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Columbia River Salmon Flow Measures OPTIONS ANALYSIS / EIS Appendices

US Army Corps of Engineers

Bonneville Power Administration

Bureau of Reclamation

January 1992

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Appendices

APPENDIX A

PROJECT OPERATION CHARACTERISTICS

Table A-1. Spill plan for 1991.

Project	Period	Spill Hours Per Day	Spill Average	Percentages Range ^{1/}
Lower Monumental	4/15 - 5/31	12	70	65 - 75
	6/1 - 7/22	12	70	65 - 75
Ice Harbor	11/15 - 5/31	12	25	15 - 35
	6/1 - 7/22	12	25	15 - 35
John Day	6/7 - 8/22	10	20	15 - 25
The Dalles ^{2/}	5/1 - 6/6	24	10	5 - 15
	6/7 - 8/22	24	5	0 - 10

1/ Proportion of total flow to be spilled during prescribed hours.

2/ Spills in both periods can be shaped on a seasonal basis to vary by 5 percent of the daily spill percentage.

Figure A-1.

Little Goose Pool Elevations

April 15 to August 15, 1988

Figure A-2.

Lower Monumental Pool Elevations

April 15 to August 15, 1988

Figure A-3.

Ice Harbor Pool Elevations

April 15 to August 15, 1988

Figure A-4.

McNary Pool Elevations April 15 to August 15, 1988

Figure A-5.

John Day Pool Elevations

April 15 to August 15, 1988 ^{1/}

^{1/} Normal range from November through May is 260 to 265.

Figure A-6.

The Dalles Pool Elevations April 15 to August 15, 1988

Figure A-7.

Bonneville Pool Elevations

April 15 to August 15, 1988

Figure A-8.

APPENDIX B

WATER QUALITY

Table B-1. Water quality data for Columbia River mainstem at Vernita Bridge, near Priest Rapids Dam, Washington (national stream quality accounting network station).

COLUMBIA RIVER MAIN STEM

12472900 COLUMBIA RIVER AT VERNITA BRIDGE, NEAR PRIEST RAPIDS DAM, WA
(National stream quality accounting network station)

LOCATION.--Lat 46°38'34", long 119°43'54", in NW 1/4 SE 1/4 sec.6, T.13 N., R.25 E., Grant County, Hydrologic Unit 17020016, at State Highway 24 Vernita Bridge crossing, 9.0 mi downstream from Priest Rapids Dam, and at mile 388.1.

DRAINAGE AREA.--96,000 mi², approximately.

PERIOD OF RECORD.--Water years 1962-63, 1972, 1974 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: July 1974 to September 1980.

REMARKS.--October 1971 to September 1972, at site 6.4 mi upstream, published as 12472800 "below Priest Rapids Dam." Prior to October 1971 published as 12472800 "at Vernita Ferry."

WATER QUALITY DATA, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE WATER (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAI, UM-MF (COLS./100 ML)	STREP-TOCOCCI FECAI, KF AGAR (COLS. PER 100 ML)	HARD-NESS (MG/L AS CaCO3)	HARD-NESS NONCARB (MG/L AS CaCO3)
NOV 08...	0955	66300	123	8.1	13.0	0.9	11.0	106	K3	120	62	8
JAN 11...	0920	148000	150	7.9	3.5	0.3	12.4	93	K2	K1	73	8
MAR 08...	1050	72400	149	8.1	2.5	2.0	13.0	96	<1	<1	74	10
MAY 09...	1105	133000	139	8.1*	11.0	2.4	14.0	130	<1	K9	69	9
JUL 18...	1025	47700	127	8.2	18.0	1.0	10.2	109	<1	K15	59	8
SEP 12...	1115	39700	132	8.3	19.0	0.9	10.1	110	--	--	62	5

DATE	CALCIUM DIS-SOLVED (MG/L AS Ca)	MAGNE-SIUM, DIS-SOLVED (MG/L AS Mg)	SODIUM, DIS-SOLVED (MG/L AS Na)	SODIUM PERCENT	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY WATER DIS IT FIELD (MG/L AS CaCO3)	BICAR-BONATE WATER DIS IT FIELD (MG/L AS HCO3)	CAR-BONATE WATER DIS IT FIELD (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS Cl)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
NOV 08...	18	4.2	2.1	7	0.1	0.8	53	65	0	12	1.0	0.1
JAN 11...	21	5.0	2.1	6	0.1	0.9	61	74	0	14	1.3	0.1
MAR 08...	21	5.2	2.2	6	0.1	0.9	64	78	0	13	1.0	0.1
MAY 09...	20	4.7	2.6	7	0.1	1.0	59	--	--	12	0.9	0.2
JUL 18...	17	4.1	2.4	8	0.1	0.8	52	63	0	9.0	1.6	0.1
SEP 12...	18	4.2	2.4	8	0.1	0.7	53	65	0	10	1.0	0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHOROUS TOTAL (MG/L AS P)	PHOS-PHOROUS DIS-SOLVED (MG/L AS P)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P)
NOV 08...	4.2	79	76	0.11	14100	<0.01	0.14	0.02	<0.2	0.03	0.03	0.02
JAN 11...	4.9	95	89	0.13	38000	<0.01	0.15	0.02	0.2	0.04	0.04	0.03
MAR 08...	4.8	86	87	0.12	16800	<0.01	0.13	<0.01	0.4	0.06	0.03	0.02
MAY 09...	4.9	80	82	0.11	28700	<0.01	<0.10	<0.01	0.4	0.03	0.02	<0.01
JUL 18...	4.5	69	71	0.09	8890	<0.01	<0.10	0.04	<0.2	0.02	0.01	0.01
SEP 12...	4.3	80	75	0.11	8580	<0.01	<0.10	0.01	0.3	0.01	0.01	0.01

K - Results based on colony count outside the acceptable range (non-ideal colony count).
* - Laboratory value.

Table B-1. Water quality data for Columbia River mainstem at Vernita Bridge, Near Priest Rapids Dam, Washington (national stream quality accounting network station).

COLUMBIA RIVER MAIN STEM												
12472906 COLUMBIA RIVER AT VERNITA BRIDGE, NEAR PRIEST RAPIDS DAM, WA--Continued												
WATER QUALITY DATA, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989												
DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
NOV 08...	40	1	22	1	<1	<1	<3	2	65	<5	7	5
JAN 11...	--	--	--	--	--	--	--	--	--	--	--	--
MAR 08...	<10	<1	27	<0.5	<1	<1	<3	2	4	<5	<4	4
MAY 09...	10	1	37	<0.5	2	<1	<3	3	9	<1	<4	<1
JUL 18...	<10	1	28	<0.5	<1	<1	<3	3	9	1	<4	<1
SEP 12...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
NOV 08...	<0.1	<10	<1	<1	<1	97	<6	7	--	2	358
JAN 11...	--	--	--	--	--	--	--	--	1.8	1	400
MAR 08...	<0.1	<10	5	<1	<1	110	<6	10	1.6	2	...
MAY 09...	<0.1	<10	5	<1	<1	86	<6	5	1.9	6	2150
JUL 18...	<0.1	<10	1	<1	<1	86	<6	4	2.1	3	386
SEP 12...	--	--	--	--	--	--	--	--	1.8	3	322

Table B-2. Water quality data from the Columbia River mainstem at Richland, Washington.

COLUMBIA RIVER MAIN STEM

12473520 COLUMBIA RIVER AT RICHLAND, WA

LOCATION.--Lat 46°18'46", long 119°15'28", in NW 1/4 NW 1/4 sec.36, T.10 N., R.28 E., Benton County, Hydrologic Unit 17020016, at city of Richland pumping plant, 4.8 mi upstream from Yakima River, and at mile 340.2.

DRAINAGE AREA.--96,900 mi², approximately.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: July 1974 to current year. Unpublished records of stage at site 2.3 miles downstream are available in files of the Geological Survey, and U.S. Army Corps of Engineers.

INSTRUMENTATION.--Water-temperature recorder with probe located at city of Richland pumping-plant pier near right bank from July 1974 until January 1977. Since January 1977, recorder probe located 200 ft streamward from plant.

REMARKS.--Water temperatures as recorded for the period July 1974 to January 1977 did not represent mean stream temperatures (see previous state reports for correlation between thermal load measurements and recorded temperatures). Temperature probe, relocated January 1977, represents both horizontal and vertical cross section of the river.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: Maximum, 22.0°C July 21, Aug. 4, 5, 1985; minimum, 0.0°C Feb. 3, 6-9, 1989.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 21.0°C Aug. 6-8; minimum, 0.0°C Feb. 3, 6-9.

WATER QUALITY DATA, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM)	PH (STANDARD UNITS)	TEMPERATURE WATER (DEG C)	TURBIDITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER CENT SATURATION)	COLIFORM, FECAL, (PER UM-MF (COLS./100 ML)	STREPTOCOCCI, FECAL, (PER COLS. PER 100 ML)	HARDNESS (MG/L AS CaCO3)
NOV 09...	1220	128	7.9	12.5	0.8	10.6	101	K7	160	62
MAR 14...	0945	155	8.0	3.0	1.7	14.2	106	<1	K4	74
MAY 10...	1105	140	8.1*	11.0	4.0	13.0	121	K10	28	69
JUL 19...	1050	136	8.1	18.5	2.0	9.7	105	K13	110	62

DATE	HARDNESS NONCARB (MG/L AS CaCO3)	CALCIUM DIS-SOLVED (MG/L AS Ca)	MAGNESIUM, DIS-SOLVED (MG/L AS Mg)	ALKALINITY WATER DIS IT FIELD (MG/L AS CaCO3)	BICARBONATE WATER DIS IT FIELD (MG/L AS HCO3)	CARBONATE WATER DIS IT FIELD (MG/L AS CO3)	CHLORIDE, DIS-SOLVED (MG/L AS CL)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N)
NOV 09...	10	18	4.1	48	59	0	3.7	74	<0.01
MAR 14...	9	21	5.3	66	80	0	1.2	84	<0.01
MAY 10...	9	20	4.7	58	--	--	1.5	75	<0.01
JUL 19...	8	18	4.1	50	62	0	1.3	66	<0.01

DATE	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHOROUS TOTAL (MG/L AS P)	PHOSPHOROUS ORTHO, DIS-SOLVED (MG/L AS P)	CHROMIUM, DIS-SOLVED (UG/L AS CR)	IRON, DIS-SOLVED (UG/L AS FE)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	SEDIMENT, SUSPENDED (MG/L)
NOV 09...	0.11	0.04	0.3	0.03	0.02	<1	4	--	4
MAR 14...	0.13	0.01	<0.2	0.02	0.03	<1	4	1.3	5
MAY 10...	<0.10	<0.01	<0.2	0.05	<0.01	<1	6	1.8	20
JUL 19...	<0.10	0.04	<0.2	0.02	0.01	<1	5	2.4	6

K - Results based on colony count outside the acceptable range (non-ideal colony count).

* - Laboratory value.

Table B-3. Water quality records from the lower Columbia River Basin at Warrendale, Page 1 of 2 Oregon.

LOWER COLUMBIA RIVER BASIN

14128910 COLUMBIA RIVER AT WARRENDALE, OR

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1975 to current year.

WATER TEMPERATURE: October 1975 to current year.

INSTRUMENTATION.--Specific conductance and temperature recorders since October 1975.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 244 microsiemens Jan. 7, 1988; minimum, 95 microsiemens June 26, 27, 1982.

WATER TEMPERATURE: Maximum, 22.5°C Aug. 17, 18, 1977, Aug. 11, 1980; minimum recorded, 0.0°C many days in January and February, 1979.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 228 microsiemens Mar. 31; minimum recorded, 103 microsiemens June 21-23, but may have been less during period of missing record June 23 to Aug. 28.

WATER TEMPERATURE: Maximum recorded, 21.5°C Aug. 29 to Sept. 1, but may have been higher during period of missing record June 23 to Aug. 28; minimum, 1.5°C Feb. 11.

WATER QUALITY DATA, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE WATER (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)	STREP-TOCOCCI KF AGAR (COLS. PER 100 ML)	HARD-NESS (MG/L AS CaCO3)	HARD-NESS NONCARB (MG/L AS CaCO3)	
NOV 29...	1220	E134000	151	7.8	9.0	3.0	11.0	94	K2	--	63	4	
MAR 21...	1135	E169000	196	8.0	6.5	12	12.9	104	K7	K7	80	0	
MAY 16...	1215	E275000	142	8.2	13.5	8.1	11.4	--	--	K2	59	2	
SEP 05...	1130	E106000	145	7.8	20.0	1.1	8.3	91	K3	K22	59	1	
DATE		CALCIUM DIS-SOLVED (MG/L AS Ca)	MAGNE-SIUM, DIS-SOLVED (MG/L AS Mg)	SODIUM, DIS-SOLVED (MG/L AS Na)	SODIUM PERCENT	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY WATER DIS IT FIELD (MG/L AS CaCO3)	BICAR-BONATE WATER DIS IT FIELD (MG/L AS HCO3)	CAR-BONATE WATER DIS IT FIELD (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS Cl)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
NOV 29...	17		4.9	6.4	18	0.4	1.2	57	70	0	14	3.3	0.2
MAR 21...	21		6.6	9.0	19	0.5	1.9	78	95	0	18	4.8	0.2
MAY 16...	16		4.6	6.1	18	0.4	1.4	56	68	0	12	2.6	0.2
SEP 05...	16		4.6	5.6	17	0.3	1.1	58	70	0	10	2.7	0.2
DATE		SILICA, DIS-SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORG-ANIC TOTAL (MG/L AS N)	PHOS-PHOROUS ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHOROUS DIS-SOLVED (MG/L AS P)	PHOS-PHOROUS TOTAL (MG/L AS P)	
NOV 29...		8.7	97	93	E35100	E0.13	<0.01	0.28	0.3	0.03	0.03	0.05	
MAR 21...	15		133	128	E60700	E0.18	0.03	0.41	<0.2	0.07	0.04	0.06	
MAY 16...	12		77	90	E57200	E0.10	0.03	0.12	0.4	0.01	0.02	0.03	
SEP 05...		6.6	89	82	E25500	E0.12	0.03	<0.10	<0.2	0.02	<0.01	0.01	

E - Estimated value.

K - Results based on colony count outside acceptable range (non-ideal colony count).

Table B-3. Water quality records from the lower Columbia River Basin at Warrendale, Oregon.

LOWER COLUMBIA RIVER												
14128910 COLUMBIA RIVER AT WARRENDALE, OR--Continued												
WATER QUALITY DATA, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989												
DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
NOV 29...	<10	1	23	<0.5	<1	1	<3	5	13	<5	<4	2
MAR 21...	430	2	32	<0.5	<1	2	<3	11	370	9	4	26
MAY 16...	40	1	22	<0.5	<1	1	<3	3	47	1	<4	1
SEP 05...	<10	<1	24	<0.5	<1	1	<3	5	7	<1	<4	1
DATE	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. FINER THAN .062 MM	
NOV 29...	<0.1	<10	8	<1	1	100	<6	8	7	E2530	98	
MAR 21...	<0.1	<10	6	<1	<1	120	<6	13	19	E8670	98	
MAY 16...	<0.1	<10	<1	<1	<1	82	<6	<3	25	E18600	95	
SEP 05...	<0.1	<10	<1	<1	<1	89	<6	10	6	E1720	98	

E - Estimated value.

Table B-4. Water quality records from the Snake River mainstem near Anatone, Washington.

Snake River Main Stem

13334300 Snake River Near Anatone, WA-Continued

Water-Quality Records

PERIOD OF RECORD.-Water years 1973 to May 1984, Oct. 1985 to current year.

PERIOD OF DAILY RECORD.-

WATER TEMPERATURES: October 1959 to May 1984, Oct. 1985 to current year.

INSTRUMENTATION.-Temperature recorder since October 1959.

REMARKS.-Daily water temperature data for water year 1985 were missing due to equipment malfunction.

COOPERATION.-Temperature records furnished by U.S. Corps of Engineers.

EXTREMES FOR PERIOD OF DAILY RECORD.-

WATER TEMPERATURES: Maximum (1959-68, 1970-81), 25.5° C, July 15, 1981; minimum, 0.0° C, several days during winter months.

EXTREMES FOR CURRENT PERIOD.-

WATER TEMPERATURES: Maximum, 24.5° C, Aug. 6, 12-13; minimum, 2.0° C, Feb. 14-16.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	18.5	18.0	12.0	11.0	6.0	5.5	3.5	3.5	4.0	3.5	5.5	4.5
2	18.0	17.5	11.0	10.5	5.5	5.0	3.5	3.0	4.0	4.0	5.5	4.5
3	17.5	16.5	11.0	10.5	5.5	5.0	3.5	3.0	4.0	3.5	5.5	5.0
4	17.0	16.0	11.5	10.5	6.0	5.5	3.5	3.5	4.0	3.5	6.0	5.0
5	16.5	16.0	11.0	10.5	6.0	6.0	4.0	3.5	3.5	3.5	6.0	5.5
6	17.0	16.0	10.0	10.0	6.0	6.0	4.0	3.5	3.5	3.0	6.5	5.5
7	17.0	16.0	11.0	10.0	6.0	5.5	4.5	4.0	3.0	3.0	6.5	6.0
8	17.0	16.0	10.5	10.0	6.0	5.5	4.5	4.5	3.0	3.0	7.0	6.0
9	---	---	11.0	10.0	6.0	5.5	5.0	4.5	3.5	3.0	6.5	6.0
10	---	---	11.0	10.5	5.5	5.0	5.0	4.5	4.5	3.5	6.5	6.0
11	---	---	10.5	10.0	5.0	4.5	5.0	4.5	5.0	4.5	6.5	5.5
12	---	---	10.0	10.0	5.5	4.5	4.5	4.5	4.5	3.5	6.0	5.5
13	---	---	10.0	9.0	5.0	5.0	5.0	4.5	3.5	2.5	6.0	5.0
14	---	---	9.0	8.5	5.0	5.0	5.0	5.0	2.5	2.0	6.0	5.5
15	---	---	9.0	8.5	5.0	4.5	5.0	5.0	2.5	2.0	7.5	6.0
16	---	---	9.5	9.0	5.0	4.5	5.5	5.0	2.5	2.0	7.5	6.5
17	---	---	9.0	8.5	5.0	4.5	5.0	4.5	3.0	2.5	7.5	6.5
18	16.0	15.5	9.0	8.5	5.0	4.0	4.5	4.0	3.5	2.5	8.5	7.5
19	16.0	15.5	9.5	9.0	5.0	5.0	4.0	3.5	3.0	2.5	9.0	8.0
20	15.5	15.5	9.5	9.0	5.0	4.5	4.0	3.5	2.5	2.5	9.5	7.5
21	15.5	15.5	9.0	8.5	4.5	4.5	4.0	3.5	3.5	2.5	9.5	8.0
22	15.5	15.0	9.0	8.5	4.5	4.0	4.0	3.0	4.5	3.0	9.0	8.0
23	15.0	14.5	8.5	7.5	4.5	4.0	4.0	4.0	5.0	4.0	8.5	7.5
24	14.5	14.0	7.5	7.0	4.0	4.0	4.0	3.5	5.5	4.5	8.0	6.5
25	14.0	13.5	7.0	7.0	4.0	3.5	3.5	3.5	6.0	5.0	7.5	6.5
26	14.0	13.5	7.0	6.5	3.5	3.5	3.5	3.5	6.0	5.0	8.5	7.0
27	14.0	13.0	6.5	6.0	3.5	3.5	3.5	3.0	5.0	4.5	9.0	7.5
28	13.5	12.5	7.0	6.0	4.0	3.5	3.5	3.0	5.0	4.5	9.0	8.0
29	12.5	12.0	6.5	6.0	4.0	3.5	3.5	3.0	---	---	9.0	8.0
30	12.0	11.5	6.0	5.5	4.0	3.5	3.5	3.5	---	---	9.5	8.5
31	12.5	11.5	---	---	3.5	3.5	3.5	3.5	---	---	10.0	9.0
MONTH	18.5	11.5	12.0	5.5	6.0	3.5	5.5	3.0	6.0	2.0	10.0	4.5

Table B-4. Water quality records from the Snake River mainstem near Anatone, Washington.

SNAKE RIVER MAIN STEM												
13334300 SNAKE RIVER NEAR ANATONE, WA-Continued												
WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990												
DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	11.0	9.5	11.0	9.5	12.5	11.5	21.5	20.0	23.0	22.0	21.5	20.5
2	11.0	10.0	12.0	10.5	13.0	11.5	21.5	19.0	23.0	21.5	22.0	21.0
3	11.0	10.0	13.0	11.5	13.0	12.5	19.0	18.0	23.0	21.5	22.0	21.0
4	11.0	9.5	14.0	12.5	14.0	12.5	19.5	18.0	23.5	22.0	22.5	21.0
5	11.0	9.5	15.0	13.0	14.5	13.0	20.0	19.0	24.0	22.5	23.0	21.5
6	11.0	9.5	15.0	13.5	15.0	14.0	20.0	19.0	24.5	23.0	23.0	22.0
7	12.0	10.0	13.5	11.5	15.0	14.0	20.5	19.0	24.0	23.0	22.5	21.5
8	11.5	10.0	12.0	11.0	15.0	14.0	21.0	19.5	23.5	22.5	22.5	21.5
9	11.0	10.0	12.5	11.0	16.5	14.5	22.0	20.5	23.5	22.5	23.0	21.5
10	11.5	10.0	13.5	12.0	16.0	14.5	23.0	21.0	23.5	23.0	23.5	22.0
11	12.0	10.5	13.5	12.5	14.5	13.5	23.5	21.5	24.0	23.0	23.0	22.0
12	12.5	11.0	14.0	12.5	13.5	13.0	23.0	22.5	24.5	23.0	22.5	21.5
13	12.0	11.5	14.0	13.0	14.5	13.0	23.5	22.0	24.5	23.5	22.0	21.5
14	12.5	11.5	14.0	13.5	14.5	13.5	23.5	22.0	24.0	23.5	22.0	21.0
15	13.5	12.0	13.5	12.5	15.5	14.0	23.5	22.0	23.5	23.0	21.5	20.5
16	14.0	12.5	14.0	12.5	16.0	15.0	24.0	22.5	23.5	22.5	21.0	20.5
17	13.5	12.5	14.5	13.0	16.0	15.0	23.5	22.0	22.5	22.0	21.0	20.0
18	13.5	12.5	14.5	13.5	16.5	14.5	23.5	22.0	22.0	21.5	21.0	20.0
19	13.5	12.0	14.5	13.5	17.5	16.0	23.0	21.5	21.5	20.5	20.5	20.0
20	13.0	12.5	14.0	13.5	18.0	16.5	23.0	22.0	21.0	20.0	20.5	19.5
21	12.5	11.5	15.0	13.0	19.0	17.0	23.5	22.0	20.5	20.0	20.0	19.5
22	12.0	11.5	15.5	14.0	18.5	17.5	23.5	22.0	21.5	20.5	20.0	19.0
23	11.5	11.0	16.0	15.0	19.0	17.0	23.5	22.5	21.5	20.5	20.5	19.5
24	11.5	10.5	15.5	13.5	20.0	18.0	22.5	21.0	21.0	20.5	20.5	19.5
25	11.0	10.0	13.5	12.5	20.0	18.5	21.0	20.5	21.0	20.5	20.5	19.5
26	10.0	9.0	14.5	13.0	20.5	18.5	20.5	20.0	20.5	20.0	20.5	20.0
27	10.0	9.5	14.0	13.5	20.0	18.0	21.5	19.5	20.5	19.5	20.5	19.5
28	9.5	8.5	14.0	13.5	20.5	18.5	22.5	20.5	21.5	20.0	20.5	19.5
29	9.5	8.5	14.0	13.0	21.0	19.0	22.5	21.5	21.5	20.5	20.0	19.5
30	10.5	8.5	13.5	13.0	21.5	19.5	23.0	22.0	21.5	20.5	19.5	19.0
31	---	---	13.0	12.5	---	---	23.0	22.0	21.5	20.5	---	---
MONTH	14.0	8.5	16.0	9.5	21.5	11.5	24.0	18.0	24.5	19.5	23.5	19.0

**Table B-5. Water Quality data from the Snake River basin at Burbank, Washington
(national stream quality accounting network station).**

SNAKE RIVER BASIN

13353200 SNAKE RIVER AT BURBANK, WA
(National stream quality accounting network station)

LOCATION.--Lat 48°12'59", long 119°01'22", in NE 1/4 SW 1/4 sec.35, T.9 N., R.30 E., Franklin County, Hydrologic Unit 17060110, at U.S. Highway 395/410 bridge at Burbank, 2.2 mi upstream from mouth, and 7.5 mi downstream from Ice Harbor Dam.

DRAINAGE AREA.--108,800 mi².

PERIOD OF RECORD.--Water years 1960-69, 1972 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: March 1973 to September 1979.

WATER TEMPERATURE: April 1973 to September 1981.

WATER QUALITY DATA, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND	SPE- CIFIC CON- DUCT- ANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE WATER (DEG C)	TUR- BID- ITY (NTU)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)
DEC 06...	1000	25000	356	8.1	8.5	2.4	11.4	97	K2	K11	120
MAR 22...	1020	80000	312	8.3	5.0	12	12.2	97	K2	K5	120
MAY 31...	0905	75000	75	7.9	12.0	3.9	11.4	107	K2	<1	29
AUG 22...	1115	30000	162	7.9	21.5	3.5	7.0	81	<1	K12	54

DATE	HARD- NESS NONCARB MG/L AS CACO3	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LITY WATER DIS IT FIELD MG/L AS CACO3	BICAR- BONATE WATER DIS IT FIELD MG/L AS HCO3	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3	SULFATE DIS- SOLVED (MG/L AS SO4)
DEC 06...	7	28	13	28	32	1	3.5	114	139	0	48
MAR 22...	11	29	11	23	29	1	3.3	104	127	0	32
MAY 31...	0	8.0	2.1	5.1	27	0.4	1.2	26	32	0	6.0
AUG 22...	0	14	4.6	12	32	0.7	1.8	77	94	0	14

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
DEC 06...	21	0.4	19	225	234	0.31	15200	<0.01	0.57	<0.01	0.3
MAR 22...	13	0.4	26	202	210	0.27	43600	<0.01	1.70	0.05	<0.2
MAY 31...	2.1	0.1	14	57	57	0.08	11500	<0.01	<0.10	0.02	0.5
AUG 22...	6.7	0.3	13	108	113	0.15	8750	0.01	0.12	0.03	<0.2

K - Results based on colony count outside the acceptable range (non-ideal colony count).

**Table B-5. Water quality data from the Snake River basin at Burbank, Washington
(national stream quality accounting network station).**

SNAKE RIVER BASIN											
13353200 SNAKE RIVER AT BURBANK, WA--Continued											
WATER QUALITY DATA, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989											
DATE	PHOS- PHOROUS TOTAL (MG/L AS P)	PHOS- PHOROUS DIS- SOLVED (MG/L AS P)	PHOS- PHOROUS ORTHO, DIS- SOLVED (MG/L AS P)	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)
DEC 06...	0.05	0.05	0.05	<10	4	30	2	1	1	<3	2
MAR 22...	0.10	0.07	0.08	140	3	42	<0.5	<1	<1	<3	1
MAY 31...	0.03	0.02	0.01	50	1	10	<0.5	<1	<1	<3	5
AUG 22...	0.05	0.03	0.02	<10	2	19	<0.5	<1	<1	<3	1
DATE	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)
DEC 06...	27	<5	18	3	<0.1	<10	1	<1	<1	180	8
MAR 22...	120	<5	13	3	<0.1	<10	1	<1	<1	170	<6
MAY 31...	49	<1	<4	2	<0.1	<10	<1	<1	<1	51	<6
AUG 22...	26	<1	6	4	<0.1	<10	<1	<1	<1	93	<6
DATE	ZINC, DIS- SOLVED (UG/L AS ZN)	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L)	URANIUM NATURAL DIS- SOLVED (UG/L AS U)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDE (T/DAY)
DEC 06...	5	2.9	<0.4	4.5	1.5	3.5	1.6	0.04	4.3	4	270
MAR 22...	<3	--	--	--	--	--	--	--	--	13	2810
MAY 31...	4	0.6	<0.4	1.1	0.6	0.9	0.5	0.06	0.2	8	1620
AUG 22...	<3	--	--	--	--	--	--	--	--	9	729

**Table B-6. Water quality data from the Clearwater River basin at Spalding, Idaho
(national stream quality accounting network station).**

CLEARWATER RIVER BASIN

13342500 CLEARWATER RIVER AT SPALDING, ID-Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.—Water years 1959-60, 1968 to current year.

PERIOD OF DAILY RECORD.—

WATER TEMPERATURES: October 1959 to current year.

INSTRUMENTATION.—Temperature recorder since October 1959.

EXTREMES FOR PERIOD OF DAILY RECORD.—

WATER TEMPERATURES: Maximum, 28.0° C Aug. 13, 1963; minimum, 0.0° C on several days during winter months.

EXTREMES FOR CURRENT YEAR.—

WATER TEMPERATURES: Maximum, 25.0° C Aug. 13; minimum, 2.5° C Feb. 14-15.

WATER QUALITY DATA, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND	SPE- CIFIC CON- DUCT- ANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE AIR (DEG C)	TEMPER- ATURE WATER (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 KF AGAR UM-HF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS./ 100 ML)	HARD- NESS TOTAL (MG/L AS CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)
NOV 28...	1230	5220	35	7.6	12.0	3.0	12.8	102	K1	K4	14	4.0
JAN 24...	1000	5670	42	7.5	6.0	2.0	13.1	96	<1	K3	16	4.7
MAR 21...	0930	22400	41	7.6	18.0	6.0	11.8	97	K9	K8	16	4.6
MAY 16...	0800	17500	27	7.7	14.0	7.5	11.6	99	33	31	10	3.1
JUL 18...	0840	5170	31	7.9	25.0	20.0	8.1	92	53	29	11	3.4
SEP 26...	0815	10700	32	7.7	20.0	13.0	9.3	91	K4	110	12	3.5

DATE	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE WATER WH IT FIELD HCO3	CAR- BONATE WATER WH IT FIELD CO3	ALKA- LITY WAT WH TOT IT FIELD CACO3	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)
NOV 28...	0.88	2.2	25	0.60	17	0	14	<1.0	0.40	0.10	11	31
JAN 24...	1.1	2.6	25	0.90	24	0	20	2.0	0.50	0.10	14	34
MAR 21...	0.99	2.2	23	0.70	21	0	18	1.6	0.60	0.20	15	34
MAY 16...	0.60	2.0	28	0.60	16	0	13	<1.0	0.60	<0.10	12	20
JUL 18...	0.62	1.9	26	0.50	18	0	15	<1.0	0.50	<0.10	10	27
SEP 26...	0.73	1.5	21	0.50	19	0	16	<1.0	0.50	<0.10	10	28

DATE	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRITE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS TOTAL (MG/L AS P)	PHOS- PHORUS DIS- SOLVED (MG/L AS P)	PHOS- PHORUS ORTHOPHOSPHATE DIS- SOLVED (MG/L AS P)
NOV 28...	--	--	--	<0.010	<0.10	0.020	0.010	0.60	<0.010	<0.010	<0.010
JAN 24...	38	0.03	521	<0.010	0.12	0.010	<0.010	<0.20	0.010	<0.010	<0.010
MAR 21...	37	0.03	2060	<0.010	0.20	<0.010	0.010	0.30	0.040	0.020	0.020
MAY 16...	--	--	--	<0.010	<0.10	<0.010	0.020	0.30	0.010	0.010	0.010
JUL 18...	--	--	--	0.010	<0.10	0.010	<0.010	<0.20	<0.010	<0.010	<0.010
SEP 26...	--	--	--	<0.010	<0.10	0.030	<0.010	<0.20	<0.010	<0.010	<0.010

K Results based on counts outside ideal colony range.

**Table B-6. Water quality data from the Clearwater River basin at Spalding, Idaho
(national stream quality accounting network station).**

CLEARWATER RIVER BASIN										
13342500 CLEARWATER RIVER AT SPALDING, ID-Continued										
WATER QUALITY DATA, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990										
DATE	ALUM- INUM, DIS- SOLVED (UG/L AS AL)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	BERYL- LIUM, DIS- SOLVED (UG/L AS BE)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)
NOV 28...	30	<1	9	<0.5	<1.0	10	<3	3	24	1
MAR 21...	70	<1	12	<0.5	<1.0	<1	<3	1	74	<1
MAY 16...	90	<1	7	<0.5	<1.0	<1	<3	1	67	<1
SEP 26...	<10	<1	8	<0.5	<1.0	<1	<3	1	8	<1
DATE	LITHIUM DIS- SOLVED (UG/L AS LI)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	STRON- TIUM, DIS- SOLVED (UG/L AS SR)	VANA- DIUM, DIS- SOLVED (UG/L AS V)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV 28...	<4	1	0.1	<10	<1	<1	<1.0	30	<6	<3
MAR 21...	<4	4	<0.1	<10	1	<1	<1.0	30	<6	4
MAY 16...	<4	1	<0.1	<10	<1	<1	<1.0	24	<6	7
SEP 26...	<4	1	<0.1	<10	1	<1	<1.0	22	<6	<3
DATE	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)	SEDI- MENT, DIS- SOLVED (MG/L)
NOV 28...	1	9.9	96							
JAN 24...	2	31	97							
MAR 21...	23	1420	81							
MAY 16...	4	189	68							
JUL 18...	2	28	64							
SEP 26...	2	49	35							

Table B-7. Results of laboratory analysis of samples from Brownlee Reservoir and downstream in the Snake River, 1973.^{1/}

	Snake River at Joseph Gage		
	March 22	March 23	March 25
Flow (cfs)	18,600	12,900	5,500
Temperature (°C)	7.8	7.8	8.2
pH (Field)	7.2	7.42	7.28
pH (Laboratory)	7.9	7.7	7.9
Sp. Cond. (Laboratory) (μmhos)	275	300	250
D.O.	11.5	11.7	11.8
BOD ₅	0.3	0.8	0.8
COD	3.6	5.2	1.6
Turbidity (Ntu)	15	21	20
Solids, Sus.	20	32	44
Solids, Tot.	336	336	284
Alkalinity (CaCO ₃)	140	136	108
Hardness (CaCO ₃)	168	148	128
Calcium	40	34	32
Carbon, Org.	0.30	0.45	0.20
Chloride	20	20	14
Iron	0.01	0.04	0.08
Magnesium	16	15	12
Manganese	0.01	0.01	0.01
Nitrate	3.0	3.1	2.5
Nitrite	0.002	0.060	0.003
Nitrogen, Kjel.	2	2	1.2
Ammonia	0.1	0.2	0.1
Phosphate, Inorg.	0.01	0.01	0.01
Phosphate, Ortho.	0.01	0.01	0.01
Phosphorus, Tot.	0.098	0.06	0.15
Potassium	2.8	1.7	2.3
Sodium	34	26	32
Sulphate	29	26	18

1/ All values expressed as mg/l unless indicated otherwise.

Table B-7. Results of laboratory analysis of samples from Brownlee Reservoir and downstream in the Snake River, 1973.^{1/}

	Snake River Above Grande Ronde River				
	March 21	March 22	March 23	March 24	March 25
Flow (cfs)	30,000	22,000	17,000	12,000	9,500
Temperature (°C)	7.5	7.9	7.9	8.2	8.7
pH (Field)	---	---	---	---	---
pH (Laboratory)	8.0	8.0	8.2	8.2	8.3
Sp. Cond. (Laboratory) (μmhos)	260	245	205	225	235
D.O.	11.6	11.9	11.8	11.5	11.7
BOD ₅	0.4	0.3	0.8	0.3	0.5
COD	8.6	7.9	8.6	7.5	8.2
Turbidity (Ntu)	16	8	16	9	6
Solids, Sus.	20	24	20	12	12
Solids, Tot.	260	248	224	228	264
Alkalinity (CaCO ₃)	128	116	116	112	120
Hardness (CaCO ₃)	128	120	108	108	112
Calcium	27	26	22	24	26
Carbon, Org.	0.88	0.70	0.95	0.66	0.60
Chloride	16	16	12	14	14
Iron	0.01	0.01	0.01	0.07	0.06
Magnesium	14	13	12	12	12
Manganese	0.01	0.01	0.01	0.01	0.01
Nitrate	3.1	2.9	2.3	2.3	2.1
Nitrite	0.011	0.008	0.006	0.006	0.005
Nitrogen, Kjel.	1.6	1.9	2.6	2.6	3.1
Ammonia	0.3	0.2	0.2	0.2	0.3
Phosphate, Inorg.	0.06	0.01	0.01	0.01	0.01
Phosphate, Ortho.	0.05	0.01	0.01	0.01	0.01
Phosphorus, Tot.	0.036	0.042	0.039	0.036	0.046
Potassium	1.7	1.8	1.6	2.2	1.6
Sodium	20	26	24	30	24
Sulphate	23	18	14	12	11

1/ All values expressed as mg/l unless indicated otherwise.

Table B-7. Results of laboratory analysis of samples from Brownlee Reservoir and downstream in the Snake River, 1973.^{1/}

	Snake River Above and Below Oxbow Dam, March 20, 1973	
	Oxbow Reservoir	Below Oxbow Dam
Flow (cfs)	---	20,100
Temperature (°C)	7.0	6.8
pH (Field)	8.45	8.33
pH (Laboratory)	7.6	7.6
Sp. Cond. (Laboratory) (μmhos)	335	330
D.O.	11.1	11.1
BOD ₅	0.3	0.1
COD	15.6	1.2
Turbidity (Ntu)	22	18
Solids, Sus.	12	8
Solids, Tot.	360	360
Alkalinity (CaCO ₃)	144	152
Hardness (CaCO ₃)	156	168
Calcium	37	37
Carbon, Org.	1	0.20
Chloride	20	20
Iron	0.14	0.10
Magnesium	15	18
Manganese	0.01	0.01
Nitrate	3.5	4.0
Nitrite	0.020	0.04
Nitrogen, Kjel.	4.8	0.8
Ammonia	0.1	0.1
Phosphate, Inorg.	0.01	0.01
Phosphate, Ortho.	0.01	0.01
Phosphorus, Tot.	0.134	0.091
Potassium	3.0	2.2
Sodium	36	30
Sulphate	29	30

^{1/} All values expressed as mg/l unless indicated otherwise.

Table B-7. Results of laboratory analysis of samples from Brownlee Reservoir and downstream in the Snake River, 1973.^{1/}

	Snake River Below Hells Canyon Dam		
	March 21	March 23	March 25
Flow (cfs)	27,000	12,000	5,000
Temperature (°C)	6.5	6.7	6.9
pH (Field)	8.3	8.3	8.3
pH (Laboratory)	7.8	7.8	7.7
Sp. Cond. (Laboratory) (μmhos)	345	335	305
D.O.	11.2	11.1	11.5
BOD ₅	0.5	0.1	0.1
COD	2.8	0.8	4.4
Turbidity (Ntu)	19	19	20
Solids, Sus.	28	20	20
Solids, Tot.	388	344	324
Alkalinity (CaCO ₃)	144	148	156
Hardness (CaCO ₃)	160	160	156
Calcium	37	34	42
Carbon, Org.	0.40	0.10	0.30
Chloride	20	16	20
Iron	0.06	0.07	0.04
Magnesium	16	18	12
Manganese	0.01	0.01	0.01
Nitrate	3.6	3.6	3.5
Nitrite	0.050	0.050	0.005
Nitrogen, Kjel.	1.2	0.4	1.2
Ammonia	0.2	0.1	0.2
Phosphate, Inorg.	0.01	0.01	0.01
Phosphate, Ortho.	0.01	0.01	0.01
Phosphorus, Tot.	0.065	0.062	0.072
Potassium	2.8	2.4	2.5
Sodium	37	32	34
Sulphate	30	29	29

^{1/} All values expressed as mg/l unless indicated otherwise.

Table B-7. Results of laboratory analysis of samples from Brownlee Reservoir and downstream in the Snake River, 1973.^{1/}

	Snake River at Pittsburg Landing		
	March 21	March 23	March 25
Discharge at Dam (cfs)	27,000	12,000	5,000
Temperature (°C)	7.0	7.0	7.5
pH (Field)	8.6	8.4	8.3
pH (Laboratory)	7.5	7.7	7.7
Sp. Cond. (Laboratory) (μmhos)	325	300	340
D.O.	11.3	12.2	12.2
BOD ₅	0.05	0.4	2.7
COD	6.8	8.4	6.8
Turbidity (Ntu)	20	22	13
Solids, Sus.	20	16	28
Solids, Tot.	340	340	372
Alkalinity (CaCO ₃)	156	144	140
Hardness (CaCO ₃)	160	144	152
Calcium	32	40	34
Carbon, Org.	0.55	0.75	0.60
Chloride	18	18	16
Iron	0.03	0.06	0.07
Magnesium	19	11	16
Manganese	0.01	0.01	0.01
Nitrate	3.2	3.1	3.5
Nitrite	0.010	0.020	0.070
Nitrogen, Kjel.	2.8	4.2	5.2
Ammonia	0.1	0.1	0.4
Phosphate, Inorg.	0.01	0.01	0.01
Phosphate, Ortho.	0.01	0.01	0.01
Phosphorus, Tot.	0.056	0.075	0.147
Potassium	2.8	2.3	3.4
Sodium	38	32	39
Sulphate	28	25	31

1/ All values expressed as mg/l unless indicated otherwise.

Table B-7. Results of laboratory analysis of samples from Brownlee Reservoir and downstream in the Snake River, 1973.^{1/}

	Snake River Above and Below Brownlee Dam, March 20, 1973	
	Brownlee Reservoir	Below Brownlee Dam
Flow (cfs)	---	---
Temperature (°C)	6.8	6.8
pH (Field)	8.5	8.4
pH (Laboratory)	8.0	7.9
Sp. Cond. (Laboratory) (μ mhos)	345	350
D.O.	10.9	11.0
BOD ₅	0.4	0.2
COD	10.8	1.6
Turbidity (Ntu)	18	21
Solids, Sus.	24	8
Solids, Tot.	384	392
Alkalinity (CaCO ₃)	156	148
Hardness (CaCO ₃)	164	160
Calcium	37	38
Carbon, Org.	0.90	0.22
Chloride	16	18
Iron	0.13	0.06
Magnesium	17	15
Manganese	0.02	0.01
Nitrate	3.7	3.7
Nitrite	0.030	0.010
Nitrogen, Kjel.	4.2	1.1
Ammonia	0.5	0.3
Phosphate, Inorg.	0.01	0.01
Phosphate, Ortho.	0.01	0.01
Phosphorus, Tot.	0.088	0.124
Potassium	2.6	2.8
Sodium	32	35
Sulphate	26	28

^{1/} All values expressed as mg/l unless indicated otherwise.

Table B-8. Chemical analysis of composite water samples collected October 1 and 15, 1970, at Upper, Mid-, and Lower Brownlee reservoir locations.^{1/}

	<u>Upper Reservoir</u>		<u>Mid-Reservoir</u>		<u>Lower Reservoir</u>	
	10/1/70	10/15/70	10/1/70	10/15/70	10/1/70	10/15/70
pH	8.0	8.2	7.6	7.8	7.8	7.9
Total Solids	404	412	384	400	384	380
Total Dissolved Solids	360	380	344	364	350	344
Alkalinity (CaCO ₃)	208	200	184	196	188	185
Hardness (CaCO ₃)	188	188	168	172	160	164
Calcium	21	21	37	32	35	34
Magnesium	32	32	18	22	17	19
Iron	0.16	0.20	0.04	0.01	0.05	0.07
Manganese	<0.01	<0.01	0.45	0.29	0.01	0.01
Sodium	41	39	37	39	38	36
Chloride	3	7	3	3	10	7
Sulphate	68	65	55	66	53	60
Nitrate	3.5	3.6	3.7	3.9	3.6	3.7
Phosphate	0.21	0.19	0.38	0.43	0.30	0.14
Silica	18	26	18	18	18	18
Fluoride	0.37	0.46	0.49	0.46	0.35	0.49
Ammonia	0.7	1.0	0.6	0.6	0.6	0.6
Zinc	0.035	0.019	0.038	0.015	0.043	0.015
Copper	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Potassium	4.7	4.7	4.5	4.7	4.6	4.6

^{1/} Analysis conducted by Idaho Department of Health. All values other than pH expressed in ppm or mg/l.

Source: Goodnight, 1971.

Table B-9. Calculations for human health risk assessment.

	RfDo (mg/kg-d)	CPFo (1/mg/kg-d)	Sediment Conc. (ug/kg)	Water Conc. (mg/L)	Fish Conc. (mg/kg)	BCF (L/kg)	Estimated Kd (L/kg)	Kow	Estimated PC (cm/hr)
METALS									
Arsenic	1.00E-03	NA	4600.00	NA	NA	8.71	NA	NA	NA
Cadmium	5.00E-04	NA	230.00	NA	NA	63.10	NA	NA	NA
Copper	3.70E-02	NA	24000.00	NA	NA	245.47	NA	NA	NA
Chromium (VI)	5.00E-03	NA	30000.00	NA	NA	11.22	NA	NA	NA
Lead	NA	NA	16000.00	NA	NA	79.43	NA	NA	NA
Mercury	3.00E-04	NA	14.00	NA	NA	269.15	NA	NA	NA
Zinc	2.00E-01	NA	110000.00	NA	NA	371.54	NA	NA	NA
ALKYL BENZENES									
sec-Butylbenzene	NA	NA	8.00	NA	NA	NA	NA	NA	NA
1-Methyl-4-isopropylbenzene	NA	NA	58.00	NA	NA	NA	NA	NA	NA
1,3-Dimethyl-5-ethylbenzene	NA	NA	83.00	NA	NA	NA	NA	NA	NA
1,2-Dimethyl-4-ethylbenzene	NA	NA	155.00	NA	NA	NA	NA	NA	NA
1,2,3,5-Tetramethylbenzene	NA	NA	16.00	NA	NA	NA	NA	NA	NA
PAH COMPOUNDS									
1-Methylphenanthrene	NA	NA	5.00	NA	NA	NA	NA	NA	NA
2,3,6-Trimethylnaphthalene	NA	NA	37.00	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	1.15E+01	22.00	8.59E-06	2.16E-02	2511.89	2559.69	457088.19	1.29E-02
Benzo(a)pyrene	NA	1.15E+01	56.00	1.07E-05	6.17E-03	575.44	5226.22	933254.30	5.84
Benzo(b)fluoranthene	NA	1.15E+01	53.00	7.18E-06	1.72E-01	23988.33	7382.24	1318256.74	3.51
Benzo(e)pyrene	NA	1.15E+01	22.00	4.21E-06	2.42E-03	575.44	5226.22	933254.30	7.24
Benzo(g,h,i)perylene	NA	NA	44.00	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	1.15E+01	18.00	2.42E-06	5.05E-02	20892.96	7450.54	1330454.42	3.04
Chrysene	NA	1.15E+01	42.00	1.64E-05	9.44E-02	5754.40	2559.69	457088.19	3.51
Dibenz(a,h)anthracene	NA	1.15E+01	39.00	2.21E-06	1.11E-01	50118.72	17613.60	3145286.59	1.29E-02
Fluoranthene	4.00E-02	NA	2281.00	4.57E-03	#####	812.83	499.10	89125.09	1.02E+00
Indeno(1,2,3-c,d)pyrene	NA	1.15E+01	65.00	3.02E-06	1.91E-01	63095.73	21487.61	3837072.46	15.3
Perylene	NA	NA	11.00	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	14.00	NA	NA	NA	NA	NA	NA
Pyrene	3.00E-02	NA	52.00	1.22E-04	3.29E-01	2691.53	424.80	75857.76	7.24
PESTICIDES									
p,p'-DDE	NA	3.40E-01	4.80	2.15E-06	#####	776247.12	2229.40	398107.17	1.291
p,p'-DDD	NA	2.40E-01	3.00	1.48E-06	#####	776247.12	2033.24	363078.05	1.627

Table B-9. Calculations for human health risk assessment.

FISH INGESTION				INCIDENTAL INGESTION				4-Sep-91
	Intake (Noncarc) (mg/kg-d)	Intake (Carc) (mg/kg-d)	HAZARD INDEX	CANCER RISK	Intake (Noncarc) (mg/kg-d)	Intake (Carc) (mg/kg-d)	HAZARD INDEX	CANCER RISK
METALS								
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (VI)	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA
ALKYLBENZENES								
sec-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1-Methyl-4-isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dimethyl-5-ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dimethyl-4-ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,5-Tetramethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
PAH COMPOUNDS								
1-Methylphenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
2,3,6-Trimethylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	1.60E-05	6.84E-06	NA	7.87E-05	1.31E-09	5.62E-10	NA	6.47E-09
Benzo(a)pyrene	4.56E-06	1.95E-06	NA	2.25E-05	1.64E-09	7.01E-10	NA	8.06E-09
Benzo(b)fluoranthene	1.27E-04	5.46E-05	NA	6.28E-04	1.10E-09	4.70E-10	NA	5.40E-09
Benzo(e)pyrene	1.79E-06	7.68E-07	NA	8.83E-06	6.43E-10	2.75E-10	NA	3.17E-09
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	3.73E-05	1.60E-05	NA	1.84E-04	3.69E-10	1.58E-10	NA	1.82E-09
Chrysene	6.98E-05	2.99E-05	NA	3.44E-04	2.50E-09	1.07E-09	NA	1.23E-08
Dibenz(a,h)anthracene	8.21E-05	3.52E-05	NA	4.05E-04	3.38E-10	1.45E-10	NA	1.67E-09
Fluoranthene	2.75E-03	1.18E-03	6.87E-02	NA	6.98E-07	2.99E-07	1.74E-05	NA
Indeno(1,2,3-c,d)pyrene	1.41E-04	6.05E-05	NA	6.96E-04	4.62E-10	1.98E-10	NA	2.28E-09
Perylene	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	2.44E-04	1.04E-04	8.12E-03	NA	1.87E-08	8.01E-09	6.23E-07	NA
PESTICIDES								
p,p'-DDE	1.24E-03	5.30E-04	NA	1.80E-04	3.29E-10	1.41E-10	NA	4.79E-11
p,p'-DDD	8.47E-04	3.63E-04	NA	8.71E-05	2.25E-07	9.65E-11	NA	2.32E-11
			7.68E-02	2.63E-03			1.81E-05	4.13E-08

Table B-9. Calculations for human health risk assessment.

DERMAL CONT. WHILE SWIMMING				
	Intake (Noncarc) (mg/kg-d)	Intake (Carc) (mg/kg-d)	HAZARD INDEX	CANCER RISK
METALS				
Arsenic	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Chromium (VI)	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Mercury	NA	NA	NA	NA
Zinc	NA	NA	NA	NA
ALKYLBENZENES				
sec-Butylbenzene	NA	NA	NA	NA
1-Methyl-4-isopropylbenzene	NA	NA	NA	NA
1,3-Dimethyl-5-ethylbenzene	NA	NA	NA	NA
1,2-Dimethyl-4-ethylbenzene	NA	NA	NA	NA
1,2,3,5-Tetramethylbenzene	NA	NA	NA	NA
PAH COMPOUNDS				
1-Methylphenanthrene	NA	NA	NA	NA
2,3,6-Trimethylnaphthalene	NA	NA	NA	NA
Benzo(a)anthracene	6.77E-09	2.90E-09	NA	3.34E-08
Benzo(a)pyrene	3.82E-06	1.64E-06	NA	1.88E-05
Benzo(b)fluoranthene	1.54E-06	6.59E-07	NA	7.58E-06
Benzo(e)pyrene	1.86E-06	7.97E-07	NA	9.17E-06
Benzo(g,h,i)perylene	NA	NA	NA	NA
Benzo(k)fluoranthene	4.48E-07	1.92E-07	NA	2.21E-06
Chrysene	3.52E-06	1.51E-06	NA	1.73E-05
Dibenz(a,h)anthracene	1.74E-09	7.47E-10	NA	8.60E-09
Fluoranthene	2.84E-04	1.22E-04	7.11E-03	NA
Indeno(1,2,3-c,d)pyrene	2.83E-06	1.21E-06	NA	1.39E-05
Perylene	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA
Pyrene	5.41E-05	2.32E-05	1.80E-03	NA
PESTICIDES				
p,p'-DDE	1.70E-07	7.27E-08	NA	2.47E-08
p,p'-DDD	1.47E-07	6.28E-08	NA	1.51E-08

8.91E-03 6.91E-05

Table B-9. Calculations for human health risk assessment.

SEDIMENT INGESTION			DERMAL CONT. WITH SEDIMENT					
	Intake (Noncarc) (mg/kg-d)	Intake (Carc) (mg/kg-d)	HAZARD INDEX	CANCER RISK	Intake (Noncarc) (mg/kg-d)	Intake (Carc) (mg/kg-d)	HAZARD INDEX	CANCER RISK
METALS								
Arsenic	5.40E-07	2.31E-07	5.40E-04	NA	2.62E-02	1.78E-02	2.62E+01	NA
Cadmium	2.70E-08	1.16E-08	5.40E-05	NA	1.31E-03	8.91E-04	2.62E+00	NA
Copper	2.82E-06	1.21E-06	7.62E-05	NA	1.37E-01	9.30E-02	3.69E+00	NA
Chromium (VI)	3.52E-06	1.51E-06	7.05E-04	NA	1.71E-01	1.16E-01	3.42E+01	NA
Lead	1.88E-06	8.05E-07	NA	NA	9.11E-02	6.20E-02	NA	NA
Mercury	1.64E-09	7.05E-10	5.48E-06	NA	7.97E-05	5.42E-05	2.66E-01	NA
Zinc	1.29E-05	5.54E-06	6.46E-05	NA	6.26E-01	4.26E-01	3.13E+00	NA
ALKYLBENZENES								
sec-Butylbenzene	9.39E-10	4.03E-10	NA	NA	5.79E-03	2.48E-03	NA	NA
1-Methyl-4-isopropylbenzene	6.81E-09	2.92E-09	NA	NA	4.20E-02	1.80E-02	NA	NA
1,3-Dimethyl-5-ethylbenzene	9.75E-09	4.18E-09	NA	NA	6.00E-02	2.57E-02	NA	NA
1,2-Dimethyl-4-ethylbenzene	1.82E-08	7.80E-09	NA	NA	1.12E-01	4.80E-02	NA	NA
1,2,3,5-Tetramethylbenzene	1.88E-09	8.05E-10	NA	NA	1.16E-02	4.96E-03	NA	NA
PAH COMPOUNDS								
1-Methylphenanthrene	5.87E-10	2.52E-10	NA	NA	3.62E-03	1.55E-03	NA	NA
2,3,6-Trimethylnaphthalene	4.34E-09	1.86E-09	NA	NA	2.68E-02	1.15E-02	NA	NA
Benzo(a)anthracene	2.58E-09	1.11E-09	NA	1.43E-11	1.59E-02	6.82E-03	NA	7.84E-02
Benzo(a)pyrene	6.58E-09	2.82E-09	NA	1.65E-08	4.05E-02	1.74E-02	NA	2.00E-01
Benzo(b)fluoranthene	6.22E-09	2.67E-09	NA	9.36E-09	3.83E-02	1.64E-02	NA	1.89E-01
Benzo(e)pyrene	2.58E-09	1.11E-09	NA	8.02E-09	1.59E-02	6.82E-03	NA	7.84E-02
Benzo(g,h,i)perylene	5.17E-09	2.21E-09	NA	NA	3.18E-02	1.36E-02	NA	NA
Benzo(k)fluoranthene	2.11E-09	9.06E-10	NA	2.75E-09	1.30E-02	5.58E-03	NA	6.42E-02
Chrysene	4.93E-09	2.11E-09	NA	7.42E-09	3.04E-02	1.30E-02	NA	1.50E-01
Dibenz(a,h)anthracene	4.58E-09	1.96E-09	NA	2.53E-11	2.82E-02	1.21E-02	NA	1.39E-01
Fluoranthene	2.68E-07	1.15E-07	5.37E-10	NA	#####	7.07E-01	4.12E+01	2.32E-01
Indeno(1,2,3-c,d)pyrene	7.63E-09	3.27E-09	NA	5.00E-08	4.70E-02	2.01E-02	NA	NA
Perylene	1.29E-09	5.54E-10	NA	NA	7.96E-03	3.41E-03	NA	NA
Phenanthrene	1.64E-09	7.05E-10	NA	NA	1.01E-02	4.34E-03	NA	NA
Pyrene	6.11E-09	2.62E-09	1.44E-11	NA	3.76E-02	1.61E-02	1.25E+00	NA
PESTICIDES								
p,p'-DDE	5.64E-10	2.42E-10	NA	3.12E-10	3.47E-03	1.49E-03	NA	5.06E-04
p,p'-DDD	3.52E-10	1.51E-10	NA	2.46E-10	2.17E-03	9.30E-04	NA	2.23E-04

1.44E-03 9.46E-08

1.13E+02 1.13E+00

APPENDIX C

SPILLWAY DEFLECTORS

APPENDIX C - SPILLWAY DEFLECTORS

The purpose of this appendix is to discuss why spillway deflectors (also called flip lips) are necessary and how they operate.

The function of spillway deflectors is to reduce high levels of nitrogen gas supersaturation caused by operation of the spillways on the Snake and Columbia rivers. The operation of the spillways without deflectors results in highly aerated water plunging deep into the stilling basin, which causes high levels of atmospheric nitrogen to be dissolved in the water (nitrogen supersaturation). The plunging flow is required to dissipate the water's energy within the stilling basin. The deflector is designed to prevent this plunging from occurring, thus reducing the dissolved gas level in the river (see Sketch A).

As can be seen from Sketch A, the goals of effective energy dissipation and low gas supersaturation levels are in conflict. However, through the use of model studies, a compromise between the two conflicting purposes was discovered. If the deflectors were properly sized and located, smaller-volume spillway flows would be unlikely to cause damage downstream as a result of poor energy dissipation. Spillway flows are smaller in volume than powerhouse flows under typical conditions. Combining the smaller spillway flows with full powerhouse flows would provide effective gas supersaturation control for most

normal flows. However, with larger spillway flows, the deflectors were overridden causing deep plunging flow with effective energy dissipation (see Sketch B).

During the model studies one factor was identified as being especially critical to the effective operation of the deflectors. This was the relationship between tailwater elevation and the elevation of the deflector. If the deflector was higher than the tailwater, the flow was unstable and plunged near the center of the basin, causing air entrainment. If the deflector was placed too low, the deflector created standing waves in the basin which drew air into the flow. The elevations of the deflectors were set using tailwaters developed assuming full powerhouse flow. If the downstream reservoir is lowered substantially and the powerhouse is not operating, the tailwater will be considerably lower than the tailwater elevation used in the design of the deflectors. This will result in unstable skimming flows and higher gas supersaturation levels (see Sketch C). In addition, without powerhouse operation all river flows must be routed over the spillway, which means that the deflectors would become ineffective at a considerably lower river flow level (see Sketch B).

The actual operation of the deflectors is dependent on a number of site-specific variables. This, combined with the complex process of gas transfer theory, makes it very difficult to predict nitrogen gas supersaturation levels once conditions are outside the normal experience range.

Spillways at the following projects are equipped with flow deflectors (flip lips):

<u>Project</u>	<u>Spillway Bays</u>
Lower Granite	All 8 bays
Little Goose	Bays 2-7 (out of 8)
Lower Monumental	Bays 2-7 (out of 8)
Ice Harbor	None (out of 10)
McNary	Bays 4-19 (out of 22)
John Day	None (out of 20)
The Dalles	None (out of 23)
Bonneville	Bays 5-14 (out of 18)

Deep Plunging Flow (without flip lip)

Skimming Flow

Sketch A

Smaller Spillway Flows
Effective Deflectors
Skimming Flow

Large Spillway Flows
Overridden Deflector
Deep Plunging Flow

Sketch B

Deflector Higher than Tailwater

Deflector Too Low

Sketch C

APPENDIX D

RESIDENT FISH

Table D-1. Species composition of Lower Snake River reservoirs (adapted from Bennett et al. 1983).

Common Name	Scientific Name	Relative Abundance ^{1/}			
		Lower Granite	Little Goose	Lower Monumental	Ice Harbor
White Sturgeon	<i>Acipenser transmontanus</i>	—	C	R	R
American shad	<i>Alosa sapidissima</i>	—	R	R	—
Sockeye salmon	<i>Oncorhynchus nerka</i>	—	R	—	—
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	L	L	R	R
Mountain whitefish	<i>Prosopium williamsoni</i>	R	L	R	L
Rainbow trout	<i>Oncorhynchus mykiss</i>	L	C	L	L
Brown trout	<i>Salmo trutta</i>	—	R	—	—
Chiselmouth	<i>Acrocheilus alutaceus</i>	A	A	A	L
Carp	<i>Cyprinus carpio</i>	A	A	C	C
Peamouth	<i>Mylocheilus caurinus</i>	R	L	L	L
Northern squawfish	<i>Ptychocheilus oregonensis</i>	A	A	A	C
Speckled dace	<i>Rhinichthys osculus</i>	—	R	—	—
Redside shiner	<i>Richardsonius balteatus</i>	A	A	C	A
Bridgelip sucker	<i>Catostomus columbianus</i>	A	A	A	A
Largescale sucker	<i>Catostomus macrocheilus</i>	A	A	A	A
Yellow bullhead	<i>Ictalurus natalis</i>	L	C	L	R
Brown bullhead	<i>Ictalurus nebulosus</i>	C	C	L	L
Channel catfish	<i>Ictalurus punctatus</i>	L	A	C	C
Tadpole madtom	<i>Noturus gyrinus</i>	—	L	R	R
Flathead catfish	<i>Pylodictis olivaris</i>	—	—	—	R
Pumpkinseed	<i>Lepomis gibbosus</i>	L	A	C	L
Warmouth	<i>Lepomis gulosus</i>	—	L	—	—
Bluegill	<i>Lepomis macrochirus</i>	L	A	R	L
Smallmouth bass	<i>Micropterus dolomieu</i>	A	A	C	C
Largemouth bass	<i>Micropterus salmoides</i>	—	L	—	L
White crappie	<i>Pomoxis annularis</i>	C	A	A	C
Black crappie	<i>Pomoxis nigromaculatus</i>	C	A	C	C
Yellow perch	<i>Perca flavescens</i>	C	A	C	C
Sculpin	<i>Cottus sp.</i>	—	C	L	L

- 1/ A = Abundant
C = Common
L = Low Density
R = Rare
— = not present or extremely rare

Table D-2. Fish species of the mainstem Columbia River (adapted from Stober et al., 1979). Page 1 of 2

Species	Scientific Name	Bonneville	The Dalles	John Day	McNary (incl. Hanford)
<u>Anadromous Salmonids</u>					
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	x	x	x	x
Sockeye salmon	<i>Oncorhynchus nerka</i>	x	x	x	x
Coho salmon	<i>Oncorhynchus kisutch</i>	x	x	x	x
Chum salmon	<i>Oncorhynchus keta</i>	x	x		
Steelhead	<i>Salmo gairdneri</i>	x	x	x	x
<u>Cold Water Game Fish</u>					
Rainbow trout	<i>Salmo gairdneri</i>	x	x	x	x
Cutthroat trout	<i>Salmo clarki</i> *				x
American shad ^{1/}	<i>Alosa sapidissima</i>	x	x	x	x
Burbot	<i>Lota lota</i> *				x
Mountain whitefish	<i>Prosopium williamsoni</i>	x	x	x	x
Lake whitefish	<i>Coregonus clupeaformis</i> *				x
White Sturgeon	<i>Acipenser transmontanus</i>	x	x	x	x
<u>Warm Water Game Fish</u>					
Walleye ^{1/}	<i>Stizostedion vitreum vitreum</i>	x	x	x	x
Yellow perch ^{1/}	<i>Perca flavescens</i>	x	x	x	x
Largemouth bass ^{1/}	<i>Micropterus salmoides</i>	x	x	x	x
Smallmouth bass ^{1/}	<i>Micropterus dolomieu</i>	x	x	x	x
Black crappie ^{1/}	<i>Pomoxis nigromaculatus</i>	x	x	x	x
White crappie ^{1/}	<i>Pomoxis annularis</i>	x	x	x	x
Bluegill ^{1/}	<i>Lepomis macrochirus</i>	x	x	x	x
Pumpkinseed ^{1/}	<i>Lepomis gibbosus</i>	x	x	x	x
Channel catfish ^{1/}	<i>Ictalurus punctatus</i>	x	x	x	x
Black bullhead ^{1/}	<i>Ictalurus melas</i>				x
Brown bullhead ^{1/}	<i>Ictalurus nebulosus</i>	x	x	x	x
Yellow bullhead ^{1/}	<i>Ictalurus natalis</i> *				x

* = Distribution of these species in the Columbia is wider than indicated, but no definite records of recent distribution are available.

1 = Exotic species, not native to the Columbia River Basin.

Table D-2. Fish species of the mainstem Columbia River (adapted from Stober et al., 1979). Page 2 of 2

Non-Game Fish

Northern squawfish	<i>Ptychocheilus oregonensis</i>	x	x	x	x
Peamouth	<i>Mylocheilus caurinus</i>	1	x	x	x
Chiselmouth	<i>Acrocheilus alutaceus</i>	x	x	x	x
Largescale sucker	<i>Catostomus macrocheilus</i>	x	x	x	x
Bridgelip sucker	<i>Catostomus columbianus</i>	x	x	x	x
Mountain sucker	<i>Catostomus platyrhynchus</i>				x
Redside shiner	<i>Richardsonius balteatus</i>	x	x	x	x
Speckled dace	<i>Rhinichthys osculus*</i>				x
Leopard dace	<i>Rhinichthys falcatus*</i>				x
Longnose dace	<i>Rhinichthys cataractae*</i>				x
Carp ¹	<i>Cyprinus carpio</i>	x	x	x	x
Threespine stickleback	<i>Gasterosteus aculeatus</i>	x	x	x	x
Tadpole madtom ¹	<i>Noturus gyrinus</i>	x	x	x	x
Tench ¹	<i>Tinca tinca</i>	x	x	x	x
Pacific lamprey	<i>Entosphenus tridentatus</i>	x	x	x	x
Western brook lamprey	<i>Lampetra richardsoni*</i>				x
River lamprey	<i>Lampetra ayresi*</i>				x
Sandroller	<i>Percopsis transmontana</i>	x	x	x	x
Prickly sculpin	<i>Cottus asper*</i>				x
Torrent sculpin	<i>Cottus rhotheus*</i>				x
Mottled sculpin	<i>Cottus bairdi*</i>				x
Piute sculpin	<i>Cottus beldingi*</i>				x
Reticulate sculpin	<i>Cottus perplexus*</i>				x

* = Distribution of these species in the Columbia is wider than indicated, but no definite records of recent distribution are available.

1 = Exotic species, not native to the Columbia River Basin.

Table D-3. Species composition of Lake Roosevelt (adapted from Peone et al., 1990).

Common Name	Scientific Name	Relative Abundance ^{1/}
Yellow Perch	<i>Perca flavescens</i>	A
Walleye	<i>Stizostedion vitreum</i>	A
Largescale sucker	<i>Catostomus macrocheilus</i>	A
Rainbow trout	<i>Oncorhynchus mykiss</i>	C
Kokanee salmon	<i>Oncorhynchus nerka</i>	C
Squawfish	<i>Ptychocheilus oregonensis</i>	C
Lake whitefish	<i>Coregonus clupeaformis</i>	C
Smallmouth bass	<i>Micropterus dolomieu</i>	C
Piute sculpin	<i>Cottus beldingi</i>	C
Carp	<i>Cyprinus carpio</i>	C
Black crappie	<i>Pomoxis nigromaculatus</i>	C
Brown trout	<i>Salmo trutta</i>	L
Largemouth bass	<i>Micropterus salmoides</i>	L
Pearmouth	<i>Mylocheilus caurinus</i>	L
Burbot	<i>Lota lota</i>	L
Longnose sucker	<i>Catostomus catostomus</i>	L
Mountain whitefish	<i>Prosopium williamsoni</i>	L
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	L
Pumpkinseed	<i>Lepomis gibbosus</i>	L
Yellow bullhead	<i>Ictalurus natalis</i>	L
Tench	<i>Tinca tinca</i>	R
Brook trout	<i>Salvelinus fontinalis</i>	R
Chiselmouth	<i>Acrocheilus alutaceus</i>	R
Cutthroat trout	<i>Oncorhynchus clarki</i>	R
Bull trout	<i>Salvelinus confluentus</i>	R

^{1/} A = Abundant
 C = Common
 L = Low Density
 R = Rare

Table D-4. Fish species inhabiting Dworshak Reservoir.

Common Name	Scientific Name
Chiselmouth ^a	<i>Acrocheilus alutaceus</i>
Bridgelip sucker	<i>Catostomus columbianus</i>
Largescale sucker	<i>Catostomus macrocheilus</i>
Sculpin	<i>Cottus spp.</i>
Northern pike	<i>Esox lucius</i>
Pacific lamprey	<i>Lampetra tridentata</i>
Brown bullhead	<i>Ictalurus nebulosus</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Largemouth bass	<i>Micropterus salmoides</i>
Kokanee	<i>Oncorhynchus nerka</i>
Mountain whitefish	<i>Prosopium williamsoni</i>
Northern squawfish	<i>Ptychocheilus oregonensis</i>
Speckled dace	<i>Rhinichthys osculus</i>
Longnose dace	<i>Rhinichthys cataractae</i>
Redside shiner	<i>Richardsonius balteatus</i>
Cutthroat trout	<i>Salmo clarki</i>
Rainbow trout	<i>Salmo gairdneri</i>
Eastern brook trout	<i>Salmo fontinalis</i>
Bull trout	<i>Salvelinus confluentus</i>

Source: (Horton, 1981; adapted from Maiolie, 1988).

a/ Chiselmouth documented prior to impoundment, but may have been eradicated in the 1971 squoxin treatment.

Table D-5. Species composition of Brownlee Reservoir (adapted from BPA 1985).

Common Name	Scientific Name	Relative Abundance ^{1/}
Largemouth bass	<i>Micropterus salmoides</i>	L
Smallmouth bass	<i>Micropterus dolomieu</i>	C
Bluegill	<i>Lepomis macrochirus</i>	C
Black bullhead	<i>Ictalurus melas</i>	A
Carp	<i>Cyprinus carpio</i>	A
Black crappie	<i>Pomoxis nigromaculatus</i>	A
Channel catfish	<i>Ictalurus punctatus</i>	A
Flathead catfish	<i>Pylodictis olivaris</i>	C
Chiselmouth	<i>Acrocheilus alutaceus</i>	A
Tadpole Madtom	<i>Noturus gyrinus</i>	C
Yellow perch	<i>Perca flavescens</i>	C
Pumpkinseed	<i>Lepomis gibbosus</i>	C
Northern squawfish	<i>Ptychocheilus caurinus</i>	C
Common sucker	<i>Castostomidae</i>	L
Finescale dace	<i>Phoxinus hegaeur</i>	A
Longnose sucker	<i>Catostomus catostomus</i>	C
White sucker	<i>Catostomus commersoni</i>	A
Warmouth	<i>Lepomis gulosus</i>	R
Mountain whitefish	<i>Prosopium williamsoni</i>	C
Dolly varden	<i>Salvelinus malma</i>	R
Lamprey	<i>Lampeta sp.</i>	R
Longnose dace	<i>Rhinichthys cataractae</i>	R
Peamouth	<i>Mylocheilus caurinus</i>	R
White sturgeon	<i>Acipenser transmontanus</i>	R
Sculpin	<i>Cottus sp.</i>	R
Shiners	<i>Notropis sp.</i>	L

1/ A = Abundant
 C = Common
 L = Low Density
 R = Rare

APPENDIX E

BIOLOGICAL ASSESSMENTS

APPENDIX E - BIOLOGICAL ASSESSMENTS

1.0 INTRODUCTION

1.1 Description of Proposed Project

The U.S. Army Corps of Engineers (Corps) is evaluating a proposal to increase water velocities on the Columbia, Snake, and Clearwater rivers by manipulating water levels among 11 reservoirs on these rivers during spring and summer 1992 (a description of the project area is provided in Section 3.4.1.). The purpose of this proposed action is to provide more running water to assist juvenile salmon when crossing dams during migration from their spawning areas to the Pacific Ocean. Currently, several species of Pacific salmon are experiencing precipitous population declines caused largely by the high mortality of juveniles that become trapped in either dam turbines or the slack water behind dams when migrating downstream.

In an effort to increase water velocities on the Columbia, Snake, and Clearwater rivers during salmon downstream migration in 1992, a variety of water management alternatives is being considered:

- 1) draw down all four lower Snake River reservoirs (Lower Granite, Little Goose, Lower Monumental, and Ice Harbor) to near minimum operating pool (MOP) from approximately April 1 to July 31;
- 2) draw down all four lower Snake River reservoirs to near spillway crest from approximately April 15 to June 15 or August 15;
- 3) draw down Lower Granite reservoir to 710 feet above mean sea level (msl) from about April 15 to June 15, while maintaining other lower Snake reservoirs at MOP;
- 4) draw down one to four reservoirs on the lower Columbia (McNary, John Day, The Dalles, and Bonneville) to MOP for an unspecified period of time between April 1 and August 31;
- 5) operate McNary Reservoir at 337 msl, John Day Reservoir at 262.5 msl, and The Dalles

and Bonneville pools at MOP from April 1 to August 31;

- 6) increase flows on the lower Snake from Dworshak and Brownlee reservoirs and shift flood control space to Grand Coulee Dam;
- 7) increase flows on lower Columbia by modifying releases from Grand Coulee Dam; or
- 8) a combination of the above.

In addition, a physical test of the impacts of drawdown to the system is proposed. This test would involve drafting Lower Granite and Little Goose pools to spillway crest and near spillway crest, respectively, for a 4- to 6-week period beginning March 1, 1992.

Lastly, the temporary control test 13 proposed, whereby Dworshak pool would be lowered by 20 feet for 20 days in August. The bald eagle (*Haliaeetus leucocephalus*) is federally listed as threatened in Washington and Oregon and endangered in Idaho, and the American peregrine falcon (*Falco peregrinus anatum*) is federally listed as endangered throughout its range. Both species inhabit portions of the project area for breeding and/or wintering.

1.2 Study Objectives

This biological assessment was prepared in compliance with Section 7 of the Endangered Species Act of 1973. The purpose of this assessment was to evaluate whether the proposed actions are likely to affect any bald eagles or peregrine falcons that use the project area. Specific objectives were to (1) describe overall use of the project area by bald eagles and peregrine falcons, (2) describe the habitat features important to bald eagles and peregrine falcons, and (3) determine the effects the alternative actions may have on these species.

2.0 METHODS

The methods used to determine potential use of the project area by bald eagles and peregrine falcons included a search of the existing literature on use of the project area by these species and interviews with agency biologists.

APPENDIX E

3.0 RESULTS AND DISCUSSION

3.1 Bald Eagle

Bald eagle reproduction throughout North America declined dramatically between 1947 and 1970 (Sprunt et al., 1973) largely due to intake of organochloride pesticides. By 1978, the bald eagle was federally listed as an endangered species in the lower 48 states, excluding Oregon, Washington, Michigan, Minnesota, and Wisconsin, where it was considered threatened (FWS, 1986). Historically, bald eagles nested throughout most of the continent; however, bald eagle nesting is currently limited primarily to the Pacific Northwest, Alaska, Canada, the Great Lake states, Chesapeake Bay, and Florida. The wintering range of bald eagles in the Pacific Northwest extends further south than the breeding range.

3.1.1 Habitat Requirements

3.1.1.1 Foraging Habitat

Bald eagles are opportunistic foragers; thus, their diets vary considerably both spatially and temporally. Bald eagles in the Pacific Northwest primarily consume fish, waterfowl, jack rabbits (*Lepus* spp.), and a variety of mammalian carrion (FWS, 1986; Stalmaster, 1987). On the lower Columbia River below Bonneville Dam, fish are the most prevalent prey year-round; waterfowl are consumed primarily during the wintering period (Garrett et al., 1988). Mammalian carrion (e.g., big game and livestock) appear to be an important alternate winter food source in Washington (Stalmaster, 1975 in FWS, 1986). The primary species of fish consumed by eagles on the lower Columbia, in descending order of importance, include the largescale sucker (*Catostomus macrocheilus*), American shad (*Alosa sapidissima*), common carp (*Cyprinus carpio*), peamouth (*Mylocheilus caurinus*), salmon (*Oncorhynchus* spp.), and steelhead (*O. mykiss*) (Garrett et al., 1988). Coots (*Fulica americana*), mallards (*Anas platyrhynchos*), and chukars (*Alectoris chukar*) are also important food sources for bald eagles wintering on the Columbia (Fielder, 1982) and Snake rivers (personal communication, R. Taylor, WDW, July 23, 1991).

3.1.1.2 Nest Habitat

The nesting season for bald eagles generally extends from mid-February through August (Issacs et al., 1983). Availability of suitable nest and perch trees is critical to bald eagle populations (FWS, 1986). Bald eagle nest sites are invariably located in proximity to water (Stalmaster, 1987). In the Pacific Northwest, bald eagles typically nest in multi-layered, mostly coniferous stands containing old-growth trees, and located within 1 mile (1.6 km) of large bodies of water (i.e., lakes, reservoirs, large rivers, or coastal estuaries) with adequate food supplies (Anthony et al., 1982). Nest trees in the Pacific Northwest are primarily in Ponderosa pine, mixed-conifer, Douglas-fir, and Sitka spruce (*Picea sitchensis*)/western hemlock forest types (Anthony et al., 1982). Species of trees used for nesting, however, vary among areas. On the lower Columbia River, nest trees are generally located in mixed-mature and old-growth Douglas-fir/western hemlock forests (Garrett et al., 1988), although some nests occur in black cottonwoods (*Populus trichocarpa*) in riparian communities along large river systems (Anthony et al., 1982). In Idaho, nests are typically found in large cottonwoods (*Populus* spp.), Ponderosa pines, and Douglas-firs (FWS, 1986).

3.1.1.3 Perch Habitat

Eagles in the Pacific Northwest use a variety of tree species for perching, depending largely on tree species availability and proximity to food sources (FWS, 1986). Important characteristics of diurnal perch sites for bald eagles in western Washington include (1) height and morphological aspects of the perch tree; (2) proximity to water, feeding sites, and open regions; and (3) sighting distance from the perch (Stalmaster and Newman, 1979). Preferred trees typically provide an unobstructed view of the surrounding vegetation and are usually either snags or have no relatively open foliage (Stalmaster and Newman, 1979). Bald eagles strongly prefer snags as daytime perches on the Nooksack River in northwestern Washington; bigleaf maple (*Acer macrophyllum*) and black cottonwood are the preferred deciduous trees, and Sitka spruce is the preferred coniferous tree (Stalmaster and Newman, 1979). Eagles on the lower Columbia River have been observed perching primarily in Sitka spruce, black cottonwood, and Douglas-fir (Garrett et al., 1988). In eastern Washington, including the Columbia River, eagles primarily use Ponderosa pines, snags, and cottonwoods for perching (Fielder and Starkey, 1986). In northern Idaho, bald eagles roost in western white pine and western larch (*Larix occidentalis*) (Lint, 1975).

3.1.1.4 Wintering Habitat

Over 25 percent of the wintering bald eagles in the lower 48 states occur in the Pacific Northwest (FWS, 1986). The wintering period for bald eagles in the Northwest occurs from approximately November through March (personal communication, K. Steenhof, Boise District Bureau of Land Management (BLM), July 18, 1991). Characteristics of communal winter roost sites differ considerably from those of diurnal perch sites (FWS, 1986). Bald eagles roost in trees with characteristics similar to those preferred for diurnal perching; however, roost sites are invariably located near concentrated food sources, such as anadromous fish runs or high concentrations of waterfowl, and tend to provide more protection from weather than diurnal perch sites (Hansen, 1977; Keister, 1981; Keister and Anthony, 1983). Communal roosts in the Pacific Northwest tend to be located in uneven-aged forest stands with some degree of old-growth forest structure (Anthony et al., 1982). In western Washington, bald eagles prefer dense stands of live conifers (e.g., Douglas-fir and western red cedar) for night roosting (Stalmaster and Newman, 1979; Anthony et al., 1982). Conifers may provide a more thermally favorable microenvironment than dead or deciduous trees, which may explain their high use by wintering eagles. In eastern Washington, bald eagles have been observed roosting in mixed stands of Douglas-fir and Ponderosa pine and in stands of black locusts (*Robinia pseudoacacia*) and black cottonwood (R. L. Knight, Washington Department of Game, unpubl. data in FWS, 1986).

3.1.2 Use of the Project Area

3.1.2.1 Breeding

Currently, six to seven bald eagle breeding territories are associated with reservoirs in the project area (personal communication, K. McAllister, Washington Department of Wildlife (WDW), July 18, 1991). One bald eagle nest site is located on the lower Columbia River, in Washington, immediately above Bonneville Dam (personal communication, D. Anderson, WDW, July 18, 1991). In addition, five to six bald eagle territories are located on the shoreline of Lake Roosevelt (K. McAllister, WDW, July 18, 1991). No bald eagle nest sites have been located on either the lower Snake or Clearwater rivers (personal communication, K. McAllister, WDW, July 18,

1991, and G. Stevens, Idaho Natural Heritage Program (INHP), July 18, 1991).

3.1.2.2 Wintering

Results of Washington midwinter bald eagle surveys showed that approximately 150 to 200 eagles wintered on Lake Roosevelt, 25 on the lower Columbia River, and 10 on the lower Snake River (personal communication, R. Taylor, WDW, July 23, 1991). Oregon mid-winter 1991 counts showed 40 bald eagles wintering on Umatilla National Wildlife Refuge and 15 elsewhere on the lower Columbia (letter from F. Isaacs, Oregon Eagle Foundation, 1991).

Results of Idaho midwinter bald eagle surveys from 1980 to 1991 showed that from 4 to 29 eagles wintered on Dworshak Reservoir (19 in 1991) (personal communication, G. Stevens, INHP, July 18, 1991 and K. Steenhof, BLM, July 18, 1991). Brownlee Reservoir is apparently an important wintering area for bald eagles; in the winter of 1989, approximately 150 eagles were counted there (personal communication, K. Steenhof, BLM, July 18, 1991). Brownlee Reservoir generally freezes over during winter; thus, annual midwinter counts for this reservoir vary widely.

3.1.3 Project Effects

Bald eagles inhabiting the project area may be affected by the proposed 1992 water budget manipulations on the Columbia, Snake and Clearwater rivers if one or more of the following occurs:

- bald eagle nesting food sources (primarily fish and waterfowl) are significantly affected on the Bonneville pool or Lake Roosevelt during the nesting season (mid-February through August);
- bald eagle wintering food sources (primarily waterfowl and upland gamebirds) are significantly affected in the project area between November and April; and/or
- occurrence of potential perching, roosting, or nesting trees in the project area (primarily cottonwoods and Ponderosa pines) is significantly affected.

Temporarily lowering water levels at any of the project pools during spring and summer has the potential to both positively and negatively affect bald eagles using the Columbia, Snake, and Clearwater rivers. Bald

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eagles could benefit from pool drawdowns in the following ways:

- more adult fish may eventually return to the project area for spawning, providing more potential food for bald eagles foraging along the Columbia, Snake, and Clearwater rivers in the future (see Section 4.2);
- more fish may become stranded or concentrated in resultant shallow-water areas, thus temporarily increasing their availability to bald eagles (see Section 4.3);
- more nesting waterfowl may become vulnerable to predation as a result of loss of nesting and escape cover due to temporary drought and/or an increase in distance between shoreline escape cover and the water's edge (see Section 4.4.5); and
- more large snags may become available for bald eagle perching and roosting as a result of project-related desiccation.

Likewise, the proposed pool lowering could negatively affect bald eagles using the Columbia, Snake, and Clearwater rivers in the following ways:

- at spillway crest, overall numbers of resident fish may decline due to reductions in shallow-water habitat (see Section 4.3);
- a decrease in 1992 waterfowl production may occur (see Section 4.4.5), thus decreasing bald eagle foraging opportunities;
- a decrease in waterfowl wintering in the project area may occur (see Section 4.4.5), thus decreasing winter food sources for bald eagles;
- a decrease in upland gamebirds may occur (see Section 4.4.7), thus decreasing bald eagle foraging opportunities; and
- a decrease in the recruitment of potential perching, roosting, or nesting trees may occur due to project-related desiccation.

The extent to which these potential impacts may affect bald eagles would depend largely on the location, time of year, and duration and degree of pool lowering. Potential effects on bald eagles

would be greatest where they are most concentrated and the degree of pool lowering is relatively high, and least significant where eagles are uncommon and pool lowering is minimal. Although, nesting bald eagles occur only on Lake Roosevelt and Bonneville Reservoir, and wintering eagles are concentrated on Lake Roosevelt, Brownlee and Dworshak reservoirs, and Umatilla NWR, impacts of pool drawdown to the surrounding environment at these reservoirs are expected to be minimal (see Sections 4.4.1 to 4.4.4). Impacts of lowering pools on the lower Snake to spillway crest for 4 months would be considerably greater to the surrounding environment than lowering the pools to MOP (see Sections 4.4.1 to 4.4.4); however, bald eagle use of the lower Snake is basically restricted to the winter and appears to be minimal. Although a more detailed assessment of the effects on bald eagles is not possible at this time, based on existing information, none of the proposed flow options is expected to affect bald eagle use of the project reservoirs.

3.2 PEREGRINE FALCON

Peregrine falcon populations began experiencing largescale declines following World War II caused largely by contamination from chlorinated hydrocarbon pesticides and a loss of nesting habitat (Pacific Coast American Peregrine Falcon Recovery Team, 1982). Consequently, the peregrine falcon was federally listed as an endangered species in 1973. Since then, peregrine falcon populations have been gradually increasing primarily because of protection and recovery efforts. Increases in the number of sightings and reoccupation of historical eyries have recently occurred in Washington, southern Oregon, and northern California (Pacific Coast American Peregrine Falcon Recovery Team, 1982).

3.2.1 Habitat Requirements

3.2.1.1 Foraging Habitat

Peregrines feed almost exclusively on avian prey captured in flight, including ducks, upland game birds, shorebirds, and small perching birds (Bent, 1961). Peregrines have also been known to feed occasionally on mammals (e.g., hares, squirrels and mice), fish, and insects. However, when available, rock doves (*Columbia livia*), mourning doves (*Z. macroura*), and band-tailed pigeons (*C. fasciata*) are preferred prey, especially late in the nesting season (Hunt, 1979, Weinstein, 1979). In Washington, shorebirds and waterfowl comprise the majority of the peregrine diet at

Grays Harbor (central Washington coast) and the Skagit Flats (northern Puget Sound) (Pacific Coast American Peregrine Falcon Recovery Team, 1982). Overwintering and migrating peregrines in the project area probably feed on abundant concentrations of waterfowl, shorebirds in delta mudflats along the Columbia River and wetlands along tributaries leading into the Columbia, starlings, rock doves, and a variety of songbirds.

3.2.1.2 Nesting Habitat

Peregrine falcons almost always nest on ledges located on sheer cliffs greater than 150 feet in height that are close to water (Pacific Coast American Peregrine Falcon Recovery Team, 1982). Nest sites have been documented on cliffs from near sea level to over 11,000 feet, in virtually every habitat but desert (Pacific Coast American Peregrine Falcon Recovery Team, 1982). Most peregrine nest sites in the west occur below timberline in areas with adequate prey resources (Bond, 1946). The majority of peregrine nests in the southwestern Rocky Mountains is located within 1 mile of a stream or river, areas often associated with lowlands providing abundant birds and open areas to hunt (Call, 1978). In Oregon, historical nest sites occur in the coastal and western parts of the state, the Columbia River, the Cascade mountains, and eastern Oregon (Henny and Nelson, 1981).

3.2.1.3 Wintering Habitat

Little information is available regarding habitat requirements of peregrines wintering along the Pacific Coast (Pacific Coast American Peregrine Falcon Recovery Team, 1982). Wintering areas most commonly used by peregrines in Washington include intertidal mudflats and estuaries of the Skagit Flats, Grays Harbor, and Willapa Bay (southern Washington coast).

3.2.2 Use of Project Area

The only documented use of the project area by peregrine falcons is on the lower Columbia River. One pair of peregrines nests approximately 5 miles downstream of Bonneville Dam; four pairs nest between Bonneville and The Dalles pools; and one pair nests immediately above The Dalles Dam (personal communication, K. McAllister, WDW, January 3, 1992; Corps, unpublished).

Peregrine falcons may occasionally use portions of the project area during migration. Sporadic sightings of migrating peregrines have occurred throughout eastern Washington; however, most peregrine sightings are associated with coastal areas (personal communication, K. McAllister, WDW, July 24, 1991).

3.2.3 Project Effects

Peregrine falcons not associated with nest sites along the lower Columbia would likely not be affected by the proposed pool lowerings; use of regions of the project area outside of the lower Columbia by peregrines appears to be low. Peregrines above the Bonneville and The Dalles pools are also not expected to be affected by drawdown, since drawdown to MOP is not likely to significantly alter wetlands or riparian areas on which associated prey species depend (see Sections 4.4.2 and 4.4.3). Thus, based on existing information, none of the proposed flow options is likely to affect peregrine falcon use of the project reservoirs.

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3.3 REFERENCES

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APPENDIX F

STATE AND FEDERALLY LISTED SPECIES

Table F-1. State and federally listed species potentially occurring in wetlands and riparian areas associated with the project reservoirs along the Columbia, Snake and Clearwater rivers in Washington and Idaho.

	SPECIES		STATUS ^a	USE OR OCCURRENCE IN WETLANDS/RIPARIAN AREAS ^a
Lower Columbia River Reservoirs, WA				
Plants	Bog clubmoss	<i>Lycopodium inundatum</i>	SS	bogs, wet areas
	Nuttall's quillwort	<i>Isoetes nuttallii</i>	SS ^d	wet areas
	Soft-leaved willow	<i>Salix sessilifolia</i>	SS ^d	stream banks
	Branching montia	<i>Montia diffusa</i>	SS ^d	moist areas
	White meconella	<i>Meconella oregana</i>	SS	open, wet areas
	Persistentsepal yellow-cress	<i>Rorippa columbiae</i>	SE ^d ,FC	moist areas, wetlands
	Pygmy-weed	<i>Tillaea aquatica</i>	SS	mudflats, vernal pools
	Western yellow oxalis	<i>Oxalis suksdorfii</i>	SS ^d	moist, coastal woods
	Oregon coyote-thistle	<i>Eryngium petiolatum</i>	ST	submerged areas during the spring
	False-pimpernel	<i>Lindernia anagallidea</i>	SS ^d	moist banks along rivers
	Few-flowered collinsia	<i>Collinsia sparsiflora</i> var <i>bruciae</i>	SS	open slopes and swales
	Liverwort monkey-flower	<i>Mimulus jungermannioides</i>	X	moist areas
	Pulsifer's monkey-flower	<i>Mimulus pulsiferae</i>	SS ^d	moist areas
	Suksdorf's monkey-flower	<i>Mimulus suksdorfii</i>	SS ^d	moist areas
	Green-fruited sedge	<i>Carex interrupta</i>	SS ^d	rocky banks, stream beds
	Kellogg's rush	<i>Juncus kelloggii</i>	SS ^d	wet areas
	Pacific bluegrass	<i>Poa gracillima</i> var <i>multnomae</i>	SS ^d	near waterfalls
	Giant helleborine	<i>Epipactis gigantea</i>	SS ^d	springs, seeps, stream banks

Table F-1. State and federally listed species potentially occurring in wetlands and riparian areas associated with the project reservoirs along the Columbia, Snake and Clearwater rivers in Washington and Idaho (continued).

	SPECIES		STATUS ^a	USE OR OCCURRENCE IN WETLANDS/RIPARIAN AREAS ^b
	Western ladies-tresses	<i>Spiranthes romanzoffiana</i> var <i>porrifolia</i>	SS	moist, swampy areas
Insects	Columbia River tiger beetle	<i>Cicindela columbica</i>	FC	foraging/breeding
	Dun skipper	<i>Euphyes vestris vestris</i>	SM	foraging/breeding
	Viceroy	<i>Limenitis archippus lahontani</i>	SM	foraging/breeding
	Pale crescent	<i>Phyciodes pallidus barnesi</i>	SM	foraging/breeding
Reptiles/Amphibians	Tiger salamander	<i>Ambystoma tigrinum</i>	SM	foraging/breeding
	Olympic salamander	<i>Rhyacotriton olympicus</i>	SM	foraging/breeding
	Tailed frog	<i>Ascaphus truei</i>	SM	foraging/breeding
	Woodhouse's toad	<i>Bufo woodhousei</i>	SM	foraging/breeding
	Western pond turtle	<i>Clemmys marmota</i>	ST, FC	foraging/breeding
	Sharp-tailed snake	<i>Contia tenuis</i>	SM	foraging/breeding
	Ring-necked snake	<i>Diadophis punctatus</i>	SM	foraging/breeding
Birds	American white pelican	<i>Pelecanus erythrorhynchos</i>	SE, FS	foraging
	Black-crowned night heron	<i>Nycticorax nycticorax</i>	SM	foraging/breeding
	Great blue heron	<i>Ardea herodias</i>	SM	foraging/breeding
	Long-billed curlew	<i>Numenius americanus</i>	SM, FC	foraging/breeding
	Forster's tern	<i>Sterna forsteri</i>	SM	foraging/breeding
	Turkey vulture	<i>Cathartes aura</i>	SM	foraging/breeding
	Golden eagle	<i>Aquila chrysaetos</i>	SC	foraging

Table F-1. State and federally listed species potentially occurring in wetlands and riparian areas associated with the project reservoirs along the Columbia, Snake and Clearwater rivers in Washington and Idaho (continued).

	SPECIES		STATUS ^d	USE OR OCCURRENCE IN WETLANDS/RIPARIAN AREAS ^d
	Bald eagle	<i>Haliaeetus leucocephalus</i>	FT	foraging/breeding/wintering
	Swainson's hawk	<i>Buteo swainsoni</i>	SC	foraging/breeding
	Osprey	<i>Pandion haliaetus</i>	SM	foraging/breeding
	Prairie falcon	<i>Falco mexicanus</i>	SM	foraging
	Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	SM	foraging/breeding
	Purple martin	<i>Progne subis</i>	SC, FS	foraging/breeding
Mammals	Long-legged myotis	<i>Myotis volans</i>	SM	foraging/breeding
	Western pipittrille	<i>Pipistrellus hesperus</i>	SM	foraging/breeding
	Western gray squirrel	<i>Sciurus griseus</i>	SC	foraging
	White salmon pocket gopher	<i>Thomomys talpoides limosus</i>	SM	foraging/breeding
Lower Snake River Reservoirs, WA				
Plants	Pygmy-weed	<i>Tillaea aquatica</i>	SS	mudflats, vernal pools
	Umatilla gooseberry	<i>Ribes oxycanthoides ssp cognatum</i>	SS ^d	riparian areas
	Idaho gooseberry	<i>Ribes oxycanthoides ssp irriguum</i>	SS ^d	riparian areas
	Northwest raspberry	<i>Rubus nigerrimus</i>	ST ^d , FC	moist hillsides
	Piper's milk-vetch	<i>Astragalus riparius</i>	SS	along rivers
	Porcupine sedge	<i>Carex hystricina</i>	SS	wet areas near streams
	Shining flat sedge	<i>Cyperus rivularis</i>	SS ^d	moist areas

Table F-1. State and federally listed species potentially occurring in wetlands and riparian areas associated with the project reservoirs along the Columbia, Snake and Clearwater rivers in Washington and Idaho (continued).

	SPECIES		STATUS ^a	USE OR OCCURRENCE IN WETLANDS/RIPARIAN AREAS ^a
	Prairie cord grass	<i>Spartina pectinata</i>	SS	ditches, ponds, marshes
	Giant helleborine	<i>Epipactis gigantea</i>	SS ^d	springs, seeps, stream banks
Insects	Pale crescent	<i>Phyciodes pallidus barnesi</i>	SM	foraging/breeding
	Columbia River tiger beetle	<i>Cicindela columbica</i>	FC	foraging/breeding
	Shepard's parnassian	<i>Parnassius clodius shepardii</i>	SC	foraging/breeding
Reptiles/Amphibians	Tiger salamander	<i>Ambystoma tigrinum</i>	SM	foraging/breeding
	Woodhouse's toad	<i>Bufo woodhousei</i>	SM	foraging/breeding
	Ring-necked snake	<i>Diadophis punctatus</i>	SM	foraging/breeding
Birds	Black-crowned night heron	<i>Nycticorax nycticorax</i>	SM	foraging/breeding
	Great blue heron	<i>Ardea herodias</i>	SM	foraging/breeding
	Bald eagle	<i>Haliaeetus leucocephalus</i>	FT	wintering
	Swainson's hawk	<i>Buteo swainsoni</i>	SC	foraging/breeding
	Prairie falcon	<i>Falco mexicanus</i>	SM	foraging

Table F-1. State and federally listed species potentially occurring in wetlands and riparian areas associated with the project reservoirs along the Columbia, Snake and Clearwater rivers in Washington and Idaho (continued).

	SPECIES		STATUS ^v	USE OR OCCURRENCE IN WETLANDS/RIPARIAN AREAS ^v
Upper Columbia River - FDR Reservoir, WA				
Plants	Giant helleborine	<i>Epipactis gigantea</i>	SS ^d	springs, seeps, stream banks
	Pygmy-weed	<i>Tillaea aquatica</i>	SS	mudflats, vernal pools
Insects	Immaculate green hairstreak	<i>Callophrys affinis affinis</i>	SM	foraging/breeding
Birds	Great blue heron	<i>Ardea herodias</i>	SM	foraging/breeding
	Golden eagle	<i>Aquila chrysaetos</i>	SC	foraging
	Bald eagle	<i>Haliaeetus leucocephalus</i>	FT	foraging/breeding/wintering
	Osprey	<i>Pandion haliaetus</i>	SM	foraging/breeding
Mammals	Long-legged myotis	<i>Myotis volans</i>	SM	foraging/breeding
	Gray wolf	<i>Canis lupus</i>	FE	foraging
Clearwater River - Brownlee Reservoir, ID				
Plants	American wood sage	<i>Teucrium canadense</i> var. <i>occidentale</i>	FS	moist swales
	Cusick's camassia	<i>Camassia cusickii</i>	FC, FS	riparian, moist hillsides
Birds	Bald eagle	<i>Haliaeetus leucocephalus</i>	FE	wintering
	Long-billed curlew	<i>Numenius americanus</i>	FC, FS	foraging
Clearwater River - Dworshak Reservoir, ID				
Plants	Constance's bittercress	<i>Cardamine constancei</i>	FC, FS	moist woods
	Broad-leaved starflower	<i>Trientalis latifolia</i>	FS, FS	moist woods
	Bank monkey-flower	<i>Mimulus clivicola</i>	FC, FS	moist areas

Table F-1. State and federally listed species potentially occurring in wetlands and riparian areas associated with the project reservoirs along the Columbia, Snake and Clearwater rivers in Washington and Idaho (continued).

	SPECIES		STATUS ^a	USE OR OCCURRENCE IN WETLANDS/RIPARIAN AREAS ^b
	Henderson's sedge	<i>Carex hendersonii</i>	FW, FS	swamps, moist woods
	Phantom orchid	<i>Eburophyton austiniiae</i>	FS	moist woods
Amphibians	Coeur d'Alene salamander	<i>Plethodon idahoensis</i>	FC, FS	foraging/breeding
Birds	Bald eagle	<i>Haliaeetus leucocephalus</i>	FE	wintering
Mammals	Gray wolf	<i>Canis lupus</i>	FE	foraging

a/ FS - federal sensitive species; FC - federal candidate; FW - federal watch list; FE - federal endangered; FT - federal threatened; SM - state monitor; ST - state threatened; SC - state special concern; X - possibly extinct; SS - state sensitive; SE - state endangered.

b/ Based on Thomas (1979), Brown (1985), Hitchcock and Cronquist (1973).

c/ Historic site - has not been field verified since 1980.

Table F-2. State and federally listed species potentially occurring in wetlands and riparian areas associated with the project reservoirs along the lower Columbia River, Oregon.

	SPECIES		STATUS ^{a/}	USE OR OCCURRENCE IN WETLANDS/RIPARIAN AREAS ^{a/}
Lower Columbia River Reservoirs, OR				
Plants	Columbia cress	<i>Rorippa columbiae</i>	SS, FC ₂	sandy/gravel river beds; mouths of rivers
	Oregon bolandra	<i>Bolandra oregana</i>	SC ₁	creeks, moist rocks
	Oregon sullivantia	<i>Sullivantia oregana</i>	SS, FC ₂	moist cliffs
Reptiles/Amphibians	Oregon slender salamander	<i>Batrachoseps wrighui</i>	SC	foraging/breeding
	Painted turtle	<i>Chrysemys picta</i>	SC	foraging/breeding
	California mountain kingsnake	<i>Lampropeltis zonata</i>	SC	foraging/breeding
Birds	Lesser scaup	<i>Aythya affinis</i>	SR	foraging/breeding
	Ring-necked duck	<i>Aythya collaris</i>	SW	foraging/breeding
	Swainson's hawk	<i>Buteo swainsoni</i>	SV	foraging/breeding
	Peregrine falcon	<i>Falco peregrinus</i>	FE	foraging/breeding
	Bald eagle	<i>Haliaeetus leucocephalus</i>	FT	wintering
	Long-billed curlew	<i>Numenius americanus</i>	FC	foraging/breeding
	Purple martin	<i>Progne subis</i>	SC	foraging/breeding
Mammals	Townsend's big-eared bat	<i>Plecotus townsendii</i>	SS, FC	foraging/breeding

a/ SC₁ - state candidate list 1; SC₂ - state candidate list 2; SS - state sensitive; SR - state review; SW - state watch list; SV - state sensitive-vulnerable; FC₁ - federal candidate 1; FC₂ - federal candidate 2.

b/ Based on Thomas (1979), Brown (1985), Hitchcock and Cronquist (1973).

APPENDIX G

TRANSPORTATION

Table G-1. Port facilities on the upper Columbia/Snake River dams and pools.

No.	Name	Mile	Owner	Operator	Use	Depth Alongside
Bonneville Pool						
98	SDS Lumber Co. Dock	170.5	SDS Lumber Co.	SDS Lumber Co.	Wood chips/log raft shipment	15
99	Mountain Fir Lumber Co., The Dalles Div. Log and Wood Chip Docks	187.1	Port of The Dalles	Mountain Fir Lumber Co.	Receipt of logs, wood chip shipment	12
101	Cargill The Dalles Grain Elevator Dock	188.7	Port of The Dalles	Cargill, Inc.	Grain shipment	15
102	Port of The Dalles Dock	189.6	Port of The Dalles	Port of The Dalles and Mid Columbia Grain Growers, Inc.	Grain shipment, mooring cruise vessels	24
The Dalles Pool						
104	Mid Columbia Grain Growers, A-House Dock	207.5	Mid Columbia Grain Growers	Mid Columbia Grain Growers, Inc.	Grain shipment	25
John Day Pool						
105	Cargill Arlington Grain Elevator Dock	241.6	Port of Arlington	Cargill, Inc.	Grain Shipment	19
106	Farmers Warehouse & Commission Co. Dock	243.5	Farmers Warehouse & Comm. Co.	Farmers Warehouse & Comm. Co.	Grain Shipment	20
107	Idaho Overseas Log Ramp	269.9	Port of Morrow	Idaho Overseas, Inc.	Log shipment by raft	15
108	Longview Fibre Co., Boardman Wood Chip Dock	270.2	Port of Morrow	Longview Fibre Co.	Wood chip shipment	15
109	Port of Morrow West Beach Terminal 3 Container Dock	270.6	Port of Morrow	Inland Container Service, Inc.	R/S general cargo, mooring barges for fleeing	15
110	SK Terminal Dock	271.6	Port of Morrow	SK Terminal, Inc.	Grain shipment	
111	Morrow County Grain Growers, Hogue-Warner Elevator Wharf	278.2	Morrow County Grain Growers	Morrow County Grain Growers	Grain shipment	15

Table G-1. Port facilities on the upper Columbia/Snake River dams and pools (continued).

No.	Name	Mile	Owner	Operator	Use	Depth Alongside
McNary Pool						
112	Port of Umatilla Commercial Dock	292.5	Port of Umatilla	Forest Recovery, Inc	Containers, Heavy lift, wood chips	20
113	Pendleton Grain Growers	292.7	Pendleton Grain Growers	Pendleton Grain Growers	Grain shipments	19
114	Tidewater Barge Lines	292.8	Tidewater Barge Lines	Tidewater Terminal Co.	R/S Petrol Prods, liquid fertilizer, fueling vessels	19
115	Walla Walla Grain Growers	311.6	Walla Walla Grain Growers	Walla Walla Grain Growers	Grain shipment	10-12
116	Walla Walla Grain Growers	314.5	Walla Walla Grain Growers	Walla Walla Grain Growers	Grain shipment	16
117	Boise Cascade Wallula Plant	316.5	Boise Cascade Corp	Boise Cascade Corp	Wood pulp shipment	12
118	Phillips Pacific Chemical Co	321.6	Phillips Pacific Chemical Co	Phillips Pacific Chemical Co	Shipment of liquid fertilizer	12
119	Chevron Chemical Co	322.6	Chevron Chemical Co	Not used	Not used	15
120	Unocal Chemicals	323.3	Unocal Chemicals Division	Unocal Chemicals Division	Receipt of ammonia & urea, shipment of ammonia	30
121	Northern Pacific Grain Growers	328	Northern Pac. Grain Growers	Northern Pacific Grain Growers	Grain shipments	14
122	Port of Benton Barge Slip	343.1	Port of Benton	Port of Benton	R/S heavy lift	10
123	Port of Benton	343.3	Port of Benton	Port of Benton	R/S heavy lift	10
124	Port of Pasco Marine Terminal	328.2	Port of Pasco	Continental Grains/ Columbia Marine Lines	Ship grain, receive petrol prods	12-14
125	Port of Pasco Barge Slip1. RO/RO Dock	326.9	Port of Pasco	Port of Pasco	RO/RO, mooring barges	20
126	Port of Pasco Container Terminal	326.8	Port of Pasco	Columbia Basin Container Corp	R/S containers, heavy lift	20
127	Port of Walla Walla Dock	1.7	Port of Walla Walla	Not used	Not used	6-10
128	Connell Grain Growers	1.8	Port of Walla Walla	Connell Grain Growers	Grain shipments	16-20
129	Cargill Butbank Grain Elevator Dock	2	Port of Walla Walla	Cargill, Inc	Grain shipment	10-12
130	Chevron Pipe Line Co, East Pasco Terminal	2.2	Chevron USA, Inc	Chevron Pipe Line Co	R/S petrol prods	22
131	Tidewater Terminal Co, Mooring Docks	2.7	Tidewater Terminal Co	Tidewater Terminal Co	Mooring vessels, handling supplies	8
132	Tidewater Terminal Co	2.9	Tidewater Terminal Co	Tidewater Terminal Co	R/S petrol prods	15
133	Tidewater Terminal Co Molasses Dock	3	Tidewater Terminal Co	Tidewater Terminal Co	R/S Molasses & liquid fertilizer	14

Table G-1. Port facilities on the upper Columbia/Snake River dams and pools (continued).

No.	Name	Mile	Owner	Operator	Use	Depth Alongside
Ice Harbor Pool						
134	Walla Walla Grain Growers, Sheffer Dock	29	Walla Walla Grain Growers	Walla Walla Grain Growers	Grain shipment	40
135	Louis Dreyfus Windust Station Dock	38.5	Louis Dreyfus Corp	Louis Dreyfus Corp	Grain shipment	16
Lower Monumental Pool						
136	Columbia County Grain Growers, Lyons Ferry Dock	61.1	Columbia County Grain Growers, Inc	Columbia County Grain Growers, Inc	Grain shipment	26
Little Goose Pool						
137	Pomeroy Grain Growers Dock	83	Port of Garfield	Pomeroy Grain Growers, Inc.	Grain shipment	24
138	Columbia Grain, Central Ferry Elevator	83.5	Port of Whitman County	Columbia Grain, Inc.	Grain shipment	18
139	Central Ferry Terminal	83.7	Central Ferry Terminal Association	Harvest States Cooperatives	Grain shipment	20
140	McGregor Terminal	NA	McGregor Company	McGregor Company	Ammonia shipment	NA
141	Almota Elevator Co Dock	103.6	Almota Elevator Co	Almota Elevator Co	Grain shipment	30
142	S & R Grain Co, Port of Almota Dock	103.7	Port of Whitman	S & R Grain Co & Palouse Producers	Grain shipment, receive liquid fertilizer	12-13
Lower Granite Pool						
143	Tidewater Terminal Co	135.3	Tidewater Terminal Co	Tidewater Terminal Co	R/S containers, R petrol Prods, liquid fert & salt	16
144	Port of Whitman County, Site H Wharf	135.6	Port of Whitman County	various lessors	R/S logs & general cargo	30
145	Potlatch Corp Dock	135.7	Potlatch Corp	Gem Chip & Trading, Inc	Ship wood chips	30
146	Mountain Fir Lumber Co Wilma Dock	136	Longview Fibre Co	Mountain Fir Lumber Co, Inc	Ship wood chips	15
147	Stegner Grain Terminal Dock	136.5	Port of Whitman County	Stegner Grain & Seed Co.	Grain shipment	30
148	Port of Whitman County Site A Dock	137	Port of Whitman County	various operators	R/S logs & general cargo	20
149	Port of Clarkston Dock	137.8	Port of Clarkston	Port of Clarkston	R/S containers, logs, heavy lift	16
150	Clarkston Grain Terminal Dock	138.4	United Grain Corp	Clarkston Grain Terminal, Inc.	Grain shipment	12
151	Mountain Fir Lumber Co, Lewiston Div Dock (Clearwater River)	0.5	Longview Fibre Co	Mountain Fir Lumber Co, Inc	Ship wood chips and hogged fuel	16
152	Port of Lewiston Container Terminal	1.1	Port of Lewiston	Knappton Terminals, Inc	R/S containers, general cargo, lumber, paper	14
153	Continental Grain Co, Lewiston Dock	1.3	Continental Grain Co	Continental Grain Co	Grain shipment	20
154	Lewis-Clark Terminal Association Dock	1.4	Lewis-Clark Term. Assoc., Inc	Lewis-Clark Term. Assoc., Inc	Grain shipment	15

Source: US Army Corps of Engineers Ports Series Number 33

Table G-2. Grain terminals on the upper Columbia and Snake rivers.

Table G-2. Grain terminals on the upper Columbia and Snake rivers.

Operator	Berthing Space (ft)	Depth Alongside	Capacity (Bu) Inside	Capacity (Bu) Outside	Barge Loading Rate Bu/hr	Barge Unloading Rate Bu/h
Continental Grain Co	705	40	5,165,000		29,000	12,500
Peavey Co	589	40	2,000,000		100,000	32,000
Harvest States Cooperatives	1,366	42	6,400,000		56,000	1,860
United Grain Corp	1,678	40	5,000,000		80,000	40,000
Cargill, Inc	350	15	200,000		5,000	
Mid-Columbia Grain Growers, Inc	180	24	1,400,000		12,000	
Mid-Columbia Grain Growers, Inc	255	25	1,785,000		12,000	
Cargill, Inc	180	19	750,000		10,000	
Farmers Warehouse and Commission Co	280	20	1,027,000		17,000	
SK Terminal, Inc	250	17	800,000		30,000	
Morrow County Grain Growers, Inc	300	15	1,649,000	2,750,000	10,000	
			3,000,000 ^{a/}			
Pendleton Grain Growers, Inc	500	19	3,000,000		18,000	
Walla Walla Grain Growers, Inc	200	11	3,305,000		25,000	
Walla Walla Grain Growers, Inc	200	16	1,255,000	3,000,000	20,000	
Northern Pacific Grain Growers	500	14	5,200,000	250,000	20,000	
Continental Grain Co	228	14	450,000		15,000	
				30,000		
Connell Grain Growers	550	18	665,000	665,000	28,000	
Cargill, Inc	400	11	2,600,000		15,000	
Walla Walla Grain Growers, Inc	210	40	490,000	2,300,000	25,000	
Dreyfus, Louis, Corp	300	16	320,000		30,000	
Columbia County Grain Growers, Inc	300	26	1,200,000	3,100,000	16,000	
Pomeroy Grain Growers, Inc	300	24	2,400,000	1,000,000	25,000	
Columbia Grain, Inc	500	18	2,146,000		25,000	
Harvest States Cooperatives	200	20	1,480,000	4,000,000	17,000	
Almota Elevator Co	350	30	1,500,000		15,000	
S & R Grain Co	204	12	357,000	350,000	38,000	
			300,000 ^{b/}			
Stegner Grain & Seed Co	295	30	4,100,000		30,000	
Clarkston Grain Terminal, Inc	300	12	580,000		30,000	
Continental Grain Co	350	20	500,000	500,000	30,000	
Lewis-Clark Terminal Association, Inc	350	15	5,256,200			
Totals			63,280,200	20,915,000		

a/ Outside storage area in rear of elevators is owned by Port of Lewiston.

b/ Second elevator in rear consisting of 2 steel tanks is served only by rail and truck.

Source: US Army Corps of Engineers Ports Series Number 33

Table G-3. Oil handling and bunkering terminals on the upper Columbia and Snake rivers.

