed agreement between the Weyerhaeuser Company and the U.S. Fish and Wildlife Service;

WHEREAS, any future development of the Weyerhaeuser property will be subject to laws and regulations, and to the plans and ordinances to be developed under this Agreement, which have as a goal protection of the shorelines as defined in Chapter 90.58 RCW from adverse environmental impacts;

WHEREAS, a comprehensive land use plan and implementing ordinances is desirable to provide for the orderly development of land within the City of DuPont and to insure that development adjacent to the shorelines is consistent with the provisions and guidelines of the Shoreline Management Act;

WHEREAS, the City of DuPont has begun the preparation of a new comprehensive land use plan and implementing ordinances and expects to amend existing ordinances to be consistent with said plan;

NOW, THEREFORE, IT IS AGREED:

1. The Department of Ecology finds that the permit, as supplemented by the terms of this Agreement, for a forest products transshipment facility project, consisting primarily of a dock, access roads, marshalling yard and road and rail access from Interstate Highway No. 5, is consistent with the pertinent policies of the Shoreline Management Act and the applicable master program.

2. The City of DuPont shall complete a new comprehensive land use plan, environmental impact statement, and implementing ordinances for all lands within the city limits on or before January 31, 1984. If litigation prevents completion by such date, the City of DuPont will endeavor in good faith to complete the plan and ordinances at the earliest practicable date thereafter.

3. The City of DuPont will establish an Advisory Committee consisting of, but not limited to, designees of the Washington State Departments of Ecology, Fisheries, Natural Resources, Game, and Commerce & Economic Development to assist the City Planner and DuPont Planning Agency in authoring a new comprehensive land use plan.

The Advisory Committee shall be used in part to fulfill the requirements of RCW 90.58.340 of the Shoreline Management Act. The preparation of the new comprehensive land use plan will utilize accepted land use planning principles including performance standards for the orderly development of the land and control of nonpoint sources of pollution. Such plan shall take into account the relationship of upland areas to the shorelines of statewide significance and the Nisqually estuary and provide reasonable protection of scenic values, wildlife research areas, air, water, and land from pollution.

The Mayor or his/her designee shall be the Chairman of said Advisory Committee.

4. The Weyerhaeuser Company may construct the export facility, consisting primarily of the dock, access roads, marshalling yard and road and rail access from Interstate Highway No. 5, permitted under the substantial development permit issued by the City of DuPont. The Company agrees not to construct further major facilities within the City until January 31, 1984 or at such time as a comprehensive land use plan and amended implementing ordinances are adopted by the City of DuPont, whichever comes first. Any further development by the Weyerhaeuser Company must be in compliance with the new comprehensive plan and ordinances. The Weyerhaeuser Company agrees that any sale or lease of its property within the City of DuPont shall contain a restrictive covenant implementing this paragraph, which shall not expire prior to January 31, 1984, except for real property trades with Lone Star Industries, Inc., and the U.S. Government.

5. The City recognizes that adoption of its comprehensive plan and implementing ordinances is a major action significantly affecting the quality of the environment and requiring an environmental impact statement.

6. Weyerhaeuser may terminate this Agreement at any time if it first surrenders all its rights under the shoreline permit.

7. The parties to this Agreement will provide adequate funding for the City of DuPont to develop the above described comprehensive plan, environmental impact statement, and implementing ordinances as follows:

A. The Department of Ecology will provide up to one hundred fifty thousand dollars ($150,000) to the City of DuPont;

B. The Weyerhaeuser Company will reimburse 50 percent of the funds disbursed by subparagraph A of this paragraph to the Department of Ecology;

C. Neither the Department of Ecology nor the Weyerhaeuser Company shall withhold or advance funding to influence the substantive content of the new comprehensive plan, environmental impact statement, and implementing ordinances, except as may be required by state or federal statutes or regulations; and

D. Said funding shall include financing the position of City Planner until such time as the new comprehensive plan is complete, or by January 31, 1984, whichever is earlier.

8. For the purposes of this Agreement, the Weyerhaeuser Company and the Department of Ecology agree to abide by the terms and conditions of the proposed agreement between the Weyerhaeuser Company and the U.S. Fish and Wildlife Service as attached hereto.

9. The Weyerhaeuser Company shall not make any bulk transshipments through the export facility, without the prior approval of the Department of Ecology, of any "hazardous substances" listed in 40 C.F.R. § 116.4, Tables 116.4A and 116.4B. The Weyerhaeuser Company will give notice to the Department of Ecology before making any bulk transshipments of potentially

toxic or hazardous materials comparable to those so listed and not previously reported, or previously disapproved or conditioned under paragraphs 9 or 10 of this Agreement. The Department of Ecology may disapprove such shipments if they pose a significant toxic or hazardous risk to the aquatic environment.

10. The Weyerhaeuser Company shall give 30 days notice to the City of DuPont and the Department of Ecology before the transshipment, on a regular basis, of non-forest product cargoes. The City of DuPont and/or the Department of Ecology may impose conditions on such transshipments if there is greater risk of harm to the environment than is inherent in the transshipment of forest products cargoes. If such conditions will not substantially reduce the risk of harm to the environment, the City of DuPont and/or the Department of Ecology may disapprove the transshipment of such cargoes.

11. Notwithstanding the terms of the current permit approved by the City of DuPont, the Weyerhaeuser Company shall periodically monitor surface water quality at its boundary adjacent to the refuge in accordance with a monitoring plan satisfactory to the Department of Ecology for a period of three years after completion of construction.

12. In consideration of the agreement by the City of DuPont and the Weyerhaeuser Company to mitigate the adverse impacts of future upland development on shorelines of statewide significance as contained herein, the Department of Ecology will withdraw its Pleading in Intervention (SHB No. 81-8) appealing the substantial development permit issued by the City of DuPont. The parties will file a copy of this Agreement with the Shorelines Hearings Board as a stipulation between the respondents and the intervenor fully resolving all the issues raised by the Department of Ecology in its Pleading in Intervention. If the Weyerhaeuser Company or the City of DuPont breaches this Agreement, the

Department of Ecology may review and withdraw its determination of compliance or may bring such injunctive, declaratory, or other court actions as are necessary to enforce the terms of this Agreement and the parties hereby agree to submit to the jurisdiction of the Pierce County Superior Court. If the Department of Ecology breaches this Agreement, the Weyerhaeuser Company and/or the City of DuPont may bring such injunctive, declaratory, or other court actions as are necessary to enforce the terms of this Agreement, and the Department of Ecology hereby agrees to submit to the jurisdiction of the Pierce County Superior Court.

AGREED TO this 29 day of June, 1981, by the City of DuPont, Respondent, subject to ratification by the DuPont City Council:

Pola A. Andre

POLA A. ANDRE
Mayor
City of DuPont

AGREED TO this 29 day of June, 1981, by the Weyerhaeuser Company, Respondent:

Richard H. Lucas

RICHARD H. LUCAS
Vice President for Special Projects
The Weyerhaeuser Company

AGREED TO this 29 day of June, 1981, by the State of Washington, Department of Ecology, Intervenor:

DONALD W. MOOS
Director
Washington State Department of Ecology

The following Memorandum of Understanding (MOU) was developed between the United States Department of the Interior, Fish and Wildlife Service (FWS) and Weyerhaeuser Company prior to issuance of the January 23, 1981 Public Notice from the Corps of Engineers. That Public Notice identified the southern dock location as the proposed location for the project as discussed throughout the Final EIS. The alternate location referred to in the following MOU is the southern location, which is now the proposed dock location. The preferred location referred to in the MOU is the northern location, which is now the alternate dock location.

Weyerhaeuser and FWS have indicated that the MOU will be signed by both parties following the issuance of this Final EIS.

MEMORANDUM OF UNDERSTANDING

Between the UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ("FWS") and WEYERHAEUSER COMPANY ("Weyerhaeuser"), dated _____, 1980.

RECITALS

Weyerhaeuser desires to construct an export facility at Dupont, Washington, as described in the Draft Environmental Impact Statement issued July 20, 1979, by the Seattle District, Army Corps of Engineers ("the Corps"). In connection with that project, Weyerhaeuser has applied for a permit from the Corps under Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403). FWS has the responsibility to comment on the draft EIS and the permit application. FWS and Weyerhaeuser both desire that the export center not adversely affect the Nisqually National Wildlife Refuge, fish or wildlife resources, their habitats, or the environment generally, and that all reasonable steps be taken to minimize and mitigate any unavoidable adverse impacts and risks. This Agreement outlines the steps the FWS and Weyerhaeuser consider reasonable and appropriate to achieve those objectives.

AGREEMENTS

1. Scenic Easement - Bluff. Before the January 30 following the first shipment from the export facility dock, Weyerhaeuser will grant to the United States a scenic easement in the form of Exhibit A. Until then, Weyerhaeuser will not alter any of the land described in Exhibit A in a manner inconsistent with that easement without prior written approval of FWS.

2. Scenic and Wildlife Management Easement - Sequalitchew Creek. Before the January 30 following the first shipment from the export facility dock, Weyerhaeuser will grant to the State of Washington an easement in the form of Exhibit B. Until then, Weyerhaeuser will not alter any of the land described in Exhibit B in a manner inconsistent with that easement without prior written approval of the Washington State Departments of Fisheries and Game. If Weyerhaeuser starts construction of the export facility before conveying that easement, it will allow authorized representatives of the Departments of Fisheries and Game to enter that property for purposes of surveys, studies, engineering, etc. relating to possible future exercise of the rights to be granted under this easement.

3. Covenants Limiting Development - Hoffman Hill. Before the January 30 following the first shipment from the export facility dock, Weyerhaeuser will execute and record covenants to FWS in the form of Exhibit C. The purpose of these covenants is to limit use of these lands to forestry, agriculture, grazing, open space "common area" for any developments on adjoining land, recreational use by Weyerhaeuser's employees and guests, and low density residential uses, all under conditions designed to minimize potentially adverse effects on the Nisqually National Wildlife Refuge. Until such recording, Weyerhaeuser will not conduct any activity which would be inconsistent with those covenants.

4. Covenants Limiting Development - Old Fort Lake. Before the January 30 following the first commercial use of the export facility dock, Weyerhaeuser will execute and record covenants to the State of Washington in the form of Exhibit D. The purpose of these covenants is to prohibit use of these lands for basic manufacturing or similar heavy industry, and to assure that consideration is given to minimizing adverse effects on wildlife from any other development of these lands.

5. Wildlife Study Area - Oak Savannah. The lands described as "Wildlife Study Area - Oak Savannah" in Exhibit E contain part of an "Oak Savannah" vegetation type, which may potentially be an important type of wildlife habitat. Although these lands are being held for possible development, in the interim they provide opportunities for wildlife research. Weyerhaeuser agrees to allow authorized representatives of FWS and the Washington Department of Game, and any consultants they may retain, access to these lands for purposes of wildlife research. FWS will be responsible for coordinating the research projects so that they do not interfere with each other, and therefore the Department of Game will obtain FWS approval of its study plans. Weyerhaeuser will use reasonable care to avoid interference with any ongoing or planned wildlife research activities, except emergency actions to prevent fires or other casualties from significantly damaging its lands. All proposed studies will be discussed with Weyerhaeuser to minimize possible conflicts with Weyerhaeuser's use of surrounding lands, avoid conflict with other ongoing and planned wildlife studies, and minimize the chances that future development might require premature termination of the study. If Weyerhaeuser develops any of these lands, it will use reasonable care to minimize disruption of any ongoing studies. This paragraph 5 may be terminated on 12 months' notice as to part or all of any area on which uncompleted wildlife studies are being conducted, and 3 months' notice as to any other lands described as "Wildlife Study Area - Oak Savannah" in Exhibit E.

6. Edmond Marsh. Weyerhaeuser and FWS will jointly recommend to the City of Dupont that, if the export facility is constructed, Edmond Marsh be redesignated from "Urban" to "Conservancy" in the City's Shoreline Management Master Program (if it is subject to the Shoreline Management Act), designated as a "Conservation Area" in any City Comprehensive Plan, and zoned accordingly. The location of Edmond Marsh is approximately as shown on Exhibit E. If the City is unwilling to designate the marsh as "Conservancy," before the January 30 following the first shipment from the export facility dock Weyerhaeuser will execute and record covenants to the FWS limiting future activities in the marsh to those allowed under the "Conservancy" designation in the City's shoreline master program except as other activities may be approved by the FWS. Weyerhaeuser will not conduct any activity which would be inconsistent with the Conservancy designation in the interim without consent of FWS.

7. Tidelands. If the export facility dock is constructed at the "Preferred Location," Weyerhaeuser and FWS will jointly recommend to the City of Dupont that the "Urban Environment" designation be relocated northward so that all Weyerhaeuser-owned tidelands south of Sequalitchew Creek are redesignated from "Urban" to "Conservancy" in the City's Shoreline Management Master Program, designated as a "Conservation Area" in any City Comprehensive Plan, and zoned accordingly. The location of these tidelands is approximately as shown on Exhibit E. If the City is unwilling to designate such tidelands as "Conservancy," before the

January 30 following the first shipment from the export facility dock, Weyerhaeuser will execute and record covenants to the FWS limiting future activities on those tidelands to those allowed under the "Conservancy" designation in the City's shoreline master program except as other activities may be approved by the FWS. Weyerhaeuser will not conduct any activity which would be inconsistent with the Conservancy designation in the interim without consent of FWS.

8. Burlington Northern Easement. Certain lands shown in Exhibit E would have been included in the easement described in paragraph 1 if they had been owned by Weyerhaeuser rather than Burlington Northern, Inc. ("BNI"). If the export facility is constructed, Weyerhaeuser will use its best efforts to persuade BNI to grant to the U.S. an easement covering these lands on the same terms as the Weyerhaeuser easement described in paragraph 1 or on other terms satisfactory to FWS.

9. Spill Prevention, Containment and Control Plans. Before commencing construction of the dock, Weyerhaeuser will submit for review of the Coast Guard and EPA a written plan for prevention, containment and control of spills of oil and other pollutants during construction of the dock, and provide FWS copies of the plan and any comments on it by the Coast Guard and EPA. Before commencement of shipping from the dock, Weyerhaeuser will submit for review of the Coast Guard and EPA a second written plan for prevention, containment and control of spills during operations using the dock, and provide FWS copies of that plan and any comments on it by the Coast Guard and EPA. Weyerhaeuser will include in such plans any reasonable changes requested by the Coast Guard or EPA.

10. Corps Permit Conditions Controlling. It is understood that the Corps may impose additional or differing requirements as conditions of any Section 10 permit. FWS agrees not to seek any different or additional requirements than those described in this Memorandum, except as necessary to respond to new information not available to FWS before execution of this agreement. If there should be any conflict between the requirements of this agreement and any Corps permit conditions, the Corps permit conditions shall be controlling and Weyerhaeuser shall be excused from the arrangements described in this Memorandum to the extent necessary to comply with any such Corps conditions. Weyerhaeuser agrees not to object to, and waives any rights to appeal, any Corps permit condition requiring compliance with this Memorandum. However, Weyerhaeuser reserves all rights to appeal any other Corps conditions.

11. Other Modifications. This Memorandum may be modified by written agreement between Weyerhaeuser and FWS, unless compliance with it has been made a condition of a Corps permit, in which case any modifications shall be subject in addition to approval of the Corps.

12. Termination. USFWS may terminate this agreement by written notice to Weyerhaeuser and the Corps of any time within 60 days after issuance of the final federal EIS for the export facility project. Weyerhaeuser may terminate this agreement by written notice to FWS and the Corps at any time before commencement of any work requiring a permit under 33 USC 403, if it surrenders any previously issued Corps permit requiring compliance with this Memorandum.

L 163
7 280

Executed as of the date first above written.