Operator	Berthing Space (ft)	Depth Alongside	Storage Tanks	Capacity (Barrels)
Pacific Coast Seafoods	172	20	2	500
McCall Oil Co	2,965	40	5	101,700
Hatton, A.M., dba Carmichael Oil	380	40	5	5650
Crown Zellerbach Corp	650	31	1	40,000
Portland General Electric Co	900	40	9	1,350,000
Chevron USA, Inc	850	40	14	92,000
Longview Fibre Co	870	40	2	450,000
Kalama Chemical, Inc	680	45	1	20,000
Boise Cascade Corp	200	21	1	40,000
Aminoil USA, Inc	90	32	5	300,000
Farmers Union Central Exchange, Inc	90	32	5	260000
GATX Terminals Corp	90	32	21	85,800
PRI Northwest, Inc	650	35	4	70,000
Boise Cascade Corp	275	25	1	4,500
Crown Zellerbach Corp	360	5	1	43000
Chevron USA, Inc	300	19	1	42,000
Tidewater Terminal Co	300	19	20	170,000
Columbia Marine Lines, Inc	500	12	29	285,700
Chevron Pipe Line Co	265	22	20	590,100
Tidewater Terminal Co	300	15	29	379,200
Tidewater Terminal Co	375	16	7	85,000
			183	4,415,150

Source: US Army Corps of Engineers Ports Series Number 33

Table G-4. Walla Walla District - navigation tonnage history (cumulative totals^{1/}).

Year	McNary	Ice Harbor	Lower Monumental	Little Goose	Lower Granite
1951	30,904	----	----	----	----
1952	489,701	----	----	----	----
1953	415,326	----	----	----	----
1954	521,426	----	----	----	----
1955	712,040	----	----	----	----
1956	801,197	----	----	----	----
1957	906,250	----	----	----	----
1958	967,728	----	----	----	----
1959	1,069,335	----	----	----	----
1960	1,417,787	----	----	----	----
1961	1,087,279	----	----	----	----
1962	1,186,306	18,721	----	----	----
1963	1,278,270	77,853	----	----	----
1964	1,169,356	78,450	----	----	----
1965	1,511,001	81,059	----	----	----
1966	1,477,490	210,900	----	----	----
1967	1,796,943	292,084	----	----	----
1968	1,278,295	170,298	----	----	----
1969	1,784,508	239,227	6,971	----	----
1970	2,149,645	409,140	134,879	127,729	----
1971	2,220,315	611,963	388,601	355,081	----
1972	3,684,662	1,353,792	1,057,767	893,932	----
1973	3,646,207	1,203,647	926,616	831,872	----
1974	3,014,769	1,073,443	875,474	755,877	----
1975	3,507,571	1,267,045	994,496	882,118	165,857
1976	4,763,122	1,930,846	1,651,113	1,464,707	558,796
1977	4,617,283	2,215,469	1,966,395	1,799,123	888,977
1978	5,721,341	3,060,440	2,749,557	2,589,196	1,422,291
1979	5,926,078	3,263,292	2,652,101	2,517,156	1,402,102
1980	7,311,132	4,009,858	3,572,893	3,379,847	2,218,357
1981	7,995,446	4,386,471	3,754,625	3,536,124	2,135,784
1982	6,778,659	3,771,458	3,260,570	3,118,728	1,889,026
1983	6,446,035	3,770,935	3,315,635	3,218,032	1,997,377
1984	7,193,965	4,016,465	3,476,343	3,294,635	2,249,814
1985	5,335,910	2,710,209	2,373,725	2,229,185	1,578,327
1986	5,922,438	3,100,943	2,720,358	2,630,019	1,823,134
1987	6,578,615	3,800,619	3,258,560	3,123,240	2,114,115
1988	8,199,337	4,949,054	4,257,796	4,056,396	2,567,567
1989	6,592,134	3,645,388	3,169,696	3,057,974	2,131,516
1990	6,732,465	4,024,909	3,522,494	3,382,550	2,207,199
Tonnage originating/destined for individual pools					
1990	2,707,556	502,415	139,944	1,1775,351	2,207,199
percent	40.2%	7.5%	2.1%	17.5%	32.8%

^{1/} Tonnage shown moving through McNary is the total tonnage moving from McNary and all upstream pools.
Source: Walla Walla Corps of Engineers

Table G-5. Deep draft vessel calls, lower Columbia River, 1990 to 1991.

	Vessel Draft (in feet)						
	36	37	38	39	40	41	Total
<u>Washington Vessel Calls</u>							
Grain	69	45	25	68	36	1	224
Other	35	17	6	3	2		63
<u>Oregon Vessel Calls</u>							
Grain	30	15	11	4	3		63
Container	37	3					70
Other	38	14	12	7	2	1	74
							484

Source: Ogden Beeman, 1990.

Table G-6. Columbia-Snake inland waterway, port facilities with low water depths at MOP.

No.	Name	Mile	Owner	Operator	Use	Depth Alongside
Bonneville Pool						
93	Mountain Fir Lumber Co.	187.1	Port of The Dalles	Mountain Fir Lumber Co.	Log, Wood Chips	12
The Dalles Pool						
None						
John Day Pool						
None						
McNary Pool						
115	Walla Walla Grain Growers	311.6	Wall Walla Grain Growers	Walla Walla Grain Growers	Grain Shipment	10-12
117	Boise Cascade Wallula Plant	316.5	Boise Cascade Corp	Boise Cascade Corp	Wood pulp shipment	12
118	Phillips Pacific Chemical Co.	321.6	Phillips Pacific Chemical Co.	Phillips Pacific Chemical Co.	Shipment of liquid fertilizer	12
121	Northern Pacific Grain Growers	328	Northern Pac. Grain Growers	Northern Pac. Grain Growers	Grain shipments	14
122	Port of Benton Barge Slip	343.1	Port of Benton	Port of Benton	R/S heavy lift	10
123	Port of Benton	343.3	Port of Benton	Port of Benton	R/S heavy lift	10
124	Port of Pasco Marine Terminal	328.2	Port of Pasco	Continental Grains/Columbia Marine Lines	Ship grain, receive petrol prods	12-14
127	Port of Walla Walla Dock	1.7	Port of Walla Walla	Not used	Not used	6-10
129	Cargill Burbank Grain Elevator Dock	2	Port of Walla Walla	Cargill, Inc.	Grain shipment	10-12
131	Tidewater Terminal Co. Mooring Docks	2.7	Tidewater Terminal Co.	Tidewater Terminal Co.	Mooring vessels, handling supplies	8
133	Tidewater Terminal Co. Molasses Dock	3	Tidewater Terminal Co.	Tidewater Terminal Co.	R/S molasses & liquid fertilizer	14
Ice Harbor Pool						
None						
Lower Monumental Pool						
141	S&R Grain Co. Port of Almota Dock	103.7	Port of Whitman	S & R Grain Co. & Palouse Producers	Grain shipment, receive liquid fertilizer	12-13
Lower-Granite Pool						
149	Clarkston Grain Terminal Dock	138.4	United Grain Corp.	Clarkston Grain Terminal, Inc.	Grain shipment	12
151	Port of Lewiston Container Terminal	1.1	Port of Lewiston	Knappton Terminals, Inc.	R/S containers, general cargo, lumber, paper	14

Source: U.S. Army Corps of Engineers, Ports Series Handbook, Number 33, 1986

Table G-7. Lower Columbia vessel draft impacts 39 feet for 2 months.

Actual Draft	1989 Number of Trips	DWT Tonnage Unconstrained	DWT Tonnage Constrained 39 feet	Number of Impacted Trips	Lost Tonnage	Cost/Ton (\$)	Cost Impact
36	155	33,734	33,734	0.0	0	12.99	0
37	70	36,703	36,703	0.0	0	12.51	0
38	35	39,933	39,933	0.0	0	12.02	0
39	50	43,447		8.3	29,283	11.53	174,577
40	60	47,270		10.0	73,370	11.03	413,934
41	4	51,430		0.7	7,664	10.55	41,727
Total	374			19.0	110,318		630,239

Source: BST Associates using Portland District Corps data for 1989 (latest available).

Table G-8. Lower Columbia vessel draft impacts 38 feet for 1 month.

Actual Draft	1989 Number of Trips	DWT Tonnage Unconstrained	DWT Tonnage Constrained 38 feet	Number of Impacted Trips	Lost Tonnage	Cost/Ton (\$)	Cost Impact
36	155	33,734	33,734	0.0	0	12.99	0
37	70	36,703	36,703	0.0	0	12.51	0
38	35	39,933		2.9	116,471	12.02	60,783
39	50	43,447		4.2	181,029	11.53	174,122
40	60	47,270		5.0	236,350	11.03	311,167
41	4	51,430		0.3	17,143	10.55	27,810
Total	374			12.0	550,993		573,884

Source: BST Associates using Portland District Corps data for 1989 (latest available).

APPENDIX H

RECREATION

Table H-1. Columbia River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
BELOW									
BONNEVILLE DAM									
1. Corbett Launch Ramp	Oregon DOT	*						*	
2. Rooster Rock State Park	Oregon State Parks	*	*	*	*	*		*	*
3. Dalton Point	Oregon DOT	*						*	
4. Benson State Park	Oregon State Parks			*	*			*	*
5. Barsteads Landing	Private	*	*						
6. Hankins Landing	Private	*	*						
7. Coverts Landing	Private	*	*						
8. Beacon Rock State Park	WA State Park	*	*	*	*	*	*	*	*
9. Hamilton Island	Corps	*		*				*	*
10. Bonneville Hatchery	OR Depl. of F & W			*				*	*

Table H-1. Columbia River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
BONNEVILLE DAM AND LAKE BONNEVILLE									
1. Bonneville Dam Visitor Center	Corps		*	*				*	*
2. Overlook Park	Forest Service			*				*	*
3. Bonneville Dam Visitor Orientation	Corps							*	*
4. Cascade Locks Marine Park	Port of Cascade Locks	*	*	*	*			*	*
5. Rock Creek Park	Skamania County			*			*	*	*
6. Wind River Boat Ramp	Skamania County	*						*	
7. Home Valley Park	Skamania County/Corps			*	*	*	*	*	*
8. Viento State Park	Oregon State Parks			*		*	*		*
9. Drano Lake	Skamania County	*						*	*
10. Spring Creek Fish Hatchery	USFWS			*		*		*	*
11. Hood Vista Sail Park	Private			*		*	*		*
12. Hood River Boat Basin & Marina	Port of Hood River	*	*	*	*	*	*	*	*
13. Koberg Beach State Wayside	Oregon State Parks			*	*	*		*	*
14. Bingen Boat Basin, Marina, & Park	Port of Kllickitat	*	*	*					*
15. Rowland Lake Boat Ramp	WA Depr. of Wildlife	*						*	
16. Memaloose State Park	Oregon State Parks			*			*		*

Table H-1. Columbia River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
BONNEVILLE DAM AND LAKE BONNEVILLE (cont.)									
17. Mayer State Park	Oregon State Parks	*		*	*	*		*	*
18. Doug's Beach	Private					*	*		
19. Crates Point	OR Dept of F & W/ Corps							*	*
20. The Dalles Boat Basin	Port of The Dalles	*	*						*
21. The Dalles Riverfront Park	Port of The Dalles			*	*	*			*

Table H-1. Columbia River recreational facility inventory.

Page 4 of 6

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
THE DALLES DAM AND LAKE CELILO (RIVER MILE 192-215)									
1. Seufert Visitor Area	Corps			*					*
2. Hess Park	Corps			*					*
3. Spearfish Lake	Corps	*		*				*	*
4. Horsethief Lake	Washington State Parks	*		*	*		*	*	*
5. Avery Park	Corps	*							
6. Celilo Park	Corps	*		*	*	*		*	*
7. Deschutes State Park	Oregon State Parks	*		*	*		*	*	*
8. Biggs Park	Corps	*		*					*
9. Maryhill State Park	Washington State Parks	*		*	*	*	*	*	*
10. Rufus Area (Giles French)	Corps	*		*			*	*	
11. Cliffs Area	Corps	*		*				*	*

Table H-1. Columbia River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
JOHN DAY DAM AND LAKE UMATILLA (RIVER MILE 215-290)									
1. Railroad Island	Corps	*		*					
2. LePage Park	Corps	*	*	*	*		*	*	*
3. Philippi Park	Corps		*	*	*		*	*	*
4. Rock Creek	Corps	*		*	*				
5. Sundale Park	Corps	*		*				*	*
6. Roosevelt Park	Corps	*		*	*			*	*
7. Arlington Park	City of Arlington	*	*	*	*				*
8. Willow Creek Wildlife Refuge	OR Dept. of Fish & Wildlife								
9. Quesnel Park	Corps	*		*		*	*	*	*
10. Alderdale	Corps							*	
11. Crow Butte State Park	Washington State Parks	*	*	*	*		*	*	*
12. Umatilla Nat'l Wildlife Refuge	U.S. Fish & Wildlife Service	*							
13. Boardman Park	Boardman Park & Rec. District	*		*	*		*		*
14. Irrigon Park	City of Irrigon	*	*	*	*				*
15. Nugent Park	Port of Umatilla	*	*					*	*
16. Umatilla Park	Port of Umatilla								
17. Plymouth Park	Corps	*		*	*	*	*		*

Table H-1. Columbia River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
MCNARY DAM/ LAKE WALLULA									
1. McNary Dam	Corps	*		*				*	*
2. McNary Beach				*	*			*	*
3. Hat Rock State Park	OR State Parks	*		*				*	*
4. Warehouse Beach				*				*	*
5. Sand Station				*			* random	*	*
6. Madame Dorian		*		*			* random	*	*
7. Hover Park	Benton County							*	
8. Two Rivers Park	Benton County	*		*	*			*	*
9. Hood Park		*		*	*		*	*	*
10. Sacajawea State Park	WA State Parks	*		*	*			*	*
11. Pasco Boat Basin	City of Pasco	*	*	*				*	*
12. Columbia Park	City of Kennewick City of Richland	*		*	*		*	*	*
13. Chiawana/Rd. 54 Park	Franklin County	*		*				*	*
14. Wye Park	City of Richland	*		*				*	*
15. Howard Amon Park	City of Richland	*		*				*	*
16. Leslie Groves Park	City of Richland	*		*				*	*
17. Walla Walla Yacht Club	Private		*						
18. McNary Yacht Club	Private	*	*						

Table H-2. Snake River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
ICE HARBOR DAM/ LAKE SACAJAWEA									
1. Charbonneau		*	*	*	*		*	*	*
2. Levey		*		*	*			*	*
3. Fishhook		*		*	*		*	*	*
4. Windust		*		*	*		* Primitive	*	*
5. Mathews		*						*	*
6. Ice Harbor Dam	Corps	*		*				*	*
LOWER MONUMENTAL DAM/ LAKE HERBERT G. WEST									
1. Devils Bench		*		*				*	*
2. Ayer Boat Basin		*		*				*	*
3. Lyons Ferry	State of Washington	*		*	*		*	*	*
4. Lyons Ferry Marina	Port of Columbia	*	*	*			*	*	*
5. Texas Rapids		*		*				*	*
6. Riparia								*	*

Table H-2. Snake River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
LITTLE GOOSE DAM/ LAKE BRYAN									
1. Central Ferry	State of Washington	*		*	*		*	*	*
2. Boyer Park and Marina	Port of Whitman County (operated by concessionaire)	*	*	*	*		*	*	*
3. Little Goose Landing		*		*				*	*
4. Willow Landing		*		*				*	*
5. Illia Landing		*		*				*	*
6. Garfield Ramp	Port of Garfield	*							*
LOWER GRANITE DAM/LAKE									
1. Chief Timothy State Park	State of Washington	*		*	*		*	*	*
2. Hells Gate State Park	State of Idaho	*	*	*	*		*	*	*
3. Wawawai Bay	Whitman County Parks	*		*			*	*	*
		(adjacent at W.a. Landing)							
4. Chief Looking Glass	Town of Asotin	*	*	*	*			*	*
5. Red Wolf Marina	Port of Clarkston	*	*	*					*

Table H-2. Snake River recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
LOWER GRANITE DAM/LAKE (CONTINUED)									
6. Clearwater Park	City of Lewiston							*	*
7. Clearwater Ramp	Nez Perce County	*						*	* Chemical
8. Southway Ramp	Nez Perce County	*						*	* Chemical
9. Wawawai Landing	Portion leased to Univ. of WA	*		*	* Primitive			*	*
10. Offfield Landing		*		*				*	*
11. Blyton Landing		*		*				*	*
12. Nisqually John Landing		*		*	* Primitive			*	*
13. O & M Ramp		*						*	*
14. Greenbelt				*				*	*
15. Swallows Park		*		*	*			*	*
16. Lewiston Levee Parkways				*				*	*

Table H-3. Dworshak recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
DWORSHAK DAM									
1. Brices Eddy		*						*	*
2. Merry's Bay				*				*	*
3. Grandad Creek		*		*			* Primitive	*	*
4. Canyon Creek		*		*			* Primitive	*	*
5. Cold Springs				*			* Group-primitive	*	* chemical
6. Magnus Bay				*			* Primitive	*	*
7. Dent Acres		*		*	*		*	*	*
8. Dent Group Area				*			* Group	*	*
9. Dworshak State Park	Idaho State Parks	*		*	*		*	*	*
10. Big Eddy Marina	Nez Perce Tribe		*						
11. Big Eddy Launching Area	Corps	* only low water ramp on lake		*	*			*	*
12. Mini Camp Sites (all around lake)				*			*	*	* Chemical

Table H-4. Brownlee recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
BROWNLEE DAM									
1. Woodhead Park	Idaho Power Co.	*		*	*		*		*
2. Hewitt Park	Baker Co.	*		*			*		*
3. Spring Recreation Site	BLM	*		*			*		*
4. Steck Park	BLM	*		*	*		*		*
5. Farewell Bend State Park	State of Oregon	*		*	*				*

Table H-5. Grand Coulee recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
GRAND COULEE DAM/ LAKE ROOSEVELT									
1. Spring Canyon	National Park Service	*	*	*	*		*		*
2. Plum Point	National Park Service		*(dock)	*			*(tent)		*
3. Keller Park	National Park Service	*	*(dock)	*			*(tent)		*
4. Keller Ferry	National Park Service	*	*(dock)	*	*		*		*
5. Penix Canyon	National Park Service		*(dock)	*			*(tent)		*
6. Jones Bay	National Park Service	*	*(dock)	*			*(tent)		*
7. Halverson Canyon	National Park Service			*			*(tent)		*
8. Hawk Creek	National Park Service	*	*(dock)	*			*		*
9. Seven Bays	National Park Service	*	*(dock)	*					
10. Fort Spokane	National Park Service	*	*(dock)	*	*		*		*
11. Crystal Cove	National Park Service			*			*(tent)		*
12. Pierre	National Park Service			*			*		*
13. McCoys	National Park Service		*(dock)	*					

Table H-5. Grand Coulee recreational facility inventory.

Page 2 of 3

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
GRAND COULEE DAM/ LAKE ROOSEVELT (cont.)									
14. Ponderosa	National Park Service			*			* (tent)		*
15. Detullion	National Park Service		* (dock)	*			* (tent)		*
16. Porcupine Bay	National Park Service	*	* (dock)	*	*		*		*
17. Enterprise	National Park Service			*			* (tent)		*
18. Rogers Bar	National Park Service			*			* (tent)		*
19. Hunters	National Park Service	*	* (dock)	*	*		*		*
20. Gifford	National Park Service	*	* (dock)	*			*		*
21. Cloverleaf	National Park Service		* (dock)	*	*				
22. Daisy	National Park Service	*	* (dock)						
23. Barnaby Island	National Park Service			*			* (tent)		*
24. Bradbury Beach	National Park Service	*	* (dock)	*			*		*
25. Haag Cove	National Park Service		* (dock)	*			*		*
26. Sherman Creek	National Park Service		* (dock)	*			* (tent)		*
27. Keule Falls	National Park Service	*	* (dock)	*	*		*		*
28. Marcus Island	National Park Service	*	* (dock)	*			*		*

Table II-5. Grand Coulee recreational facility inventory.

Site Name	Management Authority	Boat Ramp	Boat Moorage	Picnic Tables	Swim Beach	Windsurf Beach	Camp Sites	Fishing Access	Rest Rooms
GRAND COULEE DAM/ LAKE ROOSEVELT (cont.)									
29. Kamloops	National Park Service		* (dock)	*			*		*
30. Kettle River	National Park Service		* (dock)	*			*		*
31. Summer Island	National Park Service		* (dock)	*			* (tent)		*
32. Evans	National Park Service	*	* (dock)	*	*		*		*
33. Snag Cove	National Park Service		* (dock)	*			*		*
34. North Gorge	National Park Service	*	* (dock)	*			*		*
35. China Bend	National Park Service	*	* (dock)						

Table H-6. Effects of drawdown options on existing recreation facilities.

Project/Option	Boat Ramp ^u			Moorage Facilities ^u			Swimming Areas ^v	
	Fully Functional ^u	Marginally Functional ^u	Unusable ^u	Fully Functional ^u	Marginally Functional ^u	Unusable ^u	Functional ^{10w}	Unusable ^{11v}
Bonneville Dam & Lake Bonneville								
Existing Normal Operations (Elev. 71.5'-76.5')	7	1	0	5	0	0	6	0
Minimum Operating Pool (Elev. 70.0', 4/1/91-8/31/91)	2	5	1	1	4	0	2	4
The Dalles Dam & Lake Celilo								
Existing Normal Operations (Elev. 155.0'-160.0')	5	2	0	0	0	0	4	0
Minimum Operating Pool (Elev. 155.0', 4/1/91-8/31/91)	1	3	2	0	0	0	1	3
John Day Dam & Lake Umatilla								
Existing Normal Operations (Elev. 260.0'-268.0')	8	4	0	7	0	0	7	0
Minimum Operating Pool (Elev. 257.0', 4/1/91-8/31/91)	4	3	5	5	2	0	1	6
Combination (Elev. 262.5', 4/1/91-8/31/91)	5	4	3	7	0	0	3	4

- 1/ Includes courtesy loading docks and floats.
2/ Includes boat channels, boat basins, and year-round or seasonal moorages and related facilities such as gas docks.
3/ Includes water areas of developed or designated swimming areas.
4/ Size of boat that can be launched, time required to launch, and safety are unaffected by water depth or flow.
5/ The size of boat that can be launched, time required to launch, or launching safety are significantly affected by water levels and/or flows.
6/ Water depths and/or flows so low ramps cannot be safely or efficiently used for normal recreational craft—usually less than 3 feet at toe of ramp.
7/ All moorage facilities are usable for the size and numbers of recreational craft for which they were designed.
8/ Low water levels and/or flows place constraints on the numbers and size of craft that can use the facilities.
9/ Moorage facilities totally unusable due to low water levels or flows.
10/ Adequate water area and depth remains within the designated swimming area to allow safe swimming use—usually greater than 2 feet.
11/ Inadequate water area or depth remains in designated swimming area to allow safe, functional use—usually more than 2 feet in depth.

Table II-6. Effects of drawdown options on existing recreation facilities (continued).

Project/Option	Boat Ramps ^u			Moorage Facilities ^u			Swimming Areas ^v		
	Fully Functional ^u	Marginally Functional ^u	Unusable ^u	Fully Functional ^u	Marginally Functional ^u	Unusable ^u	Functional ^u	Marginally Functional ^u	Unusable ^u
McNary									
MOP		4	5	2	3		3	1	2
Ice Harbor									
MOP		6			1			4	
Spillway			6			1			4
Lower Monumental									
MOP	3	2		1				1	
Spillway			5			1			1
Little Goose									
MOP	2	4			1				2
Spillway			6			1			2
Lower Granite									
710			11			2			4
MOP	9	2			2		2		2
Spillway			11			2			4

1/ Includes courtesy loading docks and floats.

2/ Includes boat channels, boat basins, and year-round or seasonal moorages and related facilities such as gas docks.

3/ Includes water areas of developed or designated swimming areas.

4/ Size of boat that can be launched, time required to launch, and safety are unaffected by water depth or flow.

5/ The size of boat that can be launched, time required to launch, or launching safety are significantly affected by water levels and/or flows.

6/ Water depths and/or flows so low ramps cannot be safely or efficiently used for normal recreational craft—usually less than 3 feet at toe of ramp.

7/ All moorage facilities are usable for the size and numbers of recreational craft for which they were designed.

8/ Low water levels and/or flows place constraints on the numbers and size of craft that can use the facilities.

9/ Moorage facilities totally unusable due to low water levels or flows.

10/ Adequate water area and depth remains within the designated swimming area to allow safe swimming use—usually greater than 2 feet.

11/ Inadequate water area or depth remains in designated swimming area to allow safe, functional use—usually more than 2 feet in depth.

Table II-7. Summary of operational impacts to existing recreation sites (only projects currently affected are shown). Page 1 of 3

Site Name	Pool Elevations (msl)		Minimum Usable Pool Elevation			
	Max	Min	Boat Ramps	Boat Moorages	Swim Beach	Irrigation
McNary Dam						
Two Rivers Park	356.5	335	—	—	—	at MOP will be out of water
Chiawana	356.5	335	—	—	swimming will be difficult at MOP	both irrigation intakes out of water
Walla Walla Yacht Club	356.5	335	marginal use at MOP	larger boats will be stuck in mud at 335	—	intake will be out of water
McNary Yacht Club	356.5	335	marginal use	grounded boats & boathouses at MOP	—	—
Columbia Park Boat Shop Marina	356.5	335	can't be used at MOP	—	—	—
Ice Harbor						
Charbonneau Park Marina	440	437	—	difficult to enter at 437	—	—
All boat ramps	440	437	can't be used below normal operating range	—	—	—
Lower Monumental Dam						
Lyons Ferry Marina	540	537	537	portion of moorage in only 6 ft of water; deepest part is 18 ft deep	—	—
Ayer Boat Basin	540	537	537	522 (boat tunnel)	—	—
All Boat Ramps	540	537	537	—	—	—
Little Goose						
Central Ferry	638	633	two lanes unusable at 633	—	unusable at 633	—

Table II-7. Summary of operational impacts to existing recreation sites (only projects currently affected are shown). Page 2 of 3

Site Name	Pool Elevations (msl)		Minimum Usable Pool Elevation			
	Max	Min	Boat Ramps	Boat Moorages	Swim Beach	Irrigation
Boyer Park	638	633	—	sandbar partially blocking marina entrance at MOP	unusable at 633	—
Lower Granite						
Chief Looking Glass	738	733	barely usable at 733	only jet boats can enter basin at 733	—	—
Hells Gate Marina	738	733	—	moorage of large boats restricted at 733	—	—
Red Wolf Marina	738	733	—	at 733 access to marina is limited	—	—
Brownlee Reservoir						
Woodhead Park	—	—	2,026	—	—	—
Hewett Park	—	—	2,073 2,069	dock 2,069 dock 2,073	2,069	—
Spring Creek Recreation Site	—	—	2,034	—	—	—
Steck Park	—	—	2,047	dock 2,057	2,073	—
Farewell Bend S.P.	—	—	2,065 launching difficult at 2070	dock 2,067	—	—
Dworshak						
Bruces Eddy	1,600	1,445	1,480	—	—	—
Merry's Bay	1,600	1,445	—	—	—	—
Grandad Creek	1,600	1,445	1,555	—	—	—
Canyon Creek	1,600	1,445	1,577	—	—	—
Colt Springs	1,600	1,445	—	—	—	—
Magnus Bay	1,600	1,445	—	—	—	—
Dent Acres	1,600	1,445	1,520	—	—	—

Table II-7. Summary of operational impacts to existing recreation sites (only projects currently affected are shown). Page 3 of 3

Site Name	Pool Elevations (msl)		Minimum Usable Pool Elevation			
	Max	Min	Boat Ramps	Boat Moorages	Swim Beach	Irrigation
Dent Group Area	1,600	1,445	—	—	—	—
Dworshak State Park	1,600	1,445	1,535	—	marginal at 1,595	water intake for Camp Three Meadows at 1,480
Big Eddy Marina	1,600	1,445	1,430	—	—	water intake at 1,430
Big Eddy Launch Area	1,600	1,445	—	—	—	—
Mini Campsites	1,600	1,445	—	—	—	—

Table H-8. Summary of operational impacts to existing Lower Columbia River recreation sites.

# ²	Site Name	River Mile	Pool Elevations ¹		Minimum Usable Pool Elevation			Existing Problems/Concerns Related to Reservoir Operations
			Max. ³ Pool	Min. ⁴ Pool	Boat Ramps ⁵	Boat Moorages	Swim Beach	
<u>Below Bonneville Dam (River Mile 125-145)</u>								
1	Corbett Launch Ramp	126	n/a	n/a	unk.	n/a	n/a	- no existing problems identified
2	Rooster Rock State Park	128	n/a	n/a	2 ft.	2 ft.	2-4 ft.	- sedimentation blocks entrance to boat basin at low flows. - high flows erode swimming beach. - river levels below approx. 2'-4" leave swimming beach dry; river channel located close to end of beach. - irrigation intake in boat basin impacted by low water (<2 ft.).
3	Dalton Point	134	n/a	n/a	unk	n/a	n/a	
4	Benson State Park	136	n/a	n/a	n/a	n/a	2-4 ft.	- seep lake affected by river elevations. - irrigation intake affected at low flows; improved efficiency at higher levels.
5	Barsteds Landing	139	n/a	n/a	unk	unk	n/a	
6	Hankins Landing	140	n/a	n/a	unk	unk	n/a	
7	Coverts Landing	141	n/a	n/a	unk	unk	n/a	
8	Beacon Rock State Park	142	n/a	n/a	unk	unk	unk	- shallow boat basin restricts access during low flows.
9	Hamilton Island	144	n/a	n/a	7.0'	7.0'	n/a	- normal river level is 11.0 ft. NGVD - high water and fast currents create hazards for boaters and fishermen. - popular fishing access area that gets congested. - low water levels allow unauthorized off-road vehicle access to Hamilton Island.
10	Bonneville Hatchery	145	n/a	n/a	n/a	n/a	n/a	- includes Tanner Creek fishing access point.
<u>Bonneville Dam and Lake Bonneville (River Mile 145-195)</u>								
11	Bonneville Dam Visitor Center	146	77.0	70.0	n/a	n/a	n/a	
12	Overlook Park	147	77.1	70.1	n/a	n/a	n/a	
13	Bonneville Dam Visitor Orientation	146	77.0	70.0	n/a	n/a	n/a	
14	Cascade Locks Marine Park	148	77.2	70.2	69.0'	unk	unk	- existing boat basin requires periodic dredging. - new 2-lane ramp and boarding float planned at elev. 67.5 (bottom end of ramp at 70.5).
15	Rock Creek Park	150	77.7	71.0	n/a	n/a	n/a	- sediment deposits impact and constrain recreational boating.
16	Wind River Boat Ramp	154	77.9	71.3	unk	unk	n/a	- sediment deposits/shoaling in Wind River arm create difficulties for recreational boating and navigation. - shallow embayment near boat ramp requires periodic dredging.

Table H-8. Summary of operational impacts to existing Lower Columbia River recreation sites.

Site Name	River Mile	Pool Elevations		Minimum Usable Pool Elevation			Existing Problems/Concerns Related to Reservoir Operations
		Max. Pool	Min. Pool	Boat Ramps	Boat Moorages	Swim Beach	
17 Home Valley Park	155	77.9	71.3	n/a	n/a	65'	- natural swimming beach usable below minimum pool. - sediment deposits block mouth of Home Valley Creek; water quality concerns.
18 Viento State Park	161	78.0	71.7	n/a	n/a	n/a	- very popular unimproved windsurfing beach and cove. - extent of sandy beach limited; rocks & stumps may be exposed at low water. - no formal access across RR tracks from campground to river.
19 Drano Lake	163	78.0	71.7	n/a	n/a	n/a	- Sediment deposits in Drano Lake & mouth of Little White Salmon River create recreational hazards and difficulties.
20 Spring Creek Fish Hatchery	167	78.2	71.9	n/a	n/a	n/a	- Swell City, unimproved windsurfing beach not affected by low pools. - parking and minimal facilities constrain windsurfing use.
21 Hood Vista Sail Park	169	78.3	72.2	unk	unk	unk	
22 Hood River Boat Basin & Marina	169	78.3	72.2	76.0	76.0	71.5	- siltation at mouth of Hood River and boat basin; shallow entrance to boat basin (est. 12' at 78' NGVD). - shoreline an estimated 300' distance from events area facilities at low pool. - temporary plywood "platforms" used to provide windsurfer access across rocks.
23 Koberg Beach State Wayside	171	78.4	72.3	unk.	n/a	66.5	- very little water-related recreation; mostly highway rest area. - large, unimproved swimming beach; usable at low water levels. - minor sediment deposition problem at beach & boat ramp.
24 Bingen Boat Basin, Marina & Park	171	78.4	72.3	unk.	unk.	unk.	- shallow water conditions create problems during low flow periods.
25 Rowland Lake Boat Ramp	176	78.7	72.7	unk	n/a	n/a	- Rowland Lake is a steep lake influenced by river levels.
26 Memaloose State Park	177	78.7	72.8	n/a	n/a	n/a	- no river access. - irrigation efficiency may be effected by low water levels.
27 Mayer State Park	181	78.8	73.0	75.0	n/a	71.5	- boat access limited by shallow channel during low flow periods. - minor sediment deposition a problem. - channel from river into boat basin needs to be marked. - East Mayer Beach an extremely popular windsurfing site; recent 90 space parking lot overwhelmed at peak periods.
28 Crates Point	187	79.0	73.2	n/a	n/a	n/a	- Taylor Lake fluctuates with Columbia River pool elevations.
29 The Dalles Boat Basin	190	79.1	73.5	73.0'	unk	n/a	- ramp repairs, boarding & transient floats needed.
30 The Dalles Riverfront Park	191	79.1	73.5	n/a	n/a	unk.	
31 Seufert Visitor Area	192	79.1	73.5	n/a	n/a	n/a	- visitor facilities not directly influenced by project operations.

Table H-8. Summary of operational impacts to existing Lower Columbia River recreation sites.

Site Name	River Mile	Pool Elevations		Minimum Usable Pool Elevation		Existing Problems/Concerns Related to Reservoir Operations
		Max. Pool	Min. Pool	Boat Ramps	Boat Moorings Beach	
<u>The Dalles Dam and Lake Celilo (River Mile 192-215)</u>						
		155.0 ft.	160.0 ft.			
32 Hless Park	192	160.0	155.0	n/a	n/a	- site presently semi-closed.
33 Spearfish Lake	193	160.1	155.1	unk	n/a	- site presently semi-closed. - seep lake subject to river level fluctuations.
34 Horsethief Lake	194	160.1	155.1	157	157	- seep lake subject to river level fluctuations. - river boat ramp nearly unusable at minimum operating pool.
35 Avery Park	198	160.5	155.5	157.0	n/a	- boat ramp severely damaged by erosion at toe; not usable at low pool.
36 Celilo Park	201	160.9	155.9	158.0	unk	- boat ramp severely damaged by erosion at toe w/serious & hazardous drop-off; not usable at low pool. - channel into boat basin needs to be marked.
37 Deschutes State Park	203	161.2	156.2	157.0	n/a	- sediment deposition at mouth of Deschutes River. - large rocks exposed at low pool; need to mark channel from river to ramp.
38 Riggs Park	208	162.1	157.1	n/a	n/a	- site closed. - use of boat ramp severely constrained by sediment deposition.
39 Maryhill State Park	209	162.3	157.3	157.3	157.3	- boat prop wash scours hole at end of ramp and creates gravel berm 15' out; creates difficult landing conditions at low water; berm must be periodically removed. - irrigation intake may be exposed at minimum operating pool. - swimming beach pretty much unusable at minimum operating pool.
40 Giles French Park	214	163.9	158.9	unk	n/a	
41 Cliffs Area	214	163.9	158.9	unk	n/a	- boat ramp severely damaged by erosion at toe; not usable at low pool
<u>John Day Dam and Lake Umatilla (River Mile 215-290)</u>						
		268.0	257.0/262.0 ⁶			
42 Railroad Island	216	268.0	257.0/262.0	unk	n/a	- embayment lake; access to lake influenced by pool elevations, sedimentation.
43 LePage Park	217	268.0	257.0/262.0	256.0	unk	
44 Philippi Park	4	268.0	257.0/262.0	n/a	unk	- boat in access only; campground w/mooring & transient floats. - shoaling in arm, above park may restrict boat access to the "Narrows".
45 Rock Creek	229	268.0	257.0/262.0	unk	n/a	- embayment lake "harbor of refuge"; access to lake influenced by river levels. - site development potential partially constrained by sedimentation and shoaling
46 Sundale Park	237	268.0	257.0/262.0	unk	n/a	- embayment lake "harbor of refuge"; access to lake influenced by river levels. - site development potential partially constrained by sedimentation and shoaling - boat loading dock float piers severely damaged by wind-driven waves.
47 Rock Hill Park	241	268.0	257.0/262.0	unk	n/a	- significant wave-cut erosion at toe of boat ramp.

Table H-8. Summary of operational impacts to existing Lower Columbia River recreation sites.

Site Name	River Mile	Pool Elevations		Minimum Usable Pool Elevation			Existing Problems/Concerns Related to Reservoir Operations
		Max. Pool	Min. Pool	Boat Ramps	Boat Moorages	Swim Beach	
48 Arlington Park	241	268.0	257.0/262.0	256.0	unk	unk	- sedimentation and shoaling a regular maintenance problem.
49 Willow Creek Wildlife Refuge	253	268.2	257.0/262.0	unk	n/a	n/a	- significant wave-cut erosion at toe of boat ramp; not usable at low pool elevations.
50 Quesnel Park	255	268.2	257.0/262.0	259.0	n/a	n/a	- boat loading floats were damaged by wind-driven waves and removed.
51 Alderdale	257	268.2	257.0/262.0	unk	n/a	n/a	- significant wave-cut erosion; boat ramp destroyed and unusable.
52 Crow Butte State Park	262	268.3	257.0/262.1	unk.	unk.	unk.	- sedimentation in boat basin & channel a continuing problem.
53 Umatilla National Wildlife Refuge	262-287	n/a	n/a	unk	n/a	n/a	
54 Boardman Park	268	268.3	257.1/262.1	256.0	256.0	265.0	
55 Irrigon Park	282	268.7	257.8/262.7	256.0	unk	unk	- shoreline erosion is an existing problem; cultural resource site is being eroded.
56 Nugent Park	289	269.8	260.0/263.8	265.0	unk	unk.	
57 Umatilla Marina	290	269.8	260.0/263.8	257.5	unk	unk	
58 Plymouth Park	289	269.8	260.0/263.8	unk	unk	unk	

Legend
n/a = not applicable
unk = unknown

1. Based on backwater curves for Columbia River 1992 Operation EIS "target flow" of 200,000 CFS.
2. Map reference number for Figure R1
3. Maximum operating pools.
4. Minimum operating pool.
5. Includes 3 feet of water over toe of ramp to provide adequate depth for full, safe use.
6. Minimum pool elevations under alternatives 2 and 3, respectively.

Table H-9. Estimated recreation days displaced by activity at Snake River projects as result of reservoir drawdown options.

Option/Project	Boating	Swimming	Camping	Day Use	Total
Near Spillway Crest 4/15 - 8/15					
Lower Granite	66,179	117,592	2,301	115,750	301,822
Lower Monumental	12,876	7,855	2,741	40,521	63,993
Little Goose	29,978	68,501	11,123	130,185	239,787
Ice Harbor	63,737	42,334	5,801	16,428	128,300
Subtotal	172,770	236,282	21,966	302,884	733,902
Near Spillway Crest 4/15 - 6/15					
Lower Granite	29,302	31,981	707	51,003	112,933
Lower Monumental	3,661	1,434	1,081	11,863	18,039
Little Goose	11,930	17,298	4,036	46,078	79,342
Ice Harbor	22,688	12,885	1,633	5,989	43,195
Subtotal	67,581	63,598	7,457	114,933	253,569
Lower Granite @ 710 4/15 - 6/15, remaining reservoirs at MOP					
Lower Granite	29,302	31,981	707	51,003	112,993
Lower Monumental	--	--	--	--	--
Little Goose	1,703	17,298	--	--	19,001
Ice Harbor	--	--	--	--	--
Subtotal	31,005	49,279	707	51,003	131,994
Lower Granite @ 710 2/1-2/28 4 Weeks, remaining reservoirs at MOP					
Lower Granite	20,145	--	--	--	20,145
Lower Monumental	--	--	--	--	--
Little Goose	--	--	--	--	--
Ice Harbor	--	--	--	--	--
Subtotal	20,145	--	--	--	20,145

Table II-10. Summary of projected Dworshak recreation losses by facility and option.

Facility	Lost Visitor Days, By Option									
	A	B	C	D	E	F	G	H	I	J
1A. Big Eddy Marina	0	16,600	2,100	10,400	0	41,500	0	2,100	0	2,100
1B. Big Eddy Other	0	0	0	0	0	36,200	0	0	0	0
2. Bruce's Eddy	0	4,200	1,700	3,600	300	5,000	0	600	0	600
3. Canyon Creek	0	9,000	3,600	7,800	600	10,800	0	1,200	0	1,200
4. Dent Acres	0	6,600	0	4,400	0	39,700	0	0	0	0
5. Freeman	0	9,700	0	9,700	0	58,200	0	0	0	0
6. Grandad	0	13,100	4,400	13,100	3,700	13,100	700	1,500	0	1,500
7. Mini-Camps	0	11,300	11,300	11,300	11,300	11,300	1,300	1,300	1,300	1,300
8. Merry's Bay	0	300	0	300	0	2,100	0	100	0	100
9. Dworshak Dam	0	4,000	0	4,000	0	41,700	0	0	0	0
10. Visitor Center	0	700	0	700	0	8,400	0	0	0	0
TOTAL	0	75,500	23,100	65,300	15,900	268,000	2,000	6,800	1,300	6,800
Percent Loss From Base (349,131)	0	22	7	19	5	77	1	2	-	2

APPENDIX I

SOCIOECONOMICS

Table I-1. Population of study area counties and selected cities.

	1970 ^{a/b/c/d}	1980 ^{a/b/c/d}	Percent Change 1970-1980	1990 ^{d/}	Percent Change 1980-1990
WASHINGTON					
Asotin	13,799	16,823	21.91	17,605	4.65
Clarkston	6,312	6,897	9.27	6,753	(2.09)
Benton	67,540	109,444	62.04	112,560	2.85
Columbia	4,439	4,057	(8.61)	4,024	(0.81)
Ferry	3,655	5,811	59.0	6,295	8.33
Franklin	25,816	35,025	35.67	37,473	6.99
Garfield	2,911	2,468	(15.22)	2,248	(8.91)
Grant	41,881	48,522	15.86	54,758	12.85
Klickitat	12,138	15,822	30.35	16,616	5.02
Lincoln	9,572	9,604	0.33	8,864	(7.71)
Skamania	5,845	7,919	35.48	8,289	4.67
Stevens	17,405	28,979	66.50	30,948	6.79
Walla Walla	42,176	47,435	12.47	48,439	2.12
Whitman	37,900	40,103	5.81	38,775	(3.31)
Subtotal, WA Counties	285,077	372,012	30.50	386,894	4.00
WA State Total	3,413,244	4,132,353	21.07	4,866,692	17.77
OREGON					
Baker	14,919	16,134	8.14	15,317	(5.06)
Gilliam	2,342	2,057	(12.17)	1,717	(16.52)
Hood River	13,187	15,835	20.08	16,903	6.74
Malheur	23,169	26,896	16.09	26,038	(3.19)
Morrow	4,465	7,519	68.40	7,625	1.41
Multnomah	554,668	562,647	1.44	583,887	3.78
Sherman	2,139	2,172	1.54	1,918	(11.70)
Umatilla	44,923	58,861	31.03	59,249	0.66
Wallowa	6,247	7,273	16.42	6,911	(4.98)

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Table I-1. Population of study area counties and selected cities (continued).

	1970 ^{a/,b/,d/}	1980 ^{a/,b/,d/}	Percent Change 1970-1980	1990 ^{d/}	Percent Change 1980-1990
Wasco	20,133	21,732	7.94	21,683	(0.23)
Subtotal, OR Counties	686,192	721,126	5.10	741,248	2.79
OR State Total	2,091,533	2,633,105	25.91	2,842,321	7.95
IDAHO					
Adams	2,877	3,347	16.34	3,254	(2.78)
Clearwater	10,871	10,390	(4.42)	8,505	(18.14)
Orofino	3,883	3,711	(4.43)	2,868	(22.72)
Idaho	12,891	14,769	14.57	13,783	(6.68)
Riggins	533	527	(1.13)	443	15.94
Lewis	3,867	4,118	6.50	3,516	(14.62)
Nez Perce	30,376	33,220	9.36	33,754	1.61
Lewiston	26,068	27,986	7.36	28,082	0.34
Payette	12,401	15,825	27.61	16,434	3.85
Washington	7,633	8,803	15.33	8,550	(2.87)
Subtotal ID Counties	80,916	90,472	11.81	87,796	(2.96)
ID State Total	713,015	943,935	32.39	1,006,749	6.65

a/ Total Study Area, Washington, OFM, 1983.

b/ U.S. Bureau of the Census. 1981a.

c/ U.S. Bureau of the Census. 1981b.

d/ Letter, Barbara Bryant, Director, Washington, D.C.; U.S. Bureau of the Census, January 24, 1991.

Table I-2. Non-agricultural employment by county and industry (1990).

	Manufacturing	Construction & Mining	Transportation & Public Utilities	Wholesale & Retail	Finance & Real Estate	Services & Miscellaneous	Government	Total Employment
Washington								
Asotin	280	230	60	1,110	120	990	840	3,510
Benton/Franklin ^{a/}	13,900	3,600	12,600	13,100	1,800	15,900	11,100	62,000
Columbia	590	20	70	180	30	150	510	1,550
Ferry	240	410	30	300	20	210	640	1,850
Garfield	—	10	—	180	20	20	430	670
Grant	2,500	1,100	700	4,500	400	2,800	4,800	16,900
Klickitat	1,600	100	300	800	100	600	1,600	5,000
Lincoln	50	30	90	600	90	190	1,170	2,220
Skamania	540	70	30	160	20	120	910	1,840
Stevens	1,960	380	360	1,350	210	1,360	2,060	7,680
Walla Walla	4,170	480	800	4,350	830	4,780	4,580	20,170
Whitman	210	290	330	3,020	350	1,630	10,540	16,370
Oregon								
Baker	670	180	290	1,110	230	1,000	1,300	4,770
Gilliam	5	25	95	100	15	90	180	510
Hood River	1,250	280	590	2,130	200	1,860	1,200	7,520
Malheur	1,540	240	500	3,130	340	1,670	2,220	9,630
Morrow	950	30	170	280	60	130	740	2,360
Multnomah	—	5	15	210	10	40	285	560
Sherman	720	570	1,270	5,020	690	3,580	5,100	20,940
Umatilla	510	90	90	420	90	280	770	2,260
Wallowa	1,170	140	260	2,000	310	1,760	1,960	7,590
Washington ^{a/}								
Idaho								
Adams ^{a/}	969	77	99	436	85	228	1,214	3,108
Clearwater	852	213	144	771	132	439	1,362	3,913
Lewis ^{a/}	347	—	—	274	38	48	379	1,137
Nez Perce	3,970	521	957	4,191	908	3,758	2,486	16,846
Payette ^{a/}								
Washington ^{a/}								

Source: Personal communication, Doug Tweedy, Idaho Department of Employment, Labor Market Analyst, July 25, 1991;
Washington Employment Security Department, 1991.

a/ Industry employment data for Benton and Franklin counties was available in combined form only.
b/ 1990 Employment by industry data not currently available, but will be included upon receipt.

APPENDIX J

RESERVOIR REGULATION CHANGES

APPENDIX J - RESERVOIR REGULATION CHANGES

SUMMARY OF IMPACT OF DWORSHAK FLOW AUGMENTATION

The operation of Dworshak varies considerably from option to option, as does the operation of Brownlee, although to a lesser extent. Table J-1 summarizes key operating characteristics for the flow augmentation options, based on the average of each of the values over the 50-year period of the HYSSR analysis (1978-77). Table J-2 shows the average change of each of these characteristics compared to the Base Case (option A). Tables J-3 through J-5 show the average monthly reservoir elevations for Dworshak, Brownlee, and Grand Coulee, for representative options. Table J-6 shows the probability of meeting the various flow targets for each Option.

Base Case (Option A). Dworshak is usually at its maximum elevation in July, following the snowmelt runoff. The objective is to maintain the reservoir at this elevation through Labor Day, although some drafting may be required for hydropower or to maintain minimum flows. After Labor Day, drafts are initiated for hydropower, with the additional objective of reaching El. 1558.0 by December 15 in order to provide the 700 KAF flood control requirement. On January 1, the first runoff forecasts become available, and drafting continues, primarily for power generation, with reservoir elevations being constrained on the high side by the mandatory flood control curve (MRC) and on the low side by a rule curve designed to ensure an acceptable refill probability. Drafting below the refill curve would occur only to maintain minimum downstream flow requirements. Further adjustments are made to this operation as new runoff forecasts become available. The reservoir reaches its low point in mid-April and then refill begins. Between mid-April and July, the reservoir is allowed to refill with snowmelt runoff, with a gradually diminishing amount of space being provided for flood control and with releases being made for power generation. In addition, up to 600 KAF of Water Budget releases are made during May to help meet an 85 kcfs flow requirement at Lower Granite.

1200 KAF Fixed Discharge in May (Option B). In this option the overall operating strategy is

basically the same as for the Base Case except that 1200 KAF is released from Dworshak every year in May for Water Budget in lieu of the variable discharge of up to 600 KAF. The result is a deeper draft in May and a lower probability of refill by the end of July. Table J-2 shows the average end-of-month elevation in July to be 34.2 feet lower than the Base Case. This lower elevation prevails throughout the summer. During the fall and early winter, the project operates at minimum discharge in an attempt to restore the reservoir to its normal operation rule curve. In most years it reaches this curve by mid-winter and operates generally as described for the Base Case until May, when the 1200 KAF May fixed discharge is again required. In low flow years, however, the project operates only to meet the 2 kcfs minimum discharge requirement for most or all of the year (except May), with the result that the reservoir elevation is always below the Base Case elevation. As shown by Figure 3-4.2, the reservoir elevations are about the same as for the Base Case in a high runoff year. In an average year the elevations are about the same in the fall and winter but substantially lower from May through November. In low water years, year-round elevations are lower with the greatest departures occurring during the May-through-November period.

1200 KAF Fixed Discharge Divided Between May and June (Option C). This operation is similar to Option B except that the 1200 KAF discharge requirement is to be divided equally between May and June. The results are generally similar to those for Option B except that the May-June draft is lower. This is because more of the 1200 KAF total discharge requirement can be met with inflow; i.e., the combined inflow of May and June can be credited to the 1200 KAF requirement instead of only the May inflow, as was the case in Option B. As a result, refill probabilities are somewhat greater than for Option B, and the average elevations for both the summer and the year as a whole are an average of 7.5 feet higher.

1200 KAF Fixed May Discharge Plus Operation to MRC's and Flood Control Transfer (Option D). This operation is based on criteria similar to Option B except that the reservoir is not allowed to fall below the flood control rule curves (MRC's) except in May (during the Water Budget draft) or when drafts are required to meet the 2 kcfs minimum discharge requirement. In this option, the power requirements almost cease to influence the operation. In poor water

Table J-1. Summary of Key Operating Characteristics for Flow Augmentation Options^{a/}

OPTION	A	B	C	D	E	F	G	H	I	J	NPPC
DWR May EOM Elev, ft	1555.2	1501.7	1544.6	1514.9	1558.8	1434.3	1544.9	1555.7	1552.7	1553.6	1555.5
DWR Jul EOM Elev, ft	1588.5	1553.1	1560.6	1562.9	1570.2	1515.5	1583.5	1588.5	1588.9	1594.6	1590.1
Julys DWR did not fill ^{b/}	16	44	46	43	46	44	21	13	34	13	18
DWR Aug2 EOM Elev, ft	1585.0	1550.8	1558.3	1561.0	1568.4	1512.7	1580.1	1586.6	1587.2	1595.1	1589.6
DWR Avge Pool Elev, ft	1545.5	1527.1	1534.4	1539.6	1547.7	1497.3	1543.3	1549.7	1555.5	1558.3	1556.2
BRN May EOM Elev, ft	2057.6	2039.4	2048.9	2039.4	2048.9	1998.6	2040.4	2057.6	2044.2	2057.6	2057.6
BRN Jul EOM Elev, ft	2067.7	2067.7	2067.7	2067.7	2067.7	2058.9	2067.7	2067.7	2067.7	2067.7	2067.7
GCL Jul EOM Elev, ft	1289.2	1289.2	1289.2	1289.2	1289.2	1289.2	1289.2	1289.2	1289.2	1289.5	1289.1
DWR Apr2 Discharge, cfs	9,098	8,934	8,986	8,536	8,616	8,560	9,050	11,592	9,167	11,862	10,626
DWR May Disc. arge, cfs	7,657	19,855	10,000	19,901	10,000	27,436	10,648	9,023	10,754	9,210	9,319
LGR Apr2 Discharge, cfs	83,727	83,563	83,615	84,065	84,145	83,189	83,678	86,221	83,795	86,491	85,255
Apr2 Months 85 kcfs or above	21	20	19	21	21	21	22	24	22	24	21
LGR May Discharge, cfs	104,901	125,229	111,300	125,771	111,796	141,607	112,591	106,268	110,438	106,454	106,563
May Months 85 kcfs or above	37	49	42	49	42	49	45	42	43	37	38
Crit Period Energy, MWe	11,508	11,468	11,496	11,405	11,430	11,429	11,488	11,588	11,442	11,424	11,481

a/ Average monthly values based on simulation of the historical streamflow period 1928-77.

b/ Within five feet of full.

Table J-2. Changes in Key Operating Characteristics for Flow Augmentation Options^{a/}
Compared to Base Case Conditions (Option A)

OPTION	A	B	C	D	E	F	G	H	I	J	NPPC
DWR May EOM Elev, ft	1555.2	-53.5	-10.6	-40.3	0.6	-100.9	-10.3	0.5	-2.5	-1.6	0.3
DWR Jul EOM Elev, ft	1588.5	-35.4	-27.9	-25.6	-18.3	-73.0	-5.0	0.0	0.4	6.1	1.6
Julys DWR did not fill ^{b/}	16	28	30	27	30	28	5	-3	18	-3	2
DWR Aug2 EOM Elev, ft	1585.0	-34.2	-26.7	-24.0	-16.6	-72.3	-4.9	1.6	2.2	10.1	4.6
DWR Avge Pool Elev, ft	1545.5	-18.4	-11.1	-5.9	1.8	-48.2	-2.2	4.2	10.0	12.8	10.7
BRN May EOM Elev, ft	2057.6	-18.2	-8.7	-18.2	-8.7	-59.0	-17.2	0.0	-13.4	0.0	0.0
BRN Jul EOM Elev, ft	2067.7	0.0	0.0	0.0	0.0	-8.8	0.0	0.0	0.0	0.0	0.0
GCL Jul EOM Elev, ft	1289.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-0.1
DWR Apr2 Discharge, cfs	9,098	-164	-112	-562	-482	-538	-48	2,294	69	2,764	1,528
DWR May Discharge, cfs	7,657	12,198	2,343	12,244	2,343	19,779	2,991	1,366	3,097	1,553	1,662
LGR Apr2 Discharge, cfs	83,727	-164	-112	338	418	-538	-49	4,494	68	2,764	1,528
Apr2 Months 85 kcfs or above	21	-1	-2	0	0	0	1	3	1	3	0
LGR May Discharge, cfs	104,901	20,328	6,399	20,870	6,895	36,706	7,690	1,367	5,537	1,553	1,662
May Months 85 kcfs or above	37	12	5	12	5	12	8	5	6	0	1
Crit Period Energy, MWe	11,508	-40	-12	-103	-78	-79	-20	-20	-66	-84	-27

a/ Average monthly values based on simulation of the historical streamflow period 1928-77.

b/ Within five feet of full.

Table J-3. Summary of Dworshak reservoir end-of-month elevations with flow augmentation options (ft msl).

	Base Case Up to 600 KAF in May ^{a/} (Option A)	Fixed Draft 1,200 KAF in May ^{a/} (Option B)	Fixed Draft 1,200 KAF in May and June ^{a/} (Option C)	Unlimited Draft to Meet Target Flow of 140 kcfs in May ^{a/} (Option F)	Variable Draft of Up to 900 KAF to Meet Target of 100 kcfs in May ^{a/} (Option G)	Up to 1,200 KAF to Meet 85 kcfs Target Flow from Mid- April - Mid- May ^{a/} (Option H)	Variable Draft of 900 KAF or more to meet target of 100 kcfs from April 15 to May 31 (Option J)	Variable Draft of 900 KAF ± based on runoff forecast from April 16 to June 15 (NPPC Plan)
Average Values								
July	1,588.5	1,553.1	1,560.6	1,515.5	1,583.5	1,5788.5	1,587.2	1,590.1
August	1,585.0	1,550.8	1,558.3	1,512.7	1,580.1	1,5786.6	1,581.7	1,589.6
September	1,563.5	1,545.6	1,552.3	1,507.1	1,562.1	1,5664.8	1,562.4	1,580.9
October	1,559.7	1,543.9	1,550.4	1,505.4	1,559.0	1,561.1	1,558.8	1,576.9
November	1,550.7	1,541.4	1,545.3	1,505.7	1,550.4	1,551.5	1,550.5	1,565.9
December	1,542.2	1,537.3	1,539.1	1,506.6	1,542.2	1,547.6	1,546.7	1,556.5
January	1,522.5	1,518.7	1,519.8	1,496.9	1,522.6	1,532.4	1,531.9	1,538.4
February	1,503.1	1,500.6	1,501.4	1,485.1	1,503.3	1,516.8	1,516.4	1,521.6
March	1,488.0	1,487.1	1,487.1	1,479.3	1,488.4	1,498.4	1,498.1	1,502.5
April	1,504.2	1,503.6	1,503.5	1,498.8	1,505.6	1,510.1	1,510.0	1,512.9
May	1,555.2	1,501.7	1,544.6	1,454.3	1,544.9	1,555.7	1,553.4	1,555.5
June	1,585.1	1,545.7	1,553.7	1,506.5	1,579.3	1,584.9	1,583.4	1,585.7
Avg Annual Flood Fluctuation (ft) from Full Pool Elevation	112.0	112.9	112.9	145.7	111.6	101.6	101.9	97.5
Average Annual Pool Elevation	1,545.5	1,527.9	1,534.4	1,497.3	1,543.3	1,549.7	1,548.2	1,556.2
Median Values								
April	1,507.3	1,507.3	1,507.3	1,503.7	1,507.3	1,509.4	1,501.7	1,516.3
May	1,558.4	1,506.6	1,548.6	1,445.0	1,550.1	1,557.9	1,556.5	1,559.5
June	1,592.2	1,549.3	1,557.2	1,496.2	1,590.7	1,593.1	1,588.5	1,591.8
July	1,600.0	1,556.0	1,565.3	1,502.2	1,597.6	1,600.0	1,596.9	1,600.0
August	1,597.7	1,553.9	1,563.2	1,499.7	1,594.8	1,597.8	1,592.7	1,599.3

a/ Corresponds to current operations.

b/ Operating to flood control rule curves with a system flood control shift to Grand Coulee results in average elevation increases of 6 to 11 feet, and corresponds to Alternative D.

c/ Operating to flood control rule curves with a system flood control shift to Grand Coulee results in average elevation increases of approximately 7 to 13 feet, and corresponds to Alternative E.

d/ Operating to flood control rule curves (MRCs) and system flood control shift to Grand Coulee.

Table J-4. Summary of Brownlee reservoir end-of-month reservoir elevations resulting from flow augmentation options (ft msl).

Target	Option A Base Case No Brownlee Augmentation Target ^{a/}	Option B Fixed Draft 200 KAF In May	Option C Fixed Draft 200 KAF in May and June	Option F Unlimited Draft to Meet May 140 kcfs Target	Option G Variable Draft to Meet May 100 kcfs Target
Average Values					
July	2,067.7	2,067.7	2,067.7	2,058.9	2,067.7
August	2,064.4	2,064.4	2,064.4	2,061.8	2,064.4
September	2,066.7	2,066.7	2,066.7	2,066.1	2,066.7
October	2,071.8	2,071.8	2,071.8	2,071.8	2,071.8
November	2,073.8	2,073.8	2,073.8	2,073.8	2,073.8
December	2,072.7	2,072.7	2,072.7	2,072.7	2,072.7
January	2,066.5	2,066.5	2,066.5	2,066.5	2,066.5
February	2,046.6	2,046.6	2,046.6	2,046.6	2,046.6
March	2,040.2	2,040.2	2,040.2	2,040.2	2,040.2
April	2,036.5	2,036.5	2,036.5	2,036.5	2,036.5
May	2,057.6	2,039.4	2,048.9	1,998.6	2,040.3
June	2,076.6	2,075.4	2,069.4	2,054.9	2,075.9
Avg. Annual Elevation	2,062.0	2,060.4	2,060.7	2,054.1	2,060.5
Avg. Annual Fluctuation (ft)	40.5	40.5	40.5	78.4	40.5
Median Values^{c/}					
January	2,077.0	2,077.0	2,077.0	2,077.0	2,077.0
February	2,044.8	2,044.8	2,044.8	2,044.8	2,044.8
March	2,044.8	2,044.8	2,044.8	2,044.8	2,044.8
April	2,044.6	2,044.6	2,044.6	2,044.6	2,044.6
May	2,063.5	2,046.1	2,055.1	1,976.0	2,047.3

Source: HYSSR analyses.

a/ Options calling for system flood control shifts to Grand Coulee do not alter results for Brownlee.

b/ Includes balanced power loads.

c/ Months not shown indicate relatively small differences between average and median values.

years, the project operates almost the same as for Case B, in that the reservoir fails to fill and the project operates at minimum flow most of the year. In good water years, the project operates to the MRC, releasing discharges in excess of minimum flows only if it is possible to do so and still remain on the MRC. In average water years, the project remains on minimum flow much of the year in an attempt to reach the MRC, with releases in excess of minimum flow being possible only in the January-April time period. Generally speaking, operating to the MRC improves refill and generally increases reservoir elevation the year around. The end of July reservoir elevations average ten feet higher than for Option B, and the annual average

increases by 12 feet, but at the cost of a substantially reduced firm energy output. It should be noted that the transfer of system flood control storage from Dworshak to Brownlee raises the MRCs slightly compared to the Base Case MRCs for low-to-moderate runoff forecasts. This makes more storage space potentially available for Water Budget and subsequent refill. However, because transfer is not possible in high runoff years and because flows are insufficient to fill this space in many of the remaining years, flood control transfer improves refill in only about one-third of the water years.

1200 KAF Fixed May/June Discharge Plus Operation to MRCs and Flood Control Transfer (Option E).
This operation and its results are very similar to Option

APPENDIX J

Table J-5. Summary of Grand Coulee reservoir end-of-month elevations with flow augmentation options (ft msl).

	Base Case 600 KAF from Dworshak No Flood Control Shifting ^{a/} (Option A)	Flood Control Shift with 1,200 KAF from Dworshak in May ^{a/} (Option D)	Flood control Shift with Unlimited Releases from Dworshak and Brownlee to Meet Target Flow of 140 kcfs in May ^{a/} (Option F)	Base Case Without Target 200 ^{b/} (Option A)	Base Case with Target 200 ^{a/} (Option S)
July	1,289.2	1,289.2	1,289.2	1,289.9	1,289.9
August	1,288.6	1,288.5	1,288.4	1,289.9	1,289.9
September	1,286.9	1,286.8	1,286.8	1,288.2	1,288.2
October	1,286.7	1,286.5	1,286.5	1,288.2	1,288.3
November	1,286.8	1,286.7	1,286.6	1,288.3	1,288.4
December	1,286.5	1,286.3	1,286.1	1,287.2	1,287.1
January	1,272.7	1,267.9	1,272.2	1,277.6	1,278.8
February	1,255.2	1,254.3	1,254.7	1,263.8	1,265.8
March	1,232.2	1,230.9	1,231.3	1,238.3	1,241.3
April	1,232.2	1,231.0	1,231.7	1,228.8	1,231.3
May	1,244.2	1,244.4	1,245.0	1,248.9	1,252.1
June	1,284.2	1,284.3	1,284.4	1,285.1	1,285.5
Median Values ^{d/}					
March	1,214.9	1,214.9	1,214.9	1,208.0 ^{e/}	1,208.0 ^{d/}
April	1,220.3	1,220.3	1,220.3	1,208.0 ^{e/}	1,208.0 ^{d/}
May	1,240.2	1,240.0	1,240.0	1,220.2 ^{f/}	1,220.2 ^{f/}
June	—	—	—	1,240.8 ^{f/}	1,240.8 ^{f/}

a/ Corps of Engineers analyses.
b/ BPA analyses.
c/ Months not shown indicate negligible difference between average and median values.
d/ Minimum pool. Achieved in 8 of 50 years of simulation.
e/ Minimum pool. Achieved in 13 of 50 years of simulation.
f/ Lowest pool achieved in 50-year simulation.
g/ Minimum pool. Achieved in 17 of 50 years of simulation.
h/ Lowest pool achieved in 3 of 50 years of simulation.

D except that distributing the 1200 KAF discharge requirement between May and June reduces the amount of storage that must be drafted from Dworshak. This in turn improves refill and increases average annual reservoir elevations somewhat compared to Option D. The end of July reservoir elevations increase by an average of more than seven feet and the average annual elevations by nearly eight feet.

Unrestricted Draft to Meet 140 kcfs (Option F).
This case has the most severe impact on reservoir

elevations of any of the options examined for the EIS. The objective is to meet a 140 kcfs flow requirement in May at Lower Granite, and this results in all available storage being drafted from both Dworshak and Brownlee in many years. This has a severe impact on refill at Dworshak, with the reservoir refilling only six years out of 50 and the average end-of-July elevation being 73 feet lower than the Base Case. Since the reservoir fails to refill most of the time, the project operates on minimum discharge until January in most years in an attempt to return to its power rule curves. In some years it remains on minimums up until the

Table J-6. Annual frequency in achieving target flows with flow augmentation options (number of years in 50-year simulation).

Augmentation Condition	Targets	Results at Lower Granite ^{a/b/}
<u>Option A</u> Dworshak - up to 600 KAF in May	85 kcfs at Lower Granite in May	<u>May</u> 13 yrs < 85 kcfs
<u>Option B</u> Dworshak - Specified 1,200 KAF in May Brownlee - Specified 200 KAF in May Above Brownlee - Specified 300 KAF in May	No specific targets	<u>May</u> 1 yr < 85 kcfs 8 yrs < 100 kcfs 37 yrs < 140 kcfs
<u>Option C</u> Same as Option B except discharges in May and June.	No specific targets	<u>May</u> 7 yrs < 85 kcfs 22 yrs < 100 kcfs 42 yrs < 140 kcfs <u>June</u> 13 yrs < 85 kcfs 25 yrs < 100 kcfs 39 yrs < 140 kcfs
<u>Option D</u> Flood Control Shift to Grand Coulee Dworshak - Specified 1,200 acre-feet in May Brownlee - Specified 200 acre-feet in May Above Brownlee - Specified 300 KAF in May	No specific targets	<u>May</u> 1 yr < 85 kcfs 8 yrs < 100 kcfs 35 yrs < 140 kcfs
<u>Option E</u> Same as Option D except discharges in May and June	No specific targets	<u>May</u> 8 yrs < 85 kcfs 23 yrs < 100 kcfs 42 yrs < 140 kcfs <u>June</u> 13 yrs < 85 kcfs 25 yrs < 100 kcfs 39 yrs < 140 kcfs
<u>Option F</u> Discharge whatever necessary from Dworshak and Brownlee to meet target flows	140 kcfs at Lower Granite in May	49 yrs < 85 kcfs 48 yrs < 100 kcfs
<u>Option G</u> Dworshak - Up to 900 KAF in May Brownlee - Up to 150 KAF in May Above Brownlee - Up to 100 KAF in May	100 kcfs at Lower Granite in May	5 yrs < 85 kcfs in May 14 yrs < 100 kcfs in May 37 yrs < 140 kcfs in May
<u>Option H</u> Dworshak - up to 1,200 KAF between April 15 and May 15	85 kcfs at Lower Granite from mid-April through mid-May	8 yrs < 85 kcfs ^d

APPENDIX J

Table J-6. Annual frequency in achieving target flows with flow augmentation options (number of years in 50-year simulation) (continued).

Augmentation Condition	Targets	Results at Lower Granite ^{a/b/}
<u>Option I</u> Dworshak - 600 KAF in May Brownlee - 150 KAF in May	No specific targets.	<u>May</u> 7 yrs < 85 kcfs 22 yrs < 100 kcfs 42 yrs < 140 kcfs
<u>Option J</u> Dworshak - 900 KAF or more, April 15 - May 31	100 kcfs at Lower Granite in May	<u>April 2</u> 26 yrs < 85 kcfs 33 yrs < 100 kcfs 45 yrs < 140 kcfs <u>May</u> 13 yrs < 85 kcfs 25 yrs < 100 kcfs 41 yrs < 140 kcfs
<u>NPPC Plan</u>	85 kcfs at Lower Granite	<u>April 2</u> 29 yrs < 85 kcfs 34 yrs < 100 kcfs 45 yrs < 140 kcfs <u>May</u> 12 yrs < 85 kcfs 24 yrs < 100 kcfs 41 yrs < 140 kcfs
<u>Option S</u> Dworshak - 600 KAF with Target 200	200 kcfs at The Dalles	<u>May</u> 1 yr < 200 kcfs ^{d/} <u>June</u> 15 yrs < 200kcfs ^{d/}
<u>Option U</u> Dworshak - 1,200 KAF with Target 200	2,000 kcfs at The Dalles	<u>May</u> 15 yrs < 200 kcfs ^{d/} <u>June</u> 15 yrs < 200 kcfs ^{d/}

a/ All simulations based on 50-year period.

b/ Flows "reasonably" close to targets assumed to have achieved target flow.

c/ Estimated from using average of the combined average monthly flows for May and June.

d/ Results at The Dalles.

following April, when the snowmelt runoff begins. In average to good water years, some additional discharges are possible for power generation in the January-April period, but the project's firm power output is reduced by one-third (compared to the Base Case) and about half of the project's secondary energy potential is lost due to having to spill in May to meet the Lower Granite flow requirement. Compared to the Base Case, the average annual reservoir elevation is nearly 50 feet lower. Figures 3.4-1 and 3.4-2 show that in a high water year, there is little difference in elevation in a high year, but in both average and low water years, elevations are substantially lower than the Base Case most of the year.

Discharge up to 900 KAF in May to Meet 100 kcfs (Option G). The operation at Dworshak is very similar in this option to the Base Case except that the Lower Granite flow target is higher, and 900 KAF is available instead of 600 KAF to help meet this requirement. The primary impact is that the reservoir does not refill as often as in the Base Case, and the elevations are lower in years when it does not refill. It fully refills only 22 years out of 50, instead of 28, and the average end of July elevation is five feet lower than for the Base Case. In those years where refill does not occur, lower reservoir elevations are experienced throughout the summer, but by operating at minimum flows, the reservoir usually returns to Base Case elevations by fall (see Table J-3). Figures 3.4-1 and 3.4-2 show that the operation is very close to Base Case operation in average and high runoff years, but elevations are lower from May through September in low runoff year 1930 and for nearly the entire year in 1929.

Discharge up to 1200 KAF in Late April and May to Meet 85 kcfs Plus Operation to MRCs and Flood Control Transfer (Option H). In this operation up to 1200 KAF is discharged from Dworshak in the last half of April and in May. Because (1) the full 1200 KAF is not required in all years, (2) Dworshak inflows from both the second half of April and May can be credited against the 1200 KAF, and (3) Dworshak is operated to MRCs from January through mid-April, the impact on refill was not as great as in Options B through E. The refill probability is better than the Base Case, but the end-of-July elevations averaged about the same. The latter occurred because the reservoirs were drafted deeper in the lowest water years, which offset the gain in some of the other water years. The average annual pool elevation is about

4 feet higher than the Base Case. In the late summer and fall, reservoir elevations averaged slightly above Base Case. Because an attempt was made to operate the project to MRCs from January on, reservoir elevations were generally higher than for the Base Case from January through April.

600 KAF Fixed Discharge in May Plus Operation to MRCs and Flood Control Transfer (Option I). This option is similar to Option B except that the fixed May discharge is 600 KAF instead of 1200 KAF. Because the discharge is limited to 600 KAF, the impact on refill is not as great. Because of the greater refill success and the fact that operating to MRCs tends to keep the pool elevation higher overall, both the end of July and average annual elevations are the highest of any option, including the Base Case. The reservoir does not fully refill as often as the Base Case, but it comes close in most years and reservoir elevation are much higher than for the Base Case in poor water years. The average end of July elevation is 0.4 feet higher than the Base Case, and the average annual elevation is ten feet higher.

Discharge 900 KAF in Late April and May to Meet 100 kcfs Plus Operation to MRCs and Flood Control Transfer (Option J). This operation combines some of the key features of Options G and H. Dworshak operates to the mandatory flood control rule curve (MRC) from about the first of the year until 15 April, which puts the reservoir elevation well above the Base Case during this period. Operating to the MRC typically requires that releases be reduced to the 2 kcfs minimum during the December-January-February period in many years to get to the rule curve, and releases during March and early April must be higher than Base Case releases to stay on the rule curves. Because the project is at the MRC on April 15, the drafts required to meet the 900 KAF discharge requirement are not as deep as Option G, and end-of-July elevations average only about a foot lower than the Base Case (compared to 5 feet lower for Option G). Late summer and fall operation are similar to the Base Case.

In comparing the performance of Option J in meeting the Lower Granite flow target to Option G, it is important to keep in mind that Option J does not include additional Water Budget storage from Brownlee and the upper Snake. Water Budget releases from Brownlee and upper Snake add an average of 4,700 cfs to the Lower Granite discharge in May, and this must be deducted when comparing Dworshak's effectiveness in the two options.

APPENDIX J

Furthermore, Option J specifies that the 900 KAF is available for Water Budget in the last half of April as well as May. In the simulation studies, the 900 KAF was divided approximately one-third for use in the last half of April and two-thirds in May. In actual operation, however, the timing of the downstream migrant passage may dictate a different distribution.

Since Option J studies do not allocate as much water for May release as Option G, the performance in meeting the 100 kcfs flow target at Lower Granite is not as good as Option G (see Table J-1), even after the 4,700 cfs Brownlee-upper Snake contribution is deducted. However, the effect of the one-third/two-thirds allocation is offset to some extent by the fact that more than 900 KAF can be released in years when runoff forecasts indicate that a 70 percent probability of refill can be assured. Because a portion of the 900 KAF is allocated to the last half of April, discharges at Lower Granite in that period are greater than either the Base Case or Option G.

Another important point is the fact that operating to the 70 percent refill curve does not insure that the reservoir will refill 70 percent of the years. For example, in Option J Dworshak failed to fill within five feet 20 years out of 50, for a refill probability of 60 percent. This is because in poor water years the reservoir is drafted below the 70 percent refill curve to meet the 900 KAF discharge requirement and thus fails to refill. When these events are added to the failures resulting from operating to the 70 percent refill curve, the total refill probability is less than 70 percent.

Northwest Power Planning Council Plan (NPPC Plan). The NPPC Plan is in many respects similar to Option J, most significantly in that the base Water Budget at Dworshak is 900 KAF for both plans. The main differences between the two plans are as follows:

- the NPPC plan does not have a 100 kcfs flow target cap on Dworshak releases, the intent of the cap being to improve probability of refill in years when 100 kcfs at Lower Granite is already assured
- the NPPC Plan calls for the 900 KAF to be fully shapeable and in addition to the 2 kcfs Dworshak minimum discharge, while in Option J the minimum flow

requirement must be met from the 900 KAF Water Budget

- the NPPC Plan relaxes the 900 KAF requirement if the Lower Granite runoff forecast exceeds 16 MAF, limiting the Water Budget in those years to inflow plus storage above the 70 percent confidence refill curve on 15 April
- for forecasts above 29 MAF the NPPC Plan does not call for contributions from Dworshak, while Option J provides additional water if the reservoir is above the 70 percent refill curve
- the NPPC plan adds water obtained from the flood control shift to the Water Budget, while Option J uses the shift to improve refill probability

The NPPC Plan introduces the concept of having different Water Budget procedures for low, intermediate, and high runoff years. Table J-7 summarizes the manner in which the various operating parameters vary under each of the three ranges of forecasted runoff. By way of contrast, a similar table (Table J-8) shows the same parameters for Option J. It can be seen that, although the Water Budget rule does not change with runoff forecast, the actual operation itself does (see Footnotes 2 through 4 to Table J-8).

The full details of the NPPC Water Budget operation at Dworshak have not been fully defined, but for purposes of the HYSSR study of the NPPC Plan, it was assumed that Dworshak would operate as close to the flood control rule curves from the end of the refill season until 15 April. This resulted in reservoir elevations significantly higher than the Base Case through the summer and fall months.

However, another provision of the overall NPPC Plan calls for Dworshak to be drafted up to 20 feet in August to test the feasibility of water temperature control on the lower Snake. This draft was not modeled in the HYSSR study because as it is still in the experimental stage. But if that were adopted on a permanent basis, reservoir elevations would be much lower in late summer and early fall than in the Base Case.

Because the project continues to operate on MRCs from January through 15 April and system flood control space is transferred to Grand Coulee in many years, the reservoir elevation in the spring is higher than the Base Case. However the larger spring Water Budget

Table J-7. Variation of NPPC Water Budget Operation with Runoff Forecast.

Lower Granite April-July Runoff Forecast	up to 16 MAF	16 to 29 MAF	29 MAF and up
Operate to MRC 1 Jan - 15 Apr	yes	yes	yes
Flood Control Shift to Coulee	yes (as much as can be stored)	yes (as much as can be stored) ^{a/}	not applicable
Base Water Budget	900 KAF	flow above 70 percent refill probability	current operation
Add Flood Control Shift	yes	yes (if applicable)	not applicable
Total Shapeable Water Budget	900 KAF plus shift	flow above 70% refill plus shift	current operation
Add 2 kcfs Min Flow	242 KAF ^{b/}	included in above	included in above
Total Discharge	1142 KAF plus shift	flow above 70% refill plus shift	current operation
15 Jun - 31 Jul Discharge	2 kcfs	2 kcfs or more	current operation
Lower Granite flow target	none	none	none
a/ For Dworshak April-July inflow forecasts of up to 2.6 MAF b/ 61 days at 2 kcfs.			

Table J-8. Variation of Option J Water Budget operation with runoff forecast.

Lower Granite April-July Runoff Forecast	up to 16 MAF	16 to 29 MAF	29 MAF and up
Operate to MRC 1 Jan - 15 Apr	yes	yes	yes
Flood Control Shift to Coulee	yes (as much as can be stored)	yes (as much as can be stored) ^{a/}	not applicable
Base Water Budget	900 KAF minimum ^{b/}	900 KAF minimum ^{c/}	900 KAF minimum ^{d/}
Add Flood Control Shift	no (included in base water budget)	no (included in base water budget)	not applicable
Total Shapeable Water Budget	base water budget less minimum flow	base water budget less minimum flow	base water budget less minimum flow
Add 2 kcfs Min Flow	included in base water budget	included in base water budget	included in base water budget
Total Discharge	base water budget	base water budget	base water budget
15 Jun - 31 Jul Discharge	2 kcfs	2 kcfs or more	current operation
Lower Granite flow target	100 kcfs	100 kcfs	100 kcfs

a/ For Dworshak April-July inflow forecasts of up to 2.6 MAF.
b/ Procedure described in footnote a/ applies except that in this flow range the 900 KAF minimum is normally in effect.
c/ 900 KAF minimum Water Budget unless Lower Granite discharge is greater than 100 kcfs, in which case Dworshak discharge is limited to the greater of the 2 kcfs minimum discharge or the discharge required to provide 100 kcfs at Lower Granite; more than 900 KAF will be provided if reservoir is above 70 percent refill curve on April 15.
d/ Procedure described in footnote a/ applies except that in this flow range the 100 kcfs Lower Granite flow target may limit Dworshak contribution to less than 900 KAF.

requirements in many years fully use the additional storage made available by the flood control shift and MRC operations. Overall, the refill probability is somewhat lower than for the Base Case, but the average end-of-July elevation is slightly better than for the Base Case. The higher average elevation is because the project did not draft as deeply in low flow years.

SUMMARY OF IMPACT OF FLOW AUGMENTATION OPTIONS ON BROWNLEE OPERATION

Compared to Dworshak, flow augmentation drafts from Brownlee have a relatively small impact on reservoir operation. There are two primary reasons for this: (1) inflow is large compared to the usable storage at Brownlee, so the reservoir recovers more quickly, and (2) the drafts imposed on Brownlee are generally smaller than those required at Dworshak. In addition, it was assumed in the simulation studies that Idaho Power Company's loss in power generation at Brownlee would be replaced by generation from the Federal system. The delivery of replacement power in June and July made it possible for the project to return to its normal rule curve elevations during the summer in all years. Thus, the operation from the middle of August through the initiation of draft for flow augmentation in May is exactly the same as the Base Case in all years for all options. The return to rule curve elevations was made possible by reducing Brownlee discharges in June and July.

It should be noted that neither the Corps nor BPA has the authority to require Idaho Power Company (IPC) to make releases for flow augmentation, nor is BPA required to provide replacement power if IPC chooses to make such releases. However, such arrangements have been made in previous years, so these assumptions were included in several of the options to show what could be done if the parties involved so agree.

Another operation which affects Brownlee in some options is providing storage releases from reservoirs upstream of Brownlee. These releases would be passed through Brownlee in May (and in some cases June), increasing power generation but not affecting reservoir elevations. It was assumed that this water would be replaced in the upstream reservoirs in the winter, so inflows to Brownlee were reduced accordingly in the months of November, December, and January. Power

generation would be reduced in these months, but it was assumed that replacement power would come from the Federal system, so there would be no impact on reservoir elevations.

Therefore, the only months in which the Brownlee reservoir operation departs from the Base Case are those in which the flow augmentation drafts are made (May and in some cases June) and those in which refill is accomplished (primarily June and July). In Option B, a fixed draft of 200 KAF was provided in every year. This resulted in elevations at the end of May averaging about 18 feet lower than current operations (Table J-2). In most years the reservoirs had recovered by the end of June.

In Option C, the 200 KAF draft was spread out over two months instead of one. The result was a less severe elevation impact at the end of May (averaging about 9 feet lower than Base Case), but a greater impact at the end of June (averaging about 5 feet lower than Base Case). In the current Brownlee operation, the reservoir already operates to the MRCs during the spring, so Options B and C also incorporate this procedure as well. Thus, the Brownlee operation in Option D would not differ from that shown for Option B, and the operation shown for Option E would be identical to the Option C operation.

Unlimited draft of Brownlee to meet the 140,000 cfs discharge requirement at Lower Granite (Option F) had the most severe impact of any of the options on reservoir elevations. In 28 out of 50 years the reservoir reached the bottom by the end of May, and in most of the remaining years it was well below its Base Case elevation. At the end of June, the reservoir elevation still averaged 22 feet below the Base Case, and it filled by the end of June only 23 years out of 50, compared to 46 times in the Base Case. In many years the reservoir did not return to its Base Case elevations until mid-August.

In Option G, the draft from Brownlee varied with the runoff forecast, ranging from 50 KAF in low runoff years to 200 KAF in moderate to high runoff years and averaging about 150 KAF over the 50-year period. The impact on end-of-May reservoir elevations was less than for the 200 KAF fixed draft, averaging about 17 feet lower than the Base Case.

In Options H, I and J, reservoir operation at Brownlee was the same as for the Base Case.

APPENDIX K

TEMPERATURE CONTROL

APPENDIX K - TEMPERATURE CONTROL

The Corps made a preliminary analysis of storage releases for downstream temperature control, analyzing a total of 44 different release scenarios using the COLTEMP model and 1985 hydrologic and climatic conditions. The scenarios varied with respect to: (1) Dworshak release flows, which varied from 10 kcfs to 25 kcfs; duration of releases of from 5 to 20 days; (2) release water temperature, which was taken to be either 45°F or 55°F; and (3) starting dates of the initial release, which ranged from between July 1 and September 4. The corresponding Dworshak drafts ranged from 6 feet to about 32 feet from full pool by the end of the drawdown period for water temperature control. All of the water temperature modeling studies involved release options at Dworshak (DWR) and used Lower Granite (LWG) and Ice Harbor (IHR) as control points. Specific temperature and time targets were assigned, including achieving 68°F temperature release at LWG or IHR on dates such as August 23 and September 1.

Water temperature impacts varied, depending on the magnitude of the release and its timing. The time window where the need for temperature control is the greatest is usually from late August to early September. Within that period, the greatest impact that could potentially be achieved in 1985 was an average reduction of temperature at Ice Harbor of 3.5°F, which would have met the 68°F target by September 1 desired by the fishery biologists. This reduction was achieved with Dworshak releasing 25,000 cfs continuously through the bottom regulating outlets, starting in August. Since regulating outlets are designed to operate only under much lower pool ranges, the

next best scenario using the same discharge and normal outlets would only achieve an average temperature reduction of 3.0°F. However, under more realistic release conditions, model predictions showed that the range of temperature reduction would not exceed 2°F.

This level of temperature improvement would not be sufficient to completely lift the temperature block that may exist at the entrance of the lower Snake River below Ice Harbor. A test release schedule has been implemented this summer, complete with detailed water temperature and current velocity measurements along the lower Snake River. The test started on August 16 with a release of 10,000 cfs for 5 days at 45°F, which brought the Dworshak Reservoir down by about 5 feet from full. Test releases are ongoing. The data gained will be incorporated into the model and further analyses.

In preparation for this OAD/EIS, model runs were made to predict the impacts of several reservoir drawdown options. These runs assume the same release schedules as in 1985 both in terms of discharges and timing. Daily pool elevations at the lower Snake River reservoirs, however, were modified as needed to reflect the special drawdown conditions under consideration. Reservoir inflows and outflows were also modified as needed. Summary results in terms of predicted release temperatures at Lower Granite and Ice Harbor are shown in Table K-1. Temperature changes from one scenario to the next appear to be relatively small within the time frame of interest (late August early September).

APPENDIX K

Table K-1. Preliminary predicted reservoir release water temperatures at Lower Granite and Ice Harbor dams (°F).

Date	Lower Granite Options ^{a/}				Ice Harbor Options ^{a/}			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
7/04	65.8	67.6	65.8	67.6	67.5	67.6	68.0	68.0
7/09	68.7	72.3	68.7	72.3	72.1	72.3	73.0	73.0
7/14	71.8	72.0	72.0	72.0	73.2	74.1	73.8	73.9
7/19	72.5	74.7	72.5	74.7	75.6	76.8	75.9	76.3
7/24	73.2	73.0	73.2	73.0	75.2	76.3	75.6	75.9
7/29	73.2	73.2	73.4	73.2	75.4	76.6	75.2	75.6
8/03	72.3	70.9	72.3	70.9	73.4	74.3	73.0	73.2
8/08	71.4	73.6	71.4	73.6	72.3	73.2	71.8	72.1
8/13	70.9	68.0	70.9	68.0	70.3	71.8	69.6	69.8
8/18	69.3	69.6	69.3	69.6	69.8	70.9	70.0	70.2
8/23	68.9	68.0	68.7	68.0	68.7	69.1	69.1	69.1
8/28	68.7	69.8	68.5	69.8	70.0	70.7	70.5	70.5
9/02	68.4	66.0	68.2	66.0	68.5	69.4	68.4	68.4
9/07	66.7	66.4	66.6	66.4	68.0	68.4	68.0	67.8
9/12	65.3	64.2	65.1	64.2	67.3	67.5	67.5	67.3
9/17	63.9	63.3	63.7	63.3	65.7	64.9	65.7	65.3
9/22	62.1	61.3	61.7	61.3	63.5	63.0	63.7	63.3
9/27	60.4	59.9	60.3	59.9	61.9	61.3	62.1	61.7

a/ Options considered included the following:

- (1) Base case (1985) water temperatures.
- (2) All four reservoirs (Lower Granite, Little Goose, Lower Monumental and Ice Harbor) operating at spillway crest.
- (3) All four reservoirs at minimum operating pool.
- (4) Lower Granite at spillway crest; remaining three reservoirs at minimum pool.

APPENDIX L

PRELIMINARY SECTION 404(b)(1) EVALUATION

APPENDIX L - PRELIMINARY SECTION 404(b)(1) EVALUATION

1.0 PROJECT DESCRIPTION

1.1 PURPOSE AND AUTHORITY

The Army Corps of Engineers (Corps), Walla Walla District is currently considering several alternative water management actions for dam and reservoir projects along the lower Snake and Columbia rivers. These actions for proposed implementation in 1992 would be intended to help the downstream migration of juvenile salmon, or to develop test information needed to plan future actions to improve migration conditions.

The Corps of Engineers was requested to "undertake the processes necessary to design a study for Snake River reservoir drawdown during the operational year 1992 that would improve passage of migrants (juveniles) without impeding the upstream migrations (adults)." Subsequent agency discussions expanded the original scope of work to include all practical water management measures to improve salmon passage. This work, including all necessary National Environmental Policy Act analysis was to be completed by March 1992. Accordingly, the Corps of Engineers, Walla Walla District, initiated this work on May 10, 1991 and anticipates implementing an action plan in time for the 1992 spring outmigration. The Bureau of Reclamation and Bonneville Power Administration are cooperating agencies, while the U.S. Fish and Wildlife Service is a participating agency.

Options available for implementation in 1992 can be grouped into four general alternatives: (1) maintenance of existing conditions ("no actions"), (2) reservoir drawdown, (3) flow augmentation, and (4) combination of drawdown and augmentation. The Columbia River Options Analysis/Environmental Impact Statement (OA/EIS) measures the effects of the latter three flow improvement alternatives against the no action alternative (the way the Columbia River System was operated from 1985 through 1990).

A wide range of potential measures to improve flow conditions during the 1992 salmon and steelhead migration is considered in the OA/EIS.

These actions are partially in response to the listing of the Snake River sockeye salmon stock and the proposed listing of two other wild salmon stocks as endangered or threatened species under the Endangered Species Act. The concept of drafting lower Snake River reservoirs below normal minimum operating pool has been proposed by various parties in the region to assist juvenile salmonids in their downstream migration. Lowering the water surface elevations of the reservoirs would reduce the cross-sectional area and increase the average water particle velocity. An inter-agency group met in April 1991, facilitated by the Corps of Engineers, to develop potential alternatives for a test of the reservoir drawdown concept. The group reconvened in September and October 1991 to develop specific elements of test design.

A broad range of reservoir drawdown options, as well as numerous other options for modifying river flows, is addressed in the 1992 Columbia River Salmon Flow Measures OA/EIS prepared cooperatively by the Corps, the Bonneville Power Administration (BPA), and the Bureau of Reclamation (BoR). The preferred alternative identified in the final OA/EIS includes a test drawdown of two reservoirs on the lower Snake River during March of 1992. As part of this proposed action, the Corps may need to place additional riprap along the reservoirs for bank stabilization. Consequently, this evaluation has been prepared pursuant to Section 404(b)(1) of the Clean Water Act, in accordance with guidelines (40 CFR 230) promulgated by the U.S. Environmental Protection Agency (EPA) for the evaluation of the discharge and placement of fill material in, or construction activities within, waters of the United States. The proposed bank stabilization actions will be implemented under the specific Federal operation and maintenance authorizations for the Lower Granite and Little Goose projects.

1.2 LOCATION

The Lower Granite and Little Goose reservoirs are located in southeastern Washington. The upper part of the Lower Granite Pool near Lewiston-Clarkston lies between the states of Washington and Idaho. The Snake River from the Little Goose Dam upstream, is the dividing line between Whitman County on the north side of the river and Walla Walla, Columbia, and Garfield counties on the south. The Lower Granite

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Dam is located at river mile 107.5. The reservoir pool passes through Whitman, Garfield, and Asotin counties in Washington and Nez Perce County in Idaho. The pool reaches upriver past Lewiston-Clarkston to near Asotin, Washington. Little Goose Dam is located at river mile 70.3. Its pool extends upriver approximately 37 miles to the Lower Granite Dam. Downriver from Little Goose Dam is the Lower Monumental Pool. Figure L-1 shows the general location of the Lower Granite and Little Goose projects.

1.3 GENERAL PROJECT DESCRIPTION

One of the actions is proposed in the OA/EIS is to conduct a test drawdown of Lower Granite Reservoir to near spillway crest elevation, and Little Goose Reservoir to a point at which the Lower Granite tailwater elevation is equivalent to near spillway crest. The proposed time frame for this test is a four week period beginning as early in March as the ongoing EIS process will allow (March 2, 1991 is the scheduled date for signing of the Record of Decision, but see explanation further on in document). Reservoir drafting and refill plans for three different possible flow conditions are included in the test design. An extensive program of monitoring and evaluation studies will be conducted as part of the test. The objective of these studies is to develop field condition data on water quality, hydraulics, erosion, structural stability, and other key physical parameters.

Beginning as early as possible in March (following signing of the record of decision by the cooperating EIS agencies and allowing reasonable time for affected parties to make appropriate arrangements), Lower Granite Reservoir will be drafted from minimum operating pool (elevation 733 feet) to elevation 705 feet at a maximum rate of two feet per day. While Lower Granite Reservoir is maintained between elevation 705 and 703, Little Goose Reservoir will be drafted two feet per day until the tailwater is equivalent to near spillway crest level. This will lower Little Goose Reservoir to elevation 618 feet, or 15 feet below the minimum operating pool (MOP) of 633 feet. At this point, Lower Granite Reservoir will be drafted at a rate of two feet per day to a minimum elevation of 696 feet, test conditions permitting.

Lowering the two pools to elevations significantly below MOP will expose unprotected rock fill

embankments that are extensive along the reservoirs. The dam embankments at Little Goose have riprap protection down to MOP, while Lower Granite Dam embankments are protected to 9 feet below MOP. Railroad and highway embankments along the reservoir margins, bridge piers, and the Lewiston levees are generally protected to a few feet below MOP. At the reservoir levels that would occur during much of the test period, wave action could erode the unprotected sections of the embankments and result in unstable fill. Depending on the rate of erosion, there is some risk that sloughing and eventual embankment failure could occur.

This 404(b)(1) evaluation addresses the possible inwater work that would be associated with the placement of rock and riprap fill on eroded areas that threaten the structural integrity of existing embankments and to repair damage that has occurred to these embankments. Approximately 15,000 cy of rock and riprap material will be stockpiled to provide emergency repair to existing embankments that may occur during the 4 week test drawdown. Embankment protection, in the form of additional riprap and fill placement, will therefore be necessary if and where embankment stability is compromised during the test. Dam embankments will be monitored on a continuous basis throughout the test period. Railroad and highway embankments, the Lewiston levee system, and all other areas potentially at risk of failure will be monitored on an as-needed basis. Personnel will inspect by vehicle and aerial methods. Types of fill material used in the levees and embankments will be recorded for future reference, where possible. Areas of slumping will be documented. Additional rock fill and riprap will be placed as necessary to stop erosion and repair damage to embankments.

1.4 GENERAL DESCRIPTION OF RIPRAP/FILL MATERIAL

The material that will be used to protect embankments and levees that may experience damage during the test will be the same material used for the existing embankments and levees. The material is Snake River basalt and will be obtained from stockpiles located at three existing quarries. Material beneath the water line in project embankments and levees is rock fill consisting of 6-inch MMW shot rock and river gravel in smaller pieces. The riprap material that will be used to protect embankments or levees experiencing failure is the same as that currently being used. It consists primarily of angular basalt block cubes, most with faces ranging in size from 1 foot by 1 foot to 2 feet by 2 feet

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and weighing approximately 175 pounds per 1 foot cube. Fines included in the riprap or rock fill will be less than 5 percent by weight.

1.5 DESCRIPTION OF THE PROPOSED RIPRAP/FILL PLACEMENT SITES

It is difficult to predict where and when erosion caused by the lowering of the reservoir pools and the increase in stream velocity will affect the shoreline. Areas historically subject to erosion have been protected with the construction of levees or the riprapping of embankments. Monitoring efforts during the test will concentrate on these areas. Because the drawdown will be limited to 2 feet per day, there will be opportunities to better estimate where actions will need to be taken soon after the drawdown test commences. When erosion problems begin to occur or appear likely to occur, corrective measures will be taken by placing riprap or rock fill material in the area experiencing the erosion. Although it is not possible to identify where erosion will occur and where it will be necessary to place fill, the following sections will briefly describe areas at the two reservoirs where levees and embankments are located.

1.5.1 Lower Granite

As Figure L-2 illustrates, most of the levees at the Lower Granite project are located near the towns of Lewiston and Clarkston. The approximately eight miles of Lewiston levees line the banks of the Snake and the Clearwater rivers west and north of the town of Lewiston and across the river from Lewiston on the north bank of the Clearwater River (see Figure L-3). The West Lewiston levee starts on the right bank of the Snake at approximately river mile 141 and continues north to the confluence of the Clearwater. At the confluence, the levee turns right and heads up the Clearwater River and connects to the East Lewiston levee. Across the river, near the North Lewiston sewage treatment plant, is the North Lewiston levee. It is located on the north bank and ends at the embankment of U.S. Interstate 195. Embankments at the Lower Granite project protect highways and railroads. The Camas Prairie railroad tracks follow the right bank of the Snake from the Lower Granite Dam to just before the railroad bridge crossing the Clearwater into Lewiston. Wawawai Road follows the protective embankment as it parallels the

railroad tracks from Wawawai to near North Lewiston. On the left bank of the river, U.S. 12 follows the river from approximately one mile east of Silcott Island to the Red Wolf Marina. It is protected by an embankment along much of the route.

There are three bridges that cross the Snake River that could be potentially impacted by the drawdown. The State Route 129 bridge crosses from the north side of the river to the south side near the Red Wolf Marina. The Bridge Street lift-bridge that connects Lewiston and Clarkston is located on the Snake River above the confluence with the Clearwater River. The Lewiston-Clarkston bridge is located further upstream on the Snake River. The bridge embankments on the Clarkston side are armored with riprap.

Lower Granite Dam has an earth- and rock-filled embankment approximately 1,600 feet in length which is protected with riprap between the elevations of 719 and 756 (the top of the dam embankment). The riprap protects the dam embankment during normal operating elevations. Riprap embankments line the reservoir shore upstream from the dam and below the spillway.

1.5.2 Little Goose

The Little Goose project contains no levees, but there are extensive embankments along the shore. The Camas Prairie Railroad follows the entire right bank of the river from Lower Granite Dam downstream to the Little Goose Dam (see Figure L-4). Of the approximately 38 miles of railroad between the two dams, a significant amount of track is protected by embankments. Almota Road between Boyer Marina and Almota is located adjacent to the embankment and the railroad near Almota. On the left bank, Almota Ferry Road is protected by embankments from Lower Granite Dam to where the road turns away from the river. Near Central Ferry, Washington State Route 127 crosses the Snake River.

The construction of the Little Goose Dam embankment is similar in design to the Lower Granite Dam embankment. Riprap protects the embankment at near the top of the dam from elevation 638 to elevation 628. Riprap also protects a service road upriver from the dam on the left bank and on the banks surrounding the BPA tower below the dam near the fish ladders.

Figure L-3
Location of Levees
Near Lewiston, Idaho.

Figure L-4
Location of Highways, & Railroad
Tracks Near Little Goose.

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1.6 DESCRIPTION OF RIPRAP/FILL PLACEMENT METHOD

Placement of riprap material will be dependent upon need. When an area has been determined to need reinforcement, material will be loaded from the stockpiles located at one of the three quarries into dump trucks which will be driven to the site. The dump trucks will access the effected site and dump the riprap material in the appropriate location.

2.0 FACTUAL DETERMINATIONS

2.1 PHYSICAL SUBSTRATE DETERMINATIONS

2.1.1 Substrate Elevation and Slope

At Lower Granite, the normal operating range is between 738 and 733 feet msl, and spillway crest is 681 feet msl. Embankment areas above elevation 696 feet could be affected by this test. For Little Goose the normal operating range is 638 to 633 feet msl, and spillway crest is 581 feet msl. The Little Goose Pool will be lowered no more than 20 feet below minimum pool for this test, potentially affecting embankment areas down to elevation 613 feet. Potential for wave erosion, mass movement and river erosion exists over the entire elevational range and length of the embankments.

The dam embankments were constructed to a 2 to 1 slope. Specific data on the slope of highway and railroad embankments are not available. General observations, however, indicate that they have fairly steep slopes probably in the range of 20 to 30 degrees.

Riprap placement at problem sites will range from one to five feet. Slope angles will remain about the same as they are presently.

2.1.2 Sediment Type

The substrate of the embankments is variable. Some embankments consist of materials that are the same as the riprap that will be placed. These sites should not require new riprap placement though monitoring will still be required. Other embankments are mixtures of varying amounts of river gravels, riprap blocks, and finer fill material. Additionally, in some places the roads and railroads

have been built over alluvial fan deltas deposited into the reservoirs by small tributary streams. All these areas will have a variable response to drawdown and the associated surface erosion, culvert spillage erosion, wave erosion, and mass movement. No detailed information is presently available on the areal extent of specific fill types. Monitoring will be required along the entire length of the embankments.

Dam embankments were constructed of material made available by dam construction. Consequently, these embankments consist of variably sized materials, ranging from shot rock to gravel to finer silts.

All embankments may be covered by a small depth of fine-grained sediment which has accumulated over the life of the reservoir. The depth of this sediment should not exceed a few inches.

2.1.3 Riprap/Fill Material Movement

Some potential for introduction of sediment into the water column would occur due to remobilization of the bottom adjacent to riprap/fill placement sites.

The material that will be used in this operation is riprap ranging from one foot by one foot to about two feet by two feet in dimension with less than five percent fine sediment. This material will be taken from land-based quarries and transported to the riprap sites by truck. Since the materials will be mined and transported in a dry condition, there is virtually no potential for introduction of sediment into the reservoir except at the sites of riprap placement.

Riprap is placed in a more or less interlocking structure. Consequently, once riprap is in place there is minimal potential for its downslope movement.

2.2 WATER CIRCULATION, FLUCTUATION, AND SALINITY DETERMINATIONS

Flow patterns and velocity will not perceptibly change after the test is completed due to the placement of additional riprap. Based on the expected volumes of riprap/fill the existing cross-sectional areas will not noticeably change. Water fluctuations in the reservoirs are determined primarily by dam operation. The proposed test would have no measurable effect on water levels. Neither site is located within an area influenced by marine waters; hence, salinity at the sites will not be affected.

2.3 SUSPENDED PARTICULATE/ TURBIDITY EFFECTS

2.3.1 Expected Changes in Suspended Particulates and Turbidity Levels

Potential for introduction of sediment into the water column would occur during operations due to remobilization of the bottom adjacent to the riprap/fill placement sites (Morton, 1977; LaSalle, 1990). Dispersal of these materials is dependent on current velocities in the area of the operations and the grain size of the disturbed sediment.

Suspended particulates will increase slightly during riprap placement. Where finer sediment already exists at the site, the large riprap will stir up this sediment. Silts and clays will be suspended while sands will flow downslope. Additionally, some of the less than 5 percent of fine sediment in the riprap or rock fill will also enter the water. Overall, however, the amount of material suspended would be minimal, and it would quickly settle to the bottom once disturbance ceased. Disposal of large amounts of relatively fine-grained dredged sediment in these reservoirs has had minimal effects on water turbidity. By comparison, the minor sediment involved in riprap placement will be negligible.

2.3.2 Effects on Chemical and Physical Properties of the Water Column

Riprap/fill placement activities would cause a negligible decrease in light penetration. Any effect would be localized in the immediate area. The majority of the resuspended sediments would not affect light penetration because it would be small in quantity and not disperse into the euphotic zone.

Dissolved oxygen concentrations in the immediate vicinity of disposal operations may be reduced slightly by oxidation of anoxic sediments. Based on the volumes to be placed and the typical dissolved oxygen concentrations in the area, significant reductions are unlikely.

Any reduction in dissolved oxygen that occurs during disposal activities should be small, localized and temporary and should at all times exceed the minimum required for aquatic life, which is

generally accepted to be approximately 5 mg/l for most higher life forms.

Releases of sediment-bound nutrients can potentially result in chemical loading of the water column which could affect the productivity of an aquatic system (increase eutrophication). Nutrients added to the water column as a result of riprap placement would be virtually undetectable and would be diluted downstream of the placement sites.

Based on the minor amounts of sediment (less than 5 percent by weight) and the low total organic carbon contents of the sediments, it is unlikely that placement of riprap would cause any problems with odors. In addition, no effect on water color is expected. The effect that riprap placement activities may have on taste is expected to be insignificant. Concentrations within the two reservoirs of sulphur, iron, phosphate, and other chemicals which may affect taste are too low to have a noticeable effect.

Measurements collected along the Columbia and Snake rivers within the region of proposed activities do not indicate any unusually high concentrations of pathogens in the water column. A pulse in the concentration of pathogens that may be present is not expected given the low nutrient levels in the sediments that might be disturbed and the cold water temperatures expected.

2.3.3 Effect on Biota (Production, Photosynthesis, Suspension/Filter Feeders, Sight Feeders)

Little or no reduction in light penetration is anticipated. Any effects on light penetration should be localized and should dissipate rapidly. Also, primary production during the winter is generally at very low levels because of the air and water temperatures. As a result, no significant impacts should occur on primary production outside of the immediate site where riprap and rock fill will be placed.

Increased turbidity will be negligible and of short duration. It is not expected to affect feeding of benthic invertebrates downstream of the immediate area of disturbance. Any impact that might occur is expected to be very localized and short term.

The increase in suspended material resulting from the placement of riprap will not be sufficient to interfere with predation of sight feeders. Exposures to suspended sediment within the range anticipated are not expected to cause significant impacts to most organisms

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(Bennett et al., 1990; Servizi and Eng, 1990; Sigler, 1990; Gregory, 1990).

2.4 CONTAMINANT DETERMINATIONS

The quarry material to be used for riprap and rock fill has not been tested for the presence of chemical contaminants. However, there is no reason to suspect that any such contaminants are present. The riprap and fill material will come from existing land-based basalt quarries that have been long-term sources of embankment materials for the reservoirs. The quarry sites themselves do not have a history of use that would introduce contaminants, and there have been no indications that existing materials from these quarries have introduced contamination to the reservoirs.

2.5 AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS

2.5.1 Plankton Effects

Effects on light penetration are expected to be minimal. The actual effect on plankton production is expected to be little to none.

2.5.2 Benthos Effects

Bennett and Shrier (1986) and Bennett et al. (1988) conducted extensive benthic surveys in Lower Granite Reservoir. Both studies found that benthic communities were almost entirely composed of oligochaetes and dipterans (primarily chironomids). These species are important in the diets of anadromous species. Seasonally, densities were found to be highest in the summer and lowest in the spring. Since the riprap will be placed in early spring, the density of benthic organisms that inhabit the area will be low. However, any benthic organism located in the substrate at the riprap site and a small area around the sites would be inundated and lost. Recolonization of the disposed sediments should occur through lateral invasion from adjacent areas and transport of larvae with fresh sediment in the latter part of the spring. Dipterans would likely recolonize more quickly than oligochaetes because of differences in depth of strata used. Based upon studies conducted in Lower Granite Pool, recolonization of the disturbed areas would likely commence within 4 months and would be nearly complete after 6 months (Bennett

et al., 1991). Total recolonization should be complete within one year (Bennett et al., 1991). Considering expected recolonization rates and the small size of the areas to be disturbed, the plan is expected to have a minimal effect on the food resources of reservoir fish species.

2.5.3 Nekton Effects

Effects of suspended sediment and increased turbidity on aquatic biota are expected to be minimal to nonexistent. All sites where riprap will be placed will create some resuspension and redistribution of sediment slightly downslope. But, this will be very localized and for a very short period of time. Numerous laboratory tests have been conducted to test mortality associated with exposure to suspended sediments (Bennett and Shrier, 1986; Servizi and Eng, 1990). Results of these tests suggest that sediments suspended by placing riprap are considerably lower in concentration than levels that typically induce mortality. Sublethal effects of suspended sediment on fish may include avoidance behavior, interference with feeding patterns, disruption of dominance hierarchies, reduction of growth, and increased stress. Servizi and Eng (1990), Sigler (1990), and Gregory (1990) summarized results of testing for lethal and sublethal effects. Tests involved suspended sediment levels much greater than the minute levels expected during the placement of riprap in both reservoirs. Even under the most extreme conditions, short exposures to suspended sediments are not expected to cause significant impacts to most organisms.

Project effects on salmon are of particular concern. To avoid impacts to salmon, the project has been scheduled to avoid periods of use of the project areas by migrating and rearing salmon. The anticipated drawdown is going to occur March 1, 1992 to April 10, 1992. There are very few anadromous fish in the system during the proposed period. The fish that are there would be able to easily avoid the turbid areas.

Of particular interest is the effect of placing riprap near chinook salmon spawning areas. It has been reported that spawning of fall chinook may be occurring below Lower Granite Dam (Bennett, 1991). If fall chinook spawn in these areas, it is probably in water 10 to 30 feet deep just downstream of the dam. The areas that may need the riprap and rock fill will be along embankments and levees near or on part of the dam structure where riprap has already been laid. Large deposits of rock may also be placed directly below the dam spillway where high velocities of water pour

directly into the pool below. Neither of these locations are areas where spawning gravel for fall chinook would be found. The spawning grounds downstream of the dam spillway will not be affected by the placement of riprap along the dam's foundation.

The change in the bathymetry of Lower Granite Reservoir and Little Goose Reservoir should not affect the fish community in the area. The riprap will be placed along embankments and levees where the water is already shallow. The change in bathymetry will be minimal. Investigations conducted in the reservoirs generally indicate that fish abundance in shallow water is generally greater than at other depths and that these areas provide important spawning and nursery habitat for many species (Bennett et al., 1983; Hjort et al., 1981). Shallow-water areas are important not only to resident fish but to salmonids as well. Bennett and Shrier (1986) and Parente and Smith (1981) demonstrated the importance of shallow-water habitat to rearing chinook salmon prior to migration. The minimal additions of rock substrate may create additional shallow-water habitat around the levees and embankments and may increase habitat available to local reservoir fishes, including rearing Columbia River chinook salmon stocks. The increase relative to habitat availability throughout the reservoirs would be very small. As a result, positive effects on fish would be very localized.

2.5.4 Aquatic Food Web Effects

Burial of benthic communities in the project area would somewhat reduce feeding success of fish. This may displace some resident fish populations to surrounding waters until the food chain is reestablished. However, the displaced benthos will be so localized and in a very small area, resulting in very few displaced fish. Recolonization of the benthos is expected to be largely complete within six months and completely reestablished within one year (Bennett et al., 1990).

2.5.5 Special Aquatic Site Effects

There are no known special aquatic sites that would be likely to be affected by repair work to embankments or levees.

2.5.6 Threatened and Endangered Species

The United States Fish and Wildlife Service has identified two federally listed threatened or endangered species, the bald eagle (*Haliaeetus leucocephalus*) and the peregrine falcon (*Falco peregrinus*), as potentially present in the project area. A Biological Assessment (Appendix E) addressing the effects of the flow measures under consideration has been prepared in compliance with Section 7 of the Endangered Species Act of 1973, the National Environmental Policy Act of 1969, and subsequent regulations issued by the Council on Environmental Quality (40 CFR 1500). No effects of the proposed riprap/fill placement on these threatened or endangered species have been identified.

The Snake River sockeye salmon (*Oncorhynchus nerka*) has been officially listed as endangered by the National Marine Fisheries Service (NMFS); in addition to the listed species, two stocks of salmon, including Snake River spring-summer chinook salmon (*Oncorhynchus tshawytscha*) and fall chinook salmon, have been proposed for federal listing as threatened species. The potential project effects on these stocks have been considered in a separate Biological Assessment (Appendix M).

2.5.7 Other Wildlife

Aquatic furbearers that occur in the Lower Granite and Little Goose pools include beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), river otter (*Lutra canadensis*), and mink (*Mustela vison*). In general, these aquatic furbearers are dependent on riverine areas, embayments, ponds, tributaries, and riparian forests for denning and foraging. All four species use the open shoreline for denning along the Lower Columbia (Tabor et al., 1981); however, most beaver dens (65 percent) along the Lower Columbia are found in shallow-water areas, embayments, tributaries, or ponds, rather than along the open shoreline. Beaver and muskrat along the Lower Columbia primarily use bank burrows for denning (Tabor et al., 1981). Both mink and river otter often use riprap areas along the banks of the lower Snake River for denning (Sather-Blair et al., 1991). Denning for all four aquatic furbearers occurs primarily from March to July.

The proposed post-drawdown deposition of riprap along selected portions of the open shoreline of Lower Granite and Little Goose pools may destroy all furbearer den sites occurring along the open shoreline in the affected areas, and could impact furbearer

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productivity during 1992. Riprap deposition will also likely impact potential future bank den sites for both beaver and muskrat. Mink and otter, however, may potentially benefit from shoreline riprap deposition due to creation of potential denning habitat for future use.

2.6 PROPOSED DISPOSAL SITE DETERMINATIONS

2.6.1 Mixing Zone Determinations

Suspended particulates and chemical constituents would be in such small quantities as to be almost indistinguishable and would be quickly diluted downstream from placement sites.

2.6.2 Determination of Compliance with Applicable Water Quality Standards

Water quality downstream of the mixing zone would be in compliance with the state of Washington and Federal water quality standards.

2.6.3 Potential Effects on Human Use Characteristics

2.6.3.1 Municipal and Private Water Supply

Municipal and industrial intakes on Lower Granite Reservoir are limited to a section of the Clearwater River in and above the town of Lewiston. Elevations and water depths of intakes are expected to be sufficiently below water levels during the test that repairs to any nearby embankments should not affect the intakes.

There are no known municipal or industrial water intakes on Little Goose Reservoir.

2.6.3.2 Recreational and Commercial Fisheries

The proposed operations to repair embankments and levees damaged by the proposed test drawdown would have minor effects on recreational fishing.