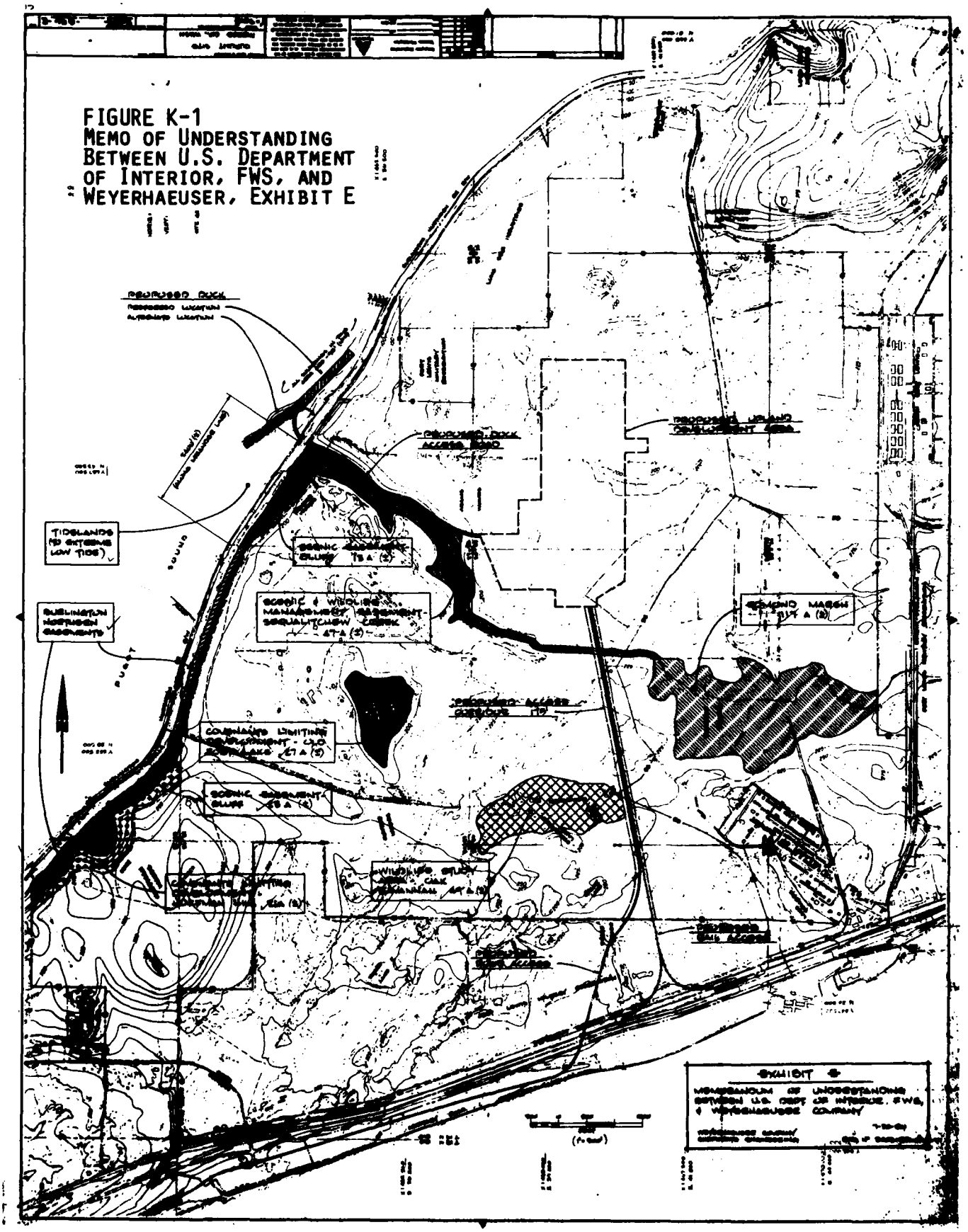
WEYERHAEUSER COMPANY

by _____

UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

by _____

FIGURE K-1
MEMO OF UNDERSTANDING
BETWEEN U.S. DEPARTMENT
OF INTERIOR, FWS, AND
WEYERHAEUSER, EXHIBIT E



L 163
7 300

Exhibit A
(Scenic Easement - Bluff)

DEED OF SCENIC EASEMENT

WEYERHAEUSER COMPANY, a Washington corporation, ("Weyerhaeuser") hereby grants to the UNITED STATES OF AMERICA a scenic easement on the following terms and conditions:

1. Area Covered. This easement covers the land described in Exhibit A-1.

2. Restrictions on Weyerhaeuser's Use. Neither Weyerhaeuser nor its successors may construct any structure for industrial, commercial or residential use on any of the lands described in Exhibit A-1, without prior written approval of the United States acting through the U.S. Fish and Wildlife Service or such other agency as may acquire responsibility for management of the Nisqually National Wildlife Refuge ("FWS"). These lands may not be clearcut except where necessary to re-establish conifer stands or salvage merchantable timber killed or severely damaged by fire, disease, pests or other casualty, and then only in accordance with plans approved by FWS. Selective logging is permitted after 60 days' notice to FWS, if the harvest is so distributed and conducted as to maintain a forested appearance as seen from the Nisqually National Wildlife Refuge and Nisqually Reach, and if FWS has not objected within 60 days from such notice. Weyerhaeuser or its successors may use these lands as open space for their employees and guests, and may allow the general public to use part or all of these lands for recreational purposes. FWS will be given at least 30 days' notice before construction of any hiking trails, lookouts, historic monuments, or similar improvements intended to facilitate or encourage recreational uses. The lands also may be used for archaeological, historical, or environmental research. FWS will be given at least 30 days' notice before commencement of any excavation or other construction incidental to such research. Certain lands at the mouth of Sequalitchew Creek (will be/are) subject to a Scenic and Fisheries Management Easement (to be) granted to the state of Washington. Any alteration of the creek, or the salt marsh at its mouth, under that easement shall be subject to approval of FWS, which approval shall not be unreasonably withheld. The lands described in Exhibit A-1 may be included in calculation of any site coverage or density requirements applicable to any development of adjacent lands.

3. Authorized FWS Uses. FWS may enter the lands described in Exhibit A-1 for the purpose of improving wildlife habitat through provision of nest sites, forage, escape cover, and predator control. FWS will not cut any merchantable timber without consent of the underlying fee owner. FWS may not authorize the general public to enter the easement area without written consent of the fee owner and each owner of adjacent private land.

4. Coordination with Adjacent Landowners. In conducting activities authorized under paragraph 3, FWS will avoid creating hazards or impediments to present and potential uses of adjacent private lands. Actions taken under this

easement shall not be grounds for restricting or penalizing any use of adjacent lands. (For example, if FWS girdles a tree top to create an eagle nesting site, which then is occupied by an eagle nest, no restrictions or penalties may be imposed on use of lands outside the easement area because of their proximity to the nest. Likewise, if FWS introduces a non-native endangered species to the easement area, no restrictions or penalties may be imposed on use of adjacent lands either to protect specimens which have migrated beyond the easement area or to "buffer" the easement area from activities on adjacent lands.) FWS will not undertake any activities on the easement area which would restrict or penalize activities on adjacent private lands under state or local law, without first protecting the affected landowner from such effects through interagency agreement or other appropriate means.

5. Fire Control, Pest Protection and Security. In conducting activities authorized under paragraph 3, FWS will take all reasonable steps to avoid increasing the risks of damage to adjacent private property from fire, pest infestations, theft, vandalism and trespass. FWS will reimburse the underlying fee owner and owners of adjacent private lands for all costs reasonably incurred to control any fires caused by FWS activities conducted under this easement. If such FWS activities contribute to pest infestations or recurring theft, vandalism or trespass on adjacent private lands, FWS will take all actions necessary to reduce these risks to no more than the level that would have occurred if this easement had not been granted.

6. FWS Access Across Adjacent Lands. Weyerhaeuser agrees to allow FWS access, for the purposes described in paragraph 3, across any adjacent land it may own and control, provided such access does not unreasonably interfere with any use Weyerhaeuser then is making of those adjacent lands. However, unless they otherwise agree, neither Weyerhaeuser's successors nor its lessees need allow FWS to enter adjacent lands except to the extent FWS may have rights of entry onto all private property generally.

7. Indemnification. FWS will indemnify Weyerhaeuser and its successors against any claims by third parties for damages alleged to be caused by FWS activities under this easement. Also FWS will reimburse Weyerhaeuser and its successors for any increase in property taxes, insurance premiums or other direct expenses of owning the underlying land that are attributable to this easement.

8. Title. This easement is subject to:

(a) All matters of public record as of _____, 1980.

(b) Rights (to be) granted to the State of Washington under a Scenic and Fisheries Management Easement for Sequalitchew Creek and certain adjacent lands.

(c) All applicable state and local laws and regulations, including those relating to property taxed as forestlands, agricultural land or open space.

9. Term. This easement shall be perpetual unless terminated, as to part or all of the lands involved, by mutual agreement of FWS and the owner of the underlying fee of the area being terminated. It may be terminated by such fee

owner if FWS materially breaches its obligations and fails to cure such breach within 180 days of a notice, delivered personally or by registered mail, specifying the nature of the breach and expressing an intention to terminate this easement if the breach is not cured.

Executed as of the date first above written.

WEYERHAEUSER COMPANY

_____

State of Washington)
) ss.
County of King)

On this _____ day of _____, 19___, before me personally appeared _____ to me known to be the _____ of the corporation that executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and an oath stated that he was authorized to execute said instrument and that the seal affixed is the corporate seal of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and afixed my official seal the day and year first above written.

_____
Notary Public in and for the
State of Washington residing at

_____

L 163
7 300

Exhibit B
(Scenic and Wildlife
Management Easement -
Sequalitchew Creek)

SCENIC AND WILDLIFE MANAGEMENT EASEMENT

WEYERHAEUSER COMPANY, a Washington corporation, ("Weyerhaeuser") hereby grants to the STATE OF WASHINGTON an easement on the following terms and conditions:

1. Area Covered. This easement covers the land described in Exhibit B-1.

2. Restrictions on Weyerhaeuser's Use. Neither Weyerhaeuser nor its successors may construct any structure for industrial, commercial or residential use on any of the lands described in Exhibit B-1, without prior written approval of the State of Washington acting through its Department of Fisheries and Game or such other state agencies as may acquire responsibility for management of commercial fish resources and wildlife ("the State"). These lands may not be clearcut except where necessary to re-establish conifer stands or salvage merchantable timber killed or severely damaged by fire, disease, pests or other casualty, and then only in accordance with salvage plans approved by the State. Selective logging is permitted after 60 days' notice to the State, if the harvest is so distributed and conducted as to maintain a forested appearance, and if the State has not objected within 60 days from such notice. Weyerhaeuser or its successors may use these lands as recreational open space for their employees and guests, and may allow the general public to use part or all of these lands for recreational purposes. The State will be given at least 30 days notice before construction of any hiking trails, lookouts, historic monuments, or similar improvements intended to facilitate or encourage recreational uses. The lands also may be used for archaeological, historical, or environmental research. The State will be given at least 30 days' notice before commencement of any excavation or other construction incidental to such research. If reserved as open space in a manner consistent with this Easement, the lands described in Exhibit B-1 may be included in calculation of any site coverage or density requirements applicable to any development of adjacent lands. Weyerhaeuser reserves the right to cross the creek above the 180-foot contour line with roads, utility lines, conveyor belts, pipelines and other transportation facilities and to use and maintain all existing improvements within the easement area.

3. Authorized State Activities. The State may enter the lands described in Exhibit B-1 for the purposes of improving fishing resources through stream channel improvements, installation of egg boxes and fish rearing facilities, and controls on water flow, and of improving wildlife habitat through provision of nest sites, forage, escape cover, and predator control. If these activities result in cutting of any merchantable timber, the State will consult with the underlying fee owner and deliver the recoverable logs to any reasonable location he may designate within a 25 mile radius. The State may not authorize the general public to enter the easement area without written consent of the fee owner and each owner of

adjacent private land. Certain lands at the mouth of Sequalitchew Creek (will be/are) subject to a Scenic Easement (to be) granted to the United States, on behalf of the U. S. Fish and Wildlife Service ("FWS"). Any alteration of the area covered by that easement requires approval of FWS. Although FWS has agreed that such approval shall not be unreasonably withheld, Weyerhaeuser and its successors shall have no responsibility for any failure of FWS to approve any activities proposed by the State under this easement.

4. Coordination with Adjacent Landowners. In conducting activities authorized under paragraph 3, the State will avoid creating hazards or impediments to present and potential uses of adjacent private lands. No actions taken under this easement as grounds for restrictions or penalties on use of adjacent lands. (For example, if the States girdles a tree top to create an eagle nesting site, which then is occupied by an eagle nest, no restriction or penalties may be imposed on use of lands outside the easement area because of their proximity to the nest. Likewise, if the State introduces a non-native endangered species to the easement area, no restrictions or penalties may be imposed on use of adjacent lands either to protect specimens which have migrated beyond the easement area or to "buffer" the easement area from activities on adjacent lands.) The State will not undertake any activities on the easement area which would restrict or penalize activities on adjacent private lands under federal or local law, without first protecting the affected landowner from such effects through interagency agreement or other appropriate means.

5. Fire Control, Pest Protection and Security. In conducting activities authorized under paragraph 3, the State will take all reasonable steps to avoid increasing the risks of damage to adjacent private property from fire, pest infestations, theft, vandalism and trespass. The State will reimburse the underlying fee owner and owners of adjacent private lands for all costs reasonably incurred to control any fires caused by the State's activities conducted under this easement. If such activities contribute to pest infestations or recurring theft, vandalism or trespass on adjacent private lands, the the State will take all actions necessary to reduce these risks to no more than the level that would have occurred if this easement had not been granted.

6. State Access Across Adjacent Lands. Weyerhaeuser agrees to allow the State access, for the purposes described in paragraph 3, across any adjacent land it may own and control, provided such access does not unreasonably interfere with any use Weyerhaeuser then is making of those adjacent lands. However, unless they otherwise agree, neither Weyerhaeuser's successors nor its lessees need allow the State to enter adjacent lands except to the extent the State may have rights of entry onto all private property generally.

7. Indemnification. The State will indemnify Weyerhaeuser and its successors against any claims by third parties for damages alleged to be caused by the State's activities under this easement. Also the State will reimburse Weyerhaeuser and its successors for any increase in property taxes, insurance premiums or other direct expenses of owning the underlying land that are attributable to this easement.

8. State May Grant Rights to Nisqually Indians. The State may grant part or all of its rights under this easement to the Nisqually Indian tribe or any entity

owned and controlled by the Nisqually Indian tribe, if the tribe agrees to be bound by the conditions of this easement.

9. Title. This easement is subject to:

(a) All matters of public record as of _____, 1980.

(b) Rights (to be) granted to the United States under a Scenic Easement for the Nisqually Reach bluffs.

(c) All applicable federal, state and local laws and regulations, including those relating to property taxed as forestlands, agricultural land or open space.

10. Term. This easement shall be perpetual unless terminated, as to part or all of the lands involved, by mutual agreement of the State (and the Nisqually Indian tribe if it has been granted any rights under paragraph 8) and the owner of the underlying fee of the area being terminated. It may be terminated by such fee owner if the State (or the Nisqually Indian tribe if it has been granted any rights under paragraph 8) materially breaches its obligations and fails to cure such breach within 180 days of a notice, delivered, personally or by registered mail, specifying the nature of the breach and expressing an intention to terminate this easement if the breach is not cured.

Executed as of the date first above written.

WEYERHAEUSER COMPANY

_____

State of Washington)
) ss.
County of King)

On this _____ day of _____, 19___, before me personally appeared _____ to me known to be the _____ of the corporation that executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and an oath stated that he was authorized to execute said instrument and that the seal affixed is the corporate seal of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and afixed my official seal the day and year first above written.

_____
Notary Public in and for the
State of Washington residing at

_____

L 163
7 280

Exhibit C
(Hoffman Hill)

DECLARATION OF COVENANTS LIMITING DEVELOPMENT

WEYERHAEUSER COMPANY, a Washington Corporation ("Weyerhaeuser"), as owner of the real property described in Exhibit C-1, hereby makes the following covenants running with said lands:

1. Use Restrictions. Unless otherwise agreed in writing by the agency of the United States responsible for management of the Nisqually National Wildlife Refuge ("Refuge Manager"), the lands described in the attached Exhibit C-1 shall be used only for forestry, agriculture, grazing, open space "common area" for any developments on adjoining land, recreational use by the fee owners' employees and guests, and residential use.

2. Special Forestry Requirements. With respect to any commercial logging on the lands described in Exhibit C-1, unless otherwise agreed by the Refuge Manager, the following minimum requirements shall apply: no more than 15 contiguous acres may be clearcut until the adjoining area has a well established plantation having at least 400 trees per acre averaging at least 5 feet tall; reforestation shall be accomplished within one year of completion of logging; all cut and filled slopes visible from the Nisqually National Wildlife Refuge, or which could cause siltation of streams feeding into the Nisqually National Wildlife Refuge, shall be promptly seeded with grass or other native ground cover or otherwise stabilized. The Refuge Manager shall receive a copy of all applications to state agencies for forest practices on those lands.

3. Special Residential Requirements. With respect to residential development on the lands described in Exhibit C-1, unless otherwise agreed by the Refuge Manager, the following requirements shall apply: average density shall not exceed one residential unit per one gross acre; substantial numbers of native trees shall be left so that the area generally maintains a wooded appearance as seen from the Nisqually National Wildlife Refuge and Nisqually Reach, except that dead, dying and dangerous trees may be removed notwithstanding this limitaiton; where practical, roads and utility facilities shall be designed so as not to be visible from the Refuge; no residential structure visible from the Refuge shall exceed 35 feet in height above the average natural ground level.

4. Coordination with Refuge Manager. The Refuge Manager may request that additional requirements to further protect the Nisqually National Wildlife Refuge be attached as conditions to any federal, state, local or regional permit or approval needed for any use of the lands described in Exhibit C-1. The Refuge Manager will be provided with copies of all applications for plats, permits and other government approvals requested in connection with any such land uses, and copies of all such plats, permits and approvals. The Refuge Manager shall be notified at least five days before commencement of any work authorized by such plats, permits or approvals.

5. Enforcement, Termination, Etc. These covenants shall be binding on Weyerhaeuser and each successor owner of any of the lands described in Exhibit C-1, unless and until modified by written agreement between the Refuge Manager and the owner of the lands to which the modification or termination applies. These covenants may be enforced only by the Refuge Manager. Weyerhaeuser and its successors may rely on any decisions of the Refuge Manager, and need not delay any activity pending resolution of any claims by third parties that the Refuge Manager should have administered these covenants differently.

Executed _____, 19____.

WEYERHAEUSER COMPANY

By _____
Vice President

Accepted: _____ 19____

UNITED STATES FISH AND WILDLIFE SERVICE

By _____

STATE OF WASHINGTON)
) ss.
County of King)

Before me personally appeared _____, known to me to be the Vice President of Weyerhaeuser Company, the corporation that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument and that the seal affixed is the corporate seal of said corporation.

IN WITNESS WHEREOF, I have hereunto set me hand and affixed my official seal the day and year herein first above written.

_____
Notary Public in and for the
State of Washington, residing
at _____.

L 163
7 280

Exhibit D
(Old Fort Lake)

DECLARATION OF COVENANTS LIMITING DEVELOPMENT

WEYERHAEUSER COMPANY, a Washington Corporation ("Weyerhaeuser"), as owner of the real property described in Exhibit D-1, hereby makes the following covenants running with said lands:

1. Use Restrictions. Unless otherwise agreed in writing by the Washington Department of Game, or any successor state agency responsible for management of wildlife resources (the "Game Department"), the lands described in the attached Exhibit D-1 shall not be occupied by any heavy industrial structure, such as a sawmill, or by any other improvement emitting air or water pollutants or noise or vibration at levels beyond those permissible in residential areas.

2. Coordination with Game Department. The Game Department may request that requirements to protect wildlife resources be attached as conditions to any federal, state, local or regional permit or approval needed for any use of the lands described in Exhibit D-1. The Game Department will be provided with copies of all applications for plats, permits and other government approvals requested in connection with any such land uses, and copies of all such plats, permits and approvals. The Game Department shall be notified at least five days before commencement of any work authorized by such plats, permits or approvals.

3. Enforcement, Termination, Etc. These covenants shall be binding on Weyerhaeuser and each successor owner of any of the lands described in Exhibit D-1, unless and until modified by written agreement between the Game Department and the owner of the lands to which the modification or termination applies. These covenants may be enforced only by the Game Department. Weyerhaeuser and its successors may rely on any decisions of the Game Department, and need not delay any activity pending resolution of any claims by third parties that the Game Department should have administered these covenants differently.

Executed _____, 19____.

WEYERHAEUSER COMPANY

By _____
Vice President

Accepted: _____ 19____

UNITED STATES FISH AND WILDLIFE SERVICE

By _____

STATE OF WASHINGTON)
) ss.
County of King)

Before me personally appeared _____, known to me to be the Vice President of Weyerhaeuser Company, the corporation that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument and that the seal affixed is the corporate seal of said corporation.

IN WITNESS WHEREOF, I have hereunto set me hand and affixed my official seal the day and year herein first above written.

_____
Notary Public in and for the
State of Washington, residing
at _____.

APPENDIX L

OIL SPILL IMPACT ANALYSIS

Prepared by URS Company

APPENDIX L

INTRODUCTION

The following discussion is an assessment of the range of potential impacts which might result from oil spilled in Nisqually Reach. This assessment addresses the potential environmental impacts of spilled oil, regardless of the probability of such a spill, and includes a discussion of what is presently known about acute or chronic oil exposure. A list of conclusions is included on the last page of this discussion.

OIL SPILL MOVEMENT

The spill analysis is based on a hypothetical spill at or near the proposed Weyerhaeuser dock which could occur under a range of wind and current conditions. The probability of such a spill is discussed in the risk analysis conducted by the Oceanographic Institute of Washington (OIW, 1978). These conditions, and the eventual fate of the spill, have been modeled (CH_2M Hill, 1978, MSNW, 1978). The oil spill modeling is the basis for the oil spill distribution included in this impact analysis. The spill model is a modular, computerized tool with great flexibility as to locations modelled, input units and methods, and outputs generated. The spill model combines the movement of the oil slick edge resulting from the natural spreading of the oil, the effects of tidal and wind-induced current, and the direction effects of the wind on the oil to determine the size and location of the slick as a function of time.

Wind direction and tidal stage are the two most important factors controlling movement of an oil spill. Because the tidal current near the DuPont dock moves in only two directions twice a day (ebb and flood) the probability of one of the two directions occurring during or immediately after a spill is about 50 percent. Wind direction and velocity probabilities are much more complex and are listed in Table L-1.

As shown in the table, there is a higher probability of winds coming from the south in summer and winter than from the north. Thus, although there is no way to predict wind and tide conditions which might occur during a spill, it is more likely that wind, if it occurs, would be from the south than from any other direction. However, high barometric pressure can result in northerly winds. As shown in Table L-1 such winds can be expected to occur from 10-13 percent at the time. The importance of these wind conditions lies in the fact that wind would induce a current on the surface of the water equalling approximately 3 percent of the wind speed. This current, coupled with the wave action and the tidal currents, has a very important impact on the progress of an oil slick. This coupling is complex and is accounted for quite rigorously in the model. In general, of course, a wind from the south or southwest would tend to keep a slick away from the Nisqually Delta, while a wind from the north would tend to drive the slick toward the Delta. This phenomena can be clearly seen in both the trajectory and the dispersion runs that were made.

Tidal current velocity has also been modeled. Information was derived from available tide tables of the area, a study of the wind and current conditions of the Nisqually Reach (CH_2M-Hill, 1978) and actual measurements. Current velocity was shown to have less effect on the fate of spilled oil than current direction. Due to the spreading characteristics of oil, similar areas would be affected regardless of current velocity. Current direction at the time of the spill, however, would determine the area which is most likely to be affected. This portion of the study did show that the tidal current movement in Nisqually Reach is quite vigorous. Time lapse photography prepared by the University of Washington shows that the water from the Reach is exchanged through the Tacoma narrows. Due to geometry of the region the net outflow (north bound) from the Reach is approximately 6.3 cm/sec (0.124 knots). This would indicate a complete change of water in the Reach every eight to ten days. This is in addition to the exchange brought about by river inflow.

For proper context it should be repeated here that the addition of 28 to 88 port calls in Southern Puget Sound due to Weyerhaeuser operations would result in an increase of about one spill greater than or equal to 2.4 barrels every 103 to 325 years, depending on the number of port calls. The areas discussed here include Oro Bay and the Nisqually Delta.

TABLE L-1

SUMMARY OF WIND DIRECTION AND VELOCITY PROBABILITIES

Direction (°T)	PROBABILITY Summer	Winter
	<0.5 m/sec (0.97 knots)	
No Wind	0.2	.01
	2.6 m/sec (5 knots)	
10-30	.10	.07
190-210	.20	.32
	5.1 m/sec (10 knots)	
10-30	.03	.03
190-210	.11	.20
	7.7 m/sec (15 knots)	
10-30	.007	.015
190-210	.05	.12

Table L-2

SUMMARY OF EFFECTS OF OIL ON POPULATIONS AND COMMUNITIES

Community or Population Type	Expected Degree of Initial Impact		Expected Recovery	
Plankton	Light to Moderate:	Impact dependent on chance event of contacting floating slick. Decrease in population densities may have effect on local productivity. Greatest danger to small local breeding populations composed of larval fish.	Fast to Moderate:	Effective reproductive and dispersal mechanisms for most phyto- and zooplankton in open waters (populations dense, widely dispersed; individuals ubiquitous, prolific, grow quickly to maturity). Local breeding populations of larval fish and shellfish may take much longer to recover.
Nekton	Unknown:	Chance of contact high since communities exist on or near surface. Contamination reported, but effects unknown.	Unknown:	Ecology poorly understood.
Benthic Communities		Mortalities lead to decrease in population densities and age distributions; changes in species abundance and distribution; imbalances between interacting populations.		
Rocky Intertidal	Light: (with exceptions, e.g., Tampico Maru spill)	Hardiness of organisms. Most damage from coating leading to suffocation or loss of purchase on substrates.	Fast:	Oil rapidly removed by waves. Populations rapidly restored since individuals grow and reproduce rapidly.
Sandy or Muddy Intertidal	Moderate:	Impact increased by persistence of oil in unconsolidated substrates. Chance for greater mortalities since infaunal organisms may be more sensitive than rocky intertidal organisms that have developed defense mechanisms for living in rigorous and variable environments.	Moderate:	Persistence of oil in sediments prolongs toxic effects.

Table L-2 continued

Community or Population Type		Expected Degree of Initial Impact		Expected Recovery
Subtidal, Offshore	Heavy:	Impact increased by persistence of oil in unconsolidated substrates. Chance for greater mortalities since many subtidal organisms may be more sensitive than rocky intertidal organisms that have developed defense mechanisms for living in rigorous and variable environments.	Slow:	Persistence of oil. Possibly, slow rate of biological succession for complex, highly structured communities found in some subtidal areas where abiotic factors have been historically constant.
Fish	Light to Moderate:	Possibility of avoiding spills; some resistance offered by mucous coating. Greatest danger to local breeding populations in confined waterways (increased chance of contact; sensitive larval forms present; adults display complex breeding behavior) or benthic fish in heavily polluted substrates.	Fast to Moderate:	Effective reproductive and dispersal mechanisms for most pelagic populations (fast immigration of larvae and adults). Local breeding populations may take much longer to recover.
Birds	Heavy:	Mortality from ingestion of oil droplets and coating (loss of body heat and buoyancy). Mortalities lead to decrease in population densities.	Slow:	Individuals long-lived; low fecundity; gregarious behavior increases chances of losing entire population.
Mammals	Light:	In comparison to other groups, marine mammals not extremely abundant along most coasts. Impact dependent on chance event of small population contacting floating slick. Due to mobility, most mammals can probably avoid heavily-polluted areas. Conclusive evidence of mortalities, due to oil pollution, is rare. Possible effects include ingestion of toxic oil droplets during grooming; loss of thermal insulation and/or waterproofing, due to coating; and irritation of eyes and exposed mucous membranes. Eye irritation reported after Arrow spill[51] and spill in Alaska.[52]	Slow, if Population Seriously Affected:	Individuals long-lived; low fecundity--hence, time for recovery increased. Also, some mammals near extinction. However, no supportive evidence for loss of entire populations as result of oil pollution.

Source: Hyland & Schneider, 1978

The fuel spill model was run in a trajectory mode for 24 cases in June and 19 cases in November. (These two times represented the highest tidal current flow or "spring" tides and the lowest tidal current flow or "neap" tides, respectively.) These cases were analyzed as to time of travel, trajectory trends, and location of beaching. From these 43 runs two probable, yet different dispersion runs were made.

The combination of factors used to develop the trajectory run selected was based on the following considerations:

- Periods of maximum and minimum tidal current velocities as occurred during the June and November simulation period were given, but the time of hypothetical spills occurred at different stages of the tidal cycle.

- The wind speeds and directions were chosen so as to represent the most probable cases and also the cases giving a high probability of causing the oil to impact sensitive ecological areas.

- Approximately 98 percent of all oil spills would involve less than 500 gallons, according to the OIW report. Also, it was determined on the basis of that study that the proposed wharf at the DuPont site is the most probable spill site. Discussions with Weyerhaeuser and Texaco indicated that Weyerhaeuser vessels would most likely be using an intermediate fuel oil. For the model runs a spill of 500 gallons of Redwood No. 1 intermediate fuel oil was used. This oil has a specific gravity of 0.95, an interfacial tension of 45 dynes/cm and the kinematic viscosity of water was given at 0.01 cm^2/second.

- The Nisqually Delta was considered to be a sensitive environmental area so that testing of various combinations of tidal currents and wind speeds was required to determine the shortest time it would take a spill to move from the DuPont wharf to the Delta.

Given the spreading behavior of oil and the strong tidal exchange in the Nisqually Reach, it is likely that at least part of any oil spilled would reach the shore.

The model has shown that any spill occurring in the vicinity of the dock would start to move ashore, in most cases, in less than four hours. The point on the tidal cycle at which the spill occurs influences the ultimate destination of the slick. Spill modeling has indicated that an oil spill would move toward Lyle Point, close to Oro Bay, if the spill occurred during weak flood tide conditions with southerly winds. Such tide conditions occur regularly and, with southerly winds, it is possible that oil from a spill at the Weyerhaeuser dock could reach Oro Bay in 4-5 hours.

Spill modeling has shown that an oil spill occurring during or immediately before a flood tide would reach the delta if wind conditions are calm or from the North. A spill occurring on or just before a flood tide with a northerly wind, has the potential of impacting the delta. A spill near the wharf on a flood tide, with a 15-knot northerly wind could reach the Delta in as little as two hours. The combination of these conditions occurs only

about 2% of the time. Southerly winds, which are more likely, would keep the oil away from the Delta.

The Nisqually River itself may afford some protection for the Delta. The river forms an active freshwater lens and debris line which nearly crosses the Reach. This freshwater lens could form somewhat of a barrier to the oil in three ways. First, it is a flowing freshwater field which would maintain a slight flow against the oncoming oil. Second, the edge of the lens traps debris, logs, grass, etc. and would comprise a physical barrier to the oil in some areas. Third, the physical phenomenon of a freshwater/saltwater interface is actually an energy barrier which would require energy to cross. The existence of such a barrier was shown clearly during field observations conducted in Nisqually Reach (CH_2M Hill, 1978). Observations on both sides of the leading edge of the plume during very low flow found salinity differences from 4 to 20 parts per thousand. Greater differences can be expected during periods of higher flow. It is safe to assume, however, that a strong wind from the north would provide enough energy to breach the barrier and push the oil toward the Nisqually Flats.

ACUTE IMPACT ANALYSIS

Petroleum

The potential for impact from a spill would depend upon the volume and type of oil lost. A number of basic distillates can be refined from crude oil and are shown below by weight (expressed as number of carbon atoms/ molecule). Although crude oil composition can vary greatly from source to source, a typical composition is as follows:

Fraction	Molecular Size	% Composition in Crude	Specific Gravity
Gasoline	C-5 to C-10	30%	0.70
Kerosene	C-10 to C-12	10%	0.80
Diesel (#2 fuel oil)	C-12 to C-20	15%	0.85
Bunker (heavy distillate)	C-20 to C-40	25%	1.0
Residual	Greater than C-40	20%	

Petroleum fractions less than C-15 are highly volatile. They would volatilize from the water surface in a matter of days. Fractions in the range of C-15 to C-25 have limited volatility and would remain, for the most part. Molecules above C-25 have a rather high boiling point (greater than 400|C) and there would be practically no loss from such a spill due to volatility. A Bunker C oil would lose less than 10% through evaporation. Diesel (#2 fuel oil) volatilizes rapidly with losses of 75% from an oil spill. Only traces of the light petroleum products (kerosene and gasoline) will ever be retained in water.

A similar pattern is exhibited with regard to solubility in water. The lightest fractions are relatively soluble (1-2000 ppm). Above C-6 to C-12, solubility is reduced to less than 0.1 ppm. This indicates that for the heavier distillates, diesel and Bunker C, direct biological impact is likely to be restricted to the effects from physical contact with the spill at the water surface or in the intertidal zone.

It is likely that ships visiting the new dock would have on board all the petroleum fractions discussed above. However, that fraction comprising the greatest volume on board (>90%) would be the Bunker C type, used to power the ship. Diesel would comprise most of the rest (OIW, 1977). Therefore, an oil spill would be unlikely to volatilize or to dissolve into the water to any significant extent. Spills would have to be physically removed by clamp crews as weathering would not play a major role in oil dispersal, at least in the short term. Direct biological impact would be largely limited to the water surface covered by the spill and to the intertidal area of any beach it impacts. Indirect impact could be more extensive if basic food organisms are severely affected, as discussed in the next section.

BIOLOGICAL IMPACT ANALYSIS

The following is a review of the literature pertaining to the impacts of oil upon primarily marine or marine-associated organisms. Much of the discussion deals with the effects of the lighter, more potentially toxic fractions. Since a spill at the DuPont site would most likely be comprised of a heavy (and, therefore, generally less toxic) distillate, this discussion presents the "worst case" view.

It may be assumed that, to some degree, the life forms discussed here may be exposed to oil in the event of a spill. The low probability of a spill, and the cleanup measures to be implemented, should reduce considerably the risk to these forms.

Algae

Microalgae (phytoplankton) response to exposure to No. 2 fuel oils has been shown to range from growth stimulation to complete cessation of growth.(1,22) Phytoplankton are generally relatively tolerant to high levels of petroleum. Growth has been reported in solutions of 100 to more than 1000 ppm of crude oil.(23) Time of exposure is an important factor. Significant mortality rates were reported for diatom after 10 days of exposure at only 10 ppm.(24)

A number of sublethal effects may occur. Some kelps secrete a mucus which prevents contact with the oil so that little subsequent biological change occurs. Fuel oil concentrations between 1 and 100 ppm greatly reduce photosynthesis in both phytoplankton and macroalgae. Although marine diatoms have been shown to accumulate petroleum hydrocarbons within the cell,(25) significant transfer of such hydrocarbons from primary producers to herbivores in the food chain has not been documented.(26) One indirect impact of oil in an area may be a rapid increase in some phytoplankton populations due to the elimination of the grazers.(8,9) Due to the logrithmic growth rate and

distribution throughout the moving surface waters, phytoplankton populations in a local area would recover quickly once oil was removed from the area. Assuming effective cleanup, the eight day flushing characteristics (CH_2M-Hill, 1978) of surface waters of the Reach would indicate recovery would occur at least by that time.

Macroalgae, on the other hand, may do very well, as indicated by increases in algal populations in contaminated areas due to the reduction of grazers.[8,9] Effect of oil on plankton and other communities are shown on Table I.

Zooplankton

Studies after the Torrey Canyon crude oil spill[12] found that in the long term, the plankton were unaffected. Similar observations were made after the Santa Barbara spill.[10] One effect observed in a marsh community[13] was an initial decrease in zooplankton, accompanied by phytoplankton blooms, followed by rapid increase in zooplankton populations in response to the large food source. The crucial exception here is that, in a nursery area such as the Nisqually area, larval forms of fish and shellfish could be severely affected by a large spill. Research dealing with the toxicity of petroleum oils has been carried out mostly on adult animals. Eggs and larvae of most marine inyertebrates, according to laboratory studies are more sensitive than adults[48].

Intertidal Organisms

The principal effect of shoreline contamination by heavy fuel oils is the deposition of an oily surface layer on top of the substrate, plant surfaces, and other organisms present on the surface of the substrate. The degree of contamination can be heavy enough to cause suffocation of both animals and plants.

Mortality of burrowing and surface organisms and plants would occur within a few days. Oil would be retained in marsh and mudflat sediments, and would be subject to leaching and remobilization during each period of tidal flushing, thus increasing the exposure of the organisms to its toxic effects. In one case, the effects of sediment-immobilized oil were observable in a marsh seven years after the spill.[36]

Observable mortality of clams such as macoma clams and in marine worms can be expected. Eelgrass beds at low tide would exhibit browning and some loss of leaves. Mortality among other organisms would also occur but probably would not be easily observed. Loss of eelgrass would reduce productivity in the immediate area for at least one year.