Fishing during the test drawdown would essentially be restricted to fishing from banks. Access to the river from banks might be difficult, and in areas

where the river was close to its banks, there would be the potential of damage to the banks due to fast moving water. Fishing near damaged banks could be dangerous, and access to the banks might prove difficult if bank repair work was being conducted.

Placing riprap material in the water would slightly increase turbidity (although turbidity would already be increased due to the lowered pool levels and increased flow velocity), which could lower visibility for fish to a minor, highly localized degree. Perceived beliefs that a turbidity plume caused by riprap might affect fishing success could reduce fishing efforts near project activities. Data, however, do not indicate a decrease in angler success caused by increased turbidity within the range anticipated (Bennett and Shrier, 1986). Impacts to fishing would only last the length of the project. Upon completion of the project, fishing near the repair sites would be expected to return to normal. No significant conflicts between fishing and disposal activities have been reported to date.

Commercial fishing does not occur on the Lower Granite and Little Goose pools during March or the first half of April, so there will be no impacts to commercial fishing (personal communication, G. Norman, Biologist, Harvest Management Office, Department of Fisheries, Battleground, Washington).

2.6.3.3 Recreation

Recreational facilities and activities near Lewiston could be disturbed by possible repairs to levees and embankments. The Lewiston Levee Parkway and the Clearwater and Snake River National Recreation Trail are located on and near the East and West Lewiston levees. They contain recreational facilities such as boat docks, picnic tables, and bicycle and hiking trails. If repairs are required to the adjacent levees, recreational access could be closed until repairs are made. During the repair work, park amenities such as lawns, irrigation systems, and trails could experience physical damage, but would be restored or replaced upon completion of the repairs. Dispersed recreation that occurs near levees and embankments could be temporarily displaced by curtailed access during repair activities.

2.6.3.4 Aesthetics

Repair work would temporarily create additional minor impacts as a result of operating machinery. There would also be a temporary increase in water- and land-based traffic. Dump trucks, repair equipment, and

repair activities would introduce new temporary visual elements to the site's environment. Some viewers might be drawn out of curiosity to view the process. Because of the nature of the riprap material, turbidity effects should be negligible.

2.6.3.5 Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

There are approximately 15 developed recreation areas adjacent to Lower Granite Reservoir. They include three state parks (Chief Looking Glass, Hells Gate, and Chief Timothy), one county park (Wawawai County Park), and several areas managed by the Army Corps of Engineers. The Clearwater and Snake River National Recreation Trail passes through the Lewiston area via the trail system located as part of the Lewiston levees. Little Goose Reservoir has one state park (Central Ferry), several small recreation areas managed by the Corps, and Boyer Park and Marina managed by the Port of Whitman County.

As described in section 2.6.3.3, the parks with the greatest potential for being disturbed as a result of repairs to levees and embankments are those located on the Lewiston levees. The primary potential disturbance to parks would result from restricting access to levee trails. Repair work to levees or embankments might require use of park trails and could temporarily restrict recreational use of trails and access to some sections of the parks.

2.6.3.6 Terrestrial Wildlife

Placement of riprap along portions of the open shoreline along Lower Granite and Little Goose is not expected to significantly affect terrestrial wildlife beyond the negative impacts to 1992 furbearer production and to future muskrat and beaver bank burrow sites. The creation of potential denning sites for mink and river otter is discussed in Section 2.5.7.

2.6.3.7 Determination of Secondary and Cumulative Effects on the Aquatic Ecosystem

Based on the small areas to be disturbed, the rapid recolonization rate of benthic organism, and the

continued use of disposal sites by fish species, the cumulative effects are expected to be negligible. Monitoring of impacts will occur during the operation.

3.0 ACTIONS TAKEN TO MINIMIZE IMPACTS

The test drawdown has been scheduled to occur at a time when use of the area by salmonids is at a minimum. The duration of the test and the planned refilling of the reservoirs soon after reaching minimum pool elevations will help minimize erosion and the impacts of installing additional riprap. An additional precaution designed to reduce the likelihood of erosion and slumping due to soil instability will be to reduce drawdown rates to no more than 2 feet per day. During the drawdown, embankments and levees will be closely monitored and repairs made in a timely fashion to further minimize the impacts of erosion. Placement of riprap and rock fill will benefit from the low reservoir pool elevations.

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APPENDIX M

SALMON BIOLOGICAL ASSESSMENT

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1.0 INTRODUCTION

1.1 DESCRIPTION OF PROJECT

The U.S. Army Corps of Engineers (Corps) is evaluating a proposal to increase water velocities on the Columbia, Snake, and Clearwater rivers by manipulating water levels among up to 11 of the reservoirs on these rivers during spring and summer 1992. A description of the project area is provided in Section 1.2. The purpose of the proposed action is to increase velocities in the reservoirs through which juvenile salmon must pass during migration from their spawning areas to the Pacific Ocean. Currently, several species of Pacific salmon are experiencing severe population declines to such an extent that their existence is threatened. Under the provisions of the Endangered Species Act (ESA), the Snake River sockeye salmon has been recently listed as an endangered species. Other Snake River salmon stocks proposed for listing as threatened are the spring/summer and fall chinook.

Many factors have contributed to the declining populations including dams built by the Corps, other Federal agencies, and public and private utilities over many decades; loss of spawning and rearing habitat; reduced streamflows from water withdrawals; harvest levels; pollution in both river and ocean environments; and various other stress factors resulting from increased human use of environmental resources. Although many factors contribute, one factor known to affect the overall health of salmon stocks is river flow during juvenile migration. Slackwater behind the dams can reduce juvenile salmon survival by increasing their travel time. Longer travel times result in increased exposure to predation, and may result in smolts not reaching the ocean during a time in which they are physiologically prepared.

In an effort to increase water velocities on the Columbia, Snake and Clearwater rivers during salmon downstream migration in 1992, a variety of water management alternatives are being considered:

- 1) draw down all four lower Snake River reservoirs (Lower Granite, Little Goose,

Lower Monumental, and Ice Harbor) to near minimum operating pool (MOP) from approximately April 1 to July 31;

- 2) draw down all four lower Snake River reservoirs to near spillway crest from approximately April 15 to June 15 or August 15;
- 3) draw down Lower Granite Reservoir to 710 feet above mean sea level (msl) from about April 15 to June 15, while maintaining other lower Snake reservoirs at MOP;
- 4) draw down one to four reservoirs on the lower Columbia (McNary, John Day, The Dalles, and Bonneville) to MOP for an unspecified period of time between April 1 and August 31;
- 5) operate McNary Reservoir at 337 msl, John Day Reservoir at 262.5 msl, and The Dalles and Bonneville pools at MOP from April 1 to August 31;
- 6) draw down Lower Granite Reservoir to 705 to 696 feet above msl and Little Goose up to 15 feet below minimum pool in March;
- 7) augment flows on the lower Snake River by modifying storage and release schedules from Dworshak and Brownlee reservoirs and shift flood control space to Grand Coulee Dam;
- 8) augment flows on the lower Columbia River by modifying storage and release schedule from Grand Coulee Dam;
- 9) draft up to 20 feet from Dworshak Reservoir beginning as early as August 1 to reduce river temperature; or
- 10) a combination of the above.

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The preferred alternative is a combination of those presented above plus some variations, including:

Drawdown Alternatives

- Item No. 1 above
- Drawdown of John Day Reservoir to approximately elevation 262.5 feet from May 1 until irrigation water needs require higher levels (typically beyond the end of July)

Flow Augmentation Alternatives

- 900 KAF additional release in the spring (April 15 to June 30) from Dworshak, except when flows exceed 100 kcfs at Lower Granite Dam
- Up to 3 MAF additional release in spring (May and June) through additional storage releases from Grand Coulee and Arrow reservoirs

Water Temperature Test

- Item No. 9 above

Physical Test

- Item No. 6 above

1.2 PROJECT AREA

The Columbia River and its tributaries form the dominant water system in the Pacific Northwest. The geographic scope of this analysis is the Columbia River Basin from Bonneville Dam in Oregon and Washington upstream to the middle Snake River reservoirs in Idaho, and north along the mainstem to Mica Dam in British Columbia, Canada. Federal and non-Federal reservoir projects in the United States and Canada that influence flows past the eight Corps run-of-river dams on the lower Columbia and Snake rivers are shown in Figure M-1.

2.0 METHODS

This biological assessment was prepared in compliance with Section 7 of the ESA of 1973. The purpose of this assessment is to evaluate whether the proposed actions are likely to affect the Snake River spring and summer chinook, fall

chinook, and sockeye salmon. Assessment of potential project effects on these races of salmon were developed through literature reviews and interviews with regional biologists.

3.0 RESULTS AND DISCUSSION

3.1 SPECIES CHARACTERISTICS

3.1.1 Snake River Spring and Summer Chinook

The spawning timing and habitat of the Snake River spring stock is typically earlier and higher in the watershed than the summer stock. But, because the two stocks have some overlap in migration timing and might occupy the same region of a river during the spawning period, gene flow between these stocks cannot be ruled out. For this reason, they could not be classed as different stocks for proposed ESA listing by the National Marine Fisheries Service (NMFS) (Matthews and Waples, 1991). Because genetic separation is not the only consideration, the final ruling on whether to separate the two stocks under the ESA has not been made.

3.1.1.1 Status

A low estimate of total chinook produced from the Snake River Basin prior to 1850, based on amount of habitat available, was 1.4 million fish (NPPC, 1986). Other estimating methods suggest the run could have been twice this size (NPCC, 1986). By the mid-1900s, historical abundance of spring and summer chinook from the Snake River had been reduced by 95 percent. In the last 30 to 40 years, abundance has been decreased another tenfold. Current populations of wild fish are only 0.5 percent of historical levels (Matthews and Waples, 1991). The Snake River wild spring and summer chinook population, as indicated by the number of spawning redds, declined from 13,000 redds in 1957 to 620 redds in 1980 (Figure M-2). The number of redds increased gradually through 1988 to 3,395 but has since declined. In 1989, 1,008 redds were counted, and in 1990, 1,224 redds were found (Matthews and Waples, 1991).

3.1.1.2 Life History and Habitat Requirements

Adult spring/summer chinook salmon begin entering the Columbia River in February, reaching the Snake River in late March through early August. By July, most

Figure M-1. Study area.

have passed by the Corps projects on the lower Columbia and Snake Rivers (Figure M-3) and have moved into their natal streams far above the influence of the dams. Once they reach their natal streams, they hold in deep pools as they mature and then spawn in August and September (Chapman et al., 1991).

The Snake River spring/summer chinook stock migrates above Lower Granite Dam to spawn in small streams at high elevations (Matthews and Waples, 1991). There are 5 major spawning and rearing basins for this stock including three large river basins (Clearwater, Grande Ronde, and Salmon), and two smaller basins (Tucannon and Imnaha).

Fry emerge from the gravel in spring and the young rear through the summer in the natal streams. The following spring, the young migrate seaward. On the trip to the ocean, juvenile spring chinook outmigrate as yearlings from about March

through June (Chapman et al., 1991). The majority pass the mainstem dams in April and May (Figure M-4).

Within the Hanford reach (a free-flowing stretch of the Columbia River, upstream of Richland, Washington), a relationship between water depth and velocity and size of chinook outmigrants has been documented. The smaller fish were more often captured in shallower water while larger fish were more abundant in deeper, faster flowing water during spring and summer migration periods (Dauble et al., 1989). It is believed that the larger hatchery fish and upriver fish, including Snake River stocks, are actively migrating seaward. The majority of the smaller fish are probably Columbia River summer stocks that are continuing to rear in the reservoir and migrate later.

Figure M-2. Number of Snake River wild spawning spring/summer chinok (redds), wild fall chinook above Lower Granit Dam, and sockeye passing Ice Harbor (before 1975) and Lower Granite Dam (after 1974) (Sources: Waples et al., 1991; Mathews and Waples, 1991; and Corps, 1990).

a/ Migration period range and peak annual counts shown as darker central region.

Figure M-3. Adult salmonid main upstream migration periods.

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STOCK AND LOCATION a/	MONTHS					
	MARCH	APRIL	MAY	JUNE	JULY	AUGUST
Yearling Chinook						
McNary Dam		██████████				
Lower Granite Dam		██████████	██████████			
Subyearling Chinook						
McNary Dam				██████████		██████████
Lower Granite Dam		██████████	██████████	██████████	██████████	
Sockeye						
McNary Dam				██████████		
Lower Granite Dam b/		██████████		██████████		

a/ Range of 10% and 90% passage for 1986 to 1990 except where indicated (source: the Corps).

b/ Range of 10% and 90% passage for 1989 and 1990 (source: Koski et al. 1990, and Ceballos et al. 1991)

Figure M-4 Peak periods of downstream migration of salmonid smolts.

3.1.1.3 Use of Project Area

SNAKE RIVER spring/summer chinook salmon are not known to spawn or rear in lower Columbia or Snake River reservoirs. Their presence in the project areas is limited to periods of upriver migration of adults (spring and summer) and downstream migration of smolts (spring).

3.1.2 Snake River Fall Chinook Salmon

3.1.2.1 Status

The historical runs of fall chinook for the Snake River are not known but were probably a large part of the total chinook runs. Abundance was decreased early in the century by the construction of Swan Falls Dam (Snake RM 456) in 1910 that blocked 150 miles of spawning habitat. By 1958, another 165 miles of spawning habitat was lost with the construction of Brownlee Dam (Snake RM 285). Other dams, including Hells Canyon (Snake RM 247; completed in 1967), excluded prime upstream spawning areas from access. The four lower Snake River projects also reduced spawning areas. Estimated average escapement went from 72,000 fish in 1938 to 1949 down to 29,000 fish during the 1950s (Waples et al., 1991). By 1964 to 1968, average counts over Ice Harbor Dam were 13,000 fish. The Snake River wild fall chinook gradually declined from these levels to about 1,000 in the mid-1970s. Escapement ranged from 200 to 400 fish from 1983 to 1989, with sharp decline to only 78 fish in 1990 (Figure M-2) (Waples et al., 1991).

3.1.2.2 Life History and Habitat Requirements

Adult fall chinook begin entering the Columbia River in August. While some enter the Snake River in August, most arrive in September and October, and pass by the mainstem dams by the end of November (Figure M-3; Chapman et al., 1991). The current known spawning range of the proposed threatened Snake River stock is limited to approximately 103 miles of the mainstem Snake River—from Hells Canyon Dam to the Lower Granite Pool—and the lower reaches of its major tributaries including the Imnaha, Grande Ronde, Clearwater, and Tucannon Rivers. Some deep-water spawning might occur below the tailrace of the lower Snake River dams (Waples et al.,

1991). Small fry collected in Little Goose Pool in 1991 suggest spawning likely occurs in the four mile region along the north shore from the tailrace of Lower Granite Dam downstream (Bennett et al., 1991).

Juveniles emerge in March and April and rear for several weeks in their native streams or reaches farther downstream. Fall chinook outmigrate in early and mid-summer (Figure M-4).

3.1.2.3 Use of Project Area

Some portion of the fall chinook population rears as juveniles in Lower Granite and Little Goose pools (Bennett et al., 1991) and also in pool areas behind each of the projects farther downstream. Rearing continues for several weeks following emergence in March and April. Most chinook that rear in the Snake River outmigrate by mid-July although some remain in the reservoirs through late July (Bennett et al., 1991). Water temperatures of the Snake River increase to levels generally considered unsuitable for chinook in late summer (Waples et al., 1991). In addition to potential rearing in the upper reservoirs during late spring and summer, fall chinook pass through the mainstream project areas during the summer outmigration period and the fall upriver spawning migration.

3.1.3 Snake River Sockeye Salmon

3.1.3.1 Status

The historical run size of sockeye from the Snake River was estimated to be about 150,000 fish (Northwest Power Planning Council [NPPC], 1986). Much of the original rearing habitat has been cut off from access; hence, potential production under existing conditions is greatly reduced. The only remaining spawning and rearing area for Snake River sockeye salmon is Redfish Lake, located in the Stanley Basin, Idaho. Potential production of Redfish Lake has been estimated at 1,500 spawning adults (Chapman et al., 1991). If access were provided, four additional lakes in the basin could potentially provide spawning and rearing habitats. Current estimates of potential for escapement to the remaining Stanley Basin lakes is about 6,000 (CBFWA, 1991b).

The returns of sockeye destined for Redfish Lake have been less than 1,000 fish since 1970 and less than 100 since 1981 (Chapman et al., 1991). Based on counts past Ice Harbor Dam, escapement averaged less than 20 fish from 1985 to 1988. Only 2 fish returned in 1989

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and none in 1990 (Figure M-4). However, in 1991, 8 sockeye passed Lower Granite Dam and 4 returned to Redfish Lake.

3.1.3.2 Life History and Habitat Requirements

Adult sockeye salmon begin entering the Columbia River in April and continue to pass the dams through October. The majority of adult passage occurs from June through early August. These fish typically arrive from mid-July through August at Redfish Lake to spawn in beach gravel during October (Chapman et al., 1991). Juveniles rear in the lake 1 to 2 years before migrating seaward in May and June. In recent years, the majority have passed Lower Granite Dam by mid-June (Chapman et al., 1991).

3.1.3.3 Use of Project Area

Since the Snake River sockeye salmon are not known to rear in Snake or lower Columbia River reservoirs, the presence of this stock in the project areas is limited to periods of upriver migration (summer) of adults and downstream migration (spring) of smolts.

3.2 PROJECT EFFECTS ON SPRING AND SUMMER CHINOOK, FALL CHINOOK, AND SOCKEYE

The following section discusses project effects for all species because they will be similar for each. Where there are differences among species, they are noted in the discussion.

Proposed actions assessed in this OA/EIS are centered on the concept of reducing the water particle travel time (time it takes a unit of water to get from one point to another) down the Columbia-Snake River System. (The traditional and generally accepted way to calculate theoretical water particle travel time is to divide reservoir or river reach volume by daily discharge rate.) Based on data presented by the Columbia Basin Fish and Wildlife Authority (CBFWA) (1991a), a primary concern is the relationship between flow, water particle travel time, and salmon and steelhead smolt survival. The effect of flow on adult upstream migration of adult salmon is also considered.

To evaluate the effects of the various options, a primary understanding of the relationship between water particle travel time (or flow) and fish travel time (or survival) is discussed, followed by an assessment of other effects of the various options. This evaluation is based on the most recent analyses of these relationships.

3.2.1 Juvenile Anadromous Fish

The following sections discuss the various factors affecting smolt survival of spring and summer chinook (chinook yearlings for the Snake River stock), fall chinook (subyearlings for the Snake River stock), and sockeye resulting from the alternatives. The analysis is limited to the effects that may occur while fish are passing through the mainstem Snake and Lower Columbia River projects.

It is important to note that factors outside of the project area have significant effects on downstream migrating smolt survival before they arrive at these projects. There are indications that, historically, mortality that occurred during migration in this system may have been quite low. Raymond (1979) found mortality of chinook yearlings from Whitebird on the Salmon River to Ice Harbor Dam (about 223 miles, with no intervening dams at the time) averaged 11 percent for three years. The portions of this mortality that occurred in the river and in the reservoir are not known. However, recent information on smolts that migrate down the rivers above Lower Granite Pool indicates these fish may have higher mortality. For example, Kiefer and Forster (1990a) estimated 60 and 47 percent mortality of chinook and steelhead, respectively, during spring outmigration in 1989 from the Crooked River to the head of Lower Granite Pool (about 120 miles). From a similar study in 1988 (Kiefer and Forster, 1990b), spring chinook mortality and steelhead mortality from the upper Salmon River to the head of Lower Granite Pool (about 420 miles) were estimated to be 63 and 85 percent, respectively. These results need to be considered with caution, as they were not intended to be used as an estimate of migration mortality; however, they suggest that significant smolt mortality can and does occur independent of effects at the Federal projects. The sources of their mortality are not completely known. But Giorgi (1991a) suggested several possible causes of this high mortality that may not have been present historically. These factors include high BKD disease among hatcheries and wild spring chinook stock, high numbers of hatchery-released fish depleting the food source of the migration corridor (currently, 5 to 10 times the number of smolts are present in the region than was there in the 1960s),

large numbers of hatchery smolts adversely affecting migration behavior of wild fish, and low vitality of hatchery stocks.

3.2.1.1 Flow Effects on Survival

This section contains four parts: (1) a summary of current knowledge of the effects of flow on smolt travel time and survival, (2) a summary of the effects of the various alternatives on water particle travel time, (3) effects of the alternatives on smolt travel time, and (4) attempts to apply this information to the various alternatives to assess effects on smolt travel time and survival.

Current Knowledge of Flow, Travel Time, and Survival Relationships. Overall, this OA/EIS presents the scientific uncertainty that exists regarding the relationship between flow, travel time, and survival. This discussion presents a wide range in analyses among regional experts and their interpretations of the biological data. One analysis was not selected as right or wrong, since all are based on the same database, which is very limited. The Corps believes the public should be aware of this issue since the flow/travel time/survival relationships are the basis for the drawdown experiment. Several primary sources have been used to assess the relationship between flow, fish travel time, and survival: *The Biological and Technical Justification for the Flow Proposal of the Columbia Basin Fish and Wildlife Authority*, by the CBFWA (CBFWA, 1991a); (2) *The Flow/Survival/Travel Time Relationship; Review and Analysis of Supporting Information and Rationale For Flows for Juvenile Spring and Summer Chinook Migrations* by Ray Kindley of the Pacific Northwest Utilities Conference Committee (Kindley, 1991); and (3) *Biological Issues Pertaining to Smolt Migration and Reservoir Drawdown in the Snake and Columbia Rivers with Special Reference to Salmon Petitioned for Listing Under the Endangered Species Act* (Giorgi, 1991b) by Al Giorgi of Don Chapman Consultants Inc. Several other sources were also reviewed but were used less extensively in the analysis. A brief summary of some of these sources and their conclusions are presented below.

The basic conclusion of the following reports is that there is a statistically significant relationship between smolt travel time and water flow, at least to some threshold flow level (80 to 100 kcfs in the Snake River and 190 to 240 kcfs in the Columbia

River). The degree of this correlation varies by species, location, season, and flow. While flow is strongly correlated with smolt travel speed or survival at lower flows, its importance at higher flows is less well defined and may not correspond with increased travel speed or survival in these flow ranges. Also, the importance of flow in affecting the migration rate of some endangered or potentially endangered stocks is less clear (fall chinook and sockeye). There are various other factors that also correlate significantly with migration rate, including the level of smolt development.

Reference is made throughout this section to the terms "significant" and "correlated." These terms are used according to their statistical definitions. If a relationship is significant, this indicates a relationship other than just "random chance" is occurring between two variables. It does not indicate the strength of the relationship between the variables. Correlation (described by an r^2 value) indicates the strength, or how closely matched, the measured data follow a predicted relationship. A regression line is the most common method used of predicting the relationship between variables. A low correlation (r^2 near 0) means the predicted line is not a good fit with the measured data. A high correlation (r^2 near 1) does fit the measured data well. Two variables can be significant, but be either weakly or highly correlated. The higher the correlation, the stronger the relationship.

CBFWA (1991a) - The authors conclude that "Travel time is a key migrational characteristic reflecting the dynamics of the downstream migration of juvenile salmonids. The physiological condition of smolts changes over the time they are migrating. Travel time determines whether the smolts arrive at the estuary during the biological window, so they can successfully survive the transition to salt water. Travel time is inversely related to flow. With the present hydrosystem, even extremely high flows cannot achieve pre-dam water velocities."

The authors recommend flows of up to 300 kcfs in the Columbia River and 140 kcfs in the Snake River during peak spring outmigration (April 1 to June 15) to protect downstream migrating smolts of steelhead, chinook, sockeye, and coho. The authors state, "The similarity of fish travel time to water particle travel time indicates a causative, rather than simply a correlative, relation between flow and travel time of juvenile salmonids."

The primary basis for these recommendations is data concerning flow, travel time, and survival. The primary data presented are developed from older (1973

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to 1979) study data (Sims and Osslander, 1981) that show significance and strong correlation (usually P = less than 0.01, and r^2 greater than 0.8), based on seven annual data points, for the relationship between flow and travel time and the relationship between flow and survival of yearling chinook and steelhead from the upper Snake River Dam to The Dalles Dam. The flow range of this analysis was 40 to 160 kfs on the Snake River and 115 to 340 kfs on the Columbia River.

The authors conclude that flow affects survival of all species and life stages even though spill was found to significantly relate to survival in these earlier studies, and other factors recently found to correlate with travel time had not been tested in earlier studies.

There are several possibly negative effects of delay in migration. Delay reduces success of survival in the ocean either because the smolts do not arrive in the ocean when food is abundant or their physiological development has proceeded improperly, leaving them unable to complete the normal transition from freshwater to saltwater. The authors also suggest that predation may increase with lower flows because predators may have easier access to smolts or because higher water temperatures associated with lower flows increase the food intake by the predators. Higher temperatures occurring later in the migration season are believed to be detrimental because they indirectly adversely affect survival (e.g., increase predation and food requirements).

Berggren and Filardo (1991) examined the relationships between flow and other variables to the travel time of yearling chinook salmon and steelhead in the Snake River and subyearling chinook in John Day Pool. They conducted univariate analysis with just flow and then multivariate analysis using flow and other variables. The Snake River analysis used data from 1982 through 1990 and found yearling chinook travel time correlated with the reciprocal of flow ($r^2 = 0.43$). Subyearling chinook travel time in the John Day Pool (data from 1981 to 1983 and 1986 to 1988) was statistically significant but weakly correlated with the reciprocal of flow ($r^2 = 0.33$). Multiple regression analysis for yearling chinook in the Snake River was significant and increased the correlation ($r^2 = 0.74$) with the addition of two variables, days to prior arrival at the trap (as an indication of stage of smolt development) and change in flow. For subyearling chinook in John

Day Pool multiple regression analysis was significant and increased correlation ($r^2 = 0.60$) with addition of change in flow and release date (also as an indication of smolt development). Flow remained the primary component in both the Snake River and John Day Pool analysis. Berggren and Filardo did not attempt any bivariate analysis with any other factor than flow.

The data sets predicted reduced travel time with increased flow. The greatest effect on travel time occurred at lower flows, while changes were less pronounced at higher flows. Berggren and Filardo concluded that the similarities in water particle travel time and smolt travel time suggest a causative and not a simple correlative relationship.

Kindley, 1991 - Using analysis of recent data (1986 to 1990) from the Snake and Columbia rivers, Kindley concluded "Flow levels up to certain flow ranges decrease the travel times for migrating juvenile chinook salmon. Travel time estimates indicate that flows in excess of a range from 85 to 95 kfs in the lower Snake River and greater than a range of 190 to 240 kfs in the lower Columbia River do not appreciably reduce travel time."

Kindley analyzed three regions for yearling chinook smolt travel time relationships: the head of Lower Granite Pool to Lower Granite Dam, Lower Granite Dam to McNary Dam, and McNary Dam to John Day Dam (John Day Pool). Generally, when the data were available, Kindley found significant relationships between travel time and flow, release date, and ATPase activity level (adenosine triphosphatase, a measure of smolt development). Because there are significant correlations among these factors, it is not possible to determine which factor is the cause of the change in migration rate. Kindley found a negative relationship (i.e., slower migration correlated with higher flow) in one (nine fish recaptured) of the two sets of data for Lower Granite Pool, 1989. Flow was significantly correlated with yearling chinook travel time (with r^2 values less than 0.66). Another significant but strongly correlated factors were gill ATPase level and release date (r^2 value greater than 0.8).

In studies that evaluated travel times for tagged yearling chinook released at Lower Granite and recaptured at McNary Dam, flow (measured at Ice Harbor) versus smolt travel time did not have a significant ($p = 0.55$, $r^2 = 0.03$) relationship while ATPase levels were significant and strongly correlated ($r^2 = 0.79$). Kindley suggested that part of the flow problem might be that Columbia River flows did not correlate with Snake River flows.

Kindley used data from 1986 to 1988 to assess flow versus yearling chinook travel time relationships in John Day Pool. Flow did have a significant and strongly correlated relationship ($p = .0001$, $r^2 = 0.88$) for the flow range of 135 to 285 kfs. Analysis conducted only on flows greater than 195 kfs revealed no significant relationship between travel time and flow, while the release date was significant for this reduced data set. A polynomial regression of the whole data set indicated little reduction in travel time for flows above 240 kfs. Kindley concluded that travel time in John Day Pool improved as flows increased, but only to flows in the 190 to 240 kfs range.

Kindley concluded, "Water particle travel time is an unreliable predictor of juvenile spring and summer chinook travel time. Travel time is a product of many factors; flow is merely one factor. State of physiological development, or smoltification, significantly influences travel time."

Giorgi, 1991b - Giorgi examined the available information on yearling chinook responses to flow in three regions: the Lower Granite Pool, the Snake River from Lower Granite to McNary Dam, and John Day Pool. He found that while there are some significant relationships between flow and migration rate, they are not clear. He also found very limited data demonstrating a relationship between increased flow and increased smolt survival.

Giorgi's review of data on the Lower Granite Pool yearling chinook migration rate indicated that there is a relationship between flow and migration rate, but the relationship is not consistent. This is demonstrated by the fact that fish entering from the Clearwater River migrate much more slowly than fish entering from the Snake River. Although there are differences between studies, some studies found that yearling chinook smolts generally moved twice as fast at 100 kfs as at 50 kfs. Other studies examining the data indicated that other factors showed stronger correlations between travel time and flow, including release date and level of smolt development (as measured by gill ATPase activity).

Giorgi (1991b) found that yearling chinook smolt travel time data for the Snake River reach to McNary Dam also had varying results. While some data indicated a relationship between flow and travel time, other sets showed no relationship but had strong correlations to release date or level of smolt development. In one case, strong

downstream migration occurred at flows of 31 to 78 kfs. The analysis of flow or other effects is confounded because they are often correlated, but the cause cannot be determined.

Giorgi (1991b) developed and examined varying sets of regressions from historical to present data (1972 to 1987) to predict yearling chinook travel time through Snake River to McNary Dam. The highest correlation model was a third order polynomial ($r^2 = 0.90$) indicating no reduction in travel time at flows over 110 kfs. In general, all models indicated that little change in smolt travel time occurs at flows greater than 80 to 100 kfs.

Giorgi (1991b) also summarized data on yearling chinook smolt travel time through John Day Pool. The Fish Passage Center's (FPC's) analysis of data from 1986 to 1988 indicated a significant and strong relationship between flow and travel time and recommended that flows remain above 220 kfs during this below-average-flow year. Different approaches to these data resulted in different conclusions. For example, Kindley (1991) found that a flow threshold may exist near 190 to 240 kfs. Analysis of later data (1989 and 1990) by Kindley did not find consistent relationships between flow and travel time. Two regression models, log and polynomial, were evaluated to predict yearling chinook smolt travel time. The log model, developed by the FPC (1989), continues to show reduced travel times with increased flow, but the relationship greatly diminishes at higher flows. The polynomial showed that travel time decreases up to 200 to 240 kfs.

In Giorgi's (1991b) assessment of survival data, he questioned the validity of relating these historical values to flow because many other factors have also varied among years (e.g., flows through turbines, bypass flows, and environmental factors). Giorgi re-analyzed the historical survival versus flow indices and found the best fit of the data was a quadratic regression ($r^2 = 0.77$). His analysis indicated that the rate of survival rose little at flows greater than 100 kfs in the Snake River.

Petrosky (undated) reanalyzed data from 1970 to 1980 estimating smolt survival in the Snake River primarily using data from Raymond (1979). His analysis suggested increased survival would occur at flows higher than 85 kfs. He concluded that an exponential analysis (that is one that continues to increase with increasing flow) best fits the data indicating significant and strong correlation to increasing smolt survival with increasing flow ($r^2 = 0.71$). When he applied polynomial analysis (which he believed was not the best

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way to analyze the data) to the data, his figures indicated increasing survival even in the range of 85 to 110 kcfs. He believed the exponential analysis is most valid based on the fact that historical survival without dams was much higher for the same stretch of river. Also, some of the data that suggested a leveling off of survival at flows in the range of 80 to 120 were from years when high mortality was occurring in the river from increased gas supersaturation. The total effect of this gas supersaturation cannot be determined, but at present under normal project operation it is generally not believed to be a problem, although it could be.

Few of the data examined demonstrated a positive relationship between travel time and increased flow for subyearling chinook. In addition, one study (Sims and Miller, 1982; Miller and Sims, 1983, 1984) found no significant relationship or correlation between travel times and flows for subyearling chinook (flows ranging from 112 to 393 kcfs in John Day Pool). These authors also found that many of these fish remained in the same region or moved upstream in the reservoir over time. One study of data from 1981 to 1983 and 1986 to 1988 found a statistically significant but weak correlation between flow and travel time ($r^2=0.33$) (Berggren and Filardo, 1991). Giorgi (1991b) concluded, "of the analyses conducted to date, none have identified a convincing substantive relationship between subyearling chinook migration speed and river flow/water velocity." In addition, Giorgi found that no data are available specifically for the Snake River subyearling chinook.

In 1991 a study on the Snake River with 104 subyearling chinook (presumably fall chinook) found a positive significant relation to travel time through Lower Granite Pool with flow and fish length (memorandum from Michele DeHart, FPC, to Merritt Tuttle, NMFS, October 16, 1991). The relationship was significant and correlated ($r^2 = 0.58$) with the two parameters. About equal explanation could be assigned to the two variables (i.e., correlation with just flow may be about 0.3, although this was not presented). This indicates that a significant but weakly correlated relationship would exist between just flow rate and rate of migration of fall chinook in the Snake River. Giorgi noted that other factors such as temperature and date of release also correlated with travel time.

Limited data are available on sockeye salmon migration rate in the Snake River. During 1991,

20 PIT-tagged sockeye released from Redfish Lake, 462 miles above Lower Granite Dam were recaptured. These data indicate a significant relationship with weak correlation ($r^2 = 0.28$) between flow rate and migration rate of these fish (memorandum from Michele DeHart, FPC, to Bert Bowler, Idaho Department of Fish and Game, July 19, 1991). The range of flow when fish were captured varied from 85 to 103 kcfs at Lower Granite Dam.

3.2.1.2 Effects of Flow Options on Water Particle Travel Time

Based on the previous discussion, it is apparent that water particle travel time may affect fish travel time and survival. Water particle travel times for the various pool elevations for the Snake and lower Columbia projects are shown in Tables M-1 and M-2.

Snake River. Water particle travel time is similar among Snake River project pools, ranging from 21 percent of the total water particle travel time for the reach in Lower Monumental to 30 percent in Little Goose (at maximum pool) within the Lower Snake River reach. At typical medium spring flows of 100 kcfs in the Snake River, decreasing all reservoirs to MOP from maximum pool reduces water particle travel time by 0.6 day (from 8.5 to 7.9 days). At high flows of 140 kcfs, the change is 0.4 day (from 6.2 to 5.8 days), and at low flow of 60 kcfs, the change is 1 day (from 14.2 to 13.2 days). At all three flow levels, the decrease in water particle travel time relative to maximum pool is 6 to 7 percent.

The largest effect on water particle travel time in the Snake River, without flow augmentation, occurs when all reservoirs are lowered from full pool to near spillway crest. At medium flow, the change is 4.5 days (from 8.5 to 4.0 days); at high flow the change is 3 days (from 6.2 to 3.2 days); and at low flow, it is 8.5 days (from 14.2 to 5.7 days) (Table M-1). The range in percent decrease in water particle travel time is from 48 percent at high flow to 60 percent at low flow.

Intermediate reservoir elevations would have lesser effects on water particle travel time in the Snake River. For example, lowering Lower Granite to 710 feet and others to MOP from maximum pool reduces travel time from 0.9 to 2.3 days from high to low flow, or 15 to 16 percent from maximum pool (Table M-3).

Several flow augmentation alternatives for the Snake River were modeled based on predicted available flow releases from Dworshak and Brownlee reservoirs,

Table M-1. Estimated water particle travel time in the lower Snake River reach.

Project Reach	Miles	Elevation (ft)	Theoretical Travel Time (Days) by Discharge (kcfs) Category							
			20 kcfs	40 kcfs	60 kcfs	80 kcfs	100 kcfs	120 kcfs	140 kcfs	
Lower Granite	32	738	10.8 days	5.4 days	3.6 days	2.7 days	2.2 days	1.8 days	1.5 days	
		733	9.9	5.0	3.3	2.5	2.0	1.7	1.4	
		710	6.0	3.1	2.0	1.5	1.3	1.0	0.9	
		681 ^w	3.4	1.9	1.4	1.1	1.0	0.8	0.8	
Little Goose	37	638	12.8	6.4	4.3	3.2	2.6	2.1	1.8	
		633	11.7	5.8	3.9	2.9	2.3	2.0	1.7	
		581 ^w	4.0	2.3	1.7	1.4	1.2	1.0	0.9	
Lower Monumental	29	540	8.7	4.3	2.9	2.2	1.8	1.5	1.3	
		537	8.3	4.1	2.8	2.0	1.7	1.4	1.2	
		483 ^w	3.0	1.7	1.2	1.0	0.8	0.8	0.7	
Ice Harbor	32	440	9.5	4.9	3.2	2.5	1.9	1.7	1.4	
		437	9.0	4.6	3.0	2.3	1.8	1.5	1.3	
		391 ^w	2.9	1.7	1.2	1.0	0.9	0.8	0.7	
Clearwater River ^w Confluence to Snake-Columbia River Confluence	139	Max. Pools	42.3	21.4	14.2	10.7	8.5	7.2	6.2	
		Min. Pools	39.4	19.8	13.2	10.0	7.9	6.7	5.8	
		L. Gran. (710) ^w	35.5	18.2	12.1	9.3	7.3	6.1	5.5	
		Spillway	13.9	7.8	5.7	4.6	4.0	3.5	3.2	

Source: Calculated using Corps backwater models.

a/ Included water particle travel time from Ice Harbor Dam to confluence with Columbia River.

b/ Spillway crest elevation; actual water level would be somewhat higher and variable, depending upon inflow.

c/ All pools minimum pool except Lower Granite at 710 feet.

Table M-2. Estimated water particle travel time in the lower Columbia River reach.

Project Pool	Miles	Elevation (ft)	Theoretical Travel Time (Days) by Discharge (kcfs) Category		
			100 kcfs	200 kcfs	300 kcfs
Columbia-Snake River Confluence to McNary	32	340	4.3 days	2.2 days	1.4 days
		337	4.0	2.0	1.3
		335	3.8	1.9	1.3
John Day	75	268	12.7	6.4	4.3
		262	11.0	5.5	3.7
		257	10.1	5.0	3.4
The Dalles	24	160	1.8	0.9	0.6
		155	1.5	0.8	0.6
Bonneville	45	77	3.5	1.8	1.2
		70	2.9	1.5	1.0
Confluence of Snake River to Bonneville Dam	176	Max.	22.3	11.3	7.5
		Inter. ^{a/}	19.4	9.8	6.6
		Min.	18.3	9.2	6.3

Source: Corps, Walla Walla District.

^{a/} Uses two intermediate drawdown elevations at McNary and John Day and lower elevations at other projects.

Table M-3. Estimated water particle travel time with different combinations of options.

Flow ^{a/} and Alternatives ^{b/}	Snake			Columbia			Snake and Columbia		
	Change From Maximum			Change From Maximum			Change From Maximum		
	Total Days	Days	%	Total Days	Days	%	Total Days	Days	%
High Flow									
Maximum Pool	6.2	-	-	7.5	-	-	13.7	-	-
All at MOP	5.8	0.4	6	6.3	1.2	16	12.1	1.6	12
MOP, except John Day, McNary, and L. Granite	5.3	0.9	15	6.6	0.9	12	11.9	1.8	13
Columbia at MOP, Snake at Spillway	3.2	3.0	48	6.3	1.2	16	9.5	4.2	31
Medium Flow									
Maximum Pool	8.5	-	-	11.3	-	-	19.8	-	-
All at MOP	7.9	0.6	7	9.2	2.1	19	17.1	1.7	14
MOP, except John Day, McNary, and L. Granite	7.2	1.3	15	9.7	1.6	14	16.9	2.9	15
Columbia at MOP, Snake at Spillway	4.0	4.5	53	9.2	2.1	19	13.2	6.6	33
Low Flow									
Maximum Pool	14.2	-	-	22.3	-	-	36.5	-	-
All at MOP	13.2	1.0	7	18.3	4.0	18	31.5	5.0	14
MOP, except John Day, McNary, and L. Granite	11.9	2.3	16	19.2	3.1	14	31.1	5.4	15
Columbia at MOP, Snake at Spillway	5.7	8.5	60	18.3	4.0	18	24.0	12.5	34

Source: Based on data from Tables 4.2-1 and 4.2-2.

a/ High flow: Snake River = 140 kcfs; Columbia River = 300 kcfs;

Medium flow: Snake River = 100 kcfs; Columbia River = 200 kcfs;

Low flow: Snake River = 60 kcfs; Columbia River = 100 kcfs;

b/ Maximum Pool = All pools, Columbia and Snake at full pool.

All at MOP = All pools, Columbia and Snake at minimum operating pool.

MOP at Except John Day and Lower Granite = John Day at elevation 262 and Lower Granite at elevation 710.

Columbia at MOP, Snake at Spillway = All Columbia dams at MOP and all Snake dams at spillway crest.

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different goals of flow releases, and expected restrictions on the available storage and reservoir levels. Ten flow augmentation alternatives were modeled to assess what the average change in flow would be for the second half of April and all of May, and June. The purposes of the alternatives evaluated were to increase flows for different periods including May, April, and May, and April through June.

Based on the model analysis, additional flows in May above what normally occurs (baseline) ranged from 1 to 37 kcfs. Only three alternatives had flows of 20 kcfs or higher, while seven estimated flow increases of less than 8 kcfs in May at Lower Granite Dam. The highest flow increase alternative (an additional 37 kcfs in May) used a target flow of 140 kcfs for Lower Granite Dam in May. The other two alternatives with high flow releases of about 20 kcfs used the goal of increasing flow in May only with no target flow but an increase in available storage volume from Dworshak (600 KAF) and Brownlee (200 KAF) reservoirs over a normal May flow release. The alternatives with lower additional flows in May assumed one or more of the following factors: less available storage water for release from the two upper reservoirs; extended flow release periods; different target flow goals; greater restrictions on instantaneous flow releases from Dworshak Reservoir; and other operational restrictions. Depending on the goals of each model, flow could be less in other months than what currently occurs. At least four of the models indicated reduced June flows of 4 to 6 kcfs over baseline through the process of increasing flows in May.

The example of 20 kcfs was used as representative of a high flow augmentation in water particle travel time calculations and related analysis.

The length of time that 20 kcfs could be delivered depends on available storage used for flow augmentation. For all but one of the augmentation options, a flow of an additional 20 kcfs could be supplied for 28 days or less in an average water supply year. With the allocation of this flow increase to May or June, lower flows than typical would occur in summer months.

Flow augmentation would have varying effects on water particle travel time depending on existing flow, reservoir elevation, and quantity added. For example, if augmentation of 20 kcfs were possible during a low flow year (60 kcfs), travel time at

maximum pool would be reduced 3.5 days or 25 percent (from 14.2 to 10.7 days), which is one of the largest reductions in water particle travel time with flow augmentation. During a more typical flow year (100 kcfs), at maximum operating pool, an additional 20 kcfs would reduce water particle travel time by 1.3 days or 15 percent (from 8.5 to 7.2 days).

The March test drawdown option would reduce water particle travel time in Lower Granite Pool slightly more than the 710 alternative (because minimum elevations will be from 705 to 696 feet). Also, water particle travel time in Little Goose Pool would be reduced about midway between the MOP and spillway options as the pool would be up to 15 feet below minimum pool. However, the objective of this option is to provide test data on physical parameters rather than travel time benefits to the few migrating fish that will be present.

Columbia River. At typical Columbia River spring flows of 200 kcfs, lowering the four lower Columbia River pools to MOP would decrease water particle travel time by 2.1 days (from 11.3 to 9.2 days) from the Snake River confluence to Bonneville Dam (Table M-2). The reduction at high flows of 300 kcfs would be 1.2 days (from 7.5 to 6.3 days), and at a low flow of 100 kcfs, the reduction would be 5.0 days (from 22.3 to 18.3 days). All three flow levels have similar decreases of 16 to 19 percent in water particle travel time relative to maximum pool.

Leaving John Day Pool at elevation 262.5 feet would have lesser effects, reducing existing travel time by 0.9 to 3.1 days or 12 to 14 percent from high to low flows, respectively (Table M-3). Because John Day Pool has the largest volume of the lower Columbia reservoirs, from 54 to 57 percent of the total water particle travel time for a given flow occurs here. The Dalles Pool, the smallest reservoir, accounts for less than 10 percent of the theoretical water particle travel time in the lower Columbia reach.

Although the estimated decreases in water particle travel time are from 16 to 19 percent for the Columbia River reach, this is based on reducing the reservoirs from maximum to minimum pool. In normal operations, reservoirs operate below full pool. For example, John Day Pool, which has the largest volume, operates near 262 feet for part of the year. Lowering this pool from normal operation to MOP (257 feet) would result in a decrease in water particle travel time of about 9 percent. Considering that all projects normally are operated between full pool and MOP, a more reasonable estimate of reduction in water particle travel

time by lowering the projects to MOP is about 10 percent.

Augmenting flow by 20 kcfs in the Columbia River during a low flow period (100 kcfs) would reduce the water particle travel time by 5 to 5.5 days or 25 to 27 percent for the Columbia River reach, over the potential range of reservoir operations considered. At high flow (300 kcfs), the reduction for this reach would be less than 0.7 day, or 10 percent over considered operations.

Snake and Columbia Rivers. Combined alternatives for the Snake and Columbia rivers have a wide variety of effects on theoretical water particle travel time (Table M-3). Through the project area from the Clearwater River to Bonneville Dam, the water particle travel time is 36.5, 19.8, and 13.7 days, respectively for low (60 kcfs Snake River, 100 kcfs Columbia River), medium (100 kcfs Snake River, 200 kcfs Columbia River), and high (140 and 300 kcfs, respectively) flows at maximum pool elevations (Table M-3). Maximum reduction in water particle travel time would occur with the combination options of Columbia River projects at MOP and all Snake River projects at spillway crest, resulting in water particle travel time of 24.0, 13.2, and 9.5 days for low, medium, and high flows, respectively (Table M-3). Overall, for low, medium, and high flow, this would reduce water particle travel time by 12.5, 6.6, and 4.2 days, respectively, or 34 to 31 percent over maximum pool. Combinations of intermediate options would reduce water particle travel time by 5.4, 2.9, or 1.8 days, respectively, or 15 to 13 percent relative to maximum pool (Table M-3).

A high augmentation of 20 kcfs in May or June during low flow (i.e., increasing Snake River flow from 60 to 80 kcfs and Columbia River flow from 100 to 120 kcfs) at maximum pool would reduce the water particle travel time by 8 days (from 36.5 to 27 days), or 22 percent. During medium flow at maximum pool, the reduction would be 2.8 days (19.8 to 17 days), or 14 percent. Effects are relatively less with reduced pool elevation options. In nearly all cases, an augmentation flow of 20 kcfs in May or June will result in increased water particle travel time in summer months (July to September). This is because increased spring releases would likely use some water that would otherwise be available later, resulting in below-normal summer flows.

3.2.1.3 Effects of Flow Options on Smolt Travel Time

Yearling Chinook.

Snake River - Lower Granite Pool - Because many variables affect yearling chinook smolt travel time, accurate predictive models of travel time through Lower Granite Pool have not been developed. While the relationship between flow and travel time is not consistent in this pool, the strongest single factor correlating with travel time has been found to be flow (Buettner, undated). So for purposes of this OA/EIS, the ability to predict smolt responses to water particle travel time is needed. Therefore, making the assumption that smolt migration rates are directly related to water particle travel time for lack of appropriate data provides a relative estimate of smolt travel time (Table 3.2-1) and a basis for comparison without definitive data.

Reducing pools to MOP at 40, 80, and 120 kcfs would result in an estimated reduction of yearling chinook smolt travel time of 0.4, 0.2, and 0.1 days, respectively, through the pool. Because the Lower Granite Pool is usually operated at less than full pool during migration periods, the reduction in travel time would be about half those values. If augmentation flows of 20 kcfs were added at maximum pool, smolt travel time would be reduced by 1.8, 0.5, and 0.3 days, respectively, at initial flows of 40, 80, and 120 kcfs.

The apparent reduction in smolt travel time by lowering Lower Granite to elevation 710 feet over flow ranges of 40 to 120 kcfs is 2.3 to 0.8 days. The March drawdown alternative (705 to 696 feet) will reduce migration rate to a similar level; however, few fish will be present. In addition, based on these same assumptions, reduction to near spillway crest would reduce travel time by 3.5 to 1.0 days. Estimated changes in smolt travel time resulting from these two options must be weighed carefully against potential negative effects of dissolved gas supersaturation, physical injury, loss of bypass and transport operation, and other factors (discussed in later sections). Therefore, apparent reductions in smolt travel time may be outweighed by other factors for which there are no previous experience to develop predictions on survival benefits.

Snake River - Lower Granite Dam to Ice Harbor Dam - No studies on yearling chinook smolts have been specifically conducted on just the Snake River under existing conditions (all dams in place with current

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operating programs). Raymond (1979) conducted studies in this reach from 1966 to 1975. While this data may also have been used, the Corps chose to use the more recent data. However, varied relationships have been found between flow and travel time for yearling chinook from Lower Granite Dam to McNary or John Day dams. Although factors such as smolt development have also been found to correlate strongly with travel time in this area, different models (regressions) were developed to determine the relationship between flow and travel time in this region. Giorgi (1991b) presented the results of the various models (Figure M-5).

Using models based on past operations to determine changes in smolt travel time for different project alternatives on the Snake River relies on many tenuous assumptions. Most models developed show significant relationships between flow and smolt travel time, at least to a threshold level (80 to 100 kcfs in the Snake River and 190 to 240 kcfs in the Columbia River). However, they differ in what this relationship is and to what level of flow the relationship either is positive, or shows marked changes with flow increase. For the following analysis, several models were examined to obtain examples of how these 1992 options may alter smolt travel time. The travel times of various groups of fish from Lower Granite to McNary Dam have been evaluated by several authors. Differences of opinion exist over how to interpret the data, as discussed previously. To summarize the range of estimates for this reach of the Snake River, Giorgi (1991b) compared water particle travel time at MOP for Little Goose, Lower Monumental, and Ice Harbor. This reach was selected for comparison because it has the historical data gathered and analyzed by several groups (Sims et al., 1983; Chapman et al., 1991; Kindley, 1991). Other data sets from the same region were analyzed by CBFWA (1991a) and Berggren and Filardo (1991). Giorgi (1991b) presented four different regression models based on the above analysis (Figure M-5). With these models, he analyzed the relationship between flow and travel time in this reach. Giorgi (1991b) suggested that because of the general and limited nature of the data, the polynomial model that he developed and the reciprocal flow model developed by Berggren and Filardo (1991) encompassed the range of flow/migration rate values that may be expected in this region.

The polynomial model developed by Giorgi (1991b) indicated no reduction in travel time at flow greater than 110 kcfs. The reciprocal flow model developed by Berggren and Filardo (1991) indicated that travel times decreased with increasing flow. In general, however, at water particle travel time greater than 1.9 to 2.4 days per project (which corresponds to 80 to 100 kcfs at normal pool levels), the decrease in travel time is small (Giorgi, 1991b). Thus, Giorgi (1991b) concluded this range of travel times should be suitable for effective migratory conditions.

A summary of the relationships of these two models (Giorgi, 1991b and Berggren and Filardo, 1991) and a corresponding calculated average per project (three lower Snake River pools) water particle travel times resulting from the models are presented in Table M-4.

Using Table M-4, examples of the relationship between changes in project operation and smolt travel times can be estimated. Although projects are operated normally at less than full pool in this region operation at full pool condition is assumed to be an optimistic estimate of gains expected from changes in operation. Over the range of flows typically occurring in the Snake River during outmigrations, the reduction in water particle travel time when projects are reduced from maximum pool to MOP is 6 to 7 percent. The Corps assumed in the example that a reduction to MOP resulted in a change in water particle travel time of 7 percent over the entire range. To be consistent with the water particle travel time changes presented earlier, all calculations are presented for reduction from maximum to minimum pool levels. Actual reduction would be about half of this because pool levels are normally maintained between maximum and minimum levels.

As examples of the changes that may be expected with different alternatives, three flow levels (40, 80, and 120 kcfs) were used to show estimates in smolt travel time (Table M-5). These changes were estimated by comparing the proportional change in water particle travel time to proportional change in smolt travel time predicted by the reciprocal flow and polynomial models. Reducing projects to MOP from maximum pool would reduce estimated smolt travel time from Lower Granite Dam to Ice Harbor Dam (by 1.8 to 0.9 days) at 40 kcfs for the two models. At the high flow of 120 kcfs, the estimated reduction in smolt travel time ranges from -0.1 to 0.3 day. The intermediate flow of 80 kcfs results in the same change (0.6 day reduction) under both models. Actual changes would be about half at those shown because normal operation is less than full pool. The polynomial model indicates an increase in travel time at higher flows. With flow augmentation

Figure M-5. Comparison of four models describing the relationship between yearling chinook travel time and flow in the Snake River, plus water particle travel time (Source: modified from Giorgi, 1991b).

of 20 kcfs as an example, at a base of 40 kcfs, the reduction in travel time would be from 7.2 to 3.9 days. At a high flow of 120 kcfs, reductions would range from -0.3 to 0.6 day smolt travel time for the two models. Intermediate changes would range from 0.8 to 1.2 days. If both projects were lowered to MOP and had 20 kcfs augmentation flow, reductions in travel time at the three flows would be approximately additive. Therefore, at 40 kcfs with both pools lowered and 20 kcfs additional flow changes, the reduction in travel time would be about 9 and 4 days for the polynomial and reciprocal flow models, respectively. At high flows, the change would be less than 1 day increase or reduction in travel time for this reach, while at intermediate flow it would be less than 2 days reduction.

Table M-5 also presents the change in smolt travel time estimates based on a reduction to near spillway crest at the three flows; however, this condition has never been tested and is outside the normal range of activities at these projects. Therefore, use of these models to measure actual reductions (or increases as predicted by the polynomial model at intermediate and higher flows) is not appropriate, especially when considering models that predict changes in survival based on changes in travel time, as will be discussed later. However, in an effort to provide some basis for comparison, yearling chinook smolt travel times based on these models are presented.

Smolt travel time changes through Little Goose Pool would be between MOP and spillway crest for the March downstream test; however, few fish will be present then.

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Table M-4. Predicted average median yearling chinook travel time per Snake River project.

Flow (kcfs)	Water Particle Travel Time (Days) ^{b/}	Smolt Travel Time (Days) ^{a/}	
		Polynomial ^{a/}	Reciprocal Flow ^{d/}
40	5.2	7.3	5.0
50		5.9	4.2
60	3.5	4.9	3.7
70		4.0	3.4
80	2.6	3.4	3.1
90		3.0	2.9
100	2.1	2.8	2.7
110		2.6	2.6
120	1.8	2.6	2.5
130		2.6	2.4
140	1.5	2.7	2.3

a/ Estimates are based on models that were fit to the data set presented in Giorgi (1991b).

b/ Average water particle travel times calculated from Corps travel time curves at maximum pool for Little Goose, Lower Monumental, and Ice Harbor pools.

c/ Described in Giorgi (1991b).

d/ Derived from different data set than polynomial model; by Berggren and Filardo (1991). The values they calculated were for travel time from Lower Granite to McNary Dam. These values presented are their estimates divided by 4 to obtain estimate per project.

Columbia River - The only data available, independent of Snake River data, to evaluate the yearling chinook migration rate in the lower Columbia River are for the John Day Pool (Giorgi, 1991b). Giorgi (1991b) pointed out that none of the available data measured smolt development, which has been closely correlated with the smolt migration rate.

Giorgi (1991b) presented two models developed to predict yearling chinook smolt travel time based only on flow in the John Day Pool. One is the logarithmic model developed by the FPC (1989) and the other is a polynomial regression developed by Kindley (1991) of the Pacific Northwest Utilities Conference Committee (PNUCC), which uses bias-

corrected data, not used by the FPC (Figure M-6). Kindley (1991) concluded from his analysis that at a flow greater than 190 to 240 kcfs, little change occurs in travel time. The shortest travel time with this model occurred at 260 kcfs. The FPC model indicates that travel time continues to decrease with increased flow, but at reduced rates at higher flow. In contrast, the estimated water particle travel time decreases almost linearly with increased flow. The polynomial regression more closely followed this relationship. In Giorgi's discussion of the two models, he stated, "The models are so disparate, any alternative actually implemented will be cloaked in uncertainty and require thorough and extensive evaluation studies."

Table M-5. Estimated changes in yearling chinook travel time from Lower Granite Dam to Ice Harbor Dam.

Starting Flow (kcfs)	Option ^{b/}	Yearling Chinook Travel Time (Days)					
		Polynomial Model ^{a/}			Reciprocal Flow Model ^{a/}		
		Start	New	Change	Start	New	Change
40	To MOP ^{c/}	21.9	20.1	1.8	15.0	14.1	0.9
40	+ 20 kcfs	21.9	14.7	7.2	15.0	11.1	3.9
40	Near Spillway	21.9	8.0	13.9	15.0	7.7	7.3
80	To MOP ^{c/}	10.2	9.6	0.6	9.3	8.7	0.6
80	+ 20 kcfs	10.2	8.4	0.8	9.3	8.1	1.2
80	Near Spillway	10.2	8.1	2.1	9.3	6.3	3.0
120	To MOP ^{c/}	7.8	7.9	-0.1	7.5	7.2	0.3
120	+ 20 kcfs	7.8	8.1	-0.3	7.5	6.9	0.6
120	Near Spillway ^{d/}	7.8	>8.1	<-0.3	7.5	<6.3	>1.2

a/ Based on respective models presented in Giorgi (1991b).

b/ Options are lowering reservoirs to MOP, adding 20 kcfs flow at maximum pool, and reducing to spillway crest.

c/ Based on the difference from maximum to minimum pool, actual changes would be about half of those shown because pools are normally operating at less than full pool.

d/ Values out of range of models.

The extrapolation of these data to the entire lower Columbia River has many potential problems. John Day Reservoir is the largest of the four lower Columbia reservoirs and generally accounts for about 56 percent of the total water particle travel time in this region (Table M-2). The overall effect on travel time of the fish and how they behave in different reservoirs at the same flow could lead to spurious conclusions. For comparison purposes, a range of possible values based on the two models at a typical flow level is presented (Table M-6).

Examples of how smolt travel time might vary in the lower Columbia River with some of the options is presented in Table M-7, based on the determination that water particle travel time

decreases by 10 percent over all flow ranges when projects are lowered to MOP. Reductions to MOP at a relatively low flow (160 kcfs) reduces estimated smolt travel time by 2.5 and 2.0 days for the FPC and PNUCC models, respectively. Changes at the upper flow range of 260 kcfs would be less, ranging from 1.6 days to a -0.5 day for the two models. Augmentation flow of 20 kcfs has an effect similar to lowering the projects to MOP. If flows were augmented and the reservoirs were lowered to MOP, the net effect would be similar to adding the two effects shown; at 160 kcfs, the net reduction would be 4 to 5 days. At a flow of 260 kcfs, the smolt migration rate might be reduced by about 3 days or increased by 1 day under the two models.

Figure M-6. Relationship between yearling chinook travel time and flow between McNary Dam and John Day Dam. Freeze-branded fish were released in the tailrace and recovered at John Day Dam (Source: Georgi, 1991b).

Subyearling Chinook. There are no studies available for fall chinook migration in the region from Lower Granite Dam to Ice Harbor Dam, and only one recent study (in 1991) is available for fall chinook migration in the Lower Granite Pool (memorandum from Michele DeHart, FPC, to Merritt Tuttle, NMFS, October 16, 1991). This study, using multiple regression, found a significant relationship between fall chinook travel time and the independent variable flow and fish length. It did not examine the effects of just flow but stated the two variables (flow and fish length) accounted for about equal portions of the variability in fish migration rate. No investigations describing the relationship between survival and flow for fall chinook salmon have been conducted in the Snake River. Studies conducted on the lower Columbia River indicated varied benefits from increased flow (see below). Therefore, benefits to fall chinook

from increased flow are less clear.

Studies performed on the Columbia River for subyearlings include fall chinook and upper Columbia summer chinook (Georgi, 1991b). They suggested that the relationship between subyearling chinook travel time and flow range from statistically significant but weakly correlated to not statistically significant in the Columbia River. NMFS studied subyearling chinook travel behavior in the John Day Pool from 1981 through 1983. Based on these studies (Sims and Miller, 1982; Miller and Sims, 1983, 1984), the authors concluded there was no relationship between flow and travel time between the flow range of 112 to 393 kcfs. The researchers noted that 54 percent of the fish tagged for identification were recaptured at or upstream from the original release site. Subyearlings did not appear to be actively migrating. Georgi et al. (1990a) examined the adult contribution data from the NMFS studies and

Table M-6. Predicted yearling chinook travel time through John Day Pool.

Flow (kcfs)	Water Particle Travel Time ^{a/}	Smolt Travel Time (Days)	
		FPC ^{b/}	PNUCC ^{c/}
160	6.7	9.1	7.2
180	5.9	7.5	5.9
200	5.5	6.3	5.0
220	5.0	5.4	4.4
240	4.5	4.6	4.1
260	4.1	4.1	3.9
280	3.8	3.6	4.0
300	3.7	3.2	4.2

Source: Modified from Table 3 in Giorgi (1991b).

a/ Water particle travel time at elevation 262 estimated from Corps travel time curves.

b/ The FPC model is a logarithmic function (FPC, 1989).

c/ The PNUCC model is the polynomial function presented by Kindley (1991).

included two variables, temperature and release date, in addition to flow. The authors found no relationship between travel time and flow.

Berggren and Filardo (1991) regressed subyearling chinook travel time in the John Day Pool against a subset of the groups tagged in 1981 to 1983, and 1986 to 1988 by NMFS, as well as against transport controls released at the McNary tailrace. The correlation between travel time and flow was statistically significant but weakly correlated ($r^2=0.33$). This low correlation indicates that the measured migration rate for smolts at any given flow is wide.

This reduces the ability to accurately predict specific changes in travel time with changes in flow. The implication is that with an increased flow, some reduction in travel time will occur but the level of this reduction is unclear.

Based on Berggren and Filardo, CBFWA (1991a) concluded that increased flow benefits subyearling chinook travel time, although the benefit diminishes at higher flows.

Sockeye. One limited study (20 fish in 1991) as presented in a memorandum from Michele DeHart, FPC, to Bert Bowler, Idaho Department of Fish and Game, July 19, 1991 on sockeye salmon indicated a significant but weak correlation in the Snake River between migration rate and flow from Redfish Lake to Lower Granite and Little Goose dams. No information is available for the Columbia River.

3.2.1.4 Effects of Flow Options on Juvenile Survival

General. Smolt travel time has been used as the primary index of non-transported smolt survival, in part because of the difficulty in measuring smolt survival through a pool or reach where multiple variables confound the analysis.

Annual indices of smolt survival in the river during migration without transport were plotted against an index of flow based on studies conducted by Sims and Osslander (1981), Committee on Fisheries Operations (COFO) (1982), and Sims et al. (1983), as described by Giorgi (1991b). The results indicated that survival

Table M-7. Estimated changes in yearling chinook travel time in the Columbia River from the Snake River confluence to Bonneville Dam.

Starting Flow	Option ^{a/}	FPC Model ^{a/}			PNUCC Model ^{a/}		
		Smolt Travel Time (Days)			Smolt Travel Time (Days)		
		Start	New	Change	Start	New	Change
160	To MOP	16.3	13.8	2.5	12.9	10.9	2.0
160	+20 kcfs	16.3	13.4	2.9	12.9	10.5	2.3
200	To MOP	11.3	9.3	2.0	8.9	7.7	1.2
200	+20 kcfs	11.3	9.6	1.7	8.9	7.9	1.0
260	To MOP	7.3	5.7	1.6	7.0	7.5	-0.5
260	+20 kcfs	7.3	6.4	0.9	7.0	7.1	-0.1

a/ Based on models summarized in Giorgi (1991b).

b/ Options are lowering reservoirs to MOP or adding 20 kcfs flow at maximum pool.

increased historically to a point and then decreased with increasing flow (a polynomial regression). Based on this and other data, associated travel time/flow relationships have been used to identify the minimum flows for fish protection of 85 kfs at Lower Granite Dam and 220 kfs at McNary Dam (Glorgi, 1991b).

Most of these analyses of flow/survival of yearling chinook and steelhead were based on studies using release points in the Snake River (Lower Granite or Little Goose) downstream to recovery points in the Columbia River (The Dalles). As pointed out by Glorgi (1991b) and discussed earlier, there are several serious concerns with using these data to predict flow/survival relationships (e.g., lack of estimates of variance, annual changes in the hydrosystem, confounding effects of spill, variations in fish guidance efficiency, and number of turbines in operation).

Sims and Osslander (1981) provided some of the early data that correlated survival of yearling chinook and steelhead to flow quantity in the Snake River. They also found a significant relationship between spill quantity and survival. Because flow and spill are highly correlated, it is not possible to differentiate which has the greater effect on survival. However, they did not examine effects of any other variables on survival.

CBFWA (1991a), based extensively on Sims and Osslander's (1981) work, provided estimates of benefits to survival associated with increased flow, which are the regressions of Snake River chinook and steelhead annual survival indices versus flow at The Dalles Dam. The relationship proposed in figures presented by CBFWA suggests that increasing Columbia River flow from 200 kfs to 220 kfs would increase absolute survival rates of non-transported Snake River yearling chinook salmon (traveling from Lower Granite or Little Goose downstream to The Dalles) from 11 percent to 13 percent based on the annual survival indices (derived by interpolation). For steelhead, the survival rate would increase from 8 to 10 percent.

Because of the nature of the annual survival indices, it is not possible to isolate benefits that can be associated with the Snake River reach and lower Columbia River reach. It is not possible to define the precision of these estimates, because none are provided with the CBFWA document. Finally, it is not possible to estimate which portion of the system survival response can be attributed entirely to flow,

because there were so many changes made to the system and volumes spilled during the period tested. Sims and Osslander (1981) attributed a larger effect on survival from spill than flow. For these reasons, the annual survival indices only provide a general indication of survival responses to flow. They do not account for annual variation in factors such as smolt development, spill, temperature, number of turbines operating, and number of bypasses installed.

Using an alternative method, Bell et al. (1976) tried to estimate the relationship between travel time and flow by taking the available survival reach information, subtracting estimated mortality associated with turbines, nitrogen saturation, and spillway passage, and comparing the resultant reservoir survival to flow. These authors calculated daily reservoir losses to be 0.7 percent for smolts that were about 5 inches long.

Estimates of change in yearling chinook survival will be presented by river segments for different alternatives in the following subsections. Survival is calculated as changes in absolute percent (not relative) survival for fish that are not transported for each of the river segments.

Estimates of changes in survival due to increased flow or reduced water particle travel time are highly speculative. Many other factors influence survival independent of flow or travel time. Therefore, the following calculations of changes in survival based on changes in travel time or flow should be viewed with caution as the level of accuracy and precision cannot be determined. Because of the many variables affecting survival, the calculations of survival shown to the nearest 0.1 percent are only presented to show general trends and magnitude of differences between different alternatives and should not be considered a statistical level of precision. The values are simply the results from the models used rounded to the nearest 0.1 percent.

Snake River - Lower Granite Pool. Using Bell's estimate of reservoir attrition (0.7 percent per day), general estimates of changes in survival from different options can be estimated based on estimated changes in travel time through Lower Granite Pool (as presented in the previous section). Lowering this pool from maximum pool to MOP would increase estimated absolute survival from 0.3 to 0.1 percent at flows of 40, 80, and 120 kfs, respectively. Values would actually be about half because normal pool levels are less than maximum. It could be predicted that increasing flow by 20 kfs would increase absolute survival by 1.3, 0.4 to 0.2 percent for the same flow values. For all but one flow augmentation option, a

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flow increase of 20 kfs over baseline flow would only be available for less than 1 month of continuous release in an average water year. If it was assumed that other factors have no effect, based only on travel time, absolute survival would increase by 2.4, 1.1, and 0.7 percent with pool reduction from maximum to near spillway at flows of 40, 80, and 120 kfs, respectively. It must be emphasized that operation at 710 feet or near spillway crest would cause other negative factors (discussed later) that would likely outweigh the benefits of estimated reduced travel time through this pool.

Snake River - Lower Granite Dam to Ice Harbor Dam. Two ways of estimating in river survival of non-transported fish are presented in the literature. The first uses the values from Bell et al. (1976), 0.7 percent loss per day of estimated smolt travel time, and the estimated smolt travel time values from the polynomial model and reciprocal flow model (Table M-5). To use the reciprocal flow model of Berggren and Filardo (1991), the estimated migration rate measured from Lower Granite to McNary Dam was equally apportioned among the four pools. The second method uses the quadratic and linear models discussed by Giorgi (1991b) that directly predict changes in survival from changes in flow. The estimates of these two methods are shown for selected options at flows of 40, 80, and 120 kfs (Table M-8).

The estimated changes from the two methods in chinook yearling traveling time from Lower Granite Dam to Ice Harbor Dam (from the smolt travel time section) times an estimated mortality rate of 0.7 percent per day (Bell et al., 1976) will predict changes in absolute survival with selected options. Reducing pools from maximum pool to MOP at 40 kfs will increase absolute survival by 1.2 or 0.6 percent based on the polynomial and reciprocal flow models, respectively (Table M-8). Lowering the projects to MOP at 80 kfs increases absolute survival by 0.6 percent for both models. Operating at MOP at higher flows may actually decrease survival. Actual calculated changes in survival would be about half because the pool level is typically operated at less than full pool. The addition of 20 kfs to a flow of 40 kfs would increase absolute survival by an estimated 5.0 to 2.7 percent. At 80 kfs, the increase would be about 0.6 to 0.8 percent, and at higher flows, gains would be less and possibly negative. If flow augmentation of 20 kfs and lowering the reservoir to MOP were both implemented, the effects would

be nearly additive; therefore, at low flow (40 kfs), the change may be at its highest at 6.3 to 3.4 percent based on the two models. Increases at higher flow (80 kfs and above) with both drawdown and flow augmentation are much lower, about 1 percent or less.

Using the quadratic formula presented by Giorgi (see Table 4 in Giorgi, 1991b), changes in survival can be estimated from changes in water particle travel time resulting from various options. For the calculations for this OA/EIS, it was assumed that the water particle travel time for each flow level used in this model was at maximum pool (Giorgi's Table 4 shows water particle travel time at MOP). Changes in the predicted survival were calculated by extrapolating the relative change in water particle travel time to proportional change in absolute survival of the quadratic model. Based on the quadratic model, lowering the reservoirs to MOP increases absolute survival from 0.8 percent (40 kfs) to 3.7 percent (80 kfs) (Table M-8). Again, real estimated changes would be about half because normal pool operations are less than maximum pool level.

Augmenting flow by 20 kfs has a greater effect on increasing absolute survival, resulting in an increase of an estimated 10.9 percent (at 40 kfs) to 2.0 percent (120 kfs). Lowering pool level and augmenting flow of 20 kfs would be nearly additive in its effect on absolute survival at a specific flow; therefore, by lowering reservoirs to MOP and adding 20 kfs, increased absolute survival could be calculated to be about 13 to 14 percent increase at flows of 40 and 80 kfs, respectively, and less than 3 percent at the higher flow (120 kfs). Water to augment flows by 20 kfs would be available for less than 1 month of continuous operation with all but one option. In addition, the use of an additional 20 kfs in spring would reduce typical flows in the summer, which would negatively affect later outmigrating smolts.

Based on the linear model developed by Chapman et al. (1991), which used only data for flows over 84 kfs, no increase in survival would be predicted for any activity at flows over 80 kfs (Table M-8).

Survival estimates for yearling chinook with the lower Snake River reservoirs operated near spillway crest were not calculated because none of the models used above were developed under such radically different project operations. Also, many potentially negative effects not accounted for in these models (see later discussion) may occur to smolts with this option. Therefore, no reasonable estimate of changes in survival of yearling chinook smolts can be estimated for the near spillway crest option.

Table M-8. Estimated hypothetical changes in absolute survival of non-transported yearling chinook from Lower Granite Dam to Ice Harbor Dam.^{a/}

Starting Flow (kfs)	Option ^{d/}	Smolt Survival Change (Percent)			
		Smolt Travel Time Models ^{b/}		Flow Models ^{e/}	
		Polynomial	Reciprocal Flow	Quadratic	Linear ^{f/}
40	To MOP ^{d/}	1.3	0.6	2.1	--
40	+20 kfs	4.9	2.7	10.9	--
80	To MOP ^{d/}	0.4	0.4	3.7	0
80	+20 kfs	0.6	0.8	9.9	0
120	To MOP ^{d/}	-0.1	0.2	0.8	0
120	+20 kfs	-0.2	0.4	2.0	0

a/ Precision less than the 0.1 percent displayed.

b/ Survival based on estimated smolt travel time changes by using the polynomial or reciprocal flow models, from Giorgi (1991b) shown earlier (Table M-4) and multiplying by mortality of 0.7 percent/day from Bell et al. (1976).

c/ Estimated survival based on models shown in Giorgi (1991b) for effects of flow changes directly on survival.

d/ Options are lowering reservoirs from maximum to MOP or adding 20 kfs flow at maximum pool.

e/ Model from Chapman et al., 1991; only used data from flows greater than 84 kfs.

f/ Predicted changes relative to normal pool levels would be about half of those as pools are normally operated at less than full pool.

Columbia River. Estimated mortality rates for selected options were calculated for the lower Columbia reach using estimated daily reservoir attrition values developed by Bell et al. (1976) or changes in absolute survival (Table M-7). These rates were based on changes in predicted smolt travel time (Table M-7). At a flow of 160 kfs, the predicted increase in survival by lowering the projects to MOP would be 1.8 and 1.4 percent, based on changes in the number of days yearling chinook smolts spent migrating through the reservoir, as determined by the FPC (1989) and PNUCC (Kindley, 1991) models, respectively (Table M-9). At higher flows, the predicted absolute survival increases range from 1.4 to 0.8 percent at 200 kfs to 1.6 to -0.4 percent at 260 kfs for the two models, respectively. Adding a 20-kfs flow has nearly the same estimated effect as

lowering the reservoirs to MOP for the same flows. Benefits are greatest at lower flows. For example, survival changes range from 2.0 to 1.6 percent at 160 kfs and from 0.9 to -0.1 percent at 260 kfs. Lowering the reservoirs to MOP and adding 20 kfs would have nearly additive effects on survival. For example, at 160 kfs increased survival would be about 4 to 3 percent, while at 260 kfs, there would be a change in survival of about 3 to 1 percent, based on the two models. However, use of augmentation flow of 20 kfs in the spring may reduce flow in the summer, adversely affecting later outmigrants.

The March drawdown of Lower Granite and Little Goose pools would not affect survival during migration, as few smolts will be migrating during this time.

Table M-9. Summary of estimated hypothetical high and low range of changes in yearling chinook total percent survival from Lower Granite Pool to Bonneville Dam.^{a/}

Flow ^{d/} and Alternatives ^{d/}	Region ^{b/}							
	Lower Granite Pool ^{c/}		Lower Granite Dam to Ice Harbor Dam ^{c/}		Columbia River		Total	
	Low	High	Low	High	Low	High	Low	High
Low Flow								
To MOP	0.3	0.3	0.6	2.1	1.4	1.8	2.3	4.2
+ 20 kcfs	1.3	1.3	2.7	10.9	1.6	2.0	5.6	14.2
Medium Flow								
To MOP	0.1	0.1	0	3.7	0.8	1.4	0.9	5.2
+ 20 kcfs	0.4	0.4	0	9.9	0.7	1.2	1.1	11.5
High Flow								
To MOP	0.1	0.1	-0.1	0.8	-0.4	1.1	-0.4	2.0
+ 20 kcfs	0.2	0.2	-0.2	2.0	-0.1	0.6	-0.1	2.8
a/	Precision less than the 0.1% reported.							
b/	Values can be found in the text section discussing survival through Lower Granite Pool and Tables 4.2-8 and 4.2-9. The low and high values correspond to those values found for each model estimate by alternative.							
c/	Low flow: Snake = 40 kcfs; Columbia = 160 kcfs. Medium flow: Snake = 80 kcfs; Columbia = 200 kcfs. High flow: Snake = 120 kcfs; Columbia = 260 kcfs.							
d/	Alternatives are lowering reservoirs from maximum to minimum operations pool (MOP) or adding 20 kcfs at maximum pool.							
e/	Actual changes to MOP for the Snake River are about half because pools typically operated at less than maximum pool.							

Summary. Estimated changes in river survival of non-transported fish, based on water particle travel time changes, should be considered only as an index because many factors that affect survival are independent of water particle travel time. But, based on these estimates, the greatest benefit would occur at lower flows in both systems. The largest increase in estimated survival from any single alternative would occur by augmenting flows by 20 kcfs during low flow years. However, flow augmentation of 20 kcfs above baseline would be limited to less than 1 month of continuous operation per year for all but one option. In addition, its use in the spring reduces flow in summer and may adversely affect any summer outmigrants. Further, water for flow augmentation is likely to be less available during a low flow year when it would have the most benefit. Many assumptions were used to estimate survival rates for the various alternatives. Many factors besides water travel time affect survival. Therefore, estimates of survival should be considered more as an index of change than as absolute estimates.

Based on the values presented for each alternative in the survival section, as applied to the various regions of the study area, a range of survival estimates can be made. The lowest estimated increase in survival was calculated by adding together the lowest values from any of the models used within each of the three regions where estimates were made [i.e., Lower Granite Pool in the smolt survival section, Lower Granite Dam to Ice Harbor Dam (Table M-8), and McNary Pool to Bonneville Dam (Table M-9)] for respective flows and options. This was done in the same manner for the highest values. A summary of these calculations is presented in Table M-9.

For lower flow conditions (Snake River at 40 kcfs, Columbia River at 160 kcfs), lowering all Columbia and Snake River projects to MOP would result in an estimated increase in survival of 2 to 4 percent for fish originating above Lower Granite Dam (Table M-9). Estimated changes in survival would be even less than those as Snake River projects are normally operated at less than full pool. Survival benefits would be expected to increase with lower flows in both systems. In general, the benefits decrease at higher flows with a range of 1 to 5 percent increase in survival at intermediate flows (Snake River at 80 kcfs, Columbia River at 200 kcfs), and 0 to 2 percent at higher flows (Snake River at 120 kcfs and Columbia River at 260 kcfs).

Flow augmentation of 20 kcfs would generally have greater potential for increasing survival than lowering projects to MOP over the same flow ranges (Table M-9). At low flows (see above), the estimated increase in absolute survival for Snake River fish from 20 kcfs of augmented flow would be 6 to 14 percent. At intermediate and high flows, the range of survival increase would be 1 to 12 percent and 0 to 3 percent, respectively.

The options that would draft all Snake River projects to near spillway crest or Lower Granite to elevation 710 feet would greatly reduce water particle travel time, particularly at low flow; however, specific changes in juvenile survival based on these estimated reductions cannot be made because survival changes would not be occurring in isolation. Other factors associated with these options (e.g., lack of smolt transport, increased gas saturation, and increased spillway mortality) would be expected to offset velocity-related improvements by increasing mortality of migrating fish. No models that estimate survival have been developed for the Snake River System for full spill conditions, because all existing models have been developed with flows through turbines. Therefore, none of these models was suitable to predict changes in survival.

The available information regarding the relationship between increased flow (or decreased pool elevations) and survival is limited and subject to a great deal of scientific uncertainty. The relationship between increased flow and reduced smolt travel time is more clear. Therefore, a considerable amount of attention has been focused on this measurement as a general evaluator of migration success.

While some studies suggest increasing reductions in yearling chinook smolt travel time with increasing flow in the Snake and Columbia rivers (e.g., Filardo and Berggren, 1991), some other recent analyses suggest there is a threshold for flow, or possibly water particle travel time, above which reductions in smolt travel time does not occur. Giorgi (1991b) suggested water particle travel time equivalent to flows above about 80 to 100 kcfs does not substantially reduce yearling chinook travel time in the Snake River. Kindley (1991) suggested from his analysis of John Day Pool data that yearling chinook travel time does not decrease substantially at Columbia River flows above about 190 to 240 kcfs.

The issue of quantifying the effects of lowering the lower Columbia River pools on smolt survival still remains. Simply stated, there is very little data on the survival of smolts through the lower river. The annual

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survival indices, which reflect the reach from Lower Granite to The Dalles, are the best data sets available, but their utility in predicting smolt survival has been a subject of debate.

Although some benefits to spring and summer chinook may be achieved with the alternatives considered, the benefits to Snake River sockeye (endangered) and Snake River fall chinook (proposed as threatened) are less clear, based solely on water particle travel time reductions. Only limited data (1991 only) are available from portions of the Snake River that suggest a significant relationship between flow and smolt travel time. Although potential benefits seem apparent, data and analyses to support these benefits are few. Also, there is sufficient uncertainty, even in the data that exist for the more abundant species, to make reasonable estimates of gains in travel time reduction or survival from the proposed alternatives.

3.2.1.5 Effects of Flow Options on Juvenile Bypass, Collection, and Transport

Fish bypass facilities and transport could be negatively affected by most alternatives. Fish bypass facilities (including submerged traveling screens and sluiceways), which divert juvenile fish from entering the turbines, are located at all project dams except Lower Monumental (which has a facility under construction with operation by spring 1992). Ice Harbor and The Dalles currently only have sluiceways for fish bypass. These will be replaced with submerged traveling screens by 1994 and 1998, respectively. A description of how these facilities operate and where they are located is presented in Section 2.2. These facilities are mostly traveling screens while some have sluiceways. Additionally, juvenile fish are captured at Lower Granite, Little Goose, and McNary dams and transported for release downstream of Bonneville Dam. The efficiency of the collection and bypass facilities varies by project (Table M-10). In 1991, for example, 8.4 million and 2.2 million smolts were transported from Lower Granite and Little Goose dams, respectively, to below Bonneville Dam (FPC, 1991b).

The percentage of total downstream migrants that arrive at the dams that are transported around dams is high and can be more than 60 percent of Snake River smolt migration. This is true at least for

yearling spring and summer chinook and possibly 40 percent for subyearling fall chinook when no spill occurs, and fish guidance efficiency (as indicated below) is used as a reasonable representation of proportion of stocks collected and transported. Generally during migration periods, little involuntary spill occurs at Lower Granite Dam.

Fish Guidance Efficiency

Yearling Chinook	63%
Fall Chinook	40%

Therefore, these percentages of the Snake River stocks are typically transported at Lower Granite. The efficiency of capture for subyearling chinook and sockeye is less than 50 percent (Table M-10). Under the current operating regime, significant increases have been found in survival of transported fall chinook and spring chinook (Park and Athearn, 1985; Matthews et al., 1990) compared to untransported. For example, although wide variability occurs among test results, the following transport benefit ratios of transported to untransported fish (i.e., relative survival between transported marked fish to marked control fish not transported) from McNary Dam for test years 1978 to 1980 (Park and Athearn, 1985) and recent data for Lower Granite Dam for 1986 (Matthews et al., 1990) are presented:

	McNary	Lower Granite
Subyearling Chinook	4:1	—
Yearling Chinook	—	1.6:1*

* C.I. (95% 1.01 to 2.46)

However, the overall survival from smolt to adult remains low for all fish. The reasons for the low survival are not totally known but may be partly the result of bacterial kidney disease (BKD) that could be causing high mortality of fish even after they arrive below Bonneville Dam (Raymond, 1988). Generally in the Columbia and Snake rivers, hatchery fish have much lower survival rates from smolts to adults than do wild fish of the same species and region (Raymond, 1988).

Drafting all Snake River pools to near spillway crest would eliminate all transport of fish because the

Table M-10. Fish guiding efficiency (FGE) (in percent) of passage systems at mainstem dams (1992 condition).

Project	Species					Coho	Bypass Systems and Transportation
	Chinook Yearling	Chinook Subyearling	Steelhead	Sockeye			
Lower Granite	63	40	81	--	--	--	Submerged traveling screen (STS), mechanical bypass, raised gates (extended length screen 1996). Transportation.
Little Goose	73	40	74	--	--	--	Submerged traveling screen (STS), mechanical bypass, raised gates (extended length screen 1996). Transportation.
Lower Monumental ^{a/}	60	35	79	--	--	--	STS, mechanical bypass 1992 (raised gates by 1994) ^{d/} (Transportation facilities available in 1993).
Ice Harbor ^{a/}	51	51	51	--	--	--	Sluiceway (STS mechanical bypass system operational by 1994).
McNary	75	40	75	--	--	--	STS, mechanical bypass (extended raised screen gates length 1995). Transportation.
John Day	72	30	86	--	--	--	STS, mechanical bypass.
The Dalles ^{b/}	43	43	43	--	--	--	Sluiceway (extended length, mechanical bypass 1998).
Bonneville, Powerhouse 1	42	39, 10 ^{d/}	56	23	63	63	Sluiceway and STS mechanical bypass system.
Bonneville, Powerhouse 2 ^{d/}	19	20, 24 ^{d/}	35	14	25	25	STS (improvements 1993). ^{d/}

Source: Corps, Walla Walla District.

a/ As projected by prototype FGE study, (Ledgerwood et al., 1986) with no raised gate.

b/ Sluiceway system.

c/ First and second value before and after June 15, respectively.

d/ FGE with raised gates 73% yearling chinook, 83% steelhead.

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collection systems would not be operational. The collection facilities for transport at Lower Granite and Little Goose dams rely on operation of the submerged traveling screens located in the openings to the turbines. The screens rely on the turbines being in operation, as they separate the fish from the upper portion of the water flowing toward the turbines. Also, at water levels below MOP, there would not be sufficient head (water elevation) within the system to allow water with the fish to flow through the orifices and the bypass conduits in the dam to the collection or discharge location.

Under these conditions juvenile fish that would normally be bypassed or transported downstream would instead pass through the turbines. In general, passing through turbines is considerably worse for fish than passing over spillways or through collection or bypass systems except at Bonneville Dam. Turbine mortality would presumably be so high at reservoir elevations below MOP as to defeat the purpose of pool lowering, requiring that power generation cease during the drawdown period for these options.

Spilling the entire flow at all dams would eliminate turbine mortality in the Snake River. The level of mortality from spillage injuries could increase, but no data currently exist to assess if or how much greater this would be. Additional mortality could also occur from increased dissolved gas supersaturation (see Section 3.2.1.7). If fish are not transported, they would also be subject to natural mortality (by predation) that would occur during passage through each reservoir. Fish that pass through the four Snake River dams would be collected at McNary, or they would have to pass through the remaining four dams and reservoirs and be subject to any additional mortality that may occur during this passage. Additionally, even with Snake River projects lowered to near spillway crest and the lower Columbia projects to MOP, smolt travel time would be much longer for fish not transported than for those that would have been transported. Typical travel time from collection, holding, and barge transport from Lower Granite to below Bonneville Dam is less than 3 to 5 days. Under the above condition, even if smolts traveled at the same rate as water particles, their travel time would be considerably longer under most flows. For example, at medium and low flows, water particle travel time would be 13 and 24 days, respectively, from Lower Granite Pool to Bonneville Dam with this alternative (see Table M-3).

Reducing Lower Granite Pool to elevation 710 would make it impossible to collect and transport fish from this facility. The majority of fish transported from the Snake River are collected at Lower Granite Dam. Therefore, a majority of the juvenile outmigrants would have to travel through an additional reservoir before they could be collected at Little Goose Dam.

Reducing Lower Granite to the range of 705 to 696 feet and Little Goose up to 15 feet below minimum pool in March would eliminate the transport facility use. However, less than 10 percent of yearly chinook or even fewer of other fish (underyearling chinook, steelhead, and sockeye) typically migrate before mid-April and transportation typically does not begin until March 25. Effects on transported fish would be minor.

The lowering of any of these projects to MOP should have minor effects on fish. Although the fish passage systems are designed to work over the entire range of operating pools, the efficiency (defined as the portion of smolts diverted from the turbine intakes) might change with lower pools.

At The Dalles Dam, 43 percent of the daytime migrating fish pass through a sluiceway. Lowering this pool could reduce efficiency of the sluiceway bypass because flow in the sluiceway would be reduced from 4,800 to 3,600 cfs, thus reducing attraction flow. Survival of fish passing through these sluiceway systems is generally considered to be close to 99 percent. Therefore, any reduction in the efficiency of this system could result in an increase in fish passing through turbines where the fish have an assumed survival rate of about 85 percent. As a result of the reduced efficiency, there would be an increase in the overall project mortality.

Augmented flow would have no significant effects on bypass or transportation of fish.

3.2.1.6 Effects of Flow Options on Turbine and Spillway Survival

Under some of the options, significant numbers of juvenile salmon could suffer from increased turbine mortality. Although the current operating plans for the Columbia and Snake rivers are designed to minimize turbine passage by juvenile fish, large portions of the migrants still pass through the turbines. Estimates of turbine mortality during passage on the Columbia River System have ranged from 2 to 4 percent (Ledgerwood et al., 1990; Weber, 1954) to 33 percent including predation (Long et al., 1968). The generally assumed

value is about 15 percent direct and indirect mortality (NPPC, 1989).

Turbine mortality is affected by several factors. The two factors considered to be of primary importance are the efficiency of the turbine and the depth that it is submerged. Lowering pools from 3 to 5 feet in most Columbia and Snake River projects would not change the existing mortality because turbines operate at optimum efficiency within these pool levels. The exception is when John Day is lowered to 257 feet (reducing head from 111 to 98 feet). At John Day, this decreased pool elevation would cause a reduction in turbine efficiency and a resulting increase in mortality of about 1.3 percent (based on estimates that decreases in the percent survival are proportional to decreases in turbine efficiency, U.S. Army Corps of Engineers, Progress Report No. 6). Lowering John Day also would reduce submergence on McNary turbines, which is estimated to increase mortality at this facility by as much as 1 percent (Cramer and Oligher, 1961). Overall, if John Day is lowered to 257 feet, additional mortality to fish would be about 1.3 percent at John Day, and 1 percent at McNary.

If the Snake River projects are lowered to near spillway crest and turbines were not operated, all turbine mortality at these projects would be eliminated. However, a larger number of fish would pass through operating turbines in the lower Columbia River because juvenile fish transport facilities could not operate, except at McNary Dam (see discussion on juvenile transport, Section 2.2.4.2). In addition, increased gas saturation from spill may increase mortality when fish pass through the turbines (see Section 3.2.4.3, Dissolved Gas Saturation). This mortality increase is caused by a sudden drop in pressure that would occur when water passes through the turbines, which would increase the effects of gas supersaturation.

Additional flow would have no direct effects on turbine mortality because the operating efficiency and depth of submergence for the turbines would not change.

Based on studies at McNary and Big Cliff Dam, estimates of direct mortality of smolts passing over spillways average about 2 percent (Schoeneman et al., 1961). These test results are believed to be characteristic of current operating ranges on the Columbia River projects. However, this mortality does not account for any delayed mortality that

could occur from passing over spillways. Under the spillway crest alternatives considered for the Snake River projects, direct and indirect mortality of fish passing over the spillways could increase. Some factors indicate higher mortality (e.g., lower tailwater, higher nitrogen, less efficient energy dissipation causing greater turbulence and possibly shear) and others lower mortality with less head. This increase in mortality cannot be determined from existing information.

The test drawdown of Lower Granite and Little Goose in March may have minor effect on survival of fish because less than 10 percent of all smolts will be migrating at this time, although most of the fish that migrate during this period are wild summer chinook.

3.2.1.7 Dissolved Gas Saturation

Some alternatives could result in increased mortalities of juvenile salmon and steelhead from increased dissolved gas saturation. The incidence of gas bubble disease is well documented on the Columbia River System. Incidence of gas bubble disease in fish depends on the level of supersaturation, duration of exposure to the fish, water temperature, general physical condition of the fish, and the swimming depth maintained by the fish (Ebel and Raymond, 1976). Weitkamp and Katz (1980) also suggested that fish tolerance to supersaturation depends on their life history stage and follows two general trends: (1) tolerance decreases from very great in the egg stage to very low in older juveniles; and (2) tolerance increases following the juvenile life stage, with adults being the most tolerant free-swimming life stage. They also reported that juvenile fish subjected to sublethal levels of supersaturation may recover when returned to normal saturation levels, but adult salmonids do not recover.

Current standards recommend levels below 110 percent saturation. Weitkamp and Katz (1980) reviewed the literature on effects of dissolved gas saturation. They cited a study on the Columbia River that found 50 percent mortality occurred to juvenile chinook in 10 days at gas saturation levels of 118 to 123 percent, while similar mortality occurred in two days at concentrations above 125 percent. Both tests were conducted with fish in water less than 3 feet. In their review summary, they stated, "The above studies indicate that a dramatic change occurs in both the number of deaths and time of death at approximately 120 to 125 percent saturation in shallow water (3 feet or less)." At higher concentrations, mortalities increased dramatically. For fish in deeper water, dissolved gas concentrations would have to be higher

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because for every 3 feet of depth, the effective gas saturation is reduced by 10 percent.

Intensive laboratory and field investigations on the effects of supersaturation were conducted from 1966 through the mid-1970s. Some of the results of these investigations were summarized by Ebel et al. (1975). Exposure of juvenile spring chinook and steelhead to 120 percent saturation for 3 days in shallow tanks resulted in 100 percent mortality. A threshold level where mortality significantly increased was 115 percent saturation. Follow-up studies reported by Ebel et al. (1975) suggested that mortality decreased when juveniles were given the option to sound (swim deeper in the water), but that substantial mortality still occurred at levels above 120 percent. Field evaluations confirmed these results. Live cage tests conducted by several agencies and summarized by Ebel et al. (1975) suggested that nearly 100 percent mortality occurred in surface cages and ranged from 6 to 68 percent in deep cages, depending on the level of saturation and stock of fish used in the test. Substantial mortality occurred in the deep cages when saturation levels exceeded 125 percent. Free-swimming juveniles were also evaluated by sampling gawell catches in 1970 and 1971 at Ice Harbor Dam. Incidence of gas bubble disease symptoms on chinook migrants ranged from 25 to 45 percent in 1970; estimates of survival of chinook from the Salmon River to Ice Harbor was 30 percent. In 1971, incidence of gas bubble disease ranged from 10 to 32 percent during the main migration season, and estimates of survival were 50 percent. However, Ebel et al. (1975) suggested that incidence of symptoms of gas bubble disease cannot be directly correlated to percent mortality, but is indicative of the level of stress a population is suffering from exposure to supersaturated atmospheric gas.

Ebel et al. (1975) reported estimates of percent mortality associated with supersaturation of gases relative to the factors known to affect juvenile survival. These estimates were calculated from the upper Snake to Ice Harbor Dam and from the upper dam (this dam varied during other years of tests) to The Dalles Dam. However, other known causes of mortality such as disease, turbine-related factors, or predation were included in these estimates.

Relationships between juvenile travel time, supersaturation of nitrogen, and survival of juvenile chinook from the Salmon River to Ice Harbor were developed (Ebel et al., 1975). Decreasing the

travel time from 25 to 12 days, even with an increase from 130 to 136 percent of nitrogen saturation, was reported to increase survival from 25 to 50 percent. Reducing the overall saturation levels to 109 percent for part of the migration also increased the survival from 25 to 37 percent. These estimates should be used cautiously, because other mortality factors were not measured. However, it appears that in years when river flows were normal to high and corresponding gas saturation levels were high, mortality from gas supersaturation can override other mortality factors and result in substantial losses of juvenile salmonids, ranging from 40 to 95 percent.

During 1990, all the flow was released over the John Day spillway because of a fire that occurred at this project. The FPC (1991) reported, "There were no reports of major injury to fish as a result of gas supersaturation. However, large numbers of sockeye, coho, and steelhead exhibited symptoms of the disease, with the highest incidence recorded from the group of steelhead released from the barge above John Day Dam subsequent to the fire in the John Day Powerhouse. These fish passed John Day Dam when 100 percent of the flow at the project was being spilled and dissolved gas levels reached 135 percent supersaturation." Currently, the dissolved gas level below the dams peaks annually at close to 120 percent, although high levels in the spring are closer to 110 percent. The current gas saturation monitoring stations (Water Quality, Section 4.1) may not be measuring the higher levels because they are located in the forebays. Therefore, actual concentrations below the spillways may be higher because the gas often dissipates as it moves downstream. For example, in 1991 a newly placed monitoring station below the spillway at Lower Monumental recorded peak levels of 136 percent during spill specifically provided for fish passage.

These results suggest that current levels may be a problem for juvenile salmonids, particularly during periods of high spill. Therefore, increases in gas saturation could contribute to mortality of downstream migrating smolts.

Overall, operation at MOP might increase exposure to supersaturated gas because more spill might occur at night than under current operations. Projects would have reduced ability to store water at night if the water levels were maintained at MOP. Because nightly power demands are not as great as daytime, more flow could go over the spillway at night. However, some flexibility is available so that spill may not increase at night. The degree of supersaturation may also increase because the reduction of the water levels in pools below

each project would reduce the effectiveness of the flip lips and, hence, increase gas saturation. These changes in gas supersaturation levels and exposures could result in minor negative effects on fish, especially under higher than average flow conditions.

Reducing all reservoirs on the Snake River to near spillway crest would most likely have significant adverse effects on juveniles during high spring flows. Predicted dissolved gas saturation levels would be over 120 percent and could be over 140 percent (see Water Quality Impacts, Section 4.1). Because all flow would be passing over all four projects, the gas saturation would tend to increase from one project to the next, with the highest levels below Ice Harbor. Without the fish transport system, all smolts originating above Lower Granite Dam would be subject to increased dissolved gas levels as they travel downstream. As discussed above, based on the work done by Ebel et al. (1975), increased gas saturation levels in this range, during spring of normal and high flow years could increase gas saturation to where it is the overriding survival factor in the system, possibly causing mortality in the range of 40 to 95 percent.

Adverse effects from dissolved gas would likely be less from lowering Lower Granite to 710 feet and operating the others at MOP than from lowering projects to spillway crest, although levels below this dam would still be in the range of measured mortality in tests. Some dissipation of dissolved gas level is likely to occur below Lower Granite as downstream reservoirs would be at MOP and have lower spill quantity because most of the flow would be going through the turbines instead of over the spillway.

The test drawdown of Lower Granite and Little Goose in March would be conducted in a manner to minimize increases in dissolved gas levels. Few fish are present in the reservoir (less than 10 percent of smolts occur there) but potential impact could be to the fall chinook fry present in the reservoir or alevins still in the gravel during these periods. An estimated 4,000 rearing fall chinook were present in 1991 in Little Goose Pool prior to the migration period (Bennett et al., 1991). This number of rearing fall chinook is substantial relative to their numbers currently migrating through the system (about 14,000 collected in 1991 at Lower Granite Dam [FPC, 1991b]). These fish would be especially susceptible to injury from gas supersaturation because these smaller fish rear in

shallow water and alevins in the gravel may also be in shallow water where effects of supersaturation are the worst.

3.2.1.8 Predation

Predation is currently considered one of the major sources of smolt mortality during migration in the Columbia and Snake River System (Poe and Rieman, 1988) and is believed to cause mortality equal to or greater than that caused by passage at the dams (Rieman et al., 1991). Changes in predation rates for the various options will vary by option and fish species. Bennett (1991), in his assessment of effects of lowering all Snake River projects to near spillway crest, stated that although predators would be concentrated, the reduced residence time experienced by steelhead and yearling smolts and increased turbidity would probably result in reduced predation in this system. There is some information on the Columbia River that suggests that within the normal range of operations, an increased flushing rate may not reduce predation (Beamesderfer et al., 1990). Bennett also stated that lowering the Lower Granite Pool to elevation 710 would reduce predation in this pool. Yearling chinook and steelhead appear to "stage" or remain in this pool for longer periods than lower Snake River pools. Consequently, the effect of lowering this pool may be greater than other pools because staging may be reduced, shortening the time fish might be subject to predation. Whether fish would actually migrate more rapidly from this pool if it were lowered cannot be determined.

In contrast, reducing pool levels to near spillway crest or Lower Granite to elevation 710 feet may increase predation on fall chinook in the Snake River pools. Unlike most steelhead and yearling chinook, the migration rate of fall chinook through reservoirs is either minimally affected or not affected at all by flow because they are actively rearing in these regions. Therefore, reduced reservoir volume would concentrate the predators and rearing fall chinook in the same regions, while not causing significant increases in migration rates through the reservoirs. These effects would be most apparent in Lower Granite Pool relative to other reservoirs. This is because increased spill would create higher velocities below spillways that may reduce predator concentrations below the dams (Faler et al., 1988) which are traditionally regions of high predation (Poe and Rieman, 1988). Bennett (1991) concluded that there may be no effect on predation from reducing Snake River reservoirs to MOP because predators are concentrated in tailwater and forebay

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areas and distribution is not likely to change substantially.

Lowering the Columbia and Snake river projects to MOP might have no significant direct effects on predation for the same reasons, although any increased temperatures resulting from drawdown could result in increased predation. Changes in flow may not alter predation activities.

Beamesderfer et al. (1990) developed a model to determine factors affecting predation rates in the John Day Pool, which covers the range of flows expected at MOP. The authors stated, "Changes in flow are not expected to cause large changes in predation in John Day Reservoir. Survival was not sensitive to residence time." This conclusion suggested other factors, such as increases in predation, may outweigh any benefits from reduction in smolt travel time. They found that the major factor correlating with predation was temperature, mainly because the consumption rate of squawfish (the main predator in this region) increases dramatically with increasing spring and summer temperature up to 72°F (22°C). For example, the number of smolts that could be consumed by a squawfish daily increased from about 1 to 4, with a corresponding temperature increase of 54 to 63°F (12 to 17°C). It is possible that factors not included in the model, such as changes in relative predator distribution in tailwaters and forebays, may be influenced by flow and ultimately affect predation.

Based on the information by Beamesderfer et al., (1990), increased temperature could significantly increase predation. Predation is currently a major source of loss of juvenile fish in the Columbia River. For example, Columbia River subyearling chinook losses may be as high as 61 percent during August in the John Day Pool. Overall loss in this pool during a season has been estimated at 14 percent of all smolts (Rieman and Beamesderfer, 1988). It has been estimated that the annual temperature might peak 2 weeks earlier if the reservoirs in the lower Columbia were lowered (see Water Quality, Section 4.1). If this occurs, predation might increase on earlier stocks such as yearling chinook and steelhead but decrease on fall summer and upper Columbia summer chinook. However, temperatures might remain higher, which would maintain predation levels on fall chinook. The temperature changes have not been modeled, so predictions of effects on fish are also unknown. However, these effects are a possibility. With reservoirs on the Snake River at MOP,

temperatures are also expected to shift earlier, but may be lower later. The net effect of these changes is that predation might be slightly reduced, although the outcome is not clear. Reducing all Snake River reservoirs to near spillway crest might result in a net reduction in temperature, which might also reduce mortalities from predation. However, the overall effect of temperature changes on predation (which have not been accurately predicted at this time), concentrating predators and juvenile salmonids in smaller pool areas, and increasing water particle travel time cannot be reasonably predicted at this time.

Flow augmentation may also reduce temperature but changes are likely to be small. Therefore, effects on predation may be minor.

Reservoir drawdown to spillway crest or Lower Granite to 710 feet could enhance predation control by concentrating predators. However, turbidity and possibly redistribution of predators could reduce predator control. Northern squawfish populations may be less directly affected from drawdown than other resident species because they are typically abundant under lotic conditions. However, the reduction of rearing habitat for juveniles and reduced food production could reduce population, primarily of younger age-classes, which would probably have limited direct effects on predation rates.

3.2.1.9 Effect on Habitat

Drawdown of any form would reduce rearing habitat quality and possibly quantity for salmon and steelhead in the Columbia-Snake River System. The most detrimental effects would be drawdown to near spillway crest of the four Snake River reservoirs. Fall chinook would be affected most because they spend longer periods rearing in reservoirs before migrating than other stocks. Shallow-water, low velocity habitat in these reservoirs (less than 20 feet deep and sandy) is the preferred rearing area for fall chinook (Bennett, 1991). All of the current shallow-water regions would be lost with drawdown to spillway crest in each reservoir. These areas are also the most productive for benthic food sources, which are used heavily by salmon and steelhead during rearing and migration. Although other shallow water areas will be present with the drawdown, these areas will be less productive because the benthic food density will be less. Also, the decreased channel area will increase velocity, further reducing preferred habitat of fall chinook. Because of increased flushing, reduced zooplankton abundance would reduce food resources. Drawdown to elevation 710 feet in Lower

Granite would still dewater most of the currently used habitat for fall chinook in this region. Reduction of Lower Granite ranging from 705 to 696 feet and Little Goose 10 to 20 feet below full pool would have similar effects as the 710 option. However, because the drawdown test will occur in early spring, very few or no juvenile fall chinook originating from above Lower Granite Dam will be present in Lower Granite Pool (personal communication, David H. Bennett, Department of Fish and Wildlife Resources, University of Idaho, Moscow, Idaho, December 6, 1991). Although some fall chinook juveniles originating from spawning directly in Little Goose Pool may be present during the March test, they are expected to begin to emerge from the gravel about mid-March. The habitat will still be less productive when fish arrive because of lost benthic production. Also, Little Goose fry of fall chinook could be affected the most because they would be out of the gravel during the March drawdown test. During this period, these smaller fish would likely remain in very shallow-water, low-velocity areas that would be most affected by the drawdown, thus reducing the quantity of their rearing habitat.

Reducing pool levels to MOP in the lower Columbia River or Snake River would have lesser effects than drawdown to near spillway crest on the Snake River, because much of the shallow-water habitat would still remain in both systems (see Resident Fish discussion concerning shallow-water habitat). However, the level of impact cannot be determined accurately at this time and may still be significant.

In different studies on the lower Columbia River pools, it was found that some juvenile salmonids reside for various periods in backwaters and sloughs along the river, particularly in the spring and summer (Zimmerman and Rasmussen, 1981; Parente and Smith, 1981). The most abundant and longest residents of these backwaters are subyearling chinook (most likely fall or upper Columbia River summer chinook). Predation by resident fish in these backwaters is apparently low (Parente and Smith, 1981). Residency varies among backwaters from a few days to weeks, and sometimes longer in systems where fish cannot find the outlet. Growth is apparently good in these regions, with food sources varying mostly between zooplankton and benthic insects. The importance of these shallow backwater areas to total populations of salmonids in the Columbia and Snake rivers is not known but is probably most

important for subyearling chinook, which typically rear in the mainstem Columbia and Snake rivers from early spring to early or late summer before migrating as smolts.

Reduction of pool levels to MOP on the lower Columbia River will result in loss of some shallow-water habitat used for rearing. The importance of this loss cannot be assessed since the quantity and importance of other suitable habitat is not known. As discussed above, fall chinook and upper Columbia River summer chinook will be most heavily affected.

Stranding of salmonids from any alternative is unlikely with the possible exception of stilled backwater areas. Drawdown with any alternative will be no more than 2 feet per day. This rate should allow fish to move out of any shallow shoreline areas before becoming stranded. Backwater areas in the regions of potentially the highest drawdown, the Snake River, are uncommon. Thus, the potential for rearing fish, such as underyearling chinook, being stranded in these regions is unlikely.

Stranding of fall chinook eggs or alevins in redds from the drawdown of Little Goose Pool in March is of concern. A search for redds will be made prior to these tests and, if redds are found in the potential drawdown zone, drawdown will not occur beyond this elevation. However, there is the possibility that redds could be missed which could result in potential impacts to these life stages from the drawdown test. Additional monitoring will occur during drawdown to ensure protection of redds.

Other miscellaneous factors could affect habitat for juvenile salmonids. Suspended sediment levels will increase with drawdown alternatives that lower pools below MOP. Under the worst case scenarios, it was estimated suspended sediment could average 200 mg/l for 27 days in Lower Granite Pool. These levels could reduce food supply for juvenile fish but are not high enough over the short term to cause direct mortality (Alabaster and Lloyd, 1982). If concentrations were to remain in this range for a whole month, they could cause some direct mortality of juvenile salmonids (Newcombe and MacDonald, 1991). However, the higher turbidity would also increase cover protection from predators.

The direction and magnitude of temperature change with deep drawdowns is not well known. It is thought that drawdowns to spillway crest might produce hotter temperatures earlier in the year, and that highs may be higher and lows lower than at present. If temperatures

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shift to higher levels earlier, this could be detrimental to rearing and migrating stocks of salmonids.

Nothing is known about potential changes in fish disease organisms from drawdown, so no assessment can be made.

Increased dissolved gas saturation from high spill that would occur with deep drawdowns would also reduce invertebrate food supply for fish. Many of these invertebrate organisms (pelagic crustaceans, benthic insects) suffer mortalities from gas supersaturation at levels similar to juvenile salmonids (greater than 110 to 130 percent saturation).

3.2.1.10 Summary of Effects on Juveniles

Benefits associated with any option considered in this OA/EIS are based on past studies of the Columbia and Snake River System which indicated that increases in flow increase the rate of downstream migration and, therefore, presumably increase juvenile fish survival. An underlying assumption in these studies has been that changes in flow are the cause for changes in migration rate and, consequently, survival.

In conducting the analyses for this OA/EIS, a major assumption in most of the determinations has been that changes in water particle travel time, proportional to past calculated flow effects, would equal the same changes in either migration rate or survival of smolts. While this assumption seems reasonable for the reservoirs under the range of normal operation, it is not reasonable to apply the assumptions to radically different operations. This is because (1) all models that predict changes in migration rate and survival were determined under the normal range of project operation, and (2) many potential and real additional impacts are likely to occur from options designed to increase water particle travel time by radical changes in operation.

Based on a variety of different models for conditions other than reducing Snake River projects to near spillway crest, even the highest estimates of increased survival are relatively low (Table M-9). Reducing all projects to MOP is predicted at maximum to increase absolute survival by 4, 5, and 2 percent from Lower Granite Pool to Bonneville

Dam at low, medium, and high flows, respectively. Augmenting flows by 20 kfs, which could only occur for limited periods (less than one month for all but one alternative) would at most increase absolute survival by 14, 12, and 3 percent at low, medium, and high flows, respectively.

If water particle travel time is the only significant factor affecting smolt survival during passage down the Snake and Columbia rivers, then options that cause the greatest reduction in water particle travel time would show the greatest benefit to migrating smolts. However, available information and lack of knowledge of the total effects of some of the various options suggest that some options designed to reduce water particle travel time would have significant negative effects or minor or unknown benefits on smolt survival.

The combination of reducing the Snake River projects to near spillway crest, augmenting flow, and reducing the Columbia River projects to MOP would cause the greatest total reduction in water particle travel time. However, different studies suggest that the effects on smolt travel time and survival from reducing water particle travel time (i.e., based on effects with changing flow) are varied. Therefore, a simple reduction in water particle travel time may not benefit smolt survival. Some information suggests that there may be a water particle travel time plateau in both the Snake and Columbia rivers above which no reductions or minor reductions in smolt travel time occur. That range in the water particle travel time may be the equivalent of 80 to 100 kfs in the Snake River and 190 to 240 kfs in the Columbia River at full pool. Other analyses of the data suggest that smolt travel time will continue to decrease proportional to water particle travel time. Regardless, with all options other than spillway crest, smolt travel time reduction will be very slight at flows above those projected at the plateau levels. These values are based on yearling chinook studies.

Effects on subyearling chinook (includes fall, and Columbia River summer chinook) of reducing the water particle travel time are not clear; they range from significant but weakly correlated to no effect on smolt travel time. Limited data on the Snake River (one study in 1991) in Lower Granite Pool suggest that sockeye salmon smolt travel time is significantly related to flow when fish size is considered. There have been no tests on Columbia River sockeye, but their similar migration timing and size suggest they may have similar responses to water particle travel time as yearling chinook. However, this has not been tested. Other analyses suggest that lowering reservoirs to spillway

crest, even at high flows, could cause significant reduction in smolt travel time. Based on these studies, a reduction in water particle travel time for all Snake River projects to near spillway crest would have the effect of reducing water particle travel time to levels above the threshold values (equivalent to 100 to 140 kcf) when river flows are in the low range (possibly 40 to 60 kcf) on the Snake River.

Reducing the Columbia to MOP and augmenting flow may also reduce smolt travel time, particularly at low flows (in the range of 160 to 200 kcf or less). Overall reduction in smolt travel time in this reach would be small, particularly at medium and higher flows.

With each of the options, other factors affecting survival would also change. If Snake River projects are operated at near spillway crest, fish survival might be positively affected by reduced smolt travel time and possible reduced predation. However, two additional negative factors may occur to reduce smolt survival. First, it is probable that gas saturation would increase to toxic levels in the Snake River, thus causing increased mortality because all smolts would pass down the Snake River under relatively higher gas saturation. Because the fish collection facilities at Lower Granite and Little Goose would not be operational with this alternative, even if dissolved gas saturation is not a problem, a high proportion of fish from the upper region would be subject to increased injury and mortality from passing the dams because they would not be transported. Second, eliminating transport would increase the travel time significantly for the fish that would normally have been transported. Fish transported from Lower Granite take at most 3 to 5 days from collection to release below Bonneville Dam. Even with moderate and high flows with Snake River projects at spillway crest, smolt travel time would be 24 and 13 days, respectively, assuming that travel time is directly proportional to water particle travel time. This alternative would also reduce rearing habitat for fall chinook and possibly increase predation on these stocks, because they do not move directly with reduced water particle travel time.