Because of the weathering effects of waves, recurrent tidal exposure, sunlight and air, and its own resiliency, the intertidal community can recover much quicker than the subtidal community (discussed below). The adaptions that intertidal organisms have evolved to cope with the stress of alternating periods of submergence and exposure has been atributed as one reason for this resiliency.[26] One common result of a spill is the

appearance of opportunistic animal or plant species after competitors or grazers have been killed by oil. Other than that, the intertidal community appears to be affected the least and to recover the fastest, usually within two years.(14) Tainted flesh of shellfish and other organisms can occur for a longer period. Anoxic conditions to within one centimeter of the surface in some fine-grained habitats such as mud flats could result in inhibited biodegradation of petroleum hydrocarbons and their persistence for periods of years.(49)

Subtidal Organisms

Subtidal communities are slower to recover after a spill. Apparently, this is due to their low resistance and the lack of oil weathering away from waves and sun. Fortunately, due to the steep dropoff along the shores of Nisqually Reach, the width of -5 to -30 foot depth is narrow and does not represent a large population. Furthermore, very little of the heavy fuel would solubilize, thus effectively isolating subtidal organisms from the spill. In rough conditions, sand mixed with the beached oil may be transported and deposited in subtidal areas, killing organisms which are physically covered.

Fishes/Shellfish

Fish sensitivity to oil varies considerably with physical factors, such as water temperature, salinity, organism type, and age of the organism. Anadromous fish are among the most highly sensitive. Significant mortality occurs in the concentration range of 1-15 ppm for smolt of pink salmon, sockeye salmon and Dolly Varden.(40) Eggs of pink and coho salmon were found to be relatively resistant to crude oil and its benzene fraction, tolerating up to 25 ppm crude oil. However, the emergent fry were found to have considerably lower tolerance limits to crude oil (8 ppm).(41) The same study found several species of freshwater fish (threespine stickleback and slimy sculpins) to be somewhat more tolerant to crude oil. Rainbow trout have been found to have similar tolerance to crude oil fractions as do the salmon. Median lethal dose in 96-hour bioassays was in the range of 2-20 ppm of toluene, xylene and benzene.(42)

Sublethal concentrations of petroleum often cause initial increases in the rate of fish respiration. Respiration may then decrease as the petroleum exerts a narcotic effect upon the fish. This has been observed in juvenile chinook salmon and striped bass after short-term exposure to 10 ppm benzene(40) The effects are reversible, but the exposed fish are probably more vulnerable to predation in the interim. Exposure of Pacific herring larvae to sublethal oil concentrations causes increased respiration and reductions in embryonic tissue growth.(43) Two day exposure of the larvae to 1 ppm crude oil resulted in 100% mortality within 60 days due to developmental problems. Flounder larvae survived considerably higher short-term exposure levels (50 ppm) but experienced an increase in developmental abnormalities.(44) Adult flatfish of 3 species exposed to 1% crude oil-mixed sediments showed no serious pathological effects.(45)

Fish are highly mobile and can often avoid petroleum accumulations. Examples include pink salmon fry, freshwater minnows, marine goby, perch, striped mullet and bass. This avoidance can interfere with the homing instincts of adult salmon. Upstream migration has been shown to be inhibited when soluble hydrocarbon concentrations exceeded 0.7 ppm. An oil spill

reaching an estuary might cause a similar effect. Not all fish, however, appear to be able to detect oil. Some of the latter include rainbow trout, suafish, English sole and fresh water dace. Avoidance of oil is therefore not a universal trait of fish. Dungeness crab also showed no avoidance of oiled substrate.(45)

Certain environmental factors have been found to increase the tolerance of fish and other marine organisms to oil. Temperature has been shown to have a small, but measurable effect. Crude oil, naphthalene and toluene were slightly more toxic to pink salmon fry at 4°C than at 12°C.(46) Salinity is an even more important factor. Work on outmigrating pink and sockeye salmon and in Dolly Varden show that the fish are able to survive approximately twice the concentration of crude oil in seawater as in freshwater.(41) This suggests that fry that are in an estuary, adapting to a marine environment, may be particularly vulnerable to a marine oil spill. Other work suggests invertebrates are less sensitive to salinity variations.(48) Osmotic regulation in both shrimp and oysters is disrupted when the animals are simultaneously subjected to low levels of oil (<2 ppm fuel oil) and varying levels of salinity.(47)

Birds and Mammals

Following the Santa Barbara channel spill, the number of birds killed by oil contamination was given as 3,686 based upon the number of birds treated at rescue stations and found dead on the shoreline. (Cal. Fish and Game, 1969b.). Pathology studies of these birds showed that death was caused by malnutrition due to reduced or total loss of food intake (caused by the stress of oiling and cleaning), compounded by heavy parasitism, and respiratory infections acquired during captivity at the treatment center. It appeared that the incidence of fungal and infectious diseases increased with time in captivity. There was no evidence of toxic changes in any of the tissues of the birds from Santa Barbara.

The number of birds which could be affected by an oil spill in Nisqually Reach is dependent on the season since the area is a major resting area on the Pacific Flyway. The greatest number of birds were observed (Klotz, et al, 1978) on the mudflats from September to February. They were dominated by American wigeon, gull, Western sandpiper, green winged teal and later in the season, by Dunlin. Over a dozen species of waterfowl were very common during this period. Their feeding habits would make them very susceptible to an oil spill in the area, although it is impossible to estimate the a number of ducks or other waterfowl which might be affected.

Wading birds such as herons, egrets, sandpipers, snipe, and rails have no known natural response to avoid oil. They may wade in oil slicks or deposits, they may sit in oil if it contaminates the location of the nest or resting area, they may feed through oil deposits contaminating bills or heads. While this degree of contamination is not good for the bird, it is unlikely to cause death. Sea birds such as auks and diving ducks are particularly threatened by spills since they dive and rarely fly. Causes of death include feather exposure causing loss of buoyancy or insulation, oil ingestion,

and starvation caused by a combination of increased metabolism and decreased feeding.[14] Population replenishment can be slow. The most critical season, perhaps, for a spill's effects on birds in the Nisqually Reach would be in the fall when migrating bird populations are present. Southerly winds occurring at this time of year would help to move the oil away from the delta, if spills occurred.

Direct effects of spilled oil on mammals are rare and have not been serious.[14,15] Contamination of a mammal breeding area would be an exception, however, in the tidal areas of Nisqually Reach. Possible harmful effects include ingestion of oil during grooming, loss of insulation or waterproofing, and eye irritation.[51,52] Some of these impacts could occur to the migrant harbor seal population in the delta if a large spill reached it. Oiled elephant-seal pups on San Miguel Island, in the Santa Barbara Channel, however, survived and behaved normally.[15]

Estuarine Areas and Wetlands

An artificially oiled-estuarine pond was shown to suffer reduction in wetland plants and severe changes in diversity and density of fish populations.[13] Plants were able to recover quickly unless exposed to additional oil. Effects of oil on estuarine and wetland ecosystems are shown in Table II.

Spilled oil may affect juvenile or breeding populations more than other groups. Therefore, the time of year of any spill would have an effect on its potential impact. Spring is perhaps the most critical period because of the presence of nesting birds, outmigrating juvenile salmonids, fish eggs and larvae in the plankton, and emerging plant growth. Migratory waterfowl are also present. It is likely that a significant spill occurring in early spring would kill planktonic organisms in the immediate spill area and would be detrimental to juvenile fish nearshore. If cleanup efforts fail to keep the oil out of the Delta, plants and associated animal life would be severely affected. Nesting birds would not be affected directly but their feeding areas may be disrupted. Oil ingestion could affect egg viability. Quantitative prediction of actual impacts is impossible. Factors that reduce the chance of such an occurrence include the low risk of a spill, a contingency plan specifying prompt cleanup measures, and the Nisqually River freshwater plume.

CLEANUP

Assuming that Weyerhaeuser receives all necessary permits, a contingency plan will be prepared after the facility design has been completed and before construction occurs. It would specify employee training, response team and equipment availability, and cleanup procedures. Spill response would likely include procedures such as boom emplacement, beach cleanup, cleaning (skimmer) boats, and hoses to keep oil off the beach and keep birds away.

TABLE L-3

SUMMARY OF EFFECTS OF OIL ON SOME MAJOR ECOSYSTEMS

Type of Environment		Expected Initial Impact		Expected Recovery
Open Estuarine Areas, Bays, Channels, Harbors	Moderate to Heavy	Chronic oil may depress populations of fish and some benthos; or induce changes in species abundance and distribution. Spilled oil effects dependent on time of year (spawning, migration, etc.) and oil's persistence.	Fast to Slow:	Dependent on flushing characteristics, route to benthos, shoreline characteristics, and community stability. Individual year classes of larval fauna may be severely impacted.
Wetlands: Marshes and Mangroves	Heavy:	Potential serious threat as result of vulnerability to spills and significance of estuarine functions (nursery and breeding grounds; high productivity; basis of detritus food chain). Several effects noted: faunal mortalities leading to decreases in population density, changes in species abundance and distribution; damage to marsh grases after repeated exposure, and decrease in productivity; damage to mangroves and neighboring grasses.	Moderate to Slow:	Persistence of oil in sediments prolongs toxicity. Yet, once removed, biological succession may be moderate in some areas, since generally organisms reproduce and disperse fairly rapidly. Mangroves particularly complex and may take long to recover. Marsh area at West Falmouth still slightly affected 5 years after spill.

Source: Hyland and Schneider, 1978

Cleanup on open water during moderate weather conditions is fairly efficient. However, containment of oil under adverse conditions (winds greater than 15 mph) is almost impossible and it is likely that the oil would go ashore. The most difficult areas to clean are rocky/cobble beaches. These are usually exposed to waves and currents and could be expected to cleanse themselves naturally in a short period. Mud/sand beaches can be scraped and cleaned very efficiently. Marshes are perhaps the most difficult areas from which to remove oil. Cleanup measures, if not carefully handled, may be as damaging as the oil itself. The best approach is isolation of the marsh by booming or other means. Such an area merits top priority in the allocation of manpower and equipment in the critical first few hours following a spill.

Oil spills on navigable waters of the United States are within the jurisdiction of the United States Coast Guard. The Coast Guard and other state and federal agencies would be on site in the event of any major spill to assist and coordinate cleanup efforts. The resource agencies would assist the Weyerhaeuser cleanup crew and administer continuous cleanup as long as it is deemed appropriate.

RECOVERY

Recovery from a spill is difficult to predict. As shown by the U.S. Council on Environmental Quality(5), although an individual organism may prove to be extremely sensitive to oil in the laboratory, natural conditions such as effective dispersion, and high birth, immigration, and maturation rates, may cause an entire population to recuperate rapidly. Similarly, "resistant" organisms may recover slowly under natural conditions due to competition or food source dependence.

Studies have indicated that there can be a substantial difference between the recovery rates observed on the rocky, wave-swept shores [a few weeks(10)] and the soft-bottom marsh communities [several years(11)]. The relatively calm Nisqually Delta area would probably be more similar to the latter case.

SUMMARY

The following additional statements may be made regarding an oil spill in Nisqually Reach.

- The probability of an oil spill due to the operation of Weyerhaeuser ships in Nisqually Reach would be low, projected at one spill greater than 2.4 barrels in Southern Puget Sound in 103 years to 325 years depending on the number of port calls.

- A spill contingency plan would be prepared by Weyerhaeuser after the facility is designed and before construction or operation begins. The plan would contain such elements as: a response team of Weyerhaeuser personnel, standard spill procedures, cleanup equipment on site, contact with professional response teams and additional measures.

- If oil were spilled, it would most likely be the heavy distillate used to power the ships. This oil is less soluble and generally less toxic than crude oil and its lighter fractions. Direct biological impacts would be most significant in the upper water column and intertidal areas where physical contact with the oil would occur.

- Because of its physical (shallow mudflats calm waters) and biological (estuarine and nursing area, wildlife refuge) characteristics, the Nisqually Delta is susceptible to significant environmental damage should a spill occur.

- Wind analysis in Nisqually Reach has shown that, when wind is blowing, there is a much greater probability of wind from the south (from two to eight times as great) than from the north. This indicates a low probability that oil from a given spill would reach the Delta.

- Should a spill occur, the season in which it occurs would have an important effect on the significance of the spill. The two most critical periods appear to be spring and fall.

- Recovery would occur relatively quickly in the rocky intertidal (perhaps weeks) and more slowly in the subtidal, mudflat or salt marsh communities (perhaps years).

- Except for juveniles salmonids which occur seasonally, a spill would not be expected to have a serious effect on fish. Adverse impacts on plankton and benthic organisms could affect fish through the loss of food sources. The duration and extent of such indirect impacts would depend on a variety of conditions associated with a spill.

- Due to the nature of the project (not oil related) the runoff collection and treatment system, and the tidal exchange characteristics of the Reach, chronic impacts from oil pollution appear to be unlikely.

- Quantitative predictions on the numbers or species of plant or animal life which would be seriously affected by a spill are dependent upon the nature of the spill. Studies have shown that impacts are dependent on species, weather, substrate, spill volume, season, oil type and other factors.

References

1. Parker, P. L., et al. 1976. Petroleum Pollution: Chemical Characteristic and Biological Effect, Symp. Proc., A.I.B.S., Sources Effects and Sinks of Pet. HC. in the aquatic environment.

2. CH_2M-Hill undated Hydrological and modeling studies of Nisqually Reach.

3. Hyland, Jeffrey L. and Eric D. Schneider. 1978. Petroleum Hydrocarbons and their effect on marine organisms, populations, communities and ecosystems. Symp. Proc. A.I.B.S., Sources, Effects and Sinks of Pet. HC. in the aquatic environment, EPA, E.R.C.

4. Moore, S.F. 1973. Background Information for ocean affairs board workshop on imputs, fates, and effects of petroleum in the marine environment, Airle, Va., (May), National Academy Sci., pp. 635-653.

5. U.S. Council on Environmental Quality 1974. OCS oil and gas - an environmental assessment, A report to the president, 5 Volumes.

6. Copeland, B. J. Estuarine classification and responses to disturbance, Trans.

7. Boesch, D. F. 1974. Diversity, stability and response to human disturbances in estuarine ecosystems, Proc. International Cong. Ecol., Netherlands, (September).

8. Nelson-Smith, A. 1968. The effects of oil pollution and emulsifier cleansing on marine life in southwest britain, J. Appl. Ecol. 5:97-107.

9. North, W. J., et al.1965. Successive Biological Changes Observed in a Marine Cover Exposed to a large spillage of oil, Symp. Comm. Int'l. Exploration Sci. Mer., Netherlands, Monaco 1964, pp. 335-354.

10. Straughan, D. (Ed.) 1971. Biological and oceanographical survey of the Santa Barbara Channel Oio spill, 1969-1970, Biology and Bacteriology, V.II Allan Hammock Foundation, USC , LA, 426 p.

11. Michael, A. D., et al. 1975. Long-term effects of an Oil Spill at West Falmouth, Mass., Proc. Conf. Prev. & Con. Oil Pol., SFO, March 25-27, API, EPA, USCG, pp. 573-582.

12. Smith, J. (Ed.) 1968. Torrey Canyon - Pollution and Marine Life, M.B.A., UK, Cambridge University Press, London.

13. Lytte, J. S. 1975. Fate and Effects of crude oil on an estuarine pond (see 11) API, EPA, USCG, pp. 595-600.

14. Boesch, D. F., et al. 1974. Oil Spills and the Marine Environment Ballinger Publishing company, Cambridge, Mass.

15. LeBoeuf, B. J. 1971. Oil contamination and elephant seal mortality - a Negative Finding, in Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill 1969-70, Biology and Bacteriology, A.H.F., USC, 1971.

16 Farrington, J. W. and J. G. Quinn 1973. Petroleum hydrocarbons in Narragonsett Bay, Estuarine and Coastal Marine Science, 1:71-79.

17. Reish, D. J. 1971. Effect of pollution abatement in Los Angeles harbor, Marine Pollution Bulletin, 2:71-74.

18. Barker, J. M. 1971. Botanical studies with oil. Proceeding symposium on the ecological effects of oil pollution on littoral communities, Institute of Petroleum, London.

19. Sharp, J. M. and J. W. Tupen, 1979. Gulf Universities Research Corporation The Offshore Ecology Investigation: Final Project Planning Council Conseensus Report September 20, Galvaston, Texas.

20. Neff, J. M., et al. 1971. Effects of petroleum on survival, respiration and growth of marine animals, in Source effects and sinks of hydrocarbons in the aquatic environment, August 9-11, A.I.B.S., American Univ.

21. Hillis, W. E., Ed. 1962. Wood extractives and their significance to the pulp and paper industries Academic Press, New York.

22. Dunstan, W.M., L.P. Atkinson, and J. Natoli, 1975. Stimulation and inhibition of phytoplankton growth by low molecular weight hydrocarbons. Mar. Biol. (Berl.) 31:305-10.

23. Pulrich, W.M., Jr., K. Winters, and C. van Baalen. 1974. The effects of a No. 2 fuel oil and two crude oils on the growth and photosynthesis of microalgae. Mar. Biol. (Berl.) 28:87-94.

24. Hsaio, S.I.C. 1978. Effects of crude oils on the growth of Arctic marine phytoplankton. Environ. Pollut. 17:93-107.

25. Thompson, S. and G. Eglinton, 1976. The presence of pollutant hydrocarbons in estuarine epipelic diatom populations. Estuarine and Coastal Marine Science 4:417-25.

26. Johnson, F.G. 1979 The effects of aromatic petroleum hydrocarbons on chemosensory behavior of the sea urchin, Strongylocentrotus droebachiensis, and the nudibranch, Onchidoris bilamellata. PhD Thesis, University of Washington, Seattle, 110 p.

27. Kasymov, A.G. and A.D. Aliev, 1973. Experimental study of the effect of oil on some representatives of benthos in the Caspian Sea. Water Air Soil Pollut. 2:235-45.

28. Carr, R.S., and D.J. Reish 1977. The effect of petrochemicals on the survival and life history of polychaetous annelids. In: Proceedings of Symposium on Fate and Effects of Petroleum Hydrocarbons in Marine Ecosystems and Organisms (D. Wolfe, ed). Pergamon Press, New York.