Operating Lower Granite at elevation 710 feet would have some of the same effects as lowering it to near spillway crest at similar flow levels. Moderate to minor reductions in migration rate would occur for some stocks, but probably not for

fall chinook. Some increased dissolved gas saturation could cause mortality below Lower Granite, but these levels would be reduced downstream. All downstream migrants from the Snake River would be exposed to these elevated gas levels present below Lower Granite. Some fish would not be transported, but many would be captured at Little Goose Dam, the next dam downstream. Habitat quality for fall chinook would be reduced and predation probably would increase in Lower Granite Pool. These factors would probably remain negative at moderate to high flows because fall chinook movement is not well correlated with flow changes.

Reducing reservoirs to MOP or augmenting flow would have minor benefits on smolt survival in the Snake and Columbia rivers. Changes in water particle travel time by reducing reservoirs to MOP are about 10 percent on the Columbia River and 7 percent on the Snake River. Therefore, smolt travel times cannot be changed markedly, even if there is a one-to-one relationship between smolt travel time and water particle travel time. Flow augmentation of 20 kcf has a greater effect on reducing water particle travel time in the Snake River than reducing reservoirs to MOP. The effects on water particle travel time of both flow augmentations and operating reservoirs at MOP are similar to the Columbia River. The benefits are most apparent at low flow in the range of 40 to 60 kcf in the Snake River and less than about 160 kcf on the Columbia River. With all but one flow augmentation option, the ability to supply additional flow of 20 kcf is limited to less than 1 month of continuous operations in an average flow year.

Other factors affected by these options are generally neutral although there may be minor negative effects on fish diversion from turbines, possible gas level increase effects, and slight reduction in rearing habitat quantity for subyearling chinook in the Columbia River. Flow augmentation would result in greater benefits if augmentations are relatively high (e.g., 20 kcf), particularly during low flow migration periods.

The test drawdown of Lower Granite and Little Goose in March could have similar effects to lowering the pools to spillway crest. These effects would mostly be insignificant because of the season, and the duration restrictions placed on the tests to protect fish resources. The most significant impact would be to rearing fall chinook which are spawned in Little Goose Pool. Lowering could desiccate redds before fry have emerged in the spring. However, a search will be made for redds prior to sampling, and lowering will not occur if redds are found. Currently, the location,

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abundance, and depth of spawning areas are not known for this pool. Rearing habitat in this pool would experience desiccation and loss of benthic food organisms before fry are present. The rearing area for early emerging fry, which prefer low velocity, shallow waters, would also be reduced. Gas supersaturation from the spill could also affect eggs, alevins, and fry. However, the tests will be conducted in a manner to prevent excessive levels of supersaturation. Effects would be worse on fry because they prefer shallow water where supersaturation effects are most severe to fish. Lower Granite rearing habitat would also be adversely affected because of loss of benthic resources from the drawdown. However, the current shallow-water habitat will still be present for other important uses (e.g., predator and high-flow avoidance) when the majority of fall chinook arrive, after the drawdown test. Loss of transport facilities and traveling screen operation will have a minor effect because less than 10 percent of any stock is likely to pass Lower Granite Dam before the systems are operating (starting typically March 25).

3.2.2 Adult Anadromous Fish

3.2.2.1 Adult Passage

Adult fish passage would be affected differently under various options. The most detrimental effects would occur from lowering all Snake River projects to near spillway crest. The least detrimental is under current conditions.

If all Snake River projects are lowered to near spillway crest, no adult fish passage would be possible at any Snake River dam. This is because several functions critical to ladder operation would not be possible (see Section 2.2 for additional information on fish ladder operation). The specific reasons the ladders would not function include:

- insufficient water depth in the forebay to cover the exit and allow water to flow into the ladder for fish to exit
- insufficient water depth in the forebay to supply auxiliary pumps
- insufficient tailwater elevation to allow auxiliary flow tailwater pumps to operate
- insufficient tailwater elevation to cover fish entrance
- unsuitable tailwater hydraulics for adult fishway attraction

For a ladder to function, flow needs to get into the top end of the ladder (the exit). With the pool lowered to near spillway crest, no flow would enter the top end of the ladder unless the volume of flow is high enough in the river to cause the river level to rise to the exit level.

At all projects, flow would have to exceed 300 kfs for the water level to be at the same elevation as the primary fish ladder exits under spillway crest drawdown. Substantially higher flows would be needed to cover exits. Flows of this magnitude do not occur in the Snake River, so no water would flow naturally into the fish ladder exit. Additionally, the ability to add water to the ladder by auxiliary pumps at the forebay would require at least 161 kfs to bring the river level up high enough for the pumps to function. The inability to use these pumps, even with the flow from the upstream end of the ladder, would reduce the ability of fish to migrate up the ladder.

With the lowering of tailwater levels, most ladder entrances would be out of the water. The fish ladder entrance at Ice Harbor would not be affected by flow quantity because the tailwater is not affected. Because of the free-flow conditions, tailwater elevations would drop at the other three projects, leaving ladder entrances out of the water except at higher flows. Minimum flow required for ladder entrances to be at least even with water level are 54 kfs, 148 kfs, and 102 kfs at Lower Monumental, Little Goose, and Lower Granite, respectively. Even higher flows would be needed to attain an elevation suitable for fish to swim into the ladder.

Additional flow at the ladder entrance, above what is needed to allow fish to swim up the ladder, is essential for fish to detect the entrance to the ladder when higher river flows (relative to flow coming down the ladder) and turbulence occur. Without this additional flow, fish will have great difficulty detecting the entrance and entering the ladder. To ensure that proper attraction flow occurs at the ladder entrance, additional water is pumped to the entrance regions by auxiliary pumps. To ensure that the ladder works, specific flow and velocity criteria must be provided both at the entrances and in the ladder.

Although some of the flows needed for these facilities are in the range of typical spring flows (generally

average 100 kcfs during peak flow months), most are not, which generally eliminates the ladder use under these options. None of these conditions could be changed by altering ladder construction, pump design, or adding more pumps by the proposed test period in 1992. Planning, design, funding, and procurement processes would require more time than is available.

Drawdown to near spillway crest would affect upstream migration of different stocks depending on the duration of the drawdown. The drawdown from mid-April to mid-June would affect mostly spring chinook, eliminating all upstream migration of this stock. If drawdown goes into mid-August, all summer chinook stocks would also be affected. Sockeye, which typically migrate upstream mainly in June and July, would be affected with both options. Even after spillway drawdown tests are stopped, several days or weeks delay, depending on the flow, would occur until all reservoirs are refilled to levels allowing the operation of ladders. Even the early spring drawdown tests may affect summer chinook, while later tests may cause extended delays on stocks arriving later, including fall chinook.

Even if fish ladders were functional, the proposed spill regime would greatly limit fish migration. The spill test of 100 kcfs at Lower Granite Dam in June 1991 indicated very poor conditions for adult fish attraction to the ladders. The primary purpose of this test was to observe flow conditions below the dam that may occur if Lower Granite Reservoir is drawn down to elevation 710, and the other three lower Snake reservoirs are maintained at MOP. Although Lower Granite Reservoir was maintained at MOP during this test, general flow patterns should be indicative of what will occur if the reservoir is operated at 23 feet below MOP (elevation 710). Three spill patterns were tested over a 4-hour period, and flows were observed downstream of the powerhouse and the adult fish collection facilities. During all spill patterns, a large counter-clockwise eddy was formed downstream of the powerhouse. During the spill test, the north and south shore entrances were washed out. The north powerhouse entrances were not blocked, but extreme turbulence and high velocities would likely make access for fish very difficult. Part of the problem is that flow patterns assumed for ladder entrance design are based on operation of the turbines; when the turbines are not operated, flow patterns are not favorable for successful ladder operation. Therefore, based on

these tests, it was concluded that fish would generally have a very difficult time migrating upstream at these flow levels, under any pattern of spill (letter from Ted Bjornn, University of Idaho, Moscow, Idaho, June 6, 1991). In former tests of radio-tagged adult chinook, it was found that at spill levels of 40 kcfs at Lower Granite Dam, adult spring chinook delayed migration. Similar delays were noted during high spills at Ice Harbor and Lower Monumental (Turner et al., 1983, 1984). These results suggest that impediments to migration are likely at the other projects, and may occur even at lower spill volumes. These delays could potentially affect spawning success.

Operating Lower Granite at elevation 710 and others at MOP would greatly impede or eliminate upstream migration at Lower Granite Dam only. Although the fish ladder exit and entrance could be maintained with water, the tailwater flow hydraulics from spilling all the flow and not operating the turbines would be disrupted.

The test drawdown of Lower Granite and Little Goose in March will have minor effects on the passage of adult salmon and steelhead. Ladders at Lower Granite and Little Goose dams will be inoperable during about half of the test period, but few adult fish pass at this time of year. Typically, no spring chinook pass Lower Granite Dam prior to the end of March (Corps, 1991). About 3 percent of all steelhead pass Lower Granite in March, and probably only half of these would be delayed by the test. This delay may cause some additional pre-spawning mortality of these steelhead. Other stocks will not arrive at Little Goose until after the tests are complete.

The operation of the lower Columbia and Snake rivers at MOP are not likely to have any effect on adult migration because the ladders were designed to operate over the array of flow, elevation, and turbine operation that would occur.

Augmented flow in the high range of 20 kcfs would probably have no effect on migration or survival. The CBFWA (1991a) suggested that flow increases may benefit upstream migrants. Gibson et al. (1979) found that increased flow correlated with apparent reduced survival between lower Columbia River projects. However, the flow ranges where the effects were noted were over a much wider range, and many of the losses may have been from ladder deficiencies that have been corrected. Analysis by Bjornn (personal communication, Ted Bjornn, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow, Idaho, October 1991) on past Snake River passage suggested that better adult passage occurs with

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lower flows. Chapman et al. (1991) examined recent data on apparent losses of adult chinook migrants between Columbia River projects and found no correlations (i.e., no increase or decrease in adult chinook losses between dams with changes in flow) with flows between approximately 100 to 400 kcs.

3.2.2.2 Dissolved Gas Saturation

Negative effects similar to those described for juvenile fish would occur to adult salmon and steelhead from the various alternatives. As Weitkamp and Katz (1980) stated in their literature review of gas saturation effects, results from studies of the Columbia River from 1965 through 1970 showed that 6 to 60 percent of adult salmon during this period were killed by high gas saturation levels. The authors stated that carcasses of adults were found in the river when nitrogen gas saturation was higher than 120 percent, while few were found when saturation was less than 112 percent. They also stated that adult salmon were more tolerant of gas bubble effects than juveniles, although few studies were available for confirmation. Information from laboratory and field evaluations suggests that adults have similar symptoms and exposures to juveniles, but adults can avoid the disease better due to their sounding capability. Ebel et al. (1975) reported that in laboratory tests, coho salmon were the most susceptible of the adults tested and spring chinook were the most tolerant with 50 percent mortality occurring in both groups after 7 days and 22 days, respectively, at 110 percent saturation.

Field evaluations have confirmed that substantial losses of adult salmonids occur in the river environment. Ebel et al. (1975) reported that in 1962, large numbers of adult prespawning mortalities occurred in the McNary spawning channel. Further investigation revealed that large numbers of the adults were blind as a result from high levels of gas saturation. In levels of high saturation (116 to 130 percent), 34 percent of the test fish were blind within 10 days and 88 percent of these fish died before spawning. It was determined that blinded females did not dig redds, and males were unsuccessful in covering eggs with milt. Ebel also reported that in 1968, levels of saturated gas were measured from 123 to 143 percent below John Day Dam. Thirteen sockeye and 365 chinook salmon were recovered in one day below the project. Based on the recovery of dead

salmon, Ebel et al. (1975) reported that the Oregon Fish Commission estimated that over 20,000 summer chinook were missing below John Day project.

Additional flow control and spill deflectors (flip lips) were in place at some dams by the late 1970s. These reduced the level of nitrogen saturation and, consequently, reduced the amount of time salmonids were exposed to high levels of saturated gasses in the Columbia and Snake rivers. Levels above those considered safe (less than 110 percent) still occur annually on the Columbia and Snake rivers, but most of the mortalities associated with gas saturation are believed to have been eliminated (Ebel, 1979).

Currently, there are few reports of recent impacts from gas saturation on the Columbia and Snake rivers, but there have been reports of upstream migrant salmon at the Snake River projects arriving at ladders with open sores on their heads (personal communication, Jerry Harmon, NMFS, Lower Granite Dam, July 1991). This type of injury may be caused by high gas saturation levels.

Lowering all pool elevations on the Snake River would have the greatest negative effect because dissolved gas levels would probably be higher than 120 percent, and possibly higher than 140 percent in the spring (see water quality section). Levels would increase downstream from one pool to the next, with the highest levels below Ice Harbor. Lowering the Lower Granite Pool to elevation 710 would still result in elevated dissolved gas levels that could be harmful to adults passing through the pool (see juvenile discussion). The effects would be worse if adult migration was delayed or stopped past this area, subjecting the fish to extended periods of high gas supersaturation. Duration of exposure as well as percent is a contributing factor. Projects at MOP could also cause some negative affects; but currently, it is not expected they will be significantly out of the range of what normally exist.

The test drawdown of Lower Granite and Little Goose in March would have minor impacts on adults from gas supersaturation. This is because very few fish would be present in Little Goose Pool when gas levels may be elevated; elevated gas levels will be minimized (planned spill will occur less than 4 times during the month) but may be more frequent, and if high, tests will be stopped (see passage discussion).

Augmented flow should not affect these values or increase adverse effects.

3.2.2.3 Spawning Habitat

Some options may affect fall chinook salmon spawning areas on the Snake River. Currently, about 30 percent of fall chinook that pass Ice Harbor Dam do not pass Lower Monumental. Although these fish could be suffering mortality or be over-counted at Ice Harbor due to fall back, it is also possible that a majority of these fish is spawning below Lower Monumental. Further, it has been reported that spawning of fall chinook may be occurring below Lower Granite Dam (Bennett, 1991). If fall chinook spawn in these areas, it is probably in water 10 to 30 feet deep just downstream of the dams. Drawdown to near spillway at either of the dams, or Lower Granite to elevation 710 feet, in places upstream of the pools would not directly affect the availability of spawning habitat in these areas because they would be back to pre-testing water levels during the fall spawning and fall-winter incubation periods. However, if the lower reservoirs disrupt bottom structure in the spawning areas, they may be unsuitable for spawning. There is currently no way to estimate these effects. No other spawning areas would be affected by any alternative because they are all above the eight reservoirs of the project area.

Drawdowns of the reservoirs to the spillway crest level or Lower Granite Pool to 710 feet could temporarily delay upstream migration at the deltas of the Snake and Clearwater rivers, and the Tucannon which drains into Lower Monumental Pool. However, all migration, except for fish already in the pools, would have stopped prior to major delta erosion due to inoperation of ladders from the drawdown.

The Snake and Clearwater deltas would not be a problem because they have been dredged on a consistent basis. Therefore, these large flows and fine sediment will cut rapidly through the remaining sediments and prevent passage delays. Passage may be more of a problem at the mouth of the Tucannon River because this river delta has not been dredged. Also, it is a small stream so it may take longer for the flow to cut through the delta to a sufficient level to allow upstream passage of adults. This river has spring chinook and some fall chinook. It is unlikely that fish could get to this pool because of lower dam passage problems with the drawdown. If fish did reach the Tucannon during such a drawdown, they may be delayed until

late summer, either after the delta has cut a new channel or the reservoir has returned to full pool. This would be more of a problem for spring chinook, which typically enter the Tucannon River in May and June. Fall chinook do not enter until late summer.

The delta erosion and increased sediment concentration are not likely to prevent adult fish from homing during migration. However, because of the prevention of migration from lack of ladder operation, very few or no fish would be present in the pool during the delta erosion. The high average suspended sediment concentration predicted for full drawdown of Lower Granite Pool is 200 mg/l. Whitman et al. (1982) found that it took suspended volcanic ash of 650 mg/l to disrupt homing behavior of chinook salmon in the Toutle River, Washington. If the 200 mg/l were maintained for a whole month in the reservoir, some mortality of adult salmon and steelhead could occur (Newcombe and MacDonald, 1991).

If Little Goose is lowered by up to 15 feet below minimum pool in the March drawdown test, it would have minor effects on potential spawning habitat for fall chinook in this pool. The region that contains potential conditions suitable for fall chinook spawning is about 4 miles long along the north shore from Lower Granite Dam downstream. Most of this area is not expected to be physically disrupted from drawdown and will be completely covered with water prior to fall spawning. However, any spawning redds that may be present in water less than 10 to 20 feet deep could be left dry before all of the fry have emerged in the spring. Expected emergence is probably from mid-March to mid-April (personal communication, David H. Bennett, Department of Fish and Wildlife Resources, University of Idaho, Moscow, Idaho, December 6, 1991). However, surveys are planned prior to conducting experiments to locate any redds. If redds are found in the potential drawdown zone, reservoir lowering will not occur. Monitoring will occur during the test to attempt to ensure redds are protected.

3.2.2.4 Temperature

The various options that result from changes in temperature could affect adult migration. In general, adult salmon and steelhead migration is impeded at temperatures above 70°F (21°C) (EPA and NMFS, 1971). In 1967 and 1968, high temperatures (75 to 79°F, 24 to 26°C) at the mouth of the Snake River blocked upstream migration of summer chinook and steelhead. Currently, lower Snake River temperatures from 1985 to 1989 averaged higher than 70°F (21°C)

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from July 19 to August 19 (Vigg and Watkins, 1991). However, there has been a general decrease in the trend of late summer temperatures in the Snake River from 1962 to 1989 (Chapman et al., 1991). No reliable estimates of temperature changes from any of the drawdown alternatives can be made; only the general direction of possible changes can be estimated. Therefore, the effects on salmon and steelhead are difficult to predict. It is expected that only slight changes in temperature would occur from lowering the reservoirs to MOP on the Columbia and Snake rivers. Temperature is not currently considered a problem for migrants in the Columbia River, so minor changes should have no effect.

Changes at MOP on the Snake River should not change adult migration unless they cause temperature increases during the period of highest temperature in the summer, when summer and fall chinook and steelhead migration could be impeded. Drawing the reservoirs to spillway crest is believed to shift the temperature peak to several weeks earlier. This may impede migration of an earlier portion of the run, possibly affecting more summer chinook migrants if temperatures are high, but effects on later portions of the runs, including fall chinook which typically migrate after mid-August, could be reduced if temperatures are cooler. Temperature increase, even below lethal levels, could reduce the spawning success of fish that pass through the region.

Flow augmentation that occurs in spring and mid-summer may have little effect on temperature and, therefore, little effect on adult migration. Tests from Dworshak Dam (Vigg and Watkins, 1991) were conducted in September when flows are low. The authors found that temperatures were reduced by about 4°F (2.2°C), but the temperature changes were not conclusive. Considering that base flows in the Snake River would be higher during most of the flow augmentation period (April to mid-July), any effects of Dworshak releases would be reduced to less than that found by Vigg and Watkins (1991) due to dilution. Based on the available information on temperature changes, it appears flow augmentation would have little effect on migration.

Temperature control test releases of 10 kcfs from Dworshak Reservoir in August for 20 days could help passage of adult summer or fall chinook and steelhead up the Snake River by cooling Snake River temperatures. Various scenarios of cold-water flow releases from Dworshak Reservoir were

evaluated to determine which would be most beneficial to adult fall chinook given specific operation constraints on the reservoir (Karr et al., 1991). Since these model runs were made, reservoir operations have changed so that alternative flows were available to evaluate. These latest flow alternatives were evaluated. The results of this latest evaluation indicated a proposed flow releases of approximately 10 kcfs for 20 days in August from Dworshak Reservoir will reduce water temperatures at Ice Harbor Dam about 2 to 3°F in a year like 1991. This would assist upstream migration of fall chinook and some steelhead by lowering temperatures to 70°F about two weeks earlier than would occur without this flow (in 1991, temperatures would have been lowered to 70°F by August 23 compared to September 8). Currently, some fish migrate upstream when temperatures exceed 70°F, so the real effect of lowering these temperatures on migration is not known.

3.3 MITIGATION

3.3.1 Juveniles

Juveniles would be significantly affected when alternatives are implemented which preclude operation of juvenile fish bypass facilities and, as a result, operation of the juvenile fish transportation program. No readily implementable measure could be provided by 1992 to allow operation of these facilities under these drawdown alternatives. Juvenile bypass systems function within specific reservoir levels; operating outside these levels would result in an inoperable system or increased juvenile mortality.

For the transportation system to operate, juveniles must first be collected. This is currently accomplished by using juvenile bypass systems at three projects. The loss of juvenile bypass system operation would preclude transport at the inoperable facility. While upstream juvenile traps might be deployed to mitigate this loss of collection capability, effective traps could not be provided by 1992. Part of the benefit of the juvenile transportation program is avoiding increased losses from predation. To offset these losses, the predator removal program could be intensified but not implementable by 1992 to offset loss of transport.

Another significant impact to juveniles would be gas supersaturation. As discussed in the water quality section, little can be done to mitigate this impact except for reducing spill volumes when problems are encountered.

3.3.2 Adults

Impacts of alternatives which preclude adult passage (pool levels to spillway crest or high spill conditions) cannot be readily mitigated. The effective operation of fish ladders requires maintaining a carefully balanced flow volume and velocity to first attract adults into the system and then to ensure their movement through the system. The volume of water required and criteria that must be met does not readily allow a "quick fix" to provide passage.

Another alternative discussed to mitigate the loss of ladder function is to use a trap and haul facility. A trap, however, requires flow conditions for attraction and collection similar to those required for ladders. In addition, the large number of adults that would require handling (approximately 34,000 chinook and 6,000 steelhead at Ice Harbor) makes this approach infeasible for 1992. Furthermore, the destination of these adults would not be known and the effect of such handling may be deleterious.

The potential loss of adult entrance into Spring Creek hatchery was further identified as a potential problem. This might be mitigated by removing rock outcroppings which create this problem.

Temperature impacts could not be mitigated without modifying release strategies.

3.4 SUPPLEMENTAL DETERMINATION OF EFFECTS OF THE PREFERRED ALTERNATIVE TO SURVIVAL OF DOWNSTREAM MIGRATING SNAKE RIVER SPRING AND SUMMER CHINOOK

These supplemental determinations were developed to assess the specific effects of the preferred spring and summer reservoir drawdown and augmentation flow alternatives to downstream migrating spring and summer Snake River chinook stocks. The information in this supplement relies on analysis done in the proceeding portions of the biological assessment. This section only estimates changes in survival based on changes of flow and reservoir level reductions to MOP without considering factors other than estimated changes in yearling chinook travel time on survival. Other factors

discussed earlier that relate to this alternative are also valid but will not be presented here.

3.4.1 Snake River Flow Augmentation

The objective of the Option J augmentation flow is to allow increases in flow from April 16 through May 31 by increasing available flow releases from Dworshak Reservoir. The target flow for this period is 100 kcfs and no additional flow releases above baseline would occur when flow exceeds this value. To evaluate the effects of this flow alternative, a 50-year period of record (1928 to 1978) was examined to determine how flows would change with additional flows from this option. Three years were examined as representative of low, medium, and high flow years for the period of flow augmentation (Table M-11). As is apparent during a typical medium or high flow year, essentially no additional releases would occur with this alternative. However, during a low flow year Snake River flows would be augmented.

The quantity of augmentation is dependent on several factors, including available flood control transfer and additional runoff. Generally, the additional water volume (above the existing 600 KAF) available (over the existing Water Budget) for release from April 16 through May is from 480 to 880 KAF. The total volume available in any year would have three components, summarized as follows:

- 300 KAF of inflow to Dworshak that would be allocated to flow augmentation;
- Up to 400 KAF that would be available through shift of system flood control storage to Grand Coulee, in years when this would be possible; and
- 180 KAF representing the volume associated with the 2 kcfs minimum discharge from Dworshak, which is included in the flow augmentation total as specified in the preferred plan.

For modeling purposes, it has been assumed that the 180 KAF would be released at a constant rate over the 45-day period, while the remaining 300 to 700 KAF could be released as desired. This would allow for a period of selected high flow releases that could be used to peak flows if desired during periods of peak downstream smolt migration. An example of how flow could be peaked over this period for the 300 and 700 KAF available storage is shown below.

Table M-11. Representative average monthly base flow conditions in the Snake and Columbia rivers for low, medium or high flow years for periods of flow augmentation.

Year Type		Flow (1,000 cfs) ^{a/}			
		Lower Granite ^{b/}		The Dalles ^{c/}	
		April ^{d/}	May	May	June
Low Flow	Base	45.1	71.5	214.6	106.8
Medium Flow	Base	104.1	99.1	282.9	267.0
High Flow	Base	103.7	113.8	418.2	411.2

a/ Data record is from 1929 through 1978, years selected as representative.

b/ Years used were 1931, 1950, and 1951 for low, medium, and high flow years, respectively.

c/ Years used were 1930, 1938, and 1956 for low, medium, and high flow years, respectively.

d/ April 16-30 period average.

Available Storage (KAF)	Number of Weeks			
	1	2	4	6
300	21	11	5	4
700	50	25	13	8

This additional flow would also continue down the Columbia River and may add to the Columbia River flow augmentation option Target 200.

To evaluate the changes in flow from Snake River flow augmentation Option J, two possible scenarios were evaluated and their flow added to projected Base Case flows for the low flow year 1931. The first flow scenario considered was the 2-kcfs daily flow from the 180 KAF available storage from April 16 through May 31. Also, as part of this flow option, it was assumed that the inflow to 300 KAF from Dworshak Reservoir would be released at a constant rate from May 1 through May 31. The change in flow for this flow scenario is shown in Table M-12. The second flow scenario considered is the same as the first except a constant flow release from a 700 KAF Dworshak volume (including flood control shift) would occur during May. For both flow options the benefits of the flow is carried through the Columbia River. It was assumed that the additional flow from this alternative would add to the Target 200 flow option in the lower Columbia River. This is a reasonable assumption because Target 200 is based on projected available storage in the spring and not on direct flow releases in from the Snake River during April and May.

3.4.2 Columbia River Flow Augmentation

The preferred alternative for flow augmentation to the Columbia River (Target 200) is intended to increase May and June flows to at least 191 kcfs. The effect of this alternative on river flows was modeled and evaluated by projecting existing alternative flows on available flow from the years 1929 to 1978. This alternative succeeded in increasing average monthly flows for all May and June months to at least 191 kcfs in all but 3 of the 50 years. The projections indicated that during some May periods flow will be decreased from baseline conditions but not to the extent they will be increased in June. During most low flow years average flow increase for the May-June period will be about 20 kcfs with this alternative. Three years

were selected as representative of what flow changes would occur during a low medium and high flow year for May and June (Table M-11). Because flows exceed 191 kcfs in May and June during the medium and high flow years, no additional flow would typically occur during these flow years.

However during the low flow year, flows would typically decrease at The Dalles in May and increase in June as shown below for the low flow year of 1930.

	May	June
With Augmentation (kcfs)	190.7	172.6
Base Flow (kcfs)	214.6	106.8
Flow Gain (kcfs)	-23.9	65.8

3.4.3 Travel Time and Survival Changes in the Snake River for Yearling Chinook

Changes in travel time and survival for yearling chinook were calculated using the same methods as those presented earlier for the Snake River. One change was that the reduction in water particle and smolt travel times were calculated as half of those presented in the tables for the same flow level to account for the fact that the Snake River projects are operated at less than full pool, not maximum pool, which the original calculations are based on. Changes in smolt travel time through Lower Granite Pool were based directly on changes in water particle travel time as they were in the main section. Changes in the remaining Snake River reach from Lower Granite Dam to Ice Harbor Dam were based on the polynomial model from Giorgi (1991b) and the reciprocal flow model from Berggren and Filardo (1991) as they were before. The methods used to calculate changes in smolt travel time in the Columbia River are described under the next subsection, which describes the changes in travel time and survival in the Columbia River. Survival changes were calculated using the 0.7 percent mortality per day of travel time from Bell et al. (1976), which results in an estimated change in survival proportional to the reduction in calculated number of days travel time from this alternative.

Generally minor reduction in smolt travel time is predicted for the Option J flow releases for the example examined. The changes in yearling chinook travel time through the Snake River reach for the lower flow option (Flow No. 1 in Table M-13) in April were reduced from 1.8 to 1.2 days and in May from 1.8 to 1.0 days

Table M-12. Estimated possible changes of flow from the preferred augmentation flow Alternative J for the Snake and Columbia rivers for a representative low-flow year.

Flow Type	Flow (1,000 cfs) ^{a/}			
	Lower Granite		The Dalles	
	April ^{b/}	May	April	May
Flow No. 1 ^{c/}				
Base ^{d/}	47.1	76.7	130.6	195.9
Gain	45.1	71.5	128.6	190.7
	2.0	5.2	2.0	5.2
Flow No. 2 ^{c/}				
Base ^{d/}	47.1	84.7	130.6	203.9
Gain	45.1	71.5	128.6	190.7
	2.0	13.2	2.0	13.2

a/ Flows predicted for base flow year of 1931.

b/ April 16-30 average period.

c/ 180 KAF uniform release - April 16 through May 31, plus 300 KAF release May 1 through May 31 from Dworshak.

d/ Base flow in Snake existing conditions. Base flow in Columbia with Target 200 flow augmentation conditions.

e/ 180 KAF uniform release April 16 through May 31, plus 700 KAF release May 1 to May 31 from Dworshak.

Table M-13. Estimated changes in yearling chinook travel time from Lower Granite Pool to Bonneville Dam from the preferred Snake River augmentation Alternative J.

Region	Yearling Chinook Travel Time Changes (days) ^{a/}					
	Snake River					
	<u>Polynomial</u> ^{b/}		<u>Reciprocal</u> ^{b/}		<u>Polynomial</u> ^{b/}	
	Flow No. 1 ^{c/}		Flow No. 1		Flow No. 2 ^{d/}	
	April	May	April	May	April	May
Lower Granite Pool ^{d/}	0.4	0.3	0.4	0.3	0.4	0.5
Lower Granite to Ice Harbor	1.4	1.5	0.8	0.7	1.4	2.5
Total Snake	1.8	1.8	1.2	1.0	1.8	3.0
					1.2	2.4
Total Columbia	Lower Columbia River					
	<u>Polynomial</u> ^{b/}		<u>Logarithmic</u> ^{b/}		<u>Polynomial</u> ^{b/}	
	Flow No. 1		Flow No. 1		Flow No. 2	
	April	May	April	May	April	May
	0.4	0.4	0.6	0.5	0.4	1.0
					1.0	1.3
Total Snake and Columbia ^{e/}	Snake and Lower Columbia River					
	Flow No. 1		Flow No. 1		Flow No. 2	
	April	Low	High	Low	April	May
	High	Low	High	Low	High	Low
	2.4	1.6	2.3	1.4	2.4	1.6
					4.3	3.4

a/ Methods used are the same as those discussed in the text in Section 3.2.1.3.

b/ The polynomial and reciprocal flow models for the Snake River and the polynomial and logarithmic flow models for the Columbia River are described in Giorgi (1991b).

c/ Flow alternatives No. 1 and No.2 assume different storage for release from Dworshak reservoir (see test and Table M-12).

d/ Uses water particle travel time changes as estimates of smolt travel time changes.

e/ High and Low are the sum of the highest and lowest values for the month and flow type.

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for the two models used. Travel time was reduced in May with flow option No. 2, being 3.0 to 2.4 days less through the Snake River reach. Carrying these flow augmentation scenarios through the lower Columbia River resulted in less than one day reduction for any option or period except for flow option No. 2 in May (ranging from 1.0 to 1.3 days reduction). For the Snake and lower Columbia rivers combined, the highest benefit that would be predicted is for a reduction of travel time from Lower Granite to Bonneville Dam of 4.3 days in May under the higher flow release alternative using the highest model results (Table M-13). Most reductions in travel time for this region were about 1 to 2 days for April and 2 to 4 days for May.

As is expected from the low reduction in travel time, minor reductions in predicted survival also occur with this flow alternative (Table M-14). Applying the 0.7 percent mortality rate per day the total change in survival for April ranged from 1.1 to 1.7 percent, while in May from 1.0 to 3.0 percent.

The distribution of wild downstream migrants suggested that the flow option No. 2 will have about equal benefit for wild spring and summer chinook. The average 1989 through 1991 wild spring chinook migrants passing Lower Granite Dam was 20, 48, and 28 percent in the latter half of April, May, and June. The wild summer chinook migration pattern for 1989 through 1991 was earlier than spring chinook, with 43, 35, and 12 percent respectively, in the second half of April, May, and June. Based on the highest survival for the higher of the two flow scenarios and the two species' distribution, the average overall increase in survival would be about 1.8 percent each. However, considering the many assumptions that are contained within any measured benefits calculated, any small changes in survival as measured should not be relied upon to delineate differences or absolute changes in survival. These small survival changes can only delineate general direction and magnitude. These low levels of increased survival should be considered speculative at best.

The calculations are based on estimated changes in average flow over the entire 1½-month period. In reality, the available storage release can be regulated or shaped so that selected releases could be made to substantially increase flows for shorter periods that could be selected to coincide with expected peaks in smolt migration. For example,

available additional storage allows for releases of 10 to 25 kcfs for a selected 2- or 3-week span that could increase flows for these selected peak migration periods. This release method could result in benefits to fish survival that are not readily calculated using average flows.

3.4.4 Travel Time and Survival Changes in the Columbia River for Yearling Chinook

Changes in smolt travel time and survival for the lower Columbia River were also determined independently of flow augmentation activities on the Snake River. The following determinations are made for only the changes in Columbia River reservoir operation and the Target 200 flows. The benefits of the Target 200 flow alternative are determined independently because it is possible that flow augmentation in the Columbia River may not coincide with flow augmentation in the Snake River, so the benefits to Snake River threatened stocks from Columbia River augmentation could be independent of the Snake River augmentation. If the two flow augmentation options (Option J and Target 200) occurred simultaneously then benefits calculated here would be additive to those calculated for the Snake River. However, it is not possible at this time to be able to predict if this will be the case.

Methods similar to those used to calculate changes in travel time and survival in the Columbia River in the main text were used here. However, for these calculations, water particle travel time through all Columbia River reservoirs were assumed to be the average of maximum and minimum pool for all flow because projects are normally operated at less than full pool. Also reductions to 262.5 feet for John Day Pool, which is also part of the alternative considered to be baseline conditions for May, are based on standard operating procedures for this reservoir. However, this elevation is lower than what normally occurs in June because elevations are typically between 265 and 268 feet. Changes in water particle travel time from baseline to the proposed alternative were compared to what water particle travel time would have been at reservoir elevation 266.5. The benefits of the preferred alternative were evaluated against the Base Case for flow, John Day Reservoir elevation 262.5 in May and 266.5 in June, and all other reservoirs the average of maximum and minimum pool levels. The same two models (the polynomial model from Kindley, 1991 and the logarithmic model from the FPC, 1989) that predicted changes in yearling chinook travel time through John Day Pool with changes in flow, were used

Table M-14. Estimated changes in absolute survival of yearling chinook from Lower Granite Pool to the Bonneville Dam for flow augmentation Alternative J.

Value	Yearling Chinook Smolt Survival Changes (Percent) ^{a/}					
	Flow No. 1 ^{b/}		Flow No. 2 ^{b/}		Flow No. 2	
	April	May	April	May	April	May
Survival	High ^{c/} 1.6	Low ^{c/} 1.1	High 1.6	Low 1.0	High 1.7	Low 1.1
					High 3.0	Low 2.4

a/ Survival based on estimated smolt travel time changes (see Table M-13) and a mortality rate of 0.7 percent/day from Bell et al. 1976.

b/ The two flows alternative No. 1 and No. 2 assume different quantities of available storage for release from Dworshak Reservoir (see text and Table M-12).

c/ High and low based on the higher of two values each from two models used on the Snake and Lower Columbia rivers for months and flow type.

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for the assessment of changes in travel time for the lower Columbia River (see Section 3.2.1.3 for more detail). Survival changes were calculated in the same manner as for the Snake River using the 0.7 percent per day mortality rate from Bell et al., 1976 for migrating fish.

The change in travel time and survival in a representative low flow year (1930) is shown in Table M-15. The reduction in flow has a minor increase ranging from an increase in smolt travel time from the Snake River mouth to Bonneville Dam of 1 to 3 days for the logarithmic and polynomial model, respectively, in smolt travel time with either model for May. The corresponding reduction in smolt survival ranges from less than 1 to 2 percent. In June, a substantial reduction in estimated smolt travel time occurs ranging from 13 to 24 days for the polynomial and logarithmic models, respectively. The corresponding estimated increase in survival is 9 and 16 percent in June for the two models.

The exact proportion of wild Snake River smolts that travel through this region by month is not known, so effects on these stocks directly cannot be determined. However, for all Snake River wild and hatchery spring and summer chinook stocks estimated proportion of total migrating in the Columbia River is 46, 45, and 9 percent for April, May, and June, respectively. If these numbers were representative of wild stocks, then the polynomial model results would indicate little overall change in survival with a net loss of 0.9 percent in May and 0.8 percent gain in June. The results of the logarithmic model suggested a slight gain as calculations would predict a net loss of 0.2 percent in May and 1.4 percent gain in June.

3.5 SUMMARY

The following summarizes anticipated project effects on the salmon species.

Table M-15. Estimated change in yearling chinook smolt travel time and absolute survival from the Snake River confluence with the Columbia to Bonneville Dam for a representative low-flow year based on Target 200 flow augmentation alternative.

Value	Polynomial ^{a/}		Logarithmic ^{a/}	
	Yearling Chinook Travel Time (days) ^{b/}			
	May	June	May	June
Travel time	-2.8	12.6	-0.5	24.3
	Smolt Survival Changes (Percent) ^{c/}			
Survival	-2.0	8.5	-0.4	15.7

a/ Polynomial and logarithmic models defined in Giorgi, 1991b.

b/ Methods similar to those discussed in the text under Section 3.2.1.3.

c/ Survival based on estimated smolt travel time change (above) and a mortality rate of 0.7 percent/day from Bell et al., 1976.

SUMMARY OF EFFECTS OF CONSIDERED ALTERNATIVES ON SNAKE RIVER SPRING, SUMMER, AND FALL CHINOOK AND SOCKEYE SALMON.

Considerable uncertainty exists regarding the relationship between water particle travel time, juvenile travel time, and juvenile survival; this uncertainty is greatest for flows generally above 85 kcfs in the Snake River and 220 kcfs in the Columbia River. Reported are differing comparisons of this relationship that bracket the range of values that may be expected primarily for yearling spring and summer chinook juveniles. No clear relationship exists for subyearling fall chinook or sockeye juveniles, although increased flow rate appears to reduce travel time. The information presented encompasses differing juvenile travel time estimates and calculates the corresponding juvenile survival relationship for yearling juveniles by utilizing either a 0.7 percent increase in survival per day travel time is reduced or models depicting historical survival.

Alternative/Option	Potential Significant Impacts (Positive and Adverse)
Reservoir Drawdown	
<i>Snake River</i>	
All 4 projects to MOP (April to July)	<ul style="list-style-type: none"> • Water particle travel time reduced by a maximum 7 percent (normally half of this) over entire range of flows. • Smolt travel time reductions through Lower Granite Pool (assuming, because of lack of specific data, that smolt travel time is equal to water particle travel time) would be the same as changes in water particle travel time over the entire flow range (maximum 7 percent reduction [normally half of this]). • Minor potential smolt travel time changes would occur from Lower Granite Dam to Ice Harbor, most changes less than 1 day reduction, or 6 percent maximum change from existing conditions. • Absolute percent smolt survival increases from Lower Granite Pool to Ice Harbor Dam, depending on the models used, ranges from 3.9 to 0.2 percent maximum (normally half these values) at medium flow (80 kcfs), with lower percent increases at higher flows. • Minor reduction in rearing habitat for subyearling chinook.
All 4 projects to near spillway crest (April 15 to August 15)	<ul style="list-style-type: none"> • Water particle travel time reduced by about 54 percent over entire range of flows. • Smolt travel time from Lower Granite Pool potentially reduced significantly, depending on the model, by 17.4 to 10.8 days at a low flow of 40 kcfs, by 4.6 to 3.7 days at a medium flow of 80 kcfs, and greater than 2.2 days to less than 0.7 days at a high flow of 120 kcfs. • Absolute smolt survival change is unknown but may be worsened from existing conditions by 1) elimination of fish transport from all Snake River facilities subjecting typically transported fish to longer travel times, 2) increased mortality from significantly increased high gas supersaturation levels, 3) increased downstream predation and turbine mortality for typically transported fish, 4) significant loss of shallow-water rearing habitat in the Snake River, and 5) reduced benthic and pelagic food production. • Elimination of all adult fish passage during drawdown and reservoir refilling period, eliminating passage of all spring and summer chinook. • Temperature peak would be shifted several weeks earlier, possibly impeding early portion of the adult run. Cooler temperatures could benefit later portions of the run.

Anadromous Fish (continued)

Alternative/Option	Potential Significant Impacts (Positive and Adverse)
Reservoir Drawdown (continued)	
<i>Snake River (continued)</i>	
All 4 projects to near spillway crest (April 15 to June 15)	<ul style="list-style-type: none"> • Similar to spillway drawdown to August 15 except with a decrease in duration of certain negative effects (e.g., reduced food production, increased predation, gas supersaturation mortality, effects from elimination of bypass/collection/transport facilities). • Reduced adverse effects to adults and subyearling chinook relative to longer drawdown as discussed above.
Lower Granite to near spillway crest, others to MOP (February 1993 or July 15 to August 15)	<ul style="list-style-type: none"> • Effects similar to reduction to MOP except as discussed below. • Water particle travel time reduced by about 3.5, 1.6, and 0.8 days over flows of 40, 80, and 120 kcfs through Lower Granite pool (others see above). • Survival increases, similar to reduction to MOP for all Snake River Projects, would occur with summer test (no fish in February) but may be less for reasons presented for reduction to near spillway crest (see above). • The July option of this alternative proposed to be conducted during the latter part of the subyearling smolt migration. Effects on travel time and survival of these fish are unknown. • During the July and August alternative although turbine mortality would be eliminated at Lower Granite Dam, juvenile subyearling survival may be worsened because 1) no juvenile fish transport from Lower Granite Dam, 2) increased mortality from high gas supersaturation in Little Goose Pool, 3) increased predation in Lower Granite Pool from predator concentration, 4) possible increased spillway passage mortality, 5) increased downstream turbine passage and predation mortality for fish typically transported, and 6) reduced shallow-water rearing habitat in Lower Granite Pool. • No adult passage above Lower Granite during drawdown periods affecting adult summer chinook and lesser portions of fall chinook and summer steelhead.

Anadromous Fish (continued)

Alternative/Option	Potential Significant Impacts (Positive and Adverse)
Reservoir Drawdown (continued)	
<i>Snake River (continued)</i>	
Lower Granite to 710 feet, others to MOP	<ul style="list-style-type: none"> • Effects similar to reduction to MOP except as discussed below. • Water particle travel time reduced by 2.3, 1.2, and 0.8 days for flows ranging from 40, 80, and 120 kcfs, respectively, in Lower Granite Pool or about 44 percent from existing (others shown above). • Assume smolt travel time potentially reduced through Lower Granite Pool the same as water particle travel time. • Absolute smolt mortality through Lower Granite Pool potentially reduced by 1.6, 0.8, and 0.6 percent for flows 40, 80, and 120 kcfs, respectively, if <u>only</u> travel time is considered. • Although turbine mortality would be reduced at Lower Granite Dam, other factors will possibly reduce overall survival including: 1) no transport of fish from Lower Granite Dam, 2) increased mortality from higher gas supersaturation levels in Little Goose Pool, 3) increased predation in Lower Granite Pool on subyearlings from predator concentration, 4) possible increased mortality from spillway passage, 5) increased downstream turbine and predation mortality for fish typically transported at Lower Granite, and 6) reduced shallow-water rearing habitat in Lower Granite Pool for subyearling chinook. • Adult migration may be greatly impeded or eliminated at Lower Granite.
Lower Granite/Little Goose drawdown test (March)	<ul style="list-style-type: none"> • Effects similar to reduction to MOP except as discussed below. • Water particle travel time reduced by about 3.5, 1.6, and 0.8 days over flows of 40, 80, and 120 kcfs through Lower Granite Pool. Little Goose water particle travel reduced between MOP and spillway crest (see above). • Juvenile and adult passage survival not affected as limited passage occurring. • Potential reduced rearing habitat and habitat quality for fall chinook in Little Goose and Lower Granite pools. • Potential partial stranding of fall chinook fry or alevins in gravel in Little Goose Pool. • No adult passage above Little Goose during drawdown periods delaying less than 3 percent of summer steelhead.

Anadromous Fish (continued)

Alternative/Option	Potential Significant Impacts (Positive and Adverse)
Reservoir Drawdown (continued)	
<i>Lower Columbia</i> All 4 projects to MOP	<ul style="list-style-type: none"> • Water particle travel time reduced by about 16 to 19 percent from maximum pool over entire range of flows. Actual reduction about 10 percent relative to existing operation. • Smolt travel time through lower Columbia system potentially reduced by 2.5 to 2.0 days at 160 kcfs, 2.0 to 1.2 days at 200 kcfs, and 1.6 to -0.5 at 260 kcfs. • Absolute smolt survival through lower Columbia System potentially increased by 1.8 to 1.4 percent at 160 kcfs, from 1.4 to 0.8 percent at 200 kcfs, and from 1.6 to -0.4 percent at 260 kcfs. • At The Dalles, efficiency of sluiceway bypass could be reduced forcing more fish through turbines increasing mortality. • At John Day and McNary, turbine efficiency is reduced, potentially increasing mortality of fish passing through turbines by about 1.3 and 1 percent, respectively. • Slight increase in gas saturation, especially under high flows, with minor effects on fish. • Minor reduction in shallow-water habitat reduces rearing habitat for subyearling chinook.
John Day at 262.5 feet, McNary at 337 feet, remainder at MOP	<ul style="list-style-type: none"> • Water particle travel time reduced by about 12 to 14 percent from maximum pool over entire flow range. • Smolt survival through lower Columbia System reduced by slightly less than reduction for all at MOP. • At The Dalles, efficiency of sluiceway bypass could be reduced forcing more fish through turbines, increasing mortality. • Slight increase in gas saturation at The Dalles and Bonneville with minor effects on fish, especially under high flows. • Minor reduction in shallow-water habitat at The Dalles and Bonneville not expected to cause adverse effects on rearing to any stock.
Flow Augmentation	<ul style="list-style-type: none"> • Although some alternatives include flow from Grand Coulee, most flow augmentation alternatives occur primarily with water from Dworshak, Hells Canyon, or a combination increasing flow in the Snake River into the Columbia below the confluence of the Snake and Columbia rivers. Available storage and discharge capability will allow for a flow rate increase of 0 to 28 kcfs from these two Snake River reservoirs. Available storage will allow for limited periods of flow at these rates over what currently occurs. As an example, only one of the alternatives will allow for more than 1 month of continuous flow increase of 20 kcfs over what currently occurs from these projects. All of the alternatives

Anadromous Fish (continued)

Alternative/Option	Potential Significant Impacts (Positive and Adverse)
Flow Augmentation (continued)	<p>are designed to increase flow in May, with some including parts of April and June without consideration of the available flow for later periods. The exact flow will dependent on what is currently available and target flows selected. The alternative with flow from Grand Coulee could increase flow by 0 kcfs to more than 30 kcfs in the Columbia River only.</p> <ul style="list-style-type: none"> • Greatest effect on water particle travel time from high augmentation of 20 kcfs: in the Snake River during low flow (60 kcfs) at maximum pool reduction would be 8 days, or 22 percent; at medium flow (100 kcfs), the reduction would be 2.8 days, or 14 percent. In the Columbia River reach, the reduction is from 5 days at low flow (100 kcfs) to 7 days at high flow (300 kcfs). • Smolt travel time in the Snake River would be reduced by 4 to 8 days at low flow (40 kcfs) and 1 to 2 days at medium flow (80 kcfs). • In the Columbia River reach the reduction of smolt travel time would be 2 to 3 days at low flow (160 kcfs) and 1 to 2 days at medium flow (200 kcfs). • Flow augmentation reduces available flow in the summer (July to September) possibly affecting summer downstream migrants. • Minor potential gas saturation level increases. • No effect on adult migration. • Effects on absolute smolt survival for both Columbia and Snake River combined for a flow augmentation of 20 kcfs range from 5.6 to 14.2 percent for low flows (Snake 40 kcfs, Columbia 160 kcfs); 1.1 to 11.5 percent for medium flows (Snake 80 kcfs, Columbia 200 kcfs); and 0.1 to 2.8 for high flows (Snake 120 kcfs, Columbia 260 kcfs).
Combination	<ul style="list-style-type: none"> • Effects additive; see drawdown and augmentation.
Temperature Control Test (August)	<ul style="list-style-type: none"> • Enhance upstream migration success of some fall chinook and steelhead in late August through early September by potentially lowering temperature 2 weeks earlier than current condition. • Reduced growth of part of Dworshak hatchery steelhead. • Possible less water available for following spring releases.

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APPENDIX N

COMMENTS AND RESPONSES

APPENDIX N - COMMENTS AND RESPONSES

This appendix documents the public and agency review of the draft OA/EIS and how this review was used to formulate the final OA/EIS. The appendix includes a summary of the review process, discussion of the nature of the comments, a listing of all commentors, full reproduction of letter comments, and responses to all comments. Changes in the OA/EIS text in response to comments are noted in the responses.

1.0 DRAFT OA/EIS REVIEW PROCESS

The draft OA/EIS was officially filed with the U.S. Environmental Protection Agency and released for public and agency review on September 27, 1991. Approximately 1,500 copies of the draft OA/EIS were distributed to elected officials, government agencies, tribal organizations, associations, businesses, individuals, and public libraries. A 50-day period, ending November 15, 1991, was allowed for review of the draft OA/EIS.

Six public meetings were held at locations throughout the region to facilitate review of the draft document. Each meeting consisted of three parts. The first part was a presentation of the proposed actions and the draft OA/EIS by cooperating agency staff. The second part was a workshop session following the presentation, with audience members assembling in small groups to discuss specific resource issues such as fish and water quality, transportation, and recreation and cultural resources. Each workgroup discussion was facilitated by a cooperating agency staff person who answered questions and encouraged participants to identify their concerns. All concerns identified were recorded, and a summary of the discussion in each group was presented to the entire audience at the close of the workshop session. The third part of each public meeting was a formal public hearing open to all speakers who wished to provide formal testimony. All hearing testimony (and the workgroup summary discussions) was documented by a court reporter, and hearing transcripts are available for purchase at the cost of reproduction.

Recipients of the draft OA/EIS were encouraged to submit written comments on the document by November 15, 1991. Many letters were received,

including some after the official closing date for the comment period, and were reviewed by the cooperating agencies as part of final OA/EIS preparation. Commentors were asked to direct their comments to the Corps, but comments were forwarded as necessary to BPA and the BoR.

2.0 DRAFT OA/EIS COMMENTS

The cooperating agencies received written or verbal input from a total of 207 commentors during the review process. This included 64 speakers at the public hearings, 136 letters, and 7 written statements submitted at the public meetings. The total of 207 commentors included some duplication, as a number of hearing speakers also submitted written comments. The comment letters received ranged from one-page handwritten notes to large packages with lengthy reviews supported by multiple attachments. All comments were considered seriously, regardless of style or volume.

Corps and contractor staff reviewed all comment letters, statements, and hearing records and identified substantive comments on each source. Letters and written and verbal statements were all assigned alphanumeric codes, and all comments within each source were numbered sequentially to provide a unique identifier for each comment. This process resulted in the identification of approximately 1,300 comments among all comment sources.

A summary of the draft OA/EIS review input is provided in Table N1. Nearly half of the letters and written statements (64 out of 141) were from individuals and businesses from throughout the region and the project area. Comment letters were received from multiple state agencies and elected officials in Idaho, Montana, Oregon and Washington. Nine Federal agencies and 2 members of Congress submitted letters, as did 5 tribal organizations. The 8 letters from local government units primarily represented municipalities, port districts, and public utility districts with concerns over adverse impacts to their operations. The 24 associations and organizations submitting letters were rather evenly divided between river user interests concerned about operational impacts from various flow measures and groups emphasizing the need for urgent measures to conserve the salmon stocks. Representation among comment letters from individuals

APPENDIX N

Table N1. Summary of Draft OA/EIS review input.

Category	Number
Federal government (F)	12
Individual/Business (I)	64
Local government (L)	8
Association/Organization (A)	24
Regional/Tribal organizations (R)	5
State government (S)	30
Testimony at hearing	64
Total	207

and businesses was similarly divided. A number of the letters from individuals, as well as a few from associations, were formula letters that repeated a consistent set of comment themes.

A complete listing of all commentors is included as Table N2, which follows the text discussion of this appendix and functions as a table of contents for the comments reproduced here. All comment letters and written statements submitted at the public hearings are reproduced in this appendix, except for multiple copies of formula letters that repeat the same comments. Comment letter attachments that do not contain substantive comments directly addressing the OA/EIS are also omitted. Because of the large volume of the hearing transcripts and the fact that most hearing testimony is repeated in letter comments, comments identified from the hearing record are also not reproduced. Copies of the hearing transcripts are available on request. The complete printed record of all comments received on the draft OA/EIS is maintained by the Walla Walla District of the Corps and is available for public review at the District offices.

As part of the comment review process, comments were categorized according to the issues addressed and support for or opposition to specific flow measure alternatives or options. Effects on salmon were the most frequent issues mentioned and were the subject of about 13 percent of all the comments (169 out of 1,278). The next most common issue was the scope of the OA/EIS, which was

mentioned in 138 comments (11 percent). Other common issue categories were the cost effectiveness of the options analyzed (121 comments), plan selection methods and results (113 comments), impacts to agriculture (69 comments), transportation (68 comments), benefit/cost analysis (66 comments), electric power (58 comments), and resident fish (51 comments). All other issue categories received less than 50 comments, or less than 4 percent of the comment total.

About 10 percent of the comments explicitly stated support for a flow measure alternative or option. The most typical comments in this category were support for a test drawdown of Lower Granite and Little Goose reservoirs on the lower Snake River before the spring 1992 fish migration (33 comments); flow augmentation in general, without reference to a specific option (32 comments); and reservoir drawdown in general (14 comments). A total of 36 supportive comments were distributed among the various Snake and Columbia River drawdown options, while only 6 comments mentioned a specific flow augmentation option. Opposition to various flow measures was expressed in 55 comments, of which 23 opposed reservoir drawdown in general. No other alternative or option received more than 5 opposition comments.

3.0 RESPONSE TO COMMENTS

The cooperating agencies have prepared a response to each of the 1,278 comments received on the draft OA/EIS, regardless of whether the comment is

Table N2. Commenters on the Draft OA/EIS.

Comment	Organization/Person	Person	Date
F01	LaRocco, Larry, Hon.	U.S. House of Repre.	91/11/01
F02	US. Dept of Interior	Polityka, C.	91/11/14
F03	U.S. Forest Service	Haugen, Gordon	91/11/13
F04	Pacific Fishery	Anderson, P.	91/11/13
F05	U.S. Forest Service	Carroll, Arthur	91/11/14
F06	U.S Fish & Wildlife	Pascho, Ronald	91/10/04
F07	U.S. Dept of Health	Holt, Kenneth	91/11/07
F08	U.S. EPA	Burd, Robert S.	91/11/29
F09	Nat Marine Fisheries	Tuttle, Merritt E.	91/11/29
F10	Craig, L.E., Hon.	U.S. Senate	91/11/15
F11	U.S. Dept Interior	Polityka, C.	91/12/03
S01	Kempton, Jim	State of Idaho, Rep.	91/10/16
S02	ID Historic Society	Green, T.	91/10/16
S03	Idaho State Senate	McLaughlin, M	
S04	State of Montana	Stephens, S.	91/10/28
S05	ID Dept. Parks & Rec	Ferrell, Y.	91/11/08
S06	State of Washington	Grant, Bill	91/11/08
S07	State of Montana Gov.	Stephens, S.	91/11/02
S08	State of OR Interg. Rel.	Prinslow, R.	91/11/05
S09	State of WA, Repres.	Neher, Richard	91/11/08
S10	State of Wyoming	Lowry, Sue	91/11/12
S11	Oregon Dept Transp.	Ford, Mark	91/11/14
S12	State of Montana	Cool, K.L.	91/11/13
S13	WA Dept of Transp.	Berentson, D.	91/11/14
S14	Oregon Dept of F&W	Martin, Jim	91/11/15
S15	OR Water Resources	Young, William	91/11/15
S16	OR Dept. of Land Cons.	Knight, Jim	91/11/15
S17	OR Dept. of Geology	Wermiel, Dan	91/11/15
S18	State of Washington	Gardner, Booth	91/11/15
S19	WA Dept. of Fisheries	Blum, Joseph	91/11/18
S20	WA Dept. of Wildlife		91/11/18
S21	WA State Parks	Ramsey, M.	91/11/18
S22	WA Dept. of Agricult.	Tefry, Stuart	91/11/07
S23	Wa State Energy Office	Lesser, Jonathan	91/11/15
S24	WY Fed. Land Planning	Miller, Rod S.	91/11/19
S25	WY State Game & Fish	White, Joe	91/11/07
S26	Montana Dept. of Agric	Shortland, E.M.	91/10/26
S27	MN Fish, Wildlife, Parks	Peterman, Larry	91/10/30
S28	ID Office of Govern	Andrus, Cecil	91/11/22
S29	WA Dept of Trans.	Chaplin, B.L.	91/12/03
S30	WA Dept. of Ecology		

Table N2. Commenters on the Draft OA/EIS (continued).

Comment	Organization/Person	Person	Date
R01	Columbia River Intertribal Fish	Strong, Ted	91/11/08
R02	Columbia River Intertribal Fish	Strong, Ted	91/11/14
R03	Shoshone-Bannock	Tribes	91/11/14
R04	Upper Columbia	United Tribes	91/11/12
R05	Colville Conf. Tribes	Truscott, K.	91/11/02
L01	City of Boardman	Brown, Wm. C.	91/11/01
L02	Port of Lewiston	McMurray, Ron	91/10/17
L03	Franklin Co. PUD	Cochrane, Beverly	91/10/23
L04	Benton County PUD	Sanders, James W.	91/10/25
L05	Port of Portland	Thorne, Mike	91/11/13
L06	City of Bingen	Long, Charles	91/11/11
L07	Port of Whitman	Weddell, Jim	91/11/15
L08	Port of Whitman	Casavant, Ken	Undated
A01	Idaho Water Users	Tominaga, Lynn	91/10/15
A02	American Waterways	McMahon, Gerald	91/10/21
A03	Lake Roosevelt Forum	Blum, Marty	91/10/21
A04	Lewis-Clark Terminal	Lyons, Arvid	91/11/22
A05	Oregon Farm Bureau	Bailey, Ken	91/10/22
A06	Pacific NW Waterways	Vanselow, G.	91/11/08
A07	Kelly Creek Flycasters	Stonebraker, Keith	91/11/08
A08	Clarkston Ch. of Comm.	Neil, Dana	91/11/13
A09	Oregon St. Salmon Comm.	Robinson, Tom	91/11/14
A10	Wasco Co. Farm Bureau	Dahle, Timothy	91/11/15
A11	Sawtooth Wildlife Council	Bauer, Cathy	91/11/11
A12	Washington Wilderness Coalition	Winn, Norman	91/11/11
A13	Washington Assoc. of Wheat Growers	Blankenship, Dan	Undated
A14	Trout Unlimited	Satterwhite, Mike	91/10/20
A15	Skamania Cty Chamber	of Commerce	91/11/08
A16	NW Resources Inform.	Center	91/11/14
A17	Pac NW Utilities	Conference	91/11/15
A18	Oregon Salmon Comm.	Robinson, Tom	91/11/15
A19	OR Nat. Heritage	Bahls, Peter	91/11/14
A20	Sierra Club	Lewis, Andrew	91/11/14
A21	Sierra Club	Arthur, William L.	91/11/14
A22	Mountaineers	The	91/11/15
A23	Public Power Council	Drummond, W.K.	91/12/03
I01	Dalles Irrigation Dist.	Bailey	91/05/28
I02	Dalles Irrigation Dist.	Bailey	91/09/17
I03	Elam, Burke & Boyd	Campbell, E.	91/10/07
I04	Elam, Burke & Boyd	Campbell, E.	91/10/07
I05	Shaffer	Paul	91/10/15
I06	Watkins	Clint	91/10/15

Table N2. Commenters on the Draft OA/EIS (continued).

Comment	Organization/Person	Person	Date
I07	Appleby	Ron	91/10/16
I08	Barr	Stephen L.	91/10/16
I09	Mathews	William L.	91/10/16
I10	Wood	Bill	91/10/17
I11	Gehrke	George	91/10/17
I12	Walkley	Van	91/10/12
I13	Heiler	Cathy	91/10/21
I14	Broetje	Ralph	91/10/22
I15	MacKay	R. Thomas	91/10/23
I16	O'Connor	James O.	91/10/25
I17	Pritchard	Jim	91/10/28
I18	Bailey	Don W.	91/10/31
I19	Lewis	Karen J.	91/11/04
I20	Kietinger	Kip	91/11/07
I21	Kovalicky	Tom	91/11/07
I22	Baker	James M.	91/11/08
I23	Mason	Ron	91/11/08
I24	Wright	Colleen	91/11/10
I25	Glickerman	David J.	91/11/10
I26	Bowers	Gregory H.	91/11/11
I27	Kean	James H.	91/11/12
I28	Roberts	Joanne M.	91/11/12
I29	Grave de Peralta	D	91/11/12
I30	Shank	Robert	91/11/13
I31	Hickman	Lawrence	91/11/13
I32	Randall	Peggy Jo	91/11/13
I33	Eldrige	Steve	91/11/15
I34	Gray	Lee	Undated
I35	Scroggie	P.R.	Undated
I36	Gunkel	Dan	Undated
I37	Clark	Dave	Undated
I38	Worden	Paul	Undated
I39	Idaho Power Company	Smith, Bruce	91/11/08
I40	Columbia Grain	Cleaver, Terry	91/11/22
I41	Vigil	Ron	91/11/12
I42	Johnson, Rick	Reed, May	91/11/22
I43	Dieringer	Kip	91/11/21
I44	Direct Service	Carr, J.	91/12/02
I45	Wright	Colleen	91/11/22
I46	Young	Eric	91/11/22
I47	Fong	Patricia	91/11/12

Table N2. Commenters on the Draft OA/EIS (continued).

Comment	Organization/Person	Person	Date
I48	Mabbott	Charles	91/11/21
I49	Baird	Dennis	91/11/22
I50	Miller	Dustin J.E.	91/11/22
I51	Wise	Ron and Mionsi	91/11/22
I52	Bureham	Janet	91/11/22
I53	Stewart	Janet L.	91/11/22
I54	Fuerstenau	Kurt	91/11/22
I55	Germain	Jeanette	91/11/22
I56	Wille	Stephen A.	91/11/22
I57	Potlatch Corp.	Maddock, Todd L.	91/11/22
I58	Delmore	Jamie	91/11/22
I59	Central Ferry Term.	Hagman, Karl R.	91/11/22
I60	Hayes	William & Marjorie	91/11/22
I61	James River Corp.	Smither, James R.	91/11/22
I62	Henderson	Edward M.	91/11/22
I63	Roberts	Nancy	91/11/22
I64	Munger	Kathy L.	91/11/22
T/1-01	Tominaga	Lynn	91/10/15
T/1-02	Ayer	Michael	91/10/15
T/1-03	Bowler	Bert	91/10/15
T/1-04	Brunelle	Andy	91/10/15
T/1-05	Reading	Don	91/10/15
T/1-06	Gardner	Richard	91/10/15
T/1-07	Woodworth	John	91/10/15
T/1-08	Ayer	Michael	91/10/15
T/1-09	Beightol	Richard	91/10/15
T/1-10	Fisch	Rick	91/10/15
T/1-11	Tominaga	Lynn	91/10/15
T/1-12	Richardson	Gary	91/10/15
T/1-13	Ford	Pat	91/10/15
T/1-14	Chaney	Ed	91/10/15
T/1-15	Schmidt	Stanely	91/10/15
T/2-01	Wik	Sarah	91/10/16
T/2-02	Mader	Cindi	91/10/16
T/2-03	Cuddy	Charles	91/10/16
T/2-04	Burnham	Bob	91/10/16
T/2-05	McElharrow	Mike	91/10/16
T/2-06	Isbelle	Greg	91/10/16
T/3-01	Graham	Greg	91/10/17
T/3-02	Schenken	Dan	91/10/17
T/3-03	Morse	Tom	91/10/17
T/3-04	Fetter	Steve	91/10/17

Table N2. Commenters on the Draft OA/EIS (continued).

Comment	Organization/Person	Person	Date
T/3-05	Davis	Rick	91/10/17
T/3-06	Schenken	Dan	91/10/17
T/3-07	Satterwhite	Mike	91/10/17
T/3-08	McMurray	Ron	91/10/17
T/3-09	Kirby	Darrell	91/10/17
T/3-10	Wood	Bill	91/10/17
T/3-11	Brewington	Clark	91/10/17
T/3-12	Gehrke	George	91/10/17
T/3-13	Wakley	Van	91/10/17
T/3-14	Watson	Gary	91/10/17
T/3-15	Gilchrist	Robert	91/10/17
T/4-01	Graham	Greg	91/10/22
T/4-02	Olson	Darryll	91/10/22
T/4-03	Bailey	Ken	91/10/22
T/4-03	Bailey	Ken	91/10/22
T/4-04	Collins	Austin	91/10/22
T/4-05	Golden	K.C.	91/10/22
T/4-06	Arthur	Bill	91/10/22
T/4-07	Wistisen	Martin	91/10/22
T/4-08	Moses	Cheryl	91/10/22
T/4-09	Stearns	Tim	91/10/22
T/5-01	Warren	Jim	91/10/23
T/5-02	Beightol	Richard D.	91/10/23
T/5-03	Mason	Mike	91/10/23
T/5-04	Graham	Greg	91/10/23
T/5-05	Cochrane	Beverly	91/10/23
T/5-06	Johnson	Ronald	91/10/23
T/5-07	Sanders	Jim	91/10/23
T/5-08	Staudacher	Randy	91/10/23
T/5-09	Chambers	David	91/10/23
T/5-10	Mackay	Tom	91/10/23
T/5-11	King	Darrell	91/10/23
T/5-12	Beightol	Richard	91/10/23
T/5-13	Olson	Darrell	91/10/23
T/5-14	Dens	Joe	91/10/23
T/5-15	Eldridge	Steve	91/10/23
T/6-01	Wik	Sarah	91/10/24
T/6-02	Morse	Tom	91/10/24
T/6-03	Reller	Mark	91/10/23
T/6-04	Blum	Martin	91/10/23

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reproduced in the appendix. These comments are provided in two formats. Certain issues or themes recurred frequently throughout the comments received on the draft OA/EIS. Broader recurring themes in this category generally related to various relatively well-known factors contributing to the current status of the salmon stocks or to issues generated by the specific, limited 1992 focus of the OA/EIS. Many other recurring themes more narrowly targeted specific criticisms of the OA/EIS and often reflected coordinated responses among interest groups and formula letters. To facilitate responding to these recurring themes, comments of this type have been grouped into 17 common issues. The common issues are listed below, followed by a synopsis of the issue and the cooperating agencies' response.

Responses to all of the comments received are provided at the back of this appendix. Individual comments that relate to one of these common issues are referred to the master response for that common issue. Individualized responses are provided to all of the comments that do not represent a common issue.

The 17 common issues are listed as follows, in no particular order:

1. Additional analysis of spillway crest drawdown effects
2. Biological justification
3. Consequences of no action
4. Cost-effectiveness of actions
5. Flow/travel time/survival relationship
6. Habitat
7. Harvest
8. Hatcheries
9. Long-term vs. short-term impacts
10. Mitigation
11. Monitoring plan
12. Northwest Power Planning Council
13. Scope

14. Structural modifications

15. Transport program

16. Two-reservoir test drawdown

17. Need for emergency measures

The specific comments and aspects associated with these common issues are summarized in order below, along with a response addressing the issue.

Common Issue 1: Additional analysis of spillway crest drawdown effects.

Issue:

Many commentors requested refinements or additions to the impact estimates for the drawdowns to near spillway crest presented in the draft OA/EIS, particularly those presented in monetary terms. Most of these comments came from river user interests and reflected concern over impacts to their operations, primarily in the areas of irrigation and navigation. A common theme for both resource areas was to investigate much more fully the adverse secondary impacts resulting from disruption of irrigation or navigation on the affected pools. For example, a number of irrigation interests felt that more attention was needed to lost employment and income in food processing, agricultural service industries, farm-oriented financial operations, real estate and other economic activities that would be indirectly affected by a loss of irrigated production. Additional impact issues that were advanced for study included changes in asset value and reestablishment costs for long-term crop resources such as orchards and vineyards. Several commentors also felt that the treatment of increased pumping costs and pump modification costs should be expanded and estimates revised upward to fully account for any and all irrigation costs that might be incurred for future pumping plant modifications.

Navigation-related comments within this issue group typically requested detailed assessment of specific aspects of interrupted barge service on the Snake River. These included potential impacts on barge shipping rates, world grain prices, the Pacific Northwest's position in the world grain market, the adequacy of railcar supply, highway maintenance costs, deep draft shipping below Bonneville Dam, and specific business sectors or shipping-dependent geographic areas. Some of these comments requested quantification or more detail on issues addressed in the draft OA/EIS, while others identified new issues.

NPPCA stated or apparent belief associated with many of the comments in this issue group was that the final OA/EIS would be used as an information base or starting point for future river management actions. This belief appeared to be strongest in regard to assertions that a full accounting of all potential mitigation costs associated with drawdown to near spillway crest was required in the final document.

Response:

The cooperating agencies acknowledge that the actions evaluated in the OA/EIS raise many complex impact issues that are only partially understood and that there is much room for fruitful research into these issues. They also recognize that there is room for improvement or refinement in the impact estimates presented in the draft OA/EIS, particularly those for the options with the greatest impact. With respect to the options for drawdown to near spillway crest, however, there is extremely limited value to significant expansion of this assessment. The draft OA/EIS reflects an emphasis on evaluating primary or direct impacts, with quantification of those where possible and more qualitative assessment of secondary impacts. These results were sufficient to establish that drawdowns to near spillway crest could not be implemented in 1992, and the draft OA/EIS stated that these options were no longer under consideration for 1992. Therefore, additional investigation of the impacts of these options would not contribute to the selection of a preferred plan for 1992 and would not be a prudent use of resources.

This general response notwithstanding, impact estimates or discussion for these options have been revised in selected instances where changes were clearly warranted and were readily achievable. While the final OA/EIS will no doubt be consulted for information in the near future, it will not and should not be used as the ultimate accounting of all costs and impacts for the development and negotiation of long-term recovery actions. Longer term study programs such as the Corps' Columbia River Salmon Mitigation Analysis and the cooperating agencies' System Operation Review, and specifically targeted studies such as the Corps' separate investigation of lower Snake River pumping facilities, are much better suited to these types of objectives.

Common Issue 2: Biological justification for action

Issue:

Comments in this issue group appeared in two primary forms. One form stated that any flow measure undertaken in 1992 (or in future years) to help fish must be supported with clear biological evidence that fish survival would be improved. (Some comments demanded absolute biological proof.) Other comments went beyond this position to state that there was insufficient biological justification that the flow measures under consideration would benefit fish. Some of these comments indicated that the flow measures would provide minimal benefits that were not worth the costs to other resources. Others maintained that there was insufficient evidence that reduced water particle travel time would translate into improved juvenile fish survival or that water particle travel time was an inappropriate performance standard.

Response:

The biological objective used in the OA/EIS is based upon water particle travel time. Information is not available at this time to translate that quantitatively into salmon survival. However, it is generally accepted by the scientific community that there are fish survival benefits to reduced water particle travel time at least up to certain threshold levels (85-100 kcfs on the Snake River, 190-240 on the Columbia River).

Common Issue 3: Consequences of No Action

Issue:

A number of commentators felt that the treatment of the no action alternative in the draft OA/EIS was inadequate. Comments of this type almost universally stated that no action would lead to the extinction of the salmon stocks listed or proposed for listing under the Endangered Species Act (ESA). Therefore, the OA/EIS should explicitly acknowledge the risk of extinction and display all of the adverse impacts that this would bring in describing the no action alternative. Most of the comments raising this common issue came from formula letters, and most specifically mentioned the economic or socioeconomic consequences of no action.

Response:

The draft OA/EIS attempted to explain in several locations that no action in the context of this document and this decision process would be the continuation of

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existing conditions (actions implemented in 1985-1990) during 1992. These existing conditions are documented extensively, if not exhaustively, in Section 2 of the OA/EIS. This information describes in detail the migration and other survival factors faced by the salmon stocks, status and trends for the key stocks, the upstream and downstream passage conditions now existing in the river system, and actions to benefit passage currently incorporated into the operation of the system.

The need for further assessment of the no action alternative appears to hinge upon one's perception of the influence of 1992 actions, or lack of further action, on the long-term viability of the salmon stocks. If it were clear or likely that no change to existing conditions in 1992 alone would be sufficient to irreversibly prevent recovery of the salmon stocks, then the cooperating agencies would be obligated to display the consequences of extinction. Taking no action in 1992 (which is not the preferred plan) would not guarantee no action in 1993 or ensuing years, and there is no basis for predicting that no action in 1992 would cause ultimate extinction. It is worth noting that there appears to be a near consensus among interested regional parties that the primary objective for 1992 should be a drawdown test that might lead to future structural modifications to improve passage conditions. Implicit in this position is the belief that 1992 is not the last hope for the salmon, as the benefits from this test would not be realized for several more years. Because no action in 1992 would not plausibly result in extinction, there is no need to address the consequences of extinction in this short-term OA/EIS.

Another issue raised is the loss of economic benefit (in Idaho) attributed to fishing of these stocks. It is important to note that this document relates proposed actions for 1992 to the base condition years of 1985-1990. There has been no sport or commercial fishing of these stocks since the 1970s; therefore, the no action alternative would not result in a loss of economic benefits when compared to the base condition.

Common Issue 4: Cost-Effectiveness of Actions

Issue:

More than 120 comments on the draft OA/EIS addressed the cost-effectiveness of the proposed actions. Virtually all of these comments came from

river user interests, and the comments collectively suggested a degree of coordinated response among these parties. They noted that because river users would likely bear the brunt of the direct costs of any flow measures implemented, the selected plan should attempt to minimize the cost per unit of improvement in conditions for fish. Most of these comments also requested a full cost-effectiveness analysis be included in the final OA/EIS, and several parties endorsed the cost-effectiveness analysis submitted by one of the reviewers (Northwest Irrigation Utilities).

A cost-effectiveness analysis has been included in the FEIS. As part of this analysis, the costs listed in the DEIS have been refined. This cost-effectiveness information will be used in the plan-selection process.

Common Issue 5: Flow/Travel Time/Survival Relationship

Considerable space in the draft OA/EIS was devoted to a review of the existing research results addressing the relationships among flows, water particle travel time, smolt travel time, and smolt survival. This research must be used to provide the conceptual basis for any proposed actions to improve flows to benefit fish. There is considerable disagreement within the region over the correct interpretation of these research results. The regional fishery agencies and environmental interests tend to accept the results as demonstrating a strong and generally universal positive relationship between increased flow or velocity and increased smolt survival. Some elements of the scientific community and other parties believe that such a relationship does not exist across the entire range of flows or for all stocks.

In the draft OA/EIS, the cooperating agencies attempted to portray all views concerning these relationships and note the areas of uncertainty or conflicting information. The draft document also stressed that, while the flow/travel time/survival relationship was somewhat uncertain and not a specific quantitative expression, the agencies accepted the existence of a general relationship that provided sufficient justification for measures to reduce water particle travel time. A number of Federal, State and tribal fishery agencies within the region took exception to this approach, and to the presentation of some of the research results in the OA/EIS. The agencies provided coordinated, nearly identical comments that referenced new information or specific aspects of already cited research that they felt buttressed arguments in favor of a strong flow/survival relationship. A number of these comments also questioned the validity of the contrary research results

or the credibility of the researchers who are skeptical of a strong flow/survival relationship.

Response:

The discussion within this document portrays the scientific uncertainty that exists regarding the relationship between flow, travel time, and survival. In this discussion, the range in analysis among regional experts and their interpretations of the limited biological data was presented. The discussions avoided selecting one analysis as right or wrong, since all are based on the same database which is very limited. The Corps believes this issue should be presented to the public, since the flow/travel time/survival relationship is the basis for the drawdown experiment.

Common Issue 6: Habitat

Issue:

Loss or disruption of anadromous fish habitat was mentioned by a number of commentators. In some cases comments only referenced habitat loss as a factor in the decline of salmon stocks. Generally, however, commentators addressing habitat requested that actions to restore habitat be addressed in the OA/EIS and/or included in the selected plan.

Response:

See No. 12 below. Areas concerning loss of habitat are not within the scope of this document and, therefore, are not considered in this OA/EIS.

Common Issue 7: Harvest

Issue:

Many commentators raised the issue of harvest of adult fish, and its contribution to declining salmon populations. They usually referred specifically to gillnetting in the lower Columbia River or to the high-seas driftnet fishery, and requested action to curb these harvest efforts.

Response:

See No. 12 below. The Corps understands that there are many factors that have contributed to the decline of the salmon runs, of which harvest is one. However, it is not within the authority of the Corps of Engineers, the Bureau of Reclamation, or the Bonneville Power Administration to evaluate issues

or implement programs related to harvesting salmon. The cooperating agencies will focus on areas where they have authority to improve conditions for salmon. This OA/EIS deals only with improvements that can be made to in-river migration by changing the operation of dams within the Columbia-Snake River system.

Common Issue 8: Hatcheries

Issue:

Hatchery operations and the effects of hatchery fish on wild salmon have been prominent topics in the regional discussions over endangered species listings and potential recovery efforts. The cooperating agencies received several comments on the draft OA/EIS that requested changes in hatchery practices be included in proposed actions.

Response:

See No. 12 below. Modifications to the operation of hatcheries is outside the scope of this EIS. However, the Northwest Power Planning Council, through its amendment process, will be looking into modifications to hatchery operations.

Common Issue 9: Long-term versus Short-term Impacts

Issue:

The presentation of the scope and impacts in the draft OA/EIS created some confusion among reviewers concerning the timing and duration of impacts. Some of the comments in this group stated that the document was confusing because it mixed discussions of short- and long-term impacts, and the distinction should be clarified. Some commentators felt that any discussion of long-term impacts was improper because the OA/EIS focuses only on 1992 actions. Conversely, others argued that more attention should be given to long-term impacts, or requested assessment of specific issues that essentially are long term in nature.

Response:

The EIS includes impacts associated with actions to be implemented in 1992 only. Where possible, a brief description of the differences between the short-term (1992) impacts and impacts associated with long-term implementation that would require mitigation have been included in the final OA/EIS.

APPENDIX N

Common Issue 10: Mitigation

Issue:

Mitigation for the impacts of the proposed flow measures was one of the most contentious issues represented in the comments. Two distinct themes relating to mitigation are reflected in the comments. One of the themes can generally be characterized as the issue of compensation for the impacts to water users or other interests dependent on the rivers. Commentors in this group felt that it was very important for the OA/EIS to include a complete accounting of all of the costs that could result from impacts to water users, principally the costs of increased pumping requirements, pumping plant modifications, crop reestablishment, recreational facility repairs, highway repairs, commodity storage or alternative transportation usage, and dredging. Most of these comments also stated that the OA/EIS should include a commitment for the Federal government to undertake these mitigation measures directly or compensate those who would be affected.

The second mitigation theme related to the presentation of flow measures (mostly drawdown options) that did not include these mitigation measures as part of the proposed action. Most of these comments related to the options for drawdown of the lower Snake River projects to near spillway crest level. The draft OA/EIS indicated that these options would produce significant impacts to fish passage, irrigation, recreation and other uses, primarily because facility modifications to accommodate lower water levels could not be implemented in time for a 1992 drawdown. Many commentors took exception to this approach. The general statement of their position is that the proponents of drawdowns recognized that major facility modifications would need to be made before such drawdowns could be feasibly implemented, and never intended or proposed to implement drawdowns prior to mitigation. Therefore, it was unfair and misleading for the OA/EIS to address these options as potential 1992 actions, and to present impacts for unmitigated drawdowns. Most of these commentors also requested that the final OA/EIS include a reanalysis of these options with facility modification and other mitigation included as the basis for impact assessment.

Response:

The actions proposed in this EIS are for 1992 only. The objectives of these actions are twofold: (1) to improve in-river migration as an interim action for 1992 only, and/or (2) to obtain information that can be used in the development of a long-term solution. Therefore, a key objective of the 1992 action will be to collect information on impacts requiring mitigation and the extent of mitigation required. It was necessary to identify the potential impacts of 1992 implementation of proposed measures to clarify why some were not feasible in 1992.

Common Issue 11: Monitoring Plan

Issue:

The cooperating agencies' plans for monitoring actions contemplated for 1992 received considerable interest from reviewers. Comments on monitoring took a variety of forms. Some affirmed the need to carefully monitor test conditions so as to develop useful data for future applications. Others requested that specific types of studies or parameters be included in the monitoring program. Another common theme was that the final OA/EIS needed to provide much more detail on the monitoring program that was proposed, so that its adequacy could be reviewed. Some comments also stipulated or suggested needs for agency coordination in developing and conducting the monitoring studies.

Response:

A monitoring plan for a physical test drawdown in 1992 is being developed. Input into this plan has been provided by fisheries agencies and tribes as well as other agencies and organizations from throughout the region that are interested in operation of the Columbia-Snake River System. The information obtained from the monitoring will be helpful in developing a complete, long-term program.

Common Issue 12: Northwest Power Planning Council Actions

Issue:

The Northwest Power Planning Council has been involved in a concurrent process to amend its regional Fish and Wildlife Program to incorporate mainstem survival measures and other fish conservation actions. Because of the overlap in scope and timing of this process with the OA/EIS, many commentors were

confused about the two processes or concerned over proper coordination of efforts.

Response:

Both the OA/EIS and the NPPC plan address some of the same alternatives associated with improving migration conditions. However, the OA/EIS evaluates only those alternatives that can be implemented in 1992. The NPPC plan includes many other proposals which are outside the scope of this OA/EIS (see Common Issue No. 13).

Common Issue 13: OA/EIS Scope

Approximately 140 comments on the draft OA/EIS addressed the scope of the document. A few indicated that the scope was too broad, and that the actions addressed in the OA/EIS were premature. Most, however, stated that the scope was too narrow in time (that it should extend beyond 1992), geographic extent, or the type of actions covered. For example, some commentators in this group felt that there had been enough study and testing, and that it was now time for more concrete action.

Response:

The scope of the EIS was limited to operation changes in the dams within the Columbia-Snake River System only for 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS includes a representative number of alternatives that would affect the operation of projects within the Columbia River Basin. The objectives of these alternatives are to improve in-river migration conditions and to collect data that can be used in the development of long-term improvements to salmon migration.

Common Issue 14: Structural Modifications

Issue:

Much of the concern over fish passage conditions involves the current structural configurations of the mainstem dams. The fish passage facilities at these dams operate effectively when the reservoirs are operated within their normal elevation ranges. If the reservoirs were drafted to provide the equivalent flow velocities desired by the fishery agencies, both upstream and downstream fish passage facilities would not function and fish mortality would increase. Consequently, many parties within the region are proposing that the fish

passage facilities or the dams themselves be modified to provide effective passage in both directions at drastically lowered reservoir elevations.

Response:

See No. 13 above. The Corps, in cooperation with the Northwest Power Planning Council, through their Northwest Power Planning Council Fish and Wildlife Program amendment process, is looking at potential structural modifications to the dams to mitigate for the various impacts identified in the EIS. The Corps is working on a reconnaissance-level study of the necessary dam modifications necessary to implement a four-reservoir drawdown on the lower Snake River as a long-term solution to improving downstream salmon migration. The scheduled completion date for that study is November 1992.

Common Issue 15:

Issue:

More than 40 comments addressed the juvenile fish transportation program that has been operated on the lower Snake and Columbia Rivers since the 1970s. Opinions on this program were sharply divided. A number of fishery agencies, environmental groups, and individuals offered strong criticism of the program, maintaining that it does not work and that a solution to provide in-river downstream migration must be developed. Some of these commentators felt that the inability to transport fish during drawdowns below minimum pool levels would be a benefit and not a detriment. Conversely, many other reviewers praised the transportation program as a success and recommended that improvements to or expansion of the program be a major emphasis in a recovery program. Many of the pro-transportation comments also recommended experimental use of a relatively new concept of floating net pens in place of enclosed barges.

Response:

See No. 13 above. Because of the limited scope of the EIS, no improvements in the transportation program are included in this EIS. It is true that for many stocks of fish the existing fish transportation program has been very successful. The Corps, in cooperation with the Northwest Power Planning Council through their Fish and Wildlife Program amendment process, will be looking into improvements in this and other programs to benefit salmon.

APPENDIX N

Common Issue 16: Two-reservoir Test Drawdown

Issue:

Among comments supporting a specific alternative or option, the most common proposal was a 4- to 6-week test drawdown of Lower Granite and Little Goose reservoirs on the lower Snake River. Lower Granite would be drawn down to near spillway crest level, and Little Goose would be drafted low enough to simulate tailwater conditions that would occur with the reservoir near spillway crest. This test would be done in the winter when few or no migrating fish would be present, with many comments specifically mentioning January or February as the preferred time. Many of these comments were delivered in formula letters, but the two-reservoir test drawdown was also proposed by several agencies and elected officials.

Response:

A new alternative physical test drawdown has been added to the final OA/EIS. This proposal consists of dropping Lower Granite Reservoir down to near spillway crest while lowering Little Goose Reservoir up to 15 feet below MOP. This would be a 4-week test starting on March 1, 1992.

Common Issue 17: Need for Emergency Measures

A significant number of commentors stated that the draft OA/EIS did not adequately acknowledge the urgency of the problem facing the salmon stocks. Most of these comments requested explicit recognition of the need for emergency measures to modify the dams or river operations. Formula letters accounted for most of the comments on this issue.

Response:

The Corps has initiated studies to evaluate potential structural modification of the dams to mitigate for various impacts which are identified in the OA/EIS. The Corps is working on a reconnaissance-level study of the necessary dam modifications necessary to implement a four-reservoir drawdown on the lower Snake River as a long-term solution to improving downstream salmon migration. The scheduled completion date for that study is November 1992.

Federal

Letter F1, Hon. Larry LaRocco, U.S. House of Representatives, Idaho, November 1, 1991

- Comment F1-1: Economic impacts of drawdown of reservoirs.
- Response F1-1: Comment noted.
- Comment F1-2: Design of drawdown test.
- Response F1-2: Many experimental designs have been and will continue to be considered as the region works to protect and enhance the Columbia River System Salmon. However, the scope of the OA/EIS was limited to operational changes within the Columbia and Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. Your recommended approach to test drawdown effectiveness in a series of phases over a number of years may be considered in other on-going studies.
- Comment F1-3: Federal funding of implementation.
- Response F1-3: Comment noted.
- Comment F1-4: Cost-effectiveness calculations of alternatives.
- Response F1-4: See response to Common Issue No. 4.
- Comment F1-5: Amendments to ESA.
- Response F1-5: Comment noted.
- Comment F1-6: Wild stocks vs. hatchery stocks.
- Response F1-6: Comment noted.
- Comment F1-7: Private interests for conservation planning and incidental take permits.
- Response F1-7: Comment noted.
- Comment F1-8: Requesting appropriations.

Response F1-8: Comment noted.

Letter F2, Department of the Interior (Charles S. Polityka, Regional Environmental Office), November 14, 1991

Comment F2-1: Drawdown below MOP.

Response F2-1: No response necessary.

Comment F2-2: Drawdown test.

Response F2-2: Your understanding of the two-reservoir drawdown test is accurate, except that it would only extend through April 1. Normal navigation lock outage has been planned to occur during this period, if the test occurs. Although some scouring in the Snake and Clearwater Rivers confluence area is expected, it is doubtful that the need for dredging will be alleviated. Subsequent spring and summer flows will not be affected because flows will not be augmented for the proposed two-reservoir drawdown test.

The Corps is currently working with the National Marine Fisheries Service to ensure impacts to the fisheries are minimized. This work is expected to include a survey accomplished by a diving team to evaluate the possible presence of fall chinook (spawning) below Lower Granite Dam. The test will be designed to prevent significant impacts to these fish. The emergency fish ladder system at Lower Granite Dam will be operated down to forebay elevation 710 msl. Below that the ladder will be dewatered and any fish in the ladder will descend the ladder and return to the tailrace, as occurs each year for ladder maintenance. It will not be necessary to salvage fish from the ladder since they will naturally evacuate as it drains.

The drawdown test plan being developed includes monitoring velocities and dissolved gas levels at a variety of different flows created by dam operations utilizing overnight pondage. Monitoring of turbine operations has also been incorporated into the plan.

Comment F2-3: Drawdown vs. flow augmentation.

Response F2-3: No response necessary.

Comment F2-4: Flow augmentation options.

Response F2-4: The cooperating agencies have adopted the Northwest Power Planning Council's (NPPC) amended flow improvement measures which are, for the Snake River, essentially on a sliding scale. For the lower Columbia River, the Target-200 flow proposal at The

Dalles is, in essence, in line with NPPC amendments. See response to comment S-14.

Comment F2-5: Flow needs for subyearling chinook salmon.

Response F2-5: Much of these data were added to the Final OA/EIS. However, at this time, the cooperating agencies will not address any new flow scenarios for the 1992 program.

Comment F2-6: Support for test.

Response F2-6: No response necessary.

Comment F2-7: Flow augmentation option from storage in upper basins.

Response F2-7: Because much of the storage in upper Snake River projects (e.g., Lucky Peak, Cascade, and American Falls) is dedicated for irrigation, and agreements were not in place for use of upper Snake River storage for flow augmentation in 1992, water from these projects was not built into the EIS alternatives. Due to the compressed time schedule of this EIS, constraints had to be placed on the extent of projects considered in alternatives. Many upper Columbia river projects (e.g., Hungry Horse and Libby) were not considered because of the lack of time needed to do the required analysis.

Comment F2-8: Identification of preferred alternative.

Response F2-8: A preferred alternative has been chosen, and is described in the text. The first round of public meetings was designed to allow discussion of options and to help reviewers understand tradeoffs, etc. There will not be sufficient time to hold a second series of workshops to discuss final plan selection, but two public information meetings will be held.

Comment F2-9: Combination drawdowns and flow augmentation.

Response F2-9: Flow augmentation schemes, in addition to Snake River projects at MOP and John Day reservoir at 262.5 msl, are included in the preferred alternative, as described in the text. Drawing the Bonneville and The Dalles pools down to MOP was not preferred because of the extent of the impacts that would result compared to the relatively minor decrease in water particle travel time.

Comment F2-10: Recreation and socioeconomic impacts.

Response F2-10: The text has been modified to include specific reference to the possibility of these types of recreation economic impacts. However, a more detailed assessment would require specific information that is not currently available. Within the time horizon of this EIS, it is not possible to predict how the physical changes identified in the EIS would translate into changes in fish and game populations, and how these would in turn relate to fishing and hunting activity levels, recreational expenditure patterns, and effects on local economic entities. It also is not clear whether these types of changes could result from a 1992 action, or whether a long-term pattern of operation at MOP would be required before these impacts would appear.

Comment F2-11: Dredging issues.

Response F2-11: The dredging program is described in general terms in the OA/EIS. The environmental impacts of the dredging program were addressed in separate environmental assessments prepared by the Corps' Walla Walla and Portland Districts. These NEPA documents are incorporated in the 1992 OA/EIS by reference. The Corps will continue to coordinate the dredging activities with the FWS, NMFS, and other resource agencies.

Comment F2-12: Lack of detail and specificity.

Response F2-12: The cooperating agencies recognize that much of the information in the EIS is aggregated or summary in nature. To a great extent this is by design, in order to maintain proper focus on the issues that are most important in evaluating options for management of a complex river system in 1992. The overall level of detail is also limited somewhat by the need to evaluate and implement a course of action by early 1992. Nevertheless, the cooperating agencies are confident that the analysis is sufficiently detailed to enable and support the decision under consideration.

The level of detail in the EIS also varies somewhat among resource and geographic areas. The drawdown options have the potential for geographically extensive impacts in virtually all resource areas, while impacts from flow augmentation would be more limited geographically and by resource type. Most of the impacts from flow augmentation are driven by changes in reservoir elevations. The reservoir regulation data in Section 3.4 of the OA/EIS clearly demonstrate that elevation changes at Lake Roosevelt would be small in magnitude (generally 5 feet or less), low in probability, and limited to a portion of the annual refill period. These factual results support the impact conclusions in areas such as cultural and recreation resources.

The scoping of this EIS determined that primarily existing data would be used in evaluating alternatives. The monitoring that will occur with whatever action is implemented in 1992 will provide more data on which to base plans to further improve conditions for the salmon. The cooperating agencies feel that we have enough information to make informed decisions for 1992 action.

Comment F2-13: Impacts on kokanee salmon fishery at Lake Roosevelt.

Response F2-13: Text has been modified. See responses to S2-14 and S2-19 regarding monitoring.

Comment F2-14: Adverse impacts to cultural resources at Grand Coulee.

Response F2-14: Proposed cultural resources actions will be coordinated with the State Historic Preservation Offices of Washington, Oregon, and Idaho, along with the Advisory Council on Historic Preservation, appropriate Indian tribes, and other interested agencies and groups. Key components of the evaluation process will be the preparation of a comprehensive overview of all identified cultural resources sites located within the project area and development of a monitoring program for assessing project impacts to sites. This information will be used in turn, to develop long-range management plans and strategies for project sites. Mitigation requirements for project impacts to cultural resources may range from simple in situ documentation to detailed data recovery and preservation plans. Potential vandalism of sites might be prevented by use of additional enforcement personnel. There would be no constraint on when these actions could begin.

Comment F2-15: Effect upon aluminum smelting industry.

Response F2-15: Several unsuccessful attempts were made to contact representatives of the aluminum industry to determine potential impacts to it. Increased electricity rates from lost firm power generation would negatively affect the part of the aluminum industry deriving power from the affected hydroelectric plants. The effect of this rate increase cannot be determined at this time, particularly in light of the other major factors (supply and demand, overall long-term energy prices, commodity prices, etc.) which impinge upon the industry.

Comment F2-16: Continuation of status quo unacceptable.

Response F2-16: Continuation of the status quo is probably not acceptable. The efforts of the cooperating agencies to put this OA/EIS together

should convey that business as usual is not preferred. See common issue response 3 and response to comment I33-1.

Comment F2-17: Insufficient knowledge of effects of drawdown.

Response F2-17: Yes, there is much that we don't know. The proposed drawdown test is designed to give us more data relevant to measures proposed to assist in recovery of the fish runs. The data we acquire will help us to improve conditions and plan for the future. Recovery of fish runs may be the goal, but many other issues must be balanced with that goal.

Comment F2-18: BLM recommendation.

Response F2-18: Recommendation noted. The Fish Passage Development and Evaluation Program (FPDEP), established in 1951 and coordinated and funded by the Corps, is an ongoing intensive effort by the Corps and many other agencies and universities in the region to conduct research designed to increase our knowledge on how to improve juvenile and adult salmonid passage in the Columbia River Basin. A comprehensive monitoring program (identified in the OA/EIS) will be included in whatever action is implemented in 1992. The preferred alternative includes limited drawdown operations during peak smolt migration periods and will include close monitoring of biological resources. Indeed, cooperative efforts are essential for success of such an extensive undertaking. However, the cooperating agencies have limited authority and can't evaluate all areas (e.g., habitat, harvest) needed to comprise a holistic approach to the problem.

Comment F2-19: The Dalles Dam inflow increases.

Response F2-19: The 10 kcfs reference is correct.

Comment F2-20: Flow augmentation for temperature control.

Response F2-20: See text changes.

Comment F2-21: Monitoring of drawdown effects on wildlife.

Response F2-21: Wildlife resources are included in the monitoring program, as discussed in Section 5.5.

Comment F2-22: Wildlife agencies in Columbia Basin Fish & Wildlife Authority.

Response F2-22: The text has been changed as requested.

Comment F2-23: Predation on juvenile salmon.

Response F2-23: The statement on page ES-12 refers to fish not transported. Those fish would be subjected to passing predators in all Snake and Columbia river pools compared to those transported. Even if predator abundance per pool were to be reduced, it would still be higher for fish not transported than for transported fish.

In the discussion of predation (Section 4.2.1.8), the OA/EIS does not predict whether predation would increase or decrease. Some factors would work to increase predation while others would reduce it, and the balance among these factors is unclear. At this point, it cannot be concluded that it will decrease with drawdown for one season.

Comment F2-24: Snake River flow levels.

Response F2-24: The text reference has been clarified as indicated.

Comment F2-25: Selection of preferred plan.

Response F2-25: Criteria designed for selecting the best plan to increase fish passage and survival would have that single goal in mind. The best plan for fish may not necessarily be clear-cut and may cause high impacts for other concerns. Tradeoffs between segments of the system need to be identified in order to make informed decisions. The cooperating agencies have chosen criteria that reflect the necessary balance between the many different resources/uses of the system.

Comment F2-26: Transportation.

Response F2-26: The benefit of transportation for steelhead and fall chinook has been well documented in various National Marine Fisheries Service annual and/or comprehensive reports prepared since the mid-1970's. The most recent transport return data for the 1986 spring chinook study at Lower Granite Dam (Matthews et al. 1991) indicates a 1.6:1 return for transported/nontransported fish (95% CI of 1.01, 2.47), with reasonably good flow and spill conditions in the Snake River providing better in-river migration conditions and assumed higher survivals of in-river fish and a lower transport/control estimate. NMFS now recommends transporting spring chinook salmon smolts from the Snake River collector dams under all flow conditions (Matthews et al. 1991). The T/C for steelhead marked in 1986 was 2.0, with a 95% CI of 1.43, 2.66. See discussion in text, Chapter 2.

The question of return to spawning ground and differences in homing/delay/timing of transported vs. non-transported adult salmonids (JFT-93-XX-1) has been discussed within the FPDEP arena (Needs and Priorities subcommittee). With current methodology and technology available for marking studies, it is not feasible to mark the number of fish required for such a study. However, there is no evidence that there is a problem with homing, delay or straying due to transportation, either downstream from or at Lower Granite (return point of all previous studies) or to spawning grounds, at least as observed in spawning ground surveys (Chapman et al. 1991).

Comment F2-27: White sturgeon.

Response F2-27: The text has been revised.

Comment F2-28: Salmon harvest.

Response F2-28: Text changed.

Comment F2-29: Bacterial kidney disease.

Response F2-29: Text changed.

Comment F2-30: Impacts of project development.

Response F2-30: The cooperating agencies acknowledge that flooding of riparian habitats by hydroelectric projects has significantly reduced the extent of riparian habitats and that the wildlife are dependent on these habitats. However, the purpose of this EIS is to assess the impacts of the proposed alternatives, not to assess the original impacts of project development or the impacts of the existing conditions on the natural state.

Comment F2-31: Marina facilities.

Response F2-31: Information in Table 2.12-1 concerning the Grand Coulee project was obtained from the Lake Roosevelt Official Guide and Map (undated) published by the National Park Service. Information concerning marina facilities added to Table 2.12-1 was based upon personal communication with S. Dotson of the National Park Service (Coulee Dam National Recreation Area, Visitor Information Office) on November 26, 1991.

Comment F2-32: Availability of water.

Response F2-32: The text has been modified to reflect these additional contingencies.

Comment F2-33: Dioxin and smelter slag effects.

Response F2-33: Information is not available to reliably address this issue. The anticipated effects of the proposed actions do not suggest there would be a change related to these pollution sources.

Comment F2-34: Travel time and flow models.

Response F2-34: Text additions made.

Comment F2-35: Kindley analysis.

Response F2-35: Text additions made.

Comment F2-36: "Giorgi (1991)"

Response F2-36: This document citation has been retained in the EIS. Some modifications to the text were made based on review comments received.

Comment F2-37: Travel-time data for PIT tagged fish.

Response F2-37: See response to S29-77 for this paragraph.

Comment F2-38: Models sharing relation between travel time and flow.

Response F2-38: See text changes.

Comment F2-39: Polynomial model.

Response F2-39: The statement has been retained, as it describes the results of this analysis.

Comment F2-40: Linear model.

Response F2-40: See text changes.

Comment F2-41: Subyearling Chinook/relation between travel time and flow.

Response F2-41: See text changes.

Comment F2-42: Berggren & Filardo analysis.

Response F2-42: See text changes.

Comment F2-43: Flow and spill.

- Response F2-43: See text changes.
- Comment F2-44: Misleading table caption.
- Response F2-44: See text changes.
- Comment F2-45: Stranding of salmonids.
- Response F2-45: See text changes.
- Comment F2-46: Net pen rearing in Lake Roosevelt.
- Response F2-46: Text has been modified.
- Comment F2-47: Reduction of zooplankton impact on kokanee salmon.
- Response F2-47: The material on resident fish has been expanded to more fully address these effects.
- Comment F2-48: Impacts of terrestrial habitats and species.
- Response F2-48: Notations of impacts from drawdown of the lower Columbia projects to MOP have been expanded in the summary table on page 4-73. Information presented in the 1981 Corps report cited (*Study of Impacts of Project Modification and River Regulation on Riparian Habitat and Associated Wildlife*), however, is not comparable to the potential impacts of drawdown of the lower Columbia reservoirs. The 1981 report addresses combined impacts of flooding and dehydration of vegetative communities.
- Economic impacts and impacts to human uses of wildlife are addressed in Sections 4.10 and 4.13, respectively.
- Comment F2-49: Impacts of John Day drawdown.
- Response F2-49: An error was noted in the summary table on page 4-73 under the impacts of drawdown of John Day to 262.5 feet and McNary to 337 feet. Impacts of this alternative to terrestrial ecology are now addressed in this table.
- Drawdown impacts to agricultural activities are discussed in Section 4.8.
- Comment F2-50: Riparian vegetation impacts.
- Response F2-50: See response to F2-30.

Comment F2-51: Riparian community losses.

Response F2-51: Text has been modified in paragraph 2 of Section 4.4.2 to eliminate the contradiction identified.

Comment F2-52: Effects on colonial nesting birds.

Response F2-52: Impacts to colonial nesting birds have been described in more detail in Section 4.4.10.

Comment F2-53: Determination of effect on bald eagles.

Response F2-53: Based on existing information, "determination of effect" on bald eagles has been stated as clearly as possible in Section 4.4.11.2.

Comment F2-54: Regional wildlife mitigation program.

Response F2-54: The cooperating agencies will take this program into account as they continue to coordinate their river management activities with fish and wildlife agencies.

Comment F2-55: Determination of original habitat losses.

Response F2-55: The text in Section 4.4.15 has been changed as suggested.

Comment F2-56: Establishment of flow targets.

Response F2-56: The cooperating agencies have proposed flow targets for flow augmentation that have been found to provide the greatest improvement with the most reasonable impacts. The system operation changes proposed for 1992 are not considered to be "minor". See responses to Common Issues 4, 10, 13, and 14.

Comment F2-57: Impacts on other fish and wildlife resources.

Response F2-57: No response necessary.

Letter F3, U.S. Department of Agriculture, Forest Service (Gordon Haugen, Columbia River Basin Fish and Wildlife Coordinator), November 13, 1991

Comment F3-1: Support of alternatives.

Response F3-1: No response necessary.

***Letter F4, Pacific Fishery Management Council (Philip Anderson, Chairman),
November 13, 1991***

Comment F4-1: Support of testing innovative methods.

Response F4-1: No response necessary.

Comment F4-2: Pretest of drawdowns.

Response F4-2: No response necessary.

Comment F4-3: Combination of drawdown and flow augmentation.

Response F4-3: No response necessary.

***Letter F5, U.S. Department of Agriculture, Forest Service (Arthur J. Carroll, Area
Manager), November 14, 1991***

Comment F5-1: Importance of protection of salmon.

Response F5-1: No response necessary.

Comment F5-2: Proposals consistent with National Scenic Area Act.

Response F5-2: No response necessary.

***Letter F6, U.S. Department of the Interior, Fish and Wildlife Service (Ronald J.
Pascho, Microbiologist), October 4, 1991***

Comment F6-1: Bacterial kidney disease.

Response F6-1: Text changed.

Comment F6-2: Percentage of BKD in smolts.

Response F6-2: Text changed.

Comment F6-3: BKD in juveniles.

Response F6-3: Text changed.

Comment F6-4: Incidence of BKD in wild fish.

Response F6-4: Text changed.

Comment F6-5: Reduction of BKD in hatchery fish.

Response F6-5: Text changed.

Letter F7, Department of Health & Human Services (Kenneth W. Holt, National Center for Environmental Health and Injury Control), November 7, 1991

Comment F7-1: Human health impacts.

Response F7-1: Textbooks use 4.13E-08 as a standard format of scientific notation. Excel and Lotus software are capable of recognizing this format. It should also be noted that databases used to report risk assessment information all use the 0.00E±00 notation.

Appendix B has been modified to include the assumptions and parameters used to derive the preliminary risk, and all abbreviations have been defined.

As stated in text, to provide a more realistic evaluation of potential health effects associated with exposure to Columbia-Snake River water and sediment, additional media-specific data (i.e., sediment, water column, and fish tissue concentrations) would be required. In order to provide a preliminary health risk evaluation, many assumptions were made regarding concentrations, parameters, and dilution factors. Therefore, the risk evaluation presented is based on extremely conservative scenarios (i.e., overestimation of risk).

Comment F7-2: Contraction of cancer from smoking.

Response F7-2: Text has been modified.

Comment F7-3: Dam safety.

Response F7-3: No response necessary.

Letter F8, Environmental Protection Agency (Robert S. Burd, Director, Water Division), November 15, 1991

Comment F8-1: Rating of drawdown and flow augmentation.

Response F8-1: Comment noted. Additional information has been included in the final OA/EIS. Comprehensive monitoring is planned and will be handled through the appropriate work group. See responses to specific comments below.

Comment F8-2: Dissolved gas levels.

Response F8-2: The text notes the Federal criterion for dissolved gas in several locations (Section 2.3.1, summary table Section 4.1). The summary

table in Section 4.1 has been revised to emphasize the criterion to allow direct comparison for each alternative.

Comment F8-3: Sediment resuspension.

Response F8-3: Within the time constraints and scope of the EIS, an attempt was made to address these concerns. The complex interactions and localized effects of sediment resuspension preclude a more detailed discussion of the impact of this process on systemic temperature and dissolved oxygen profiles. Ongoing and continuous dredging programs reduce potential for resuspension by removing sedimentary material. Potential impacts from disease organisms stem primarily from potentially exposed outfalls (Section 4.1.4.3) and are noted. Based on available information, these potential impacts do not appear to be very significant.

The effect that change of bottom topography has on fish resources would be very speculative at this point and will not be addressed. The EIS discusses loss in shallow-water habitat (Section 4.2.1.9). It is not known for sure what will happen to temperature, and the possible effects of this in the fisheries section under temperature has been discussed already (Section 4.2.2.4). A discussion was added for temperature, sediment, and disease.

Comment F8-4: Sediment analysis data.

Response F8-4: The EPA (Corvallis, OR) has been furnished a draft copy of the lower Snake River sediment analysis report. This report, prepared by Battelle/Marine Sciences Laboratory, summarizes the contaminant analyses of sediment samples taken throughout Lower Granite Reservoir, including sediments found likely to be resuspended during drawdown of Lower Granite below MOP.

Comment F8-5: Outfall depth/exposure.

Response F8-5: The EIS notes the potential for exposed outfalls (Section 4.1.3.1 and Section 4.1.4.3). The Corps and BPA do not maintain records on individual discharges, and specifically on length and depth of diffuser or piped discharge locations and quality. The effort required to compile, analyze, and summarize these data into a useable format was beyond the scope and time constraints of this document. In addition, uncertainties in the exact downstream conditions make it extremely difficult to predict potential violations and appropriate remedial measures. As information becomes available through the comment process, it will be incorporated into the document.

Comment F8-6: Effects of gas saturation on aquatic life.

- Response F8-6: See text additions to Section 4.2.1.9.
- Comment F8-7: Riparian zones and wetlands.
- Response F8-7: The cooperating agencies acknowledge the importance of riparian zones to wildlife. Impacts of the proposed alternatives to vegetative communities are assessed as completely as possible based on the information available.
- Comment F8-8: Project timing.
- Response F8-8: No response necessary.
- Comment F8-9: Drawdown of Snake River pools to spillway.
- Response F8-9: No response necessary.
- Comment F8-10: Adult survival.
- Response F8-10: All of these individual factors in the text except fish pathogens have been covered. There is not enough information about likely changes to permit speculation on effects. However, the Corps knows of no specific reason to believe levels will increase from any of the activities.
- Added text to Section 4.2.2.4.
- Comment F8-11: Effect of drawdown and dredging on sturgeon and shad.
- Response F8-11: The scope of the EIS was limited to management changes to the operation of the Columbia/Snake River System only. Dredging is not included in the scope. Effects on white sturgeon and shad were addressed in Section 4.2.3.
- Comment F8-12: Community and habitat effects.
- Response F8-12: The habitat creation efforts (conducted through the Lower Granite Sedimentation Study) will be monitored by Dr. David Bennett as part of his ongoing monitoring work. Other efforts to monitor habitat impacts include aerial flights.
- Lower than normal flows during reservoir refill should not have an impact since refill to minimum operating pool will be achieved as part of the test plan.
- Comment F8-13: Turbidity levels.

Response F8-13: Further discussion was added to the juvenile fish section. Turbidity levels exceeding state standards are anticipated to be very localized with little overall effect on fish.

Comment F8-14: Transportation.

Response F8-14: Conversion to rail or truck transport would lead to increased air emissions. However, there must be a direct effect before these indirect effects would occur, and the transportation analysis concluded there would be little shifting from barge to rail or truck transport.

Comment F8-15: Electric power.

Response F8-15: The possibility for indirect effects in the form of air emissions from replacement power sources is acknowledged in Section 4.6 of the EIS.

Comment F8-16: Monitoring.

Response F8-16: Water quality monitoring will be conducted to evaluate potential impacts, and will be coordinated with present water quality management efforts. A water quality monitoring plan for the preferred alternative actions is being developed by Corps personnel (in cooperation with EPA and other agencies) that will address dissolved gas, contaminant, nutrient, turbidity, etc. problems that could occur with reservoir drawdown. At this time, cumulative impacts to the estuary will be monitored only as can be accomplished within the scope of the individual monitoring actions occurring within the project areas (i.e., dissolved oxygen, gas supersaturation, velocity, temperature).

Because the proposed drawdown test is limited to the time period when fish activity is minimal, monitoring will not target fish species or their community dynamics. Focus will be placed on operational and structural impacts and water quality-related impacts. Your comment is noted that positive and negative effects be monitored. To the extent possible, this will be done during the monitoring effort. Development of the monitoring program is underway and will be coordinated with involved regional interests.

Comment F8-17: Water flow alteration data.

Response F8-17: The 1991 operations of minimum operating pool and expanded water budget releases will be reviewed. All available information is being used to help understand system limitations. As indicated in the F-EIS, new monitoring stations indicated that gas saturation levels

were exceeded with the spill for fish program at Lower Monumental. This information is being used to assess potential impacts associated with below MOP alternatives.

Comment F8-18: Initial test of drawdown effects.

Response F8-18: Such a test is a part of the two-reservoir Snake River drawdown proposed as part of the preferred alternative. See also response to Common Issue No. 16.

Comment F8-19: Information on pre-dam river flows.

Response F8-19: Pre-dam river flow information is available (USGS data). Chapman et. al (1991), Waples et. al (1991) and Matthews and Waples (1991) provide some review of evolutionary requirements of juvenile salmonids. It is generally accepted that in addition to flow itself, other parameters (degree of physiological advancement, temperature, turbidity, photoperiod) play a role in directing the timing of and response to migration. The EIS attempts to portray the range in analyses among regional experts and their interpretations of the biological data.

Comment F8-20: Hatchery vs. wild fish.

Response F8-20: No response necessary.

Comment F8-21: Flow augmentation vs. drawdown.

Response F8-21: No response necessary.

Comment F8-22: Other modifications.

Response F8-22: No response necessary.

Comment F8-23: Effects of loss of transport.

Response F8-23: Because the cooperating agencies cannot accurately predict the benefits (i.e., increased survival) of actions that eliminate juvenile transport (i.e., those below MOP), it cannot be determined whether the loss of transport will be offset by increased survival. We only know for sure that transport will be impossible under these conditions. The importance of the loss of rearing habitat is not currently quantifiable, so the effect of this on overall survival can not be stated in terms of number or percent of fish lost.

Letter F9, National Marine Fisheries Services (Merritt E. Tuttle, Division Chief, Environmental and Technical Services Division), November 15, 1991

Comment F9-1: Hydrosystem planning for the future.

Response F9-1: It is unclear how operational changes proposed in the final OA/EIS will be incorporated into systemwide planning under the Columbia River Treaty and Pacific Northwest Coordination Agreement. We recognize that ad hoc actions must be taken in the near-term since annual operating plans were developed without foreknowledge of measures contemplated for the 1991/92 operating year. However, the process by which measures targeted for the 1992/93 operating year and beyond are to be included in system planning should be discussed, at least at the conceptual level. This would enable an assessment of the likelihood that flow objectives for fish would be met under a variety of potential runoff conditions and operational constraints.

Comment F9-2: Limited range of alternatives.

Response F9-2: The scope of alternatives was limited due to the limited time available to conduct the OA/EIS. Further augmentation from Brownlee is not recommended because the cooperating agencies have no authority to control Brownlee operations for fish flow purposes. No summer flows for juveniles are discussed since this will be evaluated through the System Operation Review process.

Comment F9-3: Consideration of additional flow measures.