29. Sanborn, H.R., 1977. Effects of petroleum on ecosystems, p. In: Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms, Vol. II., (D.C. Malins, ed.). Acad. Press, New York.

30. Donahue, W.H., M.F. Welch, W.Y. Lee, and J.A.C. Nicol, 1977. Toxicity of water soluble fractions of petroleum oils on larvae of crabs. In: Pollutant Effects on marine Organisms (C.S. Giam, ed.). Lexington Books, Lexington, Massachusetts.

31. Rice, S.D. J.W. Short, C.C. Brodersen, T.A. Mecklenburg, D.A. Moles, C.J. Misch, D.L. Cheatham, and J.F. Karinen, 1976. Acute toxicity and uptake depuration studies with Cook Inlet crude oil, Prudhow Bay crude oil, No. 2 fuel oil, and several subarctic marine organisms. Northwest and Alaska Fisheries Center, NMFS, NOAA, U.S. Dep. of Commerce, Auke Bay Fisheries Laboratory, P.O. Box 155, Auke Bay, Alaska. Processed report, 114 p.

32. Katz, L.M. 1973. The effects of water soluble fraction of crude oil on larvae of the decapod crustacean Neopanope texana (Sayi). Environ. Pollut. 5:199-204.

33. Karinen, J.F., and S.D. Rice, 1974. Effects of Prudhoe Bay crude oil on molting crabs, Chionoecetes bairdi. U.S. Natl. Mar. Fish. Serv. Mar. Fish. Rev. 36:31-7.

34. Atema, J. and L. Stein, 1974. Effects of crude oil on the feeding behavior of the lobster, Homarus americanus. Environ. Pollut. 6:77-86.

35. Takahashi, F.T., and J.S. Kittredge, 1973. Sublethal effects of the water soluble component of oil: Chemical communication in the marine environment. In: The Microbial Degradation of Oil Pollutants (D.G. Ahearn and S.P. Meyers, eds.), p. 259-64. Publ. No. LSU-SG-73-01. Center Wetland Resources, Louisiana State University, Baton Rouge, LA.

36. Krebs, C.T., and K.A. Burns, 1977. Long-term effects of an oil spill on populations of the salt-marsh crab Uca pugnax. Science 197:484-487.

37. Stainken, D.M., 1976a. The effect of a No. 2 fuel oil and a South Louisiana crude oil on the behavior of the soft-shell clam, Mya arenaria L. Bull. Environ. Contam. Toxicol. 16:724-29.

38. Syazuki, K., 1964. Studies on the toxic effects of industrial wastes on fish and shellfish. J. Shimonoseki Coll. Fish. 13:157-211.

39. Avolizi, R.J. and Nuwayhid, M. (A.), 1974. Effects of crude oil and dispersants on bivalves. Mar. Pollut. Bull. 5:149-53.

40. Leviton, W.M., and M.H. Taylor, 1979. Physiology of salinity-dependent naphthalene toxicity in Fundulus heteroclitus. J. Fish. Res. Board Can. 36:615-620.

41. Moles, A., S.D. Rice, and S. Korn, 1979. Sensitivity of Alaskan freshwater and anadromous fishes to Prudhoe Bay crude oil and benzene. Trans. Am. Fish. Soc. 108:408-414.

42. Brenniman, G., R. Hartung, and W.J. Weber, Jr., 1976. A continuous flow bioassay method to evaluate the effects of outboard motor exhausts and selected aromatic toxicants on fish. Water Research 10:165-169.

43. Eldridge, M.B., T. Echeverria, and J.A. Whipple, 1977. Energetics of Pacific herring (Clupea harengus pallasi) embryos and larvae exposed to low concentrations of benzene, a monoaromatic component of crude oil. Trans. Am. Fish. Soc. 106:452-461.

44. Mazmanidi, N.D., and T.R. Bazhashvili, 1975. Effects of dissolved petroleum products on the embryonic development of the Black Sea flounder. Journal of Ichthyology 15:811-816.

45. National Marine Fisheries Service, 1979. Sublethal effects of petroleum hydrocarbons and trace metals, including biotransformations, as reflected by morphological, chemical, physiological, pathological, and behavioral indices. Annual Report for OCSEAP contract #R7/20819, Northwest and Alaska Fisheries Center, Seattle, WA. April 1978.

46. Korn, S., D.A. Moles, and S.D. Rice., 1979. Effects of temperature on the median tolerance limit of pink salmon and shrimp exposed to toluene, naphthalene, and Cook Inlet crude oil. Bull. Environ. Contam. Toxicol. 21:521-525.

47. Anderson, J.W., 1975. Laboratory studies on the effects of oil on marine organisms: An overview. Am. Petrol. Inst. Publ. 4249, 70 p.

48. Lee, W.Y. and J.A.C. Nicol. 1980. Toxicity of a fuel oil to the eggs of Parhyale hawaiensis and Amphithoe valida (Amphipoda). Marine Environmental Research 3(1980):297-305.

49. Augenfeld, J.M. 1980. Effects of Prudhoe Bay crude oil contamination on sediment working rates of Abarenicola pacifica. Marine Environmental Research 3(1980):307-313.

50. Blumer, M., J.M. Hunt, J. Atema, and L. Stein. 1973. Interaction between between marine organisms and oil pollution. U.S. Environ. Protection Agency, Office of Research and Monitoring, Washington, D.C. Ecol. Res. Serv. No. EPA-R3-73-042, 97p.

51. Engelhardt, F.R. 1978. Petroleum hydrocarbons in Arctic ringed seals, Phoco hispida, following experimental oil exposure. In: Conference of Assessment of Ecological Impacts of Oil Spills. American Institute of Biological Sciences. 14-17 June 1978, Keystone, Colorado.

52. Geraci, J.R., and Smith, T.G., 1976. Disrect and indirect effects of oil on ringed seals (Phoca hispida) of the Beaufort Sea. Journal of Fisheries Research Board of Canada, Volume 33, pages 1976-1984.

APPENDIX M

OIL SPILL CONTINGENCY PLAN: PURPOSE AND CONTENTS

Introduction

There would be no handling or storage of petroleum products at the DuPont dock. Ships berthing there would refuel elsewhere at existing fueling facilities (Section 1.5).

If dock equipment is refueled at the dock, up to several thousand gallons could be spilled, in the extreme case. However, the possibility exists for small spills (less than 50 gallons) at the dock. Although the probability is quite low, there is a chance of ship collision and major spill in the Nisqually Reach. As discussed in Appendix L, analysis has shown that under the proper conditions (a flood tide combined with substantial northerly winds) a spill could be driven to the Nisqually Delta in as little as two hours. A well-designed and quickly-activated Contingency Plan is essential in order to contain and clean up oil spills before major environmental damage occurs.

Since detailed operational plans for the DuPont dock have not yet been worked out, a detailed Contingency Plant must await completion of dock and terminal design. The plan would provide the framework for an emergency response effort in the event of spills at or near the DuPont dock. The Contingency Plan would also provide procedures for minimizing the possibility of spills in routine operations (Prevention) and for mobilizing additional resources if the spill event exceeds levels controllable by Weyerhaeuser personnel (Cleanup). Elements to be included in such a plan have been summarized by the State Department of Ecology (Washington Dept. of Ecology, 1977). Those applicable to this facility include:

- o A map showing drains and drainage paths taken by spilled material
- o A list of petroleum products, their volumes and method of storage (barrels, above ground tanks, etc.,) and other hazardous materials used in the ships or at the dock
- o Description of containment devices, especially the proposed holding and treatment system located under the dock
- o A company spill reporting and mobilization procedure, including telephone numbers of applicable federal and state agencies
- o A clean-up methodology, list of equipment and its location and appropriate use
- o A list and schedule of required inspections of spill control devices and practices
- o Appropriate records keeping to assure the above
- o Security provisions if needed to protect the integrity of the spill prevention system.

Similar plans have been successfully completed at other major Weyerhaeuser facilities such as those at Everett and Longview. They clearly delineate methods and practices to be utilized by operational personnel to minimize the spillage of hazardous materials. They also outline notification and response procedures for rapidly containing and cleaning up spills should they occur. The Contingency Plan for the proposed dock at DuPont would be similarly designed, taking into account the latter's unique use, location and design.

The Response Team

The Response Team would be staffed using Weyerhaeuser personnel on a rotating basis, so as to assure initiation of on-site mobilization within one hour of any reported spill. It would include, at a minimum, an on-scene manager, on-scene cleanup supervisor, off-shore cleanup supervisor and a resource support manager. Staff positions would include damage control, logistics and supply, and documentation. Key team members would receive training as to their duties and periodic drills would be conducted, including boom placement and use of sorbents.

A call-up procedure would be prepared such that all positions can be fully staffed within 3 hours of a spill and would provide for immediate notification of the Coast Guard and other responsible regulatory agencies. The local Coast Guard response center can be reached at (206) 442-1856 or (206) 442-7070. The Washington State Department of Ecology should also be notified. The general procedure for Coast Guard response is as follows. The Coast Guard would send someone to the scene to assess the size of the spill, its potential for serious harm to public safety and the environment, and the type of equipment necessary to deal with the spill. If appropriate, the Coast Guard would require the responsible entity to immediately implement control and cleanup measures. If such action was not forthcoming, the Coast Guard would direct one or more private firms in the area to clean the spill, all expenses incurred would then be billed to the responsible entity.

Protection

In-place booms may be used along side the DuPont dock, depending on its ultimate configuration. If the dock parallels the shoreline and if currents are sufficiently low, skirt booms may be placed at both ends of the dock and along the shoreside of the dock, at the waterline. These booms would be installed to trap any spilled oil which might be carried under the dock while a ship is unloading. These booms would be lifted above the water line (after assuring no oil was present), when no ships were at dock. The possibility of extending the boom (with somewhat greater skirt depth) to completely encircle ships at dock would be considered only if both: (1) the risk of a spill from a ship at dockside can be shown to be intolerably high (the present risk assessment indicates such is not the case), and (2) tidal currents, after construction is complete, are found to be sufficiently low as to allow such a boom configuration to be effective in retaining spilled oil.

Cleanup

The response team would have available, at or near the dock, sufficient boom to contain small quantities (<50 gallons) of oil along or near shore, including protection of the small salt marsh at the mouth of the Sequalitchew Creek. Means for deployment of this boom would also be immediately available (for example, a jon boat). Sorbent pads would also be available for blotting up small spills.

The response team would have available, through prior arrangements, the services of cleanup contractors (such as Crowley) who can, within a few hours, provide skimmers, vacuum trucks, additional boom and sorbent materials as well as supervisory manpower and labor.

There is a wide array of cleanup and control equipment available from private sources in southern Puget Sound to deal with an oil spill. These are listed in Table M-1. The Clean Sound Cooperative can also be called in to combat larger oil spills. The Cooperative is made up of 14 member organizations that include oil, barge and pipeline companies. The Cooperative maintains an extensive variety of oil spill containment and recovery devices. Manpower is supplied by trained personnel from the member companies. Cleanup services are available to non-members and could be called upon by Weyerhaeuser in the event of a significant spill.

TABLE M-1

Oil Cleanup Equipment Available From
Private Sources In South Puget Sound
(Tacoma - Olympia - Shelton)

Booming (Total Length)	10,140 ft.
Skimmers	7
Sorbant sources	13
Workboats	84
Tugboats	11
Bulldozers	9
Backhoes	14
Dumptrucks	47
Tank trucks	22
Other trucks	70
Loaders	18
Cranes	4
Air compressors	1
Generators	20
Portable pumps	23
Protective suits	24
Breathing masks	12
Explosion meters	10
Transceivers	28
Chemical toilets	352

Source: U.S. Coast Guard, Oil Spill Response Plan for Puget Sound, Seattle, Washington, 12/77.

APPENDIX N

ALTERNATIVES

A Document Prepared by the Weyerhaeuser Company

Summarizing Their Site Selection Process

ALTERNATIVE SITES EVALUATION

The following is a comparative evaluation of sites which had been identified in the two or three year period prior to the purchase of the DuPont property. A total of twenty-nine sites both private and public port located along the Columbia River and in Puget Sound were researched during that period. This series of sites had been identified and investigated for a variety of purposes and not solely in a search for an appropriate location for the proposed Export Facility. Those sites are identified by location and name on the Map in Table I.

This comparison first identifies and classifies site characteristics in order of priority for site location of the Export Center; then compares the sites identified to those characteristics.

Public Ports

Public ports were examined as potential areas for sites, but with the exception of the Port of Tacoma not included in this evaluation because they clearly did not satisfy the requirements for the proposed project. These are the Ports of Olympia, Everett and Seattle.

The Ports of Olympia, Everett and Seattle had only small parcels available for development. Access in each required movement through downtown areas. The Port of Olympia has a 32-foot draft limit. The Port of Seattle had no large parcels; those available were very expensive and small and required movement through congested or downtown areas.

The Port of Tacoma's expressed policy is the development of multiple purpose cargo berths with diversified industrial clients and labor intensive port uses. The Port of Tacoma is, however, included in the comparative analysis of sites because of the expessed public concerns about why the Port could not be utilized for the proposed Export Facility.

Site Criteria

Site Criteria for location of the Export Center are divided into three classifications of characteristics for comparative and screening purposes. Those are defined as:

Mandatory Site Requirements - Characteristics which all must be satisfied for a site to be considered as a viable alternative.

Critical Site Characteristics - Characteristics of high priority which must be substantially satisfied for a site to be considered.

Desirable Site Characteristics - Characteristics which are not essential for a site to satisfy, but which would be highly advantageous.

Site characteristics under each of these classifications are described in the Comparative Evaluations section. The most desirable site or sites for location of the proposed Export Center would meet all the site requirements and characteristics.

In the assessment of sites and site characteristics in Tables II, III, IV, the following key was used:

Y - The particular site requirement identified is met by the site identified.

M - The particular site requirement identified is only marginally satisfied. The marginal rating generally does not suggest an unsolvable problem, but could entail added costs or constraints on construction, operation or design.

N - The particular site requirement is not currently met by a particular site.

Comparative Evaluation

On the 29 sites including the Port of Tacoma, three sites satisfied all the Mandatory Site Requirements. The comparison of these sites

in relation to the mandatory requirements is displayed in Table II. The Mandatory Site Requirements are:

1. Marine Water access

2. Deep water access capable of allowing at least 40, but preferably 60-foot draft ships to dock and be loaded.

3. Capable of accepting a 1,000 foot dock.

4. Minimum of 200 acres of level adjoining property for unloading, staging and ship loading of logs and other forest products.

5. Centralized location for the supply of logs and other forest products from Weyerhaeuser's Western Washington operations.

A site which was rated marginal for two mandatory site requirements or received a "no" rating for any mandatory site requirement was not further considered:

The three sites that satisfy mandatory site requirements are identified below with comments.

Site Key	Name	Comment
7.	Standard Oil	The site was rated marginal in terms of being central to product supply because of location.
9.	Hawk's Prairie	The site was rated marginal in terms of Deep Water access because of the narrow transportation corrider to the water and distance to deep water from the shoreline.
11.	DuPont	No marginal ratings.
29.	Pt. Tacoma*	The site was rated marginal in terms of depth of currently maintained channel in waterway; the site did not meet the acreage requirement.

*Did not meet all mandatory requirements, but included because of expressed public concern.

These three sites meeting the mandatory requirements and the Port of Tacoma were assessed against the Critical Site Characteristics in Table III. The Critical Site characteristics are:

1. Access to freeway or comparable highway within five miles of site.

2. Railroad access must be available within relatively close proximity.

3. Utilities, especially water and power, must be available to site.

4. Access to site without intrusion into residential or downtown areas.

5. Site must be available to be purchased.

6. Additional acreage of a minimum of 300 acres within the site, contiguous or available in the vicinity for possible future forest products conversion facilities. Preferably additional acreage would have off-highway transportation access to export facility.

Of the three sites screened by the mandatory factors all met the critical site characteristics, however, with some marginal ratings. The Port of Tacoma meets the first four, but not the last two site characteristics.

The "marginal" and "no" ratings for these three sites and the Port of Tacoma are explained below:

Site Key	Name	Comment
7.	Standard Oil	The ability to purchase the site was not known, therefore rated as marginal; as well there could be impact on residential areas from site access.
9.	Hawk's Prairie	Proximity to railroad was rated as marginal.
11.	DuPont	No marginal ratings.
29.	Pt. Tacoma*	The additional acreage was not available; lands were not available for purchase.

*Included because of expressed public concern.