Response F9-3: The limited scope identified included only Grand Coulee, Mica and Arrow, and does not include Montana projects. Therefore, only limited flow augmentation for Columbia River projects was included. The limited scope was considered to be necessary due to the extremely expedited schedule for completing this OA/EIS.

Comment F9-4: Potential for greater water volume.

Response F9-4: No storage for flow augmentation above Brownlee will be recommended. This storage is dedicated to irrigation.

Comment F9-5: Uncertainty of flow/survival relationship.

Response F9-5: No response necessary.

Comment F9-6: Correlation between travel time and flow.

Response F9-6: Comment noted, recent data noted in Final OA/EIS.

Comment F9-7: Recommendations for drawdown test.

Response F9-7:

- a. Not feasible for 1992 due to the NEPA process because the Record of Decision won't be signed prior to mid-February.
- b. This has been attempted as indicated in OAD/EIS. Modeling at the WES facility is proposed for those elements adaptable to modelling.
- c. This is the proposed plan (Lower Granite, Little Goose).
- d. This is anticipated with the 703-705 elevation pool operation which will allow simulated flow tests.
- e. Comment noted.
- f. This is included in proposed testing.
- g. This is included in proposed testing.
- h. The state will have management responsibility for fish stranded outside of immediate Corps facility. The Corps will monitor and, as necessary, rescue fish within the gatewells, ladders, and other structures.
- i. This is included in strategy planning.
- j. This is included in test plan.

Comment F9-8: Recommendation of flow augmentation.

Response F9-8: No response necessary.

Comment noted.

Letter F10, Hon. Larry E. Craig, U.S. Senate, Idaho, November 15, 1991

Comment F10-1: Clarify current operations.

Response F10-1: The section describing fish transport (2.2.4.2) has been revised.

Comment F10-2: Suggested flow option.

Response F10-2: Water from Brownlee has been eliminated from further consideration. See responses to comments I-39.1 and A-21.3. Inflow to Dworshak is less than 2.6 MAF in 1 out of 3 years. The compressed schedule for this EIS limited the number of reservoirs

that could be considered for flood control transfer. Time constraints also require that no new alternatives be evaluated; a preferred alternative has been chosen for 1992. However, your contribution is appreciated and may be considered during future flow augmentation planning (SOR).

Comment F10-3: Option F infeasible.

Response F10-3: The EIS recognizes that in many years there would not be sufficient water to meet a 140 kcfs target, and that attempting to do so could have significant impacts. This option has not been recommended for implementation in 1992.

Comment F10-4: Focus on realistic options.

Response F10-4: No response necessary.

Comment F10-5: Importance of transportation for survival.

Response F10-5: Your support for the successful fish transportation program is acknowledged (see revised section 2.2.4.2, and response to comment F-2.26). At the requests of the region, ways to improved in-river smolt migration have been the focus of this EIS. One reason being that fish must first traverse Lower Granite Reservoir (for the time being) before being collected, so decreases in travel time there cannot be barge dependent. To evaluate measures, then, we must compare base case water particle travel time with improvements thereof. As you have mentioned, some of the smolts are not collected and remain in the river.

Comment F10-6: Drawdown test during fish migration.

Response F10-6: Please refer to descriptions of the preferred alternative in sections 3, 4 and 5 of the final EIS. The cooperating agencies feel that these actions yield the greatest migration and information benefits possible under the constraints imposed (time, Endangered Species Act, etc.) for 1992.

Letter F11, U.S. Department of the Interior (Charles S. Polityka, Regional Environmental Officer), November 21, 1991

Comment F11-1: BIA advocates fish protection.

Response F11-1: Comment noted.

Comment F11-2: BIA supports management of habitats.

Response F11-2: Comment noted.

Comment F11-3: Need to protect species.

Response F11-3: Comment noted.

Comment F11-4: Better spill efficiency.

Response F11-4: Comment noted.

Comment F11-5: Balance of power production and protection of fish.

Response F11-5: Comment noted.

Comment F11-6: Obligation to tribes and treaties.

Response F11-6: Comment noted.

Comment F11-7: Urge for expediency.

Response F11-7: Comment noted.

STATE

***Letter S1, Hon. D. Kempton, State of Idaho, House of Representatives,
October 16, 1991***

Comment S1-1: Economic impacts for users of ports/shipping.

Response S1-1: The DEIS indicated that refill of the lower Snake River reservoirs after drawdown to near spillway crest from April 15 through June 15 would probably occur within about 2 weeks, or by June 30. The 2-week refill period, plus a similar drafting period beginning April 1, would produce the total 3-month closure assumed for this option. Refill during June would likely be accomplished from inflow without augmentation (were such an action to be considered for future years).

Comment S1-2: Economic/environmental impact of augmented refill flow.

Response S1-2: The alternative of a four-reservoir drawdown on the lower Snake River has been eliminated from consideration as an action in 1992 (see Section 5). Therefore, the issues surrounding refill are not considered to be relevant at this time.

Comment S1-3: Requirement for using Idaho storage waters.

Response S1-3: This requirement is addressed in the FEIS.

Comment S1-4: Unusual circumstances; vagueness.

Response S1-4: Comment noted. If in your opinion the effects identified are vague, it is due to the expedited schedule for preparation of this EIS. The effects are based primarily on existing information due to the short timeframe. In some cases, the existing information base was limited.

Letter S2, Idaho State Historical Society (Thomas J. Green), October 16, 1991

Comment S2-1: Effect on archeological sites.

Response S2-1: Comment noted; text modified. See also response to F2-14.

Letter S3, Idaho State Senate (Marguerite McLaughlin), October 16, 1991

Comment S3-1: Danger of extreme fallout to Clearwater.

Response S3-1: Concerns noted. The maximum flow release from Dworshak would not exceed 25,000 cfs no matter what volume of storage is allotted to flow augmentation. This limit has been in effect for the Water Budget program since 1984.

Letter S4, State of Montana (Stan Stephens, Governor), October 28, 1991

Comment S4-1: Impacts to Montana.

Response S4-1: No impacts on Montana projects are anticipated from any 1992 action to benefit salmon.

The coordinated system planning under the Pacific Northwest Coordination Agreement (PNCA) has been completed for this operating year (August 1, 1991 to July 31, 1992). This plan established the operating rule curves for all cyclic projects including Libby and Hungry Horse. The imposition of drawdown on the lower Snake River projects and the restricted operation of Dworshak may impact the system's ability to develop its firm energy capability (FELCC). If sufficient power cannot be purchased, loads would have to be curtailed because there is no existing right or mechanism under PNCA to additionally draw upon Libby and Hungry Horse to meet this energy need. If these restrictions occur, BPA may have to purchase energy to replace lost FELCC.

As in any year, emergency requirements to meet system load are a consideration. In the event of adverse weather or stream flows, serious failure of resources or transmission systems to perform, all system reservoirs could be impacted, including the Montana projects.

Letter S5, Idaho Department of Parks and Recreation (Yvonne S. Ferrell), November 8, 1991

Comment S5-1: Economic impacts of recreation and tourism.

Response S5-1: Big-ticket recreational and real estate purchases represent long-term user decisions. It is unlikely that such decisions will be significantly affected by the actions being evaluated by this EIS for implementation in 1992. While this type of issue might be appropriate for discussion in assessment of a long-term action plan, it would be highly speculative to postulate long-term changes in consumption patterns as a result of a 1992 action.

Comment S5-2: Loss of recreation area.

Response S5-2: The text has been modified somewhat to point out that local economies such as Orofino bear a disproportionate risk from potential recreational impacts. However, this risk must be viewed in a probability context. The OA/EIS notes that the probabilities of large elevation changes and recreational impacts at Dworshak are relatively small for flow augmentation options other than Option F. More importantly, there is no probability that Dworshak and the lower Snake River projects would experience major drawdowns at the same time during the recreation season in 1992, based on the OA/EIS evaluation of the near-spillway crest drawdown options.

Comment S5-3: Determination of displaced visitor days.

Response S5-3: The Corps collects visitation data on a monthly basis from traffic counters at each of its recreation sites. From recreation use surveys conducted in 1983 and 1985, a percentage of use by recreation activity has been identified. With this percentage of use, it is possible to determine the number of visitors who participate in a given activity for each month.

Displaced use was arrived at by looking at each drawdown option. The recreation manager at each recreation site was asked to determine facilities that would be affected by drawdowns and to estimate the percentage of use of that facility that would be lost as a result of each option. For example, when a particular option resulted in a drawdown below the existing length of a boat launch ramp, the manager concluded that 100 percent of boating use would be eliminated. The number of recreationists who had participated in boating during the period of the drawdown in previous years had already been determined. By multiplying that number of recreationists by the estimated percentage of impact, an estimated number of displaced use was calculated.

Because virtually all recreational activity at Corps recreation areas are either water related or enhanced by proximity to water, it was assumed that all activities would be disrupted to some degree by drawdowns. Many people participating in water-based activities, such as water skiing or swimming, also participated in land-based activities such as picnicking or camping. If the opportunity to water ski and/or swim was diminished in quality or eliminated by drawdowns, it was assumed that there would be fewer visitors to a recreation site and thus fewer participants in land-based activities such as picnicking and camping. Estimated impacts to day-use (land-based) activities ranged from 25 percent at recreation sites that had a number of facilities not directly dependent on water, and thus not as affected by drawdowns, to 95 percent at sites where day-use (land-based) facilities were limited and tied more directly to water-

based recreation. These varying displacement percentages reflect managers' perceptions of qualitative changes due to reservoir elevations, and account for potential reduction in use that could result from users' aesthetic and water quality perceptions.

***Letter S6, State of Washington, House of Representatives (Bill Grant),
November 8, 1991***

Comment S6-1: Impacts on farmers.

Response S6-1: The alternative of a four-reservoir drawdown during the spring and summer of 1992 on the lower Snake River has been eliminated from consideration as an action in 1992 (see Section 5). Therefore, the issues surrounding pumping plant modifications are not considered to be relevant at this time. Physical tests at Lower Granite are still options. A new alternative physical test drawdown has been added to the OA/EIS. This proposal consists of dropping Lower Granite Reservoir down to near spillway crest while lowering Little Goose Reservoir up to 15 feet below MOP. This would be a four-week test starting on or around March 1, 1992. All the physical tests that are under consideration are in reservoirs where irrigation is limited and used primarily for wildlife and recreation areas. The timing of the drawdowns is not considered to be during critical irrigating seasons. As a result, the loss of irrigation on the lower Snake River is not considered to be significant.

Comment S6-2: Recommendation for measures at Little Goose and Lower Granite.

Response S6-2: See the response to S6-1.

Comment S6-3: Impacts shared among those in salmon cycle other than farmers.

Response S6-3: The scope of the EIS was limited to management changes to the operation of the Columbia/Snake River system for only 1992. Areas concerning loss of habitat, hatchery operation, harvest, etc. are not included in this EIS.

See responses to Common Issue Nos. 6 through 8.

Letter S7, State of Montana (Stan Stephens, Governor), November 2, 1991

Comment S7-1: Effects on Montana.

Response S7-1: See the response to S4-1.

Comment S7-2: Actions outside state will still affect Montana.

Response S7-2: The EIS economic evaluations are based upon National Economic Development criteria. Therefore, the regional economic impacts specific to Montana or other geographic units are not evaluated.

The EIS economic evaluations are based upon National Economic Development criteria. Therefore, the specific economic impacts to Montana will not be evaluated. Negative economic impacts identified in the EIS are economic efficiency impacts, that is, the estimated least cost responses to the alternatives. This is the correct cost measure in considering the cost effectiveness of alternatives. Identification of costs and/or benefits by state or other grouping of bearers of costs and/or recipients of benefits is not relevant to selection of a cost effective alternative.

Comment S7-3: Impacts on Montana grain industry.

Response S7-3: The EIS addresses the aggregate costs to shippers from various drawdown options, without separately allocating the costs to Washington, Oregon, Idaho, Montana, or other sources. The link between barge and rail rates is acknowledged although a specific rail rate and cost response to a given drawdown option cannot be predicted. The issue is essentially moot in any case, as the drawdown options with the greatest potential for such indirect effects were eliminated from consideration for 1992 actions in the OA/EIS.

The effects of all grain shipped out of the Lewiston/Clarkston areas are included to the OA/EIS evaluation. These estimates do not breakdown any specific sources of the grain. Only the effect once it is located in Lewiston/Clarkston.

The impact of a 20% increase in rail rates is shown in table 4.7-8 of the EIS (for all grain, April through June, not just Montana's grain).

Comment S7-4: Availability of rail cars.

Response S7-4: The EIS specifically states that availability of cars is a potential problem.

The effects of all grain shipped out of the Lewiston/Clarkston areas are not included in the OA/EIS evaluation. These estimates do not break down any specific sources of the grain; they only address the effect once it is located in Lewiston/Clarkston.

Whether or not there will be a shortage of rail cars is unknown. One could consider the 20% increase in rail rates shown in table 4.7-8 as the price necessary to call forth the needed cars (newly built or bid away from other users).

Comment S7-5: Impacts of truck transportation.

Response S7-5: In general, truck transportation is so much greater than rail transportation that shippers would not choose that option.

There may however be different local roads that could be affected. For example, traffic could be diverted from routes that move to the river to routes that move to rail car loading facilities.

The effects of all grain shipped out of the Lewiston/Clarkston areas are not included in the OA/EIS evaluation. These estimates do not break down any specific sources of the grain; they only address the effect once it is located in Lewiston/Clarkston.

Truck transport of grain is not the least cost alternative in the absence of water transport.

Comment S7-6: Aggregate impact of salmon recovery efforts.

Response S7-6: The aggregate impact on Montana grain shipments is controlled by the length of the drawdown and the aggregate impacts on transportation costs, and irrigation and power rates to the Montana or other shippers.

The effects of all grain shipped out of the Lewiston/Clarkston areas are not included in the OA/EIS evaluation. These estimates do not break down any specific sources of the grain; they only address the effect once it is located in Lewiston/Clarkston.

Comment S7-7: Socioeconomic impacts on Montana's industries and residents.

Response S7-7: The comment is correct. No attempt was made to determine secondary impacts of rate impacts. This would be beyond the scope of this document.

The final EIS identifies rate impacts expected with implementation of the preferred alternative. The impacts are not broken down by state, so specific MT impacts are not discussed. The preferred alternative does not propose any changes in the operations of MT projects.

Comment S7-8: Impacts to Libby and Hungry Horse reservoirs.

Response S7-8: See response to S4-1.

Comment S7-9: List of potential impacts.

Response S7-9: See response number 1 to Comment S-4.

Comment S7-10: Lower probabilities of refill.

Response S7-10: See response number 1 to Comment S-4.

Comment S7-11: Negative effects on trout populations.

Response S7-11: See response number 1 to Comment S-4.

Comment S7-12: Decrease in trout affects Bald Eagle population.

Response S7-12: See response number 1 to Comment S-4.

Comment S7-13: Decrease in trout affects Grizzly bear predation.

Response S7-13: See response number 1 to Comment S-4.

Comment S7-14: Exposure of Indian resources at Libby and Hungry Horse.

Response S7-14: See response number 1 to Comment S-4.

Comment S7-15: Thermal changes affect growth rate of fish.

Response S7-15: See response number 1 to Comment S-4.

Comment S7-16: Concerns for water quality of Flathead Lake.

Response S7-16: See response number 1 to Comment S-4.

Comment S7-17: Impacts on other dams.

Response S7-17: See response number 1 to Comment S-4.

Comment S7-18: Ice scour problem on Flathead River.

Response S7-18: See response number 1 to Comment S-4.

Comment S7-19: Ability to provide minimum instream flows.

Response S7-19: See response number 1 to Comment S-4.

Comment S7-20: Recreation impacts.

Response S7-20: See response number 1 to Comment S-4.

Comment S7-21: Request for delay if Montana's concerns not addressed.

Response S7-21: See response number 1 to Comment S-4.

- Comment S7-22: Forecast error.
- Response S7-22: Comment noted. Forecasting errors have been incorporated into our evaluation.
- Comment S7-23: Monitoring of economic impacts.
- Response S7-23: No impacts on Montana projects are anticipated from any 1992 action to benefit salmon.
- Comment S7-24: Effects of braiding.
- Response S7-24: See addition to text.
- Comment S7-25: Effects on salmon spawning reservoirs.
- Response S7-25: The implementation and monitoring plan for the proposed March 1992 test drawdown of Lower Granite and Little Goose includes several elements intended to protect fall chinook that may be spawning and rearing below Lower Granite.
- Comment S7-26: Effects of dredging lane to maintain shipping.
- Response S7-26: This potential impact is discussed in Section 4.7.1.3 of the OA/EIS. Measurable reductions in water levels in the deep draft shipping channel would be likely only for the most extreme cases of reservoir drawdown, such as all four lower Columbia projects to MOP and the lower Snake projects to near spillway crest through August 15. The OA/EIS concluded that the latter option could not be implemented in 1992.
- Comment S7-27: Specifics of mitigation.
- Response S7-27: See response to Common Issue No. 10.
- The EIS will include impacts associated with actions to be implemented in 1992 only. Where possible, a brief description of the differences between the short-term (1992) impacts and mitigated impacts, associated with a long-term implementation, will be included.
- Comment S7-28: Region must progress slowly and carefully.
- Response S7-28: As noted, there is considerable uncertainty associated with determining specific benefit of flow/travel time to fish survival. Some of the negative impacts are more readily identifiable based on existing knowledge. The March test drawdown does avoid the

potential impact on anadromous stocks by conducting the test during a period of minimal fish migratory use.

Comment S7-29: All power impacts should be evaluated.

Response S7-29: Although a comprehensive review of the power impacts were not undertaken, the analysis was sufficient for decision making in 1992.

Comment S7-30: Effect of load shaping operation shift.

Response S7-30: Reference statement is a "what if" observation regarding effects associated with maintaining load shaping capability. The final OA/EIS assumes that this capacity would be lost if replaced with power from outside the system.

Comment S7-31: Take time to include Montana.

Response S7-31: See response to Comment S-1.

Letter S8, State of Oregon, Intergovernmental Relations Division (Robert Prinslow), November 5, 1991

Comment S8-1: No comment received.

Response S8-1: No response necessary.

Letter S9, State of Washington, House of Representatives (Richard P. Neher), November 8, 1991

Comment S9-1: Uncertainty of drawdown/migration relationship.

Response S9-1: See response to common issue 5.

The scientific community believes that the relationship between water particle travel time and salmon survival generally is true. For a fixed flow (volume of water per unit time) through a reservoir, average instream water velocities are increased by lowering the surface elevation. This reduces the cross-sectional area of the reservoir, allowing the flow to travel more rapidly. The increased water velocity results in reduced water particle travel time through the reservoir, which translate into reduced travel time for migrating smolts.

Comment S9-2: Program should be expanded to include more anadromous fish.

Response S9-2: See response to Common Issue No. 15.

Letter S10, State of Wyoming, State Engineer's Office (Sue Lowry), November 12, 1991

Comment S10-1: No immediate impacts upon Wyoming.

Response S10-1: No response necessary.

Letter S11, State of Oregon, Department of Transportation (Mark Ford), November 14, 1991

Comment S11-1: Railroad grain car supply.

Response S11-1: The issue of rail car supply is discussed in Section 4.7.1.1. The Interstate Commerce Commission study referenced in the comment appears to be the same as the ICC (1990) report cited in the EIS. Rail industry representatives were contacted for information on car supply and current rates.

Comment S11-2: Changes in shipping patterns and effects.

Response S11-2: No response necessary.

Letter S12, State of Montana, Department of Fish, Wildlife & Parks (K.L. Cool), November 13, 1991

Comment S12-1: Impacts on Libby and Hungry Horse reservoirs inadequately addressed.

Response S12-1: The coordinated system planning under the Pacific Northwest Coordination Agreement (PNCA) has been completed for this operating year (August 1, 1991 - July 31, 1992). This plan established the operating rule curve for all cyclic projects including Libby and Hungry Horse. The imposition of drawdown on the Lower Snake River projects and the restricted operation of Dworshak may impact the system's ability to develop its firm energy capability. If sufficient power cannot be purchased, loads would have to be curtailed because there is no existing right or mechanism under PNCA to draw upon Libby and Hungry Horse to meet this energy need.

As in any year, emergency requirements to meet system load is a consideration. In the event of adverse weather or stream flows, serious failure of resources or transmission systems to perform, all system reservoirs could be impacted including the Montana projects. However, no impacts to Montana projects are anticipated from any 1992 action to benefit salmon.

Comment S12-2: Hungry Horse and Libby reservoirs must be considered.

Response S12-2: See response to comment S12-1.

Comment S12-3: Expression of desire to work with ACOE to complete information.

Response S12-3: No response necessary.

*Letter S13, Washington State Department of Transportation (Duane Berentson),
November 14, 1991*

Comment S13-1: Importance of scheduling changes in transportation patterns.

Response S13-1: Comment noted.

Comment S13-2: Drawdown to MOP.

Response S13-2: Funding for the proposed dredging program has been appropriated and environmental documentation for the activities on the lower Snake and Columbia rivers has been distributed for review. The work will proceed as planned during the winter in-river work window.

Comment S13-3: Drawdown significantly below MOP—storage and transportation of grain.

Response S13-3: When the 25-car rail rates are used, it is correct that full compensation of storage and inventory carrying costs are approximately equal to additional rail charges. However, there are two reasons why storage will probably be preferred to a shift to rail. First, the storage and inventory charges referred to in the text represent a full compensation to the operators of upriver storage facilities. These rates will however be negotiated between terminal operators and farmers based upon the rates charged by alternative transportation modes (i.e., rail or truck-barge at other locations). Storage and inventory charges will be priced by terminal operators so as not to lose market share. Second, the existing rates for rail (whether at 25-car or 3-car rates) will probably entail a surcharge over and above the quoted tariff rate to cover the short-term need for rail cars. Railcars may also not be available except at a much higher rate.

Trucking to Pasco and barging down would only be viable for farmers located relatively close to Pasco. The additional cost of trucking would be prohibitive to other farmers.

Shippers will definitely seek the most cost-effective solution for their individual needs. However, under a one-year test period, storage

will most likely be the best alternative with rates negotiated based upon response by rail and barge operators.

Comment S13-4: Railcar supply in extended navigation closure.

Response S13-4: If an extended closure of navigation on the Snake River were still under consideration, the railcar supply situation might warrant further investigation. Because of the elimination of the two-month and four-month options from further consideration for 1992, as indicated in the DEIS, this additional step is not necessary for the current decision.

Comment S13-5: Maintenance costs of traffic redistribution.

Response S13-5: This issue appears moot for two reasons. First, a three-month navigation closure would not result in 29,600 additional truck trips, because the expected response by shippers would be to store grain rather than shift to trucking, the most expensive transportation option. Second, the DEIS indicated that the drawdown options that would produce major navigation closures were no longer under consideration for action in 1992.

Comment S13-6: Road maintenance costs.

Response S13-6: See response to S13-5.

Comment S13-7: Analysis of costs of long-term solutions.

Response S13-7: Future analyses of potential long-term solutions will fully assess the cost impacts associated with the proposed actions.

Letter S14, State of Oregon, Department of Fish and Wildlife (Jim Martin), November 15, 1991

Comment S14-1: Travel time models.

Response S14-1: Changes have been made to the final OA/EIS in several areas based on some of the comments on these reports used for review. While there are some errors in these documents most of the information is valid and was retained. Results are presented in the section using both polynomial and other models presented by Berggren and Filardo. Also see response to Common Issue No. 5.

Comment S14-2: Opposition to drawdown test affecting salmon run.

Response S14-2: No response necessary. Comment noted.

Comment S14-3: Snake River flow augmentation.

Response S14-3: Both flow augmentation and reservoir drawdown alternatives provide an increase in water particle travel time, which is the objective of improving in-water migration. Combinations of these two alternatives are included as a plan of action for 1992. Included as flow augmentation options are fixed releases of various volumes of water from Dworshak. These options are similar, although not identical, to the sliding-scale alternative mentioned in this comment. The amount of flow that can be released at Dworshak is limited to 25,000 cfs. However, the fixed volume of water available at Dworshak could be shaped (within the 25,000 cfs limit) to provide as much flow as possible during low, medium, or high water years. The release of 300 KAF of water for summer migrants, assuming this is not for temperature control, will not be evaluated in this EIS. This is due to the severe time constraints for completing the EIS. This alternative is being incorporated into the Columbia River System Operation Review Study which is currently underway. The Corps is evaluating whether the sliding scale for the lower Columbia River flow augmentation can be included in the FEIS within the limits of the current schedule.

Comment S14-4: Columbia River Flow Augmentation.

Response S14-4: See the response to S14-3.

Comment S14-5: Uncertainty of biological benefits of temperature reduction.

Response S14-5: No response necessary.

Comment S14-6: Significant relation between travel time and flow.

Response S14-6: Berggren and Filardo (1991) data are now included in the text.

Comment S14-7: Defects on Kindley analysis.

Response S14-7: Some additional analysis is added to text. However, Kindley's analysis cannot be discounted.

Comment S14-8: Biased interpretation of travel time/flow data.

Response S14-8: Some text changes made.

Comment S14-9: Misinterpretation of travel time/flow relationship.

Response S14-9: Text changed.

Comment S14-10: Concerns with travel time/flow data.

Response S14-10: Some text changes made. See response to S28-80.

Comment S14-11: Partial data set for linear model.

Response S14-11: Text changes made. The linear model was retained. See response to I39-82.

Comment S14-12: Clarification of table.

Response S14-12: Text changed.

Comment S14-13: Travel time/flow relationship for Subyearling Chinook.

Response S14-13: Some text changes made.

Comment S14-14: Clarify significance of travel time/flow relationship.

Response S14-14: The word "significant" has been added, but words "weakly correlated" are retained. While the relationship is significant, only 33 percent of the variability in the measured migration rate is accounted for with just flow.

Comment S14-15: Impossibility of determining dominance between flow and spill.

Response S14-15: Comment text and tables changed.

Comment S14-16: Shortcomings of Giorgi (1991) document.

Response S14-16: Some text changes were made based on comments and reviews of the Giorgi (1991) document. The table has not been changed. The comments on Giorgi's (1991) document do not seriously affect Table 4.2-8.

***Letter S15, State of Oregon, Water Resources Department (William H. Young),
November 15, 1991***

Comment S15-1: Support of project.

Response S15-1: No comment necessary.

Comment S15-2: Impacts to groundwater resources.

Response S15-2: Comments noted. Material highlighting the potential impacts to localized water supplies is incorporated in Section 4.13. However, the Corps believes that the impact from reduced groundwater levels

will be minimized because the lowest proposed level for reservoirs in any of the alternatives will be the Minimum Operating Pool (MOP) level. Since intakes (on the river for surface water or the screened intervals for wells) for any significant water supply withdrawal should have been designed to be below the MOP, withdrawals will still be possible. There may be an increase in pumpage (energy) requirements or a decrease in the maximum withdrawal rate. However, if proper design of the systems was followed originally, this should not be significant given that the MOP is maintained.

It is also recognized that if irrigation withdrawals are diminished, because of lowering of reservoirs below intakes, then groundwater levels will be diminished in aquifers which are presently recharged by the irrigation. Again, if irrigation withdrawals are minimally affected, then this should not be a problem.

It was not possible in the scope of this EIS to assess the full effect of these changes on water supply or groundwater levels. The Corps intends to exercise one of these alternatives on a trial basis, and the effects will be taken into account in any permanent modification of reservoir operations.

Comment S15-3: Impacts on existing users.

Response S15-3: As indicated in the response to the previous comment, the Corps believes that the impact on existing water users will be minimized by the maintenance of minimum operating pool (MOP) levels in the reservoirs. While it has not been possible to review the situation of all the municipalities withdrawing their water supplies from the lower Columbia River, the City of Boardman provided some information about their system in comments. It appears from this information that while a lowering of John Day Reservoir to MOP (262 feet) will reduce the theoretical yield of the City's Ranney well system, it will not have significant impact because this lowered yield will still be above the present design capacity of its system. Continued operation of the reservoir at this level could limit or make more costly the potential expansion of Boardman's system, if population increases require increased capacity.

Comment S15-4: Loss of riparian and wetland resources.

Response S15-4: OWRD will be consulted if additional irrigation is necessary. The preferred plan for 1992 is to operate John Day at the minimum irrigation pool, so such impacts are unlikely.

Comment S15-5: Short term vs. long term considerations.

Response S15-5: See response to Common Issue No. 9.

The EIS will include impacts associated with actions to be implemented in 1992 only. Where possible, a brief description of the difference between the short-term (1992) impacts and mitigated impacts, associated with a long-term implementation, will be included.

Comment S15-6: Clarification of purpose.

Response S15-6: See response to Common Issue No. 11.

A specific monitoring program for the preferred alternative is being developed for the preferred plan of action for 1992 (see Chapter 5). The information provided will be helpful in developing long-term programs.

Letter S16, State of Oregon, Department of Land Conservation and Development (Jim Knight), November 15, 1991

Comment S16-1: Lack of effect on Oregon's coastal zone.

Response S16-1: Comment noted.

Comment S16-2: Consistency with state and local plans and laws.

Response S16-2: Comment noted.

Letter S17, State of Oregon, Department of Geology and Mineral Industries (Dan Wermiel), November 15, 1991

Comment S17-1: Statement of support and possible future input.

Response S17-1: No response necessary.

Letter S18, State of Washington (Booth Gardner, Governor), November 18, 1991

Comment S18-1: Action urged.

Response S18-1: The majority of the data that could be collected from a test drawdown could be collected from physical laboratory (hydraulic) model studies. The development of these models are underway, and will be conducted even if a test drawdown is conducted in 1992. However, a new alternative physical test drawdown has been added to the FEIS. This proposal consists of dropping Lower Granite Reservoir down to near spillway crest while lowering Little Goose

Reservoir up to 15 feet below MOP. This would be a four-week test starting on March 1, 1992.

Comment S18-2: Protect irrigation.

Response S18-2: As indicated in the EIS, pumping plant modifications could not be implemented in time for a 1992 reservoir drawdown below MOP. The Corps will be ready to expedite the permit review process if necessary.

Comment S18-3: Conduct experiment above irrigating pools.

Response S18-3: There are 11 irrigation pumping plants on Lower Granite Reservoir and 8 on Little Goose Reservoir that would be impacted during a drawdown below MOP. The majority of these pumping plants are used as wildlife habitat units and parks and recreation areas. However, minimum impacts are expected to these areas during a March drawdown timeframe.

Comment S18-4: Focus on 1992 experiment.

Response S18-4: Comment noted. The final report will clearly identify the impacts associated with only a 1-year (1992) implementation.

Comment S18-5: Avoid using long term impacts.

Response S18-5: Comment noted. See response to S18-4.

Comment S18-6: Suggestions for future EISs.

Response S18-6: Comment noted. An EIS concerning the modifications of any dam will not only address the biological impacts but will also include a biological assessment which will evaluate the effects the construction process will have on listed endangered species.

Comment S18-7: Openly evaluate experiment.

Response S18-7: Since the sockeye listing will go into effect on December 20, 1991, the Corps will begin the consultation process with the National Marine Fisheries Service (NMFS) immediately. The first step is the preparation of a Biological Assessment on actions for 1992. This assessment will be reviewed by NMFS. If the listed species is judged to be in jeopardy, NMFS will prepare a Biological Opinion and the action in question will not be implemented in 1992.

***Letter S19, State of Washington, Department of Fisheries (Joseph R. Blum),
November 18, 1991***

Comment S19-1: Clarify intention for long-range projects.

Response S19-1: The OA/EIS will identify the long-range studies to be conducted on the salmon issues. These studies are being scoped at this time in coordination with the Northwest Power Planning Council amendment process.

Comment S19-2: Preferred alternative.

Response S19-2: See response to Common Issue No. 16.

A new alternative physical test drawdown is being added to the final OA/EIS. This proposal consists of dropping lower Granite Reservoir down to near spillway crest while lower Little Goose Reservoir up to 15 feet below MOP. This would be a four-week test starting on March 1, 1992.

Comment S19-3: Monitor late-summer temperature reduction.

Response S19-3: No response necessary. This is incorporated into the monitoring plan.

Comment S19-4: Significance of travel time/flow relationship.

Response S19-4: Several additions were made to the document, including an opening statement concerning the fact that flow correlated with migration rate.

Comment S19-5: Objection to statement of "weak" correlation between travel time/flow.

Response S19-5: The word "significant" has been added, but "weak" has been retained as it is believed to be valid.

Comment S19-6: Misleading discussion.

Response S19-6: The discussion emphasizes the changes within selected flow ranges to give the range of what can be expected if flows are in those ranges during project modifications. Comparing large flow differences is only of interest if that is part of the alternatives considered. There are no options being considered that can increase flows from 60 to 120 kcfs.

Comment S19-7: Transport benefit ratios.

- Response S19-7: Addition to text added.
- Comment S19-8: Comparisons to past TBRs meaningless.
- Response S19-8: While the purpose of the proposed activities is to improve in-river fish survival, survival needs to exceed the transport benefit ratio for fish that would have been collected in the past before the activities, but are not a result of the activities, to be a benefit. In most cases on the Snake River, it is likely that more than 50 percent of downstream migrants are transported. Loss of transport could have a significant adverse effect on some fish populations if the benefits of the actions do not outweigh the benefits of transport. The Corps believes these are valid points of comparison for the proposed alternatives.
- Comment S19-9: Reported TBRs are biased.
- Response S19-9: Collecting fish to mark and release is a common mode of sampling for much of the work done in the past on the Columbia River system. Much of the data analysis that is currently used to predict smolt migration rate and survival is based on similar data analysis methods. These studies have been approved and conducted by fisheries agencies in the past. The latest study results were presented in 1991, so the approved methods are out-of-date.
- Comment S19-10: Dissolved gas monitoring.
- Response S19-10: Monitoring of dissolved gas levels is a major part of the monitoring plan for the implementation of the proposed drawdown test included in the preferred alternative. Contingency provisions have been included so that tests will be discontinued if unacceptable dissolved gas levels are detected.
- Comment S19-11: Overstatement of effects on habitat.
- Response S19-11: Text changes made.
- Comment S19-12: Smolt travel time.
- Response S19-12: See text changes. However, the discussion of plateau is retained as there is sufficient information to suggest that this is a reasonable conclusion for the available data.
- Comment S19-13: Relationship between travel time/flow.
- Response S19-13: See text changes.

Comment S19-14: Failure of present systems.

Response S19-14: No response necessary.

Comment S19-15: Effects on adult migration.

Response S19-15: No response necessary.

Comment S19-16: Danger of dissolved gas supersaturation.

Response S19-16: No response necessary.

Comment S19-17: Effects on spawning habitat.

Response S19-17: No response necessary.

Comment S19-18: Protection of Lyons Ferry Hatchery water supply.

Response S19-18: The dropping of Lower Monumental Reservoir below MOP is no longer being considered for 1992 (Section 5). If future studies look at this as an alternative, structural modifications to this water supply pipeline would be included in the evaluations as a cost.

Letter S20, State of Washington, Department of Wildlife, November 18, 1991

Comment S20-1: Preferred option, long-term vs. short-term.

Response S20-1: No response necessary.

Comment S20-2: Effect of reduced water particle time.

Response S20-2: See text changes.

Comment S20-3: Adult passage.

Response S20-3: Added text about locks. This section is not the appropriate area in which to talk about all of the factors that affect fish during passage, so the addition of fallback information is not included.

Comment S20-4: Water budget.

Response S20-4: Comment noted. Text has been revised.

Comment S20-5: Water quality criteria and standards.

Response S20-5: Text corrections made.

Comment S20-6: Steelhead trout.

Response S20-6: Text changes made.

Comment S20-7: More discussion of water particle travel time/smolt travel time.

Response S20-7: See text change.

Comment S20-8: Include smallmouth bass in list of species.

Response S20-8: Correction has been made.

Comment S20-9: Delete antelope; add black bear.

Response S20-9: The text in Section 2.6.2.5 has been changed as suggested.

Comment S20-10: Combination drawdown/flow augmentation.

Response S20-10: No response necessary.

Comment S20-11: Support of drawdown of Lower Granite and Little Goose.

Response S20-11: No response necessary.

Comment S20-12: Significance of relationship between travel time/flow.

Response S20-12: See text change.

Comment S20-13: Fuller explanation of flow/travel time relationship.

Response S20-13: Text changes made.

Comment S20-14: Giorgi paper not subjected to enough review.

Response S20-14: Some text changes made.

Comment S20-15: Weaknesses of EIS.

Response S20-15: The Berggren and Filardo Model (1991), because of its curvilinear nature, indicates that for large changes in travel time to occur, larger changes in flow above the flows noted above would be required.
Text changes made.

Comment S20-16: Clarification of caption and consistency of references.

Response S20-16: Some changes made. Mean annual indices are the way the data were reported in Giorgi (1991), so the table will remain unchanged.

Comment S20-17: Impossibility of distinguishing between spill and flow.

Response S20-17: Text changed.

Comment S20-18: Effects on resident fish.

Response S20-18: No response necessary.

Comment S20-19: Mitigating impacts on resident fish.

Response S20-19: See response to Common Issue No. 10.

The action identified in this EIS are for 1992 only. The objectives of these actions are two fold: 1) improve in-river migration as an interim action for 1992 only and/or; 2) obtain information that can be used in the development of a long-term solution. For whatever actions implemented in 1992 information will be collected on impacts requiring mitigation and the extent of mitigation needed.

Letter S21, State of Washington, Washington State Parks and Recreation Commission (Mike Ramsey), November 18, 1991

Comment S21-1: Effects on parks.

Response S21-1: No response necessary.

Comment S21-2: Irreversible damage to parks from drawdown.

Response S21-2: No response necessary. See response to Common Issue No. 1.

Comment S21-3: Focus on Lower Granite drawdown.

Response S21-3: No response necessary.

Comment S21-4: Impact on park vegetation.

Response S21-4: The comment refers to a highly site- and facility-specific impact (in this case, the inability to operate a park irrigation system) that is addressed in summary fashion in the DEIS. Due to the large number of recreational facilities in the project area, it would be impractical to provide this level of detail on specific impacts to specific sites. With respect to mitigation, refer to response to Common Issue No. 10.

Comment S21-5: Effects on boating in Chief Timothy park.

Response S21-5: No response necessary.

Comment S21-6: Expense of removing docks.

Response S21-6: See response to S21-4.

Comment S21-7: Erosion on Silcott Island.

Response S21-7: See response to Common Issue No. 11.

Comment S21-8: Responsibility of cleaning up dead fish.

Response S21-8: See response to S21-4.

Comment S21-9: Hazardous conditions caused by drawdown.

Response S21-9: See response to S21-4.

Comment S21-10: Potential for archaeological gains during drawdown.

Response S21-10: No response necessary.

Comment S21-11: Potential for damage to archaeological sites during drawdown.

Response S21-11: See response to Common Issue No. 11 and F2-14.

Comment S21-12: Prefer drawdown test to start March 1, last 4 weeks.

Response S21-12: This is the preferred plan.

Comment S21-13: Educational materials should be provided to visitors.

Response S21-13: If a physical test is implemented in 1992, informational material would be made available at parks and recreational areas that describe the drawdown effects. This type of information also will be provided to the media.

Letter S22, State of Washington, Department of Agriculture (Stuart A. Trefry), November 18, 1991

Comment S22-1: Importance of cost-effectiveness and biological justification.

Response S22-1: See responses to Common Issues No. 2 and 4.

Comment S22-2: Preference for flow augmentation options.

Response S22-2: No response necessary.

Comment S22-3: Economic impact cost comparisons.

Response S22-3: See Section 3, No. 4.

A cost-effectiveness analysis is being prepared and will be included into the final EIS. As part of this analysis, the costs listed in the draft EIS are being refined. This cost-effectiveness information is used in the plan selection process.

Comment S22-4: Broad-range evaluation crucial.

Response S22-4: See Section 3, No. 11.

A monitoring plan for a physical test drawdown in 1992 is being developed. Input into this plan has been provided by fisheries agencies and groups as well as other agencies and organizations from around the region who are interested in operation of the Columbia/Snake River system. As part of that monitoring plan, an after action report will be prepared. This report will be coordinated with those who had input into the development of the monitoring plan.

Letter S23, State of Washington, Department of Ecology

Comment S23-1: Support for early year drawdown; desire for more specificity.

Response S23-1: Comment noted.

Comment S23-2: Conflicts between dredging and drawdown.

Response S23-2: See response to Common Issue No. 13.

***Letter S24, State of Washington, Energy Office (Jonathan A. Lesser),
November 18, 1991***

Comment S24-1: Permissibility of drawdowns at Arrow.

Response S24-1: Any action taken at Arrow will be in compliance with pertinent treaty obligations and requirements.

Comment S24-2: FELCC impacts.

Response S24-2: Text has been modified. See Section 4.9.

Comment S24-3: Treatment of river transportation costs.

Response S24-3: Section 4.7 of the OA/EIS identifies the possible alternative responses to a closure of barge transportation and assesses the likelihood of each response. This evaluation is done only for an

action taken in 1992, and does not attempt to predict what the long-term responses would be if navigation closures were recurring annual events. The estimation of navigation costs was conducted according to established Federal procedures for project economic analysis. Netting out all subsidy costs for other river resource uses and other modes of transportation would unnecessarily complicate the analysis without demonstrably improving the results.

Comment S24-4: Discussion of timeframe for impacts.

Response S24-4: The cooperating agencies acknowledge that the Draft OA/EIS was confusing in places relative to the timing of actions. The Final OA/EIS has been modified to more clearly indicate that the scope is limited only to actions taken in 1992. Potential long-term responses to repeated annual events are not germane to this analysis.

Comment S24-5: Barge and rail rate interaction.

Response S24-5: The DEIS is in agreement with the comment that a reduction in barge traffic could lead to an increase in rail rates. The EIS reports the belief of many shippers that rail rates would increase in this situation, but does not predict that a rail rate increase would occur. The ultimate calculation of shipping costs presented in the EIS is based on existing rail rates, and not future rates with a hypothetical increase.

Comment S24-6: Distinction between sector and social impacts.

Response S24-6: The transportation cost analysis presented in the EIS is not based solely on identifying the costs to the barge industry; if that were the case, the results would be presented as lost revenues to the barge industry. Instead, the objective of the analysis was to identify the total increase in cost borne by shippers (and ultimately a cost to society) as a result of a navigation closure, consistent with established Federal procedures for calculating the net economic development (NED) costs or benefits of proposed actions. The costs identified are the difference between shipping the same quantities by barge, shipping by an alternate mode, or storing the commodities for later barge shipment.

With respect to taxpayer contributions to barge transportation, see the response to S24-3. These contributions are embedded in the costs of constructing and operating the waterways system, and will be incurred in 1992 regardless of whether a test drawdown disrupts barge traffic.

Comment S24-7: Lost agricultural production.

- Response S24-7:** The FEIS, Section 4.8.1, has been modified to calculate crop losses using net rather than gross crop values. Some farmers could benefit from rising crop prices, although the extent of that impact cannot be estimated. The text has also been changed to note that some irrigators could shift to less water intensive crops, although this option would be open to very few irrigators.
- Comment S24-8:** Impacts to farmers.
- Response S24-8:** We acknowledge that some farmers could go out of business either in the short or long term regardless of whether the 1992 flow test is implemented. The EIS does not make any estimates of how many farmers might go out of business because of the test.
- Comment S24-9:** Overstatement of losses.
- Response S24-9:** The FEIS, Section 4.8.1, has been modified to present crop losses in net rather than gross figures. The figure for potatoes now shown on Table 4.8-1 is \$1.484 per acre, and is based on Washington State University Cooperative Extension Service estimates of revenue less variable costs. The net loss includes fixed costs, since these would be incurred regardless of whether any crop is produced.
- Comment S24-10:** Price increases of crops.
- Response S24-10:** The text of Section 4.8.1 has been changed to note that some farmers could benefit from price increases as a result of the reduced supply of products from the Columbia/Snake River region. The extent of that effect has not been estimated.
- Comment S24-11:** Over assumptions related to test.
- Response S24-11:** Point well taken. The text of Section 4.8 has been reorganized and clarified to indicate that the effect of a 1992 test would be lost production from virtually all acres that are currently irrigated from the affected pools, but that pump modification costs and higher operating costs would not be incurred unless a longer term drawdown were implemented. Pump modification costs and increased operating costs are still discussed in the EIS because the issues were of significant interest to irrigators during the scoping process.
- Comment S24-12:** Discussion of secondary economic impacts oversimplified.
- Response S24-12:** The text has been changed to note that some economic losses within the affected region would be offset by gains to other farmers,

processors, and shippers. A detailed analysis of economic losses vs. transfers of wealth is beyond the scope of this EIS.

Comment S24-13: Distinguish between transfers and actual economic losses.

Response S24-13: See response to S24-12.

Comment S24-14: Unlikely long-term resources developed to replace one year of lost power.

Response S24-14: Long-term resource allocation not in scope of EIS. See revised text in Section 4.9.

Comment S24-15: Inadequate discussion of capacity impacts.

Response S24-15: Comment noted. See modified text in Section 4.9.

Comment S24-16: Incomplete summary of socioeconomic impacts.

Response S24-16: The table is only designed to summarize the major affects and more detailed discussion is provided in the text. The term "positive" has been removed from the table.

Comment S24-17: Incomplete discussion of transportation impacts.

Response S24-17: As discussed in Section 4.7 Transportation, the limited availability of appropriate rail and trucking equipment would severely limit the use of these alternatives as a substitute for barge transport. Because of the temporary nature of the proposed project, it is unlikely that the rail and trucking industries would respond to the increased demand by expanding their capital facilities and equipment. As a result, minimal transfer of employment to these industries is expected.

Comment S24-18: Verification of agricultural employment effects.

Response S24-18: The material attributed to Jim Barron, agriculture economist at Washington State University, appeared as quoted in the article "A Growing Problem," by Robert Woehler which appeared in the Tri-City Herald, Pasco, Kennewick, Richland, Washington on June 27, 1991. The text has been revised to include this reference. The multiplier of 2.0 was chosen after an examination of the current literature on the subject yielded multipliers ranging anywhere from 0.5 to 3.0. It was decided that a middle figure of 2.0 would be the most reasonable multiplier to use for this analysis. Although Section 4.8 Agriculture has been revised to address net impacts, the economy of and employment in the study area are reliant upon the

way and how often money moves through the system. Thus, use of gross impacts for the socioeconomic analysis is appropriate.

Comment S24-19: Lack of documentation for calculation of long-term output reduction estimate.

Response S24-19: To clarify the scope limitation to 1992 only, all references to longer-term impacts related to agriculture and other resources in Section 4.13 have been removed.

Comment S24-20: Recreation economic impacts and socioeconomic impacts.

Response S24-20: The economic aspects of potential recreation impacts are discussed in more detail in Section 4.10.3 of the DEIS, which indicates that gross expenditures associated with potentially displaced recreation would not represent a net loss due to likely shifts in expenditure patterns. Recreation user day values reflecting consumer surplus estimates have been applied to the displacement estimates for the cost-effectiveness analysis that has been added to the FEIS; gross expenditures were reported only as an indicator of potential local economic changes, and not as a measure of net cost.

The socioeconomic impacts presented in Section 4.13 were not, and were not intended to be used as measures of societal economic costs as they are treated in an NED analysis. This section of the EIS addresses the employment, social and related aspects of the resource use effects identified elsewhere in the EIS. This material is appropriately identified as sectoral or secondary impacts, whereas construction of these impacts as economic losses would result in double-counting or redundant treatment of other analyses. Aggregation and comparison of true NED costs for the various options is properly left for the plan selection chapter (see Section 5.5 of the FEIS).

Comment S24-21: Clarification of goals.

Response S24-21: See response to Common Issue No. 13.

Letter S25, Federal Land Planning Coordinator, State of Wyoming (Rod S. Miller), November 19, 1991

Comment: State of Wyoming reviewed draft.

Response: No response necessary.

***Letter S26, State of Wyoming, Game and Fish Department (Joe White),
November 7, 1991***

Comment: No comment.

Response: No response necessary.

***Letter S27, State of Montana, Department of Agriculture (E.M. Shortland),
October 31, 1991***

Comment: Response to five questions posed by planning council.

Response: No response necessary.

***Letter S28, Montana Department of Fish, Wildlife & Parks (Larry G. Peterman),
October 30, 1991***

Comment: General comments.

Response: No response necessary.

Letter S29, State of Idaho (Cecil D. Andrus, Governor), November 22, 1991

Comment S29-1: Modeling of river flow results.

Response S29-1: The comment restates OA/EIS material with respect to ability to meet target flows with drawdown or augmentation. The observation with respect to electric power system impacts is not entirely consistent with the costs presented in Section 4.9. Impact on the region's electric power system was only one of many resource areas considered in the decision process to achieve increased stream velocities.

Comment S29-2: Region efforts misconstrued in favor of river users.

Response S29-2: Analysis was based on a number of criteria, including: Ability to implement the plan in 1992; Cost Effectiveness; Performance against physical objectives; Acceptability of the environmental impacts; Public acceptability.

Comment S29-3: Support for drawdown.

Response S29-3: The analysis of the effects of the flow measures on water particle travel time indeed indicates that four-reservoir drawdown to near spillway crest is the only option that alone could meet the CBFWA goal for the lower Snake River. However, there are combinations of drawdown and flow augmentation that could yield reasonably

comparable results for the lower Snake River, and no single option could meet the CBFWA goal for the lower Snake and Columbia rivers combined. As noted in the OA/EIS, the cooperating agencies have not adopted or endorsed the CBFWA goal. The CBFWA goal is used only for comparison purposes, as it is well known within the region.

Comment S29-4: Removal of obstacles to operation of dams at spillway crest levels.

Response S29-4: Research to assist anadromous fish in passing the Columbia/Snake River dams started in 1953. Many modifications have been made since initiation of the program that have greatly increased survival of adults and juveniles in the river. The Corps continues to improve the dams for passage. See response to Common Issue No. 14.

Comment S29-5: Mitigation of impacts possible with long-term drawdown strategy.

Response S29-5: See response to Common Issue No. 9.

Comment S29-6: Critical nature of situation not emphasized in DEIS.

Response S29-6: The cooperating agencies recognized the significance of extinction of the Snake River stocks and so initiated actions to change operating regimes of the Columbia/Snake River system to improve the conditions. Alternatives were gained from the Salmon Summit task force plan. The EIS focuses on action intended to improve survival of fish migrating through the dams.

Comment S29-7: Distinguishing between impacts of drawdowns 4-15—6-15, and 4-15—8-15.

Response S29-7: Because these options were eliminated in the initial screening process, the more detailed discussion of impacts is not included in the Executive Summary of the final OA/EIS. The distinctions in timing and impacts between the two options have been clarified at other locations.

Comment S29-8: Tables should be corrected to report impacts reflected in text.

Response S29-8: Impact estimates are reported as ranges in Section 4 primarily in terms of power costs. Expected effects on navigation, irrigation, recreation, and other resources are generally reported as discrete estimates.

Comment S29-9: Example of Executive Summary's overstatement.

- Response S29-9:** The distinction here involves recreation use displaced in one area and possibly shifted to other sites. The draft OA/EIS Executive Summary correctly indicated that virtually all water-based recreation at the four projects would be eliminated during the drawdown and refill period. This effect was identified as a displaced use and not a loss of use, because some of the activity would likely be shifted to other locations. Regardless of the potential for shifting, the direct effect at the projects is an impact that must be reported.
- Comment S29-10:** Conflict between juvenile and adult survival.
- Response S29-10:** Comment noted. Section 3.3.2 "Major Structural Measures", identifies possible measures to help improve fish passage conditions. This was not intended to be an all inclusive, scientifically evaluated listing, but merely a general outline of concepts that should be considered.
- Comment S29-11:** Objection to misconstruing of Idaho Plan.
- Response S29-11:** The actions proposed in this EIS are for 1992 only. Because dam modifications could not be completed, they have been separated from the alternatives. A key objective of the 1992 action will be to collect information on impacts requiring mitigation and the extent of mitigation required. Reference to the "Idaho Plan" was done in context to drawdown schemes. Text has been modified for the Final EIS.
- Comment S29-12:** Emphasize current inadequacies in system.
- Response S29-12:** Comment noted. Additional text has been added in Section 2.2.4. Activities Related to Fish., that better explain the Corps' fish programs.
- Comment S29-13:** Do not refer jointly to spring and summer chinook.
- Response S29-13:** Text changed.
- Comment S29-14:** Trend information should refer to redd counts.
- Response S29-14:** The information on the major species of the Snake River is presented for redds or other escapement. Where not presented as such, it is sufficient for the impact analysis.
- Comment S29-15:** Should discuss impact on salmon dependent communities.
- Response S29-15:** Because of the size of the study area and the great effort that would be required, economic analysis of impacts to specific communities or

businesses was not possible. The years of declining salmon runs may have resulted in economic losses, which may partially or substantially be regained if proposed long-term measures to assist salmon populations are successful. The long-term future economic consequences of actions taken (or not taken) in 1992 are not suitable for speculation. Also see response to Common Issue No. 3.

Comment S29-16: Should include estimates of change in water particle travel time.

Response S29-16: The scope of this EIS did not allow for analysis of pre-dam construction conditions in the Columbia/Snake basin.

Comment S29-17: Blockages not responsible for low seeding levels.

Response S29-17: The whole section presents many factors that affect current and historical runs. Hydropower is presented as a major factor. The level of importance of many of these factors on production of salmon cannot be accurately predicted at this time. While level of importance of each may be useful, the Corps does not believe it can be accurately predicted for all, so it is not included. While hydropower is a major contributor, it is not the only cause. The DEIS did not state that loss of habitat is responsible for the current low abundance of fish only that habitat reduction is an important factor. All of the factors have in the past, currently are, or can in the future reduce runs of salmon in the basin. A footnote was added to the table on habitat loss.

Comment S29-18: Juvenile abundance low despite habitat quality.

Response S29-18: See response to S29-17.

Comment S29-19: Changes in data.

Response S29-19: Data are not available on the origin of cargo from each pool. Monthly traffic volumes at Columbia River lower or upriver terminals are not really pertinent to the EIS, as this traffic would not be adversely affected.

Comment S29-20: Break down visitor information into months.

Response S29-20: Figure 2.12-4 has been revised to incorporate this information.

Comment S29-21: Brownlee reservoir's high level of recreational fishing use.

Response S29-21: The text has been revised as indicated.

Comment S29-22: Outdated Brownlee figures.

- Response S29-22: Comment noted. The schedule for completing the Final OA/EIS did not allow time to locate, obtain and incorporate this information.
- Comment S29-23: Lower Granite Pool to spillway crest.
- Response S29-23: The OA/EIS has adopted, with support from State and Federal agencies, a 4-week test in March.
- Comment S29-24: Mortality factors.
- Response S29-24: Text changed.
- Comment S29-25: Improper reference to "Idaho Plan."
- Response S29-25: References to the "Idaho Plan" have been changed in the text of the Final EIS.
- Comment S29-26: "No-action" alternative unacceptable.
- Response S29-26: See response to Common Issue No. 3.
- Comment S29-27: Status quo unacceptable.
- Response S29-27: See response to Common Issue No. 3. The OA/EIS documents the decline of the salmon runs and the need for river management actions to contribute to the recovery.
- Comment S29-28: Reservoir drawdown.
- Response S29-28: See response to Common Issue No. 3.
- Comment S29-29: Lower Snake River pools to MOP.
- Response S29-29: Drafting the lower Snake River pools to MOP and detailed monitoring of physical, biological and structural conditions are both part of the preferred plan for 1992.
- Comment S29-30: Operation of lower Snake River pools not possible at spillway crest.
- Response S29-30: The cooperating agencies agree with the conclusion that drawdown to spillway crest is not practicable in 1992. The proposed test drawdown of Lower Granite and Little Goose in March of 1992 will be an important element of determining changes needed for potential future operations at reduced reservoir elevations.
- Comment S29-31: Recommendation of variation of 4-week test in February.

- Response S29-31: See response to Common Issue No. 16 and Comment S29-23.
- Comment S29-32: Structural modifications may permit powerhouse operation.
- Response S29-32: This EIS addresses only possible operation controls and problems happening in 1992. Any operation other than normal in the future will be addressed by another NEPA action.
- Comment S29-33: Flow augmentation vs. reservoir drawdown.
- Response S29-33: The identification of reservoir drawdown and flow augmentation as separate categories of alternatives is not intended to indicate that these approaches are viewed as mutually exclusive. Both flow augmentation and a test of reservoir drawdown are included in the preferred plan for 1992.
- Comment S29-34: Long-term flow augmentation for lower river pools after drawdowns.
- Response S29-34: Comment noted.
- Comment S29-35: Amendment to storage rights in Upper Snake River reservoirs.
- Response S29-35: Comment noted.
- Comment S29-36: Dworshak reservoir releases.
- Response S29-36: Comment noted.
- Comment S29-37: Biological adequacy of Target 200.
- Response S29-37: Target 200 is not a cap but a target for low flow years.
- Comment S29-38: Flawed discussion of alternatives.
- Response S29-38: Limited storage is available in 1992 due to limited scope of evaluations. Scope did not include Montana reservoirs due to the lack of time to complete evaluations. Future studies (SOR) will complete evaluations on a broader scope.
- Comment S29-39: Operation at spillway crest would not involve conventional flow augmentation during spring outmigration.
- Response S29-39: No response necessary.
- Comment S29-40: Uncertain basis for controlling temperature to benefit adults.

Response S29-40: Release of water from Dworshak Reservoir in July, specifically for fall chinook will not be identified as an alternative in the EIS. The compressed time schedule to complete this study for a 1992 action did not provide necessary time to analyze this proposal. Additionally, under the preferred alternative, including spring flow augmentation for increased water particle travel time and cool water releases from Dworshak for temperature control in the lower Snake River to benefit adult chinook, limited water in the Snake River will not provide enough water for the suggested test.

Proposals to draft Dworshak Reservoir to assist fall chinook migration will be evaluated in longer-term study programs such as the cooperating agencies' System Operation Review.

Comment S29-41: Coordinated modification of drawdown test.

Response S29-41: Monitoring will be an integral part of 4-week test. The implementation and monitoring plan for the proposed drawdown test (see Section 5.5) includes provisions for coordination with agencies and modification or cessation of the test if monitoring reveals unexpected problems.

Comment S29-42: Approval of structural modifications.

Response S29-42: Comment noted.

Comment S29-43: Incomplete reference.

Response S29-43: Comment noted.

Comment S29-44: Equal consideration for all dams.

Response S29-44: Comment noted.

Comment S29-45: Charts should show pre-dam conditions.

Response S29-45: Comment noted.

Comment S29-46: Need for clear cost-effectiveness analysis.

Response S29-46: See revised text in Section 5.4. Also see response to Common Issue 4.

Comment S29-47: Disclaimer needed.

Response S29-47: See responses to Common Issues 9, 10, 13 and 14.

Comment S29-48: Insertion needed in flow augmentation discussion.

Response S29-48: Discussion of the performance of the respective options against the physical objectives is presented in Sections 3.4 and 5.4 of the OA/EIS.

Comment S29-49: Numeric predictions for gas saturation premature.

Response S29-49: The estimates of gas saturation levels are presented as ranges or are qualified in the text, and reflect the uncertainties. Gas saturation data from recent events (e.g., John Day powerhouse fire spill), tests (June 1991 spill test), and ongoing monitoring programs define boundary conditions and allow for responsible estimates of the ranges.

Comment S29-50: Uncertain conclusions on spillway crest impacts.

Response S29-50: The OA/FEIS relates to conditions for 1992 only. Structural modifications of the projects are not within the scope of this EIS.

Comment S29-51: Explain limitations of June 1991 spill test.

Response S29-51: Continued monitoring for saturated gas levels below Little Goose and Lower Granite are part of the proposed monitoring plan for the 1992 drawdown tests.

Comment S29-52: Effects of reservoir drawdown on temperature.

Response S29-52: Comment noted. Qualifiers have been added to the text to indicate the uncertainty.

See text for changes. The EIS emphasized the maximum temperatures because current maximums already reach levels that would be considered lethal for the short term (i.e., 25 to 26°C). Admittedly, even for these levels to become directly lethal, fish might have to spend more than a full day to directly succumb. However, the higher the temperature the less time is required for a fish to spend in these temperatures to die. Whether the lower lows will significantly reduce this effect is not known. The uncertainty of this is noted in the discussion and the impacts to fisheries because of the uncertainty is not emphasized. An extensive literature review might shed light on the benefits or deficits of constant temperatures compared to higher highs and lower lows but because of the unknown total changes we do not believe this appropriate to speculate further.

Comment S29-53: Compare temperature maximums.

- Response S29-53: The text does indicate (Section 4.1.2) that maximums are comparable or slightly greater than existing conditions (Section 4.1.2.2, paragraphs 1, 2, and 4).
- Comment S29-54: Distinguish between spring and summer temperature concerns.
- Response S29-54: Comment noted. The text has been revised to indicate this distinction.
- Comment S29-55: Use water from Dworshak Reservoir to fill lower Snake River reservoirs.
- Response S29-55: The EIS devotes considerable space to the thermal effects of releases from Dworshak (Section 4.1.2.3), including benefits.
- Comment S29-56: Opposition to 20-foot draft of Dworshak Reservoir in August.
- Response S29-56: The flow augmentation requirements for temperature releases from Dworshak will be set by conditions existing in August and will be coordinated with the region. Reference: FEIS 3.2.5 Storage Releases for Temperature Control.
- Comment S29-57: Negligible benefit from August Dworshak Reservoir releases.
- Response S29-57: Water temperature control measures will be conducted in August 1992 to test the effectiveness of cool water releases from Dworshak Dam to reduce water temperatures in the lower Snake River to benefit adult fish. The objective of this test to evaluate the ability to reach target reduced water temperatures at Ice Harbor Dam by September 1, and to determine the effectiveness of this operation on adult fish passage through the lower Snake River. In September, beginning immediately after Labor day, releases of up to 200,000 acre feet will be released.
- Comment S29-58: Doubtful effectiveness of Dworshak releases in August.
- Response S29-58: See response to S29-57.
- Comment S29-59: Feasibility study of Dworshak Reservoir unavailable.
- Response S29-59: Preliminary results from the cold water releases are discussed in the Final EIS. The result generally show a necessity for additional testing.
- Comment S29-60: Problems with August Dworshak release.

- Response S29-60: Comment noted. The benefit of August releases will have to be weighed against other uses and users. The proposed 1992 release is a test and is designed to gather the necessary information to help make a decision for future operations.
- Comment S29-61: Edit discussion of toxics in reservoir sediments.
- Response S29-61: Text has been modified.
- Comment S29-62: Offset of loss of dilution capacity.
- Response S29-62: The OA/EIS states that dilution and diminishing effects, which include river velocity, were not explicitly considered in the development of water column concentrations. It is recognized that increased river velocity caused by spillway drawdown might work to partially offset the loss of dilution capacity. Conversely, increased velocity will cause increased resuspension of sediments in a decreased water volume as compared to a normal reservoir volume with minimal sediment resuspension. However, without actual sample information on contaminant concentrations in sediments, surface water, or fish tissue, the effects of these river parameters cannot be determined.
- Comment S29-63: Spillway crest drawdown offering opportunity to clean up landfill.
- Response S29-63: The Corps will monitor the landfill during drawdown. See comment T3-6.
- Comment S29-64: Misrepresentation of data in Giorgi's document.
- Response S29-64: The points made concerning errors are valid for some of the document. The text has been modified in some areas based on these comments by the FPC and Idaho. However, most of the information is not in error and will be retained for the analysis.
- We do not believe it is appropriate at this time to make major changes in the text. While use of other data sources would change the text to various degrees, the changes would not be substantial enough to change the evaluation of the alternatives in a fashion that would alter the final selection of actions for 1992.
- Comment S29-65: Errors in discussion of mortality.
- Response S29-65: While much of this mortality might be natural, some portion might not be natural because the river reaches above Lower Granite Pool are not without perturbations. This mortality, whether natural or not, affects production of the stocks. To assume that up to

85 percent mortality before reaching Lower Granite Pool is not significant because it may be natural does not describe the whole picture.

We have added Raymond's data from the 3 years when only one dam was in place to this section.

Comment S29-66: Check Raymond's estimates.

Response S29-66: Raymond's (1979) data have been added to text.

Comment S29-67: Overstatement of uncertainty between flow/travel time.

Response S29-67: Comment noted. Other data added to text.

Comment S29-68: Significance of flow/travel time relationship.

Response S29-68: Comment noted. This conclusion is presented on page 4-28 as the first analysis. Most of the analysis presented does not deny that significant relationships exist between flow and travel time. The analysis points out the relationship between flow and travel time is not always direct; also, its relative effect varies with other factors. Some of the data analysis available does not confirm that effects continue at all flows up to those recommended by the agencies.

Some text additions made.

Comment S29-69: Incorporate Berggren and Filardo (1991) paper.

Response S29-69: Text additions made.

Comment S29-70: Inaccuracy of Kindley analysis.

Response S29-70: Text addition made.

Comment S29-71: Incorrect statement concerning change in travel time.

Response S29-71: Text deletion made.

Comment S29-72: Comment noted. Conclusions in text remain the same based on analysis used.

Response S29-72: Dr. Petrosky's analysis has been added to text.

Comment S29-73: Petrosky examined additional data.

Response S29-73: Dr. Petrosky's analysis has been added to text.

- Comment S29-74: Charts clarify historic relationship between travel time and returning adult runs.
- Response S29-74: Comment noted.
- Comment S29-75: Petrosky analysis shows significant relationship between flow and smolt-to-adult returns.
- Response S29-75: Dr. Petrosky's analysis referred to spring chinook. This section refers to underyearling chinook.
- Comment S29-76: Charts provided showing additional river velocity information.
- Response S29-76: The charts do not change our analysis. Tables have been presented showing the change of flow with different combinations of alternatives. These charts will not be added.
- Comment S29-77: Review data for fish travel time through Lower Granite Pool.
- Response S29-77: While the relationships between flow and travel time have been developed for the Lower Granite Pool, the relationships have been noticeably different between rivers and years and times of the year. For example, yearling chinook travel time is about 40 percent slower than Snake River yearlings for the same moderate flow level (see figures in the FPC (1991) report). Differences between years are also different (see Figure 3 of Buettner appendix 9 report). While Buettner believes ATPase is not a major factor, he admits data is limited. In one year, there was a significant correlation; in another year, there was not. While the flow relationships presented are significant, they are not consistent (i.e., a specific travel time versus flow relationship through the pool for all years, times of year and rivers). With the inconsistency of the data, it is believed that the analysis presented using water particle travel time as a surrogate for smolt travel time is reasonable for the analysis presented.
- Comment S29-78: Buettner report included.
- Response S29-78: See response to S29-77.
- Comment S29-79: Raymond study ignored.
- Response S29-79: While the data from Raymond (1979) is pertinent, we believe the information used in our analysis is also suitable and will not change the text. We have added mention of the reanalysis of the data from Petrosky earlier (see response to S29-73).
- Comment S29-80: Models able to define travel time/flow relationship.

Response S29-80: Text changed.

While some of Giorgi's (1991) data were in error, much of them were not. The review by the FPC found some data errors, but many of their statements were disagreeing with some of the data analysis. While it can be and is argued that the use of a polynomial analysis is not justified, we believe there is enough uncertainty to retain this in our assessment, and our objective was to present the major regional views of the flow/travel time relationship.

Comment S29-81: Clarification needed on polynomial model statement.

Response S29-81: Comment noted. The use of terms here is valid and will be retained.

Comment S29-82: Description in caption unclear.

Response S29-82: Caption changed. The linear model has been retained indicating that it is only a partial data set.

Comment S29-83: Legend for table should be changed.

Response S29-83: Table has been changed.

Comment S29-84: Inappropriate reference.

Response S29-84: Text changed.

Comment S29-85: Inappropriate estimates.

Response S29-85: Text changed.

Comment S29-86: Qualify statement on reservoir drawdown.

Response S29-86: The cooperating agencies have attempted to clarify throughout the OA/EIS that a fundamental basis for all impact assessments for 1992 actions is that the dams and associated facilities could not be modified.

Comment S29-87: Insufficient information on benefits of drawdown to spillway crest.

Response S29-87: While the survival benefits could appear to be good with reservoir drawdown to spillway crest, there are too many factors that could cause significant impacts to the very fish that we are trying to benefit. While Idaho may believe that an estimate here will benefit the public by simply stating that "some factors such as nitrogen gas supersaturation may reduce these benefits somewhat" is a fair

statement, the cooperating agencies do not. The proposed alternative does not represent river conditions in any other significant factor other than to reduce water particle travel time; therefore, survival values that would be based on past river conditions such as those by Raymond (1979) are not representative. There are too many potential negative factors to consider those conditions for survival comparison. The spillway crest operation conditions do not represent anything close to the existing reservoirs, so any models based on reservoir conditions adjusted for travel time are just as unlikely to be realistic. The other options evaluated were based on models that have been developed with the dams in place and operating, so although some assumptions were made, they were not unreasonable based on the fact the information was gathered under similar situations to those that were being considered. The main exception to this was smolt travel time. Travel time reductions were estimated with all alternatives. It can be argued that it is a simple next step to predict survival changes. As stated above, however, it is quite possible that with all of the changes in the structures and operations that the effects of those changes on survival could outweigh any benefits from travel time enhancement.

Comment S29-88: Transportation not desirable substitute for safe in-river migration.

Response S29-88: While the proposed drawdown is to enhance survival of fish during migration through the reservoirs, its success has not yet been demonstrated. The discussion presented in the EIS is valid concerning what will happen to fish that would not be transported. Currently, NMFS considers smolt transport a benefit over non-transported fish. The loss of this operation would be a negative effect unless the benefits of not transporting occur. It is valid to present these negative effects of the proposal until benefits of not doing this are demonstrated.

Comment S29-89: Misleading discussion of transportation.

Response S29-89: The 98 percent survival is reasonable for fish from collection through barging to release below Bonneville dam. The fact that survival to return is not as high as expected, in some cases, based on probable bypassing reservoir and dam passage induced mortality factors is also true. The reasons for this are not known as stated in the EIS (page 4-42), but major mortality apparently does not occur in the barge. There are many possible reasons why the benefits are lower than expected, some possibly induced by barging and some independent of barging. While the benefits may be lower than expected, they are positive as shown in Section 4.2.1.5, so barging is a benefit over not barging, at least at flows designated. Activities that circumvent barging will be a negative impact unless they

outweigh the benefits of barging. The Corps believes that it has not misrepresented its description of barging benefits.

Comment S29-90: Smolt survival goals cannot be met with transportation.

Response S29-90: Comment noted. NMFS (as one management agency involved) regards transportation differently, and in fact fully supports transportation under all flow conditions (Matthews et. al 1991). Smolt survival can be improved with transportation, as evidenced in multiple years of research data.

Comment S29-91: Discuss cost savings of eliminating transportation.

Response S29-91: The transport mortality of 1 percent (direct, during transportation, from numerous FTOT reports) which would be saved as a result of eliminating the transportation program is easily offset by the loss of the benefits of transportation if the program were eliminated (the most recent data [1986 test returns at Lower Granite Dam] is 2:1 for steelhead (95 % CI of 1.43, 2.66), and 1.6:1 for spring chinook (95 % CI of 1.01, 2.47) (Matthews et. al 1991). In-river migrants are exposed to turbines, predators, dissolved gas supersaturation, etc., which reduce their survival as compared to transported fish. Post-transport mortality has not been quantified, but the Corps acknowledges that area of undocumented mortality.

These issues are not within the specific scope of the 1992 OA/EIS.

Comment S29-92: Benefits of drawdown in reducing predation; impact on northern squawfish?

Response S29-92: The EIS discussed effects of lowering reservoirs on predation and stated it would probably be reduced, although it could increase as well. It is speculative whether a one-year drawdown would reduce squawfish populations. The summary statements about resident fish primarily concern warm-water species that tend to use shallow-water spawning habitat. Squawfish are a long-lived fish that reside successfully in reservoirs and rivers so changes in reservoir conditions are likely to have only minor effects on squawfish populations (see Resident Fish section).

Comment S29-93: Inconsistent time period of analysis.

Response S29-93: Only those alternatives that could be implemented in 1992 were evaluated. No alternatives requiring significant structural modifications (for 1992) were evaluated. The Corps is evaluating long-term alternatives through the System Operation Review (jointly with BPA and BRec) and the Columbia River Salmon Mitigation

Analysis. The Northwest Power Planning Council, through their amendment process, is looking at potential structural modifications as well as other alternatives to benefit salmon.

See responses to Common Issues 9, 10, 13 and 14. Wherever possible, the OA/EIS has been clarified to indicate that the assessment applies to 1992 actions only, and that the impacts of these actions would primarily be the short-term effects that would result without structural modifications or the ability of river users to adapt to new long-term operating patterns. Long-run impacts are discussed in only selected cases, particularly agriculture, because these impacts were the focus of public input in the scoping process. Additionally, some discussion of long-run impacts is needed to provide perspective and understanding of the significance of timing in determining impacts. In general, however, a long-term perspective is not appropriate because of the specific scope of the 1992 OA/EIS, and because the least-cost alternative for long-term operation can not be identified at this time.

Comment S29-94: Options should be analyzed in consistent framework of benefits and costs.

Response S29-94: The OA/EIS economic evaluations are based generally on National Economic Development criteria, to the extent possible. This directs selection of the least cost, most environmentally-acceptable alternative. A cost-effectiveness analysis has been included in the OA/EIS. This cost-effectiveness will be used in the plan selection process. Your comments are noted.

Comment S29-95: Show cost-effectiveness, not just total cost.

Response S29-95: See response to Comment S29-94.

Comment S29-96: DEIS careless in economic concepts.

Response S29-96: Section 4.8.1 now presents crop losses in net rather than gross terms. Net values are based on Washington State University Cooperative Extension Service estimates of revenue less variable costs.

Comment S29-97: Ignore secondary economic impacts.

Response S29-97: The cooperating agencies agree that secondary economic impacts are not appropriate for inclusion in benefit-cost analysis. The Draft OA/EIS explained that it was not possible to prepare a benefit-cost analysis of the 1992 options, primarily because the benefits could not be quantified in monetary terms. The cost-effectiveness analysis that

has been added to the Final OA/EIS is based only on the direct, net costs of the options that can be reliably estimated for specific resources.

While secondary economic impacts should not be included in net cost calculations, they should not be ignored. Indeed, discussion of secondary or indirect impacts is required in NEPA documents. The OA/EIS recognizes the limitations on quantifying all of the potential secondary economic impacts and properly qualifies those impacts that are identified. In particular, no attempt has been made to quantify changes in asset values. However, agricultural interests have correctly noted that even short-term actions could induce changes in long-term asset values. Because these values can be significantly influenced by perceptions, these types of impacts must be acknowledged.

Comment S29-98: Consider economic value in restoring runs.

Response S29-98: See response to Common Issue No. 13.

Comment S29-99: Consider economic benefits of drawdowns.

Response S29-99: As indicated previously, the OA/EIS notes that benefit-cost analysis can not be applied to the 1992 options. Because drawdown of all four lower Snake River reservoirs to near spillway crest is not implementable for 1992, no point would be served by further investigation of all potential costs and benefits of these actions in the 1992 OA/EIS. The benefit issues raised by the comment may be appropriate for inclusion in analyses of long-term operational and structural changes.

Comment S29-100: Include other studies (suggestions included).

Response S29-100: Comment noted. The cooperating agencies acknowledge receipt of these references, and have considered the information as appropriate in preparing the final OA/EIS.

Comment S29-101: Data for McNary pool misleading.

Response S29-101: All impacts associated with the McNary Pool have been deleted from the text.

Comment S29-102: Shorter drawdown period impacts not clear.

Response S29-102: An assessment of the March 1 through 31 test is provided in Section 4 in the text.

Comment S29-103: Incomplete assessment of transportation costs to farmers.

Response S29-103: The EIS estimates that the farmer or shipper will take the least cost transportation alternative. In most cases, this is storage of grain at river elevators rather than a shift to rail or truck transportation modes. For those alternatives where storage is limited (i.e., at Ice Harbor under all alternatives and after three months storage at other Snake River pools), shippers will shift to the next least expensive alternative which is rail transportation.

Selling before the drawdown period would still require additional storage and inventory costs but would be imposed by downriver terminal operators as opposed to upriver terminal operators. The active downriver terminals do not have a large storage capacity and cannot be relied on to accept all grain shipments prior to drawdowns. There is an idle grain facility at Longview which has a silo capacity of 200,000 bushels and could support some downriver storage.

The two-week maintenance period is figured in the calculations implicitly. There must be time included under the three-month and five-month drawdown alternatives to load barges with grain stored during the river shutdown and to undertake routine maintenance that could not be accomplished during the drawdown period. The two-week period serves this need.

Comment S29-104: Adverse price effects from oversupply of grain after drawdown not likely.

Response S29-104: The summary impact calculations presented in the EIS do not include increases for either rail or barge transportation rates. The storage of grain is the best alternative if storage is available. Rate increases over the test year may actually occur in which case the EIS provides a conservative estimate of the impacts. The railroads may require a surcharge to make cars available on a short-term basis. If annual drawdowns are implemented, in the longer term, rate increases are also likely to occur as barge operators' cost structure and profit margins are affected.

A critical point to be emphasized is that barge competition controls rail rates. As barge rates increase so will rail rates, which could have a long range impact on substantial volumes of grain which do not use the river.

Comment S29-105: Overestimation of cargo moved.

Response S29-105: A jumbo grain barge can hold 3,600 tons of grain. If the system is operated at present levels (i.e., 3 to 5 feet above MOP), there are no constraints to this loaded draft. If the system is at MOP, the average load of the barges will be reduced to an estimated 3,000 tons. This accounts for the difference in the number of barges which actually moved as opposed to the calculated number.

Comment S29-106: Overestimation of agricultural impacts.

Response S29-106: See response S29-96 regarding the replacement of gross crop values with net values in the FEIS. With regard to EIS references to operators who may be forced out of business, the text remains essentially the same; that is, it reports what people said when they were interviewed. These responses were not used in any way to calculate additional direct or indirect impacts.

Comment S29-107: Using single-year estimates leads to overestimation.

Response S29-107: The analysis of crop losses in Section 4.8 now uses net rather than gross values, and is based on Washington State University Cooperative Extension Service Farm Budget Reports.

Comment S29-108: Analyze net farm income both with and without project.

Response S29-108: The text notes that some operators could convert to other crops, but attempts to estimate without-project production have not been done for this EIS. There is no basis at this time for estimating who would or could make the short-term change to dry crops, grazing, or production with heavy summer and fall irrigation as suggested by Dr. Gardner.

Comment S29-109: Least costly alternative is to make pump modifications.

Response S29-109: The cooperating agencies agrees that the least costly alternative is to make pump modifications and continue producing. The text of Section 4.8 has been clarified, however, to indicate that this is not an option for the 1992 season.

Comment S29-110: Assign values for agricultural losses associated with flow augmentation scheme.

Response S29-110: Section 3.2.3.1 of the OA/EIS indicates that upper Snake River contributions to any flow augmentation options would be uncontracted water excess to irrigation needs. Therefore, even the unrestricted draft option (Option F) does not involve reallocation of upper Snake River irrigation water to fish flows, and there would be no impacts to upper basin irrigation with flow augmentation. Based

on other comments on the draft OA/EIS, however, Section 4.8 has been revised to indicate that some of the flow augmentation options could increase the probability that Brownlee Reservoir elevations would not be high enough to permit irrigation pumping. This would affect a relatively small acreage around Brownlee.

Comment S29-111: Explain that drawdown of Lower Granite and Little Goose pools will not affect irrigation facilities in Ice Harbor pool.

Response S29-111: See response to S29-109. No irrigation impacts at Ice Harbor (or elsewhere) are attributed to the proposed March drawdown test of Lower Granite and Little Goose.

Comment S29-112: Overstated estimates of power loss for drawdown.

Response S29-112: Referenced section of OA/EIS has been reevaluated (see new analysis in Section 4.9).

Comment S29-113: Long-term impacts to power system.

Response S29-113: The comment is correct. However, the scope of the document only included sections that could be completed in 1992, not a long-term solution. This OA/EIS and other ongoing work with BPA, BoR, and the Corps will address the feasibility of structural modification in the future.

Comment S29-114: Contradictory cost estimation for power loss.

Response S29-114: Power impacts have been reevaluated (see new analysis results in Section 4.9).

Comment S29-115: Overestimated cost of nonfirm energy loss.

Response S29-115: See response to S29-112.

Comment S29-116: Loss of non-firm generation during flow augmentation likely to be less than drawdown.

Response S29-116: See response to S29-112.

Comment S29-117: Disregard capacity loss.

Response S29-117: Dam modification numbers are not included because modifications of the dams are not implementable in 1992, and therefore are not within the scope of this study.

Comment S29-118: DEIS projects higher power losses than should actually occur.

Response S29-118: See response to S29-112.

Comment S29-119: Capacity impacts to system due to flow augmentation.

Response S29-119: See response to S29-114.

Comment S29-120: Mitigation of impacts.

Response S29-120: See response to S29-113.

Comment S29-121: Recreational impacts.

Response S29-121: See response to S5-3 regarding data sources and techniques used to estimate the number of recreation days lost. The Draft OA/EIS did not assume that all recreational use would be lost for any alternative. The Draft OA/EIS did state that all boat ramps, moorage facilities, and swimming areas at project recreational areas would be unusable when lower Snake River pools were lowered to near spillway crest and that water-based activities would be essentially eliminated. The introduction to Section 4.10.2 also noted that limited utility of water-based facilities would produce corresponding effects on related uses at other locations, such as campgrounds, but that these changes were not incorporated into the estimates of displaced visitation. In summary, the lower Snake River displacement estimates only reflect use changes associated directly with water-based facilities, and thereby may understate actual visitation effects.

Comment S29-122: Concern over expenditure figure for recreation.

Response S29-122: See response to S29-97. Secondary impacts such as these are customary and required elements under NEPA. Various public interests in the region are aware that river management actions will lead to shifts in the distribution of recreational expenditures, as well as possible changes in magnitude; these impacts must be acknowledged. The cooperating have taken care to present these potential changes with the proper qualification and context.

Comment S29-123: Recreation does not coincide with run-off period.

Response S29-123: Table 2.12-4 illustrates the seasonality of recreational use for projects on the lower Snake River. Four percent of the annual recreational use occurs in March, 8 percent in April, 10 percent in May, 15 percent in June, 18 percent in July, and 18 percent in August. There is an increase in use at lower Snake projects after peak runoff, which could be attributed to several factors including warmer weather and water. The April 15 to June 15 drawdown option generally overlaps with the high runoff period, while the

April 15 to August 15 option extends well past the runoff peak into high-use summer months.

Letter S30, Washington State Department of Transportation (B.L. Chaplin), November 22, 1991

Comment S30-1: Concern with increased truck traffic.

Response S30-1: These types of impacts were identified as possible occurrences in the DEIS, and are valid concerns. However, the transportation analysis indicated that shippers would most likely opt for storage or a combination of storage and rail transport in response to a navigation stoppage, with little shifting to truck transport.

Comment S30-2: Erosion due to drawdown.

Response S30-2: These concerns are also addressed in the DEIS, which acknowledges a risk of embankment failure with deep drawdowns. Placement of additional riprap or other protection in advance of a drawdown is not feasible, due to the length of embankment area involved. However, embankments, bridge footings, and other key structures will be carefully monitored as part of the test drawdown proposed for 1992. The Corps will stockpile riprap at several locations to facilitate repairs to any structures where erosion damage might occur. The test program also includes provisions to halt the test if significant structural damage should occur.

Comment S30-3: Coordination with District Utilities Section.

Response S30-3: Any such coordination needs will be conducted as suggested.

Comment S30-4: Inadequate listing of affected highways.

Response S30-4: The highways identified have been added to Table 2.9-3.

Comment S30-5: Two bridges not included.

Response S30-5: These bridges were not included in the analysis of physical effects because they cross a portion of the Snake River that is within the McNary Pool, which has not been considered for drawdown to near spillway crest.

Comment S30-6: Tax revenue of trucks to maintain highways.

Response S30-6: The text has been revised slightly to reflect this point.

Comment S30-7: Low truck percentages on U.S. 395.

Response S30-7: The figure in question has been revised as suggested.

*Letter S31, Hon. Charles Cuddy, State of Idaho, House of Representatives,
December 13, 1991*

Comment S31-1: Compliance with directives commissioning Dworshak Project.

Response S31-1: No decisions had been made as of December 12, 1991. The Corps will operate within the established authorities for the Dworshak Project.

Comment S31-2: Compliance with requirements for hearings specific to changes in Dworshak drawdown.

Response S31-2: As required under Section 415B of the Water Resource Development Act of 1990, a public hearing will be held at Orofino.

Comment S31-3: OA/EIS to more adequately address effects on resident fish in the Clearwater River.

Response S31-3: Comment noted.

Comment S31-4: OA/EIS to more adequately address the present economic instability, high unemployment, and governmental deficit.

Response S31-4: Socioeconomic effects in present economic environment. The cooperating agencies acknowledge that the adverse socioeconomic effects of any 1992 measures would likely occur at a time of relative economic weakness at the national, regional, and state levels.

Comment S31-5: Restriction of offshore and inland fish harvest.

Response S31-5: Comment noted. See response to Common Issue No. 7.

Comment S31-6: Request a public hearing in Orofino, Idaho per Section 415-B of the 1990 Water Resource Development Act.

Response S31-6: Comment noted. A meeting in Orofino is being planned (an annual event).

REGIONAL

Letter R1, Columbia River Inter-Tribal Fish Commission (Ted Strong, Executive Director), November 8, 1991

Comment R1-1: Include July drafts from Dworshak in FEIS.

Response R1-1: Release of water from Dworshak Reservoir in July, specifically for fall chinook will not be identified as an alternative in the EIS. The compressed time schedule to complete this study for a 1992 action did not provide necessary time to analyze this proposal. Additionally, under the preferred alternative, including spring flow augmentation for increased water particle travel time and cool water releases from Dworshak for temperature control in the lower Snake River to benefit adult chinook, limited water in the Snake River Basin will not provide enough water for the suggested test.

Proposals to draft Dworshak Reservoir to assist fall chinook migration will be evaluated in longer-term study programs such as the cooperating agencies' System Operation Review.

Letter R2, Columbia River Inter-Tribal Fish Commission (Ted Strong, Executive Director), November 14, 1991

Comment R2-1: Need for structural modifications and consideration of use of water in basin storage reservoir.

Response R2-1: See response to Common Issues No. 13 and 14.

Comment R2-2: Support for eighth alternative.

Response R2-2: See response to Common Issue No. 16.

Comment R2-3: Current projects could affect OA/EIS.

Response R2-3: Comments Noted.

Comment R2-4: Clarify goal.

Response R2-4: The text has been changed to address this comment.

Comment R2-5: FEIS should contain analysis of basin pre-hydrosystem hydrology.

Response R2-5: The cooperating agencies do not feel that this would contribute to the purpose and scope of the OA/EIS.

- Comment R2-6: Do not support "no-action" alternative.
- Response R2-6: No response necessary.
- Comment R2-7: Support for immediate drawdown of pools to MOP; eventually to spillway crest.
- Response R2-7: No response necessary.
- Comment R2-8: Importance of flows resembling pre-hydrosystem hydrograph below Bonneville Dam.
- Response R2-8: Comment Noted; see Common Issue No. 5.
- Comment R2-9: Examine flow needs for Snake River subyearling chinook.
- Response R2-9: See text changes. Another flow alternative is not being added to the DEIS for juvenile fall chinook for the 1992 test.
- Comment R2-10: Analyze options for Snake River releases during June-September subyearling migration.
- Response R2-10: The limited amount of storage in the Snake River Basin will not enable use of large volumes of water for additional summer flow augmentation, possible refill of drawdown mainstem reservoirs, late-summer temperature control, and summer juvenile migration in the same year. Given the limited time to complete the EIS process before 1992 actions need to be implemented, it is not feasible to further complicate the analysis by evaluating another potential use of stored water. However, consideration of this type of action will be included in the longer-term System Operation Review process currently underway among the cooperating agencies.
- Comment R2-11: Evaluation of fall chinook redds.
- Response R2-11: Information from 1991 fall chinook surveys is incorporated into the text. An attempt will be made in January 1992 to locate redds below Lower Granite.
- Comment R2-12: Support of control of water temperatures in Snake River to benefit fall chinook.
- Response R2-12: The temperature model information is included in the text.
- Comment R2-13: Hydrosystem effects upon anadromous fish ecosystem.
- Response R2-13: Comments noted.

- Comment R2-14: Omission of part of salmon history.
- Response R2-14: See addition to text.
- Comment R2-15: Need to state salmon and steelhead navigate fish ladders and unnatural pool habitats with degraded water quality parameters.
- Response R2-15: The last sentence indicates the need to pass through reservoirs on eight dams. Characteristics of these reservoirs' water quality are discussed in later sections.
- Comment R2-16: Document advantages of increased flow.
- Response R2-16: Comments Noted. Reference Response, Common Issue No. 5.
- Comment R2-17: More complete description of existing environment.
- Response R2-17: A discussion of pre-dam conditions is outside the scope of this EIS. The Columbia River Estuary does provide important rearing areas for juvenile salmonids. A description of the Columbia River Estuary has not been included because the alternatives are not expected to have a significant effect on the estuary. It is possible that summer flow augmentation could alter the salt water distribution and this could have a minor effect on rearing areas and food sources, but it is not expected to be significant due to tidal influences. Additional citations for adult fallback and delay of adult passage are not considered necessary, especially given the short timeframe for preparation of the document: these issues are acknowledged in the EIS. Regarding impact analysis of the no action alternative, see response to Common Issue 3.
- Comment R2-18: FELCC's constraints should be analyzed.
- Response R2-18: The Columbia river system is a controlled system with storage reservoirs for flow augmentation. Although periods of drought cannot be ignored for their effect on the system, their effect can be dampered through utilization of flow augmentation from the storage reservoirs.
- Comment R2-19: More information needed on fish guidance efficiencies.
- Response R2-19: Comment noted.
- Comment R2-20: More documentation on transportation.
- Response R2-20: Comment noted.

- Comment R2-21: More detailed analysis needed.
- Response R2-21: Comment noted.
- Comment R2-22: Gas supersaturation levels.
- Response R2-22: Comment noted. A sentence has been added to clarify that natural supersaturation is generally restricted to small areas.
- Comment R2-23: Infraction of standards for dissolved gas.
- Response R2-23: The observation of routine exceedence appears to be correct, and from a regulatory viewpoint, additional infractions may have "little relevance." However, the extent, duration, and magnitude of exceedence are extremely important from a biological viewpoint. The 110 percent dissolved gas standard is not an absolute bioendpoint after which more severe or significant effects may not be experienced. Certain potential exceedences may have much more severe impacts than others (e.g., 115 percent for one day in a small reach vs. 135 percent for 5 days in a 5-mile reach).
- Comment R2-24: Deficiency in information on effect of options upon basin temperatures.
- Response R2-24: The thermal impact of the impoundments is noted in Section 2.3.2.2, and is in agreement with the shift and change in variance as described in the comment. Time constraints and lack of a calibrated system model precluded more detailed analyses. In addition, emphasis was given to the most recent literature and studies, where possible, to describe the system as it exists today. An accounting of the impacts of the existing system against the pristine condition is not an objective of this EIS. Regarding exceedences, the state standards also make provision for conditions when the natural temperature exceeds 20°C; it is misleading to indicate that Table 4.1-2 by itself indicates routine exceedences of thermal standards.
- Comment R2-25: Analysis of daily water temperature maximum levels at Dalles and Bonneville pools.
- Response R2-25: The basis for the statement is the information contained in the preceding paragraphs discussing drawdown of all four reservoirs to MOP. A qualifier will be added to the text to reflect the uncertainty of the evaluation.
- Comment R2-26: River basin historically more turbid.

Response R2-26: The text does indicate that turbidity may increase (Section 4.1.3.1, para. 2). A sentence will be added to Section 2.3.3.3 to describe the observations concerning historical and existing conditions.

Comment R2-27: Support of Fish Passage Center's work.

Response R2-27: No response necessary.

Comment R2-28: Concerns with section on juveniles.

Response R2-28: Comment noted.

Comment R2-29: Water quality parameters changed by hydrosystem reservoirs.

Response R2-29: Text has been modified.

The Description of the Environment, section 2.3 Water Quality, acknowledges that changes to water quality parameters have occurred due to human activity.

Comment R2-30: Project will likely result in increased macroinvertebrate diversity.

Response R2-30: Text has been modified.

Comment R2-31: Tribes and fishery agencies must be respected and included in process.

Response R2-31: Comment noted. Implementation and coordination plans are discussed in Sections 4.12 and 5.5.

Letter R3, The Shoshone-Bannock Tribes (James Osborne, Tribal Vice Chairman), November 14, 1991

Comment R3-1: Tribal belief systems must be respected.

Response R3-1: Acknowledgement that the salmon play an important role to the Tribes has been added to Section 2.15.5. The Corps has consulted with, and will continue to consult with the Tribes. Also see response to F2-14.

Comment R3-2: Tribes would like to see alternatives not listed; take part in process.

Response R3-2: Alternatives not considered either were not feasible or could not be implemented in 1992, and thus were outside the scope of the EIS. Alternatives representing long-term actions may be considered under long-term programs such as the System Operation Review and the Columbia River Salmon Mitigation Analysis. Both the programs

include tribal participation, and are open to additional interested parties.

Letter R4, Upper Columbia United Tribes Fisheries Research Center (Janelle Griffith, Lake Roosevelt SOR Biologist, and Dr. Allen T. Scholz, Director, UCUT Fisheries Research Center), November 12, 1991

Comment R4-1: Protest of lack of consultation with Spokane Tribe of Indians.

Response R4-1: A report dealing with the impacts of all flow augmentation alternatives that included flood control shifts was provided to and reviewed by UCUT staff prior to being included in the EIS.

Comment R4-2: Misuse of Lake Roosevelt Monitoring Project data.

Response R4-2: Text amended and corrected.

Comment R4-3: Need to emphasize that decreasing reservoir levels combined with increased outflow result in lower water retention times.

Response R4-3: Text amended and corrected. Also see response R4-5.

Comment R4-4: Importance of water retention time.

Response R4-4: See Response R5-4. Peone et al. (1980) documented good zooplankton production in 1989 despite the less than 30 day water retention time for a month in spring. They also documented good fish growth and good production of juvenile yellow perch, exceeding levels measured in 1980 and 1982. The text has been modified to better reflect the relationship between the water retention time and the aquatic resources of Lake Roosevelt; however, the comment appears to overstate the significance of a short-term reduction in water retention time on zooplankton production.

The comment also addresses impacts of long-term management of the reservoir at low spring water retention times. The scope of the EIS is for a one-time experimental release only and does not include impacts of long-term changes in reservoir management.

Comment R4-5: Harmful effects of reduced spring water retention time.

Response R4-5: To our knowledge, the 1991 impacts on fisheries are not documented and hence are not available for review. The cooperating agencies have attempted to modify the discussion to better reflect the importance of water retention time.

Although the 1991 flood control shift would have resulted in a maximum additional draft of approximately 5 feet around April 15, the water surface elevation as a result of flood control alone would have been 1,255 feet. The draft for hydroelectric power lowered the water surface elevation to approximately 1,235 feet, or an additional 20 feet. System flood control in Lake Roosevelt was terminated near the end of April at 1,240 feet elevation; however, the actual water surface elevation at the end of April was near 1,223 feet. The additional draft was due to hydropower needs and not the flood control shift.

The impacts to Lake Roosevelt discussed in this EIS are all based upon an impacting alternative occurring only in 1992. With that premise and the potential of any flood control shift occurring only one in three years, and considerably less than one in three if drafts below base case operations are considered, the impacts to the fishery and to recreation were considered not significant. Impacts to the fishery and to recreation from flood control shifts continuing into the future (beyond 1992) were not analyzed for this EIS.

Letter R5, Colville Confederated Tribes (Kirk Truscott, Biologist), November 2, 1991

Comment R5-1: Increase of spawning habitat on Lake Roosevelt.

Response R5-1: This statement was offered as a general reservoir impact on reservoirs with significant terraces at various levels. Spawning habitat in Lake Roosevelt at varying water surface elevations could not be determined for this EIS.

Comment R5-2: Effects of decreases in reservoir elevations.

Response R5-2: The text has been expanded. See Response R4-5.

Comment R5-3: Importance of zooplankton to fish.

Response R5-3: Comment noted. The text has been expanded.

Comment R5-4: Need for predictions of water retention times based on proposed alternatives.

Response R5-4: To date, investigators have not been able to predict zooplankton population size, growth of fish, or entrainment of fish based on water retention times. Zooplankton production and fish growth are a function of not only water retention time but also numerous other factors including photoperiod, water temperature, nutrient input, and predation. Entrainment is believed to be a function of flow, water surface elevation, and fish size. No predictive relationship as yet

exists for growth, zooplankton production, or entrainment. Hence, additional information on water retention time will be of little value in the analysis of potential effects. The author of the comment is referred to Peone et al. (1990).

We agree that the relationship of water retention times to fish production and fish entrainment through Grand Coulee Dam should be evaluated if the flood control shifts are considered as part of a long-term solution to the salmon survival problem.

LOCAL

Letter L1, City of Boardman (William C. Brown, Mayor), October 1, 1991

Comment L1-1: Effects of municipal water supplies, like Boardman's.

Response L1-1: Comment noted. The detailed engineering information provided is not appropriate for direct incorporation into the EIS. Review of the data presented indicates that the yield of the Ranney Method Collector will not be compromised by the alternatives presented in the EIS. The lowest level for drawdown of the lower Columbia reservoirs is the MOP level. For the John Day Reservoir, this is an elevation of 257 feet. At a pumping elevation of 262.5 feet (using the analysis by Ranney Method Western Corp.), this will allow a potential yield of the collector of about 8,000 gpm, still well above the 6,000 gpm design capacity. The scenarios of reservoir levels of 250 feet, 247 feet, or similar elevations are not probable. The Corps will assess the effects of the operating regime on a trial basis before instituting permanent changes. However, a paragraph highlighting the potential impacts to localized water supplies such as Boardman has been included.

Letter L2, Port of Lewiston (Ron McMurray, Manager), October 17, 1991

Comment L2-1: Support of test drawdown.

Response L2-1: No response necessary.

Comment L2-2: Implement other projects before drastic drawdowns.

Response L2-2: See response to Common Issue No. 13.

Comment L2-3: Damage to levees and railroad embankments.

Response L2-3: There are risks of such types of damage, which are addressed in Sections 4.7 and 4.14 of the EIS. Implementation of any drawdown action that could lead to levee and embankment damage will include careful monitoring of erosion and structural stability, and contingency plans for emergency repairs.

Comment L2-4: Support for limited test drawdown.

Response L2-4: See response to Common Issue No. 16.

Comment L2-5: Opposition to dramatic drawdowns.

Response L2-5: Comment noted.

***Letter L3, Franklin Public Utility District (Beverly Cochrane, Commissioner),
October 23, 1991***

Comment L3-1: Importance of cost-effectiveness and biological justification.

Response L3-1: See response to Common Issue Nos. 2 and 4.

Comment L3-2: Flow augmentation appear more viable.

Response L3-2: No response necessary.

Comment L3-3: Call for further analysis of potential hydropower costs.

Response L3-3: No response necessary.

Comment L3-4: Negative effects of drawdowns.

Response L3-4: See response to Common Issue No. 4

Comment L3-5: Impact on farmers.

Response L3-5:

Letter L4, Benton County PUD (James W. Sanders), October 25, 1991

Comment L4-1: Focus on weak stock survival.

Response L4-1: No response necessary.

Comment L4-2: Drawdown does not meet cost-effectiveness criteria.

Response L4-2: See response to Common Issue No. 4

Comment L4-3: Inclusion of drawdown study.

Response L4-3: Information from the subject studies has been incorporated into Section 4.8.13 of the Final EIS.

Comment L4-4: Effects on farmers.

Response L4-4: See response to Common Issue No. 4.

Comment L4-5: Costs of modifying pump decks.

Response L4-5: Although the costs of modifying pumps are not relevant to 1992 alternatives because there would not be time for irrigators to make those modifications, the EIS addresses modification costs because the topic has been consistently raised by irrigators in scoping meetings and comment letters. The studies by IRZ Consulting and PACAM Engineering have been reviewed and are cited in Section 4.8.3. Any more definitive study of modification costs is beyond the scope of this EIS.

Comment L4-6: Drawdown proposal not biologically sound.

Response L4-6: See response to Common Issue No. 2

Letter L5, Port of Portland (Mike Thorne, Executive Director), November 13, 1991

Comment L5-1: Importance of cost-effectiveness and biological justification.

Response L5-1: See response to Common Issue Nos. 2 and 4.

Comment L5-2: Suggestions for drawdown test.

Response L5-2: The cooperating agencies believe that the biological effects of the proposals are addressed, including explaining changes in smolt travel time, survival, and effect on adults. The CBFWA flow objective is mentioned in the EIS. But activities designed to achieve increased survival, including the CBFWA objectives, are compared to include the biological effects of each.

Comment L5-3: Underestimation of transportation costs.

Response L5-3: Potential barge and rail rate increases could occur over the long run as rail and barge rates become responsive to changes in the river system and rates changes in the competing mode. However, in this report which only covers a test in 1992, rate increases in neither rail nor barge rates are included in the summary impacts. This point has been clarified in the text.

Comment L5-4: Impact on competitiveness of Northwest grain.

Response L5-4: The increases in costs associated with shift to more expensive transportation modes or additional storage and inventory costs would not increase the price of wheat (or barley) on the international markets. Rather, these effects would decrease the country price paid to farmers.

As a result of the increased cost of transportation as well as increases in irrigation rates and power rates, some farmers may

choose to grow grain and some may choose not to grow grain. This EIS focuses on a 1-year test. Short-term impacts would tend to minimize the shift out of production. However, if the impacts become certain in the long run, producer behavior will probably be changed and depending upon the net decrease in farmer prices, production could decrease. Farmers will evaluate the least cost alternatives before making their choice.

Comment L5-5: Deep-draft shipping losses.

Response L5-5: The alternatives with hydraulic impacts to the lower Columbia River System resulting from drastic changes in water levels and velocities have been eliminated as serious candidates for assessment. The chief problem associated with these alternatives is that they create additional health risks for the smolts. Hence the impact on lower Columbia River ports will not be likely to occur.

Comment L5-6: Mitigation for deep-draft losses.

Response L5-6: Dredging the lower Columbia River channel cannot be accomplished in time for a 1992 drawdown and is therefore beyond the scope of this EIS. This mitigation option should be explored in future documents evaluating long-term actions. The 1-2 foot decrease in depth of the Columbia River below Bonneville was a worst-case scenario identified for drafting the lower Snake River reservoirs to spillway crest through August. Even if this occurred, it is unlikely that the existing deep-draft navigation channel would be affected since it is currently maintained at 40 feet (plus 5 feet over-dredge, i.e. pre-maintenance of shoal areas) below Columbia River Datum. CRD will not change, and a 40-foot channel will be maintained throughout the year. Deepening the 40-foot channel is being studied by the Corps, with a reconnaissance report due in May 1992; the feasibility report is not expected until 1995. Acceleration of the study, or deepening the channel without study completion, are not feasible mitigation measures. See also response to Common Issue 1.

Comment L5-7: Secondary impacts on navigation.

Response L5-7: The Port of Portland's concern about negative secondary impacts is duly noted.

If some terminal operators cease operations, this would significantly disrupt cash flow from leases to upriver port authorities. This could jeopardize upriver port's ability to repay loans and remain solvent.

It should be noted that these are the longer term consequences of a drawdown."

Comment L5-8: Consideration of integrated system urged.

Response L5-8: No response necessary.

Letter L6, City of Bingen (Charles B. Long, Mayor), November 11, 1991

Comment L6-1: Impact on Bingen outfall pipe.

Response L6-1: The information on this sewer outfall pipe has been added to section 4.1.4.3. of the FEIS. Mitigation of this exposed pipe situation has not been proposed at this time since normal operation of the Bonneville Pool is included in the preferred alternative.

Letter L7, Port of Whitman County (Jim Weddell, Manager), November 15, 1991

Comment L7-1: Agricultural losses on Lower Granite Pool.

Response L7-1: The EIS reference in question is to direct impacts to agriculture due to inability to pump irrigation water. The comment reference to losses to agricultural interests served by Lower Granite Pool applies to grain shipping operations, which are discussed under transportation (Section 4.7) and socioeconomics (Section 4.13) in the EIS.

Comment L7-2: Differential treatment of Snake River pools.

Response L7-2: Alternatives and options were identified for consideration in the EIS on the basis of their potential to meet the physical and biological objectives for the proposed action, while perhaps minimizing or reducing adverse impacts. Options involving deep drawdowns at only Lower Granite reflect an interest to develop meaningful test data while limiting disruptive impacts throughout the river system, and were not identified with an eye to competitive commercial advantage or disadvantage. Impacts of various actions usually are not distributed evenly or fairly, and the EIS has attempted to identify such distributional issues.

Comment L7-3: More information on extant transportation system.

Response L7-3: The DEIS has presented the transport benefit ratio that indicates in most cases fish survival is higher when transported than if not transported (see text Section 4.2.1.5). Discussion has been expanded in the final OA/EIS (Section 2.2.4.2).

Letter L8, Port of Whitman County (Ken Casavant), Undated

- Comment L8-1: Employment information of firms near Port.
- Response L8-1: The text has been revised to include a summary of the employment and income data provided.
- Comment L8-2: No impact to firms from Snake River drawdown to MOP.
- Response L8-2: The cooperating agencies agree that there is little impact at minimum pool.
- Comment L8-3: Some impact from 2-month drawdown below MOP.
- Response L8-3: The cooperating agencies agree that the impact below minimum pool for less than 2 months is additional storage costs or higher transportation costs.
- Comment L8-4: Major impact from six-month drawdown below MOP.
- Response L8-4: The cooperating agencies agree that the impact below minimum pool for 6 months could seriously jeopardize the viability of these operations. However, the decision to cease operations or relocate operations would only occur after the drawdown alternative has been put into place for a long time. This EIS focuses only on 1992.
- Comment L8-5: Importance of communication between firms and Corps.
- Response L8-5: Since filing of the petitions in the spring of 1990, to list several stocks of wild salmon as threatened or endangered, there has been uncertainty for everyone in the region regarding the best methods to save the salmon. The magnitude and long-term impacts of decisions involving the salmon make it imperative that ever individual, organization, and business be involved in the decision process. The cooperating agencies responsible for this EIS did not present a preferred alternative in the Draft EIS. Although this may have added to the uncertainty, we felt it necessary to postpone the decision to gain additional information and regional consensus.

The cooperating agencies have labored to insure information regarding decisions about the Columbia/Snake River is well circulated. We will continue to solicit public, organization, and agency input into this process and work to develop a comprehensive communication network. Notification of the drawdown action occurs as soon as allowable without prejudicing the National Environmental Policy Act (NEPA) procedures.

- Comment L8-6:** Substantial potential impact to Port itself.
- Response L8-6:** The text has been revised to include the information provided in the comment.
- Comment L8-7:** Potential increase in rail rates due to increase in barge rates.
- Response L8-7:** The cooperating agencies agree that an increase in barge rates would generate an increase in rail rates to a larger community of shippers.

ASSOCIATION OR ORGANIZATION

Letter A1, Idaho Water Users Association, Inc. (Lynn Tominaga), October 15, 1991

- Comment A1-1: Support for options A, G, and I.
- Response A1-1: No response necessary.
- Comment A1-2: Drawdown necessary with flow augmentation.
- Response A1-2: No response necessary.
- Comment A1-3: Suggestion of initial 4-week test.
- Response A1-3: No response necessary. A 4-week test is part of the preferred alternative.
- Comment A1-4: Insistence on long-term plans.
- Response A1-4: No response necessary.
- Comment A1-5: Urge for structural modifications on dams.
- Response A1-5: See response to Common Issue No. 14.
- Comment A1-6: Predator control.
- Response A1-6: See response to Common Issue No. 13.
- Comment A1-7: Turbine operations during test.
- Response A1-7: Various studies of turbine operations will be conducted as part of the test drawdown of Lower Granite and Little Goose that is included in the preferred alternative.
- Comment A1-8: Spillway modifications.
- Response A1-8: No response necessary.
- Comment A1-9: Mitigation for water users.
- Response A1-9: See response to Common Issue No. 10.
- Comment A1-10: Long-term regional comprehensive plan.
- Response A1-10: No response necessary.

Letter A2, The American Waterways Operators (Gerald P. McMahon), October 21, 1991

Comment A2-1: Balance needed between saving of fish and impacts to economy.

Response A2-1: Comment noted.

Comment A2-2: Need for cost-effectiveness, biological soundness.

Response A2-2: See responses to Common Issue Nos. 2 and 4.

Comment A2-3: Support for project goal.

Response A2-3: Comment noted.

Comment A2-4: Importance of navigation to regional economy.

Response A2-4: Economic evaluations are based upon National Economic Development criteria, not regional economics.

Comment A2-5: Contribution to economy while protecting environment.

Response A2-5: Comment noted. The EIS economic evaluations are based on National Economic Development criteria. Section 5.5, "COST EFFECTIVENESS", has been developed to describe this process in-depth.

Comment A2-6: Combination of drawdown and flow augmentation.

Response A2-6: While most of the conclusion summaries are correct, the final analysis requires testing. For example, the data available on gas supersaturation suggest it will be high. Model studies will indicate potential conditions under which gas supersaturation is likely to occur, but until an actual test is done, the level cannot be accurately determined. It is also possible to conduct a spillway crest test for a short-term period, during a season of minimal upstream or downstream migration, reducing the other impacts (e.g., adult and juvenile passage facility outages).

Comment A2-7: Support for PNUUC Flow Proposal.

Response A2-7: Comment noted.

Comment A2-8: Opposition to drawdown measure to evaluate only physical impacts.

Response A2-8: See response to common issue 15. This two-reservoir drawdown test would provide the opportunity to collect data directly related to

salmonid survival. These would include monitoring of dissolved gases, food resources and predators during drawdown conditions.

Comment A2-9: Support for Juvenile Fish Transportation Program.

Response A2-9: Comment noted.

Letter A3, Lake Roosevelt Forum (Marty Blum), October 22, 1991

Comment A3-1: Effects on resident fish.

Response A3-1: For nearly a century, each of us in the Northwest has enjoyed a lifestyle related in one manner or another to the benefits derived from harnessing the flow of the Columbia River. The sacrifices necessary to save the endangered and threatened salmon may be felt in one manner or another by all of us. The actions analyzed in this EIS, however, pertain only to actions considered for 1992 and may or may not be a part of the long-term solution.

Comment A3-2: Urge for research at Grand Coulee Dam.

Response A3-2: This comment pertains to present long-term operations and should be properly presented to the Northwest Power Planning Council regardless of whether or not a flood control shift occurs in 1992.

Comment A3-3: Effects of drawdown.

Response A3-3: Comment noted.

Comment A3-4: Objection to "minimal impact" finding for Lake Roosevelt.

Response A3-4: Based upon a 50-year model run for each flow augmentation alternative, end of May average water surface elevations in Lake Roosevelt equaled or exceeded the end of May average water surface elevation for the base-case operation.

Comment A3-5: Higher flows will disperse pollutants in river bottom sediment.

Response A3-5: The thermal profiles of the system, as presented in the EIS, are complex and dependent on level, flows, seasonal timing, and ambient atmospheric conditions. Lower temperatures may not necessarily be experienced under the postulated conditions. The dispersion of contaminated sediments is primarily a localized effect. In addition, the preferential partitioning of contaminants to the particulate phase and the volume of water column water suggest minimal (undetectable) changes to water quality. The potential for increased bioaccumulation is therefore limited. This is supported by

the lack of effects observed in the reaches where periodic scheduled dredging occurs.

Letter A4, Lewis-Clark Terminal Association, Inc. (Arvid Lyons), October 22, 1991

Comment A4-1: Effects on grain transport.

Response A4-1: No response necessary.

Comment A4-2: Economic effects to region.

Response A4-2: No response necessary.

Comment A4-3: Concern over economic impacts to region.

Response A4-3: See response to Common Issue Nos. 2 and 4.

Letter A5, Oregon Farm Bureau (Ken Bailey), October 22, 1991

Comment A5-1: Importance of biological justification and cost-effectiveness.

Response A5-1: See responses to Common Issue Nos. 2 and 4.

Comment A5-2: Call for additional analysis.

Response A5-2: No response necessary.

Letter A6, Pacific Northwest Waterways Association (Glenn Vanselow), November 8, 1991

Comment A6-1: No consensus for drawdown at Salmon Summit.

Response A6-1: No response necessary.

Comment A6-2: EIS premature.

Response A6-2: Comment noted.

NEPA regulations do not require that a draft EIS includes a preferred alternative. See response to comment I-33.1. Extensive analyses concerning drawdown feasibility and biological justification have been accomplished and are described in the revised EIS. See common issue responses 2 and 4, and responses to comments S-14.3, F-2.17, and F-2.25.

Comment A6-3: Test must provide biological information on salmon survival.

Response A6-3: See response to Common Issue No. 2.

The preferred alternative described in the final EIS has been designed to meet the criteria you have determined important. One difference you may see is that the two-reservoir drawdown test will not allow for collection of much biological data, but does include monitoring of parameters directly related to fish survival (e.g., dissolved gas supersaturation). See responses to common issues 5 and 13.

Comment A6-4: Unacceptable to test drawdown longer than four weeks.

Response A6-4: See response to common issue 16, and response to comment S-6.1. The cooperating agencies will have concurrence from the National Marine Fisheries Service that significant impact to listed stocks will not be caused by any 1992 actions prior to implementation.

Comment A6-5: Socioeconomic study area.

Response A6-5: The cooperating agencies do not agree that the socioeconomic impact study area needs to be expanded to include all hinterland areas that may be served to some degree by the Columbia/Snake River system. System transportation data indicate that grain shipments from Washington, Oregon, and Idaho predominantly originate within about 50 miles of the river. While some grain shipped on the river system originates from Montana, the Dakotas, and elsewhere to the east, these shipments account for a small share of the total grain tonnage (on the order of 5 to 10 percent). Similarly, Columbia/Snake barge shipments account for a small share of the total grain volume shipped from these more distant sources. Implementing this request would add unnecessarily to the bulk and detail of the EIS without contributing measurably to the basis for decision.

Comment A6-6: Economic effects.

Response A6-6: Lost grain sales are not likely to occur under the 3-month drawdown scenario. First, downriver loading of grain at the idle grain elevator at Longview or at other active elevators is possible as an alternative to upriver loading. Second, downriver elevators receive substantial volumes of grain by rail which can mitigate the loss of grain from upriver barge movements.

Comment A6-7: Grain storage costs.

Response A6-7: There will be an adjustment period as the grain stored in upriver elevators is barged downriver. However, other sources of grain to downriver elevators should mitigate the impact on grain sales.

The typical grain sale occurs 30 to 60 days before movement of the grain downriver. This leaves adequate time for shippers to make their transportation plans to minimize the impact of the drawdowns if the drawdown period is sufficiently prewarned. Some grain can also be prepositioned downriver prior to the drawdown.

During the drawdown period, grain arriving at downriver terminals by rail should be sufficient to maintain sales. Under the 5-month closure period, the amount of grain stored upriver is the same as under the 3-month closure. The additional grain is assumed to be railed downriver.

The physical adjustment period is implicitly accounted for in the EIS calculations by including the 2-week maintenance period in the 3- and 5-month impact estimates. Two weeks should suffice to clear the upriver elevators and make room for the new grain being harvested after the river is open again.

Comment A6-8: Grain price depression.

Response A6-8: The price of grain shipped from the region will not likely be impacted by the increased transportation costs. Rather, the net price to farmers will be decreased. During the 1-year test, grain price distortion is not expected to occur.

Comment A6-9: Barge rate increases.

Response A6-9: Barge and rail rates may increase during the 1-year test period but this is highly uncertain. Because of this uncertainty, no increases in rates are included in the summary tables.

Comment A6-10: Wood chip impacts.

Response A6-10: Wood chip impacts are addressed under the James River Corporation comments (I61-3).

Comment A6-11: Deep draft shipping losses.

Response A6-11: See response to Comments L5-5 and L5-6.

Comment A6-12: Liability of economic losses.

Response A6-12: See response to comment I57-15.

Comment A6-13: Fish transportation.

Response A6-13: See response to Common Issue No. 15, and Section 2.2.4.2 in the text.

Comment A6-14: Drawdown proposals unattractive.

Response A6-14: The cooperating agencies have a responsibility, in this EIS process, to develop a set of 1992 actions that contribute to the biological goals for the fish and balance the impacts to other segments of the system. One of the major authorized uses of this man-made system is transportation. It follows that transportation, as a beneficiary of the dams, should be prepared to share in the burden of improving conditions for the salmon.

Letter A7, Kelly Creek Flycasters (Keith Stonebroker), November 8, 1991

Comment A7-1: Support for Andrus Drawdown Plan.

Response A7-1: No response necessary.

Letter A8, Clarkston Chamber of Commerce (Dana Neil), November 13, 1991

Comment A8-1: Drawdown would have drastic effects on tourism.

Response A8-1: No response necessary.

Letter A9, Oregon Salmon Commission (Tom Robinson), November 14, 1991

Intentionally left blank.

Letter A10, Wasco Co. Farm Bureau (Timothy A. Dahle), November 15, 1991

Comment A10-1: Skeptical of benefits of Bonneville pool drawdown.

Response A10-1: See response to Common Issue No. 10.

Letter A11, Sawtooth Wildlife Council (Cathy Baer), November 11, 1991

Comment A11-1: Failure to acknowledge Andrus' "Idaho Plan."

Response A11-1: The cooperating agencies did in fact acknowledge and utilize the "Idaho Plan" from Idaho, Governor Cecil Andrus, in formulation of alternatives in the EIS. As discussed in the EIS, the action of lowering all four lower Snake Reservoirs to spillway crest would decrease juvenile fish travel time. To make this action work without significant adverse impacts to adult anadromous fish passage, would

require substantial modifications to the dams. The scope of the EIS is limited to operation changes on the dams within the Columbia-Snake River system only for 1992. Actions that require significant structural modifications were not considered in the preferred alternative.

Components of reservoir drawdown and flow augmentation are included in the preferred alternative.

Comment A11-2: Combination drawdown and flow augmentation.

Response A11-2: Please refer to the preferred alternative in the Final EIS for details of water flow augmentation.

Scope of this EIS is limited to 1992 actions. However, longer-term study programs such as the Corps' Columbia River Salmon Mitigation Analysis and the cooperating agencies' System Operation Review are better suited to these types of objectives.

Comment A11-3: Drawdown impacts on barge operators.

Response A11-3: While the point may not have been explicit in the DEIS, it is assumed that the annual 2-week lock maintenance outage could be scheduled to coincide with a Snake River drawdown option that would interrupt barge service. For a drawdown to near spillway crest from April 15 through June 15, however, the time required to draft and refill the reservoirs would add at least 2 weeks to each end of the period of no barge service. While alternative transport means are available, the EIS indicates that cost and other considerations make temporary storage of commodities a more likely response in many cases.

Comment A11-4: Establishment of in-stream downriver smolt passage.

Response A11-4: No response necessary.

See response to Common Issue No. 10.

Comment A11-5: Corps must make swift response to danger of losing salmon.

Response A11-5: See response to Common Issue No. 17 and Comment A16-2.

Letter A12, Washington Wilderness Coalition (Norman L. Winn), November 11, 1991

Comment A12-1: Mitigation measures must be adopted.

Response A12-1: See response to Common Issue No. 10.

Comment A12-2: Drawdowns.

Response A12-2: No response necessary.

Comment A12-3: Suggestion for drawdown/alternative.

Response A12-3: See response to Common Issue No. 16.

Comment A12-4: Flow augmentation.

Response A12-4: The Final EIS does include evaluation of flow augmentation through Lower Snake River Projects as requested in the comment. This action is included as a portion of the preferred alternative.

Comment A12-5: Lower Columbia reservoirs to MOP.

Response A12-5: Please refer to Chapter 5, Plan Selection and Implementation, Table 5.4-1, Comparison of Reservoir Drawdown Options, for an analysis of the Lower Columbia River Drawdown Option. This action contributes limited benefits and generates prohibitive negative impacts.

Comment A12-6: Mitigation measures after 1992.

Response A12-6: See response to Common Issue No. 16.

Comment A12-7: More information on no-action alternative.

Response A12-7: See response to Common Issue No. 3.

Letter A13, Washington Association of Wheat Growers (Dan Blankenship), Undated

Comment A13-1: Higher shipping rates due to drawdown.

Response A13-1: No response necessary.

Comment A13-2: Lost market share in world marketplace.

Response A13-2: No response necessary.

Comment A13-3: Drawdown of lower Snake River projects to MOP.

Response A13-3: Not all measures to benefit juvenile travel time carry negative impacts to survival of the salmon stocks. A portion of the preferred alternative describes a March test lowering of Lower Granite Reservoir to near spillway. This test will evaluate a number of the

physical elements which need to be examined in the system. Timing of this test was planned to minimize harm to anadromous fish.

See response to Common Issue No. 11.

Comment A13-4: Concerns about economy.

Response A13-4: No response required.

Letter A14, Trout Unlimited (Michael Satterwhite), October 20, 1991

Comment A14-1: Clarify Executive Summary.

Response A14-1: The objective of the executive summary is to provide an overview of the proposed actions, their expected consequences, and the process for plan selection. The executive summary discussion of impacts was based on the respective resource summary tables from Section 4, and was not intended to focus on the most extreme impacts possible. Further review of the text in response to the comment indicates the executive summary does refer to impact ranges in many cases. However, the cooperating agencies acknowledge that the paragraphs addressing the 2 options for drafting the lower Snake River reservoirs to near spillway crest do not adequately distinguish the impacts of drawdown through June 15 versus August 15; this has been clarified in the FEIS.

The EIS addresses measures that were proposed by various parties at the Salmon Summit and ensuing discussions. The EIS scoping process described the nature and timing of the actions proposed for consideration, and did not generate feedback that the actions identified were unrealistic. See also response to Common Issue Nos. 1, 9, 10, and 13.

Comment A14-2: Inappropriate conclusion to Section 4.2.2.

Response A14-2: The examples cited in Section 4.1.1.1 indicate a potential for significant dissolved gas supersaturation. The historical (pre-dam) supersaturation zones, in general, did not exhibit the significant lateral (downstream) and crosssectional extent as those potentially associated with the dams (e.g., 1990 John Day powerhouse fire spill). The extant data are sufficient to estimate bounds on the potential gas supersaturation conditions.

The Corps summarizes the reason for the conclusion that the net effect would be negative. It is not only dissolved gas saturation but includes other factors, such as the total blockage of adult upstream migrants during and following the drawdown test periods. In

addition, while some information might suggest that gas supersaturation does not have effects at levels until greater than 125 percent, other literature, as cited in the document for the Columbia and Snake rivers, indicates this is not the case.

While the exact levels of gas supersaturation cannot be predicted at this time, most information suggests it will be higher than current levels, which would bring it into the range of documented problems for salmon and steelhead. For this reason, the original statement remains.

Comment A14-3: Little negative impact on Bass fisheries.

Response A14-3: Comment noted. Generalizations in the text apply to "most" species.

Comment A14-4: Recreational impacts are overstated.

Response A14-4: The comment correctly notes that water-based use is dependent upon water access, and facility modifications to maintain water access at greatly reduced reservoir elevations would not be possible for the 1992 season. The 132,000 figure for potentially displaced recreation days in the April 15 to June 15 drawdown period more likely represents about 370 recreation days per pool over about a 90-day total drawdown and refill period. However, this does not equate to 370 people per pool per day, as most users engage in multiple activities during the course of a day of recreation (see response to T3-7-1 for the full definition of a recreation day as used here). Much of the use of campgrounds and other land-based facilities is associated with the water-dependent opportunities, and would therefore decrease if the water-based activities were eliminated. Land-based activity levels could also be reduced through users' aesthetic reactions to drawdowns. However, these types of indirect visitation effects were not incorporated into the displacement estimates.

Comment A14-5: Misleading conclusions on recreational losses.

Response A14-5: Seasonality of use for the lower Snake River projects has been added to Figure 2.12-4. Recreational use of lower Snake recreational project facilities reaches its peak during July and August, while approximately 21 percent of the annual total occurs between April 15 and June 15. The estimated displacement of 132,000 recreation days with the April 15 to June 15 drawdown option corresponds to 6 percent of annual visitation or 27 percent of total use during this period. See response to S5-3 for a discussion of how the impacts on recreational use were estimated. The portion of the comment

addressing economic aspects of recreation impacts is consistent with the EIS text.

Letter A15, Skamania County Chamber of Commerce (Arlene Johnson), November 8, 1991

Comment A15-1: Impacts of Columbia River drawdowns.

Response A15-1: These site-specific impacts are consistent with the EIS recreation assessment.

Letter A16, Northwest Resource Information Center, Inc. (Ed Chaney), November 14, 1991

Comment A16-1: Unrealistic conclusions of Corps in favor of status quo.

Response A16-1: See response to Common Issue No. 10.

Comment A16-2: Dams are "fish-killing machines."

Response A16-2: The EIS demonstrates that the cooperating agencies and other interested parties have been working diligently for several decades to improve fish passage conditions in the Columbia/Snake River system. The actions proposed for implementation in 1992 will provide some benefit for the 1992 migration, and test data that will be used to help develop further improvements that require longer lead times. See also response to Common Issue No. 14.

Comment A16-3: Corps erroneously assumes no generation at spillway level.

Response A16-3: The reference to flow objectives is consistent with the EIS assessment. The result of no power generation with the Snake River reservoirs drafted to near spillway levels is not an assumption. Rather, it is a policy position based on the knowledge that the juvenile fish bypass systems would not function at these elevations in 1992, resulting in unacceptable fish losses from turbine mortality. This situation is described in Section 4.9.1.1.

Comment A16-4: Drawdowns cannot be accomplished in 1992.

Response A16-4: See response to Common Issue No. 14.

Comment A16-5: Conflict between juvenile and adult fish survival.

Response A16-5: The DEIS and FEIS adequately portray available fish passage avenues and consequences. Juvenile fish can be and are passed relatively safely at the lower Snake River dams (>90% survival),

via bypass systems and spillways, while upstream passage for adults is provided by fish ladders. The conflict is not between juvenile and adult fish passage per se, but in maintaining adult fish passage at the reservoir levels proposed by NRIC and others.

Comment A16-6: Need for emergency measures.

Response A16-6: See response to Common Issue No. 17.

Comment A16-7: Suggested alternative.

Response A16-7: The preferred alternative identified in the FEIS includes a test drawdown of Lower Granite and Little Goose, the largest practicable Snake and Columbia rivers flow augmentation, and the limited lower Columbia River reservoir drawdown considered to be feasible in 1992.

Comment A16-8: Re-analyze options with post-1992 mitigating measures.

Response A16-8: See response to Common Issue No. 1.

Comment A16-9: Analyze effects of no-action alternative.

Response A16-9: See response to Common Issue No. 3.

Letter A17, Pacific Northwest Utilities Conference Committee (Al Wright), November 15, 1991

The test period for drawdown is from 1 March and continuing for 4 weeks. Critical stocks should not be impacted during this period of time. See response to common issue 16.

Comment A17-1: Concerns over Corps' predilection for Idaho Plan.

Response A17-1: Comment noted.

You are correct, a separate NEPA analysis will be necessary for long term measures.

Comment A17-2: Concern with scope of EIS.

Response A17-2: See response to Common Issue Nos. 2 and 11.

Biological concerns have been addressed by area scientists as indicated in the text of the FEIS. The 1992 EIS is the basis for the 1992 study program. The results of these tests may be adapted to modify the FEIS for long term actions.

- Comment A17-3: Another EIS needed post-1992.
- Response A17-3: The actions covered in the EIS are for 1992 only.
- Comment A17-4: Limited biological information resulting from tests.
- Response A17-4: See response to Common Issue No. 2 and Section 4.1.5.
- Comment A17-5: Particle travel time is inappropriate standard.
- Response A17-5: Reference Common Issue No. 5.
- Comment A17-6: Technical oversight committee for test evaluation.
- Response A17-6: There is a work group comprised of fishery scientists that are addressing the specifics of data analysis. There will be an oversight committee formed from this group of individuals. This subject is addressed in the FEIS.
- Comment A17-7: Firm power impact from drawdown to spillway of Lower Snake River projects.
- Response A17-7: Document has been revised to show these impacts.
- Comment A17-8: Drawdown to spillway will block adult passage.
- Response A17-8: National Marine Fisheries has been consulted and it is believed the timing of the test drawdown starting 1 March, 1992 and continuing for 4 weeks is such that returning adult steelhead should not be significantly impacted. The effected Reservoirs will be back to Minimum Operating Pool (MOP) by 1 April. Monitoring of the tailwater area for returning adults during the test drawdown is being considered. See Common Issue No. 14.
- Comment A17-9: Increase of gas supersaturation levels due to drawdown.
- Response A17-9: See response to Common Issue No. 16 and Section 4.1.1.
- Comment A17-10: Drawdown to spillway will prevent operation of bypass/collection system at Lower Granite and Little Goose dams.
- Response A17-10: The 1 March date is such that anadromous fish should not be significantly impacted by the drawdown. The National Marine Fisheries Service has been consulted as to the timing of the test drawdown and concurrence with that proposed date is expected.
- Comment A17-11: Impacts to chinook spawning areas.

Response A17-11: The EIS states what is known about these fall chinook redds, and that impacts could occur. There is no time for additional studies prior to testing. At this point, tests will begin without full answers to the questions of what might happen to these redds. However, the effects can be evaluated during the study. It is possible that part of year-class of whatever spawning population is present could be affected. However, it is possible that the fry will be out of the gravel by the time Little Goose Pool is lowered in March.

Stranding of fall chinook eggs or fry in redds from the drawdown of Little Goose pool in March is of concern. However, a search for redds will be made prior to these tests and if redds are found in the potential drawdown zone, drawdown will not occur. Very few or no fall chinook will be present in Lower Granite Pool during the drawdown test period. Reference: EIS 4.2.1.9

Comment A17-12: Impacts to resident fish.

Response A17-12: Comment noted. Brownlee is not being recommended as a source for flow augmentation in 1992. The Corps does not have control over the operation of that specific project. Impacts to resident fish have been addressed in Section 4.3.4.1

Comment A17-13: Opposition to alternative to lower McNary and Day reservoirs.

Response A17-13: Elevation 337 is 2 feet above Minimum Operating Pool (MOP) for McNary Reservoir and should not effect river users. Elevation 262.5 in John Day Reservoir is 6 feet above MOP. If irrigators are affected by this drawdown the reservoir will be raised accordingly.

Letter A18, Oregon Salmon Commission (Tom Robinson), November 14, 1991

Comment A18-1: DEIS does not address 1992 migration.

Response A18-1: Based on the evaluation of the alternatives considered in detail, the DEIS concluded that two options (both involving drawdown of the four lower Snake River reservoirs to near spillway crest) could not be implemented in 1992. The DEIS also evaluated nearly 20 other options that could be implemented in 1992. These options would have varying direct benefit for the 1992 migration and varying cost or other impacts, all of which were noted in the DEIS. A number of options would not directly benefit the 1992 migration, but would provide test data that would support actions to benefit future migrations.

Comment A18-2: Socioeconomic costs to public.

- Response A18-2: See response to Common Issue No. 2.
- Comment A18-3: Need for emergency measures.
- Response A18-3: See response to Common Issue No. 17.
- Comment A18-4: Mitigating measures for drawdown alternatives.
- Response A18-4: See response to Common Issue No. 10.
- Comment A18-5: Juvenile vs. adult passage conflict.
- Response A18-5: See response to Comment A16-2.
- Comment A18-6: Lost power generation cost.
- Response A18-6: This comparison of costs and benefits is not complete. Some of the options evaluated would not result in a reduction of FELCC. In other cases, there would be capacity and/or nonfirm energy losses in addition to the FELCC loss that would increase the total lost power costs. Benefits to fish and public fisheries must also be weighed against all costs, not just foregone power.
- Comment A18-7: Recommended 1992 plan.
- Response A18-7: The preferred alternative identified in the FEIS includes a test drawdown of Lower Granite and Little Goose in March, Snake River flow augmentation from April 15 through May, and Target 200 flows on the lower Columbia River.
- Comment A18-8: Post-1992 mitigation actions.
- Response A18-8: See response to Common Issue Nos. 1 and 9.
- Comment A18-9: Socioeconomic impacts of no action.
- Response A18-9: See response to Common Issue No. 3.
- Letter A19, Oregon Natural Heritage Council (Peter Bahls), November 14, 1991***
- Comment A19-1: Narrow choice of alternatives; suggestion for removal of dams.
- Response A19-1: See response to Common Issue No. 14.
- Comment A19-2: Effects of fish transport on smolt and adult survival.

Response A19-2: A more complete discussion of the Juvenile Fish Transportation Program is presented in Section 2.2.4.2. Transport.

Comment A19-3: Combination of drawdown to MOP and flow augmentation.

Response A19-3: No response necessary.

Letter A20, Sierra Club, Cascade Chapter (Andrew J. Lewis), November 14, 1991

Comment A20-1: Dams are "fish-killing machines."

Response A20-1: Comment noted. Juvenile survival through the lower Snake River projects is greater than 90% at each. Adult survival through each project is estimated to be greater than 90%.

Comment A20-2: Need for emergency measures.

Response A20-2: See response to Common Issue No. 17.

Comment A20-3: Failure to include mitigation for drawdown alternatives.

Response A20-3: See response to Common Issue No. 10.

Comment A20-4: Combination of drawdown and flow augmentation.

Response A20-4: See response to Common Issue Numbers 1,9,10 and 14.

Comment A20-5: Re-analyze alternative achieving fishery flow recommendations with post-1992 mitigation.

Response A20-5: See response to Common Issue Numbers 1,9,10 and 14.

Comment A20-6: Display effects of no-action alternative.

Response A20-6: See response to Common Issue No. 3.

Letter A21, Sierra Club, Northwest Office (William L. Arthur), November 15, 1991

Comment A21-1: Need to evaluate methods to avoid and mitigate impacts.

Response A21-1: See response to Common Issue No. 10.

Comment A21-2: Need for evaluation of two-reservoir drawdown.

Response A21-2: See response to Common Issue No. 16.

Comment A21-3: CBFWA proposal should be evaluated.

Response A21-3: The CBFWA flow proposal of Target 300 was not considered in this EIS. Target 300 requirements would have included drafting of the Montana reservoirs to meet the expanded flow requirements in the lower Columbia. Because of the limited time required to complete the EIS, it was not possible to include all of the upper Columbia River drainage basin in the scope of the EIS. Additionally, we have instead, adopted the flow recommendations of the Northwest Power Planning Council.

Comment A21-4: Emergency measures needed.

Response A21-4: See response to Common Issue No. 17.

Comment A21-5: Need for test which evaluates drawdown of two reservoirs to spillway crest.

Response A21-5: See response to Common Issue No. 16.

Comment A21-6: Corps must ensure greatest possible survival of migrating smolts.

Response A21-6: Comment noted. See information regarding the preferred alternative in the Final EIS.

Comment A21-7: Effects on transportation must be considered in 1992.

Response A21-7: See response to Common Issue No. 10.

Comment A21-8: Evaluate effects of no-action alternative.

Response A21-8: See response to Common Issue No. 3.

Letter A22, The Mountaineers (Dianne Hoff), November 15, 1991

Comment A22-1: Mitigation measures must be considered.

Response A22-1: See response to Common Issue No. 10.

Comment A22-2: Evaluate drawdown to spillway of Lower Granite and Little Goose reservoirs.

Response A22-2: See response to Common Issue No. 16.

Comment A22-3: Flow augmentation of lower Snake River dams.

Response A22-3: The Final EIS does include evaluation of flow augmentation through the Lower Snake River Projects as requested in the comment. This action is included as a portion of the preferred alternative.

Comment A22-4: Outdated analysis of flow augmentation options.

Response A22-4: The DEIS contained the most recent (and the only) analyses of the effects of the specific flow augmentation options considered. The assessments of the effects on power generation and resident fish were the best available as of September 1991. The reference to more recent analysis is not clear. While refined estimates of power losses were developed for the FEIS, extensive updates or revisions have not been prepared.

Comment A22-5: Mitigation measures post-1992.

Response A22-5: No response necessary.

Comment A22-6: Analyze effects of no-action alternative.

Response A22-6: See response to Common Issue No. 3.

Comment A22-7: Studying longer term options.

Response A22-7: Some of the test options, including the March 1992 test proposed as part of the preferred alternative in the FEIS, would occur at times when migratory fish are not present in the river over concerns for the health of the fish. As noted in the DEIS, it is very possible that deep drawdowns would significantly impact anadromous fish. The rationale for tests during non-migratory periods is to determine the extent of environmental impacts. Conducting such experimental drawdowns prior to resolution of the dissolved gas problem would not be prudent.

Letter A23, Public Power Council (William K. Drummond), November 15, 1991

Comment A23-1: Corps should separate and clarify proposed actions in the Final OA/EIS.

Response A23-1: See Common Issue 13 response.

Comment A23-2: Corps should more thoroughly analyze transportation alternative for 1992 plan and long-term measures.

Response A23-2: See response to Common Issue No. 15.

Comment A23-3: PPC disagrees with standards used in OA/EIS.

Response A23-3: See Common Issue No. 5 response.

The cooperating agencies have not adopted or endorsed the Columbia Basin Fish and Wildlife Authority proposal as a basis for managing the river system. However, it is a proposal that has widespread recognition within the region, and provides a useful frame of reference and comparison.

Comment A23-4: FEIS must reflect adverse impacts of more drastic alternatives.

Response A23-4: The EIS incorporates the most up-to-date data available within the timeframe allowed.

Comment A23-5: Adverse effects of severe drawdowns.

Response A23-5: The risk to salmon from drawdown measures is noted and the Final EIS does include a brief description of the impacts associated with long-term implementation of drawdown measures. However, implementation of any actions beyond 1992 is outside the scope of this EIS.

See Common Issues 10 and 13 responses.

Comment A23-6: Preferred alternative should be combination drawdown, flow augmentation, and transportation.

Response A23-6: Your comment is noted.

Comment A23-7: Long-term options should be studied based on tests.

Response A23-7: See responses to Common Issue Nos. 10 and 13.

Letter A24, Pacific Northwest Utilities Conference Committee (Al Wright), December 3, 1991

Comment A24-1: Preferred alternative should be lowering Lower Granite and Little Goose reservoirs to approximately spillway crest during March 1992.

Response A24-1: See response to Common Issue No. 16.

INDIVIDUAL

Letter I1, The Dalles Irrigation District (Don W. Bailey), May 28, 1991

Comment I1-1: Urge to not lower Bonneville Pool during May-September vital irrigation season.

Response I1-1: Comment noted.

Letter I2, Potlatch Corporation (Todd L. Maddock), September 17, 1991

Comment I2-1: Support of limited drawdown test.

Response I2-1: No response necessary.

Comment I2-2: Test drawdown effects, study less costly options.

Response I2-2: The EIS evaluates a variety of potential actions that cover a wide range of costs. The two-reservoir test drawdown proposed for March 1991 will be used to investigate the environmental and structural/physical effects of substantial reservoir drawdowns.

Comment is noted.

Comment I2-3: Evaluate other less costly measures.

Response I2-3: See response to Common Issue No. 13.

The scope of the EIS was limited to management changes to the operation of the Columbia/Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS has included a representative number of alternatives which affect the operation of projects within the basin. The objective of these alternatives is to improve in- river migration conditions and/or collect data that can be used in the development of long-term improvements to salmon migration.

Comment I2-4: Concern for continuation of operation of mill.

Response I2-4: Comment noted.

Comment I2-5: Use of Dworshak for log transportation.

Response I2-5: Comment noted.

Comment I2-6: Prefers no-action alternative.

Response I2-6: Comment noted.

Letter I3, Elam, Burke and Boyd, Attorneys and Counselors at Law (Scott L. Campbell), October 7, 1991

Comment I3-1: Pioneer Irrigation District has comments on references to flow augmentation and utilization of storage water.

Response I3-1: No response necessary.

Comment I3-2: Opposition to using irrigation water storage for project purposes.

Response I3-2: Comment noted.

Letter I4, Elam, Burke and Boyd, Attorneys and Counselors at Law (Scott L. Campbell), October 7, 1991

Comment I4-1: Settles Irrigation District concerned with usage of storage water.

Response I4-1: No response necessary.

Comment I4-2: Opposition to using irrigation water storage for project purposes.

Response I4-2: Comment noted.

Letter I5, Paul Shaffer, October 15, 1991

Comment I5-1: Urge for action.

Response I5-1: No response necessary.

Letter I6, Clint Watkins, October 15, 1991

Comment I6-1: Support for Option G.

Response I6-1: No response necessary.

Comment I6-2: Suggested solutions for saving of salmon.

Response I6-2: Comment noted. Out of all the items listed, the only one that falls within the scope of this EIS, and that could be implemented in 1992, is the water temperature control. The evaluation of temperature control is included within the FEIS.

Letter I7, Ron Appleby, October 16, 1991

Comment I7-1: Impacts on irrigation.

Response I7-1: The issue of potential impacts to irrigators is addressed in Section 4.8 Agriculture. Estimation of impacts to individual irrigators was not possible due to the size of the study area and short timeframe for conducting the study. See response to Common Issue No. 7.

Comment I7-2: Concern for sturgeon and local fish.

Response I7-2: Comment addressed in the EIS.

Comment I7-3: Funding needs.

Response I7-3: Comment noted. See response to Common Issue No. 10.

Letter I8, Stephen L. Barr, October 16, 1991

Comment I8-1: Suggestions to enhance use of fishery.

Response I8-1: Suggestions noted. All are outside the scope of this EIS. See response to Common Issue No. 13.

a. Nets:

Although this idea is a valid and functional idea in small streams, it is not feasible in large river systems for several reasons. Structural integrity, for example, is a major problem with the magnitude of flows (i.e. velocities) encountered at mainstem dams. Debris is a significant factor to be considered. Allowance for juvenile passage must be considered. This concept may have application in future planning if changes to existing river operations are made.

b. Accurate detections:

We utilize state-of-the-art equipment whenever possible in our evaluation studies. For instance, we use hydroacoustic technology to estimate fish numbers arriving at the projects to evaluate when to spill; or to evaluate how fish distribute upon approach to and entry into the powerhouse; or to evaluate density estimates within the reservoir. We use the passive integrated transponder (PIT) tag, a new tag concept developed by National Marine Fisheries Service through BPA. This tag allows individual identification of fish, to better understand travel time, distribution, behavior, etc. This tag allows new research opportunities not available with previous tags.

We have recently used underwater video technology to observe fish approaching the extended-length traveling screen to understand how fish respond to these 40-foot screens. We use state-of-the-art laser technology associated with our model efforts to better understand how we can design our bypass systems. We are evaluating "new" technology (advanced hydroacoustics and laser systems) to determine non-lethal ways to measure fish guidance at our projects. We are using the newest technology in adult fish tags (radio telemetry) to track adult fish in their migration through the Snake River projects and on to spawning grounds or hatchery locations. We are investigating better ways to count adult passage at our dams. We are researching new tools in our modeling efforts, such as computational fluid dynamics, to determine whether these methods will improve our design capabilities.

c. Debris/collector idea:

One proposal being addressed in the Columbia River Salmon Mitigation Analysis is an upstream collector facility at the confluence area (Lewiston) to collect juvenile fish arriving at the head of the Lower Granite pool. This collector would have to incorporate debris and adult passage considerations.

A debris boom in the forebay at Lower Granite effectively traps a large percentage of the debris that arrives at Lower Granite. This boom has provided considerable improvement in passage conditions at the dam by eliminating much of the debris that previously moved in to the system. Routine project maintenance during the fish outmigration period removes debris from the facility to provide the best passage conditions for fish.

d. Additional storage:

Additional storage projects to provide flows during critical months for juvenile fish are a program amendment being considered through the Northwest Power Planning Council. The Corps has evaluated such a project near Weiser, Idaho (called the Galloway Dam). At the time of the Corps study, it was determined that there was no federal interest in proceeding with the storage project. This decision may be revisited as part of the NPPC review of this program amendment.

Letter I9, William L. Mathews, October 16, 1991

Comment I9-1: Concept for moving juvenile salmon through dams.

Response I9-1: The concept presented, although ingenious, is outside the scope of this EIS. The scope of the EIS was limited to operation changes within the Columbia/Snake River System for only 1992 (see response to Common Issue No. 13). Only those alternatives that could be implemented in 1992 were evaluated. Even if the idea put forth was implementable, it is not considered to be a managerial change to the operation of the system. Because of the size of the reservoirs, a large number of pumps would be required. This equipment would take a long time to acquire.

Letter I10, Bill Wood, October 17, 1991

Comment I10-1: Opposition to drawdown longer than four weeks.

Response I10-1: Comment noted.

Comment I10-2: Adverse effects upon Lewis Clark Terminal.

Response I10-2: No response necessary.

Comment I10-3: Why is commercial harvest still allowed?

Response I10-3: See response to Common Issue No. 7.

Letter I11, Gehrke's Gink (George Gehrke), October 17, 1991

Comment I11-1: Support for Governor's Plan.

Response I11-1: Comment noted.

Comment I11-2: Perfect solution to eliminate dams.

Response I11-2: Comment noted.

Comment I11-3: Governor's Plan assures return of historic salmon run.

Response I11-3: Comment noted. The EIS discusses the many factors affecting the salmon stocks and the uncertainties involved with proposed plans.

Letter I12, Van Walkley, October 17, 1991

Comment I12-1: Importance of cost-effectiveness and biological justification.

Response I12-1: See response to Common Issue No. 3 with regard to biological justification. In addition, another objective of the 1992 actions will be to collect data that can be used in the development of a long-term solution to improve salmon migration.

Comment I12-2: Concerns over ineffective drastic measures.

Response I12-2: The lower Snake River reservoir drawdown for near spillway crest provided the largest decrease in water particle travel time of all the alternatives evaluated. However, it is obvious that to implement this alternative would require significant dam modification to mitigate for some substantial impacts. These modifications are outside the scope of this EIS since they cannot be made in 1992. As mentioned in comment 1, the scientific community generally believes that increased water particle travel time translates to increased survival; however, this relationship is not quantifiable. Refer again to Common Issue No. 2.

Comment I12-3: Desire for more study to improve transportation.

Response I12-3: See response to Common Issue No. 15.

The scope of the EIS was limited to operation changes within the Columbia/Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS has included a representative number of alternatives which effect the operation of projects with the basin. The objective of these alternatives is to improve in-river migration conditions. The fish transportation program is included as an element of the "Existing Condition" alternative. Therefore, no improvements in the transportation program are included within this EIS. However, the Corps through their Fish Passage Development and Evaluation Program, and in cooperation with the Northwest Power Planning Council, through the Fish and Wildlife Program amendment process, will be looking into these types of improvements

Comment I12-4: Concern over costs.

Response I12-4: Comment noted.

Letter I13, Cheran Orchards, Inc. (Cathy Heller), October 21, 1991

Comment I13-1: Concern over continued harvesting.

Response I13-1: See response to Common Issue No. 7.

It is not within the authority of the Corps of Engineers, Bonneville Power Administration or the Bureau of Reclamation to evaluate issues or implement programs related to harvesting salmon. Therefore, this is not within the scope of this EIS. There are many factors that have contributed to the decline of the salmon runs, of which harvest is one. However, the cooperating agencies will focus

on areas where they have authority to improve conditions for salmon. This EIS deals only with improvement that can be made to in-river migration.

Comment I13-2: Impact vs. benefits.

Response I13-2: The EIS attempts to provide (..see generic response to flow vs. travel time comments). It does appear that a benefit is attained up to a threshold range (approximately 85 kcfs or so). Beyond that threshold range, benefits do not appear well defined.

Comment I13-3: Compromise between drawdown and reduction of harvesting.

Response I13-3: Comment noted. However, Ice Harbor was operated at minimum operating pool during the downstream migration of salmon in 1991 and the Corps has sufficient authority to operate this project at this level in 1992. Because of changing inflows, it is impossible to operate a run-of-river reservoir at a static water surface elevation. Therefore, when the Corps indicates that a reservoir water surface elevation will be held at a specified level, in reality there will be a one-foot cushion to allow for some flexibility. Simply stated, if a minimum operating pool (MOP) level of operation is indicated, the pool level will normally be operated at one-foot above that level so that the project does not go below MOP.

Letter I14, Broetje Orchards (Ralph Broetje), October 22, 1991

Comment I14-1: Danger of reduced or interrupted water supply.

Response I14-1: Comment noted.

Comment I14-2: Increased costs endanger farms.

Response I14-2: No response necessary.

Comment I14-3: Support for barging of smolt.

Response I14-3: No response necessary.

Comment I14-4: Flow augmentation endangers water supply.

Response I14-4: No response necessary.

Comment I14-5: Importance of cost-effectiveness and biological justification.

Response I14-5: See responses to Common Issue Nos. 2 and 4.

Comment I14-6: Marginal benefit assessment for flows should be involved.

Response I14-6: Refer to the cost-effectiveness analysis in Section 5.4.

Comment I14-7: Harvest rate must be reduced.

Response I14-7: See response to Common Issue No. 7.

Comment I14-8: Slaughter by high seas drift net fishers must be stopped.

Response I14-8: See response to Common Issue No. 7.

Comment I14-9: Expand effective programs.

Response I14-9: See responses to Common Issue Nos. 7 and 13.

Letter I15, AgriNorthwest (R. Thomas Mackay), October 23, 1991

Comment I15-1: Extreme potential of lost crop values.

Response I15-1: We acknowledge that any variable costs of production that are incurred prior to a decision on 1992 actions would be lost to the irrigators. That point has been added to the text in Section 4.8.1 of the FEIS, although no estimate has been made of how large that cost would be.

With reference to pump modifications, the words "it appears" have been deleted from the introduction to Section 4.8.

Comment I15-2: Loss of productive assets.

Response I15-2: The cost of reestablishing fruit trees and vineyards has been added to Section 4.8.1 of the FEIS.

Comment I15-3: Costs of drawdowns to AgriNorthwest.

Response I15-3: A one-foot range of flexibility is needed to operate any reservoir so that the reservoir would not go below MOP. If Ice Harbor is operated down to MOP in 1992, the reservoir would be operated between 438 and 437 so that the reservoir will not go below MOP. This does not guarantee that under emergency circumstances the reservoir could not go slightly below MOP. Wave action could also result in reservoir elevations around pumping plants that are intermittently below MOP.

Comment I15-4: Discrepancy in smolt survival numbers.

Response I15-4: The value in Table 5.4-1 on page 5-12 includes Lower Granite Pool plus Lower Granite Dam to Ice Harbor increased survival. Table 4.2-8 is only increased survival from Lower Granite Dam to Ice Harbor Dam.

Letter I16, Clark Jennings and Associates, Inc. (James G. O'Connor), October 25, 1991

Comment I16-1: Conversion of river projects back to dry land if project implemented.

Response I16-1: Comment noted.

Comment I16-2: Paying for irrigated land.

Response I16-2: No response necessary.

Comment I16-3: Shut down of irrigated land.

Response I16-3: No response necessary.

Letter I17, Pritchard Appraisal & Farm Financial Consulting (Jim Pritchard), October 28, 1991

Comment I17-1: Supports "no-action" alternative.

Response I17-1: No response necessary.

Letter I18, The Dalles Irrigation District (Don W. Bailey), October 31, 1991

Comment I18-1: Concern over drawdown of Bonneville Pool.

Response I18-1: Comment noted.

Letter I19, Karen J. Lewis, November 4, 1991

Comment I19-1: Opposition to drawdown.

Response I19-1: No response necessary.

Comment I19-2: Consider other alternatives.

Response I19-2: See responses to Common Issue Nos. 13 and 15.

Letter I20, Kip Dietinger, November 7, 1991

Comment I20-1: Action urged.

Response I20-1: No response necessary.

Comment I20-2: Accomplish irrigation by pumping spring runoff into reservoirs away from river channels.

Response I20-2: No response necessary.

Letter I21, Tom Kovalicky, November 7, 1991

Comment I21-1: Adopt objectives of Columbia Basin Fish & Wildlife Authority Flow Proposal.

Response I21-1: The objectives identified by the Columbia Basin Fish and Wildlife Authority would be difficult to meet in 1992 with the current operation of the system (with existing flood control and irrigation requirements) using only flow augmentation and the limited drawdown proposals that are still being considered. However, if 1992 is a high water year, these objectives could still be obtainable.

Comment I21-2: Adopt safe in-river migration conditions policy.

Response I21-2: For many stocks of fish, the existing fish transportation program has been very successful. As part of the Northwest Power Planning Council proposals, the Corps will be evaluating improvements to this transportation program.

Comment I21-3: Implement drawdowns.

Response I21-3: See responses to Common Issue Nos. 13 and 14.

The scope of the EIS was limited to operation changes within the Columbia/Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS has included a representative number of alternatives which affect the operation of projects with the basin. No alternatives which required significant structural modifications were evaluated. The Corps in conjunction with the Northwest Power Planning Council, through their amendment process, is looking at potential structural modification to the dams to mitigate for the various impacts identified in the EIS. The Corps is working on a reconnaissance level study of the necessary dam modification necessary to implement a four reservoir drawdown on the lower Snake as a long-term solution to improve downstream salmon migration. November 1992 is the schedule completion date for Phase 1 of this study.

Comment I21-4: Mitigate impacts on fisheries caused by unregulated harvest.

Response I21-4: See response to Common Issue No. 7.

If Mr. Kovalicky is referring to mainstem passage losses, the Corps is committed to providing the state-of-the-art bypass at all projects (such as on-going improvements to the bypass program with extended-length screens, raised gates, new bypass facility at Lower Monumental and Ice Harbor, new juvenile facilities at McNary and Little Goose Dams); modeling efforts to evaluate turbine efficiency; research to evaluate juvenile and adult passage, and transportation and associated project improvements for stress mitigation.

Comment I21-5: Monitor escapement.

Response I21-5: See response to Common Issue No. 13.

The EIS is not establishing specific spawning escapement objectives for salmon stocks, for short-term actions being considered for only 1992. However, the Northwest Power Planning Council will be setting these objectives for their long-term programs.

Letter I22, James M. Baker, November 8, 1991

Comment I22-1: DEIS doesn't deliver on Corps' commitment.

Response I22-1: This EIS is the first step towards implementation of actions in 1992 to benefit migration for salmon. The EIS does include several drawdown proposals on the lower Snake River - as specified by the Salmon Summit. Many of these drawdown proposals on the lower Snake River are still being considered for 1992. The Corps is conducting other studies to evaluate the type of modifications necessary at the lower Snake River dams to allow drawdown that would improve salmon migration.

Comment I22-2: More aggressively test feasibility of drawdowns.

Response I22-2: The EIS evaluates the effects (positive and negative) of several test drawdowns on the lower Snake River reservoirs. The preferred alternative presented in the final OA/EIS includes a March 1992 test drawdown of Lower Granite and Little Goose reservoirs, which will be used to provide information on the feasibility of drawdowns during fish migration periods. A detailed implementation/monitoring plan is identified in the final OA/EIS.

Comment I22-3: Test during January or February.

Response I22-3: It would be impossible to prepare an EIS on a reservoir drawdown in time for a January or February implementation. The FEIS will

include a two reservoir drawdown (Lower Granite to near spillway and Little Goose up to 15 feet below MOP). This will be a 4-week test in March. However, test reservoir drawdown in 1992 is not imperative to determine what project modifications are required to mitigate impacts. The majority of the data collected from a test drawdown can be collected from physical laboratory (hydraulic) model studies. The development of these models are underway and studies will be conducted in 1992 and beyond, as necessary.

Comment I22-4: Need for mitigation measures.

Response I22-4: See response to Common Issue No. 10 and 14, and Comment I22-2.

The scope of the EIS was limited to operation changes within the Columbia/Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS has included a representative number of alternatives which effect the operation of projects within the basin. No alternatives which required significant structural modifications were evaluated. The Corps in their Columbia River Salmon Mitigation Analysis, in conjunction with the Northwest Power Planning Council, through the Fish and Wildlife Program amendment process, is looking at potential structural modification to the dams to mitigate for the various impacts identified in the EIS.

Comment I22-5: Call for completion of basic design work for drawdown by 11/92.

Response I22-5: Comment noted. However, it is essential that all the effects of all the alternatives under consideration be identified so that an informed decision can be made for actions to be taken in 1992. The Corps is working on a study of the necessary dam modifications to implement a four-reservoir drawdown on the lower Snake as a long-term solution to improve downstream salmon migration. November 1992 is the schedule completion date for Phase 1 of that study.

Comment I22-6: Adopt preferred alternative in FEIS by 1/92.

Response I22-6: The EIS is currently on an extremely expedited schedule, with a signed Record of Decision scheduled for the end of February. The Corps is also looking at any potential ways that the schedule can be shortened by a couple of weeks. There is no way that the EIS process (complete with public involvement) can be completed by January 1, 1992.

Letter I23, Ron Mason, November 8, 1991

Comment I23-1: Power Planning Act of 1980 committed to giving equal status to power and fish.

Response I23-1: No response necessary.

Letter I24, Colleen Wright, November 10, 1991

Comment I24-1: Drawdown on Lower Granite and Little Goose to spillway levels.

Response I24-1: No response necessary. See response to Common Issue No. 16.

Comment I24-2: Importance of flow augmentation during drawdown.

Response I24-2: See response to Common Issue No. 10.

Comment I24-3: EIS must consider mitigation measures.

Response I24-3: See response to Common Issue No. 10.

Comment I24-4: Analyze "no-action" alternative.

Response I24-4: See response to Common Issue No. 3.

Letter I25, David J. Glickerman, M.D., November 10, 1991

Comment I25-1: Drawdown of Little Goose and Lower Granite in late February and March.

Response I25-1: No response necessary. See response to Common Issue No. 16.

Comment I25-2: Flow augmentation during drawdowns.

Response I25-2: See response to Common Issue No. 13.

Comment I25-3: EIS must consider mitigation measures.

Response I25-3: See response to Common Issue No. 10.

Comment I25-4: Analyze "no-action" alternative.

Response I25-4: See response to Common Issue No. 3.

Letter I26, G.H. Bowers Engineering (Gregory H. Bowers), November 11, 1991

Comment I26-1: Address storage release for temperature control.

Response I26-1: The full evaluation of the 1992 actions for temperature control is included in the FEIS. Any similar action to be considered for 1993 or beyond would indeed require supplemental NEPA procedures.

*Letter I27, Pacific Grinding Wheel Company, Inc. (James H. Kean),
November 12, 1991*

Comment I27-1: Augment flows in Snake and Columbia rivers during drawdowns.

Response I27-1: The preferred alternative identified in the FEIS includes a test drawdown of Lower Granite and Little Goose in March, Snake River flow augmentation from April 15 through May, and Target 200 flows on the lower Columbia River.

Letter I28, Joanne M. Roberts, November 12, 1991

Comment I28-1: Important to keep fish in water and provide safe passage.

Response I28-1: See response to Common Issue No. 15.

The scope of the EIS was limited to operation changes within the Columbia/Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS has included a representative number of alternatives which effect the operation of projects with the basin. The objective of these alternatives is to improve in-river migration conditions. The fish transportation program is included as an element of the "Existing Condition" alternative.

Comment I28-2: Necessary for smolts to complete migration quickly.

Response I28-2: No response necessary.

Comment I28-3: Hatchery salmon no substitute.

Response I28-3: No response necessary.

Letter I29, D. Grave de Peralta, November 12, 1991

Comment I29-1: Lower Granite and Little Goose reservoirs to spillway level late February-March to avoid interfering with migration.

Response I29-1: No response necessary.

Comment I29-2: Flow augmentation during drawdowns.

Response I29-2: No response necessary.

- Comment I29-3: EIS must consider mitigation measures.
- Response I29-3: See response to Common Issue No. 10.
- Comment I29-4: Analyze effects of "no-action" alternative.
- Response I29-4: The "No Action" alternative refers to the existing condition, which is considered in the Final Environmental Impact Statement. Based on current data, we will not predict what long-term economic and environmental impacts may occur if and when the Snake River wild salmon become extinct. Additionally, the scope of the EIS was limited to management changes to the operation of the Columbia/Snake River Systems for only 1992.

Letter I30, Robert Shank, November 13, 1991

- Comment I30-1: Significant issues not addressed.
- Response I30-1: This document is not strictly an EIS. It is also a Corps planning document that includes the plan formulation process. The significant issues are addressed throughout the plan formulation process.
- Comment I30-2: Mitigation measures inadequately addressed.
- Response I30-2: See response to Common Issue No. 10.
- The action identified in this EIS are for 1992 only. The objectives of these actions are two fold: 1) improve in-river migration as an interim action for 1992 only and/or; 2) obtain information that can be used in the development of a long-term solution. For whatever actions are implemented in 1992, information will be collected on impacts requiring mitigation and the extent of mitigation needed.
- Comment I30-3: Compliance with Federal, state, and local laws.
- Response I30-3: The draft EIS was reviewed by competent attorneys within the Corps for compliance with laws and regulations. The Draft EIS was provided to various State and Federal agencies for review. The review includes any legal issues that may arise.
- Comment I30-4: Lack of reasonable alternatives.
- Response I30-4: The EIS reasonably and adequately addresses all the concerns identified.

Letter I31, Lawrence Hickman, November 13, 1991

Comment I31-1: Damage caused by fish harvest.

Response I31-1: There are many factors that have contributed to the decline of salmon (i.e., dams, over-harvest, loss of habitat, water withdrawals, pollution, etc.). This EIS deals only with the effects of dams on the lower Columbia/Snake Rivers and how to improve migration through the reservoirs.

Comment I31-2: Danger of gas saturation.

Response I31-2: Comment noted. The EIS has directed significant attention to the gas supersaturation issue due to the potential impacts.

Comment I31-3: Success of "Operation Fish Run."

Response I31-3: See response to Common Issue No. 15 and the discussion on transportation in Section 2 of the OA/EIS.

The scope of the EIS was limited to operation changes within the Columbia/Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS has included a representative number of alternatives which affect the operation of projects with the basin. The objective of these alternatives is to improve in-river migration conditions. The fish transportation program is included as an element of the "Existing Condition" alternative.

Comment I31-4: Increase number of hatchery fish to tidewater.

Response I31-4: See response to Common Issue No. 8.

Modifications of the operation of hatcheries is outside the scope of this EIS. However, the Northwest Power Planning Council, through their amendment process, will be looking into modifications hatchery operation.

Comment I31-5: Need more emphasis upon research.

Response I31-5: The Corps attempts to conduct the best research possible, by having an open review by regional experts and regional fishery agencies and tribes participate in the review of all proposed research. Funding is programmed by priority research needs identified through another regional committee. While additional funding may provide additional research studies, the priority studies identified are funded through the Corps' research program.

Many regional fishery biologists believe a major cause of declining returns is the competition between the hatchery production and the wild fish. Wild fish typically return at a higher rate than hatchery fish, have a stronger genetic constitution, higher vitality, and are overall a higher quality specimen. There are obstacles to meeting spawning goals if hatchery production is not improved, and if wild fish continue to be out competed by sheer numbers of hatchery fish released.

All research conducted to date indicates higher return rates for transported versus non-transported fish. Even spring chinook stocks, which have not responded to transportation as well as steelhead or fall chinook, still return at a higher rate than non-transported fish. Recent scale analysis of spring chinook adults (at Lower Granite Dam) indicate that the wild component is approximately 25 % (75 % are hatchery) although the hatchery component of outmigrating juvenile spring chinook is 95 % (5 % are wild). The range for returning wild steelhead adults is about 15 % (85 % are hatchery stocks). Outmigrating juveniles are also largely of hatchery contribution (approximately 90 % are hatchery). Transportation is maximized at Lower Granite, with nearly all fish collected being transported.

The question of passage at the Hells Canyon complex of dams was raised at a workshop sponsored by Sen. McClure in 1989. The Corps was invited to participate in evaluating the potential for retrofitting those projects with passage facilities. The result of the workshop indicated that some form of passage and/or transport could be designed if priority for such an effort was considered high enough to pursue the technical (and funding) issues involved. To my knowledge, no further action has been taken on this, nor is upstream passage at Dworshak, Chief Joseph or Grand Coulee being addressed.

Comment I31-6: Potential for flooding.

Response I31-6: The alternatives investigated in this EIS will not compromise flood control requirements within the Columbia River basin. In addition, the drawdown on run-of-river reservoirs (as described in the EIS) is limited to 2-feet per day which would not cause flood flow conditions. Neither flow augmentation nor reservoir drawdown would be initiated during naturally occurring flooded flow conditions.

Comment I31-7: Potential legal problems.

Response I31-7: The Corps of Engineers is making every effort reasonably possible under the circumstances to avoid damage to third parties.

Notwithstanding these efforts, losses may occur. The potential for legal liability that may be faced by the Corps is an important consideration in our final determination on any proposed drawdown. It is difficult, if not impossible, to address hypothetical damages that could result in legal liability to the Corps.

Little damage is expected since there will be both opportunity for mitigation of any potential damage before a drawdown, (i.e. boat docks) and constant monitoring of conditions (i.e. embankments) throughout the drawdown. Based on the above, damages if any, are expected to be minimal.

Comment I31-8: Economic costs and benefits.

Response I31-8: The EIS has identified the potential effects related to disruption of barge operations, increased pumping costs, and lost power generation. Benefits from potential fish conservation measures cannot be easily quantified in monetary terms, but the FEIS does include a cost-effectiveness analysis that addresses the comparative costs of various options per unit change gained in water particle travel time.

Letter I32, Peggy Jo Randall and John C. Burke, November 13, 1991

Comment I32-1: Drawdown to spillway of Lower Granite and Little Goose in early spring.

Response I32-1: No response necessary.

Comment I32-2: Flow augmentation in Columbia River from April to August.

Response I32-2: No response necessary.

Comment I32-3: Alteration of fish ladders and intake pipes.

Response I32-3: See response to Common Issue Nos. 13 and 14.

Letter I33, Umatilla Electric Cooperative Association (M. Steven Eldrige), November 15, 1991

Comment I33-1: Need for preferred alternative.

Response I33-1: It was decided by the cooperating agencies that no preferred plan would be selected until other agencies and the public had reviewed the DEIS and had an opportunity to comment on all the alternatives being evaluated.

Comment I33-2: Ecosystem EIS needed.

Response I33-2: The DEIS evaluates all elements of the ecosystem that would be affected by implementation of the alternatives being considered. The salmon are one element of that evaluation. Please keep in mind that this EIS is being prepared on an extremely expedited schedule. Because of the severe time constraints, it was determined that the evaluation would be based primarily upon existing information.

Comment I33-3: Other methods needed.

Response I33-3: The scope of the EIS was limited to operation changes within the Columbia/Snake River System for only 1992. Only those alternatives that could be implemented in 1992 were evaluated. The EIS has included a representative number of alternatives which affect the operation of projects with the basin.

Comment I33-4: Need to define positive and negative existing efforts.

Response I33-4: The National Marine Fisheries Services is the agency with responsibility for listing the salmon under the Endangered Species Act. The Salmon listed were so designated because of the low numbers of returning wild or naturally spawning adults. The EIS does not evaluate the success of the programs instituted under the Northwest Power Act. However, the Northwest Power Planning Council is in the process of amending its programs to make them more beneficial to the listed stocks of salmon.

Comment I33-5: Need for systematic approach to restoration.

Response I33-5: No response necessary.

Letter I34, Lee Gray, Undated

Comment I34-1: Suggestion to build a river.

Response I34-1: See response to Common Issue No. 14.

Comment I34-2: Introduce trout from Colorado.

Response I34-2: See response to Common Issue No. 8.

Letter I35, P.R. Scroggie, Undated

Comment I35-1: Footnote of DOE/BP-236 to EIS.

Response I35-1: Discussion of specific replacement resources is beyond the scope of this document. It is covered in other reports and will likely be covered as part of the analysis of long-term solutions.

Letter I36, Gunkel Orchards (Dan Gunkel), Undated

Comment I36-1: No recreational inventory for Dalles Pool.

Response I36-1: The text and Appendix Table H-1 have been modified to include data on The Dalles Pool.

Comment I36-2: No summary of operational impact to Peach Beach R.V. Park.

Response I36-2: Appendix Table H-8 has been modified to include this information.

Comment I36-3: Other parts of EIS must reflect Peach Beach R.V. Park.

Response I36-3: See responses to I36-1 and I36-2.

Letter I37, Dave Clark, Undated

Comment I37-1: Support for Andrus' drawdown plan.

Response I37-1: No response necessary.

Letter I38, Paul Worden, Undated

Comment I38-1: Include impacts to vegetation and wildlife.

Response I38-1: Impacts to shoreline vegetation are discussed in Sections 4.4.2 and 4.4.3, which discuss impacts to riparian and wetland vegetation, respectively. Concomitant impacts to resident wildlife species are addressed in Sections 4.4.5 through 4.4.12. All species or groups of species addressed include those for which pertinent information is available. The level of detail presented for individual species is representative of that which is available for those species addressed and is considered sufficient to assess general impacts of drawdown to those species.

In response to concern expressed regarding impacts to freshwater clams, additional information has been added in Section 4.4.10.

Letter I-39, Idaho Power Company (Bruce M. Smith), November 8, 1991

Comment I39-1: Unreasonable assumption of jurisdiction by ACOE.

Response I39-1: Since the cooperating agencies have no jurisdiction over the operation (for fish) of Brownlee Reservoir, water from there has been eliminated from further consideration and will not be recommended for flow augmentation in 1992.

Comment I39-2: ACOE reliance on erroneous BPA Hells Canyon Environmental Investigation Report.

Response I39-2: Comment noted.

Comment I39-3: Blockage of rivers.

Response I39-3: No response necessary. We appreciate the information.

Comment I39-4: DEIS should use Federal projects for flow augmentation.

Response I39-4: See response to comment number 1 above.

Comment I39-5: Erroneous chart information.

Response I39-5: Text has been modified.

Comment I39-6: Addition to hydrograph.

Response I39-6: Comment noted.

Comment I39-7: Include Federal projects in list.

Response I39-7: Storage in American Falls, Lucky Peak and Cascade Reservoirs is already dedicated for irrigation. Lack of agreements necessary to use surplus storage in these projects for flow augmentation precludes consideration of this water for 1992.

Comment I39-8: Statement of Idaho Power's responsibility needed.

Response I39-8: Text has been modified.

Comment I39-9: Misrepresentation of Idaho Power system.

Response I39-9: The comment is correct. Pertinent section has been revised.

Comment I39-10: Misrepresentation of impacts to company.

Response I39-10: The comment is correct. Pertinent section has been revised.

Comment noted. See response to comment number 1 above.

- Comment I39-11: Flood control of Brownlee Reservoir conflicts with fish.
- Response I39-11: Modification of system flood control requirements is beyond the scope of this OA/EIS.
- Comment I39-12: Erroneous application of comments to Brownlee.
- Response I39-12: Text has been modified.
- Comment I39-13: Ineffective water budget.
- Response I39-13: No response necessary.
- Comment I39-14: "Jacks" are adults, not sub-adults.
- Response I39-14: Text has been modified.
- Comment I39-15: Summer chinook spawn in tributaries of Snake River drainage.
- Response I39-15: Text changed.
- Comment I39-16: Idaho Power hatcheries unaffected by project.
- Response I39-16: No response necessary.
- Comment I39-17: Incorrect description of Brownlee Reservoir.
- Response I39-17: Oxygen depletions in the reservoir were already discussed in the text so are the dominant species indicated in the comment. The low populations of carp and sucker suggested by the comment are not supported by data reported in the literature. Likewise, the published literature indicates that forage species rather than fishing limit production in the reservoir. Without data to support information suggested in the comment, no text change is warranted.
- Comment I39-18: Inaccuracy concerning bottom spawners.
- Response I39-18: Text has been modified.
- Comment I39-19: Inaccuracy concerning effects on irrigators.
- Response I39-19: Upon further investigation, we have determined that a few irrigators could be affected by flow augmentation from Brownlee Reservoir. The extent of effect would vary depending on whether it was a low or average water year. The text of Sections 2.10 and 4.8 have been changed to include the effects to Brownlee irrigators.

- Comment I39-20: All counties in Idaho adjacent to Snake River should be included.
- Response I39-20: The analysis indicates that effects on Idaho agricultural production as a result of implementing any of the alternatives included in the EIS would occur in Washington or Payette County. It is not necessary to provide statistics for areas that will not be affected.
- Comment I39-21: Impacts to Brownlee detrimental to company.
- Response I39-21: Comment noted.
- Comment I39-22: Information needed in table.
- Response I39-22: This information has been added to Table 2.12-1.
- Comment I39-23: Underestimation of recreation importance of Brownlee Reservoir.
- Response I39-23: This information has been added to the text in Sections 2.12.1.4 and 2.12.2.4.
- Comment I39-24: Historical detriment of Corps flood control.
- Response I39-24: No response necessary.
- Comment I39-25: IPC questions need to transfer flood control requirement to Grand Coulee.
- Response I39-25: Using the eight Federal projects downstream of Brownlee for flood control would defeat the purpose of the flood control transfer. The purpose of the transfer is to store additional water in Dworshak and Brownlee reservoirs to be released for flow augmentation in the lower Snake River.
- Comment I39-26: Misunderstanding of impacts to fish.
- Response I39-26: Referenced analysis is a "what if" evaluation to illustrate the effects of different scenarios. The preferred plan of the final OA/EIS does not include any contribution of water, other than historical, from the Hells Canyon Complex.
- Comment I39-27: Opposition to flood control proposal.
- Response I39-27: See response to I39-26.
- Comment I39-28: Flood control shift.

- Response I39-28: The 4 MAF can not be increased because using the eight Federal projects below Brownlee for flood control is not feasible.
- Comment I39-29: Correctness of word "Dworshak."
- Response I39-29: The correct reference is to Brownlee.
- Comment I39-30: 50-foot draft at Dworshak.
- Response I39-30: The reference is to equivalent volumes.
- Comment I39-31: Incorrect statement regarding regional electrical operations.
- Response I39-31: Comment noted.
- Comment I39-32: Regional transmission conditions.
- Response I39-32: Your concern for your customers is noted. However, the cooperating agencies are no longer suggesting the use of non-Federal projects for additional flow augmentation in 1992. Your customers should not be impacted.
- Comment I39-33: Idaho Power losses.
- Response I39-33: See response to I39-32.
- Comment I39-34: Flow augmentation not solution.
- Response I39-34: The inclusion of alternatives other than flow augmentation (e.g., reservoir drawdown), and in combinations with flow augmentation, show that the cooperating agencies do not view flow augmentation as the solution. The comparison of water particle travel time between 20 Kcfs flow augmentation and operation at MOP merely demonstrates the need to consider drawdown below MOP, and to combine alternatives, to achieve substantial reductions in water particle travel time. The cooperating agencies certainly do understand the finite nature of storage used for flow augmentation and the tradeoffs involved, as is clearly stated at the end of the paragraph in question.
- Comment I39-35: Change in fish behavior due to change in water surface elevation.
- Response I39-35: No response necessary.
- Because additional discharges from non-federal projects (Brownlee) are no longer being recommended for flow augmentation in 1992, there should be no resultant impact to resident fisheries therein.

Comment I39-36: "Plan" to reduce risk to chinook.

Response I39-36: See response to I39-35.

Comment I39-37: Brownlee does not have significant population of suckers.

Response I39-37: Text does not indicate that there is a significant sucker population in Brownlee.

Comment I39-38: Rising water level effects.

Response I39-38: Comment noted. See response to I39-35.

Comment I39-39: Factors limiting Brownlee bass and crappie populations.

Response I39-39: See response to I39-35.

Comment I39-40: Plan to balance resident fish needs with others.

Response I39-40: See response to I39-35 above.

Comment I39-41: Transfer of flood control from Brownlee to eight Federal projects.

Response I39-41: Comment noted.

Comment I39-42: Effects to Idaho Power should be considered.

Response I39-42: Idaho power should not realize any impacts due to additional drafting of Brownlee, since the cooperating agencies are no longer considering non-Federal project storage for additional flow augmentation in 1992. This is due to the lack of cooperating agencies' authority to regulate the operation of Brownlee for fish purposes, not a lack of interest in the benefit water from the Hells Canyon complex could provide.

Comment I39-43: Note about impossibility of shaping water volumes greater than in the past.

Response I39-43: See response to I39-42.

Comment I39-44: Options directed to survival of spring and early summer migrants.

Response I39-44: No comment necessary.

Comment I39-45: Changes in elevation at Brownlee.

Response I39-45: Comment noted.

Comment I39-46: Misleading description of impacts.

Response I39-46: Comment noted. Please see response to comment number 35 above.

Comment I39-47: Incomplete index.

Response I39-47: The index will be modified to reflect the contents on the FEIS.

Comment I39-48: Incorrect identifications in table.

Response I39-48: Table has been modified.

Comment I39-49: Table modifications.

Response I39-49: Table has been modified.

Letter I40, Columbia Grain International, Inc. (Terry Cleaver), November 22, 1991

Comment I40-1: Increased costs of grain transport.

Response I40-1: The DEIS acknowledges the cost differentials for shipping grain by various methods, and the questionable capability for large-scale shifts to rail or truck transport.

Comment I40-2: No evidence that increasing velocity of river will improve survival.

Response I40-2: While the EIS indicates there is not a precise, quantifiable relationship between flow or velocity and smolt survival, it states that there is sufficient scientific agreement that a general relationship exists. The EIS also summarizes a large body of research evidence that supports this hypothesis, at least within certain flow ranges and for some species. See response to Common Issue No. 5.

Comment I40-3: Recommendation of combination drawdown and flow augmentation.

Response I40-3: No response necessary.

Letter I41, Ron Vigil, Undated

Comment I41-1: Support for combination drawdown/flow augmentation before spring migration.

Response I41-1: No response necessary.

Comment I41-2: Drawdown during spring migration.

Response I41-2: No response necessary.

Comment I41-3: Dam modifications.

Response I41-3: No response necessary.

Comment I41-4: Urge for action.

Response I41-4: No response necessary.

Letter I42, Rich Johnson and May Reed, November 2, 1991

Comment I42-1: Support for preservation of salmon.

Response I42-1: No response necessary.

Letter I43, Kip Dieringer, November 7, 1991

Comment I43-1: Destruction of river and salmon.

Response I43-1: No response necessary.

Letter I44, Direct Services Industries, Inc. (John Carr), November 14, 1991

Comment I44-1: Preferred alternatives with drawdown and flow augmentation.

Response I44-1: The preferred alternative utilizes the recommendation of this comment. Refer to the Final EIS for details of the action.

Comment I44-2: Damage to adult survival while helping juvenile survival.

Response I44-2: A portion of the preferred alternative describes a March test lowering of Lower Granite Reservoir to near spillway. This is required to determine a number of the physical elements which need to be examined in the system. Timing of the this test was planned to prevent harm to juveniles. This test will have minor effects on the passage of adult salmon and steelhead. Ladders at Lower Granite and Little Goose will be inoperable during about half of the test period, but few adult fish pass at this time of year. About 3 percent of all steelhead pass Lower Granite in March, and probably only half of these would be delayed by the test. This delay may cause some additional pre-spawning mortality. Other stocks will not arrive at Little Goose until after the test is complete.

Comment I44-3: Combination of drawdown and flow augmentation in Snake River.

Response I44-3: No response necessary.

Comment I44-4: NTU cost-effectiveness analysis.

- Response I44-4: The cooperating agencies have carefully reviewed the NTU submittal. A complete cost-effective analysis of all options is included in the FEIS as Section 5.5.
- Comment I44-5: Alternatives to increase flows do not merit consideration.
- Response I44-5: Comment noted.
- Comment I44-6: Need for analysis of cost-effectiveness.
- Response I44-6: See response to I44-4. The Corps did coordinate with NTU and other parties in implementing the suggested analysis.
- Comment I44-7: Assemble team of biologists to gather more data.
- Response I44-7: See response to Common Issue No. 11.
- Comment I44-8: Conclusions regarding effect of flows on migration.
- Response I44-8: Independent analysis performed by CBFWA (1991), Kindley (1991), and Giorgi (1991), and reviewed in the DEIS, found significant correlations between flow and migration rate for a variety of flow conditions. These authors have raised valid questions regarding the confounding effects of release data and level of smolt development on migration rate. These are, additionally, problems inherent to the methods used and the conditions under which the flow/travel rate data were collected. Although one may attempt, as Giorgi (1991) apparently did, to statistically control for these effects, the precise relationship between flow and travel time of wild smolts will remain uncertain until more observations are obtained. Based on best available information, however, we believe that flow augmentation can yield positive benefits in terms of juvenile migration and survival.
- Comment I44-9: Loss of instantaneous power capacity.
- Response I44-9: Capacity numbers have been revised (see Section 4.9.1.1).
- Comment I44-10: Firm energy loss.
- Response I44-10: Reevaluation of firm energy effects shows minor losses (see Section 4.9.1.2).
- Comment I44-11: Non-firm energy loss.
- Response I44-11: Non-firm effects have been reevaluated (see Section 4.9.1.3).

- Comment I44-12: Federal system will lose sales.
- Response I44-12: The comment is correct. Cost impacts presented in the OA/EIS are to be used for comparison of alternatives, not to predict the exact cost of the alternative (see Section 4.9.2).
- Comment I44-13: Incurred costs for DSIs and thus energy.
- Response I44-13: See response to I44-12.
- Comment I44-14: Combination of flow augmentation and drawdown best solution.
- Response I44-14: Please refer to Section 5.5 of the FEIS for the most complete and up-to-date analysis of cost-effectiveness. Power costs are one of several types of costs that the cooperating agencies considered in evaluating the options against this plan selection criterion.
- Comment I44-15: DEIS legally supportable by adopting temporary test plan.
- Response I44-15: Refer to Common Issue No. 13.
- Comment I44-16: Inclusion of Corps data into long-term studies.
- Response I44-16: The information gained by the implementation of an alternative(s) identified within this document will be used in the development of long-term studies that are underway. However, where appropriate some of the information from the evaluations contained within this EIS will be used in these on-going studies. Please note that the evaluations in this EIS pertain to short-term actions (only in 1992). In some cases, the long-term actions will have significantly different impacts. This has been noted where appropriate in the EIS.
- Comment I44-17: Clarify short-term scope of EIS.
- Response I44-17: The FEIS has been carefully edited to more clearly, consistently, and strongly emphasize that the scope pertains only to measures considered as test actions for 1992. See also response to Common Issue No. 9.
- Comment I44-18: Options not limited to purpose of testing.
- Response I44-18: There are two objectives of the EIS. The first is to improve in-water migration conditions. The second, to collect data that can be used in the development of long-term actions, which are currently under evaluation. However, the actions outlined in this EIS will only be implemented one time. Monitoring in a number of areas is being planned. The data collected will be used, where applicable in

the on-going long- term studies (i.e. System Operation Review, NPPC Fish and Wildlife amendment program, CRSMA).

Comment I44-19: Exclusion of alternatives.

Response I44-19: The transportation program is included as a portion of the Existing Condition (No Action) alternative. In addition, transportation will still be used as a part of many of the alternatives being evaluated (i.e. drawdown to MOP, flow augmentation, etc.).

Comment I44-20: Uncertain assumptions.

Response I44-20: The discussion in the draft EIS portrays the scientific uncertainty that exists regarding the relationship between flow, travel time and survival. In that discussion, the range in analyses among regional experts and their interpretations of the limited biological data was presented. The discussion avoided selecting one analysis as right or wrong, since all are based on the same data base which is limited. The Corps believes this issue should be presented to the public, since the flow/travel time/survival relationship is the basis for the drawdown experiment.

This information does indicate that there is a relationship between flow, travel time, and survival. However, because of the uncertainty, that relationship is believed to be general, not a quantifiable one.

Comment I44-21: Rate increase.

Response I44-21: See response to I57-23.

Comment I44-22: Analysis of rate impacts of proposals.

Response I44-22: Comment noted. The impacts associated with actions to be taken in 1992 are presented in the EIS.

Letter I45, Intentionally Left Blank

Letter I46, Eric Young, November 20, 1991

Comment I46-1: Urge for immediate action.

Response I46-1: Comment noted. No response necessary.

Comment I46-2: Support for drawdown test.

Response I46-2: See response to Common Issue No. 17.

Letter I47, Patricia J. Fong, November 12, 1991

- Comment I47-1: Conduct drawdown test before migrating smolts enter river.
- Response I47-1: See response to Common Issue No. 16.
- Comment I47-2: Flow augmentation during drawdowns.
- Response I47-2: The preferred alternative in the FEIS includes the largest feasible flow augmentation options for both the Snake and Columbia rivers.
- Comment I47-3: Consider mitigation measures.
- Response I47-3: See response to Common Issue No. 10.
- Comment I47-4: Analyze effects of "no-action" plan.
- Response I47-4: See response to Common Issue No. 3.

Letter I48, Charles Mabbott, November 12, 1991

- Comment I48-1: Combination drawdown and flow augmentation.
- Response I48-1: No response necessary.
- Comment I48-2: Managing river like river will create jobs.
- Response I48-2: It is difficult to attempt to reconstruct and evaluate all factors leading to the demise of various industries. Thus, the focus of the socioeconomic analysis included in the DEIS was on the short-term impacts, which were largely negative impacts to irrigators, shippers, and power users. The long-term benefits of increased fish population, including recreational activity and commercial fishing, could not be quantitatively assessed due to the short timeframe for conducting this study and lack of reliable data. References to potential improvements in fish survival rates can be found in Sections 4.2 and 4.3.
- Comment I48-3: Urge for action.
- Response I48-3: No response necessary.

Letter I49, Dennis Baird, November 12, 1991

- Comment I49-1: Choose option which allows fish passage in 14 to 16 days.
- Response I49-1: No response necessary.

Comment I49-2: Support for drawdown test.

Response I49-2: See response to Common Issue No. 16.

Comment I49-3: Urgent action needed.

Response I49-3: Selected spill provisions will be in place in 1992, as described for existing operations in Section 2.2 of the EIS. However, as demonstrated elsewhere in the EIS, major spills at multiple mainstem projects in 1992 would probably produce significantly elevated dissolved gas levels that would be highly detrimental to fish.

Comment I49-4: Admonition of possible "no-action" plan.

Response I49-4: See response to Common Issue No. 3.

Letter I50, Dustin J.E. Miller, November 12, 1991

Comment I50-1: Urgent plea for action.

Response I50-1: No response necessary.

Comment I50-2: Need for emergency measures.

Response I50-2: See response to Common Issue No. 17.

Comment I50-3: Mitigation for drawdown options.

Response I50-3: See responses to Common Issue Nos. 9 and 10.

Comment I50-4: Test drawdown of Lower Granite and Little Goose.

Response I50-4: A four-week test drawdown of these reservoirs in March 1992 is included in the preferred plan identified in the FEIS.

Comment I50-5: Requested flow augmentation.

Response I50-5: The preferred alternative also includes Snake and Columbia river flow augmentation actions considered to be feasible for 1992.

Comment I50-6: Reanalyze drawdown with mitigation.

Response I50-6: See responses to Common Issue Nos. 1, 9, 10, and 14.

Comment I50-7: Economic and environmental effects of no action.

Response I50-7: See response to Common Issue No. 3

Letter I51, Ron and Mimsi Wise, November 13, 1991

- Comment I51-1: Juvenile vs. adult fish passage.
- Response I51-1: See response to Comment A16-2.
- Comment I51-2: Need for emergency measures.
- Response I51-2: See response to Common Issue No. 17.
- Comment I51-3: Mitigation for reservoir drawdown.
- Response I51-3: See responses to Common Issue Nos. 9 and 10.
- Comment I51-4: Test drawdown of Lower Granite and Little Goose.
- Response I51-4: See response to Common Issue No. 16.
- Comment I51-5: Snake River flow augmentation.
- Response I51-5: See response to I50-5.
- Comment I51-6: Columbia River flow augmentation.
- Response I51-6: See response to I50-5.
- Comment I51-7: Re-analyze drawdown with mitigation.
- Response I51-7: See responses to Common Issue Nos. 1, 9, 10, and 14.
- Comment I51-8: Effects of no action.
- Response I51-8: See response to Common Issue No. 3.

Letter I52, Janet Burcham, November 13, 1991

- Comment I52-1: Drawdown lower Snake projects to MOP.
- Response I52-1: No response necessary.
- Comment I52-2: Implement lower Snake drawdown to near spillway crest, lower Columbia below MOP.
- Response I52-2: The DEIS indicates that the near-spillway options for the lower Snake River cannot be implemented in 1992, primarily due to the potential for serious adverse impacts to anadromous fish and concerns over structural impacts. Drafting lower Columbia pools

below MOP levels has not been identified as an option warranting consideration.

Comment I52-3: Lower Granite test cannot measure fish movement.

Response I52-3: This aspect of the option is acknowledged in the EIS. The rationale for this option is to develop valuable information on physical parameters while avoiding the risks to fish from elevated dissolved gas levels.

Comment I52-4: Lower Granite to 710 feet does not go far enough.

Response I52-4: See response to Comment I52-2.

Comment I52-5: Add flow augmentation to drawdown at all dams.

Response I52-5: No response necessary.

Comment I52-6: Lower Columbia flows, combination options, lower Columbia projects below MOP.

Response I52-6: The preferred alternative identified in the FEIS includes the Target 200 strategy for the lower Columbia River, which would provide more than 60 percent of the target flows recommended by the CBFWA. Separate analysis of more or different combination alternatives is not critical to the decision, as the various drawdown, augmentation, and temperature control options can be combined in many ways and their effects considered additively. As indicated in the response to Comment I51-2, drafting the lower Columbia pools below MOP had not been considered as an option. The aggregate adverse impacts of doing so would likely be much greater than drafting the lower Snake reservoirs to near spillway crest. With respect to navigation, such an action would effectively close down both the Snake and Columbia rivers.

Comment I52-7: Unsupported conclusions on drawdown effects on salmon.

Response I52-7: The EIS represents a good-faith effort by the cooperating agencies to comply with the requirements for environmental analysis when information is incomplete or unavailable. Agencies are expected to use existing credible evidence and accepted theoretical approaches to evaluate reasonably foreseeable impacts. The fact that the dams have not been operated near spillway levels prevents modeling of physical characteristics under these conditions, but it does not preclude informed judgment as to likely consequences. The conclusions concerning gas supersaturation are based on observations over several decades of operating experience and a clearly

demonstrated positive relationship between spill levels and dissolved gas levels. Potential impacts relating to predation and shallow water habitat are based on years of research data on reservoir habitat and fish habits, which allow logical inferences as to the direction and potential magnitude of change resulting from various actions. Comments received on the DEIS indicate general agreement with the expected consequences for fish of drawdown near spillway crest under present project configurations, and a disinclination to incur these risks during the 1992 migration.

Comment I52-8: Impartial third party needed for EIS.

Response I52-8: The National Environmental Policy Act and its implementing regulations require Federal agencies to assess the environmental impacts of their proposed actions. The actions addressed in this EIS would be undertaken by the Corps, Bonneville Power, and the Bureau of Reclamation; as managers of the river system, it is the cooperating agencies' responsibilities to implement NEPA for their respective actions.

Letter I53, Janet L. Stewart, November 13, 1991

Comment I53-1: Speed up water velocity at peak migration.

Response I53-1: No response necessary.

Comment I53-2: Invest in water and energy conservation.

Response I53-2: While these types of actions are outside the scope of the current EIS, Bonneville Power and the Bureau of Reclamation are both actively engaged in programs to accomplish water and energy conservation to help improve streamflows (CL).

Comment I53-3: Modify dams for juvenile passage other than transportation.

Response I53-3: See responses to Common Issue Nos. 14 and 15.

Letter I54, Kurt Fuerstenau, DMD, November 13, 1991

Comment I54-1: Urge for action.

Response I54-1: No response necessary.

Comment I54-2: Test drawdown of Lower Granite and Little Goose.

Response I54-2: See response to Common Issue No. 16.

Comment I54-3: Effects of no action.

Response I54-3: See response to Common Issue No. 3.

Letter I55, Jeanette Germain, November 13, 1991

Comment I55-1: Stop barging fish, modify projects.

Response I55-1: See responses to Common Issue Nos. 14 and 15.

Comment I55-2: Two-reservoir test drawdown this spring.

Response I55-2: See response to Common Issue No. 16.

Letter I56, Stephen A. Willie, November 14, 1991

Comment I56-1: Test drawdown of Lower Granite and Little Goose.

Response I56-1: See response to Common Issue No. 16.

Comment I56-2: Lower Snake River flow augmentation and drawdown.

Response I56-2: The preferred alternative identified in the FEIS includes a practicable flow augmentation action and reservoir drawdown to MOP.

Comment I56-3: Analysis and control of nitrogen supersaturation.

Response I56-3: Structural and operational measures to reduce dissolved gas supersaturation have been implemented, as described in the EIS. There is also a reasonable amount of information on the effects on adult and juvenile fish. The most significant information gap is physical data that would allow analytical prediction of gas levels under different operating regimes, such as with reservoirs near spillway crest.

Comment I56-4: Effects of no action.

Response I56-4: See response to Common Issue No. 3.

Comment I56-5: Reliance on fish transportation.

Response I56-5: See response to Common Issue No. 15.

Letter I57, Potlatch Corporation (Todd L. Maddock), November 14, 1991

Comment I57-1: Disruption of transportation.

- Response I57-1: The increased transportation cost of \$140,000 per month has been utilized in the analysis of all alternatives. The potential lack of availability of cars is already addressed on page 4-101 left column paragraph 4.
- Comment I57-2: Interruption of rail service.
- Response I57-2: The DEIS discussion of potential physical impacts to rail lines has been supplemented to indicate some of the possible economic consequences. Stability of railway embankments and other structures will be carefully monitored during the proposed drawdown test in March 1992.
- Comment I57-3: Dredging to maintain water supply.
- Response I57-3: The Corps has received conflicting information on the operating requirements for the Potlatch water supply intake on the Clearwater River. A recent contact with Potlatch staff confirmed the information presented in the DEIS, which indicated that the water supply intake would remain functional if Lower Granite were drawn down to near spillway crest. Our most recent information indicates that the intake is functional to elevation 727 feet (personal communication, Paul Hart, Potlatch Corporation, October 31, 1991) whereas the minimum Lower Granite drawdown elevation of 691.1 feet would correspond to a Clearwater River elevation of 733.8 feet at a flow of 40 kcfs.
- Comment I57-4: Water discharge.
- Response I57-4: Comment noted. This potential impact is mentioned in Section 4.1.3.1.
- Comment I57-5: Effect on power supply.
- Response I57-5: No response necessary.
- Comment I57-6: Effect on log transportation.
- Response I57-6: No response necessary.
- Comment I57-7: Failure to note Federal Register notice.
- Response I57-7: Comment noted. The text has been revised.
- Comment I57-8: Spell out test protocols, implementation, and use of results.
- Response I57-8: See response to Common Issues No. 5 and 11.

Comment I57-9: Act prudently.

Response I57-9: No response necessary.

Comment I57-10: Support for comprehensive plans to save salmon.

Response I57-10: No response necessary.

Comment I57-11: "Purpose and need" statement should be clarified.

Response I57-11: Comment noted.

Comment I57-12: Gathering of information.

Response I57-12: One of the intended values from implementing flow improvements is to develop monitoring data under new or test operating conditions that will increase knowledge of fish passage and other functions of the system. A monitoring program tailored to the specific actions is being developed. The ultimate impacts of various measures intended to improve fish passage can not be known or speculated upon until adult fish returns over a period of years have been evaluated.

A preferred plan for 1992 was selected following public and agency review of the draft document, based on the following general criteria: Ability to implement the plan in 1992; cost effectiveness; Performance against physical objectives; Acceptability of the environmental impacts; Public acceptability.

Comment I57-13: Issue of equity, mitigation.

Response I57-13: See response to Common Issue No. 10.

Comment I57-14: Social effects analysis overlooks localized impacts.

Response I57-14: The socioeconomic influences of the proposed actions will be felt primarily within the communities along the Columbia-Snake River System, in near-by upland areas that draw water supplies from the rivers and in more extensive commodity production areas that rely on the rivers for transportation. These use relationships define a primary influence zone that can extend up to 30 to 40 miles on either side of the river system.

The text has been revised to include more detailed information by pool for each resource area.

Comment I57-15: Attention to catastrophic risk.

- Response I57-15:** The preferred alternative described in the Final EIS will include a lowering of Lower Granite and Little Goose reservoirs for a one month test. This test is being done to collect data which will be used in other long-term studies to identify mitigative measures to reduce or prevent major effects or risks. The test protocol will outline procedures for halting the test in the event of major damage or imminent danger. The cooperating agencies and effected transportation businesses and agencies are working together in a monitoring and emergency response program.
- Comment I57-16:** Give emphasis to short-term drawdown tests.
- Response I57-16:** See response to Common Issue No. 16.
- Comment I57-17:** Coincide annual locks repairs with salmon flow measures.
- Response I57-17:** Annual navigation lock maintenance will occur during the preferred alternative test in March. Please refer to details of the preferred alternative in the Final EIS.
- Comment I57-18:** Effects of increased reliance on fossil fuels.
- Response I57-18:** Comment noted. The adverse impacts of increased reliance on fossil fuels are being addressed in BPA's Resource Programs Environmental Impact Statement (see Section 4.9.2.1).
- The EIS includes impacts associated with actions to be implemented in 1992 only. Where possible, a brief description of the differences between the short-term (1992) impacts and mitigated impacts, associated with a long-term implementation, will be included.
- See response to Common Issue No. 13.
- Comment I57-19:** Inadequate, underestimated analysis of power production consequences.
- Response I57-19:** Rework of power impacts has taken place. (See revised text in Section 4.9.2.) FELCC is still valued at 35 mills per kWh. BPA's recent solicitation for firm energy has produced, at least, 1,000 aMW of firm energy available in the region at a long-term cost of less than 35 mills/kWh real levelized 1990 dollars.
- See response to comment I57-18.
- Comment I57-20:** Replacement of lost FELCC.
- Response I57-20:** See response to I57-19. Question referred to BPA.

Comment I57-21: Short-term power cost impacts.

Response I57-21: See response to I57-19. Question referred to BPA.

Comment I57-22: Long-term power costs.

Response I57-22: See response to I57-19. Question referred to BPA.

Comment I57-23: Failure to estimate impact on electric ratepayers and consumers.

Response I57-23: Rates for 1992 are set and will not change. See Section 4.9 for discussion.

Comment I57-24: Water supply constraints on alternatives.

Response I57-24: As identified in the Final EIS the cooperating agencies have the authority necessary to implement all actions described in the document.

Comment I57-25: Dworshak log transportation and storage costs.

Response I57-25: Section 4.7.1.4 has been modified to incorporate this new information.

Comment I57-26: Increased vehicle emissions from trucking of logs.

Response I57-26: Acknowledgment of this impact has been added to the text. As this does not appear to be a significant impact, a specific estimate of emissions has not been added to the air quality section.

Comment I57-27: Water supply intake requires dredging.

Response I57-27: See response to Comment I57-3. The reference to intake location has been modified.

Comment I57-28: Discharge noticeable if levels in Lower Granite significantly reduced.

Response I57-28: Comment noted. This potential impact is mentioned in Section 4.1.3.1.

Letter I58, Jami Delmore, November 14, 1991

Comment I58-1: Drawdown test of Lower Granite and Little Goose.

Response I58-1: See response to Common Issue No. 16.

Comment I58-2: Flow augmentation during drawdown test.

Response I58-2: No response necessary.

Comment I58-3: Mitigation measures.

Response I58-3: See response to Common Issue No. 10.

***Letter I59, Central Ferry Terminal Association, Inc. (Karl R. Hagman),
November 14, 1991***

Comment I59-1: Correction to Table G-1.

Response I59-1: Table G-1 has been modified.

Letter I60, William S. and Marjorie G. Hayes, November 14, 1991

Comment I60-1: Drawdown test of Lower Granite and Little Goose.

Response I60-1: See response to Common Issue No. 16.

Comment I60-2: Flow augmentation during drawdown.

Response I60-2: No response necessary.

Comment I60-3: Flow from storage and drawdown.

Response I60-3: No response necessary.

Comment I60-4: Effects of no action.

Response I60-4: See response to Common Issue No. 3.

Letter I61, Northwest Fiber Supply (James R. Smither), November 15, 1991

Comment I61-1: Conditional support for project.

Response I61-1: No response necessary.

Comment I61-2: Combination of drawdown and flow augmentation.

Response I61-2: No response necessary.

Comment I61-3: Impacts below Bonneville Dam.

Response I61-3: Downriver mills may have additional storage costs associated with wood chips sourced from Snake River ports.

Comment I61-4: Effects on water quality.

Response I61-4: A sentence will be included which specifically notes these potential impacts, already alluded to in Section 4.1.3.1. It is difficult to project magnitude and extent of such impacts given the extant data and system models. Thermal impacts have been discussed at length in Section 4.1.2.

Letter I62, Edward McCrady Henderson, Jr., November 15, 1991

Comment I62-1: Urge for immediate action.

Response I62-1: No response necessary.

Comment I62-2: Dams are "fish-killing machines."

Response I62-2: See response to Common Issue No. 14.

Comment I62-3: Failure of draft to include mitigating measures.

Response I62-3: See response to Common Issue No. 10.

Comment I62-4: Design dam modifications to accommodate adults and juveniles.

Response I62-4: See response to Common Issue No. 16.

Comment I62-5: Flow augmentation during drawdown in Snake River.

Response I62-5: No response necessary.

Comment I62-6: Flow augmentation from storage in Columbia River.

Response I62-6: No response necessary.

Comment I62-7: Re-analyze drawdown with post-1992 mitigating measures.

Response I62-7: Comment noted.

Comment I62-8: Effects of no action.

Response I62-8: See response to Common Issue No. 3.

Letter I63, Nancy Roberts, M.D., Undated

Comment I63-1: Draw down rivers during February and March.

Response I63-1: See response to Common Issue No. 16.

Letter I64, Kathy L. Munger, DVM, Undated

Comment I64-1: Support for drawdown test.

Response I64-1: No response necessary.

TESTIMONY

Public Hearing Testimony, Boise, Idaho, October 15, 1991.

Testimony T1-1, Workshop Summary (Lynn Tominaga)

Comment T1-1-1: Concerns about economies and biological justification.

Response T1-1-1: No response necessary.

Comment T1-1-2: Andrus' Idaho Plan.

Response T1-1-2: No response necessary.

Comment T1-1-3: Effects of drawdown.

Response T1-1-3: No response necessary.

Comment T1-1-4: Net farm income vs. gross sales.

Response T1-1-4: No response necessary.

Comment T1-1-5: John Day drawdown concerns.

Response T1-1-5: No response necessary.

Comment T1-1-6: Corps' barge navigation.

Response T1-1-6: No response necessary.

Comment T1-1-7: Listing of possible solutions.

Response T1-1-7: No response necessary.

Comment T1-1-8: Costs must be tied to biological benefits.

Response T1-1-8: No response necessary.

Testimony T1-2, Workshop Summary (Michael Ayer)

Comment T1-2-1: Effect of sediment and turbidity during flow augmentation.

Response T1-2-1: Sedimentation effects are discussed in Section 4.5.4. (The effects of increased turbidity are addressed in Section 4.5.3.)

Comment T1-2-2: Hold water back in system.

Response T1-2-2: No response necessary.

Comment T1-2-3: Accuracy of dissolved gas estimates from flows.

Response T1-2-3: No response necessary.

Comment T1-2-4: Harvest issue.

Response T1-2-4: No response necessary.

Comment T1-2-5: Loss of habitat.

Response T1-2-5: No response necessary.

Comment T1-2-6: Evaluation of transportation efforts.

Response T1-2-6: No response necessary.

Comment T1-2-7: Responsibility of EIS.

Response T1-2-7: No response necessary.

Testimony T1-3, Idaho Department of Fish and Game (Bert Bowler)

Comment T1-3-1: DEIS does not acknowledge crisis.

Response T1-3-1: Section 2.4 of the EIS addresses the impacts of dams on anadromous fish.

Comment T1-3-2: Mitigation measures.

Response T1-3-2: See response to Common Issue No. 10.

Comment T1-3-3: Misrepresentation of impacts of drawdowns.

Response T1-3-3: See responses to Common Issue Nos. 10 and 14.

Comment T1-3-4: Additional alternatives.

Response T1-3-4: See responses to Common Issue Nos. 14 and 16.

Comment T1-3-5: Flow-survival relationship.

Response T1-3-5: No response necessary.

Comment T1-3-6: Impacts of flow augmentation.

Response T1-3-6: No response necessary.

Comment T1-3-7: Narrow range of options for lower Columbia River flows.

Response T1-3-7: For this EIS the cooperating agencies agreed on a scope that included the Target 200 flows for the lower Columbia River. The agencies did not have enough time to prepare an adequate evaluation of alternatives other than Target 200.

Comment T1-3-8: Compliance with Idaho's state water law.

Response T1-3-8: Comment noted.

Comment T1-3-9: Undemonstrated need for Dworshak temperature control releases in August.

Response T1-3-9: Releases from Dworshak for temperature control in the Snake River are being viewed as an experiment.

Testimony T1-4, Office of Governor of Idaho (Andy Brunelle)

Comment T1-4-1: Drawdown concept as long-term measure.

Response T1-4-1: Comment noted.

Comment T1-4-2: Projects unprepared for 4-pool drawdown.

Response T1-4-2: No response necessary.

Comment T1-4-3: Overstatement of impacts of drawdowns.

Response T1-4-3: A cost-effectiveness analysis was prepared and is included in the Final EIS. As part of this analysis, the costs listed in the Draft EIS have been refined. This cost-effectiveness information was used in the plan-selection process.

Comment T1-4-4: More prudent analysis of impacts.

Response T1-4-4: See responses to Common Issue Nos. 9 and 10.

Comment T1-4-5: Opposition to misuse of Dworshak.

Response T1-4-5: The flow augmentation actions identified in the preferred alternative were adopted from the Northwest Power Planning Council's proposed amendments.

Comment T1-4-6: Idaho Plan proposed alternative actions as well as drawdowns.

Response T1-4-6: Comment noted.

Testimony T1-5, State of Idaho (Don Reading)

Comment T1-5-1: Short-run vs. long-run impacts.

Response T1-5-1: See response to Common Issue No. 9.

Comment T1-5-2: Standardized units and basis of comparison.

Response T1-5-2: The DEIS acknowledged some situations where it was not possible in the time permitted to array all of the expected cost effects in purely comparable terms. For example, agricultural losses had to be presented in terms of gross crop value even though it was recognized that net income was technically more appropriate and consistent with standard valuation procedures. This change in economic basis has been incorporated in the agricultural analysis for the FEIS. The final document also includes a cost-effectiveness analysis that provides a consistent comparison of the costs of the various options in terms of their reduction in water particle travel time.

Comment T1-5-3: Cost to Idaho economies of fish decline.

Response T1-5-3: See response to Common Issue No. 3.

Comment T1-5-4: Agricultural impacts of flow augmentation.

Response T1-5-4: See response to Comment S29-110.

Comment T1-5-5: Error regarding McNary barge traffic.

Response T1-5-5: This error has been corrected in the FEIS.

Comment T1-5-6: Discrepancy on barge loadings.

Response T1-5-6: See response to S29-105.

Comment T1-5-7: FELCC and capacity losses.

Response T1-5-7: See responses to S29-112 through 114.

Power impacts have been reevaluated (see new analysis results in Section 4.9).

Comment T1-5-8: Nonfirm energy impacts.

Response T1-5-8: Estimates of nonfirm energy losses have been refined for the FEIS.

Power impacts have been reevaluated (see new analysis results in Section 4.9).

Testimony T1-6, State of Idaho (Richard Gardner)

Comment T1-6-1: Short-term vs. long-term benefits.

Response T1-6-1: See response to Common Issue No. 9.

Comment T1-6-2: Inconsistency in economic concepts in DEIS.

Response T1-6-2: See response to common issue 4, and section 5.5 in the text.

Comment T1-6-3: Difference between economic impacts and cost.

Response T1-6-3: Many of the sections on economic impacts have been Revised. See section 4.8 on agriculture. The preferred alternative for 1992 should have minimal impact on agriculture. See response to comment S-6.1.

Comment T1-6-4: Drawdown option precludes barging program.

Response T1-6-4: Comment noted.

Comment T1-6-5: Document has institutional bias against drawdown to spillway crest.

Response T1-6-5: Comment noted.

Comment T1-6-6: Drawdown vs. flow augmentation.

Response T1-6-6: This EIS is not designed to measure anything over the long run, but to evaluate alternatives implementable in 1992. Cost effectiveness has been discussed at length in section 5.5 of the revised EIS.

Testimony T1-7, John Woodworth

Comment T1-7-1: Necessity of drawdown for short term.

Response T1-7-1: No response necessary.

Comment T1-7-2: Pipeline proposal.

Response T1-7-2: See response to Common Issue No. 13.

Testimony T1-8, East Meridian Irrigators Association (Michael Ayer)

Comment T1-8-1: Effects of harvest.

- Response T1-8-1: See response to Common Issue No. 7.
- Comment T1-8-2: Long-term restoration of lost habitat.
- Response T1-8-2: See response to Common Issue No. 6.
- Comment T1-8-3: Success of bargaining.
- Response T1-8-3: See responses to Common Issue Nos. 13 and 15.
- Comment T1-8-4: Concern for public health.
- Response T1-8-4: Because of a lack of information (i.e., shellfish tissue analysis), this specific pathway was not evaluated. However, it should be noted that the fish ingestion pathway was considered in the preliminary assessment.
- Comment T1-8-5: Chinooks' use of Little Goose Pool for spawning.
- Response T1-8-5: A new discussion has been incorporated in the text about the utilization of this pool for spawning by fall chinook.
- Comment T1-8-6: Possible dust storm problem with drawdown of John Day.
- Response T1-8-6: No response necessary.
- Comment T1-8-7: Responsibility of EIS.
- Response T1-8-7: Comment noted.

Testimony T1-9, Mercer Ranches, Inc. (Richard Beightol)

- Comment T1-9-1: Choose most economically sound alternative.
- Response T1-9-1: Comment noted.
- Comment T1-9-2: Criteria for biological justification/cost-effectiveness.
- Response T1-9-2: Comment noted.
- Comment T1-9-3: Objection to pool drawdowns.
- Response T1-9-3: See responses to Common Issue Nos. 4, 13, and 15.

Testimony T1-10, Simplot (Rick Fisch)

- Comment T1-10-1: Importance of cost-effectiveness and biological justification.

Response T1-10-1: No response necessary.

Comment T1-10-2: Need for marginal benefit assessment of smolt survivability.

Response T1-10-2: Refer to the cost-effectiveness analysis in Section 5.4.

Comment T1-10-3: Delineate short-and long-term impacts.

Response T1-10-3: See response to Common Issue No. 9.

Comment T1-10-4: Recommend common format for economic analysis.

Response T1-10-4: Direct impacts include employment, income, and production impacts associated with the affected industries. Indirect impacts were calculated by applying a multiplier to the direct impacts throughout related industries and the rest of the regional economy. The text has been revised to include additional details of the impacts.

Comment T1-10-5: Re-evaluate methods of determining cost impacts.

Response T1-10-5: Cost impacts have been revised as appropriate in the Final OA/EIS.

Comment T1-10-6: Solution will be comprehensive.

Response T1-10-6: No response necessary.

Testimony T1-11, Idaho Water Users Association (Lynn Tominaga)

Comment T1-11-1: Support for options A, G, and I.

Response T1-11-1: No response necessary.

Comment T1-11-2: Drawdown to MOP and flow augmentation ineffective.

Response T1-11-2: No response necessary.

Comment T1-11-3: Favor four-week expanded test period.

Response T1-11-3: No response necessary.

Comment T1-11-4: Favor predator control.

Response T1-11-4: No response necessary.

Comment T1-11-5: Review information on hydropower and turbine operation.

Response T1-11-5: See response to Common Issue No. 11.

Comment T1-11-6: Mitigation for users of irrigation.

Response T1-11-6: See response to Common Issue No. 11.

Testimony T1-12, Idaho Conservation League (Gary Richardson)

Comment T1-12-1: Document flawed.

Response T1-12-1: See responses to Common Issue Nos. 3 and 4.

Comment T1-12-2: Benefit of stopping barge traffic to power system.

Response T1-12-2: Comment noted. See response to Common Issue No. 4.

Comment T1-12-3: Idaho's loss of salmon.

Response T1-12-3: See response to Common Issue No. 3.

Testimony T1-13, Boulder-White Clouds Council (Pat Ford)

Comment T1-13-1: Misstatement of actual numbers of salmon.

Response T1-13-1: The text has had some modification. The 2.5 million number is for all fish produced in the Columbia River, including ocean harvest, and runs to the river below Bonneville Dam. The number returning to the mouth of the Columbia has been changed from 2.5 to 1.0 million to account for ocean harvest. Fish over Bonneville Dam have fluctuated from about 500,000 to 1.1 million for the last 10 years with no definitive trend. It is correct that this is not the trend for all wild stocks, and these stock trends are included in the individual species sections.

Comment T1-13-2: Recommendation of drawdown at two reservoirs in late February-early March.

Response T1-13-2: See response to Common Issue No. 16.

Comment T1-13-3: Physical issues of drawdowns.

Response T1-13-3: See responses to Common Issue Nos. 11 and 14.

Comment T1-13-4: Oversight of test drawdown by independent agencies.

Response T1-13-4: Comment noted.

Comment T1-13-5: Prepare for completion of structural modifications by 1995.

Response T1-13-5: See responses to Common Issue Nos. 10, 11, and 14.

Comment T1-13-6: Emergency measures.

Response T1-13-6: Comment noted.

Testimony T1-14, Northwest Resource Information Center (Ed Chaney)

Comment T1-14-1: Unmitigated impacts have impugned concept of drawdowns.

Response T1-14-1: See response to Common Issue No. 10.

Comment T1-14-2: No adverse impact to anadromous fish with mitigation and modifications.

Response T1-14-2: Comment noted.

Comment T1-14-3: Energy revenue impacts of flow augmentation vs. drawdown.

Response T1-14-3: The DEIS addresses the short-term energy impacts of actions only in 1992, and presents a full assessment of those costs. The drawdown and flow augmentation options assessed in the EIS generally are intended to produce flows or equivalent velocities in the range of 85 to 140 kcfs. Flow augmentation volumes of less than 2 million acre feet can produce flows of this level during the target period, although not under all water conditions.

Comment T1-14-4: Inevitability of drawdown option.

Response T1-14-4: No response necessary.

Comment T1-14-5: Need for appropriate mitigating measures.

Response T1-14-5: No response necessary.

Comment T1-14-6: Corps' intent to create public opposition to drawdowns.

Response T1-14-6: See response to Common Issue No. 10.

Comment T1-14-7: Drawdown to spillway crest.

Response T1-14-7: No response necessary.

Testimony T1-15, Stanley Schmidt

Comment T1-15-1: Costs to taxpayers and consumers.

Response T1-15-1: Effects of the proposed actions on electric power rates, food prices and similar economic variables are highly speculative due to the short-term nature of the actions, and trying to estimate these effects would not be appropriate. However, direct cost measures have been estimated for resources normally subject to economic quantification.

Comment T1-15-2: Need for electricity.

Response T1-15-2: Comment noted.

Comment T1-15-3: Gill nets on lower Columbia River and ocean drift nets.

Response T1-15-3: See response to Common Issue No. 7.

Public Hearing Testimony, Orofino, Idaho, October 16, 1991

Testimony T2-1, Workshop Summary (Sarah Wik)

Comment T2-1-1: Water particle travel time.

Response T2-1-1: No response necessary.

Comment T2-1-2: Redfish Lake sockeyes.

Response T2-1-2: No response necessary.

Comment T2-1-3: Effects on resident fish.

Response T2-1-3: No response necessary.

Comment T2-1-4: Dissolved gas estimates effects on fish.

Response T2-1-4: No response necessary.

Testimony T2-2, Workshop Summary (Cindi Mader)

Comment T2-2-1: Reservoir level effect on recreation.

Response T2-2-1: No response necessary.

Comment T2-2-2: Sustainability of runs.

Response T2-2-2: No response necessary.

Comment T2-2-3: Housing concern.

Response T2-2-3: No response necessary.

Comment T2-2-4: Harvest.

Response T2-2-4: No response necessary.

Comment T2-2-5: Better define effects of drawdown.

Response T2-2-5: No response necessary.

Comment T2-2-6: Dworshak resident fish.

Response T2-2-6: Text has been expanded.

Comment T2-2-7: Loss of log transportation.

Response T2-2-7: No response necessary.

Testimony T2-3, Charles Cuddy

Comment T2-3-1: Effects on Clearwater community.

Response T2-3-1: Comment noted.

Comment T2-3-2: Short-term and long-term solutions.

Response T2-3-2: Comment noted.

Comment T2-3-3: Mitigation.

Response T2-3-3: See response to Common Issue No. 10.

Comment T2-3-4: Recommendation of "no action."

Response T2-3-4: No response necessary.

Testimony T2-4, Idaho Trout Unlimited (Bob Burnham)

Comment T2-4-1: Wild salmon back to Idaho.

Response T2-4-1: No response necessary.

Testimony T2-5, Statement from Office of Governor of Idaho (Mike McElharrow)

Comment T2-5-1: Superiority of drawdown.

Response T2-5-1: No response necessary.

Comment T2-5-2: Drawdown to spillway not viable for 1992.

Response T2-5-2: No response necessary.

Comment T2-5-3: DEIS exaggerates impacts from drawdowns.

Response T2-5-3: See response to Common Issue No. 1.

Comment T2-5-4: Urge for more prudent analysis.

Response T2-5-4: See responses to Common Issue Nos. 9 and 10.

Comment T2-5-5: Opposition to misuse of Dworshak.

Response T2-5-5: No response necessary.

Comment T2-5-6: Idaho Plan proposes more than just drawdown.

Response T2-5-6: Appropriate changes have been made in the text to reflect that the drawdown scenario on the Lower Snake River was only a portion of the "Idaho Plan".

Testimony T2-6, Greg Isabelle

Comment T2-6-1: Loss of personal business.

Response T2-6-1: See response to Common Issue No. 10.

Public Hearing Testimony, Lewiston, Idaho, October 17, 1991

Testimony T3-1, Workshop Summary (Greg Graham)

Comment T3-1-1: Concern over duration of drawdown.

Response T3-1-1: No response necessary.

Comment T3-1-2: Objection to drawdown extending into harvest season.

Response T3-1-2: No response necessary.

Comment T3-1-3: Preparations for potential catastrophe during drawdown.

Response T3-1-3: No response necessary.

Comment T3-1-4: Concerns about water supply intakes.

Response T3-1-4: No response necessary.

Comment T3-1-5: Irrigation water pumping plants.

Response T3-1-5: No response necessary.

Comment T3-1-6: Alternative methods of transportation.

Response T3-1-6: No response necessary.

Testimony T3-2, Workshop Summary (Dan Schenken)

Comment T3-2-1: Costs of drawdown.

Response T3-2-1: No response necessary.

Comment T3-2-2: Fish cost vs. rate cost.

Response T3-2-2: See response to Common Issue No. 4.

Comment T3-2-3: Costs of flow augmentation.

Response T3-2-3: No response necessary.

Comment T3-2-4: Danger of drawing down to spillway crest on all dams in Snake River.

Response T3-2-4: No response necessary.

Comment T3-2-5: Damage to crops.

Response T3-2-5: No response necessary.

Testimony T3-3, Workshop Summary (Tom Morse)

Comment T3-3-1: Effects and development of different uses.

Response T3-3-1: No response necessary.

Comment T3-3-2: Concern of harvest.

Response T3-3-2: No response necessary.

Comment T3-3-3: Effects on resident fish, wildlife, marinas.

Response T3-3-3: No response necessary.

Comment T3-3-4: Benefit to Chinook impacts steelhead.

Response T3-3-4: No response necessary.

Comment T3-3-5: Bias against working citizens' viewpoints.

Response T3-3-5: No response necessary.

Comment T3-3-6: Increase in electrical rates.

Response T3-3-6: No response necessary.

Comment T3-3-7: Clarify goals, develop balance.

Response T3-3-7: No response necessary.

Comment T3-3-8: Concern of timing of drawdowns.

Response T3-3-8: These impacts are addressed in the DEIS.

Comment T3-3-9: Temperature-related effects of Dworshak releases on recreation.

Response T3-3-9: Discussion of the temperature-related effects of Dworshak releases on downstream recreation has been added to the final EIS.

Comment T3-3-10: Underestimation of true value of salmon and steelhead.

Response T3-3-10: No response necessary.

Comment T3-3-11: Fisherman vs. other users; recreation vs. commercial fisheries.

Response T3-3-11: No response necessary.

Testimony T3-4, Workshop Summary (Steve Fetter)

Comment T3-4-1: Concern over dissolved gas concentrations.

Response T3-4-1: No response necessary.

Comment T3-4-2: Potlatch's effluents.

Response T3-4-2: No response necessary.

Comment T3-4-3: Project's place in "big picture."

Response T3-4-3: No response necessary.

Comment T3-4-4: Structural modifications.

Response T3-4-4: No response necessary.

Comment T3-4-5: Sediment contaminants.

Response T3-4-5: No response necessary.

Comment T3-4-6: Turbine operation.

Response T3-4-6: No response necessary.

Comment T3-4-7: Effect on in-water disposal of dredging materials.

Response T3-4-7: No response necessary.

Comment T3-4-8: Resident fish vs. anadromous fish.

Response T3-4-8: No response necessary.

Testimony T3-5, Port of Clarkston (Rick Davis)

Comment T3-5-1: Effect upon sewer plant in Clarkston.

Response T3-5-1: Refer to Section 4.1.4.3.

Comment T3-5-2: Impacts to marinas.

Response T3-5-2: The physical impacts to marinas and related facilities are addressed in summary fashion in Section 4.10.1.

Comment T3-5-3: Port facility impacts at water levels below MOP.

Response T3-5-3: The DEIS acknowledges that navigation would not be possible at water levels of 1 or 2 feet below MOP.

Comment T3-5-4: Net pens for fish transport.

Response T3-5-4: See response to Common Issue No. 15.

Testimony T3-6, Lewiston Chamber of Commerce (Dan Schenken)

Comment T3-6-1: Short timespan for drawdown of Snake River.

Response T3-6-1: See response to Comment S7-3.

Comment T3-6-2: Encapsulated waste fill.

Response T3-6-2: Procedures to monitor the encapsulated fill on the North bank of the Snake River at the mouth of the Clearwater River were initiated by the Corps of Engineers in November of 1991. Monitoring of the

buried waste will continue throughout the 1992 test to assure the integrity of the site. If groundwater leakage occurs from the site during drawdown, contaminants will be evaluated and, if necessary, clean-up procedures will be accomplished.

Testimony T3-7, Trout Unlimited (Mike Satterwhite)

Comment T3-7-1: Misrepresentation of recreation on reservoirs.

Response T3-7-1: Drawdown to near spillway crest would essentially eliminate water recreation at Snake River projects and reduce activity for other types of recreation during the drawdown period. The estimate of 733,000 recreation days displaced refers to the option of lowering the Snake River pools to near spillway crest elevation between April 15 and August 15, rather than June 15. Visitation at lower Snake projects is not evenly distributed from April through August (see Figure 2.12-4). The majority of recreation days occur during the warm summer months. The personal observation concerning the relatively small numbers of recreational users at lower Snake projects during the cool months of spring is generally consistent with visitor use records. However, the bulk of recreation days that could be displaced by this option occurs during the warm months of June (15 percent of annual use), July (18 percent), and August (18 percent). Thus, the estimated number of recreation days displaced as a result of this option (733,000) is consistent with the annual use pattern. Please see response to comment S5-3 for a discussion concerning the method used to determine displaced recreation days.

A recreation day measures the number of people that participate in a recreation activity at a given location for any part of or all of a 24-hour period. A single person could participate in more than one activity during a 24-hour period and each activity would be counted as a recreation day. Therefore, the 733,000 recreation days that could be displaced as a result of the spillway crest option do not represent 733,000 users, but rather 733,000 times that a specific recreational activity would not be participated in.

Comment T3-7-2: Benefits of drawdown.

Response T3-7-2: As indicated in the comment and the EIS, some relocation of habitat may occur; however, scientific evidence (sparse though it may be) suggests that impacts will occur in some areas for some species.

Testimony T3-8, Port of Lewiston (Ron McMurray)

Comment T3-8-1: Try other alternatives.

Response T3-8-1: See response to Common Issue No. 13.

Comment T3-8-2: Adverse effects of drawdowns to spillway crest.

Response T3-8-2: During drawdown and when refilling the reservoirs, surface area of embankments would be subjected to erosion. Because structural protection prior to reservoir lowering would be a major construction project that would delay the 1992 test, the option of repairing fills as they are damaged was agreed upon. Railroad officials are prepared to increase monitoring of their right-of-ways in the event of the drawdown test and are prepared to repair any damage as it occurs.

Comment T3-8-3: Support of two-week drawdown.

Response T3-8-3: See response to Common Issue No. 16.

Testimony T3-9, Darrell Kirby

Comment T3-9-1: Harvest of fish.

Response T3-9-1: See response to Common Issue No. 7.

Testimony T3-10, Bill Wood

Comment T3-10-1: Support for two-week drawdown.

Response T3-10-1: No response necessary.

Comment T3-10-2: Far-reaching effects upon Lewis/Clark Terminal.

Response T3-10-2: No response necessary.

Comment T3-10-3: Commercial fish harvest.

Response T3-10-3: See response to Common Issue No. 7.

Testimony T3-11, Clark Brewington

Comment T3-11-1: Effects upon irrigation.

Response T3-11-1: No response necessary.

Comment T3-11-2: Loss of crops.

Response T3-11-2: A discussion of potential agricultural losses because of a reduction in irrigation water, the loss of vegetable and fruit crops, and the acreages affected is provided in Section 4.8 Agriculture.

Comment T3-11-3: Expand section on impacts of Snake River drawdown to spillway level.

Response T3-11-3: The direct impacts to agriculture referred to in Section 4.13.1.2 include lost value of crops, pump modification costs, additional operating costs, and increased employment costs. The indirect impacts include those economic impacts resulting from a multiplier effect of lost related economic activity and the opportunity cost of redirected resources. The text has been revised to include additional details of the impacts.

Testimony T3-12, George Gehrke

Comment T3-12-1: Polluters should be stopped.

Response T3-12-1: No response necessary.

Comment T3-12-2: State of Idaho should take part in process.

Response T3-12-2: No response necessary.

Comment T3-12-3: Long-term solutions for salmon.

Response T3-12-3: No response necessary.

Comment T3-12-4: Update agricultural practices to use less water.

Response T3-12-4: No response necessary.

Comment T3-12-5: Endorsement of Governor's Plan.

Response T3-12-5: No response necessary.

Testimony T3-13, Van Walkley

Comment T3-13-1: Importance of cost-effectiveness and biological justification.

Response T3-13-1: See responses to Common Issue Nos. 2 and 4.

Comment T3-13-2: Analyze all factors causing extinction of salmon.

Response T3-13-2: See response to Common Issue No. 13.

Comment T3-13-3: Losses due to drastic drawdowns.

Response T3-13-3: No response necessary.

Comment T3-13-4: Improve smolt transportation.

Response T3-13-4: See response to Common Issue No. 15.

Comment T3-13-5: Cost increases.