These three sites and again the Port of Tacoma are assessed in Table IV in terms of the desirable Site Characteristics. The Desirable Site Characteristics are:

1. Industrial zoned.

2. The soil and geologic characteristics are such that foundation and support requirements are minimal.

3. Minimal or no dredging required - especially for maintenance after initial construction.

4. Buffer areas available to reduce noise and visibility for adjoining residents.

5. Minimal land-filing of shoreline or adjacent properties required.

6. An available work force and necessary housing for them in the area.

7. Minimally noise-sensitive land uses adjacent to the site.

8. Minimal conflict with recreational use and fishing in the surrounding areas.

9. Road and rail access to site with only moderate/ reasonable grades.

10. Minimal portion of site in swamp or wetlands.

The assessment of the three potential sites and the Port of Tacoma indicates that the DuPont site, as well as satisfying mandatory and critical factors, most closely meets all the Desirable Site Characteristics. The one marginal rating for DuPont resulted

from the location of Sequalitchew Creek in relation to the dock and dock access.

cr25/0127/1

FIGURE I

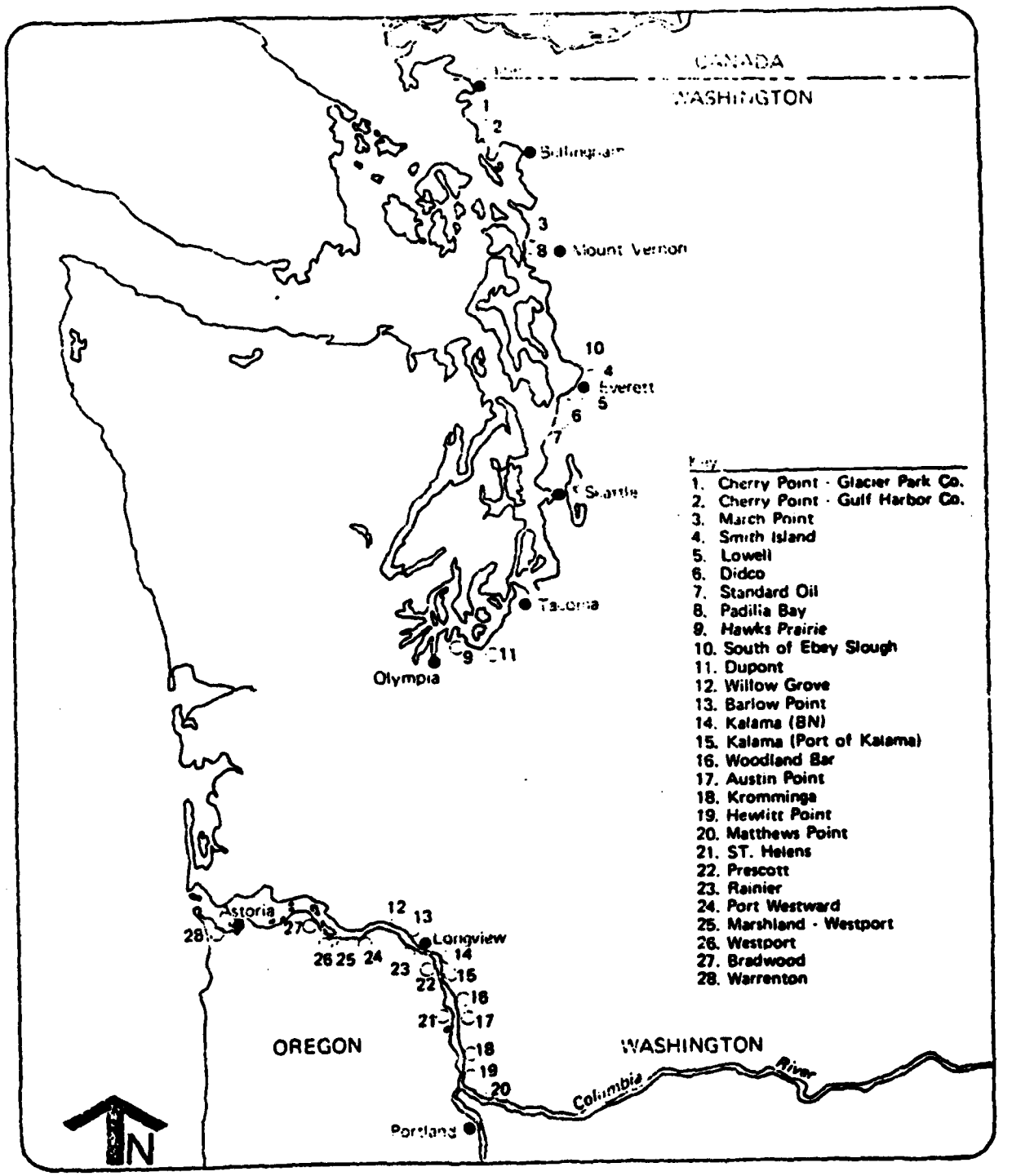

CANADA
WASHINGTON
Bellingham
Mount Vernon
Everett
Seattle
Tacoma
Olympia
Longview
Astoria
OREGON
WASHINGTON
Columbia River
Portland
N
Key
1. Cherry Point - Glacier Park Co.
2. Cherry Point - Gulf Harbor Co.
3. March Point
4. Smith Island
5. Lowell
6. Didco
7. Standard Oil
8. Padilia Bay
9. Hawks Prairie
10. South of Ebey Slough
11. Dupont
12. Willow Grove
13. Barlow Point
14. Kalama (BN)
15. Kalama (Port of Kalama)
16. Woodland Bar
17. Austin Point
18. Kromminga
19. Hewitt Point
20. Matthews Point
21. ST. Helens
22. Prescott
23. Rainier
24. Port Westward
25. Marshland - Westport
26. Westport
27. Bradwood
28. Warrenton

TABLE II

SITES COMPARED WITH MANDATORY SITE REQUIREMENTS

		1. Marine	2. Deep Water	3. Dock	4. Acres	5. Central
1.	Cherry Point (Gl Pk)	Y	Y	Y	Y	N
2.	Cherry Point (Glf Hbr)	Y	Y	Y	Y	N
3.	March Pt.	Y	M	Y	Y	N
4.	Smith Island	Y	N	N	N	M
5.	Lowell	N	N	N	Y	M
6.	Dideo	N	N	N	Y	M
7.	Standard Oil	Y	Y	Y	Y	M
8.	Padilla Bay	Y	N	Y	Y	M
9.	Hawk's Prairie	Y	M	Y	Y	Y
10.	Eby Slough	Y	N	N	Y	M
11.	Dupont	Y	Y	Y	Y	Y
12.	Willow Grove	Y	M	Y	Y	M
13.	Barlow Point	Y	M	Y	Y	M
14.	Kalama (Bn)	Y	M	Y	N	Y
15.	Kalama (Port)	Y	M	Y	N	Y
16.	Woodland	Y	M	Y	Y	M
17.	Austin Point	Y	M	Y	Y	M
18.	Kromminga	Y	M	Y	Y	M
19.	Hewlitt Point	Y	M	Y	Y	M
20.	Matthews Pt.	Y	M	Y	Y	M
21.	St. Helens	Y	M	Y	Y	M
22.	Prescott	Y	M	Y	Y	M
23.	Rainier	Y	M	Y	Y	M
24.	Pt. Westward	Y	M	Y	Y	M
25.	Marshland	Y	M	Y	Y	N
26.	Westport	Y	M	N	Y	N
27.	Bradwood	Y	M	M	Y	N
28.	Warrenton	Y	M	Y	Y	N
29.	Pt. Tacoma	Y	M	Y	N	Y

KEY:

Y - Yes
M - Marginal
N - No

▱ - Site satisfies all Mandatory Requirements.

TABLE III

COMPARISON OF SITES MEETING MANDATORY FACTORS TO CRITICAL SITE CHARACTERISTICS

	1. Freeway	2. Railroad	3. Utilities	4. Residential	5. Purchase	6. Acreage
7. Standard Oil	Y	Y	Y	M	M	Y
9. Hawk's Prairie	Y	M	Y	Y	Y	Y
11. DuPont	Y	Y	Y	Y	Y	Y
29. Pt. Tacoma*	Y	Y	Y	Y	N	N

*Carried through matrix analysis because of public interest and concern.

KEY:

Y - Yes

M - Marginal

N - No

TABLE IV

COMPARISON OF SITES MEETING CRITICAL FACTORS TO DESIRABLE SITE CHARCTERISTICS

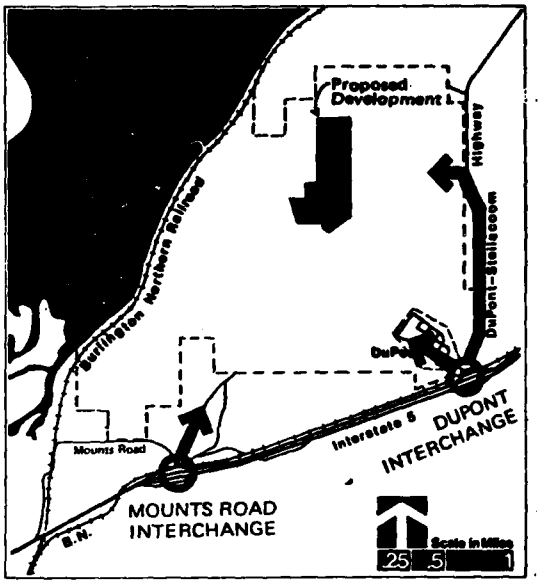
		1. Zoned	2. Soils	3. Dredging	4. Buffer	5. Landfill	6. Work Force	7. Noise	8. Recreation	9. Grades	10. Wetlands
7.	Standard Oil	M	Y	Y	Y	Y	Y	M	Y	M	Y
9.	Hawk's Prairie	Y	Y	M	Y	Y	Y	Y	M	M	Y
11.	DuPont	Y	Y	Y	Y	Y	Y	Y	Y	Y	M
29.	Pt. Tacoma*	Y	Y	N	Y	N	Y	Y	Y	Y	Y

*Carried through matrix analysis because of public interest and concern.

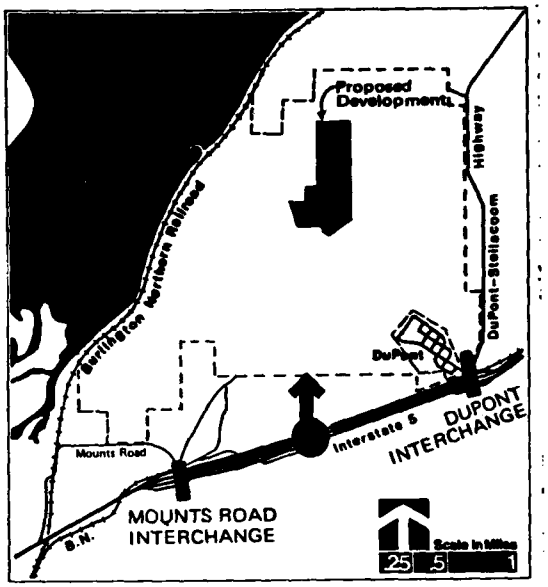
KEY:

Y - Yes
M - Marginal
N - No

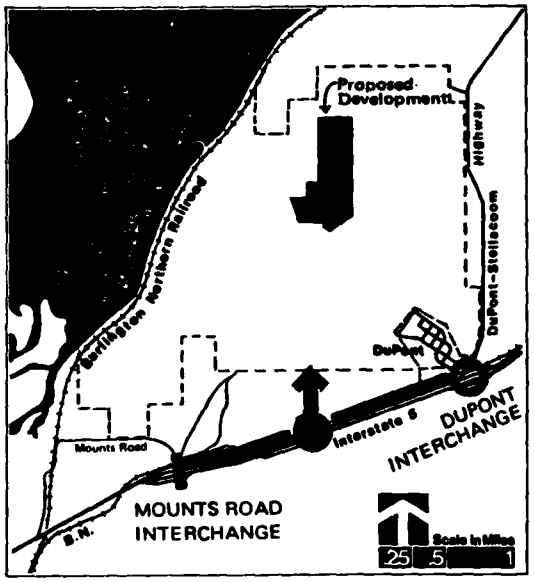
cr25/1112/12.1-2



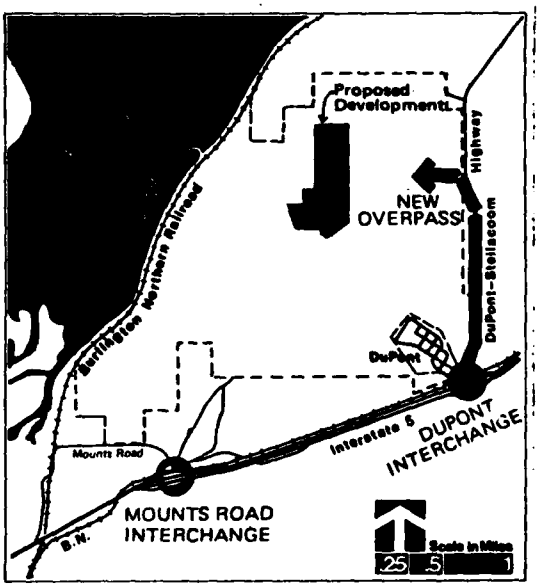
Road Access Alternative 1
Existing Access Roads



Road Access
Alternative 2



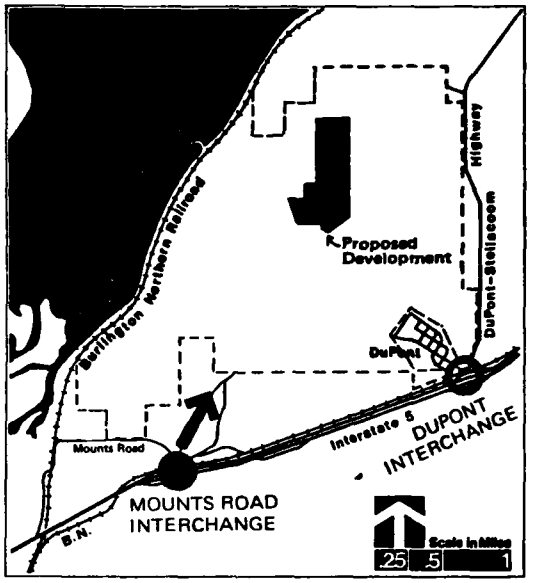
Road Access
Alternative 3



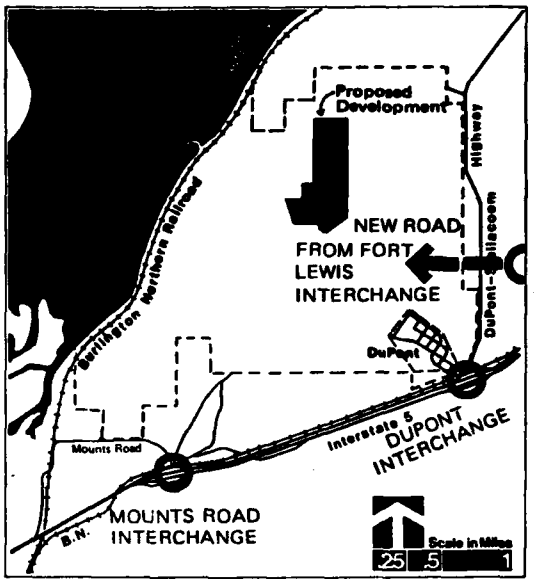
Road Access
Alternative 4

UNCHANGED
MODIFIED
OVERPASS

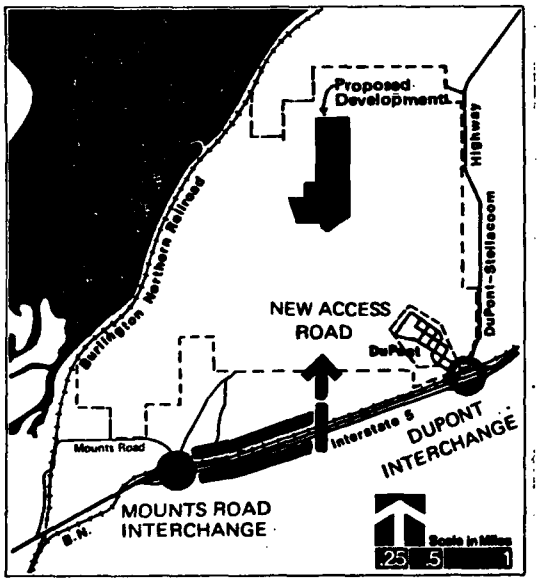
FIGURE N-1
ROAD ACCESS ALTERNATIVES



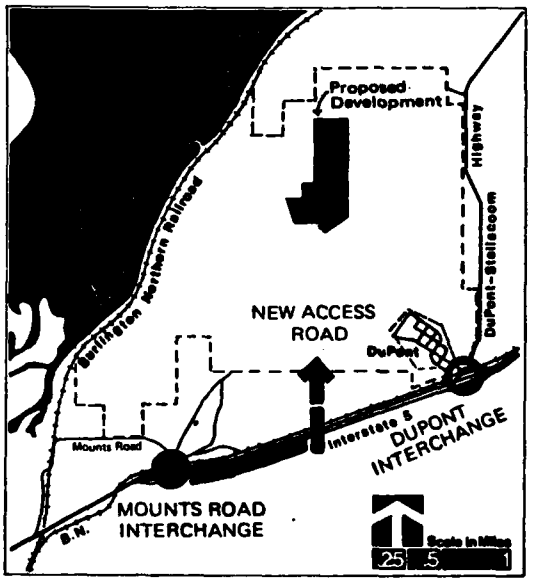
Road Access Alternative 5



Road Access Alternative 6



Road Access Alternative 7



Road Access* Alternative 8

UNCHANGED

MODIFIED

OVERPASS

FIGURE N-1 (CONT)
ROAD ACCESS ALTERNATIVES
*Proposed

TABLE N-1

DESCRIPTION OF ROADWAY ALTERNATIVES

Alternative 1

Utilize the existing freeway interchanges known as the Mounts Road and DuPont exit from Interstate Highway 5 and the existing roadway through the Fort Lewis Golf Course, DuPont-Steilacoom or Barksdale Avenue, to gain access to the site.

Alternative 2

Construct a new freeway interchange on Interstate 5, 1/2 mile east of Mounts Road between Mounts Road and the DuPont exits) with a new "frontage road" bordering on the north side of I-5, connecting to both Mounts Road and DuPont-Steilacoom Road. The existing Mounts Road and DuPont interchanges would be eliminated and replaced with overpasses to assure cross traffic. Access to the site would be assured with a new roadway located east of the golf course, moving traffic north.

Alternative 3

Construct a new freeway interchange on Interstate 5, 1/2 mile east of Mounts Road (between Mounts Road and DuPont exits) with a new "frontage road" bordering on the north side of I-5 to provide access to Mounts Road. The Mounts Road interchange would be eliminated and replaced with an overpass. The DuPont interchange would remain in its present form. Access to the site would be assured with a new roadway located east of the golf course, moving traffic northeast.

Alternative 4

Modify the DuPont interchange to accommodate the anticipated additional traffic. The primary access to the site would then be routed north on the Steilacoom Road, which would be widened from two to four lanes with an overpass ultimately moving traffic westward into the site.