Response T3-13-5: See response to Common Issue No. 10.

Comment T3-13-6: Opposition to drawdown.

Response T3-13-6: No response necessary.

Testimony T3-14, Gary Watson

Comment T3-14-1: Concerns over personal expenses incurred by drawdown.

Response T3-14-1: See response to Common Issue No. 10.

Testimony T3-15, Robert Gilchrist

Comment T3-15-1: Opposition to drawdowns.

Response T3-15-1: No response necessary.

Comment T3-15-2: Damage to marinas.

Response T3-15-2: No response necessary.

Comment T3-15-3: Effects to recreation economy.

Response T3-15-3: No response necessary.

Comment T3-15-4: Adverse economic effects.

Response T3-15-4: No response necessary.

Comment T3-15-5: Additional financial concerns.

Response T3-15-5: No response necessary.

Public Hearing Testimony, Portland, Oregon, October 22, 1991

Testimony T4-1, Workshop Summary (Greg Graham)

Comment T4-1-1: Meaningful test and monitoring program.

Response T4-1-1: No response necessary.

Comment T4-1-2: Cost-effectiveness.
Response T4-1-2: No response necessary.
Comment T4-1-3: Drawdown timing.
Response T4-1-3: No response necessary.
Comment T4-1-4: Need to refine economic analysis.
Response T4-1-4: No response necessary.
Comment T4-1-5: Speeding up EIS process.
Response T4-1-5: No response necessary.
Comment T4-1-6: Primary criteria should be smolt travel time.
Response T4-1-6: No response necessary.

Testimony T4-2, Northwest Irrigation Utilities (Darryll Olsen)

Comment T4-2-1: Importance of cost-effectiveness and biological justification.
Response T4-2-1: See response to Common Issue No. 4.
Comment T4-2-2: Separate direct and indirect costs.
Response T4-2-2: The cost-effectiveness analysis in Section 5.4 incorporates only direct costs.
Comment T4-2-3: Cost-effectiveness analysis.
Response T4-2-3: See response to Common Issue No. 4.
Comment T4-2-4: Opposition to drawdowns.
Response T4-2-4: Comment noted.
Comment T4-2-5: Would like to see comprehensive actions.
Response T4-2-5: No response necessary.
Comment T4-2-6: Marginal benefit assessment.
Response T4-2-6: No response necessary.

Testimony T4-3, Oregon Farm Bureau (Ken Bailey)

Comment T4-3-1: Cost-effectiveness and biological justification.

Response T4-3-1: See responses to Common Issue Nos. 2 and 4.

Comment T4-3-2: Opposition to drawdowns.

Response T4-3-2: No response necessary.

Comment T4-3-3: Saving of runs should not be at expense of region's farms.

Response T4-3-3: No response necessary.

Testimony T4-4, Austin Collins

Comment T4-4-1: Interruption of upstream passage to enhance downstream passage.

Response T4-4-1: No response necessary.

Comment T4-4-2: Other storage sites.

Response T4-4-2: No response necessary.

Testimony T4-5, Northwest Conservation Act Coalition (K.C. Golden)

Comment T4-5-1: Cost-effectiveness.

Response T4-5-1: See response to Common Issue No. 4.

Comment T4-5-2: Clarity of focus.

Response T4-5-2: No response necessary.

Comment T4-5-3: Corps must decide to save fish.

Response T4-5-3: No response necessary.

Testimony T4-6, Sierra Club (Bill Arthur)

Comment T4-6-1: Make river work like it did before dams.

Response T4-6-1: No response necessary.

Comment T4-6-2: Power impacts not very severe.

Response T4-6-2: No response necessary.

Comment T4-6-3: Impacts from other sources.

Response T4-6-3: See response to Common Issue No. 10.

Comment T4-6-4: Try to conduct as early as possible in 1992.

Response T4-6-4: No response necessary.

Comment T4-6-5: Tests should be conducted to determine future actions.

Response T4-6-5: See response to Common Issue No. 16.

Comment T4-6-6: Suggestions for test.

Response T4-6-6: See responses to Common Issue Nos. 10, 11, 14, and 16.

Comment T4-6-7: Going to Congress.

Response T4-6-7: No response necessary.

Testimony T4-7, AgriNorthwest (Martin Wistisen)

Comment T4-7-1: Focus on outputs.

Response T4-7-1: No response necessary.

Comment T4-7-2: Lost crop value.

Response T4-7-2: The text of Section 4.8.1 has been changed to note that any variable costs incurred before a decision on a 1992 test is made will add to the costs of irrigators. No estimate has been made of how much that cost might be. The cost of reestablishing orchards and vineyards has also been added to the analysis.

Comment T4-7-3: Operation of pumps.

Response T4-7-3: No response necessary.

Comment T4-7-4: Words "it appears" sound too tentative.

Response T4-7-4: The words "it appears" have been deleted from the referenced text.

Testimony T4-8, Cheryl Moses

Comment T4-8-1: Overharvesting of salmon.

Response T4-8-1: See response to Common Issue No. 7.

Comment T4-8-2: River pollution.

Response T4-8-2: No response necessary.

Comment T4-8-3: Flow augmentation.

Response T4-8-3: No response necessary.

Testimony T4-9, Save Our Wild Salmon (Tim Stearns)

Comment T4-9-1: Need for meaningful test.

Response T4-9-1: See response to Common Issue No. 16.

Comment T4-9-2: Four- to six-week drawdown when few fish in river.

Response T4-9-2: No response necessary.

Comment T4-9-3: Additional study.

Response T4-9-3: No response necessary.

Comment T4-9-4: Desire for Corps action in 1992.

Response T4-9-4: See responses to Common Issue Nos. 11 and 14.

Comment T4-9-5: Goals for 1993.

Response T4-9-5: See responses to Common Issue Nos. 13 and 14.

Comment T4-9-6: Goals for 1994.

Response T4-9-6: See responses to Comments 4 and 5.

Comment T4-9-7: Power mitigation strategies.

Response T4-9-7: See response to Common Issue No. 10.

Comment T4-9-8: Importance of smolt survivability and returning spawners.

Response T4-9-8: No response necessary.

Comment T4-9-9: Revision of pump strategies and cropping patterns.

Response T4-9-9: See response to Common Issue No. 10.

Comment T4-9-10: Effects of drawdown on facilities.

Response T4-9-10: See response to Common Issue No. 11.

Public Hearing Testimony, Pasco, Washington October 23, 1991

Testimony T5-1, Workshop Summary (Jim Warren)

Comment T5-1-1: Habitat betterment.

Response T5-1-1: No response necessary.

Comment T5-1-2: Increase in shad population.

Response T5-1-2: No response necessary.

Comment T5-1-3: Harvest issues.

Response T5-1-3: No response necessary.

Comment T5-1-4: Improve existing systems.

Response T5-1-4: No response necessary.

Comment T5-1-5: Clarification of goals.

Response T5-1-5: No response necessary.

Comment T5-1-6: Spawning of wild fall chinook below Lower Granite.

Response T5-1-6: No response necessary.

Comment T5-1-7: Effect on steelhead.

Response T5-1-7: No response necessary.

Testimony T5-2, Workshop Summary (Richard D. Beightol)

Comment T5-2-1: Need for additional cost-benefit analysis.

Response T5-2-1: No response necessary.

Comment T5-2-2: Biological justification.

Response T5-2-2: No response necessary.

Comment T5-2-3: Long-term economic impacts of drawdown.

Response T5-2-3: No response necessary.

Comment T5-2-4: Need for adequate harvest management.

Response T5-2-4: No response necessary.

Comment T5-2-5: Impacts on irrigation pumps.

Response T5-2-5: No response necessary.

Comment T5-2-6: Need to look more closely at costs of modifying irrigation pumping plan.

Response T5-2-6: No response necessary.

Comment T5-2-7: Transportation system.

Response T5-2-7: No response necessary.

Comment T5-2-8: Impact of lack of confidence on budget operations.

Response T5-2-8: No response necessary.

Testimony T5-3, Workshop Summary (Mike Mason)

Comment T5-3-1: Effects on shoreline vegetation.

Response T5-3-1: No response necessary.

Comment T5-3-2: Effects on water fowl.

Response T5-3-2: No response necessary.

Comment T5-3-3: Increased predation.

Response T5-3-3: No response necessary.

Comment T5-3-4: Impacts on hydro races.

Response T5-3-4: No response necessary.

Comment T5-3-5: Effects on Walla Walla River.

Response T5-3-5: No response necessary.

Testimony T5-4, Workshop Summary (Greg Graham)

Comment T5-4-1: Reduction in harvest must be borne by everyone.

Response T5-4-1: No response necessary.

Comment T5-4-2: Tri-City boat races.

Response T5-4-2: No response necessary.

Comment T5-4-3: Adequate draft for navigation.

Response T5-4-3: No response necessary.

Comment T5-4-4: Dredging program.

Response T5-4-4: No response necessary.

Comment T5-4-5: Coordinate various regional programs and studies.

Response T5-4-5: No response necessary.

Comment T5-4-6: Drawdown timing.

Response T5-4-6: No response necessary.

Comment T5-4-7: Milfoil program.

Response T5-4-7: No response necessary.

Testimony T5-5, Franklin County PUD (Beverly Cochrane)

Comment T5-5-1: Importance of cost-effectiveness and biological justification; drawdowns harmful.

Response T5-5-1: See responses to Common Issue Nos. 2 and 4.

Comment T5-5-2: Flow augmentation more viable than drawdowns.

Response T5-5-2: No response necessary.

Comment T5-5-3: Further analysis if potential hydro costs.

Response T5-5-3: No response necessary.

Comment T5-5-4: Include marginal benefit assessment.

Response T5-5-4: See response to Common Issue No. 4.

Comment T5-5-5: Impact on local farmers.

Response T5-5-5: Comment noted.

Testimony T5-6, Ronald Johnson

Comment T5-6-1: Transportation system best solution.

Response T5-6-1: See response to Common Issue No. 15.

Comment T5-6-2: Expand hatcheries.

Response T5-6-2: See response to Common Issue No. 8.

Comment T5-6-3: Control mid-Pacific fisheries.

Response T5-6-3: See response to Common Issue No. 7.

Comment T5-6-4: Control of Columbia River netting.

Response T5-6-4: Comment noted.

Comment T5-6-5: Use transportation for fish, not drawdowns.

Response T5-6-5: No response necessary.

Testimony T5-7, Benton PUD (Jim Sanders)

Comment T5-7-1: Focus on weak stock survival.

Response T5-7-1: No response necessary.

Comment T5-7-2: Importance of cost-effectiveness and biological justification.

Response T5-7-2: See responses to Common Issue Nos. 2, 4, and 11.

Comment T5-7-3: Impacts of drawdowns on District.

Response T5-7-3: No response necessary.

Comment T5-7-4: Adverse effects of John Day drawdown.

Response T5-7-4: No response necessary.

Testimony T5-8, Tri-Cities Industrial Development Council (Randy Staudacher)

Comment T5-8-1: Effects to naturally spawning wild Chinook salmon below Lower Granite Reservoir.

Response T5-8-1: Stranding of fall chinook eggs or fry in redds from the drawdown of Little Goose pool in March is of concern. However, a search for redds will be made prior to these tests and, if redds are found in the potential drawdown zones, drawdown will not occur.

See text additions in 4.2.1.9 Effects on Habitat.

Comment T5-8-2: Mitigation protection actions should be discussed in EIS.

Response T5-8-2: The test drawdown of Lower Granite and Little Goose in March will have minor effects on the passage of adult salmon and steelhead. Ladders at Lower Granite and Little Goose Dams will be inoperable during about half of the test period, but few adult fish pass at this time of year. Typically, no spring chinook pass Lower Granite Dam prior to the end of March. About 3 percent of all steelhead pass Lower Granite in March, and probably only half of these would be delayed by the test. This delay may cause some additional pre-spawning mortality of these steelhead. Other stocks will not arrive at Little Goose until after the tests are complete.

See text additions in 4.2.2.1 Adult Passage.

Comment T5-8-3: Errors in agricultural cost estimates.

Response T5-8-3: The pump modification costs at Ice Harbor have been re-estimated using an average figure of \$250 per acre. This yields a total estimate of nearly \$12 million. The Corps is aware of only two cost estimates that have been made for specific Ice Harbor pumps, and they range from \$800,000 to \$2.9 million per station. There is no indication that individual station modification costs would approach \$7 million.

Comment T5-8-4: Secondary economic effects.

Response T5-8-4: See response to Common Issue No. 1.

Comment T5-8-5: Cost benefit analysis and marginal benefit assessment should be in EIS.

Response T5-8-5: See response to Common Issue No. 4.

Comment T5-8-6: More thorough analysis needed.

Response T5-8-6: No response necessary.

Testimony T5-9, Water World Marina (David Chambers)

Comment T5-9-1: Concentrate on fish returning from ocean.

Response T5-9-1: See responses to Common Issue Nos. 7 and 15.

Comment T5-9-2: Seal problem.

Response T5-9-2: See response to Common Issue No. 13.

Comment T5-9-3: Economic hardships resulting from proposed project.

Response T5-9-3: Comment noted.

Testimony T5-10, AgriNorthwest (Tom Mackay)

Comment T5-10-1: Loss of crops.

Response T5-10-1: No response necessary.

Comment T5-10-2: Time frames for implementation of programs.

Response T5-10-2: See response to Common Issue No. 10.

Comment T5-10-3: Adverse effects of drawdowns.

Response T5-10-3: No response necessary.

Testimony T5-11, Horizon Agricultural Products (Darrell King)

Comment T5-11-1: Public needs assurance about water levels.

Response T5-11-1: Because of changing inflows, it is impossible to operate a run-of-river reservoir at a static water surface elevation. When the Corps indicates that a reservoir water surface elevation will be held at a specified level, in reality there will be a one-foot cushion to allow for some flexibility. The pool elevation will normally be operated at one-foot above that level. This does not guarantee that under emergency circumstances the reservoir could not go slightly below the set elevation. Also, wave action could result in reservoir elevations dropping intermittently below the set elevation.

The decision on pool elevations is provided in the preferred alternative as described in the Final EIS.

Comment T5-11-2: Moratorium on other water rights.

Response T5-11-2: Refer to Comment T5-11-1.

The Corps does not have the authority to limit water rights. Water rights in the State of Washington are handled by Washington State Department of Ecology.

Comment T5-11-3: Include complete economic studies in FEIS.

Response T5-11-3: See response to Common Issue No. 1.

Comment T5-11-4: Costs to farmers.

Response T5-11-4: No response necessary.

Testimony T5-12, Mercer Ranches, Inc. (Richard Berghol)

Comment T5-12-1: Opposition to drawdown.

Response T5-12-1: No response necessary.

Comment T5-12-2: Economic reality of proposal.

Response T5-12-2: No response necessary.

Comment T5-12-3: Implement emergency pilot program.

Response T5-12-3: See response to Common Issue No. 15.

Testimony T5-13, Northwest Resource Utilities (Darrell Olsen)

Comment T5-13-1: Importance of cost-effectiveness and biological justification.

Response T5-13-1: See response to Common Issue No. 4.

Comment T5-13-2: Drawdowns more expensive than flow augmentation.

Response T5-13-2: No response necessary.

Comment T5-13-3: Drawdown less beneficial than flow augmentation.

Response T5-13-3: No response necessary.

Comment T5-13-4: Opposition to drawdowns.

Response T5-13-4: No response necessary.

Comment T5-13-5: Examine flow augmentation option more closely.

Response T5-13-5: Comment noted.

Testimony T5-14, Joe Dens

Comment T5-14-1: Economic effects.

Response T5-14-1: See responses to Common Issue Nos. 2, 4, and 10.

Comment T5-14-2: Insufficient biological justification.

Response T5-14-2: Comment noted.

Comment T5-14-3: Insufficient analysis of cost-effectiveness.

Response T5-14-3: See responses to Common Issue Nos. 4 and 10.

Testimony T5-15, Umatilla Electric Corp. (Steve Eldridge)

Comment T5-15-1: EIS must become part of Northwest Power Planning Council Plan.

Response T5-15-1: See response to Common Issue No. 12.

Comment T5-15-2: Drawdown effects.

Response T5-15-2: Comment noted.

Comment T5-15-3: Lack of preferred alternative.

Response T5-15-3: It was decided by the cooperating agencies that no preferred plan would be selected until other agencies and the public had reviewed the DEIS and had the opportunity to comment on all the alternatives being evaluated.

Comment T5-15-4: Analyze effects of "no-action" alternative.

Response T5-15-4: See response to Common Issue No. 3.

Comment T5-15-5: EIS of entire river system.

Response T5-15-5: See response to Common Issue No. 13.

Public Hearing Testimony, Grand Coulee, Washington, October 24, 1991

Testimony T6-1, Workshop Summary (Sarah Wik)

Comment T6-1-1: Desire to protect resident fish.

Response T6-1-1: No response necessary.

Comment T6-1-2: Lack of emphasis on harvest issues.

Response T6-1-2: No response necessary.

Comment T6-1-3: Effect on recreation.

Response T6-1-3: No response necessary.

Comment T6-1-4: Concern over pollution.

Response T6-1-4: No response necessary.

Testimony T6-2, Workshop Summary (Tom Morse)

Comment T6-2-1: Effects of flood control shifts.

Response T6-2-1: No response necessary.

Comment T6-2-2: Impacts of drawdowns.

Response T6-2-2: No response necessary.

Comment T6-2-3: Tracking effects of EIS.

Response T6-2-3: No response necessary.

Comment T6-2-4: Identification of mitigation and funding sources.

Response T6-2-4: No response necessary.

Comment T6-2-5: Minimization of irrigation effects.

Response T6-2-5: No response necessary.

Comment T6-2-6: Thermal effects of drawdowns on fish.

Response T6-2-6: No response necessary.

Comment T6-2-7: Trigger point to cease action.

Response T6-2-7: No response necessary.

Comment T6-2-8: Effects on Libby, Hungry Horse, and Flat Head Lake.

Response T6-2-8: No response necessary.

Comment T6-2-9: Effects on Montana's grain growers and support services.

Response T6-2-9: No response necessary.

Comment T6-2-10: Lower water level effects on irrigation.

Response T6-2-10: No response necessary.

Testimony T6-3, State of Montana, Governor's Office (Mark Reller)

Comment T6-3-1: Impacts to Montana grain growers.

Response T6-3-1: See response to Comment S7-3.

See response to common issue 5.

The Northwest Power Planning Council has included drawdown as part of its plan to benefit fish. In order to meet the NPPC's plan for drawdown by 1995, the Corps needs to obtain data starting in 1992 to be used in the development of a long-term plan for reservoir drawdown.

Comment T6-3-2: Power rate ramifications for Montana.

Response T6-3-2: As noted in the DEIS, any possible effect of the proposed action on electric rates would not occur until fiscal year 1994 and are highly uncertain for a one-year action. Therefore, it is not appropriate to speculate as to possible rate changes and related socioeconomic consequences for Montana or elsewhere in the region.

Comment T6-3-3: Impacts to Libby and Hungry Horse reservoirs.

Response T6-3-3: See response to Comment S7-8.

Comment T6-3-4: Northwest Power Planning Council modeling work.

Response T6-3-4: See responses to Comments S7-9 through 13.

Comment T6-3-5: River discharge modifications.

Response T6-3-5: See responses to Comments S7-15 through 19.

Comment T6-3-6: Analyze recreation impacts.

Response T6-3-6: See response to Comment S7-20.

Comment T6-3-7: Impacts to energy-intensive industries.

Response T6-3-7: See response to Comment S7-7.

Comment T6-3-8: Review and assess forecast error.

Response T6-3-8: See response to Comment S7-22.

Comment T6-3-9: Monitoring economic impacts.

Response T6-3-9: See response to Comment S7-23.

Comment T6-3-10: Tributary access for returning adults.

Response T6-3-10: The larger tributaries will not affect fish passage. The smaller tributaries do not support salmon because they are ephemeral streams or have sufficiently high gradients that already block fish passage. We have addressed the fact that this may be an impact.

Comment T6-3-11: Reservoir spawning.

Response T6-3-11: See text additions for adults and juveniles.

Comment T6-3-12: Potential dredging need below Bonneville.

Response T6-3-12: See response to Comment S7-26.

Comment T6-3-13: Navigation.

Response T6-3-13: No response necessary.

Comment T6-3-14: Impacts to highways from trucking.

Response T6-3-14: See response to Comment S7-5.

Comment T6-3-15: Uncertainty as to benefit of drawdowns.

Response T6-3-15: The uncertainties and tradeoffs are discussed in Section 4.2 and elsewhere in the OA/EIS.

Comment T6-3-16: Power losses.

Response T6-3-16: Although a comprehensive review of the power impacts were not undertaken, the analysis is sufficient for decision making in 1992.

Comment T6-3-17: Transfer of load shaping operation.

Response T6-3-17: Reference statement is a "what if" observation regarding effects associated with maintaining load shaping capability. The final OA/EIS assumes that this capacity would be lost if replaced with power from outside the system.

Testimony T6-4, Roosevelt Forum (Martin Blum)

Comment T6-4-1: Objection to sacrifice of resident fishery.

Response T6-4-1: See response to Common Issue No. 10.

Comment T6-4-2: Monitor rate of entrainment and determine methods for deterrent barricades.

Response T6-4-2: See response to Common Issue No. 11.

Comment T6-4-3: Adverse effect of drawdowns and flow augmentation.

Response T6-4-3: No response necessary.

Comment T6-4-4: Objection to findings of "minimal impact" to Lake Roosevelt.

Response T6-4-4: No response necessary.

Comment T6-4-5: Adverse effects of drawdown.

Response T6-4-5: No response necessary.

U.S. House of Representatives, Idaho (Hon. Larry LaRocco)

LARRY LAROCO
1ST DISTRICT, IDAHO
COMMITTEE ON INTERIOR
COMMITTEE ON BANKING

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October 29, 1991

TO: Honorable Larry LaRocco
Attention: Charley Mosier

FROM: Eugene H. Buck *EHB*
Specialist, Natural Resources Policy
Environment and Natural Resources Policy Division

SUBJECT: Summary of Comments in Lewiston

This memorandum briefly summarizes the major points of my discussions with various individuals concerning salmon mitigation strategies in Lewiston, Idaho, on October 18, 1991.

Enclosed you will find a copy of a summary of Gene Buck's presentation made at our last Working Group meeting.

Our next meeting will focus on rail transport capability. We will hear from representatives of Union Pacific and Burlington Northern. I plan to have this meeting in early December. I will contact you again as soon as I confirm the date.

With best regards.

Sincerely,

Larry LaRocco
Larry LaRocco

LL/cm
Enclosure

Fl-1

1. Economic impacts could likely exclude maximum drawdown of reservoirs as an element of the Endangered Species Act (ESA) recovery process.

Although the initial development of a recovery plan depends almost entirely on biological information to determine what possible actions might benefit a species or population (as stated correctly by Bill Miller (FWS) Friday afternoon), the culmination of the recovery process can include economic considerations. Economic concerns can enter the picture during consideration of recovery plan implementation strategies. Most recovery plans could be implemented by several different approaches. If potential impacts of recovery plan implementation are seen as major (as they most likely would be for any major drawdown on the Snake River), an environmental impact statement (EIS) will likely have to be prepared (as the Corps of Engineers has already undertaken for the 1992 test drawdown). In the development of any EIS alternatives, economic impacts are an important concern. Thus, I consider it likely that the magnitude of economic impacts from a maximum drawdown test would make competing options (e.g., lesser drawdowns or non-drawdown alternatives) appear more acceptable. In addition, where economic loss by private interests might be incurred by the implementation of a recovery plan, conservative implementation strategies are often given greater weight in consideration of the potential problems with providing compensation for taking of property interests; litigation is possible if direct and permanent private losses are not compensated.

CRS-2

F1-2

2. Sound experimental design is needed to maximize benefits from any drawdown test.

As with any experimental test of a new procedure, the quality of the test design and the forethought given to well-reasoned questions for which the test is designed to provide answers determines how useful any such exercise might be. A maximum drawdown of the Snake River may alter many features -- for example, large amounts of silt trapped in the reservoirs may be mobilized, predator populations may be transported downstream to concentrate in new locations, and nitrogen gas supersaturation problems could increase salmon mortality.

One approach to experimental design might be to test drawdown effectiveness in a series of phases. A shorter drawdown to begin, in a following year a longer drawdown of moderate degree, and after several years a maximum two-month drawdown. In this manner, the contributions of various factors to enhanced fish survival or mortality might be better identified.

Overall, however, the forethought given to experimental design will determine whether or not useful answers will be gained from any test of new procedures. Appropriate measurements and other data must be gathered to provide the confidence to guide future actions.

F1-3

3. Federal dollars are unlikely for alleviating regional economic impacts of ESA species listing.

Given the current Federal deficit, the regional nature of this ESA salmon issue, and the past inability to appropriate Federal funds expressly for alleviating economic impacts resulting from Endangered Species Act listing and recovery plan implementation; I find it unlikely that any such Federal funding might be obtainable in the current Columbia River salmon situation. However, funds have been provided to Federal agencies for their efforts to comply with recovery plan implementation efforts to benefit the listed species.

The Northwest Power Planning Council has indicated a preliminary commitment to deal with the alleviation of potential economic impacts by including an element addressing this aspect in their Phase Two proposed amendments to the Columbia River Fish and Wildlife Plan (September 1991). Discussions with Mr. LaRocco's staff suggested that a request to CIG's American Law Division on any possible Bonneville Power Administration authorization to provide funding for this concern might be useful.

CRS-3

F1-4

4. Cost effectiveness calculations might provide useful information on the relative value/benefits of various alternatives, including a drawdown.

It might be helpful to evaluate alternative recovery measures, including drawdown, by determining their likelihood of producing an increase in wild salmon populations. Such an evaluation might clarify the level of confidence that recovery would be accomplished as well as cost effectiveness of the alternatives. Unless some common objective basis for evaluation such as this is attempted, subjective comparisons will fuel continued arguments and delay salmon recovery.

F1-5

5. Possible assistance might come through national consensus on amendments to the ESA.

One avenue for change is the opportunity for amending the Endangered Species Act. Although difficult to achieve, concerns with the ESA nationwide may open a door for possible amendments which could alleviate economic impacts while not lessening protection for endangered species. Since the authorization for appropriations for the ESA expires at the end of fiscal year 1992, such an opportunity for amendment could arise.

One approach discussed was the creation of a fund (similar to the Superfund) which would provide a pool of funds from a minimum tax on some segment of the resource/extractive industries to be used to alleviate economic dislocation of these taxed industries due to ESA listing. This parallels and expands on the concept suggested by the Oil, Chemical, and Atomic Workers Union (and reportedly endorsed by the AFL-CIO and the National Toxics Campaign) wherein a pool of money would be drawn from corporations to support and retrain workers displaced by environmental regulation. Such a fund represents a user-supported effort which does not impose any additional demand on the Federal Treasury. Two hurdles for this approach include the difficulties in identifying the appropriate mix of industries which might be taxed, and the political difficulties in enacting any new fee or tax whatsoever.

F1-6

6. More attention needs to be given to wild stocks to counter past emphasis on hatchery stocks.

Past emphasis on hatchery production has been detrimental to wild salmon populations. The focus of water budget actions on the timing of hatchery releases and the loss of wild chinook to large-sized hatchery steelhead predation are just two examples of this type of loss. The potential for ESA listings of salmon will force additional attention to be paid to wild stocks, and management practices should be altered to incorporate the emphasis on wild stocks.

CRS-4

FI-7

7. Private interests should be encouraged to consider conservation planning and application for incidental take permits.

The U.S. Fish and Wildlife Service has developed interim guidelines for conservation planning by private interests leading to the preparation of Habitat Conservation Plans and the issuance of incidental take permits for listed endangered and threatened species. The National Marine Fisheries Service has not yet developed similar guidelines.

Under section 10(a)(1)(B) of the ESA, private interests are provided the means to shield themselves from enforcement actions for incidental taking of listed threatened or endangered species by negotiating a conservation plan with the Federal management agency (the National Marine Fisheries Service (NMFS) for salmon) and receiving a permit allowing incidental take. Private interests might encourage NMFS to develop their guidelines for such conservation planning, and avail themselves of the protection that incidental take permits offer against potential enforcement problems.

FI-8

8. Consider requesting appropriations under the authority of the Salmon and Steelhead Conservation and Enhancement Act of 1980.

A ten-year authorization for salmon and steelhead enhancement funding was provided in section 124 of Pub.L. 96-561 (16 U.S.C. 3325), the Salmon and Steelhead Conservation and Enhancement Act of 1980. Totals authorized for the Columbia River area were \$25 million for salmon and \$7 million for steelhead; however, no funds have been appropriated under this authorization. The enhancement plan necessary prior to appropriating these funds might be met through the Northwest Power Planning Council's Fish and Wildlife Plan. The potential for using this vehicle for directing funds to fisheries enhancement might be considered; however, the authorization might have to be extended to allow sufficient time to appropriate funds.

I can be contacted directly at (202) 707-7262 if you have any questions on this summary, or should you require additional information or analysis on this or a related subject.

U.S. Department of the Interior (Charles S. Polityka)

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Affairs
500 NE Multnomah Street, Suite 600
Portland, Oregon 97232-2036

ER 91/911

November 14, 1991

Lieutenant Colonel Robert A. Volz
District Engineer, Department of the Army
Walla Walla District, Corps of Engineers
ATTN: GENPU-PL-ER
Walla Walla, Washington 99162-9265

Dear Lieutenant Colonel Volz:

The Department of the Interior has reviewed the Corps of Engineers' (Corps) Draft Options Analysis Document (OAD) and Environmental Impact Statement (EIS) for 1992 Columbia River Salmon Flow Measures in Idaho, Washington, and Oregon. The Corps' efforts to prepare the Draft OAD/EIS under a very short deadline are commendable. The following comments are provided for your use and information when preparing the final documents.

GENERAL COMMENTS

Fish and Wildlife Resources

The U.S. Fish and Wildlife Service (FWS) has major concerns with all of the alternatives which would result in drawing down reservoirs to levels lower than the minimum operating pool (MOP) during a substantial part of the anadromous fish passage season. The FWS believes that they would likely result in trading an increase in adult mortality and a loss of wildlife habitat for a decrease in juvenile mortality. Unless the turbines can be operated at lower pool elevations, these drawdown alternatives may result in high spill levels and high supersaturation of dissolved gases, and impairment or elimination of adult passage. Collection and transport of juvenile fish from Lower Granite Dam may also be eliminated. Elimination of transportation would substantially impact juvenile fish survival if run-off volume for the Snake River is low in 1992 and drawdown below the MOP is limited to only one or two reservoirs behind the collector dams.

Current planning is focusing on a drawdown test to be conducted outside of the major fish passage season (March 1-April 10). The Lower Granite Reservoir would be drawn down to a level near the spillway crest, and the Little Goose Reservoir would be drawn down only as far as necessary for the Lower Granite Dam tailrace to come under conditions equivalent to spillway crest elevation. It is the FWS' understanding that the normal navigation lock outage could be planned for this time period and that dredging would not be required to alleviate navigation problems. The FWS would support this test as long as subsequent spring and summer flows are not reduced and impacts to adult summer steelhead migrants are determined to be acceptable by the fishery agencies and tribes. In addition, a survey should be conducted to determine if fall chinook are spawning below Lower Granite Dam. The FWS would not support the

Lieutenant Colonel Robert A. Volz

drawdown test if it is determined that it would negatively impact fall chinook redds in that area. The FWS will continue to cooperate with the Corps to ensure that the test maximizes the collection of information necessary for a solution to the problem of slow water velocity in the lower Snake River and that test has minimal impacts on fish and wildlife.

The FWS recommends that fish salvaged out of the Lower Granite fish ladder during the drawdown would be transported to the head of Lower Granite Reservoir below the mouth of the Clearwater River to reduce the likelihood of the fish falling back through the turbines under the test conditions. In addition, a sufficient range of flows need to be tested to evaluate velocities and nitrogen gas supersaturation under conditions comparable to spring flow levels. Turbine efficiency should be evaluated under the various test conditions.

A likely scenario for 1992 operations is drawing down the reservoirs behind the eight dams on the lower Snake and Columbia Rivers to near MOP in combination with flow augmentation. The FWS believes that only drawing the reservoirs down to near MOP would reduce water particle travel time by a relatively small amount. Flow augmentation appears to be the only viable measure which has a high potential to substantially reduce water particle and fish travel time and increase fish survival for 1992.

Flow augmentation options selected for implementation in 1992 should substantially relieve weak salmon populations which may be listed as threatened or endangered under the Endangered Species Act. The FWS is concerned that the Corps' Draft OAD/EIS focuses on alternative storage reservoir operations without establishing travel time, water velocity, or flow objectives. The Draft OAD/EIS does discuss alternative flow targets ranging from Target 200 to the Columbia Basin Fish and Wildlife Authority flow levels. However, the three combination scenarios (drawdown and flow augmentation) which have been identified as likely scenarios for implementation in 1992, are limited to flow targets of 85 to 100 thousand cubic feet (kcfs) at Lower Granite Dam and 200 kcfs at The Dalles Dam.

These flow targets appear to be caps since available storage is to be released up to a specified volume to meet the flow target but apparently would not be released to provide higher flows. The flow targets of 85 kcfs and 200 kcfs can be met in most years under the base case. The FWS recommends that the Corps establish flow targets for alternative flow augmentation scenarios that result in substantive benefits for fish over the base case. Based on the past ten years of experience, the FWS believes that relatively minor changes in the current hydropower system operation cannot reasonably be expected to reverse current downward trends in abundance of Snake River salmon populations.

In lieu of the Corps' proposed flow caps for all years, which remain in effect regardless of the run-off conditions, a sliding scale should be considered for establishing flow minimums that would improve with increases in the April run-off forecast. For example, when the April run-off forecast is 15 million-acre-feet (MAF) or less for the Snake River, provide at least the velocity equivalent at Lower Granite Dam of 85 kcfs, a velocity equivalent of at least 100 kcfs for 15 to 23 MAF, and at least 120 kcfs for runoff greater than 23

F2-3

F2-4

F2-1

F2-2

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F2-4
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100 kcfs for 15 to 23 MAF; and at least 120 kcfs for runoff greater than 23 MAF. At The Dalles at least 200 kcfs would be provided when the run-off forecast is 80 MAF or less; at least 220 kcfs for 80 to 100 MAF; and at least 250 kcfs when the run-off projection is greater than 100 MAF. With a sliding scale, additional benefits to fish would be realized from flow augmentation as run-off conditions improve.

F2-5

The Draft OAD/EIS should address flow needs for subyearling chinook salmon. The document incorrectly concludes that there is no relationship between travel time and flow for subyearling chinook. A statistically significant relationship was measured for the 1981-83 and 1986-88 McNary to John Day reach data ($R^2 = 0.33$). When additional variables related to flow and smoltification were included, the R^2 increased to 0.6 with average flow being the most influential variable in the multiple regression model (Berggren and Fillardo, 1991). More recent analysis of 1991 PIT tagging of juvenile fall chinook in the Snake River by the Fish Passage Center also showed a statistically significant relationship between subyearling chinook travel time and flow ($R^2 = 0.58$). This analysis corroborates the analysis of subyearling chinook travel time in the lower Columbia River. Together, they indicate additional flow augmentation would benefit juvenile fall chinook migration in the Snake and Columbia rivers. The Draft OAD/EIS should address alternative flow scenarios for improving subyearling chinook migration which extend from June to near the end of August in the Snake River.

F2-6

The FWS emphasizes that the Corps should conduct the test and provide improved flows for juvenile and adult fish migration. The FWS also supports moving flood control space from Brownlee and Dworshak Reservoirs to Grand Coulee Reservoir to enable these projects to store as much water as possible from the spring runoff period. The FWS also urges the Corps, Bonneville Power Administration (BPA), and the Bureau of Reclamation to pursue flow augmentation options from storage projects in the upper Snake and Columbia River basins where it is feasible. Resident fish and wildlife habitat may be potentially degraded at upstream storage projects if this water is not appropriately delivered downstream. The Idaho Department of Fish and Game is conducting a preliminary analysis of these upstream storage issues under contract with the BPA.

F2-7

F2-8

The FWS is also concerned that the Draft OAD/EIS does not identify a preferred alternative. The lack of a preferred alternative limits our ability to evaluate potential impacts to fish and wildlife. Because the Corps did not provide a preferred alternative, reviewers of the Draft OAD/EIS do have an opportunity to comment on selection of an action plan prior to release of the final EIS. Therefore, the FWS recommends that the Corps conduct another series of workshops to discuss options and the final plan selection to help reviewers understand the tradeoffs involved in implementing any of the 20 or so different options and combinations listed in the Draft OAD/EIS.

F2-9

Because implementation of the alternatives on a long-term basis may have different impacts than the same alternative implemented on a one time trial basis, new ecological equilibriums with positive and negative effects may be established. The selected alternative should minimize the benefits, while minimizing negative effects to fish and wildlife. The given analysis shows

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F2-9
cont'd

that the gains expected to be derived from the drawdown options, with the exception of drawdowns to spillway crest, are not very great. Consequently, additional flows are needed to supplement a drawdown if a significant reduction in travel time is to be achieved. The FWS prefers the alternative for operating the Snake River projects to the MOP's and with reductions to the MOP in only the Bonneville and the Dalles pools. This alternative should be combined with a level of flow augmentation that would maximally reduce particle travel time in the Snake and Columbia Rivers.

F2-10

Recreation and Socioeconomic sections of the Draft OAD/EIS need to adequately address impacts to hunting and fishing interests and discuss in detail the associated economic aspects for the project areas in general and the wildlife refuge areas in particular. Economic effects on refuge areas from the John Day and McNary operations at MOP are likely to be substantial, and possibly significant at 262.5 for John Day. Severe fish and wildlife recreational impacts would likely occur at the MOP in John Day pool and may affect outfitters, guides, equipment outlets, and other entities.

F2-11

Under separate authority of the Energy and Water Development Appropriations Act of 1992 (Public Law 102-104), the U.S. Congress has authorized the Corps to maintain navigation access to currently operating public and private commercial dock facilities. This access maintenance covers Federal navigation projects from the Bonneville Dam to Lewiston, Idaho, and was authorized in anticipation of the need to maintain navigation depths when the pool may be lowered under a 1992 operations plan for lower Snake and Columbia River projects. Although authorized independently, the potential dredging actions are definitely related to the Draft OAD/EIS, and the dredging issues should be addressed in the final EIS for 1992 options analysis.

Although different alternatives would impact barge transportation, the Draft OAD/EIS does not follow up in addressing dredging required to maintain existing navigation access. Since the FWS is cooperating with the Corps to evaluate the impacts to fish and wildlife resources of this dredging under authority of the Fish and Wildlife Coordination Act, the impacts of the dredging should be addressed. The FWS is also concerned with blasting activities, use of in-water sites for spoil disposal, lack of adequate upland sites for disposal, ability to complete the dredging during the approved in-water work periods, and longer-term needs for maintenance dredging at some sites.

Implementation of this winter's dredging work during the approved in-water period unfortunately requires decisions which need to be made in advance of issuing a record of decision for implementing 1992 operations. A public notice (referenced NPPPE-RP 91-05, dated October 22, 1991) issued by the Portland District Corps identifies potential dredging of 432,000 cubic yards of material at 21 sites for meeting the intent of PL 10222-104. At the same time, a Draft EIS for the options analysis identified that navigation be minimally impacted and little dredging would be needed for some alternatives which could be implemented in 1992 and some alternatives (drawdown below MOP) requiring considerable dredging would very likely not be implemented in 1992. The FWS recommends that the dredging activities of these two efforts would be

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F2-11
cont'd

very closely coordinated to ensure that anadromous fish and other important resources not be needlessly impacted, given the plan of operations for 1992 Cultural and Recreation Resources

The U.S. National Park Service (NPS) which administers Coulee Dam National Recreation Area which encompasses a large portion of Lake Roosevelt. The following comments are in regard to potential impacts that the draft proposal may have on Lake Roosevelt and the National Recreation Area.

F2-12

In general, the Draft OAD/EIS lacks the details and specificity that is expected in an EIS for a project of this scope. Much of the data that would seem essential for making informed decisions is lacking. The conclusions in many sections seem speculative and are not supported by factual information and scientific findings. Statements such as, "minimal" or "not expected to be significant", are used freely throughout the document without the supporting data needed to substantiate those claims.

F2-13

The two Lake Roosevelt kokanee salmon hatchery and rearing facilities, which are funded by the BPA and have come on-line within the last year, are intended to mitigate for anadromous fish losses above Grand Coulee Dam. The NPS recommends that special consideration would be given to the needs of resident fish which are used to mitigate for anadromous fish losses. The Draft OSD/EIS should fully discuss the project impacts on the current efforts to develop the kokanee salmon fishery at Lake Roosevelt. Additional spring drawdown may add substantially to the entrapment of kokanee salmon and other species through the turbines or spill tubes. Consideration should be given to establishing and monitoring protective screening devices for resident fish populations at the Grand Coulee Dam facility prior to any changes occurring as a result of any imposed salmon flow measures.

F2-14

Further identification of the extent of adverse impacts to cultural resources at Grand Coulee is needed. The increased drawdown of Lake Roosevelt may leave additional archeological sites exposed to vandalism, looting, and physical deterioration. Allowances should be made for additional site patrol capability and detailed protection; recovery and preservation plans should be in place prior to any increased drawdown.

Mineral Resources

F2-15

The U.S. Bureau of Mines (BM) is concerned that Columbia River system water flow restrictions may severely affect the aluminum smelting industry of the Pacific Northwest, and of the nation as well, by increasing the cost of hydropower.

The Draft OAD/EIS does not adequately address potential effects to the aluminum smelting industry. In fact, it is stated in section 4.13.14 on page 4-152 that "Changes in hydroelectric generation would not result in any direct effects on employment in the study area or elsewhere in the region." The BM believes that if flow restrictions result in curtailment of the aluminum smelting industry, the opposite will be true. With electricity representing about 30 percent of the total cost of producing aluminum from alumina, the future of aluminum production in the Pacific Northwest is directly linked to

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F2-15
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the cost of hydropower. The BM recommends that socioeconomic impacts from changes in operation of the Columbia River system could have on the aluminum industry, would be addressed.

Currently, the BM is participating in the Columbia River System Operation Review that is being conducted jointly by the Corps, the Bureau of Reclamation, and the BPA membership on both the Power Work Group and the Economic Analysis Work Group. Involvement in the EIS process would ensure that the ultimate decision on operation of the Columbia River system would include adequate information on mineral industry impacts. BM's program contact for technical assistance in addressing the Pacific Northwest aluminum industry, is Mr. Carl Almquist at (509) 353-2916 and the Bureau of Mines, Western Field Operations Center, East 360 380 Avenue, Spokane, Washington 99202-1413.

Land Resources

F2-16

Throughout the Draft OAD/EIS and at the public hearing, the Corps presents a gloomy picture of what would likely result from selecting any of the alternatives. Projected adverse effects range from economic disasters to increased odors. Without a preferred alternative being selected, the Corps seems to convey that business as usual is preferred. Continuation of the status quo is not acceptable if the species are to be recovered.

F2-17

The Bureau of Land Management (BLM) does not believe that there is sufficient knowledge of the effects of various reservoir drawdown designs to recommend any one alternative. Even the strategies recommended by the State of Idaho (Andrus Plan) may not be the best to use, but at least these proposals are proactive with the recovery of fish runs as their goal.

F2-18

The BLM recommends that the Corps: (1) Immediately begin an intensive experimental program to determine the best technique(s) to move smolts through the dams/reservoirs system by testing such things as drawdown flow amounts, timing, duration, patterns (fixed verses fluctuating flows), and temperatures, etc.; (2) plan to conduct limited drawdown operations during the peak smolt migration periods (April through June), with close monitoring of effects to fish and other fish and wildlife resources; and (3) increase cooperative operations with other agencies and groups working with recovery efforts to develop a holistic approach to solve the problems. Amounts of water needed for drawdowns and storage or other fish passage techniques are closely tied to amount of water available, and a possible ending of our 5-plus year drought should also be considered as at least a temporary factor in helping fish with minimum effects to other resources.

SPECIFIC COMMENTS

F2-19

Page ES-6, Section 2.3.2 - The statement is made that Non-Treaty storage releases of up to 2.2 MAF from Mica would "increase average inflows at the Dalles Dam by 16 kfs." This is not consistent with the information presented on page 3-9 which indicates that average inflows at the Dalles Dam would be increased by 10 kfs.

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F2-20

Page ES-7, Section 2.5 - The Draft OAD/EIS implies that there is a consensus among regional fish agencies and tribes that flow augmentation for temperature control is beneficial for adult Snake River fall chinook. The biological benefits to adult fall chinook of flow augmentation for temperature control are speculative. Releases of large volumes of water for temperature control may reduce the amount of water available to augment flows for juvenile fall chinook which are migrating out of the Snake River from June through the end of August.

F2-21

Page ES-7, Section 2.6 - Since there is uncertainty of drawdown effects on wildlife and wildlife habitat and the nature of these proposals is a test evaluation, the monitoring and evaluation of resource responses needs to be clearly stated. Such a study is integral to test adequacy and could materially benefit the System Operation Review process as well. The FWS recommends that terrestrial wildlife habitat and species would be adequately addressed as an integral component of the monitoring program. The detailed program should also reference coordination with wildlife agencies.

F2-22

Page ES-9, Section 4.1.1 - This section should reflect that the Columbia Basin Fish and Wildlife Authority also comprises wildlife agencies.

F2-23

Page ES-11, Section 4.2.2 Reservoir Drawdown, paragraph 3 - This paragraph presents a conflict of information by stating that juvenile salmon would be subjected to greater mortality from increased downstream predation yet, at the same time, the predatory fish population (resident fish) would be subjected to large reductions in spawning habitat and food sources and increased mortality from gas supersaturation. It should be clarified how a greatly reduced resident fish population would exert increased predation on juvenile salmon. Predation studies on juvenile salmon in the Columbia River System have shown that a significant amount of loss in a project area occurs in the immediate vicinity of the dam as compared to open water areas in the reservoir pool. It is possible that changes in conditions at the dams with increased flows and/or lower pool levels would create increased velocities and turbulence, reduced visibility, and less area with deeper, slow water that are cover for large predatory fish, and that predation could be reduced on juvenile salmon with these operations. Throughout the document, where increased predation is assumed as part of the impact of the various alternatives, it should be clarified how this occurs.

F2-24

Page ES-14, Section 4.3.1 - The references to flow levels in the last paragraph are applicable only to the Snake River.

F2-25

Page ES-15 - The Draft OAD/EIS states that the Corps would use five criteria to select a preferred plan. The BLM does not believe that any of these criteria are designed for selecting the best plan to increase fish passage and survival.

F2-26

Page 2-15, Section 2.2.4.2 - There is uncertainty with regard to the benefits of transportation. No studies have been conducted to evaluate the success of transportation in enhancing fish survival back to the spawning grounds which is critical information for recovery and rebuilding of salmon stocks.

F2-27

Page 2-30, Section 2.4.1.7 - The first sentence should state that white sturgeon are the largest anadromous fish in the western Pacific, not the largest fish stock.

F2-28

Page 2-37, Section 2.4.4.1 - This section gives the impression that harvest of salmon in the Columbia River was unregulated until 1982 which is not the case.

F2-29

Page 2-42, Section 2.4.4.6 - We disagree with the statement in the second paragraph that the incidence of bacterial kidney disease (BKD) in the wild is apparently rare. Elliott and Pascho (1991) found that 97-100 percent of the sockeye salmon smolts, which were all wild, sampled at Priest Rapids and McNary dams in 1989 (N-210) were infected by BKD. All of the wild steelhead sampled at Lower Granite, Priest Rapids, and McNary dams (N-185) tested positive for BKD. Of the fish that tested positive for BKD, the hatchery fish tended to have lower infection levels than the wild fish.

F2-30

Page 2-6.1 - Although it may be technically correct to state that the "reservoirs have influenced the extent and distribution of numerous plant and wildlife communities", it would be more forthright to state, as recent studies and other Corps and BFA reports do, that there has been a major net loss of these resources due to project development, and that there are ongoing adverse impacts resulting from project operations for power peaking. For example, a major 1981 Corps study "Impacts of Project Modification and River Regulation on Riparian Habitats and Associated Wildlife..." does not appear to be included in this analysis.

F2-31

Page 2-73, Table 2.12-1, Recreational Facility Inventory - The inventory should include four marina facilities. Other totals should include facilities on the National Recreation Area and the two Indian Reservations. For more information in this regard contact Coulee Dam National Recreation Area.

F2-32

Page 3-9, Section 3.2.3.2 - The availability of water to augment flows under Target 200 is also contingent upon the availability of non-firm power to curtail and the availability of power to purchase on the spot market.

F2-33

Page 4-20 - The document is deficient in addressing the effects of dioxin and smelter slag on the fish populations in Lake Roosevelt.

F2-34

Page 4-28 - All of the travel time and flow models developed show a statistically significant relationship between travel time and flow. Additional factors such as smoltification can be used to account for some of the variability inherent in the travel time and flow relationship. However, regardless of the model used, flow is invariably one of the most influential factors, measured statistically, determining travel time of fish.

U.S. Department of the Interior (Charles S. Polityka)

Lieutenant Colonel Robert A. Volz

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F2-35

Page 4-29, paragraph 1 - The fact that Kindley found a slower migration associated with higher flow is an artifact of the data he used. In 1989, the Clearwater trap was operated from March 29 to April 16 and then pulled out of service due to high flows. The trap began operation again on May 23 when flows dropped. Chinook marked at the trap through April 16 were predominantly Dworshak Hatchery fish and were predominantly wild stocks after May 23. The groups had obvious smoltification differences due to their origin, length of migration before marking, and separation in time. One would expect that a best fit flow-travel time model in this situation would be meaningless because two very distinctly different groups of fish with different stages of physiological development, migrating under very different flow conditions, were combined. His analysis should not be construed as showing that fish do not respond to flow.

F2-36

Page 4-29, paragraph 3 - "Giorgi (1991)" is cited throughout this section but has never been provided to the FWS for review. All references to this document should be deleted until it has been provided to the FWS and the other fishery agencies and tribes with adequate time for review and comment.

F2-37

Page 4-35, paragraph 1 - There is travel time data available for PIT tagged fish released from the Lewiston trap from 1988 to 1991, and some data for 1987 and 1988. We suggest that you review these data and the relationship between travel time and flow they describe which has been reported in annual reports of the Fish Passage Center.

F2-38

Page 4-35, paragraph 2 - In all cases the models demonstrate a statistically significant relationship between travel time and flow.

F2-39

Page 4-35, last paragraph - The polynomial model was applied to a different set of data than was used in the other models. Therefore, it is incorrect to state that it fit all data better than the other models. In addition, the best descriptive model for the population is not necessarily the model to which the sample of data is best fit.

F2-40

Page 4-36, Figure 4-2-1 - The linear model does not include the entire data set, but only considers a subset of the travel time data. It should be noted that the linear model only utilizes a partial data set.

F2-41

Page 4-40, Subyearling Chinook - The 1991 results for travel time of PIT tagged subyearling chinook released above Lower Granite pool demonstrated a statistically significant relation between travel time and flow. We disagree with Giorgi's "negligible" opinion of the relation that exists between travel time and flow in the lower river for subyearling fish. Once again, this relation is statistically significant. Statistical significance means that there exists an underlying relation between variables that can not be explained by chance alone. It does not translate to a measure of the importance of a relation. The subyearling travel time models' predictive capabilities in the Berggren and Filardo model are improved by the addition of other, independent variables to help account for some of the variability in the data. It also should be pointed out that Giorgi et al (1990a) also

Lieutenant Colonel Robert A. Volz

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F2-41
cont'd

includes a section that suggests that adult contribution of the earlier migrants is greater than later migrants. The earlier fish which migrate at the highest yearly flow, typically have the lowest level of smoltification, and contribute the most to adult production.

F2-42

Page 4-42, top of column - Berggren and Filardo (1991) did not arbitrarily decide on a subset of the data. They established a set of criteria for determining which groups represented true estimates of the population travel time. Fish that migrated in September and beyond (outside of the middle 80 percent of the population) were not considered true migrants, and mark groups that yielded so few recoveries at John Day to produce a mathematically reliable estimate, were eliminated from the analysis. The references to "weak" relations between travel time and flow must be changed to "statistically significant" relations to represent a true statistical analysis rather than an individual's opinion.

F2-43

Page 4-42, paragraph 6 - The reference to Sims and Osslander relative to spill is not totally appropriate. Flow and spill are highly inter-correlated and, therefore, it would be virtually impossible to determine which factor dominates.

F2-44

Page 4-43, Lower Granite Dam to Ice Harbor - The Berggren and Filardo estimates are for Lower Granite Dam to McNary Dam, which the Corps divided by four dams to represent the Snake River reach. It does not actually represent travel time to Ice Harbor, which makes the table caption misleading.

F2-45

Page 4-53, Section 4.2.1.9 - The potential for stranding of salmonids, particularly sub-yearlings, should be discussed.

F2-46

Page 4-64 - Net pen rearing of fish in Lake Roosevelt would not receive positive impacts from increased drawdown as implied.

F2-47

Page 4-72 - The document is deficient in the consideration of impacts from an acknowledged reduction of zooplankton on kokanee salmon or other resident fish populations from any transfer of flood control storage. The cursory treatment of the subject only makes reference to possible effects on walleye.

F2-48

Page 4-73, Section 4.4 - The listing of significant impacts to terrestrial habitats and species in the summary table could be expanded substantially for the Lower Columbia projects at MOP. The varied effects on wildlife and habitats (some of which could have been drawn from inclusion of findings from the 1981 Corps report on "Study of Impacts of Project Modification and River Regulation on Riparian Habitat and Associated Wildlife"), human uses of wildlife, and adverse economic effects, are not very well represented in the material on page 4-73.

F2-49

There are no impacts identified for operation of John Day and McNary projects at elevation 262.5 and 337, respectively. While test monitoring may be necessary to establish any adverse effects, we believe that operating John

U.S. Department of the Interior (Charles S. Polityka)

Lieutenant Colonel Robert A. Volz

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F2-49
cont'd

Day at 262.5 will at least impact Refuge farming and possibly other activities, perhaps requiring deeper wells and longer pump lines.

F2-50
cont'd

Page 4-74, Section 4.4.2 - Although it is stated that "plant communities have established under normal pool fluctuations" and riparian vegetation is "accustomed" to 3-to-5-foot fluctuations (Section 4.4.2), the referenced 1981 analysis reports that these fluctuations are a source of ongoing problems for riparian re-establishment.

F2-51

Page 4-75, Section 4.4.2 - Paragraph 2 states that the lower Snake projects have "developed extensive riparian communities and would therefore experience significant losses due to drawdowns of this magnitude." In reference to the lower Snake projects paragraph 3 states that "development of riparian communities is extremely limited along these reservoirs (especially at the storage reservoirs) and is basically limited to backwater areas." These statements are contradictory.

F2-52

Page 4-79, Section 4.4.10 - The effects of the drawdown on colonial nesting birds, particularly those on 3 Mile Island, should be described in detail.

F2-53

Page 4-80, Section 4.4.11.2 - The "determination of effect" to bald eagles should be clearly stated and identified.

F2-54

Page 4-82, Section 4.4.15 - A major regional wildlife mitigation program is in progress under the requirements of the Northwest Power Planning Act (P.L. 96-501), in part to address unmitigated impacts of some of the hydroelectric projects involved in the 1992 drawdown and flow augmentation tests. The Power Act Mitigation Program reflects the recognition of unaddressed losses. The Draft EIS should identify this program and its background, and consider the relationship between these activities and the need for ongoing coordination to assure that information is shared, that no potentially detrimental activities are undertaken without mutual knowledge, and to provide for future cooperation.

F2-55

The extensive documentation, research and monitoring have been conducted to determine original habitat losses, not "mitigate the original habitat losses." This statement also implies that all losses of wildlife habitat resulting from Corps projects have been mitigated; the Draft OAD/EIS should clarify that this is not the case. The Draft OAD/EIS should also address that the drawdown would likely impact many areas which are managed as mitigation for original losses.

F2-56

SUMMARY COMMENTS

We recommend that the Corps establish flow targets for alternative flow augmentation scenarios that result in substantive improvement over the base case in migration conditions for upriver salmon populations. Based on the past 10 years of experience, relatively minor changes in the current hydropower system operations cannot reasonably be expected to reverse current downward trends in abundance of Snake River salmon populations.

Lieutenant Colonel Robert A. Volz

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F2-57

The FWS recognizes that all of the alternatives in the Draft OAD/EIS have negative impacts to at least some of the fish and wildlife resources. Since the objective is to enhance survival during outmigration of weak salmon populations which may be listed as threatened or endangered under the Endangered Species Act, other fish and wildlife resources may be impacted because of the tradeoffs. The FWS will continue to work with the Corps to ensure that measures that are implemented to improve migration conditions for anadromous fish have minimal impacts to other fish and wildlife resources. Tests conducted in 1992 should maximize the collection of information to accomplish this task.

We appreciate the opportunity to comment.

Sincerely,

Charles S. Polityka
Regional Environmental Officer

Attachment

U.S. Department of Agriculture, Forest Service (Gordon Haugen)

United States Department of Agriculture	Forest Service	Pacific Northwest Region	P.O. Box 3623 Portland, OR 97208-3623 333 S.W. First Avenue Portland, OR 97204
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Reply To: 2630

Date: November 13, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

Thank you for the opportunity to review and comment on the Draft 1992 Columbia River Season Flow Measures Environmental Impact Statement. Unfortunately, due to lack of time, funding, and staffing, we have been unable to give it a thorough review. However, we commend the Army Corps of Engineers in this monumental undertaking and support any water management alternatives that lead to the recovery of anadromous fisheries stocks in the Columbia Basin. Full utilization of the anadromous fish habitat on USFS lands relies on the ability of fish to access these areas.

The Columbia River Gorge National Scenic Area will be providing comments specific to Bonneville and the Dalles Pool for your consideration.

Sincerely,

GORDON HAUGEN
Columbia River Basin Fish
and Wildlife Coordinator

cc:
Rick Stowell, Region 1
Don Burtschi, Region 4
Art Carroll, Area Manager, CGNSA

F3-1

Pacific Fishery Management Council (Philip Anderson)

PACIFIC FISHERY MANAGEMENT COUNCIL

CHAIRMAN
Philip Anderson

Metro Center, Suite 420
2000 S.W. First Avenue
Portland, Oregon 97201

Phone: Commercial (503) 324-6352
FTS 423-6352

EXECUTIVE DIRECTOR
Lawrence D. Six

November 13, 1991

Lieutenant Colonel Robert A. Volz
District Engineer, Department of the Army
Walla Walla District
Corps of Engineers
Building 602, City-County Airport
Walla Walla, WA 99362-2965

Dear Lieutenant Colonel Volz:

F4-1 The Pacific Fishery Management Council (Council) has reviewed your Draft Options Analysis Document (OAD) and Environmental Impact Statement (EIS) for special 1992 flow measures to be carried out in the Snake and Columbia rivers. The Council is supportive of testing innovative methods to achieve sorely needed improvements in the survival of juvenile salmon from Snake River stocks. The approaches used to date have not shown a sufficient level of success. With the proposed listing of the Snake River salmon stocks under the Endangered Species Act, it is especially clear that a significant departure from status quo operations is necessary.

F4-2 The actions proposed for 1992 are not long-term operations, but tests to help evaluate the impacts from such operations. There are certainly potential negative aspects of any test alternative which makes a significant departure from current operations. However, the draft OAD/EIS seems to contain more than the required amount of very speculative analysis as to the negative impacts of the proposals as long-term operations. In this regard, the Council agrees with several other fishery management entities that a pretest of reservoir drawdown, at a time when impacts on fish and other river users is minimal, may be beneficial. Such a test would help confirm or alleviate some of the fears which were speculated upon in the EIS.

F4-3 In choosing a final test alternative for 1992 operations, the Council believes a combination of drawing down the reservoirs and flow augmentation will be necessary to achieve a significant decrease in water particle and fish travel time. Simply drawing down the reservoir levels to near minimum pool will result in little decrease in juvenile fish migration time and improved survival.

Sincerely,

Philip Anderson
Chairman

JCC
cc Council Members

U.S. Department of Agriculture, Forest Service (Arthur J. Carroll)

United States Department of Agriculture	Forest Service	Columbia River Gorge National Scenic Area	902 Vasco Avenue Suite 200 Hood River, OR 97031
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Reply: 1900

Date: November 14, 1991

Mr. Robert D. Volz
Department of the Army
Walla Walla District, Corps of Engineers
Attn: CENPU-PL-ER
Walla Walla, Washington 99362-9265

Dear Mr. Volz:

Pursuant to Section 14(d) of the Columbia River Gorge National Scenic Area (NSA) Act, we appreciate the opportunity to consult with the Army Corps of Engineers on the Columbia River Salmon Flow Measures Options Analysis EIS. Section 14(d) requires federal agencies to exercise their responsibilities consistent with the provisions of the National Scenic Area Act. These provisions include the need to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Columbia River Gorge.

F5-1

We have reviewed the EIS and will limit our comments to the effects on the Columbia River Gorge National Scenic Area. We agree with the findings of the EIS which states that the lowering of the Bonneville and The Dalles pools by 1 to 2 feet would affect some recreation resources such as boat ramps and swimming areas. However, protection of the salmon resource is of critical importance and considering that the effects on recreation are minimal and in many instances could be mitigated, the proposals in the EIS appear to be balanced and justified.

F5-2

Our review of the proposals found them to be consistent with the National Scenic Area Act.

Sincerely,

Arthur J. Carroll
ARTHUR J. CARROLL
Area Manager

U.S. Department of the Interior, Fish and Wildlife (Ronald J. Pascho)

United States Department of the Interior

FISH AND WILDLIFE SERVICE

NATIONAL FISHERY RESEARCH CENTER

BLDC 206, NAVAL STATION

SEATTLE, WASHINGTON 98105 3007

October 4, 1991

Department of the Army
Walla Walla District
Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

To whom it may concern,

I would like to comment on section 2.4.4.6 (Hatcheries, Disease, and Genetics) of the "Columbia River Salmon Flow Measures-1992 Options Analysis/Environmental Impact Statement (EIS)" - specifically, the second paragraph of page 2-42 which discusses bacterial kidney disease. For the ease of discussion, I have quoted the appropriate sentence prior to my comments.

"One of the most severe problems of fish disease on the Columbia is bacterial kidney disease (BKD), which can be transmitted from parent stocks directly to eggs and ultimately juveniles."

The exact mechanism by which *R. salmoninarum* is transmitted is not fully understood, but there is evidence that the bacterium is transmitted vertically. It might be more appropriate to say there is evidence that *R. salmoninarum* (not the disease as written) is transmitted in association with the salmonid egg and cite the review by Elliott et al. 1989, or use references from that review (enclosed). Also, the sentence is written such that "fish disease" has the BKD problem, not the fish.

"Warren (1989) indicated that incidence of the disease in smolt in Snake River federal hatcheries ranged from 15 percent to greater than 60 percent."

There are only three federal hatcheries in the Snake River Basin, and if you look at Mr. Warren's summary on pages 16-17 of the cited report you will see that this statement is in error. The prevalence (not the incidence as written) of BKD in spring chinook at Dworshak ranged between 15% and 40%, while the fish at Kooskia and Hagerman NFIs had a prevalence of 16.6% and 8.8%, respectively. The prevalence of BKD in fish at Winthrop NFI was 60%, but this hatchery is on the Columbia River. "Smolt" should be plural.

F6-3

"Juveniles reared from adults with a low incidence of the disease survived at a rate three time higher than predicted, while smolts from high disease incidence adults survived at 70 percent of the predicted rate."

The basis of this segregation was not the prevalence (again, not the incidence) of BKD in the parents, but the levels of *R. salmoninarum* antigen (which generally correlates with the level of infection) in tissues from those adults. In addition, the report states that the progeny returned to the hatchery in higher rates than predicted, not that they survived at higher rates. A discussion of the survival of the progeny would have to include the period during which they were reared in the hatchery, not just adult returns.

"This disease theoretically could be passed on to wild fish, but its incidence in the wild is apparently rare (Chapman et al., 1991)."

Our laboratory has tested juvenile summer/spring chinook salmon from natural and wild production areas of the Snake River Basin for BKD by the ELISA. The results suggest a significantly different picture than that presented cited from Chapman.

Following are selected points from two annual reports:

- Pascho, R.J., and D.G. Elliott. 1989. Juvenile fish transportation: Impact of bacterial kidney disease on survival of spring/summer chinook salmon stocks. Annual Report, 1988 (Contract E86880047) prepared by the U.S. Fish and Wildlife Service, Seattle, Washington, for the U.S. Army Corps of Engineers.

During 1988, we tested summer chinook parr from the Secesh River and spring chinook parr from Valley Creek in Idaho. Because the fish were relatively small, they were tested as 3-fish pools. All pools were positive for BKD at both locations.

We also monitored the prevalence and levels of BKD in steelhead smolts leaving the Snake and Columbia River Basins; fish were collected at Lower Granite, Priest Rapids, and McNary Dams. Wild and hatchery steelhead smolts could be distinguished because of adipose fin clips and other marks. The proportion of fish which were BKD-positive was consistently lower in hatchery fish than wild fish at each location except Priest Rapids Dam, where all of the steelhead were BKD-positive (see P-56 of that report). The *R. salmoninarum* infection levels were also consistently higher in wild fish.

- Elliott, D.G., and R.J. Pascho. 1991. Juvenile fish transportation: Impact of bacterial kidney disease on survival of spring/summer chinook salmon stocks. Annual Report, 1989 (Contract E86880047) prepared by the U.S. Fish and Wildlife Service, Seattle, Washington, for the U.S. Army Corps of Engineers.

During 1989 chinook salmon parr were sampled from Marsh Creek, Valley Creek and the Secesh River. Again, 100% of the 3-fish pools tested were positive by the ELISA. Overall, the infection levels were higher than those measured

F6-4

U.S. Department of the Interior, Fish and Wildlife (Ronald J. Pascho)

F6-4
continued

during 1988. The presence of BKD-negative fish may have been masked by the inclusion of at least one positive fish in a pool.

F6-5

"Recent progress has reduced the level of BKD in hatchery fish in Washington State hatcheries (Micitak et al., 1990), although indications are that greater than 85% percent of the spring chinook are infected (Pascho and Elliott, 1990)".

"Micitak" is correctly spelled *Michak*.

The citation in the reference section misspelled Kevin Amc name.

The first half of this sentence is unclear, and cannot be clarified by reading the report; it appears to reference the use of erythromycin. In addition, Michak et al. 1990 are reporting the results of their augmented fish health monitoring for hatcheries maintained by the Washington State Department of Fisheries, not the entire State of Washington.

"Elliott" is correctly spelled *Elliott*.

The Pascho and Elliott citation is incorrect, it probably should be Pascho and Elliott 1989 - the first reference stated in the previous discussion. You should also note that this reference is not even included (in any form) in the reference section. We did not publish a report during 1990 that said that 85% of the chinook are infected with BKD. It this sentence is referencing the 1989 report, we were discussing the prevalence of BKD in spring/summer smolts leaving the mid-Columbia and Snake Rivers. As it is written, the sentence suggests that greater than 85% of all spring chinook are infected with BKD.

Thank you for the opportunity to comment on this section of the draft EIS. If you have any questions, please feel free to contact me at this laboratory; (206) 526-6282, FTS 392-6282.

Sincerely,

Ronald J. Pascho
Microbiologist

Department of Health & Human Services, Center for Disease Control (Kenneth W. Holt)

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Center for Disease Control
Atlanta GA 30333
November 7, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Dear Sir:

We have completed our review of the Draft Environmental Impact Statement (DEIS) for 1992 Columbia River Salmon Flow Measures Options Analysis. We are responding on behalf of the U.S. Public Health Service.

We have reviewed the Draft EIS for potential adverse impacts on human health. The discussion of contaminated sediments on pages 4-20 and 4-21 needs expansion and clarification. First, notation such as "4.13E-08" is peculiar to computers. The more general notation is "4.13 x 10⁻⁸". Appendix B lacks information on the derivation of these numbers. Also, the abbreviations in the tables are undefined. The text suggests that dermal contact with sediments could increase lifetime risk of cancer by 1.13/0.19 ((1.13E+00)/[1.9E-01]), a 5.9-fold increase. If this were true, it would represent an unacceptable risk. The statements "This is an extremely conservative assumption because it does not consider factors..." and "there is considerable uncertainty in the evaluation" are not sufficient to allay alarm.

We suspect that "extremely conservative" in this context means biased toward overestimation of risk. ("Conservative," in some contexts, means exactly the opposite). The usual methods of quantitative risk assessment are, "at best, about as accurate as a five-year weather forecast and at worst pure voodoo." We would guess that these particular estimates are not among the best, but lack the information which would be needed to state that with confidence.

The statement "... a person has ... a 2.1E-01 chance of contracting cancer from smoking (including heart disease)" seems to suggest that primary malignancy of the heart is a significant risk with smoking. It seems more likely that 0.21 is a lifetime risk of dying of complications of smoking, not specific to cancers induced by smoking.

F7-1

F7-2

Page 2 - DoA

F7-3

Dam safety is an obvious and primary concern, and we concur that maintaining dam embankment stability is critical to the integrity and safety of the proposed projects. The same concern exists with levee and roadway embankment safety. We stress that with any chosen alternative, adequate and acceptable measures must be ensured through proper contracts, oversight and inspection to minimize potential hazards. We believe the criteria used in the decision chart are good and should help achieve the selection of the best alternative while incorporating adequate mitigation of potential hazards.

Thank you for the opportunity to review and comment on this document. Please ensure that we are included on your mailing list to receive a copy of the Final EIS, and future EIS's which may indicate potential public health impact and are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

Kenneth W. Holt

Kenneth W. Holt, M.S.E.H.
Special Programs Group (F29)
National Center for Environmental
Health and Injury Control

CC: Dr. Sanford Leffingwell

United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle WA 98101

Alissa
Kuhn
Oregon
Washington

NOV 15 1991

REPLY TO
ATTN OF: WD-126

Robert D. Volz
District Engineer
Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Re: Columbia River Salmon Flow Measures Draft Environmental
Impact Statement

Dear Colonel Volz:

The Environmental Protection Agency (EPA) has reviewed the Columbia River Salmon Flow Measures Draft Environmental Impact Statement (DEIS). The DEIS evaluates alternatives proposed by the Corps of Engineers, as lead agency, and the Bonneville Power Administration and Bureau of Reclamation, as cooperating agencies, to modify the flow of water in the lower Columbia-Snake River in 1992. The intent of these actions is to assist the downstream migration of juvenile anadromous fish past eight Federal dams.

Our review is conducted in accordance with the National Environmental Policy Act (NEPA), and EPA's authorization under Section 309 of the Clean Air Act to determine whether the overall impacts associated with federally authorized actions are acceptable in terms of environmental quality, public health, and welfare.

Alternative measures analyzed in the DEIS consist of various reservoir drawdown and flow augmentation options. Reservoir drawdown options entail lowering "run-of-river" dam reservoir pools to either minimum operating pool or near spillway levels during downstream fish migration. Flow augmentation options involve release of water from upstream storage reservoirs during downstream fish migration. A preferred alternative was not identified.

Of the various options evaluated in the DEIS, it was concluded that two were not implementable in 1992: (1) drawdown of all four lower Snake River projects to near spillway reservoir elevations, and (2) flow augmentation involving water volumes greater than 100 KAF (thousand acre feet) from the upper Snake River System (above Brownlee). We have therefore not considered these options in our ratings, below.

F8-1

2

Based on our review we have rated both of the remaining general action alternatives, including: (1) drawdown measures (other than all four lower Snake River projects at near spillway), and (2) flow augmentation measures (other than greater than 100 KAF from upper Snake River) as EC (Environmental Concerns). We have rated the DEIS 2 (Insufficient Information). A summary of the EPA rating system for DEISs is enclosed for your reference. These ratings and a summary of our comments will be published in the Federal Register.

The general action alternatives, which are intended to assist the downstream migration of juvenile anadromous fish past the eight Federal dams in 1992, could result in other potentially offsetting environmental impacts. Our concerns pertain primarily to water quality impacts resulting from potential increases in dissolved gas levels, turbidity, and resuspension of sediments, and potential reductions of wetland, riparian, and shallow water spawning and rearing habitat. Additional information is needed to fully assess these impacts and to better evaluate the overall net effects of the flow measures on anadromous fish survival. Comprehensive monitoring is a critical component of any proposed measure. Our specific comments on the DEIS which address these concerns and the need for additional information are attached.

Thank you for the opportunity to review the DEIS. We would be pleased to provide assistance in addressing our comments. Rick Seaborn in the Environmental Review Section is the lead contact person for this review and can be contacted at (206) 553-8510 or (FTS) 399-8510.

Sincerely,

Robert S. Burd
Director, Water Division

Enclosures

Environmental Protection Agency (Robert S. Burd)

U.S. Environmental Protection Agency (EPA) Region 10
Detailed Comments On Columbia River Salmon Flow Measures
Draft Environmental Impact Statement (DEIS)

Water quality

Section 4.1.1.1, Gas Saturation, pages 4-3 through 4-11: Reservoir drawdown options would increase dissolved gas levels to varying degrees throughout the affected reaches, depending on the extent, and combination of, drawdowns implemented. Drawdowns to near spillway would clearly result in further increases in dissolved gas at locations where the standard of 110 percent saturation is already exceeded under existing conditions. The Final Environmental Impact Statement (FEIS) should include direct comparisons of projected dissolved gas percentages under the alternatives with the water quality standard.

Section 4.1.1.3, Turbidity and Other Water Quality Parameters, and Section 4.1.4, Toxics and Disease Organisms, pages 4-19 through 4-20, and Section 4.5.4, Sedimentation, pages 4-86 through 4-90: Physical effects associated with sediment resuspension and input include loss of habitat complexity (e.g., simplification of bottom topography). In addition, increased sedimentation and decreased pool depth can lead to increased water temperatures and decreased dissolved oxygen (DO). Changes in physical parameters may, in turn, lead to further reductions in native populations and increased predator (non-native) populations and pathogen loads. Alteration of physical parameters often lead to shifts in population dominance. In addition, altered timing in temperature maxima and DO minima could affect adult survival and reproductive success. The FEIS should discuss the potential for these effects associated with sediment transport and also provide information on potential impacts from disease organisms.

Sediment analysis data needed to assess potential exposure effects of contaminated sediments is not currently available. This information should be provided for review as it becomes available.

Section 4.1.3.1, Drawdown Options, page 4-19: Decreases in outfall depths or outfall exposure resulting from reservoir drawdown could cause discharges to exceed state water quality standards on a localized basis. The FEIS should provide a better description of the number, locations, and types of discharges which may be potentially affected, and remedial measures which would need to be employed to prevent standards violations (including the feasibility of such measures).

Section 4.2.1.7, Dissolved Gas Saturation, pages 4-50 through 4-52, and Section 4.2.2.2, Dissolved Gas Saturation, pages 4-57 through 4-58, and Section 4.3.1, Potential Impact Mechanisms, pages 4-64 through 4-65: These sections discuss the effects on

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fish of gas supersaturation caused by increased spillage over dams. Many studies have documented the impact of dissolved gases on aquatic life. The major impact on fish of water containing excessive dissolved gases is the release of gases from their circulatory system in the form of bubbles which block the flow of their blood through the capillaries. It should be recognized that this "gas bubble disease" not only affects fish but may also impact aquatic invertebrates.

Several conclusions can be drawn about the impact on aquatic life:

- Mortality can occur when gas exceeds 110% saturation.
- Survival estimates in the Snake River made from 1966-1975 showed that juvenile fish losses of 40-95% do occur with a major portion of the mortality due to supersaturation of atmospheric gases.
- Though juvenile salmon have been shown to recover when moved, after exposure to high dissolved gas concentration, adults do not recover and generally die.
- Dawley and Abel (1975) determined that for juveniles of spring chinook (*Oncorhynchus tshawytscha*) and steelhead trout (*Salmo gairdneri*) the threshold level where significant mortalities begin occurring is 111% total gas saturation.
- *Daphnia magna* were tested at 115% saturation and were tolerant to this level for a few days. Stoneflies exhibited mortality at 130% saturation.

Much of this work is the basis for the Water Quality Criteria (and subsequently State Standards). To protect freshwater organisms the total dissolved gas concentrations in water should not exceed 110% of the saturation value for gases at existing atmospheric and hydrostatic pressures.

Wetlands, and riparian areas

Section 4.4, Terrestrial Ecology, pages 4-73 through 4-83: The FEIS should provide additional information on the extent to which drawdowns would impact riparian zones, grass/forb communities, and wetlands (approximately 2,300 acres emergent wetlands), migration corridors, and wildlife. Drawdown will affect surface and subsurface flows required to maintain riparian and wetland areas. Riparian zones are highly productive and valuable areas especially in the arid west.

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F8-7

Environmental Protection Agency (Robert S. Burd)

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Fish habitat and migration

F8-8 Section 4.2.1.4, Effects of Flow Options on Juvenile Survival, pages 4-42 through 4-47: Any project designed to increase juvenile salmonid survival must consider project timing. Project timing should address the needs of wild salmon stocks (e.g., April 1 through August 31 is preferable).

F8-9 Section 4.2.2, Adult Anadromous Fish, pages 4-56 through 4-59: Operation of lower Snake River pools at elevations to near spillway, which would prevent successful operation of adult fish ladders or juvenile bypass systems, is counterproductive and would not attain the objectives of the measures proposed.

F8-10 Adults require strong attraction flows. Upriver delays can deplete adult energy reserves, thereby decreasing reproductive success. The EIS must consider the effect of increased temperatures, increased pathogen load, decreased DO, gas supersaturation, and loss of holding and spawning habitat on adult survival. In addition, these alterations can lead to decreased reproductive success and decreased juvenile survival (i.e. increased temperatures experienced by adult spring chinook salmon can lead to reduced offspring survival).

F8-11 Section 4.3, Resident Fish and Aquatic Ecology, pages 4-63 through 4-72: Loss of deep water sandy and near shore shallow habitat through dredging and pool drawdown could significantly affect aquatic populations. Additional information regarding habitat loss and possible white sturgeon and shad population responses should be provided. White sturgeon occupy deep water pools and may be significantly affected by pool drawdown as well as the proposed dredging.

Continued loss of shallow water habitats through dredging and operational alterations could further reduce resident fish stocks. How will decreased near shore invertebrate production affect fish and wildlife?

F8-12 Other - Sections 4.2, and 4.3: The FEIS should describe habitat restoration and creation efforts which may be affected by the flow measures alternatives and indicate how habitat and flow measures would be coordinated:

What are the possible habitat and community effects associated with lower than normal flows during reservoir refill periods?

F8-13 Impacts to fish associated with anticipated increases in turbidity levels which may exceed state standards need to be discussed in the FEIS.

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Indirect effects

F8-14 Section 4.7, Transportation, page 4-94: The indirect effects associated with loss of barge capacity needs to be discussed. Conversion to rail or truck transport would result in impacts to air emissions or other resources.

F8-15 Section 4-9, Electric Power, Page 4-122: Discussion of the indirect environmental effects associated with the loss of firm hydroelectric energy resources is needed. The loss of firm energy may result in increased generation at other projects in the system, acquisition of additional capacity from thermal plants, or purchase of power from outside the region. For example the acquisition of power from coal-fired plant sources may result in an increase in air emissions, as well as the concomitant impacts of coal extraction.

Baseline conditions & monitoring

F8-16 Section 2.6, Monitoring, page ES-7: Monitoring efforts would need to specifically take into account water quality impacts. Drawdowns and flow changes could result in downstream scouring, increased gas supersaturation, decreased dissolved oxygen in deeper waters, increased turbidity, and resuspension of contaminated fine sediments. Upstream impacts may include decreased water volumes and flows, increased temperatures, decreased dissolved oxygen concentrations, increased pollutant concentrations, and altered mixing of outfall discharges. These effects could result in violations of water quality standards. Therefore, water quality monitoring should be conducted upstream and downstream of the proposed flow measures. Cumulative impacts to the estuary below Bonneville Dam must also be monitored. All monitoring efforts should be coordinated with present water quality management efforts.

All flow measure proposals should include detailed pre-project baseline data collection and post-project monitoring (e.g., PIT tag studies). Monitoring studies should address the aquatic community and should not target single species (e.g., community dynamics and cumulative effects). Operational alterations should be viewed as an experiment (e.g., adaptive management concepts). Data collection is especially important in light of the extremely limited information currently available.

Anticipated positive and negative effects of operational changes need to be monitored. Increases in temperature, predators, pathogens, and supersaturation and decreases in DO could eliminate any potential beneficial effects of increased flows.

Environmental Protection Agency (Robert S. Burd)

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F8-17

The EIS should include 1991 water flow alteration data. Will this information be utilized to design operations criteria? What were supersaturation complications?

F8-18

An initial test of drawdown effects on the physical and chemical environment should be conducted. There are many unknown variables involved in each of the proposed strategies, and therefore an initial information gathering period is warranted.

F8-19

Is there available information on pre-dam river flows? Pre-dam flows should be reviewed to adequately understand the evolutionary requirements of juvenile salmon.

F8-20

The relative passage success of hatchery vs. wild fish needs to be monitored.

General

F8-21

Flow augmentation options are generally preferable to reservoir drawdown to the extent that outmigration of juvenile salmon can be improved while minimizing the numerous impacts associated with lowered reservoir pools. The DEIS indicates that water quality in the Lower Snake would be slightly improved by releases from Dworshak, however it would be degraded by releases from Brownlee. Increased water velocities and depths may contribute to improved reservoir water quality (e.g., DO, temperature) thereby further assisting outmigrating juveniles and reducing predator and pathogen populations. In addition, riparian, backwater, and wetland habitat may be protected.

F8-22

Storage releases for temperature control, and further structural modifications should occur regardless of operational changes. Implementation of these non-project alterations could decrease negative operational effects. Small scale flow studies should be considered to demonstrate a) physical effects b) chemical effects and c) fish passage effects of proposed operational changes.

F8-23

The DEIS states, "Fish bypass facilities and transport could be negatively affected by most alternatives." Would increased fish passage through the turbines and reduced transport measures counteract any potential for increased fish survival? How would loss of rearing habitat further alter predictions of increased juvenile survival?

National Marine Fisheries Services (Merritt E. Tuttle)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of the Chief Scientist
Washington, DC 20230
November 25, 1991

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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November 15, 1991 F/RM03

Lieutenant Colonel Robert D. Volz
Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CEMFV-PL-XX
Walla Walla, WA 99362-9265

Dear Colonel Volz:

Lieutenant Colonel Robert D. Volz
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9265

Dear Colonel Volz:

Enclosed are comments on the Draft Environmental Impact Statement for the Columbia River Salmon Flow Measures, Options Analysis/Environmental Impact Statement. Thank you for giving us an opportunity to review the document.

Sincerely,

David Tuttle
David Tuttle
Director

Ecology and Conservation Office

Enclosure

We commend you for completing the Draft 1992 Columbia River Salmon Flow Measures Options Analysis Environmental Impact Statement (DEIS) within the short time period available, and appreciate the opportunity to review its contents and offer our comments.

The DEIS reviews a wide range of flow measures but, regrettably, does not identify a preferred alternative. We would be able to provide more specific comments if such an alternative were identified. Our comments are limited primarily to potential impacts on anadromous salmon and apply to the entire array of flow alternatives considered in the DEIS, unless otherwise indicated.

Hydrosystem Planning

It is unclear how operational changes proposed in the final EIS will be incorporated into systems planning under the Columbia River Treaty and Pacific Northwest Coordination Agreement. We recognize that ad hoc actions must be taken in the near-term since annual operating plans were developed without foreknowledge of measures contemplated for the 1991/92 operating year. However, the process by which measures targeted for the 1992/93 operating year and beyond are to be included in system planning should be discussed, at least at the conceptual level. This would enable an assessment of the likelihood that flow objectives for fish would be met under a variety of potential runoff conditions and operational constraints.

Range of Alternatives

We are concerned by the limited range of alternatives considered in both the Snake and Columbia rivers. In the Snake River, for example, the range of spring augmentation from Brownlee Reservoir is 0.2 maf of 1.0 maf capacity. The comparable figure for projects above Brownlee Reservoir is 0.3 maf of roughly 2 maf capacity. Furthermore, we note that the draft EIS does not address summer operation of Dworshak Reservoir to provide improved conditions for juvenile fall chinook migrants. So as not to foreclose such an option for 1992, we recommend that the final EIS address the potential for this additional operation.

F9-3 Alternatives identified for the lower Columbia River likewise do not reflect the full spectrum of possible actions. The use of a 200 kaf target as the only augmentation objective for the lower Columbia River seems unnecessarily restrictive. Since benefits that accrue from Snake River flow measures may be nullified by water management in downstream reaches, we encourage consideration of additional flow alternatives. The final FIS should identify flow measures which minimize juvenile fish travel time and maximize fish survival in both the Snake and Columbia rivers.

F9-4 The DEIS implies that less than 100 kaf will be available from water storage reservoirs in the upper Snake River Basin to augment flows in 1992. A much greater volume of water may be available, particularly if normal runoff conditions prevail and additional water supplies are pursued. For instance, we note that 91 kaf was released into the Snake River for fish during the period of 15 June to 11 July 1991, and an additional 200 kaf was released for fish in September 1991. The Northwest Power Planning Council has proposed that 237 kaf of stored water in the upper Snake River Basin be reserved for summertime flow augmentation. Alternatives considered in the DEIS should therefore reflect the potential for water supplies in excess of 200 kaf.

Analytical Approach

F9-5 The DEIS underscores uncertainty about the relationship between water particle travel time (i.e., mean water velocity), juvenile migration rate, and juvenile survival. This relationship is obscured further by the non-uniform distribution of velocities and migration rate of smolts within the reservoirs and within free-flowing reaches of river. We note, however, that independent analyses performed by CFWA (1991), Kindley (1991), and Giorgi (1991), and reviewed in the DEIS, found significant correlations between flow and migration rate for a variety of flow conditions. These authors have raised valid questions regarding the confounding effects of release date and level of smolt development on migration rate. There are, additionally, problems inherent to the methods used and the conditions under which the flow/travel rate data were collected. Although one may attempt, as Giorgi (1991) apparently did, to statistically control for these effects, the precise relationship between flow and travel time of wild smolts will remain uncertain until more observations are obtained. The effects of flow on short- and long-term survival will require a similar research commitment. Based on the best available information, however, we believe that flow augmentation can yield positive benefits in terms of juvenile migration and survival.

F9-6 With regard to subyearling fall chinook salmon, models developed by Berggren and Filardo (1991) found a correlation ($r^2 = 0.33$) between travel time and flow in the lower Columbia River. Although the amount of variability explained by flow alone is not very high,

F9-6 the relationship is statistically significant. Smaller data are available for fall chinook subyearlings captured, marked, and released near Astoria, Washington, and subsequently recaptured at Lower Granite Dam.

Reservoir Drawdown

F9-7 We support a feasibility study of reservoir drawdown. Our major concern is with timing of the study. We are convinced that the drawdown should be conducted during the January-February period as suggested in the DEIS when the number of fish actively migrating is at a minimum. We have concerns about drafting sediments from reservoirs to below minimum operating pool without undertaking major structural modifications of existing facilities. Many scientists are as concerned with potential negative impacts to fish from drawdown as they are hopeful about benefits. To avoid negative impacts, we offer the following recommendations for your consideration:

- 1) Conduct drawdown tests only in January or February, and in the shortest practical time interval;
- 2) Anticipate the effects of drawdown tests and design studies prior to full scale implementation using models, expert opinion, and other sources of information;
- 3) Conduct preliminary tests within a representative reach containing two reservoirs; extrapolate the results of these tests to the remainder of the river;
- 4) Provide and evaluate a range of flows that are representative of typical spring runoff levels; develop contingency plans for atypical runoff conditions;
- 5) Avoid reductions in subsequent spring and summer runoff by shifting and shaping reservoir releases to provide the flows necessary for winter drawdown tests;
- 6) Evaluate the effects of various spill, powerhouse discharge, and structural configurations (e.g., different types of screens, draft tube stoplogs, etc.) on turbine performance and other physical parameters;
- 7) Measure atmospheric gas supersaturation levels and flow patterns throughout the river, with an emphasis on areas near fish passage entrances and exits;
- 8) Monitor and, where possible, rescue fish that are imperiled during the drawdown tests (e.g., dipnet smolts from gatewalls, remove adults trapped in fish ladders, and seine fish stranded in nearshore areas);

National Marine Fisheries Services (Merritt E. Tuttle)

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F9-7 | 9) Be prepared to immediately repair any fish passage facilities
com'd | that may be damaged during the test;

10) After the drawdown study and prior to the arrival of juvenile
migrants return to reservoir levels where bypass facilities can
provide effective fish passage.

We support drawdown tests that are not likely to impair adult or
juvenile fish passage, force smolts to pass through turbines
operating at reduced efficiencies, or dewater fall chinook redds.
From measurements taken during drawdown tests it may be possible
to identify structural or operational modifications that would
improve passage conditions and collection efficiencies.

Flow Augmentation

F9-8

Since the potential for adverse biological consequences makes it
unlikely that substantial reservoir drawdown tests could occur
during the 1992 smolt passage season, we recommend that flow
augmentation continue to be used to minimize juvenile fish travel
time and maximize fish survival. The storage and subsequent
release of large volumes of water in the Snake and Columbia rivers
during the spring and summer months can improve passage conditions
for smolts of all species.

Sincerely,

Merritt E. Tuttle
Division Chief

Enclosure

cc: Columbia Basin Fish and Wildlife Authority
Bonneville Power Administration
Bureau of Reclamation
Northwest Power Planning Council

LARRY E. CRAIG

U.S. SENATE
OFFICE OF THE CLERK
WASHINGTON, D.C. 20540

United States Senate

WASHINGTON, DC 20510-1203

November 15, 1991

LTC Robert D. Volz, District Engineer
Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington, 99362-9265

Dear Colonel Volz:

Thank you for the opportunity to comment on your Draft Environmental Impact Statement (DEIS) dealing with Flow Measures on the Columbia and Snake Rivers.

I compliment you on the amount of information and analysis compiled in the DEIS in a very short period of time. I know you are on a "fast track" to filing a Record of Decision, and I hope you are able to reach a timely decision about reservoir drawdowns in the spring of 1992.

Following are some suggestions I hope you will strongly consider in completing the final EIS (FEIS).

SECTION 2.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

F10-1 I suggest that subpart 2.2.4 be expanded to describe more completely the bypass and transport of juvenile fish. This is most important since alternative actions will be compared to the NO Action alternative, which is basically how the system was being operated in 1990. Show the percentage of juveniles which are being transported or bypassed around the dams vs. the percentage which go through the turbines. The public is being misled by the media to believe that upwards of 90% of the fish are being killed by the dams. Our analysis (copy attached), which is largely based on information you have provided, shows that only about 8% of the juveniles die as a direct result of the turbines. A majority of the fish avoid the turbines via transportation and bypass. The public must understand this fact in order to fairly judge the various alternatives.

The FEIS should note that only 2% of the fish die during transport or bypass, and that effort is made to deposit fish at night in several locations below Bonneville Dam in order to reduce predation.

You mention a two day travel time for transported fish. I am told that the maximum time period for the collection, holding and transport from Lower Granite Dam to below Bonneville Dam is 5 days. That is important to include in this subpart because it further:

U.S. Senate, Idaho (Hon. Larry E. Craig)

AGRICULTURE, NUTRITION
AND FORESTRY
ENERGY AND NATURAL
RESOURCES
SPECIAL COMMITTEE
ON AGING

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emphasizes that transport offers the speediest movement of the juveniles downstream past all the dams.

F10-2

SECTION 3.0 PROPOSED ACTIONS AND ALTERNATIVES

Under subpart 3.2.3 Flow Augmentation I am requesting you examine and display the effects of an additional flow alternative which I believe might be very useful.

My suggested flow option permits greater flexibility in the transfer of flood control responsibilities from Dworshak and Brownlee reservoirs than you have described in the DEIS. Your options restrict the transfer of flood control only to Grand Coulee and only in those years when the predicted inflow to Dworshak is less than 2.6 MAF, and when the predicted inflow to Brownlee is less than 4.0 MAF. These conditions are very rare, and will only occasionally contribute to flow augmentation which will aid fish migration.

I suggest that flood control transfer not be restricted to Grand Coulee, but be transferred to other reservoirs in the coordinated system. Conditions would permit much more frequent transfer under this option with very positive benefits for fish. Absent flood control responsibility, approximately 1.4 MAF would be available in May and June (rather than March and April) from Dworshak and Brownlee to speed fish passage. I would like you to calculate the decrease in water particle travel time which will result from this option and compare it to other options in the FEIS.

F10-3

I believe Option F in the DEIS is infeasible and should be dropped from further consideration. There is not enough water in the Snake River except in extremely high water years to achieve a flow of 140,000 cfs. Even then it can't physically be delivered downstream without flooding and other significant problems. I would strongly oppose this option.

F10-4

I support your decisions in subpart 3.3 to eliminate from further consideration those alternatives which cannot feasibly be undertaken in 1992, or where the information to be gained is questionable. You must focus your energies only on realistic alternatives for next year. There is no time to do otherwise. I do foresee that additional drawdown tests may be designed for future years based on what is learned from implementation of your Record of Decision on this FEIS.

F10-5

SECTION 5.0 PLAN SELECTION AND IMPLEMENTATION

I am very concerned that your evaluation criteria may be missing an extremely important consideration. That is - using water particle travel time as a criteria does not address the value of speedy downstream movement achieved via the transportation of juveniles. In comparing alternatives, using the No Action alternative as the

U.S. Senate, Idaho (Hon. Larry E. Craig)

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base, you are drawing a fairly direct relationship between the speed of water particles and the worthiness of the alternative. The value of barging in speeding delivery of fish is being ignored.

My analysis (enclosed) reveals that in a typical year 92% of the juveniles which survive to below Bonneville Dam got there by being transported in barges. Water particle travel time in the river is irrelevant to these transported fish. It is important to the 8% which came down the river. I believe your comparison of alternatives in Table 5.4-1 and elsewhere relates only to the 8%.

It is crucial to recognize that in the base alternative a majority of the juveniles got downstream in five days or less by barge. No other alternative you are examining can match that travel time. The positive benefits of delivering the fish downstream before their natural physiological metamorphosis to salt water is no less beneficial because it was accomplished by barge.

Your comparison of alternatives must recognize that only a small proportion of the base alternative relates to water particle travel time and a very large proportion of the base does not. If 4-2 million (92%) fish in the No Action alternative are barged downstream in five days, and the remaining 8% negotiate the river in an average of 20 days, then a factor can be calculated against which the other alternatives should be measured. Such a comparison will reveal far more information than a simple notation that transportation will or will not be undertaken in various alternatives. It is my contention that the comparison of the alternatives in the DEIS overemphasizes the importance of decreases in water particle travel time.

Water particle travel time is a surrogate for measuring speed of migration. It is assumed that the speedier the migration, the greater the survival of the fish. Since transportation offers the speediest migration, the DEIS must give it full consideration.

I have one last comment. I believe an action alternative should be selected which calls for a drawdown test during the period of fish migration. I realize there are negative aspects in doing so, but I also feel we will learn more. This will be a very costly and disruptive experiment. We must get the most out of it in terms of measurable effects. Since drawdowns are specifically intended to aid migrating salmon, I believe any test should be conducted while the fish are in the river.

I hope you will find these comments useful.

Sincerely,

LARRY E. CRAIG
United States Senator

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F10-6

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Affairs
500 NE Multnomah Street, Suite 600
Portland, Oregon 97232-2036

November 21, 1991

ER 91/911

Lieutenant Colonel Robert A. Volz
District Engineer, Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Dear Lieutenant Colonel Volz:

This is in reference to the Department of the Interior letter of November 14, 1991, concerning the Draft Columbia River Salmon Flow Measures - 1992 Options Analysis/Environmental Impact Statement (EIS). The Bureau of Indian Affairs (BIA) was not able to respond in time to have their comments included in the Departmental letter. They have subsequently submitted comments that I believe to be significant. The BIA comments are:

The Bureau of Indian Affairs (BIA) believes that an alternative which would increase fish protection measures at each project through a combination of spill and improved fish guidance/passage, with a concomitant reduction in generation should be considered. BIA supports strong conservation measures which protect fish and reduce mortalities at dams to avoid problems like are now faced with listing the Snake River sockeye and salmon stocks under the Endangered Species Act.

BIA supports a "gravel-to-gravel" management for all stocks of salmon. Under such a management scheme, the habitat requirements for each life history stage must be examined to achieve maximum protection of the particular stock of concern. Each critical life history phase must be protected in order to assure survival and regeneration of runs. For salmon and steelhead, each life history phase may occupy a different habitat at a different time of the year, requiring continuous management of each segment of essential habitat in one or more ecosystems. Therefore, essential habitat must be defined in both geographic and temporal terms, in order to preserve and protect such stocks or runs of fish.

The most significant factor contributing to the decline of Columbia and Snake River salmon stocks is the mortality each suffers during its migration to the ocean. The decline of these stocks can be traced through the series of technical reports published by NMFS and others since the early 1970's. All should be part of the administrative record for this proceeding. Each

U.S. Department of the Interior (Charles S. Polityka)

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of the Columbia and Snake River hydroelectric projects provides a key element in the potential recovery of the species of concern. Fish protection and passage measures taken at each of the projects have been inadequate to compensate for the unreasonably high mortality caused by passage either upstream or downstream. Mortalities measured at individual projects by NMFS technical research staff have ranged up to 49% for various projects. The assumed mortality, adopted by convention or convenience by local biologists, is 15% per project. The cumulative mortality of eight projects means that only about 23-28% of juvenile fish survive to below Bonneville Dam from the upper Columbia or Snake River. Survival rates may be lower due to low flow and predation in reservoirs. Present operating systems do not provide the appropriate level of protection for juvenile migrants and hydropower operators must act to correct this deficiency to protect the species.

The same research which has verified the losses of juveniles at and between Columbia and Snake River projects has also demonstrated that the mortalities of juvenile fish can be significantly reduced by spilling water at appropriate times. With better spill efficiency, mortalities could decline to significantly lower levels, providing that habitat essential to continued survival of these species is protected. Protective measures such as increased spill may need to be extended beyond the present operational period in order to protect juvenile fish. Artificially limiting spill and other measures, such as increased flows in the spring freshet, have not proven successful in counteracting the serious mortality factors at each hydroelectric project. Nor have any of the fish passage related engineering changes and additions at each of the projects had any demonstrable effect on long term survival. The Corps of Engineers must acknowledge the validity of the extensive literature which leads one to these conclusions.

The Corps must also evaluate options which balance power production with fish passage and protection. Reasonable options must exist which provide an adequate level of protection for fish and allow the system to be operated to produce power. Power production may be forced into a baseload type operation, rather than be operated for peaking as has happened in the past. Power peaking, maximizes generation and revenues for power producers while making fish protection and survival an external cost of operation. Modifying power operations to incorporate steps to protect fish and reduce dam related mortalities may mean baseload or run-of-river operations for all projects. But this type of balancing merely represents the internalization of the environmental cost of power production, which, heretofore, has been successfully treated as an external economic cost. The

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U.S. Department of the Interior (Charles S. Polityka)

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present analysis does not include such an option and we recommend that this be added to the Corps report.

F11-6

It is obvious that the most critical element for the survival of salmon and steelhead stocks is the passage at mainstem dams. Independent and objective information on the optimization of fish and power objectives must be the result of this analysis. Support for the Corps action to protect Snake River stocks lies in the Indian treaties, statutes and numerous court cases. When the Corps acts, it must recognize its obligation to the tribes of the Pacific Northwest as a trustee for resources reserved by Northwest tribes in their treaties. This is a special obligation to protect these resources for its beneficiaries.

The Northwest Power Planning and Conservation Act provides sufficient statutory authority to protect stocks as suggested above. First, by examining the biological needs of the species; and, second, by then balancing factors affecting each run of fish which will contribute to the preservation of those stocks. Third, by formulating a realistic plan which protects, mitigates and enhances fish affected by hydropower operations.

F11-7

As we have noted in our previous comments, case law supports the application of conservation measures in a balanced manner. We believe that the problem of increasing survival of salmon and steelhead must be attacked directly, to reduce mortalities at and between the hydroelectric dams. Something must be done with a hydropower system which continues to "harvest" stocks of fish in an uncontrolled fashion. We believe that a revolutionary approach must be adopted by the Corps to correct deficiencies in a vast array of costly programs which have proven ineffective. Examination of the hydropower system for uniform application of all known passage and protective measures must be initiated at once. Evaluation of the effects of reduced generation, increased spill, and other measures must be started at once. Optimization of the hydropower system for fish and for power must be evaluated to achieve protection of the remaining stocks of fish in the Columbia and Snake Rivers. Additional measures must be initiated in the upper drainage to correct problems contributing to reduced survival of juveniles and to provide maximum opportunities for spawning for adult escaping to up-river habitat areas. Stream flows and water quality, and land use practices must be accounted for to assist in rebuilding these runs.

Sincerely,

Charles S. Polityka
Regional Environmental Officer

State of Idaho, House of Representatives (Jim D. Kempton)

JIM D. KEMPTON
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COMMITTEES
REVENUE & TAXATION
ENVIRONMENTAL
AFFAIRS

October 16, 1991

House of Representatives State of Idaho

Department of the Army
Walla Walla District
Corps of Engineers
Building 602, City-County Airport
Walla Walla, WA 99362-2965

Subject: Comments; Columbia River Salmon Flow Measures, Options
Analysis/EIS (:1992 Draft)

This draft document addresses an obviously complex environmental issue regarding options for assisting juvenile salmon migration downstream through the Lower Snake River and Columbia River Basin. The document is certainly detailed in presentation, but lacks information in two areas which I feel are germane.

Assuming reservoir drawdown of the four lower Snake River projects to near spill-way levels, and possibly including augmented flows from the lower Columbia projects to MOP, refill time of the reservoirs to levels sufficient to renew full river transportation will extend beyond the three month period April 15 thru June 15. The extent of this delay in river navigation, and the source(s) for augmented flow, has not been made clear. This leaves open the issue of additional economic impact for all users of ports/shipping. It also leaves open the question of where augmented refill flow might be achieved and what the related economic/environmental impacts may be.

Secondly, the "Idaho Plan", as it relates to the release of Snake River water does not constitute authority for any agency to release storage water traditionally under the jurisdiction of the Idaho Department of Water Resources; this includes Idaho Power, the Bureau of Reclamation, and the Army Corps of Engineers. (This is not addressed one way or the other.) The Director of the Idaho Department of Water Resources has notified water users who made releases last spring that they will need to apply for formal water transfers if they want to release water again in 1992.

Water transfers, or a change of use in a water right, require public notification and formal findings by the Director, Idaho Department of Water Resources. Following this, public hearings

SI-3
cont'd

may be required to address appeal of the Director's decision(s). The process may be more time consuming than this draft presumes; depending again on the degree to which Idaho storage waters are impacted. Of particular concern is the refill requirement for Brownlee. Given continued drought conditions in southern Idaho, refill of Brownlee could impact either downstream navigation, upstream water storage, or a combination of both. The obviously complex economic impacts that are possible under this scenario have not been addressed.

SI-4

The salmon issue is important to all of us in Idaho, but there is no inclination on my part to be satisfied with draft environmental plans that are vague in reference to conditions of unusual circumstance. Contingency planning, as it may relate to an impact on upper Snake River storage water, is an important aspect of this particular planning process. In the case of salmon migration during periods of drought, both environmental and water related economic impacts could be on the line for many more Idaho counties than the two addressed in the "Agricultural Area of Study" of this document.

Thank you for the opportunity to comment on this draft planning document.

SI-1

SI-2

SI-3

Jim D. Kempton

Idaho State Historical Society (Thomas J. Green)

IDAHO STATE HISTORICAL SOCIETY

CECIL D. ANDRUS, Governor

October 16, 1991

Dr. David L. Crowder
Director
210 Main St.
Boise, Idaho 83702
208 334-3890

Archaeology
210 Main St.
Boise, Idaho 83702
208 334-3847

Education
610 N. Julia Davis Dr.
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Geological Library
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Historic Preservation
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Library and Archives
610 N. Julia Davis Dr.
Boise, Idaho 83702
208 334-3356

Museum
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Old Idaho Penitentiary
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Boise, Idaho 83712
208 334-2644

S2-1
Oral History
210 Main St.
Boise, Idaho 83702
208 334-3863

Publications
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Boise, Idaho 83702
208 334-3424

Corps of Engineers
October 26, 1992
page 2

If you have any questions, feel free to contact either myself or Suzi Neitzel at 208-334-3847.

Sincerely,

Thomas J. Green
Deputy State Historic
Preservation Officer

TJG/spn
cc: John Leier, Archaeologist, USACE

RE: Draft 1992 Columbia River Salmon Flow Measures
Options Analysis/EIS

Thank you for providing our office with the draft 1992 Columbia River Salmon Flow Measures Options Analysis/EIS. The document examines water management alternatives designed to improve fish migration on the Snake and Columbia Rivers. Historic properties within the reservoirs may be affected by options that lower the reservoir elevations: Reservoir Drawdown and Flow Augmentation.

Section 2.14 of the document provides a description of known archaeological and historic sites within reservoirs areas of the Lower Snake and Lower Columbia. Reservoirs in Idaho include the Dworshak and Brownlee, and the upper reaches of the Lower Granite reservoir. Only limited portions of these reservoirs have been inspected for archaeological sites. Section 4.12 identifies effects of management alternatives which include erosion, vandalism, vehicle traffic, farming, and recreation. Mitigation of the effects is also discussed, but only in general terms.

We recommend that if the selected alternative will have the potential to affect archaeological sites, historic properties should first be identified. Following the identification process of Section 106 of the National Historic Preservation Act (36 CFR Part 800.4), archaeological inventories should be completed of reservoir areas that have not previously been inspected. Once historic properties have been identified, effects and mitigation can be discussed.

Alfred
IDAHO
HISTORICAL SOCIETY

Idaho State Senate (Marguerite McLaughlin)

COMMITTEES
FINANCE
HUMAN RESOURCES

Assistant Minority Leader
Idaho State Senate
CAPITOL BUILDING
BOISE

MARGUERITE McLAUGHLIN
DISTRICT 7
CLEARWATER, LEWIS &
KATONAH COUNTIES
HOME ADDRESS
704 FLOYD AVENUE
CROFTON, IDAHO 83844

Page 2

S3-1 As you study and review the plans for draw down of 600, 900, or 120 acre feet, remember that extreme fallout can occur both environmentally and economically to the Clearwater if moderation is not used.

Please look at the total picture. Do not devastate one area to benefit another. Let all uses share in the limitations this resource provides.

Sincerely,

Marguerite

Marguerite McLaughlin
Senator, District #7

October 16, 1991

Department of the Army
Valla District
Corps of Engineers
ATTN: Greg Graham
Building 602
City-County Airport
Valla, VA 99362-2965

Re: DRAFT - 1992 Columbia River Salmon Flow Measures

Dear Mr. Graham:

I understand the problem that the Corp is facing to address the salmon issue. I fully support reasonable and well-thought out plans for restoration of the salmon fisheries, but oppose experiments that have no factual data and could ruin one habitat while enhancing another.

In the late 1960's and 70's, we of the Clearwater Valley gave up a beautiful river to send our water over the wires. We assumed this would assure us cheaper power and contribute to flood control downriver. The promise then was to keep the pool full during the months of June, July, and August. for our growing recreation industry, and to provide transportation for the timber industry.

In the intervening years, the Dworshak pool has been held at varying levels depending on drought conditions and downriver needs.

Keep in mind that under the present plan, Dworshak already contributes a good share to several "solutions". There are fish flushes, extra for power in drought years, extra water to assist industries downriver. (Dworshak is always lowered just before the Hydroplane races at the Tri-Cities.)

Since the high dam was built near Absanka in the 1970's, this area's economy and population have been built around the water resource provided by that construction. Recreation and log transportation bring badly needed dollars into Clearwater and Nez Perce County businesses. The fish hatchery, flood control, and low cost power benefit the whole drainage.

Marguerite
IDAHO
1991-1992 SENATE

State of Montana (Stan Stephens, Governor)

State of Montana
Office of the Governor
Helena, Montana 59620
406-444-3111

October 28, 1991

STAN STEPHENS
GOVERNOR

Major General Ernest J. Harrell
Commander and Division Engineer
U.S. Army Engr. Div., No. Pac.
P.O. Box 2870
Portland, OR 97208

Dear General Harrell:

S4-1

The State of Montana has reviewed the draft Environmental Impact Statement on the Columbia River Salmon Flow Measures and is concerned that you have omitted the upper reaches of the Columbia River system (in Montana) from the scope of the EIS. As we stated during the EIS scoping process, we feel it is of paramount importance that you immediately proceed to address and include the impacts to Montana in the scope of your EIS.

The regional hydroelectric system is operated in a coordinated fashion, designed to maximize the efficiency of the system, including power production, flood control, transportation, recreation and maintenance/enhancement of fish and wildlife. Because of this coordination, any experimental drawdown on the lower Snake River or flow augmentation will have repercussions to upstream reservoirs on the Columbia, affecting some or all of the aforementioned river uses. I respectfully request that you enlarge the scope of your draft EIS to include the effects on reservoir operations in Montana.

Technical comments on the draft EIS and a listing of specific Montana concerns is being prepared and will be sent to your staff. A list of Montana contacts knowledgeable in water management, fish and wildlife biology, grain marketing and transport, industry and recreation will be included with the comments.

Your prompt attention to this project is appreciated.

Sincerely,

STAN STEPHENS
Governor

cc: Booth Gardner, Governor of Washington
Barbra Roberts, Governor of Oregon
Cecil Andrus, Governor of Idaho

EX-100 (Columbia River), EIS, Study Mgr

**IDAHO DEPARTMENT
OF
PARKS & RECREATION**

CECIL D. ANDRUS
Governor

YVONNE S. FERRELL
Director

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RECREATION BOARD**

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Secret Address
Idaho Parkview A/C

November 8, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

I would like to express the support of the Idaho Department of Parks and Recreation for an effective plan to restore the wild runs of Snake River salmon. I compliment the agencies involved for their efforts to find a workable solution. These historic runs are a part of the heritage of the northwest and it would be a tragic error if our modern society allowed them to become memories only.

I will not comment on the effectiveness of the options under review in this DEIS from a biological point of view. Fisheries science is not our area of expertise and we will leave the discussion and selection of these alternatives to those who are more qualified than ourselves. The mission of the Idaho Department of Parks and Recreation is to represent the interests of outdoor recreation and tourism and it is in this regard that I would like to address my comments and questions:

1. In the discussion of economic impacts (section 4.10.3, paragraph 1), average travel expenditures are estimated at approximately \$27 per person per day. Although this dollar figure is consistent with recent study results for travelers in Idaho, there are other categories of expenditures that have not been discussed. For example, the sale of big ticket recreation items, such as powerboats and related gear, may suffer in the areas of impact, particularly if major drawdowns were conducted for more than one year. This possibility exists because there are few alternate areas for powerboat recreation in northcentral Idaho, and because the majority of users live and make their major purchases close to the projects.

A general comment about the economic impacts of recreation and tourism is that they are well dispersed throughout the economy; they touch upon virtually every industry and extend far beyond the scope of normal "travel expenses." For example, real estate values, which are not generally thought of in this regard, are greatly influenced by the proximity of recreational offerings or aesthetics, and are in fact directly related to outdoor recreation in some cases. I would like to see a more complete discussion of economic factors relating to recreation in the final EIS.

Idaho Department of Parks and Recreation (Yvonne S. Ferrell)

Corps of Engineers
November 8, 1991
Page 2

SS-2

2. In your discussion of gross expenditures of recreational users (section 4.10.3, paragraph 2) you state that "the gross expenditure level associated with visitation changes from a given level should not be interpreted as a net loss to local or regional economies" because recreationists would shift their activity to another place or time, or substitute a new activity for their preferred one. In regard to two of the most popular activities, power boating and water skiing, there really are no suitable alternate sites within a reasonable driving time of northcentral Idaho other than Dworshak and the lower Snake River. Although some substitution of activities would likely occur, the region would definitely suffer a net loss if all reservoirs were drawn down to the point that power boating was seriously impaired.

In areas where the local economies are relatively small or non-diversified, such as the town of Orofino, the economic impact could be substantial under some of the options being considered. The existing discussion of economic impacts does not adequately convey this information.

3. In sections 4.10.2.2 and 4.10.2.3 you provide some estimates of displaced visitor days for the Lower Snake and Dworshak under various options. I would like to see more detailed information in the final EIS of how these estimates were determined. If they are based solely upon the percentage of sites that are physically unusable (section 4.10.2), then they are not only understated (as you indicate) but they are very misleading and do not provide a meaningful portrayal of the real impacts upon recreation. Our own experiences at Dworshak State Park indicate that poor aesthetics or water quality perceptions can cause sharp declines in visitation long before the facilities themselves become physically unusable.

I appreciate your efforts to clarify these concerns.

Sincerely,

Yvonne S. Ferrell

Yvonne S. Ferrell
Director

cjv/66061

SS-3

State of Washington, House of Representatives (Bill Grant)

House of Representatives

November 8, 1991
State of Washington
Olympia

Dr. Tom Morse, Commander
Walla Walla District Corps of Engineers
Building 602, City County Airport
Walla Walla, WA 99362

Dear Commander Morse:

While recognizing and supporting the need to restore Columbia River Basin salmon runs, it appears that proposed actions may be enormously at the expense of Columbia Basin farmers. With this concern I comment on both the Proposed Amendments to the Columbia River Basin Fish and Wildlife Program and the Options Analysis Document/Environmental Impact Statement. Preferably, we should avoid damaging measures, but at least we should as a region compensate farmers for losses due to salmon restoration measures.