Alternative 5

Modify the Mounts Road interchange to accommodate the anticipated additional traffic. The primary access to the site would be from Mounts Road to a new road moving through the golf course in a direct northeasterly direction. The DuPont interchange would remain as it is.

TABLE N-1 (cont.)

Alternative 6

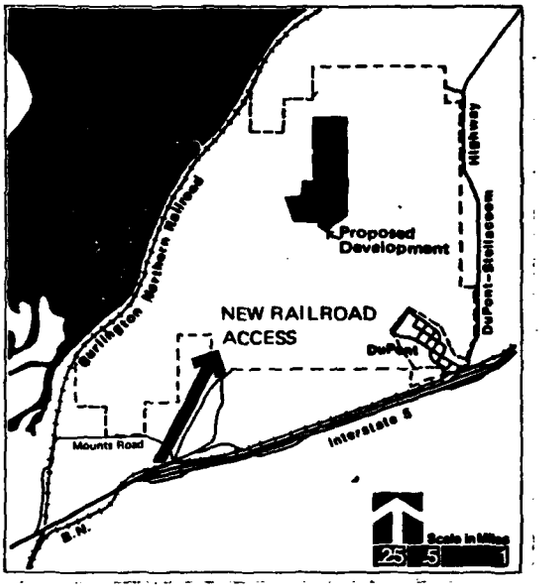
Access would be provided from the Fort Lewis interchange from I-5. A new access road to the site would be built moving traffic west on an overpass over Steilacoom Road and directly into the site. The Mounts Road and DuPont interchanges would be left as they are.

Alternative 7

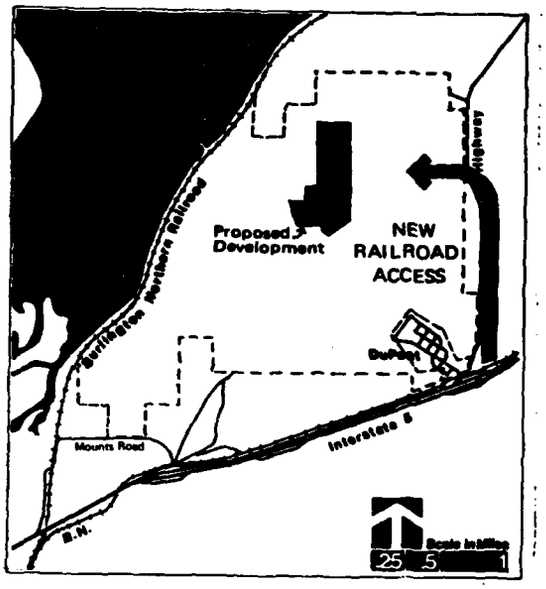
Modify the Mounts Road interchange to accommodate the anticipated additional traffic. The primary access to the site would be from a one-way perimeter road on the south side of I-5 with an overpass crossing I-5 and moving northward to the site from a new road east of the golf course. Traffic from the site would be routed south down another one-way perimeter road on the north side of the freeway and onto the freeway.

Alternative 8

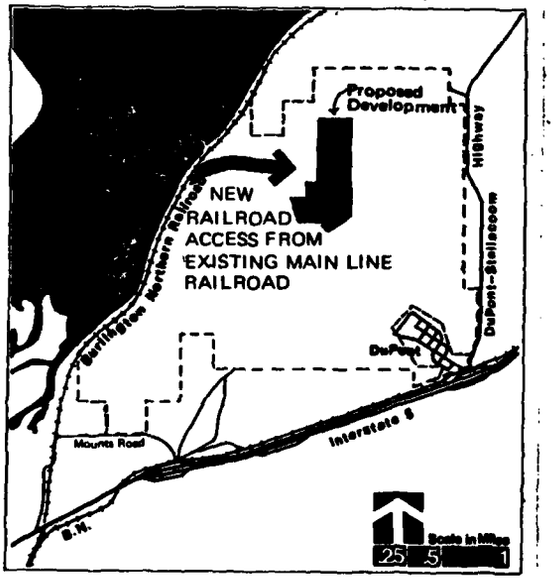
Modify the Mounts Road interchange to accommodate the anticipated additional traffic. The primary access to the site would be from a two-way perimeter road on the south side of I-5 with an overpass crossing I-5 and moving traffic northward to the site from a new road east of the golf course. Traffic from the site would be routed down the same roadway and onto the freeway.



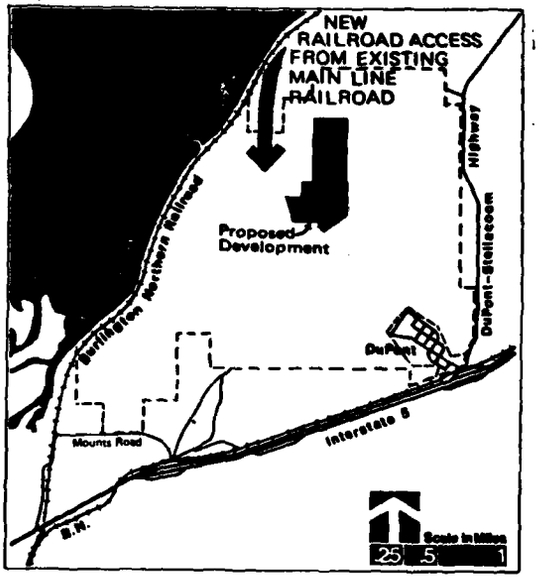
Railroad Access
Alternative 5



Railroad Access
Alternative 6

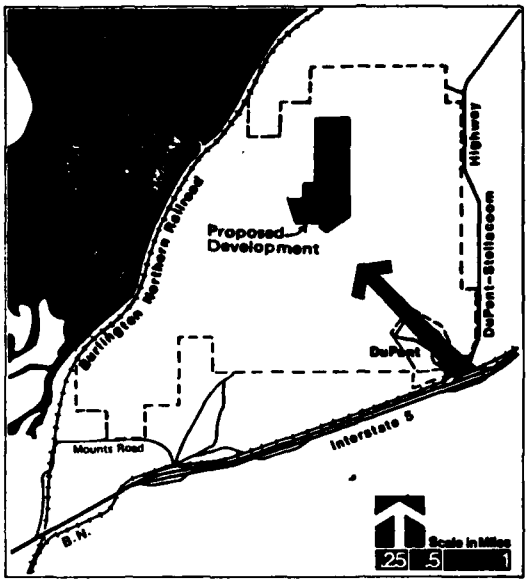


Railroad Access
Alternative 7

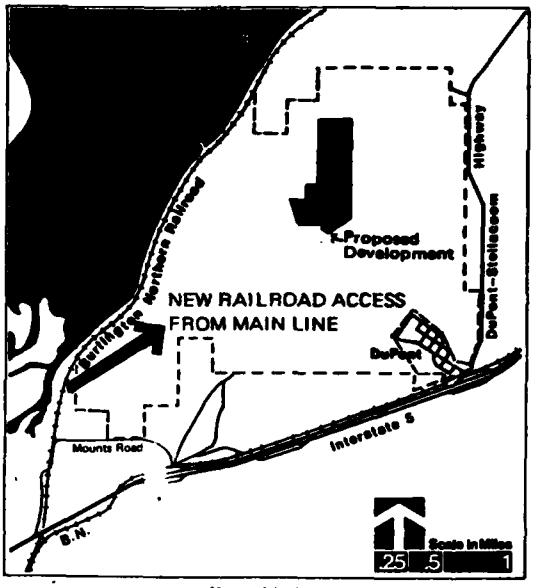


Railroad Access
Alternative 8

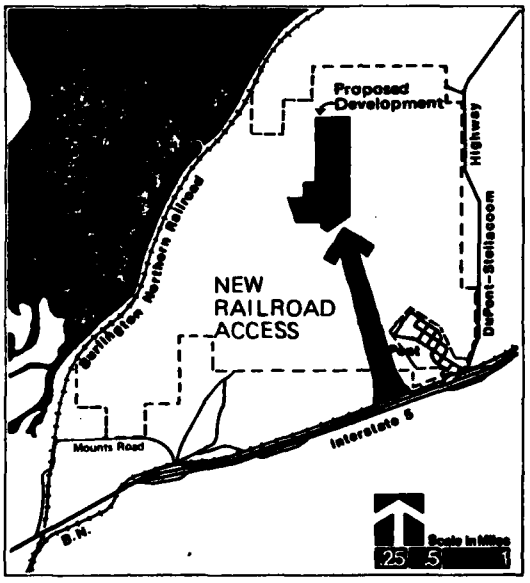
FIGURE N-2
RAIL ACCESS ALTERNATIVES



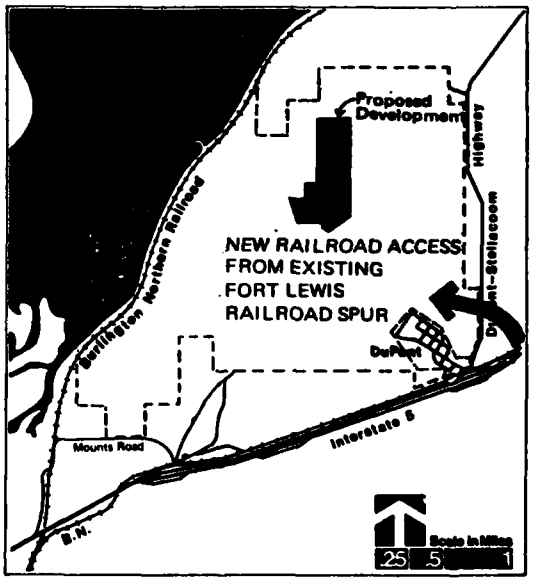
Railroad Access
Alternative 1



Railroad Access
Alternative 2



Railroad Access *
Alternative 3



Railroad Access
Alternatvie 4

FIGURE N-2 (CONT)
RAIL ACCESS ALTERNATIVES

* Proposed

TABLE N-2

DESCRIPTION OF ALTERNATIVE RAIL ACCESS ROUTES

Alternative 1

Maintain rail access routes where they presently are located. One route already parallels the shoreline; the other route parallels Interstate Freeway 5 on the south side of the freeway. The route paralleling Interstate Freeway 5 has a railway spur moving through DuPont and onto the site.

Alternative 2

Construct a railway spur from the existing shoreline route which can move forest resources up the bluff and onto the site.

Alternative 3

Construct a railway spur from the existing I-5 route which can parallel the roadway access route right-of-way east of the golf course (if selected).

Alternative 4

Construct a railway spur extending westerly from the existing North Fort Lewis railroad spur.

Alternative 5

Construct a railway spur from the existing I-5 route which can parallel the roadway access route of right-of-way moving through the golf course (north-easterly) from the Mounts Road interchange (if selected).

Alternative 6

Construct a railway spur from the existing I-5 route between the Fort Lewis and DuPont interchange, which will move down Steilacoom Road until it reaches an overpass and then moves west into the site.

Alternative 7

Construct a railway spur from the existing shoreline route across a bridge spanning Sequalitchew Creek then climbing onto the main portion of the site.

Alternative 8

Construct a railway spur from the existing shoreline route north of the site and rising onto the site.

TABLE N-3

ADVERSE ENVIRONMENTAL IMPACT RATINGS OF ACCESS ROUTES - ROAD AND RAIL

ALTERNATIVES

	1	2	3*	4	5	6	7	8*
Roads								
Noise	H	L	M	H	M	L	L	L
Topography	L	L	L	L	L	L	L	L
Soils/Geology	L	L	L	L	L	L	L	L
Traffic	H	H	L	H	L	H	L	L
Aesthetics	H	L	L	H	L	H	L	L
Flora/Fauna	M	M	M	M	M	M	M	M
Land Use	H	L	M	H	H	M	M	M
Rails								
Noise	H	M	M	M	H	M	M	M
Topography	L	H	L	L	L	L	H	H
Soils/Geology	L	H	L	L	L	L	H	H
Traffic	H	0	0	M	H	M	0	0
Aesthetics	H	L	M	M	H	M	L	L
Flora/Fauna	M	M	M	M	M	M	M	M
Land Use	H	L	L	M	H	M	L	L

H = Highly Adverse Impact
M = Moderately Adverse Impact
L = Low Impact
0 = Neutral

* Environmentally preferred alternatives

Table N-3 compares the adverse impacts of the road and rail access alternatives described in Figures N-1 and N-2 and Tables N-1 and N-2.

This comparison indicates that road access alternatives 7 and 8 are associated with the least adverse environmental impacts. Rail access alternative 3 utilizes the same corridor as these road access alternatives. Combining these two access routes minimizes areas exposed to noise impacts and minimizes disturbance of flora and fauna to one corridor rather than two, and therefore, may be environmentally preferable.

TABLE N-4

DESIGNS EVALUATED DURING DESIGN COMPETITION

Design	Terminal	Transport	Dock	Ship
A.	Conventional storage area; no unitizing	Rail; towline through ramp cut in bluff; trestle over railroad	Finger pier, 40 ft. elevation, 100 ft. width, length = length of active hold	Open-hatch bulk corner c onboard cranes; 3 ships
B.	Same as A; except unitizing everything but logs	Rail; towline in sloping tunnel beneath railroad	Same as A; except with cranes	Open-hatch pallet containers, except for logs; 4 ships
C.	Same as A	Elevator in vertical shaft; rail through tunnel under railroad and under water to pier; elevator to pier	No visible connection to shoreline; elevation 30 feet	Same as A, except 4 ships
D.	Same as A	Overhead cranes inside slot	Covered slot cut into bluff	Same as A, but no cranes
E.	Canal/lake system for barges	Incline to move barges from canal on top of bluff to tunnel under railroads	Small slot inside bluff	Seabee-type barges, vessel stows barges or containers; 4 ships
F.	Same as A	Rail using existing narrow gauge railroad	Existing pier and barge loads	Same as E
G.	Same as A	Same as B	Same as F	Same as E
H.	Same as A, but containerization; conveyor	Same as A	Special high-land pier	Ro-Ro automated ship
I.	All products loaded on lift unit frame (LUF) flats	N. of Sequalitchew Creek road to dock; convential cut and fill	Ro-Ro ramp, loading platform, 3 breasting dolphins	Ro-Ro ship; 4 ships
J.	Same as I	Same as I, except south of Creek	Same as I	Same as I
K.	Same as I	Road to top of bluff; move down bluff by inclined elevation; road to dock under railroad	Same as I	Same as I

Design	Terminal	Transport	Dock	Ship
L.	Same as I	Same as I, but roadway elevated	Same as I	Same as I
M.	Same as I	Same as I, but road built using reinforced earth construction	Same as I	Same as I
N.	Same as I	Same as M	Same as I, but additional platform to accommodate lift on/lift off loading	Same as I
O.	Gantry/LUF	LUF elevator	Lo-Lo/Ro-Ro pier	Combination Ro-Ro/open hatch bulk carrier
P.	Elevating transfer vehicle	1-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Open hatch bulk carrier
Q.	Gantry/railroad	1-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P
R.	Elevating transfer vehicle	2-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P
S.	Elevating transfer vehicle	Inclined rail conveyor	Stub end railroad on bulk loading pier	Same as P
T.	Gantry/railroad	2-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P
U.	Gantry/railroad	Inclined rail conveyor	Stub end railroad on bulk loading pier	Same as P
V.	Elevating transfer vehicle	2-track railroad tunnel	Loop railroad on bulk loading pier	Same as P
W.	Gantry/railroad	2-track railroad tunnel	Loop railroad on bulk loading pier	Same as P
X.	First-in/first-out conveyor	1-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P

Design	Terminal	Transport	Dock	Ship
Y.	First-in/first-out conveyor	2-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P
Z.	First-in/first-out conveyor	Staged barge lifts	Barge facility	Sea-bee barge carrier
AA.	First-in/first-out conveyor	Inclined rail conveyor	Stub end railroad on bulk loading pier	Same as P
BB.	Fork lifts/ gantry/railroad	1-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P
CC.	First-in/first-out conveyor	2-track railroad tunnel	Loop railroad on bulk loading pier	Same as P
DD.	Barge storage on marine railway	Staged barge lifts	Barge facility	Sea-bee barge carrier
EE.	All rail	1-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P
FF.	All rail	1-track railroad down Sequalitchew Creek	Loop railroad on bulk loading pier	Same as P
GG.	All rail	Inclined rail conveyor	Stub end railroad on bulk loading pier	Same as P
HH.	All rail	2-track railroad tunnel	Loop railroad on bulk loading pier	Same as P
II.	Lineal development; centralized "conveyor" system; extensive use of space	Note a	Note b	Note c
JJ.	Intensive use of space; good site integration; decentralized conveyor	Note a	Note b	Note c

Design	Terminal	Transport	Dock	Ship
KK	Parallel linear development; intensive use of space	Note a	Note b	Note c

Note a: Several systems were mentioned; however, none were linked with a specific terminal alternative. Mechanical elements included one or two chain driven slat conveyors, guideway system with two carts, chain or tractor driven, trolley system with slung loads, cable hoist system, cable car system, funicular rail system, and gravity roller with drag chain. Ground level, elevated, and tunnel structures were considered.

Note b: Alternative pier structures evaluated included solid structures, conventional piled structures, concrete framed structures, jackup platforms supported on a few large legs, and template structures erected by floating equipment, but supported by many piles.

Note c: Ship types considered, but not limited to other elements, included conventional and open hatch bulk carriers, container ships, tug-barge systems, Sea-bee and Lash barge-type ships.

TABLE N-5

ENVIRONMENTAL IMPACT OF ALTERNATIVES
FOR UPLAND DEVELOPMENT (TERMINAL SITE)

Alternative	1	2	3	4	5	6
Total Area (Acres)	200	200	275	210	340	430
Proximity to Bluff (Feet)	750	1200	2000	3600	2300	250
Proximity to Creek (Feet)	380	280	230	250	110	350
Impervious Area (Acres)	138	100	130	45	76	36+?
Topographic Change (Million cu. yd. earth moved)	§e	None	7-10	7-10	7-10	None
Potental for Groundwater Change (Quantity & flow pattern)	Yes	Yes	Yes	No	Maybe	Maybe
Surface Water Outfall (Type)	Treated chlorinated waste to Sound	Treated, chlorinated waste to Sound	*	No (Gravel ditch drywell)	No (Gravel ditch, drywell)	Treated runoff and treated sanitary waste to Sound

*Method by which storm runoff would be handled was not specified.

TABLE N-6

TERMINAL SITE DESIGNS

ALTERNATIVES

	1	2	3	4	5	6	7*
Total Area Disturbed	L	L	L	L	M	H	L
Groundwater Flow & Quantity	M	H	M	O	L	L	M
Aesthetics	L	L	L	L	L	H	L
Topographic Change	L	H	L	M	H	L	L
Cultural Resources	L	L	M	M	M	L	M

* Proposed Alternative Site Configuration

H = Highly adverse impacts
M = Moderately adverse impacts
L = Low impacts
D = Neutral

TABLE N-7

ENVIRONMENTAL IMPACT OF TRANSPORT SYSTEM ALTERNATIVES

Alternative	1	2	3	4	5	6
Area Disrupted (Acres)	?	10	10	?	?	?
Amt. Earth Moved (Million cu. yd.)	?	1.5	0.10	0.12	0.12	?
Proximity to Sequalitchew Creek ravine (feet)	300	300	In ravine (50 ft. from Creek)	1425	1425	90
Change in Surface Contour	None	None	Moderate (Creek ravine)	Moderate (bluff)	Moderate (Bluff)	None
Barrier to animal movement (location)	None	None	Yes (ravine)	Yes (bluff)	Yes (bluff)	None
Water Quality Sequalitchew Creek)	No impact	No impact	Moderate adverse impact	No impact	No impact	No impact
Noise (Operational)	Slight metal wheel rail cars	Slight	Moderate rubber tired veh., i.e. Eng.	Moderate metal wheel	3 Moderate rail carts	2 Slight rubber tired tow carts
Use of Potential Energy	Partial	Partial	No	Partial	Partial	Partial
Safety Slope (%)	24	Vertical	5	40	40	18
Aesthetics (Adverse impact after revegetation)	None	None	Moderate	Moderately Severe	Moderately Severe	Severe
Light and Glare impact	None	None	Moderate	None	None	Moderate

TABLE N-8

ACCESS MODE

ALTERNATIVES

	1	2	3*	4	5	6	7	8	9
Total Area Disturbed	L	L	L	L	L	L	L	M	L
Topographic Change	0	0	M	M	M	0	M	M	L
Proximity to Creek with Potential W.Q. Impact	L	L	H	0	0	M	0	0	0
Barrier to Animal Movement	0	0	H	M	M	0	M	M	M
Noise	L	L	M	M	M	L	M	M	M
Energy	M	M	H	M	M	M	H	H	M
Safety	M	M	L	M	M	M	L	L	M
Aesthetics	0	0	M	H	H	H	M	H	H
Light and Glare	0	0	M	0	0	M	M	M	M

* Proposed Access Mode

H = Highly adverse impact
M = Moderately adverse impact
L = Low Impact
0 = Neutral

TABLE N-9

ENVIRONMENTAL IMPACT OF DOCK ALTERNATIVES

Alternative	1	2	3	4	5	6
Seismic Hazards	None	None	None	Maybe	Maybe	None
Visible Dock Mounted Cranes	None	None	None	None	None	Yes
Pier Size: length (feet)	700	0	1000	1300	1300	840
Surface Area: (square feet)	95000	0	47000	91000	91000	104000
Distance from Shore (feet)	620	225	400	500	500	840
Vehicles Operating on Dock	Rubber tired tractor	None	LUF tractors	Side arm tractor	Side arm tractor	None
Construction Dredging (Acres)	0	1.5	0	0	0	0
Access for Construction	From water	From upland and water	Road	?	?	From water
Aesthetics of Shoreline	Slight impact	Improvement	Moderate Impact	Moderate Impact	Moderate Impact	Severe Impact

TABLE N-10

ENVIRONMENTAL IMPACT OF SHIP ALTERNATIVES

Alternative	1	2	3	4	5	6
Vessel Size						
Length (Feet)	760	815	846	880	880	860
Weight (DWT)	11500	47000	67000	67000	70000	
Speed (knots)	17	14	17	16	16	16
Trips/yr.	38	45	44	27	27	29
Number of Ships	4	5 tugs 6 barges	4	3	3	3

TABLE N-11

DOCK ALTERNATIVES

	1	2	3	4	5	6	7*	8
Seismic Hazards	0	0	0	L	L	0	0	L
Aesthetics	L	0	M	M	M	H	M	M
Size	H	0	M	H	H	H	H	H
Dredging	0	M	0	0	0	0	0	0
Vehicles on Dock	M	0	L	M	M	0	M	M
Proximity to Delta	M	0	M	M	M	L	L	M

* Proposed Dock

H = Highly adverse impact
M = Moderately adverse impact
L = Low impact
0 = Neutral

TABLE N-12

SHIP ALTERNATIVES

	1	2	3	4	5	6
Vessel Size	M	M	M	H	H	H
Trips/Year	M	M	M	L	L	L
Speed	M	M	M	M	M	M

H = Highly adverse impact
M = Moderately adverse impact
L = Low impact
0 = Neutral

APPENDIX O

LETTERS CONCERNING THE AVAILABILITY OF ALTERNATIVES

October 17, 1978

The Honorable John G. Iafrati
Mayor, City of Dupont
P.O. Box 159
Dupont, Washington 98327

Re: Proposed Weyerhaeuser Export Facility at Dupont

Dear Mayor Iafrati:

In view of comments made on the draft EIS on this proposal, as well as statements which have appeared in the press. I would like to amplify the Port of Tacoma's previously expressed position on this project.

The Port of Tacoma is unable to accommodate Weyerhaeuser's proposed export terminal at its Commencement Bay facilities for several reasons. First, too much land would have to be dedicated to this single-purpose use. The Port does not possess a contiguous tract of sufficient size, and construction of such a project on Port property would require an uneconomic use of several parcels separated by public roads and other rights-of-way. Second, the Port's policy is to diversify the commodities it handles, so that the community will not be economically dependent on a single industry and vulnerable to cyclical changes or depressed periods in its traffic. For this reason, the Port has made strenuous and succcessful efforts in recent years to attract container, automobile, and other traffic not dependent on the wood products' industry. To devote a major new port terminal to forest products only would be inconsistent with this policy.

Finally, the Port views the Weyerhaeuser Dupont terminal as supplementary to the Port, rather than competitive with it. The terminal will handle an export commodity for which Port facilities will not be available, but the same vessels returning to Puget Sound may well bring in other cargoes which will be discharged at the Port. We understand the Weyerhaeuser terminal is to be strictly for export of forest products and will be unsuitable for off-loading containers, etc., should it be practicable to back-haul them on these ships.

For the foregoing reasons, the Port of Tacoma reiterates its support of the proposed Weyerhaeuser terminal at the Dupont site.

Cordially,

Richard Dale Smith

RICHARD DALE SMITH
Executive Director

RDS/ss

October 12, 1978

Mr. Steve Fusco
URS Company
4th & Vine Building
Seattle, Washington 98121

Dear Steve:

Subject: Weyerhaeuser-DuPont Draft EIS

I have been asked to elaborate on the Port of Tacoma's position regarding future development of our land for multiple cargo berths and diversified industrial clients.

I have stated in previous correspondence that the Port of Tacoma is not a viable alternate site for the Weyerhaeuser Export Facility. The policy of the Port of Tacoma is to develop our waterfront lands with multiple purpose cargo wharves, capable of handling high value general cargoes as well as automobiles, bulk cargoes or containers. As this implies, we are not particularly interested in attracting a single user forest products shipper.

Associated with the aforementioned policy is the Port's position relative to development of our non-waterfront lands. We are encouraging labor intensive industrial clients to locate on these lands which would also be users of our waterfront facilities. Our attempt is to attract diversified tenants with high employment needs. Again, this policy implies that we are not particularly interested in a single user forest products shipper.

I trust that this makes clear the Port of Tacoma's position relative to this matter. We support the Weyerhaeuser Corporation's proposed use of the DuPont site for their export facility.

Cordially,

GARY KUCINSKI, Director
Planning and Research

GK/im

P.O. BOX 1837 TACOMA, WASHINGTON 98401 • TELEPHONE (206) 383-5841 • TWX 910-441-2646 • TELEX 32-7473

HUGH WILD

(NO ADDRESS GIVEN)

Representing: PORT OF TACOMA

One of the questions that has been asked here tonight concerning the Weyerhaeuser development is, "Why doesn't Weyerhaeuser establish their new assembly and export facility on Port of Tacoma lands and use Port Terminals?"

The Port has studied Weyerhaeuser's requirements for acreage for their new export center. The Port is, of course, most interested in trade development and industrial development in our county and state. This creates jobs and payrolls. In fact, the Port is charged by State of Washington law with trade and industrial development so as to provide jobs for the citizens of Pierce County. Further, expanding trade is one of the vital businesses of our state and nation.

The Port does not have the space to accommodate this development. The Port's remaining acres are scattered throughout the port area. This facility would use up all of these acres and more and prevent diversification which the Port considers essential. The Port's planned use for its few remaining acres is to assist local companies to grow and to diversify by finding new companies to create new jobs and new trade. New jobs and payrolls and new trade are vital to the well being of our country, our state, our nation, and, especially, to our people.

January 19, 1978

Mr. Steve Fusco
U. R. S. Company
4th & Vine Building
Seattle, Washington 98121

Dear Mr. Fusco:

We have reviewed the alternative sites evaluation document as forwarded to you by the Weyerhaeuser Company.

The statements made therein appraising the Port of Tacoma as a potential site for Weyerhaeuser's Export Facility are accurate and do reflect the position of the Port.

Sincerely,

D. L. Mosman
Deputy Executive Director

DLM/GK/slm

PORT of TACOMA U.S.A.

P.O. BOX 1837, TACOMA, WASHINGTON 98401 • TELEPHONE (206) 383-5841 • TWX 910-441-3646 • TELEX 32-

JUN 13 1980

URS [illegible]

June 11, 1980

Mr. Paul Korsmo
Environmental Scientist
URS Company
Fourth & Vine Building
Seattle WA 98121

RE: Your letter of June 6, 1980 to William Kittrell

Dear Mr. Korsmo:

The Port of Tacoma's prior testimony in the Hearing process for the environmental impact statement for Weyerhaeuser's Dupont facility stated that the Port of Tacoma did not have the capability to meet Weyerhaeuser's requirements. Following a survey by our engineering staff in cooperation with Weyerhaeuser's staff, it was concluded that the Dupont facility would be more suitable for Weyerhaeuser than the Port of Tacoma.

The Port's remaining acreages, which are not developed, are dispersed throughout the Port area. Of greater importance is that the Port is attempting to diversify its industrial base and is also attempting to diversify its remaining terminal areas among several steamship companies which call on Ports throughout the world. This will provide the worldwide service so sorely needed by our Pierce County business firms which export/import.

The answer to your specific questions are as follows:

1. Depending upon location in each waterway, draft for the Blair Waterway is -35' to -45', and the draft for the Sitcum is between -35' to -50'. Maintenance dredging is accomplished at ten-year intervals.

2. The Port is heavily involved in the handling of logs and wood products.

3. The Port can accept a 1000' dock.

4. There are not 200 acres with direct access to a forty-foot draft dock. There are 800 acres in various locations around the waterways as indicated on the attached drawing. The two largest parcels are 115 acres and 125 acres.

PORT of TACOMA U.S.A.

P.O. BOX 1837, TACOMA, WASHINGTON 98401 • TELEPHONE (206) 383-5841 • TWX 910-441-2646 • TELEX 32-7473

5. Access to the Port of Tacoma by truck and rail is excellent except for the additional handling time required by the Union Pacific and the Burlington Northern railroads to process cars through the Belt Line Railroad owned by the City of Tacoma.

From our understanding of Weyerhaeuser plans and requirements, we would assess the Port's ability to accommodate this facility as marginal.

The Port's long-range development plans are based on studies of the greatest economic benefit to the community which the Port supports. These studies indicate that the Port should not be tied to a single industry, -- namely the timber-wood products, but should have a broad base of diversified products and industries with shipping to and from a large number of Pacific Rim countries, and other countries around the world.

Sincerely,

HUGH WILD
Senior Director
Industrial Development
& Relations

sjb

Weyerhaeuser Company
Tacoma, Washington 98401

May 15, 1980

Commander, 9th Infantry Division
and Fort Lewis
United States Army
AFZH-FEPSD-R
Fort Lewis WA 98433

Dear General:

As you are aware, Weyerhaeuser Company plans to build an export facility on our property at DuPont, Washington, near Fort Lewis. Our proposal includes a new dock on Puget Sound near the mouth of Sequalitchew Creek, replacing the existing DuPont Company powder wharf.

The Army Corps of Engineers, Seattle District, is currently preparing a Final Environmental Impact Statement with assistance from URS Company of Seattle. This letter concerns one of the issues the Corps has asked URS Company and Weyerhaeuser to investigate. The issue is the consideration of the Solo Point area as an alternative site for the Weyerhaeuser dock. I have enclosed an engineering report which outlines the physical aspects of using the Solo Point site (compared to our preferred location at Sequalitchew Creek).

We are requesting Fort Lewis' reaction to the possibility of Solo Point as an alternative dock site for Weyerhaeuser, specifically, whether or not Fort Lewis would consider this an appropriate and compatible use of the area.

Your staff already has a copy of the Corps' Draft EIS, which describes our proposed export facility construction and operation. Should you have questions about our export facility or this request, please do not hesitate to call me (924-2289).

Sincerely,

R. H. Lucas
Vice President
Special Projects

RHL:sel25/529/d1

Enclosure

cc: Steve Dice, Corps of Engineers
Sylvia Burges, URS Company

DEPARTMENT OF THE ARMY
HEADQUARTERS, 9TH INFANTRY DIVISION AND FORT LEWIS
Fort Lewis, Washington 98433

AFZH-FEPSD-R

12 JUN 1980

Mr. R. H. Lucas
Vice President
Special Projects
Weyerhaeuser Company
Tacoma, Washington 98477

Dear Mr. Lucas:

This correspondence is in reply to your May 15th letter concerning the possibility of the Weyerhaeuser Company relocating their proposed new dock construction to our Solo Point Area.

The Solo Point Area is our only usable access to Puget Sound for the conduct of military training exercises. Additionally, this area is extensively used for recreational purposes. The construction and operation of a large commercial dock in this area would not be appropriate and compatible with our military activities. Therefore, we cannot concur and approve leasing this real property to the Weyerhaeuser Company.

Sincerely,

PATRICK A. STEEL
Colonel, Infantry
Deputy Installation Commander

APPENDIX P

RESULTS FROM A COMMUNITY SURVEY

APPENDIX P

RESULTS FROM A COMMUNITY SURVEY

A survey or residents of the immediate area and Thurston-Pierce County region was conducted by the League of Women Voters in August, 1977. The survey was conducted to learn how much people knew about the proposed project and what effects they felt it would have upon them and their community. Most of those surveyed expected that the project would not affect them. Half of those surveyed in Dupont expected no effect; of those expecting an impact, 31 percent thought it would benefit DuPont while 6 percent expected adverse effects on the community. Only 29 percent of the Steilacoom residents surveyed expected no impact; those expecting impacts were evenly divided between adverse and beneficial effects. Of those in the Olympia area 42 percent expected an impact; half expected benefits, half expected adverse effects. In Tacoma, 38 percent expected no impact and 32 percent expected a positive effect; 12 percent expected an adverse impact to the community. Comments reflected the concern about jobs; many who felt that the project would have a beneficial impact on their community cited the increase in jobs.

A large proportion of those sampled in DuPont and Steilacoom use small boats in the south Puget Sound area. Frequent use (at least three times per month) is lower among Tacoma residents (12 percent) than among others surveyed (20 to 22 percent). Use of the Nisqually Delta increases with the proximity to the Delta of the area sampled; 29 percent of those in DuPont use the area occasionally. Use of the DuPont site beach also increases with proximity; 31 percent of those living in DuPont use the area. Cited uses of the Delta include boating, canoeing, fishing, hiking, visiting other farmers, and nature study. Uses mentioned for the DuPont site included picnicking, beach activities (sunbathing, clam digging, beach combing), and fishing.

In each area, some respondents were concerned about possible environmental damage. Several expressed a general concern for maintaining a "natural" environment. Others were concerned about impacts on wildlife or disturbance of the Delta. Possible emissions degrading air or water quality were cited by several people. Other environmental concerns related to noise, erosion and silt. Several respondents in each area felt that the facility was unnecessary (use of Ports of Olympia or Tacoma) or should be placed elsewhere. Several in Tacoma opposed export of the lumber. Some objected to large ships coming that far into the Sound. Others feared increased traffic congestion, particularly on the freeway. Other traffic-related concerns included an objection to changing the freeway access, concern about trucks or access route in the village (DuPont). A DuPont respondent objected to the possibility of tract housing. Other concerns included changes in beach access, population growth, and resulting overcrowding in the schools, and increases in taxes or property values. One person felt it would increase "interference by environmental administrators" who tell everyone what they can do on their own property. Some cited positive effects. Many felt that it would increase jobs and boost the local economy. Several cited an increase in the local tax base. Several people made comments [illegible] that they believed Weyerhaeuser would do a good, environmentally

sensitive job; one indicated some distrust for the company. Many more people were eager to gain the additional jobs and a boost in the local economy than were concerned about the environmental or other possible adverse impacts.

APPENDIX Q

Appears Now As Section 9.7
of Volume I