S6-1

Lowering the water level substantially, especially behind the lower Snake River dams, can uncover irrigation system intakes. Corrective action could cost \$2-4 million per farm. Inherent in this cost is relocation of the intakes and the added energy required to lift water a greater distance. These are expenses unique to the affected farmers and are expressly attributable to salmon restoration measures. Farmers should be fully compensated for these impacts from electricity revenues.

S6-2

I believe impacts on the farmers would be far less from measures taken at Little Goose and Lower Granite than at Lower Monumental and Ice Harbor. Accordingly, I urge you to explore taking the more extreme of necessary actions, if possible, at the upper two of the four dams.

S6-3

Restorative actions will raise electric rates. This is a consequence farmers are willing to share along with others in the Northwest. However, impacts should be shared among others in the salmon cycle, such as passage improvements in both directions at the dams, irrigation diversion screening, habitat improvement, changes in hatchery operations to enhance weak wild stocks, and harvest limitations. In particular, it is not clear to me that equal impact has been imposed on the harvest component.

Your serious consideration of my concerns will be greatly appreciated.

Sincerely,

Bill Grant

Bill Grant, Chair
Energy and Utilities Committee

State of Montana (Stan Stephens, Governor)

State of Montana
Office of the Governor
Helena, Montana 59620
406-444-3111

STAN STEPHENS
GOVERNOR

November 2, 1991

Dr. Tom Morse
EIS Manager
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, WA 99362-2965

Dear Dr. Morse:

This letter contains Montana's comments on the Draft 1992 Columbia River Salmon Flow Measures Options - Analysis/Environmental Impact Statement. We appreciate the opportunity to provide you with our comments on this ambitious project.

Montana has completed a review of the Draft Environmental Impact Statement (EIS) and is concerned about the potential impacts of salmon recovery efforts on Montana. Our most urgent comment on the draft EIS is a request to include an analysis of impacts to Montana in the EIS.

The EIS fails to consider any direct or indirect effects on either the economy or the natural resources of Montana. The Columbia River Basin is an integrated system for power production and flood control operations. The reservoirs in Montana act in concert with the objectives of the rest of the region's reservoirs, complementing and enhancing the regional hydro-system's operations. The operation of Montana's reservoirs respond to the actions of other reservoirs with the objective of making the system as efficient as possible.

The exclusion of Montana from the EIS by simply assuming there will not be any operational changes in Montana's reservoirs (and thus subsequent impacts) may simplify the analysis but, in the long run, may only delay the date of the drawdown experiment. In addition, actions taken on reservoirs outside of Montana's borders also influence and impact the State. One example is the curtailment of barge traffic. The revised EIS must take into consideration the direct and indirect costs to Montana's resources and economy.

The remainder of Montana's comments, as put forth in this paper, are broken into two parts. First are detailed comments on impacts to Montana that should be considered in the revised EIS. The second part consists of comments to particular areas of the Draft EIS.

GRAIN INDUSTRY

The EIS fails to acknowledge the impacts of salmon recovery efforts on the Montana grain industry. Since we ship approximately 20% of our grain down the Snake River transport system, interruptions to river navigation and subsequent increased barge rates greatly impact Montana grain interests. A large percentage of the remainder of our exported grain is transported via rail. We are termed a "captive shipper state" with only one major rail company serving us. The only competition for shipping rates for that rail line is to truck grain to inland ports and barge grain to deep water ports. Rail rates are currently a mirror image of the truck/barge rate. Thus, Montana will incur an indirect transportation cost to grain that does not move via the barge system. The Montana Wheat and Barley Commission has estimated that every one cent per bushel increase in transportation costs results in an approximate \$1.6 million cost to the Montana grain industry.

In addition, the grain industry is concerned about rail car availability for the period of the barge shut down. As a captive shipper state, we are particularly prone to rail car shortages. With an increase in demand for cars in other states as a result of river transport curtailment, Montana grain movement could be severely restricted. Since many grain delivery contracts require a specific delivery date, a restriction in grain movement would result in a loss of market access.

As a result of salmon recovery efforts, the Montana grain industry would bear increased storage costs, increased transportation costs and a loss of market access.

If truck transportation is used as an alternative, the State of Montana will be forced to bear increased highway maintenance costs and enforcement costs associated with patrol activities and scales. Because of Montana's severe climate, roads are sensitive to spring time freeze-thaw cycles. Increased traffic during this time period would be detrimental to road surfaces. Safety issues associated with increased truck activity should be addressed as well.

Given the magnitude of the grain industry and related economies in Montana, the aggregate impact of salmon recovery efforts to the Montana economy could be significant and must be evaluated.

S7-3

S7-4

S7-5

S7-6

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S7-2

State of Montana (Stan Stephens, Governor)

POWER

The EIS fails to evaluate the social and economic ramifications of increased power rates on Montana's industries and residents. Western Montana is within the service area of the Bonneville Power Administration which is targeted for funding many of the salmon recovery efforts. Increased costs in power rates associated with these efforts will directly impair many Montana customers. The Columbia Falls Aluminum Company, for example, has estimated that a 5% increase in electric rates would cost them \$3 to \$5 million annually. Higher electric rates, coupled with the currently depressed price of aluminum (\$0.53/pound) could dramatically affect the almost 800 workers at the plant in Columbia Falls. Numerous other industries such as wood products processing and mineral processing are energy intensive and sensitive to energy costs.

Other providers of power to Montana residents and industry could also be impacted by changes in river operations. For example, the Montana Power Company, which relies on river flows below Hungry Horse reservoir for power production and who buys or sells power outside of Montana, will be affected by salmon recovery efforts. Thus, a significant portion of Montana will feel the effects of changes in power costs.

RESERVOIRS

The EIS fails to examine impacts to Libby and Hungry Horse Reservoirs. These reservoirs are part of the integrated hydropower system. As a result of the Pacific Northwest Coordination Agreement contracts, increased drafts of other storage reservoirs such as Dworshak or Grand Coulee will require a proportional draft in energy content of Montana reservoirs.

The resultant impacts from increasing drafts in Montana reservoirs for anadromous fish flows or for replacing energy or capacity lost at other projects that are modified to benefit anadromous fish survival must be analyzed in the Environmental Impact Statement. On page 3-6 of the Draft EIS the following statement appears which summarizes our point: "A number of these options would effect other projects in the system".

To further illustrate our concerns we have provided the following list of potential impacts that we feel require attention in the EIS. Although the Draft EIS is intended to address only those actions which will be confronted in 1992, the available water in 1992 is not known. Therefore, all types of water years must be addressed in the analysis.

- 1) Modeling work done by the Northwest Power Planning Council indicates that the magnitude and frequency of

S7-9
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reservoir drafting will increase at Libby and Hungry Horse. This will result in reservoir impacts such as:

S7-10

- a) Lower probabilities of refill;

S7-11

- b) Loss of benthic production, reduced terrestrial insect deposition, reduced volumes of reservoir space suitable for fish production, shifts in predator-prey concentrations, and reduced primary production, all of which contribute to decreases or stresses on native trout populations which are managed as species of special concern in Montana.

S7-12

- c) The Montana Department of Fish, Wildlife & Parks (DFWP) biologists have testified before the NPPC that reduced populations of resident trout and changes in reservoir and river operations could impact the Bald Eagle, a federally endangered species. Montana impacts could reach from the projects to the border of Idaho. This area contains 23% of the known nesting population of Montana Eagles. Although Bald Eagles have recently been the topic of proposals to downlist from endangered to threatened, opposition to this downlisting has focused on the issue of future habitat security. The proposed actions on the Snake and their resultant impacts on Montana do not promote secure habitat conditions for eagles. DFWP biologists have suggested in testimony that Endangered Species Act (ESA) Section 7 formal consultations should be initiated to fully examine the impacts on nesting and migratory eagles in Montana.

To further illustrate this point I would refer you to the 1989 Interim Development and Use EIS. This document examines the impacts on Montana Reservoirs and found that decreased reservoir levels for several months affected the food source of the Bald Eagle. Mitigation was required and implemented as a stream restoration project. This example illustrates the linkage of resident fish population health and eagle population health.

S7-13

- d) Similar correlations of prey availability have been suggested between the abundance of resident fish populations and predation by Grizzly bears. Trout populations in Hungry Horse Reservoir spawn in the South Fork of the Flathead River and its tributaries. Sixty-six percent of the Hungry Horse drainage area lies within the Great Bear and Bob Marshall Wilderness areas, which are prime Grizzly Bear habitat. Non-wilderness areas within the drainage also contain Grizzly Bear habitat. The drainage is also in close

S7-7

S7-8

S7-9

State of Montana (Stan Stephens, Governor)

S7-13
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proximity to Glacier National Park - also Grizzly Bear habitat. The importance of fish in the bears' diet should be discussed with the appropriate experts to determine if ESA Section 7 consultations are also warranted for this endangered species.

S7-14

e) The Confederated Salish and Kootenai Tribes of the Flathead Nation have expressed concerns that increased drafting of Libby and Hungry Horse reservoirs will increase the exposure of Indian archaeological and cultural resources. This may be contrary to the federal governments obligation to protect these resources pursuant to the National Historic Preservation Act and the Archaeological Resources Protection Act and the recently enacted Montana Burial Preservation Act.

2) Computer modeling work also suggests that river discharges will be modified at both projects. The impacts of these changes may include:

S7-15

a) Thermal changes in the Flathead River below the Hungry Horse Reservoir resulting in cooler river temperatures during summer periods in some years, reduced aquatic productivity and reduced growth rates for resident fish.

S7-16

b) Discharges must pass through Flathead Lake, potentially modifying the lake's ecology. Concerns expressed by the Flathead Basin Commission regarding water quality is inclusive here.

S7-17

c) Discharges must pass through Kerr Dam, Thompson Falls Dam, and Noxon Rapids Dam, which are all private projects. The change in operations at these projects must be examined to ensure compliance with FERC license constraints, economic impacts and ecologic impacts.

S7-18

d) Twenty-five or more river miles on the Lower Flathead River and possibly some reaches on the Clarkfork River are currently subject to ice scour during winter freeze events. Increasing discharge during this period could compound this existing problem, degrade channel morphology, cause local flooding and impair human safety.

S7-19

e) The ability to reliably provide minimum instream flows must be examined in light of reduced reservoir contents and/or reduced probability of reservoir refill

S7-20

3) Recreation impacts must be analyzed. The operations of these reservoirs provide or influence flat water boating, white water rafting, swimming, camping, fishing, hunting for big game and waterfowl and wildlife viewing.

Both projects are in close proximity to the Glacier-Waterton International Peace Park and many of these visitors utilize the projects enroute to and from the parks. In 1991 Glacier Park had over 2.8 million visitors.

S7-21

4) The drawdown experiment is scheduled for 1992. If there is not enough time to complete an adequate EIS analysis that encompasses Montana's concerns, we request that the drawdown experiment be delayed until Montana's concerns are addressed in the EIS.

The remainder of the comments in this paper will focus on specific statements or thoughts in the Draft EIS.

Document Specific Comments

Forecast

Virtually all of the options examined in the document rely on water supply forecast accuracy. For example:

- 1) Flow Augmentation through the Target-200 approach,
- 2) Shifts in system flood control,
- 3) Refill of storage projects,
- 4) Refill of other reservoirs drafted for fish passage.

S7-22

As Montana requested in the initial scoping of the Draft EIS, a review of historic forecast accuracy should be provided so that the risk associated with forecast error can be evaluated. In addition, contingency plans for both over-estimated and under-estimated water supplies must be prepared and presented. In the document on page 3-28 the following quote illustrates our point: "The success of such a plan would be dependent on accurate runoff forecasts". For example, the "let burn policy" of the National Park Service was a good policy; however, implementing that policy in the drought and severe conditions of 1988 was not acceptable. There must be a trigger point or a forecast level at which the continuation of the experiment is deemed unacceptable.

State of Montana (Stan Stephens, Governor)

S7-23

Monitoring

On page 3-11 of the Draft EIS is a discussion of monitoring key resources and concerns. This language should be modified to include the monitoring of economic impacts.

S7-26
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shipping lane. The Draft EIS must address this issue including the effects of dredging the lane to maintain shipping.

Pool Drawd wme

The document does a good job in evaluating the potential impacts of drafting reservoirs to aid in smolt migration. However, several additional issues need to be addressed:

1) On page 4-86 the text discusses the erosion process. It does not mention the potential for braiding of the stream as it crosses the exposed delta. It also fails to make a linkage between the increased sedimentation load and water turbidity with biological impacts. For example, what is the effect of abnormally high sediment redistribution and juvenile fish survival? What is the impact on adult survival and spawning success? If significant braiding does occur, will adults be able to access tributary spawning sites, i.e. will physical barriers be created or will adults be able to locate the tributaries?

S7-24

S7-27

Uncertainty of Benefits

The following is a quote from page ES-14 under the heading of Flow/Travel Time/ Survival Relationship: "... it is generally believed that quicker downstream passage will benefit salmon stocks, but the relationship between travel time and survival is a general one and not a quantitative expression. Therefore, it is not possible to reliably predict a specific change in juvenile fish survival that will result from a given change in water particle travel time. Moreover, the migration research that supports the general travel time/survival relationship applies only to selected stocks of fish; it does not address sockeye, and presents conflicting or contradictory results for fall chinook."

On the same page under the heading, Dissolved Gas Levels and Effects, is the following quote: "These results indicate that drawdown options causing major spill would produce gas levels shown to be lethal to fish over extended reaches. Correspondingly, there is a significant probability that these options would result in increased net mortality within the system and negate any benefits that might accrue from reduced water particle travel time."

S7-28

As illustrated by the documents numerous usage of terms such as "might", "presumably", and "some believe" there appears to be a large uncertainty as to the benefits of reservoir drawdowns. However, there appears to be much less doubt regarding the negative impacts such as the effects to agriculture, power, navigation, resident fish and wildlife and even the very anadromous fish which the drawdowns are intended to benefit. Even salmon advocacy groups are calling for the experimental drawdowns to be done when no anadromous fish are in the river.

In Section 5, Plan Selection and Implementation, screening criteria are listed to aid in selecting an alternative. Using the listed criteria, it appears that all drawdowns below minimum operation pool are unacceptable in 1992.

S7-25

2) On page 4-53 the document notes the loss of shallow-water habitat used for rearing of fall chinook. These same areas are also the most productive for benthic food sources used by rearing and migrating smolts. Dr. Bennett of the University of Idaho, in a personal communication with Montana NPCC staff suggested that in-reservoir spawning may also be occurring in some of the projects targeted for drawdown.

Given that one of the goals of the ESA and of the region is to maintain genetic variability to assure adaptability of the species, it seems vital to protect those stocks of salmon which are adapting to reservoir conditions. If, indeed, significant numbers of salmon have adapted to spawn and rear in the pools, we should cultivate and protect that population. Perhaps restoration dollars should be focused directly on projects designed to enhance in-reservoir spawning and rearing conditions.

3) Recent testimony before the Northwest Power Planning Council by officials from the Port of Portland has indicated that refilling of the drafted pools could reduce levels of the Columbia River below Bonneville Dam to a degree that restricts ship traffic in this vital

S7-26

State of Montana (Stan Stephens, Governor)

S7-28
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Even the need to conduct the drawdown experiment in 1992 is in question. The returning sockeye have been captured and placed in hatcheries. Chinook populations will have benefitted from other measures such as habitat improvement, production changes, closer attention to the existing Water Budget (which was for the first time fully implemented in the Snake River in 1991), harvest restrictions in the ocean and river and improvements in transportation practices such as handling care, loading ratios and water temperatures. In addition, flow augmentation for thermal improvement was undertaken in 1991 and will likely be repeated in 1992. Screens on the remaining dams and on important irrigation diversions will soon be in place. The region has taken a giant step forward and placed a great emphasis on all life cycles of the salmon. Should we now risk the investment in those efforts with a risky drawdown, an "experiment" with a good deal of potential to actually damage the populations we are attempting to save? The benefits are highly uncertain and have very high price tags.

The eleventh hour is no longer upon us. We have started down the road to recovery. Time is available to evaluate the alternatives in greater detail. The ESA process is designed to protect species, not force risky experiments and impose great economic hardship on the region. The region must move forward in the recovery process in a responsible manner, including identification of all potential limiting factors such as spawning sites, rearing sites, winter habitat, water quality, etc.

Power Losses

Montana is very concerned about a quote on page 4-123 which reads: "A thorough review of all these impacts for each option was not possible in the time available. As a result, the most important power impacts are estimated".

This is disturbing given the magnitude of monetary and biologic impacts that are associated with the various options. The region must move forward in a responsible manner.

We are also concerned with an additional comment found on page 4-123: "Part or all of the load shaping operation would be transferred to other projects, which would in turn experience greater pool and tailwater fluctuations". The biology of this shift must be examined and must assure that other species of salmon or resident fish are not put at risk for listing under the ESA as a result of shifting load following. What other projects? Would Montana's reservoirs and Montana's species of special concern - the Bull Trout and Cutthroat Trout, be put at risk?

Conclusion

S7-31

Because the regional hydropower system is integrated, and because of Montana's reliance on the Snake/Columbia river transport system, I strongly urge that Montana and its concerns be included in the final EIS document.

If time is the limiting factor, more time must be allocated so that an accurate assessment of impacts can be determined. Montana is willing to provide information on impacts and have assembled a list of contacts who have compiled information or can readily compile information pertaining to impacts on Montana resulting from salmon recovery efforts.

Thank you once again for the opportunity to comment. Please contact Mark Reller of my staff if you have any questions or need clarification of some points.

Sincerely,

STAN STEPHENS
Governor

cc: John Keys, Bureau of Reclamation, Boise, ID
Randy Hardy, Bonneville Power Administration, Portland, OR
Greg Graham, COE EIS Project Leader, Walla Walla, WA
Ted Hallock, Northwest Power Planning Council, Portland, OR
Michael Pablo, Tribal Chairman, Confederated Salish and Kootenai Tribes
Gil Lusk, Superintendent, Glacier National Park, Chairperson, Flathead Basin Commission
Rick Bartos, Executive Director, Flathead Basin Commission
Lake County Commissioners
Flathead County Commissioners

S7-29

S7-30

State of Oregon, Intergovernmental Relations Division (Robert Prinslow)

NOVEMBER 5, 1991

U.S. ARMY CORP. OF ENGINEERS
WALLA WALLA DISTRICT
CITY COUNTY AIRPORT
WALLA WALLA, WA 99362-2965

Subject: Environmental Assessment
COLUMBIA RIVER SALMON FLOW MEASURES OPTIONS ANALYSIS
PWS# OR911015-050-4

Thank you for submitting the subject Environmental Assessment for
State of Oregon review and comment.

Your EA was referred to the appropriate state agencies for review. No
significant comments were received on this project.

Sincerely,

INTERGOVERNMENTAL RELATIONS DIVISION

ROBERT PRINSLOW
Acting Clearinghouse Coordinator

RP

1378T

S8-1 |

State of Washington, House of Representatives (Richard P. Neher)

State of
Washington
House of
Representatives

State Representative
District 16
Richard P. Neher

Office
Capital Building
House of Representatives
Environmental Affairs

November 8, 1991

U.S. Army Corps of Engineers
Walla Walla District
Building 603
Walla Walla WA 99362

Dear Sirs:

Thank you for the materials that you have been sending and the efforts you have expended on developing the Environmental Impact Statement for the Columbia and Snake River systems. I am appreciative of your efforts to put together a salmon recovery plan before the NMFS imposes a plan on our region.

As a representative of the 16th Legislative District which includes parts of the Columbia and Snake Rivers, I have attended at least a dozen meetings and seminars relative to this subject. It is obvious that there is not a simple solution that is going to be met with acceptance from the entities involved.

Realizing that this sounds selfish for our district, I agree with most aspects of the plans being presented with the exception of the drawdown of the pools to "speed the migration" of the smolts to the ocean. What I have read from the volumes of material that I have accumulated and meetings attended, this sounds practical. However, it has not been scientifically proven to be effective. Until its effectiveness has been evaluated to be biologically sound, I do not feel that our area should be confronted with the serious economic impact of this process.

To reiterate the many other thoughts and solutions that have been presented to you would be redundant. I would like to emphasize one aspect of the plan which, from experience, I would strongly endorse. That plan is the transporting of the smolts around the obstructions in the rivers.

In the mid 1970's, I was actively involved in the leadership of the Tri-State Steelheaders, located in Walla Walla. We were confronted with the loss of migrating steelhead smolts from going through the turbines and nitrogen supersaturation at the bottom of the spillways. We worked very closely with the Corps of Engineers in the Walla Walla District and developed a plan that included screening the turbine intakes, putting "flip lips" on the spillways, and the fish transporting program.

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RESIDENCE: 1013 S. BROADWAY, WALLA WALLA, WA 99362-1001
PHONE: (509) 566-1111

Page 2
U.S. Army Corps of Engineers

S9-2
cont'd

Operation Fish has been in progress since that time and has been successful in maintaining the steelhead run in the rivers. My questions at different meetings have resulted in responses that up to 90 percent of the steelhead smolts are transported around the dams.

My thoughts are that this program should be expanded significantly to include more of the anadromous fish in the Columbia and Snake Rivers. Realizing that some of the statements have indicated that this causes disorientation of the migrating instincts, I maintain that the majority of the fish will not be exposed to the risks of the dams and be saved, therefore the lowering of the pools will not be necessary. Biologically, it apparently has not effected the migrating instincts of the steelhead so I would question the effect of the similar instincts of the salmon.

We cannot allow our economy to be seriously effected by a drawdown of the reservoirs behind the dams. A meaningful co-existence has to be established between the entities involved. However, I feel that people should receive the highest priority.

Best wishes on this enormous task.

Sincerely,

Richard P. Neher
Richard P. Neher
State Representative
16th District

S9-1

S9-2

State of Wyoming, State Engineer's Office (Sue Lowry)

THE STATE OF WYOMING

MIKE SULLIVAN
GOVERNOR

State Engineer's Office

HERSCHLER BUILDING, 4-E
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STATE ENGINEER

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SI0-1

Columbia River Flows EIS
November 12, 1991
Page 2

This draft EIS is only reviewing potential changes for the 1992 operating year. Wyoming needs to remain involved as future planning documents are completed for more permanent solutions to the problems surrounding the declining salmon populations. However, as no sales from the Water Bank will be pursued next year I see no immediate impacts to Wyoming in this EIS.

November 12, 1991

If you have any further questions regarding the issues covered by this EIS or other Columbia Basin issues, don't hesitate to contact me.

Mr. Rod Miller
State Planning Coordinator's Office
Herschler Building, 4E
Cheyenne, WY 82002

RE: Columbia River Flows EIS
SPC ID# 91-120

Dear Rod:

I have reviewed the draft Environmental Impact Statement (EIS) regarding Columbia River Salmon Flow Measures. While the upper Snake River system, including the headwaters in Wyoming, doesn't make a significant contribution to the overall flows of the Columbia, the management of the upper Snake storage facilities is mentioned in the EIS. As Wyoming has now become a space holder in Palisades Reservoir, we could potentially be impacted should the upper Snake River's storage systems be managed differently to accommodate increased downstream flows for salmon migration.

The EIS considers several alternatives. The increased contributions being considered from the upper Snake River vary from 100,000 acre feet to 300,000 acre feet above Brownlee Reservoir, which is located in Idaho above Hell's Canyon on the Idaho-Oregon state line. An option being considered includes the purchase of excess water from the irrigation districts who store water in the upper Snake River facilities. Wyoming's contract for storage in Palisades Reservoir does allow for Wyoming to market its excess water through the Idaho Water Bank. This same Water Bank could be approached for making water sales for use in supplying increased salmon flows. On page 5-5 of the EIS, they state that due to the complexities of the water rights and other water issues involved with completing a purchase from the water banks, no purchases would be pursued for the 1992 season. However, this issue will likely not be easily solved and the use of water bank purchases may materialize in the future beyond 1992.

Sincerely,

Sue Lowry
Sue Lowry
Interstate Streams Engineer

cc: Jeff Fassett
Joe White

State of Oregon, Department of Transportation (Mark Ford)

Oregon

STRATEGIC PLANNING SECTION
Room 405, Transportation Building
Salem, OR 97310

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DEPARTMENT OF
TRANSPORTATION

FILE CODE
PLA

November 14, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

**Draft Columbia River Salmon Flow Measures-1992 Options
Analysis/Environmental Impact Statement**

Oregon Department of Transportation's (ODOT) comments on the above EIS are directed towards potential transportation impacts found in section four.

ODOT believes that the EIS presents a credible demonstration of the potential transportation impacts associated with the drawdown of the pools on the Snake River. The summary statement requires more cost analysis in order to be able to judge the complete financial impact to the region's transportation infrastructure.

However, the EIS fails to take into consideration the conclusions reached in a recent Interstate Commerce Commission study (Ex Part 490) relating to the railroad grain car supply. Additionally, it is not clear in the EIS, if the railroad industry's view on car supply and rates are incorporated in the analysis.

We fully recognize that any changes to the shipping patterns on the Snake/Columbia River systems will bring about a number of economic dislocations and that some public and private sectors will suffer real dollar losses. State and local governments do not have the financial resources necessary to address these consequences. However, it is incumbent upon all of us living in the region that we work together to preserve our natural resource base along with providing continued economic growth.

ODOT will continue working with the Corps of Engineers and other interested parties in addressing this very important regional issue. We also appreciate our continued involvement in the Systems Operation Review Navigation group. It allows us to participate in the process at the staff level and gather a great deal more information than what might be available otherwise.

Mark Ford

Mark Ford
Manager
cc: Don Forbes
John Elliott

Transportation Building
Salem, OR 97310

S11-1

S11-2

State of Montana, Department of Fish, Wildlife & Parks (K.L. Cool)

Page 2
November 13, 1991

**Montana Department
of
Fish, Wildlife & Parks**

Helena, MT 59620
November 13, 1991

Greg Graham
Tom Morse
Department of the Army
Walla Walla District, Corps of Engineers
Attn: CENPW-PL-ER
Walla Walla, WA 99362-9265

RE: Draft Columbia River Salmon Flow Measures Options Analysis/EIS

Dear Sirs:

The Montana Department of Fish, Wildlife and Parks has reviewed the above referenced document and finds it inadequate. We believe the document violates the intent of NEPA because it lacks an analysis of impacts on resident fish and wildlife and recreation at Libby Reservoir/Kootenai River and Hungry Horse Reservoir/Flathead River and Flathead Lake.

Several alternatives presented by ACOE include combinations of reservoir drawdown and flow augmentation as well as storage releases for temperature control. ACOE has evaluated the impacts of these alternatives on resident fish, aquatic ecology and wildlife and recreation for the lower Snake reservoirs and lower Columbia River reservoirs, as well as Brownlee, Dworshak and Lake Roosevelt. However, no mention is made of Hungry Horse and Libby Reservoirs. Page 3-21 of the draft notes that modeling restrictions included hard constraints that the Grand Coulee pool elevation remain above 1,220.2 feet at all times. The document goes on to state that drafts below this level interrupt crucial ferry service across Lake Roosevelt and adversely affect the ability of the project to meet power emergencies and water supply requirements. It is clear that if flows are to be augmented from Grand Coulee (Options X,Y,Z) and the 1,220.2 elevation is to be honored, the water must come from upstream: that is, Libby and Hungry Horse, to augment flows for salmon. However, this fact is not mentioned anywhere in the document. Additionally, there is no analysis of the effects the drafting of these reservoirs will have on them and the rivers that would deliver the flows.

S12-3

This Department has spent several years developing biological rule curves for Libby and Hungry Horse to guide in the operation of these reservoirs to minimize impacts to resident fish, wildlife and recreation. The Department would be pleased to work with the ACOE to utilize these rule curves, and other information we have developed to assess the impacts of the alternatives to resident fish, wildlife and recreation. Without this information, the EIS will clearly be inadequate and not in compliance with NEPA.

Sincerely,

K.L. Cool
Director

drg
C:

Larry Peterman
NPPC
Eileen Shore
Chris Hunter
Jim Vashro

S12-1

S12-2

**Washington State
Department of Transportation**

Transportation Building, N.E. 601
Olympia, Washington 98504-2001
(206) 753 6005

Duane Berentson
Secretary of Transportation

November 14, 1991

Mr. Robert D. Volz
November 14, 1991
Page 2

Washington State Department of Transportation (Duane Berentson)

Comments specific to the alternatives are:

Drawdown to MOP

This option minimizes transportation impacts if, 1) the additional dredging to access port docks and 2) maintenance of adequate channel depths for barge operations (Section 4.7.1.1, page 4-95) are identified and undertaken as mitigation.

Drawdown Significantly Below MOP (April to July - 3 months)

Under this option, it is difficult to predict whether the grain will be stored or be moved. This statement is based upon our disagreement with the assumption that three-car rail rates would be used versus 25-car rail rates.

When the 25-car rail rate is used in analyzing storage versus rail shipment costs, the two options become a virtual tossup for the three-month closure. It is impossible to know in advance which of the following three options will be chosen during the three-month drawdown:

- 1) storage until barge service returns
- 2) trucking to Pasco and transshipping by barge
- 3) trucking to 25-car facilities and transshipping by rail

The answer will probably involve some of all three options.

Drawdown Significantly Below MOP (April to August - 5 months)

On page 4-99, the conversion rates from river movements to rail and truck are given. Under a prolonged closure of five months, a significant portion of the barge traffic would probably shift to rail; however, the railcar shortage noted on page 4-99 needs serious consideration. It is our opinion that with an extended closure, railcar needs versus supply must be evaluated. We estimate a railcar fleet of at least 800 will be required to be repositioned in eastern Washington to handle a total shift from barge to rail. This assumes approximately one 130-car train moving daily with a six-day turnaround cycle.

This can occur only if the following conditions exist:

- adequate advance notice is provided to the railroad by the shippers
- multiple car facilities and port transshipment capacities are available

S13-2

S13-3

S13-4

Mr. Robert D. Volz
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9265

Dear Mr. Volz:

CENPW-PL-ER

The Washington State Department of Transportation (WSDOT) has reviewed the DRAFT 1991 COLUMBIA RIVER SALMON FLOW MEASURES OPTIONS ANALYSIS-EIS distributed by your cover letter of September 23, 1991.

As your document details, drawdown options of the salmon recovery plan would have significant transportation impacts. The state's multimodal transportation system contributes to the economic vitality of the state by providing mobility and cost-effective accessibility for goods and people. From this perspective we provide comments on the Draft Environmental Impact Statement (DEIS) with reference to Section 4.7 TRANSPORTATION.

COMMENTS:

We understand that the drawdown option to be implemented in the spring of 1992 is a test. We also acknowledge the salmon recovery plan as an important goal. Should drawdowns below minimum operating pool (MOP) become a long-term (months versus weeks) annual procedure, economic and transportation adjustments in the Columbia-Snake river transportation corridor will occur. Our concern is that the "test" approach, while necessary, creates an uncertainty of closure requirements (length of time and water level) which could change over time, based upon test results. If significant transport changes are required, transportation providers, grain storage operators, and others will want to be assured investments serve a long-term need.

All options which interrupt existing transportation patterns need to be scheduled well in advance with specific beginning and ending dates. This would seem essential to shippers, barge companies and other affected businesses. Advanced scheduling provides the opportunity to adequately evaluate business options and make the necessary arrangements for competitive marketing and timely transport.

S13-1

Washington State Department of Transportation (Duane Berentson)

Mr. Robert D. Volz
November 14, 1991
Page 3

The average daily heavy truck volumes (1990) on some state highway segments in the affected area are:

Route	Segment	Average Daily Heavy Truck Traffic*
SR 195	Idaho State Line to Pullman, WA	300
SR 195	Pullman to Colfax	425
SR 127	Colfax to Ict. SR 26 (Dusty)	210
SR 127	Dusty to the Snake River	80
SR 395	Oregon State Line to Kennewick	1,900
SR 395	Pasco to Mesa	1,700
SR 395	Mesa to I-90 (Ritzville)	1,000

* Vehicle of five axles or more.

Section 4.7.3.2 (page 4-112) briefly discusses the redistribution of traffic. We are currently concerned about congestion, particularly on SR 395. The 29,600 truckloads (for three-month period) of grain currently shipped by barge (page 4-99) represent average daily truck traffic volumes of 325. The diversion of this truck volume onto SR 395 and other roadways, as discussed in the DEIS, has large potential cost impacts.

The additional roadway maintenance costs resulting from a modal shift to truck should be addressed. Section 4.7.3.2 (page 4-112) briefly discusses traffic redistribution in Washington, but fails to quantify the additional costs associated with the shift.

A 1989 research study provides a means to identify additional maintenance cost in eastern Washington when heavy truck traffic increases on county roads and state highways. With extended river closures, grain transport will likely move to existing storage facilities having rail access, as suggested in the DEIS, or to new facilities that may be developed to assure the timely and cost effective movement of grain.

While we have not evaluated specific locations of such facilities, nor the truck routing to serve the facilities, nor any decrease in road miles traveled to the river, the potential impact on the road system can be illustrated. The 1989 research study identifies the increase in

S13-5

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Mr. Robert D. Volz
November 14, 1991
Page 4

S13-6

roadway maintenance costs for each additional ton-mile of heavy cargo hauled. A conservative estimate of these costs is \$0.02 and \$0.07 per ton-mile over state highways and county roads, respectively. Costs vary based on differing environment and seasonal movements, pavement design, and traffic volumes and weights. The damage to county roads is substantially greater than to state highways because most county roads were designed for much lighter loads than currently being carried by today's grain trucks.

The farm to market haul road system is an essential link in the state's total transportation system. The example below indicates the potential cost impact a long-term drawdown could have on the roadway system.

Based on the total tonnage moved by barge in April, May and June 1990 (Table 4.7.2) and its conversion to truck (29,600 trucks at 30-ton per truck, page 4-99), the potential impact can be estimated. For this example, we assume the trucks travel a net additional ten miles on state highways and 15 miles over county roads to reach storage facilities for transfer to rail or barge. The additional roadway maintenance costs would be \$1.1 million/year for a three-month closure and \$1.8 million/year for a five-month closure, as shown in the table that follows:

Additional Annual Road Maintenance Costs

	One-Way Truck Trips	x Tons	x Miles = (Millions)	Cost per Ton-Mile = (\$000)	Cost Add.
Three Months Drawdown					
County Roads	29,600	30	15	.07	932
State Highways	29,600	30	10	.02	177
				Total	\$1,109
Five Months Drawdown					
County Roads	49,300	30	15	.07	1,553
State Highways	49,300	30	10	.02	296
				Total	\$1,849

The Department agrees that saloon are an important state resource which needs safeguards. We also view our transportation system as an essential asset which must be

S13-7

1/ Ken Casavant and Jerry Lenzi, PROCEDURES FOR PREDICTING & ESTIMATING THE IMPACT OF RAIL LINE ABANDONMENTS ON WASHINGTON ROADS, Washington State Department of Transportation, Olympia, Washington, November 1989, Page 39.

Washington State Department of Transportation (Duane Berentson)

Mr. Robert D. Volz
November 14, 1991
Page 5

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cont'd |

preserved. Prior to adopting any long-term solution to the salmon recovery issue, detailed analyses should be performed to identify total impact costs and, most importantly, who will bear those costs.

Sincerely,

DUANE BERENTSON
Secretary of Transportation

By: JAMES P. TOOHEY
Assistant Secretary
Planning, Research and
Public Transportation

DB:sc
JPT

State of Oregon, Department of Fish & Wildlife (Jim Martin)

Oregon

November 1, 1991

Lieutenant Colonel Robert A. Volz
District Engineer, Department of the Army
Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla, WA 99362-2965

DEPARTMENT OF
FISH AND
WILDLIFE

Dear Lieutenant Colonel Volz:

We reviewed the "Draft Columbia River Salmon Flow Measures - 1992 Options Analysis/Environmental Impact Statement (EIS)". We have devoted most of our efforts to reviewing Section 4.2 on anadromous fish. Unfortunately, the authors relied heavily upon a flawed internal report for background material rendering many of the conclusions of Section 4.2 invalid. After reviewing the various travel time models the COE neglected to discuss the most obvious conclusion of the review. The development of travel time models (exponential, polynomial, reciprocal or logarithmic) which use the same data yield essentially the same results. Even when different data sets were used for Snake River yearling chinook, similar trends in the relation between travel time and flow emerged with the polynomial and reciprocal models. These two models yield essentially the same predictions. The efficacy of using one model versus another is not a judgement that the COE should be making in the EIS. Rather, they should review all of the models, discuss the data being modelled and the assumptions associated with each model, and then present the range of results that are derived from these models. At this point the results should be used to present the anticipated range of results that could be expected with each alternative/option.

We believe that selection of drawdown alternative tests must be made to maximize information necessary for the long term solution. Our specific comments are as follows:

P 3-3: We are opposed to any drawdown test that would either result in substantial delay to a significant portion of a run of salmon or steelhead or impact the amount of stored water available to augment flows for downstream migrants. This concern would allow the first option but prohibit the second option after April 10. A test of the third option would be permissible prior to April 10. The fourth option would be acceptable only after successfully testing the ladder operation when adult fish are not abundant. The fifth option is not acceptable because of impacts to irrigators. The sixth option is acceptable if modified to include McNary operated at minimum operating pool. The seventh option is discussed below under flow

S14-2 augmentation. An eighth option, designed to provide information needed to implement a long-term drawdown strategy, was presented by IDFG representatives at a September 13, 1991 Corps meeting on reservoir drawdown. Under this option Lower Granite Reservoir would be drawn down to near spillway crest and Little Goose Reservoir would be drawn down 25 feet between March 1 and April 10, 1992 to determine the feasibility of using reservoir drawdown to reduce juvenile travel time while maintaining adequate adult passage conditions. We are continuing to work with the Corps to assure that an adequate test is performed with minimal impact to fish and other water users.

S14-3 **P 3-6:** Snake River Flow Augmentation. Flow augmentation is incorrectly identified as an alternative to tests of reservoir drawdown. Additional flow augmentation is needed in 1992 regardless of which (if any) drawdown alternative is selected for testing in 1992. The flow augmentation alternative (seventh option) fails to identify flows needed to assist downstream migrants, although the alternatives of meeting 85 or 140 kcfs are discussed later (p 3-8). We propose a sliding scale approach for 1992 that would provide an average flow, based on the April-July run-off forecast, of at least 85 kcfs during April-June when the forecast is less than 15 MAF, at least 100 kcfs when the forecast is between 15 and 23 MAF, and at least 120 kcfs when the forecast is above 23 MAF. We also recommend that 300 KAF be provided from storage to augment flows for summer migrants. We further recommend that flows be augmented in the Columbia River to assist Snake River migrants and others through this section of the river. We recommend a similar sliding scale, based on the January-July run-off forecast, of an average flow of at least 200 kcfs during May-June when the forecast is less than 80 MAF, at least 220 kcfs when the forecast is between 80 and 100 MAF, and at least 250 kcfs when the forecast exceeds 100 MAF.

S14-4 **P 3-10:** Columbia River Flow Augmentation. The Target 200 option discussed is proposed as a cap and inadequate to protect downstream migrants. We propose a sliding scale for meeting flow targets at The Dalles for May-June based on the January-July run-off forecast. When the run-off forecast is 80 MAF or less flows will be at least 200 kcfs. When the forecast is between 80 and 100 MAF flows will be at least 220 kcfs. When the forecast is over 100 MAF flows will be at least 250 MAF.

S14-5 **P 3-11:** The biological benefits of temperature reduction for adult fall chinook are unknown and the target of 68 degrees F has little scientific basis. We are therefore

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State of Oregon, Department of Fish & Wildlife (Jim Martin)

S14-5 opposed to any flow augmentation for temperature control that would reduce the amount of water available for spring or summer flow augmentation for juveniles.

S14-6 p 4-28: The intent of the COE EIS is to determine the benefits associated with changes in water particle velocity - either from reservoir drawdown or from changes in flow. In order to predict the anticipated benefits of a proposal one must consider the impacts that changes in velocity have on anadromous fish travel time. All of the models developed show a statistically significant relation between travel time and flow. It is true that additional factors can be used to account for some of the variability inherent in the travel time - flow relation. These variables, however, do not replace flow as an extremely important variable in determining a fish's travel time. Since a proposal is not on the table to enhance a fish's smoltification level, size, or release date, one can only assess the expected change in travel time relative to change in velocity of water. We suggest you incorporate the Berggren and Fillardo (1991) paper in this discussion. Their analysis incorporated other factors into a reciprocal model to account for variability in the relation. It should also be discussed that regardless of the model used flow is invariably one of the most influential factors (as measured statistically) determining a fish's travel time.

S14-7 p 4-29, lines 2-31: The fact that Kindley found a slower migration associated with higher flow is an artifact of the data he used. In 1989 the Clearwater trap was operated from March 29 to April 16, then pulled out of service due to high flows, and returned to service May 23 when flows had dropped again. Chinook marked at the trap were predominately Dworshak Hatchery fish through April 16 and wild stocks after May 23. Had he analyzed these two groups separately, his conclusion would have been different. The groups had obvious smoltification differences due to their one month separation in time. Therefore, it is not unexpected that his best fit flow-travel time model would be meaningless in this situation because of how he lumped the two groups together. His analysis should not be construed as showing that fish do not respond to flow.

S14-8 p 4-29, last paragraph: It is not true to state that the FPC data shows little change in travel time above 220 kcfs. The rate of change in travel time at higher flow relative to the rate of change of travel time at lower flow is less, but this is a function of the curvilinear relation between the two variables. It is important to point out that 1988 was a 73% of average runoff volume year. The FPC Annual Report recaps the in-season management that was accomplished that year. In this low water year the FPC was

S14-8 requesting that the flows be kept above the fishery minimum of 220 kcfs in the lower river. The EIS presents a biased interpretation of these data.

S14-9 p 4-30, second full paragraph: The statement that none of the data examined showed a relation between travel time and flow for subyearling chinook is incorrect. In fact, the EIS presents a study which contradicts that statement. It would be more appropriate if you were to explain that when a further study incorporated 1986-1988 data, a broader range of flows was analyzed. The 1981-1983 data was collected under a relatively narrow range of high flows and many of the travel times estimated in the NMFS studies used recoveries that were far too few (in 1982 an estimate of residence time was made on the basis of one fish recaptured) to produce mathematically reliable estimates. When these were accounted for a statistically significant ($r^2=0.33$) not "weak" relation was measured. When additional flow-related and smoltification-related variables were included the R^2 increased to 0.6 with average flow being the most influential variable. We suggest you correct this apparent misinterpretation in the EIS.

S14-10 p 4-35 para. 1: There are travel time data available for PIT tagged fish released from the Lewiston trap from 1988 to 1991, and some data for 1987 and 1988. These data are analyzed in the FPC annual reports and in IDFG reports to BPA. We suggest that you review these data and the relation described between travel time and flow and reconcile statements in this paragraph with actual data.

p 4-35 para. 5: We disagree with you regarding the ability of the models to define a relation between travel time and flow. In all cases the models (regardless of which is used) demonstrate a statistically significant relation between travel time and flow in the bivariate case.

p 4-35 last paragraph: It is unclear what is meant when it is stated that the polynomial model most closely correlated with the data. We assume that it had the highest R^2 , but that does not make it any more biologically justified. But since the data set to which the polynomial model was applied was a different set of data than was used with the other models, it can not mean that it fit all data better than the other models. Additionally, the best descriptive model for the population is not necessarily the model to which the sample of data is best fit.

S14-11 p 4-36, graph: It is unclear what is meant by the caption that denotes that the data are mean annual indices etc. An explanation would be appropriate. The linear model does not include the entire data set, but only considers a

State of Oregon, Department of Fish & Wildlife (Jim Martin)

S14-11 subset of the travel time data. It should not be included here unless all of the data are included, or it should be noted that the linear model utilizes a "partial" data set.

P 4-37, Table 4.2-4: The legend for "d" should include an explanation that travel time was estimated from Lower Granite Dam to McNary Dam (Berggren and Filardo, 1991). The results were compartmentalized among the four Snake River projects by the COE and should not be attributed to the authors.

S14-13 P 4-40, Subyearling chinook: The 1991 results for travel time of PIT tagged subyearling chinook released above Lower Granite pool demonstrated a statistically significant relation between travel time and flow. We disagree with Giorgi's "negligible" opinion of the relation that exists between travel time and flow in the lower river for subyearling fish. Once again, this relation is statistically significant. Statistical significance means that there exists an underlying relation between variables that can not be explained by chance alone. It does not translate to a measure of the importance of a relation. The subyearling travel time models' predictive capabilities in the reciprocal model are improved by the addition of other, independent variables to help account for some of the variability in the data. It also should be pointed out that Giorgi et al. (1990a) also includes a section that suggests that adult contribution of the earlier migrants is greater than of the other segments. These fish do migrate at the highest yearly flow, typically have the lowest level of smoltification, and contribute the most to adult production.

S14-14 P 4-42, top of column: Once again it needs to be pointed out that Berggren and Filardo did not arbitrarily decide on a subset of the data, as did Chapman who only considered flows above 85 kcfs. What was done was to determine a set of criteria for determining which groups represented true estimates of the population travel time. Therefore, fish that migrated in September and beyond (outside of the middle 80% of the population) were not considered true migrants, and mark groups that yielded so few recoveries at John Day were eliminated from the analysis to produce a mathematically reliable estimate. The references to "weak" relations between travel time and flow must be changed to "statistically significant" relations to represent a true statistical analysis rather than an individual's opinion.

S14-15 P 4-42, para. 3. The reference to Sims and Osslander relative to spill is not totally appropriate. Flow and spill are highly inter-correlated and, therefore, it would be virtually impossible to determine which factor

S14-15 dominates.
cont'd

P 4-43, Lower Granite Dam to Ice Harbor: The Berggren Filardo estimates are for Lower Granite Dam to McNary Dam, which the COE divided by four dams to represent the Snake River reach. It does not actually represent travel time to Ice Harbor, which makes the table caption misleading.

P 4-44, Table 4.2-8:

S14-16

It appears that the EIS is based primarily upon the opinions and conclusions contained in Giorgi (1991), "Biological issues pertaining to smolt migration and reservoir draw-down in the Snake and Columbia Rivers, with special reference to salmon species petitioned for listing under the endangered species act". This paper is not included in the EIS, and has not been circulated in draft for peer review by the agencies and tribes. This represents a serious shortfall in the process. From our subsequent review of the paper (conducted two months after it had been prepared and submitted to both the COE and BPA through the System Operation Review process) it became apparent that the document is seriously flawed since it contains many inaccuracies and misrepresentations. It would have been appropriate to circulate this document in draft to allow review and comment to occur prior to use in this document. The inappropriate use of this document has rendered much of Section 4.2, and certainly the conclusions in Section 4.2, invalid.

We hope these comments will be helpful to you. We believe they will enhance the EIS by providing a more balanced analysis and remove some of the bias contained in the present draft.

Sincerely,

Jim Martin
Chief of Fisheries

State of Oregon, Water Resources Department (William Young)

Oregon

November 13, 1991

Robert D. Volz, Lieutenant Colonel
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, WA 99362-9265

Re: Comments on the Columbia River Salmon Flow Measures Options Analysis/EIS

Dear Lieutenant Colonel Volz,

The Oregon Water Resources Department (Department) appreciates the opportunity to offer comments on the Columbia River Flow Options Draft EIS. We commend the efforts of the cooperating federal agencies to produce this document in such a short timeframe.

S15-1

The Department supports the goal of improving conditions for salmon survival in the Northwest. The state policy on Instream Flow Protection, adopted by the Water Resources Commission in 1990, states: "Protecting streamflows which are needed to support public uses is a high priority for the state." Public uses include fish and wildlife uses. Based on this policy and its underlying statutory authority, the Department supports the implementation of flow measures to improve in-river migration conditions for salmon in 1992. Our comments on the DEIS concern 1) the potential impacts on water resources and existing users, 2) the short-term nature of the proposals, and 3) the factors to be used for evaluating the success of the flow measures implemented.

Groundwater Resources

S15-2

The DEIS does not address potential impacts to groundwater resources. Lowering the reservoir pools may directly affect groundwater levels and hydrology in the alluvial aquifers adjacent to the Columbia River. In addition, irrigation water supplied by the Columbia provides substantial groundwater recharge to shallow alluvial aquifers in Oregon. How will the change in river conditions and the potential reduction of irrigated acreage affect the groundwater hydrology?

Existing Users

S15-3

The proposed actions may significantly impact irrigators, municipal and industrial water users. Estimates are provided of the acreage which may lose access to irrigation water if the reservoir levels drop below pump intakes. The DEIS should point out that additional acreage, currently served by wells near the Columbia, may also be adversely affected if groundwater levels decline in response to the altered river hydrology. The DEIS states that existing municipal and industrial uses are "small" (p. 2-13). However, we believe the impact may be more significant than indicated. The Columbia River or nearby wells provide municipal supplies to the cities of Boardman, Arlington, Umatilla, Irigoin, and Rufus, and industrial supplies to the Port of Morrow.

In its disclosure of impacts, the DEIS should include water rights requirements which may apply to water users who make changes to their water supply systems. In Oregon, a water right transfer to change a point of diversion may be required if a user modifies pumping operations to adjust to lower reservoir levels. The option of seeking alternate supplies would most likely obligate application for a water-use permit. The DEIS notes that many

Robert D. Volz
November 13, 1991
p. 2

S15-3
cont'd

WATER
RESOURCES
DEPARTMENT

Farmers do not have access to alternate supplies. The document should emphasize that all users will have difficulty obtaining new surface water supplies because little unappropriated water is available during the summer months. Groundwater is also a limited resource in much of this area. New appropriations for irrigation are not allowed from Critical Groundwater Areas and other designated basalt aquifers in the Boardman-Umatilla area. Basalt aquifers along the Columbia generally have high yields but low recharge rates. The ability of alluvial aquifers to satisfy new demands may be adversely impacted by the proposed flow measures.

Riparian/Wetland Resources

S15-4

The DEIS notes that substantial riparian and wetland resources would be lost if the Columbia River reservoir levels are reduced to minimum operating pools. Most of the impacts would be at the John Day pool. Potential mitigation of the impacts to riparian and wetland resources may include diversion of water to irrigate the affected areas. We recommend that affected agencies consult with this Department about possible water rights requirements for additional irrigation.

Short-Term vs. Long-Term Considerations

S15-5

We urge the cooperating agencies to carefully weigh the potential impacts of this one-year proposal. If long-term management changes were under consideration, an evaluation of the impacts would take on a different character. New riparian and wetland resources might begin to develop in accordance with the new water levels. Water users could plan and make investments to adjust to the new conditions. Under the proposed short-term alternatives, adjustments may begin to occur, only to be reversed if future decisions change the course of action. For this reason, we urge the selection of an alternative which to the extent possible limits the more severe impacts.

Success Factors

S15-6

We believe that it is very important that the purpose and expected results of these flow measures be clearly articulated. We understand that the purpose is to improve in-river migration conditions. Will the success of the effort be judged according to the improvement in water particle travel times and flow rates? The DEIS explains that a program will be developed to monitor changes in key resource areas. Changes relating to groundwater, existing users, and riparian/wetland impacts should be included in the monitoring program. We urge the cooperating agencies to develop the program carefully so that changes can be quantified as much as possible and need to specify actions. The cooperating agencies need to ensure that this flow "experiment" produces results that improve our understanding of this complex river system.

Thank you for this opportunity to comment. Please keep us informed of future opportunities to participate in this process. If you have any questions, please contact Rick Bastasch on our planning staff (503-378-8455, ext. 238).

Sincerely,

William H. Young

William H. Young
Director

3850 Portland Rd NE
Salem, OR 97310
(503) 378-3739
FAX (503) 378-8130

State of Oregon, Department of Land Conservation & Development (Jim Knight)

Oregon

OFFICE OF
WATER RESOURCES
SALEM, OREGON

DEPARTMENT OF
LAND
CONSERVATION
AND
DEVELOPMENT

October 30, 1991

TO: Rick Bastasch, Department of Water Resources
(WRD)

FROM: Jim Knight JBK

SUBJECT: DLCD Comments on Draft Columbia River Salmon
Flow Measures

This memo responds to WRD's recent memo sent to SWMG agencies for comments on the Columbia River Salmon Flow Measures--1992 Options Analysis and Environmental Impact Statement.

DLCD's interest in this study focuses on Section 8.0 - Compliance with Environmental Statutes.

Section 8.14 - Coastal Zone Management Act

S16-1 DLCD concurs with the study's conclusion (p. 8-4) that the proposed actions will have little or no effect on water levels or uses affecting Oregon's coastal zone which lies downstream of Bonneville Dam.

Section 8.23 - State and Local Plans and Laws

S16-2 DLCD questions the assumption at 8.23 (p. 8-6) that the proposed actions would generally be consistent with state and local plans and laws simply because of the limited applicability of state and local authorities to federal multi-purpose projects.

The document provides no information or analysis to support this conclusion. Furthermore, DLCD believes that the scope of this study and the broad range of interests which may be affected justify increased attention on the question of state and local consistency.

-2-

S16-2 Consistency issues dealing with state and local plans and requirements for land use, water quality and allocation, recreation, resource protection, economic development and public facilities and transportation are viewed as particularly important.

Please contact me at 373-0085 if you have any questions concerning our comments on this study.

<sac>SWMG.COL.RIVER.FLOW

cc: Craig Greenleaf, DLCD

Barbara Roberts
Governor

1175 Court Street NE
Salem, OR 97310-0590
(503) 373-0050
FAX (503) 362 6705

State of Oregon, Department of Geology & Mineral Industries (Dan Wermiel)

Oregon

DEPARTMENT
OF GEOLOGY
AND MINERAL
INDUSTRIES

Administrative Office

October 18, 1991

Rick Bastasch
Water Resources Department
3850 Portland Road NE
Salem, OR 97310

Dear Mr. Bastasch:

This is in response to the Draft Columbia River Salmon Flow Measures-1992 Options Analysis/EIS. These comments are prepared and submitted for the coordinated response from the State of Oregon.

The Analysis/EIS adequately addresses the previous mining and geological conditions (geology and soils) of the area in the Description of the Existing Environment section (2.4.4.5 and 2.7). It also adequately factors geological conditions into the options, with emphasis on slope movement and erosion, and sediment redistribution which would result from reservoir drawdown and flow augmentation. DOGAMI may have questions and comments in the future regarding the selection of a preferred plan.

The Agency has a computerized Minerals Information Layer Oregon (MILO) which may be useful should there be a need of an inventory of mining sites in the affected area. You may contact Jerry Gray should you want to use MILO.

DOGAMI has an interest in the energy curve in Oregon, and the plan may have an effect on energy supplies in the region. This may effect the Agency's responsibilities, such as in the area of geothermal energy development. The Agency may have future input as a plan is developed regarding its impact on the energy curve in Oregon.

October 18, 1991
Rick Bastasch
Page 2

DOGAMI can not generally provide geological input on a site specific basis regarding the geological impacts of the plan. The agency is available and will contribute any data or information at its disposal upon request.

Please call if you have any questions regarding this matter.

Sincerely,

Dan E. Wermiel

Dan Wermiel
Petroleum Geologist

DEW.lk

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State of Washington, (Booth Gardner, Governor)

STATE OF WASHINGTON
OFFICE OF THE GOVERNOR

OLYMPIA
98504-0413

BOOTH GARDNER
GOVERNOR

November 8, 1991

Lt. Colonel Robert D. Volz
Corps of Engineers
Department of the Army
Walla Walla, Washington 99362

Dear Colonel Volz:

I am forwarding to you my comments pertaining to your draft Environmental Impact Statement on Columbia River Salmon Flow Measures - 1992 Options. Attached to my general comments are detailed suggestions from individual Washington State agencies for your review.

I. The Corps Must Act

S18-1 It is imperative that the Corps undertake a major experiment in the spring of 1992 to test impacts on the river system, in pursuit of our goal of saving wild Snake River salmon.

We understand that this experiment will not answer all of our questions, particularly biological questions related to survival. But it should provide substantial information on how physical structures will respond to an operation strategy based on massive drawdowns.

II. Protect Irrigators

S18-2 I am unequivocally opposed to any 1992 experiment - or any long-term drawdown scenario - which does not permit Eastern Washington irrigators to irrigate their crops. As we change river operations, our irrigators need time to adjust by redesign and replacement of their pumping systems and extension of their irrigating pipes. Governors of this region are committed to mitigating the costs of this change. This means - at a minimum - that either the region or the Congress must pay the capital costs of pump redesign and relocation. It also means that irrigators must be granted sufficient time to complete a change of their pumps. A major part of that action is the issuance of new permits by the Corps of Engineers. The Corps should begin planning now for the necessary permit review process.

S18-3 In order to avoid a negative impact to irrigators, the 1992 experiment should be conducted above irrigating pools; that is, at Lower Granite and Little Goose. I support a four-to-six-week drawdown of Lower Granite to spillway crest, beginning March 1, 1992, while lowering Little Goose reservoir as needed to simulate a reduced tailrace. Ice Harbor and Lower Monumental would stay at minimum operating pool.

III. Focus on the 1992 Experiment

S18-4 The draft EIS is an unfortunate blend of long-term and short-term impacts. The final EIS needs to state

November 15, 1991
Page Two

S18-4 clearly the goal of this EIS, which is to conduct a proper 1992 experiment, gathering information relating to a long-term change in river operations.

S18-5 The draft recovery plan of the Northwest Power Planning Council anticipates fundamental change in operations, with a four pool drawdown on the Snake River. This EIS, however, is not and should not be an analysis of that systemic change. Therefore, the Corps should avoid using long-term impacts to impede our need for a short-term experiment. It would be inappropriate to exaggerate the costs of a 1992 experiment.

S18-6 Our critical need is for information. If the 1992 experiment demonstrates that we can successfully draw down reservoirs, a subsequent EIS should focus on biological impacts and on necessary steps for dam modification. That long-term EIS should be much more attentive than this present document to the region's effort to mitigate the impacts of drawdown operations.

IV. Openly Evaluate the Experiment

S18-7 The final EIS should clearly articulate the goals of the 1992 demonstration and how the demonstration will be evaluated. The EIS should describe an evaluation process that involves parties throughout the region, who are affected by the outcome of this action.

Of particular interest to us is: how will this EIS, and the resulting 1992 experiment, be reviewed by the National Marine Fisheries Service? In other words, how will the Corps reconcile its decision on a preferred alternative with its potential future responsibility to consult with NMFS?

Thank you for your attention to these comments.

Sincerely,

Booth Gardner
Governor

Attachments

STATE OF WASHINGTON

DEPARTMENT OF FISHERIES

115 General Administration Building, MS 41-11 • Olympia, Washington 98501 • (206) 751-6600 • DCAM 24-000

COMMENTS ON COLUMBIA RIVER SALMON FLOW MEASURES
OPTIONS ANALYSIS EIS

The Draft Environmental Impact Statement (DEIS) represents a commendable effort to coordinate information and data analysis among U.S. Army Corps of Engineers (COE), Bonneville Power Administration (BPA), and Bureau of Reclamation (BOR). The background discussion of existing conditions documents fairly well that the long-term cumulative effects of Columbia and Snake River development are the major impediment to salmon survival in the Columbia and Snake River. The discussion recognizes at least tacitly that major structural modifications and/or major flow augmentation will be required to provide significant relief for the salmon resources.

S19-1 The EIS process and the EIS document are specifically limited to 1992 actions. The document should clearly specify that the 1992 actions are intended as a first step in a process to better define and understand potential long-term actions. The document mentions a shared desire by the cooperating agencies to work on long-term actions at page ES-15, but there is no specific commitment or definition of specific process. The cooperating agencies should make a specific commitment to pursue the analysis of a broader scope of long-range alternatives to address the problem of declining salmon runs in the Columbia River Basin.

Preferred Alternative

S19-2 The DOE has sponsored several discussion meetings to design the 1992 Snake reservoir drawdown experiment. These discussions have developed an alternative, in addition to those listed in the DEIS, which concentrates on evaluation of the physical attributes of major forebay and tailwater elevation reductions at Lower Granite Dam. Under this option, Lower Granite would be lowered to approximately spillway crest and Little Goose would be lowered to approximately -20 feet. The experimental drawdown would occur in March when no juvenile and few adult salmonids are present, and would not require a reservoir refill scenario that would disrupt passage of juvenile or adult salmonids. This option thus avoids the potential for harmful effects inherent in experimental operation of the projects. The Department of Fisheries supports this alternative. We would not support an alternative that involved a drawdown experiment when juveniles are present, that would impede adult passage, or that would require a reservoir refill scenario that would disrupt juvenile or adult passage.

State of Washington, Department of Fisheries (Joseph R. Blum)

- 2 -

S19-2 The Department also urges that as part of its 1992 operations the COE operate all Lower Snake River and Lower Columbia River projects at minimum operating pool (MOP) for the majority of the juvenile migration period, April 15 to August 31.

Late Summer Temperature Reduction

S19-3 The goal of reducing the Snake River temperature to 68F to aid adult migrants is intuitively appealing, but the benefits to adult fall chinook are unknown. The Department of Fisheries recommends that this activity be closely monitored to determine its benefits and carefully weighed against the benefits of other uses of the same water (for example for juvenile migration).

Environmental Effects/Anadromous Fish

S19-4 The discussion of flow and travel time relationships presented at Pages 4-28-4-30 places undue emphasis on the differences in interpretation of flow/travel time data by the various authors and, in the process, gives the reader the impression of much less certainty in the flow/travel time relationship than is indicated by the data.

There is no doubt that the flow-travel time relationship is variable and influenced by variables in addition to flows, such as temperature, smoltification, and release date. However, all of the analyses indicate a statistically significant relation between smolt travel time and flow. The point that should be stressed is that regardless of the confounding influence of other variables, flow is consistently indicated as one of the most significant variables affecting travel time.

S19-5 The second full paragraph on Page 4-30 is especially objectionable because the "weak" correlation mentioned was statistically significant. When additional smoltification-related variables were included in a multivariate analysis, the R² value increased to 0.6 with average flow being the most influential variable. In addition, there was Snake River-specific data collected in 1991 from PIT tagged subyearlings, which is available through the Fish Passage Center and could be utilized in the EIS.

S19-6 The discussion of the effects of flow options on smolt travel time on Pages 4-35-4-44 is awkward and, at times, misleading. The figures and tables give a reasonably clear depiction of the modeled data. The text, however, tends to create confusion by making comparisons across flow levels with different options instead of between flow levels. An example of this is the discussion of Table 4-2-5 on Pages 4-36 and 4-37. Instead of emphasizing that adding 20 kcfs to 120 kcfs reduced travel time

State of Washington, Department of Fisheries (Joseph R. Blum)

- 3 -

S19-6) by less than one day, it should have been stressed that the com'd difference in travel time for 60 kcfs and 120 kcfs with reservoirs at MCP is 7.5 days.

Effects of Flow Options on Juvenile Bypass Collection, and Transport

The discussion of the influence of reduced pool evaluations on bypass/collection options is reasonably clear. The discussion of transportation is highly misleading for the following reasons:

S19-7) • The transport benefit ratios (TBR) reported from the various evaluations are transport to control ratios of observed recoveries for marked study fish. These data are not survival ratios as represented on Page 4-47.

S19-8) • The impression is given that the reported TBR's are an appropriate point of comparison for potential future in-river passage conditions, which is incorrect. The purpose of modifying reservoir levels and augmenting flows is to improve in-river passage survival over current conditions. This makes comparisons to past TBRs meaningless.

S19-9) • The reported TBRs are also a biased representation for current conditions because the control fish in the evaluations have had to be collected in the transportation facilities prior to being released as "in-river" migrants. This bias was unavoidable with past evaluation technology but does not give a clear representation of potential survival for in-river migrants bypassed at a location, such as Lower Granite or McNary, instead of collected and then released.

Dissolved Gas Saturation

S19-10) The potential risks to juvenile migrants due to increased dissolved gas saturation with 100 percent spill operations are reasonably stated. The option selected for implementation in 1992 must be carefully monitored regarding dissolved gas levels. Also, contingency plans need to be in place for modifying the implementation program if harmful dissolved gas concentrations are generated.

Effects on Habitat

S19-11) The discussion of potential effects of pool level reductions on subyearling rearing habitat may be somewhat overstated. It is certainly true that presently available rearing habitat will be reduced or eliminated in some cases. However, depending on the morphology of the reservoirs, new habitats may become available at the reduced pool elevations. Insufficient information is presented to make a reasonable determination on potential rearing habitat loss or gain.

- 4 -

Summary of Effects on Juveniles

S19-12) The concept that there is a "plateau" flow above which little or no reduction in travel time occurs is somewhat misstated. The rate of incremental decrease in smolt travel time may diminish at higher flows, but the change in travel time likely remains proportional to the change in flow. An increase of 20 kcfs at a base of 40 kcfs represents a 50 percent increase. One would expect a greater smolt response than an increase of 20 kcfs at a base of 120 kcfs, which represents a 17 percent increase. We do not concur with the analysis, which indicates a "plateau" effect. We believe that any difficulty in statistically verifying an incremental fit at high flows is due to the variability of associated factors, such as smoltification, size and temperature, and the proportional magnitude of the flow change.

S19-13) We also do not agree with the conclusion that there is no positive relationship between subyearling migrant travel time and flows. The past data is difficult to interpret because many of the test fish were probably not migrants at the time of marking and release. Recent analysis of 1991 PIT tag data for subyearling Snake River fall chinook conducted by the Fish Passage Center indicates a good correlation between flows and travel time with a substantial influence by size at marking.

S19-14) The discussion of increased travel time for smolts that could have been transported if the reservoirs were not lowered is a red herring. There is ample evidence that the present system, which relies heavily on smolt transportation, is failing to protect and preserve the petitioned species. The whole point of this exercise should be to identify a viable alternative passage scenario to transportation.

Adult Anadromous Fish

S19-15) The blockage of adult passage is one of the most significant complications of the more severe reservoir drafting options on the Snake River. The Department of Fisheries opposes the implementation of any options that block or significantly limit adult migration. The new March only drawdown option for 1992 should not affect adult salmon migration, and the level of limitation to steelhead migration is apparently acceptable.

S19-16) Dissolved gas supersaturation is also a potentially lethal factor for adult migrants and the monitoring of gas levels is critical for any option tested.

S19-17) The potential effects on spawning habitat appear to be minor and possibly positive if sediment is flushed from areas, such as the Lower Granite Tailrace and upper Little Goose pool zone. Spawning habitat effects should be a relatively minor factor in selection of options for testing.

State of Washington, Department of Fisheries (Joseph R. Blum)

- 5 -

Hatcheries

S19-18 | We are aware, Page 4-61, that operating Lower Monumental to
| spillway crest would structurally damage the Lyons Ferry hatchery
| water supply. This is not an acceptable cost of doing a test in
| 1992 or at any other time. This water supply must be protected
| from damage prior to such testing.

State of Washington, Department of Wildlife

WASHINGTON DEPARTMENT OF WILDLIFE COMMENTS ON COLUMBIA RIVER SALMON FLOW MEASURES OPTIONS ANALYSIS/EIS

The Washington Department of Wildlife recognizes the effort that the Corps of Engineers, Bonneville Power Administration and the Bureau of Reclamation put into the development of this document. To assemble the quantity of information on such a wide array of issues in the time available is a remarkable achievement in itself. However, the quantity and scope of information that had to be incorporated in the OAD/EIS almost assures that there are areas where additional information is needed or areas where clarification will help improve the accuracy of the document. We hope these comments will be useful in addressing these needs.

One aspect of the document that made analysis and comment difficult was that of short-term actions versus long-term actions. We believe that for 1992, a drawdown experiment of some nature in the Snake is the only possible action that can be undertaken. Until the information from that experiment is available, it will be impossible to talk meaningfully about a preferred option among the array presented. Because of this, many of the impacts listed in section 4 will not occur in 1992 and would be largely avoidable with long-range implementation.

Our comments are arranged to follow the table of contents of the OAD/EIS.

1.0 INTRODUCTION:

1.1 Purpose and Need (p.1.1) The last sentence should be modified to reflect the fact that the reduced water particle time does not so much interfere with physiological changes the juveniles must undergo in order to cope with the saltwater environment of the estuary and ocean as it delays the smolts long enough to cause these changes to be reversed because the smolts have not reached saltwater within the natural "window". Once these physiological changes have been reversed, the fish cannot adapt to the saltwater environment and must remain in freshwater. Although some may survive until the next spring and undergo the smoltification process again, most delayed fish will not survive.

2.0 DESCRIPTION OF EXISTING ENVIRONMENT:

- S20-3 | 2.2.4.3 Adult Passage (p. 2-17) A discussion of alternate means of adult passage at the various dams (navigation locks) and the problem of adult fallback should be included here.
- S20-4 | 2.2.4.5. Water Budget (p. 2-17) The final decisions on specific releases from storage for water budget augmentation are made by the Corps after considering requests from the Fish Passage Center.
- S20-5 | 2.3.1 Water Quality Criteria and Standards (p. 2-19 and elsewhere in the document) The factor used to convert water temperature changes from Fahrenheit to Celsius are incorrect. It appears that the formula used was the one to convert actual Fahrenheit temperatures to Celsius. A 1.0 degree change in the Fahrenheit scale is equal to a change of 0.556 degrees Celsius. A temperature reading of 1.0 degrees Fahrenheit is equal to -17.2 Celsius.
- S20-6 | 2.4.1.5 Steelhead Trout (p. 2-30) Winter steelhead are only found in the Columbia system as far upstream as Fifteenmile Creek in Oregon and the Klickitat River in Washington, both tributary to the Bonneville Pool. The difference in return timing and spawning distribution between Group A and Group B steelhead should also be explained.
- S20-7 | 2.4.4.2 Dam Development (p. 2-38) A more balanced discussion of the positive relationship between water particle travel time and smolt travel time is needed. We suggest that the paper on this topic, developed by Berggren and Filardo (1991) of the Fish Passage Center staff, be incorporated in this section rather than relying only on Giorgi and Kindley.
- S20-8 | 2.5.1 Resident Fish and Aquatic Ecology (p. 2-43) Smallmouth bass are more commonly found in mainstem reservoirs than are largemouth bass and should be included in the list of species in the first paragraph.
- S20-9 | 2.6.2.5 Big Game (p. 2-56) Antelope are not found near the Grand Coulee project and should be deleted from this list. Black bear (*Ursus americanus*) are relatively common here, however, and should be added.
- S20-10 | 3.0 PROPOSED ACTIONS AND ALTERNATIVES: The Department of Wildlife is committed to the idea that existing conditions have unacceptable impacts on juvenile salmonid outmigration time and survival and that specific operational changes are needed to overcome these effects. We also believe that the so-called Target 200 flows (200 kcfs at The Dalles and 85 kcfs at Lower Granite from April 15-June 15) do not represent a significant improvement in smolt travel time or survival as compared to existing conditions. However, the Department of Wildlife is not prepared at this time to advocate any particular alternative for flow augmentation, reservoir drawdown or a combination

State of Washington, Department of Wildlife

- S20-10
com'd
- of the two measures to achieve decreased smolt travel time, although it is our general belief that a combination of flow augmentation and drawdown will prove to be the most effective way of achieving this goal.
- S20-11
- For action in 1992, the Department of Wildlife supports the experimental drawdown of Lower Granite Reservoir either alone or in combination with a lesser drawdown of Little Goose Reservoir in order to duplicate tailwater conditions at Lower Granite that would occur under a full-scale drawdown implementation. We believe this experiment should be conducted as early in the spring as feasible in order to avoid impacting juvenile outmigration or late-migrating adult summer steelhead. Rigorous monitoring during the drawdown experiment is necessary in order to obtain as much information as possible for use in developing a long range plan of action.
- 4.0 ENVIRONMENTAL EFFECTS OF ALTERNATIVES:
- S20-12
- 4.2.1.1. Flow Effects on Survival (p. 4-28) It should be acknowledged that all of the models cited showed a statistically significant relationship between smolt travel time and flow. The discussion concentrates instead on the correlation coefficients associated with the data used in each model. Although it is true that a number of variables can affect smolt travel time, flow is statistically the most important of these. Also, there are no proposals to modify any of the other variables under consideration. The analysis should present the range of results from all of the models and use that range in assessing the various options for flow augmentation/drawdown.
- S20-13
- In the last full paragraph on p. 4-29, the Fish Passage Center's analysis of 1986-1988 data shows a curvilinear relationship between flow and smolt travel time, which means that when flows are above 220 kcfs at McNary Dam the relative rate of change is less than it is at lower flows. However, to characterize this as "little change" is inaccurate and should be corrected with a fuller explanation of the nature of the relationship.
- S20-14
- In the second full paragraph on p. 4-30, the EIS again concentrates on correlation factors to characterize the relationship between flow and smolt travel time and ignores the fact that the relationship is statistically significant. The low correlation factors in the study cited are the product of a narrow range of flows and small number of recoveries of study fish. Also, the apparent weight given the Giorgi paper in the EIS is disturbing in light of the fact that this paper has not been subjected to rigorous outside review.
- S20-15
- 4.2.1.3. Effects of Flow Options on Smolt Travel Time (p. 4.35) In the last paragraph, the reliance on correlation factors and ignoring the
- S20-15
com'd
- fact that all models showed a statistically significant relationship between flow and smolt travel time weakens the EIS. The fact that the models used different data sets means that comparisons of the coefficients of correlation for the various models are inappropriate.
- S20-16
- The caption in the lower right-hand corner of the graph on p. 4-36 is confusing. What are "mean annual indicels (sic)"? Also, we would suggest consistency in referring to the various models--what is referred to as the "Berggren & Filardo" model should be the "reciprocal" model, not just here but elsewhere in the EIS.
- S20-17
- 4.2.1.4. Effects of Flow Options on Juvenile Survival (p. 4-42) In the fourth paragraph, it should be noted that it is impossible to distinguish between spill and flow since they are so closely related. This fact should be pointed out in the comment on Sims and Osslander's findings.
- S20-18
- 4.3 Resident Fish and Aquatic Ecology We concur with the impact analysis on resident fish. Operating at MOP will likely have little adverse effect on resident fish and may even be somewhat beneficial if water levels are stable during the drawdown period. More extensive drawdowns during the spring and early summer will have strong negative effects on spawning success, benthic organisms and zooplankton populations. Lowered water temperatures will inhibit growth rates of some species.
- S20-19
- 4.3.6 Mitigation The possibility of mitigating for resident fish impacts away from the Snake or Columbia reservoirs should be included in the discussion on p. 4-73. Hatchery releases of catchable-sized trout or juvenile warm-water species into the mainstem reservoirs may not be appropriate or effective in mitigating losses and may even have adverse effects on juvenile salmonids.

State of Washington, Washington State Parks & Recreation Commission (Mike Ramsey)

WASHINGTON STATE PARKS AND RECREATION COMMISSION

7150 Creamer Lane, KY-11 • Olympia, Washington 98504-5711 • (206) 751-5255

November 13, 1991

To: Tom Elwell, Environmental Review
DOE

From: Mike Ramsey, Asst. Chief, Environmental Coordination. *MR*
Subject: 35-223-27(E-3552) Columbia River Salmon Flow Measures Options
Analysis Draft Environmental Impact Statement - Chief Timothy
State Park Impacts

S21-1 Thank you for giving us the opportunity to submit comments for the coordinated state agency response on the above noted document. The proposal has the potential to cause significant impacts on our parks throughout the Columbia and Snake River systems. We concur with the purpose and need for the proposal; however, we are concerned that any substantial drawdowns affecting our parks will cause irreversible damage that must be mitigated as described below.

S21-2 The overall effect flow reductions will have on State Parks throughout the Snake and Columbia will depend solely on where and how deep they occur. Until this is determined we can only give generalizations on impacts to our parks. However, in any of the reservoir pools where extreme elevation lowering is implemented throughout the summer months our State Parks may be considered unfit for use and may receive irreversible damage.

S21-3 This comment letter will primarily focus on the impacts of the proposed experimental 20 foot draw down of Lower Granite Reservoir for four to six weeks starting in March 1992. However, these specific comments will be generally the same for most of our parks impacted by extensive pool elevation drops. It is also important to remember that some state parks within the study area may receive more substantial impacts, while others may not be as affected.

The proposed experimental drawdown will only impact one state park, Chief Timothy State Park which is a full service overnight park receiving 227,699 visitors in 1990. Chief Timothy typically experiences a moderate amount of visitation in March. It is not uncommon to have as many as 50 - 60 campsites filled.

PAW TMTM
LWCS

Tom Elwell

2

November 13, 1991

Specific Comments:

S21-4 1. Any drawdown 9 feet below the Minimum Operating Pool Elevation will eliminate the irrigation system within the park for entire time. This may damage the lawn, but more importantly it may cause serious damage to trees and shrubs that are typically dependant on irrigated water this time of year. Lack of water directly would result in some loss. If the weather is warm and dry. Indirectly, it could weaken resistance to disease and insect infestation. However, if we have a moist Spring impacts may not be as pronounced. In this arid region maintained lawn, trees and shrubs are essential for providing cover for visitors and are aesthetically pleasing. Their loss would reduce visitation to the park. This impact must be mitigated.

S21-5 2. Chief Timothy is a very popular park for boating throughout the year, except when ice covers the reservoir. The drawdown would eliminate use of the boat launch and any potential for boating. Recreational boating is typically moderate this time of year. Additionally, for those small craft boaters that could still access the water the drawdown would create new unfamiliar shallow areas that could be hazardous.

S21-6 3. There are five docks within the park campground that would require removal prior to drawdown. If they are not removed they would be broken up by laying in awkward positions. The docks are constructed in a way that a crane will be necessary to remove them. Removal and replacement of the docks must be completed at the expense of the project proponent.

S21-7 4. Chief Timothy State Park is located on Silcott Island. Silcott Island has experienced severe erosion on its north side, which recently subsided in 1985. Lowering the pool 20 feet may increase erosion on the island. This site must be monitored during the drawdown.

S21-8 5. The drawdown may land lock and kill fish and other aquatic life, creating an unsanitary condition around the park. The project proponent has a responsibility to clean up areas where there are heavy concentrations of people. The drawdown itself will be aesthetically displeasing leaving barren river bottom, reducing recreational visitation. The rotting fish must be cleaned up as to not degrade the recreation potential further.

S21-9 6. Virtually all areas around Silcott Island would be left high and dry. Park visitors would be drawn out to areas of the shoreline not normally exposed. Some of these areas are adjacent to sharp drop-offs (dredged and natural terrain) and could be very dangerous to visitors. Also, the muddy conditions could create a hazard for falls.

State of Washington, Washington State Parks & Recreation Commission (Mike Ramsey)

Tom Elwell

3

November 13, 1991

Tom Elwell

4

November 13, 1991

If you have any questions or concerns I can be reached at 753-5769.

Cultural Resources: Chief Timothy State Park

The proposed reservoir drawdown plan for Lower Granite Reservoir (Four-Six Week Test) raises concerns about cultural resources in the vicinity of Chief Timothy State Park. No systematic cultural resource survey has been performed of the entire park although several project specific cultural resource investigations have been undertaken. At present, a single prehistoric occupation site (with a historic component) has been identified within the park (Wys in Schalk 1990: 53-65). Since previous archaeological investigations in the immediate vicinity of the park (Brauner 1976) it is apparent the potential for future archaeological site discoveries is high.

In light of these known cultural resources in the park and the potential for future archaeological discoveries within the reservoir drawdown zone the following observations and concerns are raised.

1. The four to six week Pool drawdown will expose a sizable amount of ground surface. This surface will be devoid of vegetation and thereby susceptible to erosion. For archaeologists this situation presents both opportunities and management problems.
2. Reservoir drawdowns can afford archaeologists a rare opportunity to inventory and record archaeological sites under advantageous field conditions. Drawdown zones are normally denuded of vegetation which provide good to excellent surface visibility for observing exposed cultural material. This temporary drawdown should be viewed as an opportunity to gather new and supplemental site location information. Further it can provide rare access to reservoir cultural resources to monitor the effects of long-term inundation.

S21-10

3. Cultural resources near Chief Timothy State Park will most likely suffer damage due to recreational impacts since the drawdown is scheduled during a moderate to high recreational use season. Expected types of damage include: repeated vehicle traffic over archaeological sites, looting and vandalism of exposed sites, and the cumulative effect of numerous recreational visitors individually collecting artifacts and lithic debris from the newly exposed surfaces. The area should be monitored and law enforcement personnel provided by the project proponent to reduce this impact.

S21-11

- S21-12 State Park staff concurs with the need to complete the experiment with the understanding that the above measures will be implemented. We prefer that the experiment start March 1 and last four weeks. This will keep the impacts low at Chief Timothy State Park. Anything longer will only increase impacts and may cause irreversible damage.

- S21-13 Additionally, educational materials should be provided to visitors describing the proposed drawdown and the potential impacts and opportunities visitors will have within the drawdown area.

Thank you for giving us the opportunity to comment.

References Cited:

Brauner, David R.

1976 Alpowa: The Cultural History of the Alpowa Locality. Unpublished Ph.D. dissertation, Washington State University, Pullman, Washington.

Schalk, Randall

1990 Cultural Resources Reconnaissance in Washington State Parks: Biennial Summary for 1987-1989. Center for Northwest Anthropology, Washington State University, Pullman, Washington.

W:\MPS\1\COLUMBIA.CH

cc: T.J. France, Asst. Dir., Resources Development
Dennis Smith, Asst. Dir., Operations
Bill Bush, Chief, Long Range Planning
David W. Heiser, E.P., Chief, Environmental Coordination
Kris Kauffman, P.E., Chief, Engineering and Construction
Dick Fankhauser, Chief, Site Planning and Acquisition
Tom Ernsberger, Asst. Region 4 Supervisor
Gary Long, Park Manager, Chief Timothy State Park

State of Washington, Department of Agriculture (Stuart A. Trefry)

C. ALAN PETTIBONE
Director

STATE OF WASHINGTON

DEPARTMENT OF AGRICULTURE

406 General Administration Bldg., AX-17 • Olympia, Washington 98504-0617 • (206) 753-5063

DATE: November 7, 1991
TO: Tom Elwell
Department of Ecology
FROM: Stuart A. Trefry *Stu*
Assistant to the Director
SUBJECT: Columbia River Salmon Flow Measures
Options Analysis/EIS

The Draft EIS by the Army Corps of Engineers is praise-worthy in that it represents the first real effort to present both the benefits and costs of proposals to change river operations. This is a significant step toward the development of good policy.

The WSDA has reviewed the document and has these comments:

- S22-1 | 1. We agree with the Corps cost effectiveness and biological justification criteria for the purposes of option evaluation. A river plan for 1992 should be based upon both cost effectiveness and measures of physical performance that are directly tied to a sound biological foundation.
- S22-2 | 2. The data reveal that drawdown proposals are not cost-effective when compared to the flow augmentation options. We also believe the drawdown proposals lack a sound biological justification.
- S22-3 | 3. We are concerned that increased flows garner only minimal benefits compared to the potential costs and that the economic impact costs portrayed within the EIS seem to be inconsistent for comparison purposes. Such costs which need further scrutiny are those related to electrical power, increased operation costs of irrigation pumps, siltation impacts to ports and other waterside facilities and impacts to resident fisheries.
- S22-4 | 4. When the 1992 experiment is completed, its evaluation will be crucial. WSDA urges that a broad range of biological expertise from all the constituencies be utilized in that evaluation.
5. Because we are unsure of the benefits that will accrue to the region through either drawdown or flow augmentation, we are reluctant to recommend one operations scenario over another.

State of Washington, Department of Ecology

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Mail Stop PV-17 • Olympia, Washington 98504-8711 • (206) 459-6000

14 November 1991

Subject: Comments of Washington Department of Ecology on "USCOE Columbia River Salmon Flow Measures Options Analysis/EIS"

As have other agencies, we commend the Corps for the massive job they have accomplished in so short a time. Production of this document was a gigantic effort. While much could be made of the difficulty of providing complete and definitive information on each aspect of this very complicated issue, that very difficulty is, perhaps, most instructive of all. It clearly demonstrates the lack of precise data concerning the issues involved. The effort is significant, and appreciated for what it is: a major early step along a complicated path.

We support the concept of an early-year (March-April) drawdown of Lower Granite in order to perform necessary tests of the system. We do not support drawdowns which would adversely affect water intakes on the river until those intakes have been modified to accommodate the lower pool levels. Since the current document is not specific about the tests to be performed, we are unable to precisely specify what should be done to meet test requirements; however, we intend to participate in workgroups to help refine these measures.

If elevation changes in Lower Granite pool are pursued, we wish to point out the interaction between that action and the proposed dredging of sediments near the confluence of the Snake and the Clearwater. The Corps plans to dredge over 1 million cubic yards of sediment in early 1992. The 1992 lowering of the pool would occur shortly thereafter. Since the proposed lowering would convert the reach to be dredged from lake-like to riverine, significant sediment relocation could result. If lake-lowering is going to be an integral part of long-term action plans, it would seem desirable to see how that lowering would affect accumulated sediments. This would not occur were those sediments to have been recently dredged.

We look forward to following this issue closely, both independently, and as part of the overall salmon enhancement effort. Our contact is Tom Elwell at (206) 459-6053. Please make sure he receives timely notification of significant working-group meetings. Thank you.

State of Washington, Energy Office (Jonathan A. Lesser)

REINHARD M. WALTON
Director

STATE OF WASHINGTON

WASHINGTON STATE ENERGY OFFICE

809 Legion Way, N.E., FA-11 • Olympia, Washington 98504-1211

November 15, 1991

Department of the Army
Walla Walla District
Corps of Engineers
ATTN: CENPW-PL-ER
City County Airport
Walla Walla, WA 99362

Re: Comments on "Draft Columbia River Salmon Flow Measures EIS".

Dear Sirs:

The Washington State Energy Office (WSEO) is pleased to offer these comments on the "Draft Columbia River Salmon Flow Measures - 1992 Options Analysis/ Environmental Impact Statement (EIS)". We appreciate the great deal of work that the Corps, BPA, and the Bureau of Reclamation have obviously put into this EIS, and the difficulty involved.

Our understanding is that this EIS covers a range of experiments to improve fish passage and survival down the Lower Snake-Columbia rivers for the 1992 season. We interpret the impacts as those associated with such actions being taken in 1992 and not necessarily continued beyond that time. This is a key distinction in evaluating the identified short and long-term impacts of the test plan.

The primary focus of our comments is the socioeconomic impacts identified by the Corps, encompassing estimates of job losses, replacement power costs, and additional costs of water borne shipping. We are also concerned that the Corps has not fully addressed implications of the operational requirements of the Columbia River Treaty and their impact on the Target 200 options.

Treaty Storage and Target 200.

Under Target 200 (options S, T, and U in the EIS), storage from Grand Coulee and Arrow would be used to achieve the target flow of 200 kCFS at The Dalles. There is no mention in the EIS, however, whether such releases from Arrow would be permitted in lieu of operating according to the existing guidelines for Columbia River Treaty storage facilities.

The "Columbia River Treaty Principles and Procedures for Preparation and Use of Hydroelectric Operating Plans" (POP) clearly spells out the operational guidelines for Treaty storage facilities. The POP also states that "Notwithstanding the operating guidelines . . . exchanges of capacity and energy may be substituted for releases from Canadian storage, if mutually agreed by the Entities as to quantities, timing and method". (Part II, para 9f, *emph. added*.) Nowhere in the EIS is there a discussion whether such drawdowns from Arrow have received this mutual agreement from B.C. Hydro, which is the Canadian Entity.

Corps of Engineers
November 15, 1991
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S24-2 The draft indicates (at Section 4.9.3) that Firm Energy Load Carrying Capacity (FELCC) was not assumed to change for any of the Target 200 options. The draft also indicates that a longer term analysis would show FELCC impacts from a Target 200 approach, and that their inclusion would add to cost. This apparent conflict requires some further discussion. It is not clear whether the DEIS neglects FELCC impacts because they are likely to be modest, are clearly negligible under 1992 water conditions, or are too difficult to analyze in the time available.

If the latter is the case, and the impacts are significant, then FELCC changes effect the computation of the Downstream Benefits under the Columbia River Treaty, and could result in a requirement to return additional energy to B.C. Hydro. Bonneville and the Corps should investigate this issue much more closely, as it could have significant impacts not only on federal projects, but also the five Columbia projects as well.

Impacts on Specific Areas

River Transportation

S24-3 Section 4.7.1.2 of the EIS discusses the potential economic effects of reservoir drawdowns on barge transportation. The Corps assessment of these impacts appears flawed, as estimates of economic impacts do not fully address available alternatives or time frames involved. There is also the critical question of whether the impacts - however compensated for - should be treated as economic losses. If the industry does not currently pay the full opportunity cost of water transportation, then shifts to other modes could result in societal benefits.

S24-4 The EIS has little discussion of the time-frame for impacts. Clearly, economic agents are better able to adapt over time to changes in transportation markets. In a forthcoming paper entitled "The Effect of Lower Snake Reservoir Drawdown on Barge Transportation: Some Observations," Hamilton, Martin and Casavant reach conclusions that differ significantly from those presented in the EIS. For example, the authors note that seasonal interruptions from traffic are yearly occurrences for marine traffic on the Great Lakes and upper Mississippi River. Storage and transport patterns are also influenced by future grain prices and likely sales markets.

S24-5 The discussion of impacts on the barge industry is also incomplete. Tidewater Company controls about 80 percent of the barge capacity for grain. Changes in transport costs would likely result in a shift of their additional costs to farmers. While the EIS correctly notes that competition to barges is important in keeping currently shipping costs low, the EIS assumes that a reduction in barge traffic would lead to increased rates for rail shipping. This would not necessarily occur.

S24-6 The EIS is also incomplete in that it fails to distinguish between sector impacts and societal impacts. From society's perspective, barge, rail, and truck transport are all costs. The important consideration, therefore, will be the net changes in the overall costs to society from changes in the one year experiment.

For example, the EIS does not consider that barge industry losses may be offset by gains to rail and truck transport companies. Thus, the loss estimates may be significantly overstated.

Furthermore, barge transportation benefits significantly from taxpayer contributions. Thus, even if there was an apparent increase in the overall costs of shipping goods, losses to the barge

State of Washington, Energy Office (Jonathan A. Lesser)

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November 15, 1991
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S24-6 industry could be counted as economic benefits, to the extent that modal shifts reduced the magnitude of taxpayer subsidies.

Loss Agricultural Production

S24-7 The discussion in Section 4.8.3 on the value of lost agricultural production is similarly flawed. First, the estimates involve gross impacts, and do not account for reductions in the crop production costs. Second, the estimates do not consider the possibility of mitigating crop price changes, especially for such products as potatoes and alfalfa. Third, the estimates of crop losses fail to account for shifts in production to less water intensive crops.

S24-8 A study by Weber (1989), entitled Evaluating the Economic Efficiency of Irrigation Development: A State Perspective, indicated that the returns to farmers in Washington state for many crops was negative. In the long run, this suggests that some crops provide insufficient income to cover fixed and variable costs. Eventually, such farms and crops may not survive. The EIS fails to consider this. Instead, it reports that some farmers would go out of business if the 1992 flow test were implemented. If farm returns were negative, however, these farmers would eventually go out of business. Thus, the Corps may incorrectly attribute these impacts to changes in flow by improperly measuring the No Action case.

S24-9 The Corps reports only gross losses in Table 4.8-1. Potatoes, for example, are assigned a gross value of over \$3,000 per acre. According to the estimates developed by Weber (1989), however, net returns to potatoes were slightly over \$300 per acre. Assuming the rest of the Corps' analysis is correct, losses due to reductions in potato acreage may be overstated by an order of magnitude.

S24-10 The Corps also fails to consider price changes. Reductions in irrigated acreage could increase some crop prices and reduce total agricultural losses, though there would certainly be transfers between farmers, both inside and outside the region. According to Weber (1989), the elasticity of demand for potatoes and alfalfa is such that price increases could occur with declines in crop production.

S24-11 It is unclear whether the estimated impacts would occur as the result of a one year experimental flow test. It seems unrealistic to assume that irrigators would invest over \$30 million in new pumping facilities at Ice Harbor for a one year test. It seems more realistic to assume such an investment would be made only if the flow proposal were made permanent.

S24-12 The discussion of secondary economic effects in Section 4.8.4 is oversimplified. Impacts associated with forward linkages (from agricultural producers to ports, elevator operators, and agricultural processing plants) will be difficult to estimate. Moreover, estimates on actual economic losses, as opposed to transfers of wealth, require much more careful assessment than is provided in the EIS. Such a procedure is discussed in a recent paper by Hamilton, et al., entitled "Economic Impacts, Value Added, and Benefits in Regional Project Analysis".

S24-13 It is similarly difficult to estimate impacts from backward linkages, e.g. agribusinesses supplying inputs to regional agriculture. Care must be taken to distinguish between transfers and actual economic losses. The Corps would be well advised to more carefully consider this important distinction, as the EIS equates impacts with regional economic loss.

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Page Four

Electric Power Impacts

S24-14 The cost estimates to replace lost firm energy are based on replacement by resources with real (inflation adjusted) leveled costs equal to 35 mills per kWh, or about 70 mills per kWh nominal leveled. However, if the EIS covers only a one year experiment, then it is unlikely that new, long-term resources would be developed solely for the purpose of replacing potential lost power during that year.

S24-15 The discussion of capacity impacts is inadequate. The EIS indicates that "it is generally assumed that the regional power system has a capacity surplus." The EIS should be able to identify whether the system does or does not have a capacity surplus in 1992. The EIS clouds a clearly important issue by indicating that "under some conditions, those capacity losses would not be enough to cause the system to be capacity-deficit" while "under other conditions, the system could go capacity-deficit and the costs of the losses could be substantially higher."

Because significant costs are attributed to capacity loss (roughly \$25-\$55 million per year), the assessment of this issue should be much more sophisticated. Either the estimated capacity losses do or do not impact the region's ability to meet load. If the capacity margin in 1992 is quite significant, then its loss has limited or negligible consequences. If the drawdown proposal forces capacity additions, then those costs should be easily calculated. In neither case does it appear unreasonable to value the lost capacity at Bonneville's current charge (\$4/kW/month).

Socioeconomic Impacts

S24-16 Section 4.13 discusses socioeconomic impacts of the proposed alternatives. The summary of impacts on page 4-150 is incomplete and appears to overstate total impacts. While the summary proposes to assess "Positive and Adverse" impacts, the focus is solely on "adverse" impacts. Mitigating consequences or impacts with zero or limited economic cost are not discussed. The difference is critical. While there is recognition in the EIS that many impacts will represent transfers of wealth between various parties, no such recognition is forthcoming in this summary table.

S24-17 In Section 4.13.1.1, transportation impacts discussed include potential layoffs in the barge industry, but no discussion of increased employment in rail and trucking industries. Nor is their a discussion of economic impacts based on the opportunity costs of the resources affected.

S24-18 In Section 4.13.1.2, the agricultural employment effects are difficult to verify. The estimate of 34 jobs lost per million dollars of reduced agricultural output may or may not be reasonable. The reference to Barron (1991) is not contained in the list of references at the end of the document, making it impossible to review the validity of the estimate. The figures for job creation due to pump modifications and the overall output multiplier value of 2.0 are also undocumented. Such figures are usually misleading in any event, as they equate sector impacts with economic losses. Again, from a societal perspective, job changes typically represent transfers of wealth. The estimated direct and indirect impacts are also calculated as gross impacts and not net impacts. There is no consideration of the wealth transfers that would occur.

S24-19 It is similarly difficult to review the basis for the long-term impact estimate of \$1.5 million reduction in output for drawdown of the four Snake River projects, especially if the EIS is

State of Washington, Energy Office (Jonathan A. Lesser)

Corps of Engineers
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Page Five

S24-19
cont'd

covering a one year period only? Did the Corps assume that the impacts during the year of the experiment would continue indefinitely, with no adjustments in the economy? Again, there is no documentation for this calculation. Was this figure based on application of a multiplier from an input-output (I/O) model? If so, how were dynamic adjustments in the economy over time accounted for? Did the estimates account for short- and long-term changes in crop prices and crop patterns that could result from implementation of the different flow proposals?

S24-20

In Section 4.13.1.5, recreational impacts are more likely to be distributional than cumulative. The value of recreation should also be estimated using consumer surplus estimates, not expenditure patterns. Consumer surplus may be higher or lower than observed expenditures. Definitive impact estimates would require thorough recreation surveys. Lastly, we note that the Corps states on page 5-1 that plans selection is based on the Water Resources Council's Economic and Environmental Principles for Water and Related Land Resources (Principles, 1983). In estimating socioeconomic impacts, it appears that the Corps has not followed those guidelines, as evidenced by a tendency to equate sector impacts with economic losses, or to use opportunity costs of resources as the true benchmark of losses and benefits. The correct framework is alluded to on page 5-3 of the report. We would recommend that it be moved to the socioeconomic subsection in Section 4.

Plan Selection

S24-21

The EIS states that selection of the most appropriate option cannot be done in accordance with the rules set out in the Water Resource Council's Principles (1983). In light of the information available and tight deadline, we would tend to agree. However, this raises a more fundamental question of the Corps' goals. These are not spelled out, and this makes a choice of appropriate option difficult. Is the 1992 experiment designed to gather data and make a more informed judgment about future, long-term actions? If so, only those actions that will generate the desired information should be considered. Or is the goal the first step in a long-term salmon recovery plan? In that case, continuity with future actions might be of primary importance.

Without further understanding of the Corps' goals, it is difficult to determine how information and analysis will guide the Corps' decision.

We appreciate the opportunity to comment on the Draft EIS, and we hope you find our comments useful. If you have any questions about the comments we have raised in this letter, please do not hesitate to call Jonathan Lesser (206-956-2077), or Dan Dodds (206-956-2142).

Sincerely,

Jonathan A. Lesser, Ph.D.
Energy Policy Specialist

JL/ksa
D-111-66

Federal Land Planning Coordinator, State of Wyoming (Rod S. Miller)

STATE OF WYOMING
OFFICE OF THE GOVERNOR
CHEYENNE 82002

MIKE SULLIVAN
GOVERNOR

November 19, 1991

Dr. Tom Morse, EIS Manager
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, WA 99362-9265

Dear Dr. Morse:

Agencies of the State of Wyoming have reviewed the Draft Environmental Impact Statement for Columbia River Salmon Flow Measures, 1992 Options Analysis. Attached herewith are comments resulting from that review for your use. The State of Wyoming appreciates this opportunity to provide input and requests that this office be kept informed as to future developments.

Sincerely,

A handwritten signature in dark ink, appearing to read "Rod S. Miller".

Rod S. Miller
Federal Land Planning Coordinator

Attachments

State of Wyoming, Game and Fish Department (Joe White)

GAME AND FISH DEPARTMENT

Wildlife Services, Cheyenne

Franklin D. Proctor, Director

November 7, 1991

EIS 6603
U.S. Army Corps of Engineers
Walla Walla District
Draft Environmental Impact
Statement Columbia River Salmon
Flow Measures - 1992 Options
Analysis
SIN: 91-120

Rod Miller
State Planning Coordinator's Office
Herschler Building, 4th Floor East
Cheyenne, WY 82002

Dear Mr. Miller:

The staff of the Wyoming Game and Fish Department has reviewed the Draft Environmental Impact Statement for Columbia River Salmon Flow Measures, 1992 Options Analysis. The draft EIS does not directly apply to Snake River operations within Wyoming and we therefore have no comments on this document.

Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in dark ink, appearing to read "Joe White".
JOE WHITE
DEPUTY DIRECTOR

JW:TC:as
cc: Game Division
Fish Division
BAIS Division
USFWS

The seal of the Wyoming Game and Fish Department, featuring a bison in the center, surrounded by a circular border with the text "WYOMING GAME AND FISH DEPARTMENT".
Franklin D. Proctor, Director

State of Montana, Department of Agriculture (E.M. Shortland)

STATE OF MONTANA
DEPARTMENT OF AGRICULTURE

OFFICE OF THE DIRECTOR
AGRICULTURAL RESEARCH BUILDING
CAPITOL BUILDING
HELENA, MONTANA 59601

STAN STEPHENS
DIRECTOR

RECEIVED
AUG 21 1991

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RECEIVED SHORTLAND
AUG 21 1991

October 31, 1991

MEMORANDUM

TO: John C. Brenden and Stan Grace
Northwest Power Planning Council

FR: E. H. Shortland
Director

RE: Salmon Recovery Proposal Questions

I asked the staff at the Montana West and Barley Committee to address the five questions you requested information on in your memorandum of August 21, 1991. Mr. Jim Christensen's response is attached.

If we can provide additional information and be of further assistance, please call.

WRP/pb/Samsun.310
Attachment
cc: Jim Christensen
Mike Murphy
Ralph Peck

Wheat & Barley Committee

750 Bluff Street N.W. - P.O. Box 2024, Great Falls, Montana, 59403-2024

OCTOBER 31, 1991

TO: Mike Murphy
FROM: Jim Christensen

RE: Salmon Recovery Proposals and Impacts to Montana

1. Identify (in general terms) the region(s) of Montana that typically transport grain by truck to the Snake/Columbia River system.

The origination for grain movement to the Snake/Columbia River is not limited to any specific geographic area in Montana, and as a matter of fact, some of this traffic originates in North Dakota. There are some elevators in the state that are used exclusively to the river. In the Missoula area for example, and many elevators around Montana that do not have unit rail train loading capacity and must move grain by truck to a unit train loading facility, to local grain at Butte, to a commercial flour mill either in Montana's borders or interstate, or to the Snake/Columbia River system. However, the major factor in originating truck grain hauls to the river is the necessity to use grain as a "backhaul" for other freight. For example, a truck may load fertilizer at Lewiston, Idaho with the destination in southern Idaho, take on a load of potatoes for Lethbridge, Alberta, drop down across the border and pick up a load of Hard Red Spring wheat at Scobey, and haul it to United Grain's large loading facility at Clarkston on the Snake River. Certainly, that spring wheat could have gotten from Plantwood to Portland for export without the use of a truck, but the grain hauling leg of this excursion made the total equation economically viable.

2. Estimate the number of trucks required to haul the grain.

There is currently an average of 277 commercial vehicles (trucks) using Highway 12 per day between Missoula, Montana and the Snake/Columbia River System. The commodity group that involves the largest percentage of all commercial vehicles is processed lumber followed by logging trucks, general freight, grain trucks, and petroleum. Grain trucks account for 11% of the total commercial

Jim Christensen Executive Vice President Telephone (408) 761-2752 Fax (408) 761-2831

State of Montana, Department of Agriculture (E.M. Shortland)

traffic.

3. Supply an average price (or range of prices) per mile per bushel of grain hauled.

From Montana, for rail, the average cost per mile is \$1.34 per ton to Portland, and for truck, the per mile cost is \$6.07 per ton to the same destination. This per mile cost for a ton of wheat moving by horse from Lewiston, Clarkston, or Wilsa to Portland is \$1.02. The combination rate, truck/horse from Montana to Portland, is in most cases, more expensive than an exclusive use of the rail mode. This combination rate would very rarely be cheaper. However, as mentioned before, some elevators are unable to use the railroad, either because of their facility limitations, their limited inventory may make it undesirable to order rail service, the railroad may not have rolling stock available, or short-lived opportunities in grain price fluctuations may necessitate a more speedy delivery than is generally available when utilizing the railroad.

4. Estimate the costs to Montana of rail prices for shipping grain increases by \$0.01, \$0.05, or \$0.10 per bushel and identify who would most likely be forced to absorb those costs (assuming historic levels of sales) ----- 5. Estimate the volume of sales lost through loss of access to markets.

All wheat purchased in Montana is priced to the farmer as though it were going to Portland for export, regardless of its ultimate disposition. The local elevator price, then, is determined by taking the FOB Portland price and subtracting transportation costs to Portland and the local elevator's handling charges. Thus, any increases incurred in transportation costs between the local Montana elevator and Portland will be deducted from the prices paid to the farmer. In other words, any increases in transportation costs are paid by grain producers. Taking a worse case scenario, if the Snake/Columbia basin system were unavailable for a three month period, and the export facilities have a three week storage capacity at the terminus of the barge system, the results would be a loss of nine weeks for the waterway share of deliveries to the export market. Currently, 19% of the supply of grain moving to Portland for export is moved by barge. The Portland facilities do not have the capacity to handle additional rail cars that would be needed to meet the demand. Not only are they unable to unload that many more additional hopper cars, the railroad itself does not have the reserve rolling stock capacity to build additional storage capacity, normally move by barge. In any case, it would not be economically feasible for port facilities to invest in additional hopper cars for a nor for the railroad to exist for only nine weeks out of the year. Any additional costs, should the volume normally moved by barge be moved at all, would be absorbed by the farmer-producer. However, it is much more likely that the sales opportunities in the export market during the nine week shutdown would simply be lost. Foreign customers would go elsewhere to make their purchases -- at best,

the death toll up to 100,000, and the loss of the 100,000, or 10% of the population, may have been averted if the 100,000 had been mean lower prices in Montana.

If foreign supplies were to be used to meet the demand for the death of the Snake/Columbia basin system by not carrying the barge each year, because of the near-availability of lower quality Montana wheat, the nonavailability more export business than the 25% percentage of the barge total that originated in Montana. A high percentage of Montana hard red winter wheat is on-shipped with soft winter wheat from Washington, Oregon and Idaho. Without cost wheat volume, hard red wheat volume would drop remarkably. It is impossible to quantify the resulting costs of a disruption of the barge delivery system. Alternative transportation costs under this hypothetical stressed situation would likely not be comparable to the costs Montana is experiencing today. Montana is, after all, a western shipper, and one must assume that the railroad would take advantage of one distress with higher rates. The user could very well be said to be distressed. It is equally unorthodox to suggest that the barge would total to one produced if 10 million bushels of wheat were available for export for a nine week period at Portland. Whatever those costs might be, suffice it to say the Montana economy could not bear them.

*Montana Department
of
Fish, Wildlife & Parks*

1420 East Sixth Avenue
Helena, Montana 59620
October 25, 1991

Mr. James Goller, Chairman
Northwest Power Planning Council
831 S.W. 6th Avenue, Suite 1100
Portland, OR 97204-1348

Dear Mr. Goller:

The recovery of the Columbia River drainage salmon is important to all of us as residents of the Pacific Northwest. But as managers of Montana's fishery resources, we cannot let the recovery take place at the expense of our resident fisheries. One of the key issues the Council raises is trade-offs between resident fish and wildlife resources and anadromous fish improvements. For Montana there are no trade-offs. We have no anadromous fish. Our responsibility is the protection of our resident fish and wildlife.

The proposed operational alternatives will all affect Montana's resident fish and wildlife resources. The most obvious impacts will be to reservoir fisheries and recreation, due to both the increased frequency that Libby and Hungry Horse will not refill and the magnitude of the drawdowns in dry years. The drawdowns affect reservoir productivity as well as spawning and rearing.

The Department has spent several years developing Biological Rule Curves (BRC) for these reservoirs. Preliminary biological model runs comparing the BRC's to the NPPC base case and the three proposed alternatives, indicate that a significant reduction in fish production will result under the proposed operation plans.

The base case itself, which reflects 1992 PNCA constraints, is more damaging to the reservoir fisheries than were historic operations. The BRC's designed to mitigate for past operations are exceeded by the base case during more than half of the period of record. Operational alternatives showing no significant change when compared to the base case may be viewed as not affecting reservoir fisheries. In reality, losses in fishery production are significant during years in which the alternative operations differ only slightly from the base case. Nearly a decade of effort directed at the maintenance and enhancement of the reservoir fisheries could be hampered by the base case operational constraints and proposed alternatives. In most years, the alternatives result in greater impacts than the base case.

Mr. James Goller
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A comparison of the three alternatives revealed that the hybrid proposal is the least desirable alternative. Although the biological effects of the firm planning and operational alternatives are similar, the operational alternative is the most desirable option (other than the base case) during more years. (Please refer to enclosed bar charts).

We have recommended that the Hungry Horse Reservoir reach full pool by July 1, and remain at full pool through September 15. After September 15, drafting should be conservative to not exceed -34 feet (3,526 msl) by December 31, prior to the first inflow forecast. During an average water year (100 percent of normal), the trajectory of the draft could increase toward elevation 3,496.5 msl (-63.5 feet) on January 31, allowing for increased generation during the cold month. The draft rate would then decrease toward 3,485 (-75 feet) on April 15. After April 15, the reservoir would store spring runoff and fill on July 1.

For Libby Reservoir, drawdown should be limited to elevations dictated by flood control constraints prior to January 1, or the first inflow forecast. We recommend following a BRC upon receipt of each inflow forecast. We will continue to coordinate dam operation with downstream concerns to achieve an integrated solution.

We recommend that an alternative be evaluated that withholds water in Libby and Hungry Horse through the winter explicitly for release during the salmon water budget period. This alternative has similarities to the Firm planning and Operational alternatives which strive to withhold water in Grand Coulee for later release. A later release from Libby and Hungry Horse would aid in the salmon recovery while maintaining higher production of resident fish in Montana if maximum drafts after April 16 are limited so that the refill probability is not compromised.

In addition to the reservoir fisheries, we have concerns regarding the effects of the proposals on bull trout, a native Species of Special Concern. If Hungry Horse is drafted deeply in the spring, in very dry years there may not be adequate flows to support bull trout spawning runs from Flathead Lake. In addition, the drawdown of Hungry Horse could affect productivity of bull trout inhabiting Hungry Horse and South Fork of the Flathead.

The Army Corps of Engineers (ACOE) Draft FIS on 1992 operations, which includes many of the same actions described in these amendments, does not even acknowledge the existence of Hungry Horse and Libby. ACOE has made absolutely no attempt to describe the impacts to Montana's resident fish and wildlife associated with its proposed 1992 operations. We hope the Council will consider the

Montana Department of Fish, Wildlife & Parks (Larry G. Peterman)

Mr. James Goller
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October 25, 1991

Montana resident fish and wildlife issues carefully. We have attached our recommendations for Hungry Horse operations to this letter for your information.

I would like to comment on a few specific additional items:

III. 2. Predation

The performance standard should be expressed without reference to a particular predator.

B. Measures - MDFWP believes the expansion of the squawfish control program to additional reservoirs prior to completion of the evaluation at John Day is a very costly and inappropriate measure.

III. 3. Transportation

B.10. We do not support the proposed evaluation of the feasibility of constructing an alternative stream channel adjacent to the river to transport smolts to below Bonneville Dam.

III. 4. Flow, Velocity and Temperature Improvements

We believe there is untapped potential in energy exchanges that could contribute toward resolving the flow problems in the Columbia. We direct the Council's attention to the 1991 report to Pacific States Marine Fisheries Commission, by Jim Lazer, titled "Electric Power Resource Evaluation for Improved Fish Migration".

B.5.a.3 - MDFWP supports this measure describing Bonneville's responsibilities regarding testing and evaluation of additional measures to increase survival. We will take an active role in these efforts.

V.B.3.a. Montana should be represented on the Integrated Hatchery Operation Team. All members expenses to participate on this team should be paid.

Mr. James Goller
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At your November meeting in Helena, you will take action on the Hungry Horse mitigation plan. This plan is based upon almost 10 years of research, analysis and public input. It is designed to repay the citizens of the state for the fishery losses Montana incurred by the construction and operation of Hungry Horse Dam. The bull trout and westslope cutthroat, native species of Special Concern, were hardest hit by that development and are an important component of the mitigation plan. On that same day, you will take action on these mainstem survival, harvest and production amendments. We sincerely hope that your actions on the mainstem amendments do not negate your action on the Hungry Horse Mitigation Plan.

Sincerely,

Larry G. Peterman
Larry G. Peterman
Administrator
Fisheries Division

dry
Enclosure
C: MT NPPC Members
Joe DosSantos

State of Idaho (Cecil D. Andrus, Governor)

OFFICE OF THE GOVERNOR

STATE CAPITOL

BOISE 83720-1000

CECIL D. ANDRUS
GOVERNOR

(208) 334-2100

November 14, 1991

Lt. Col. Robert D. Volz
District Engineer
Army Corps of Engineers
Building 602, City-County Airport
Walla Walla, WA 99362

Dear Col. Volz:

Enclosed are the state of Idaho's comments on the Corps of Engineers' Draft 1992 Columbia River Salmon Flow Measures Options Analysis/Environmental Impact Statement. Thank you for the opportunity to comment.

The Corps of Engineers deserves credit for producing this large document on a complex issue in such a short period of time. It is clear that your staff has worked very hard in recent months to meet the request of the Salmon Summit and the governors of this region to address improvements for migrations of anadromous fish in the Snake and Columbia rivers.

The EIS includes a great deal of information that will be useful in developing a program to modify the lower Snake River dams and in implementing a springtime drawdown to increase water velocities and improve downstream migration. For example, your modeling of river flows under a drawdown concludes that stream velocities can be attained that meet or exceed the levels recommended by the region's fishery agencies as necessary to protect salmon and steelhead. In contrast, the most radical flow augmentation option of emptying Brownlee and Dworshak reservoirs can achieve the target flows only 56 percent of the time. Most significant to this information is that a drawdown will have less impact on the region's electric power system than augmenting flows to achieve the stream velocities.

The state of Idaho also has invested considerable time and resources in a review of this document. I hope our comments are useful. Although we clearly take issue with much of the analysis presented in the document, our comments should be regarded as constructive criticism in an effort to improve the final EIS.

I am most concerned that the document misconstrues key aspects of regional efforts to develop a recovery plan. The need

Lt. Col. Robert D. Volz
November 14, 1991
Page Two

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cont'd

to modify the dams to allow for drawdowns has been a common-sense assumption. As you are aware, Idaho has led efforts in that area by hiring Morrison-Knudsen Engineers, Inc., to suggest possible changes to the design features of the dams. A second objective has been the effort to protect these fish while not causing unmanageable economic impacts. The state of Idaho and the Northwest Power Planning Council have stated their intent on the need to mitigate economic impacts.

In both cases the Corps has apparently ignored these efforts, leaving an analysis that overstates and exaggerates impacts from drawdowns. The Corps has either intentionally or unwittingly played into the hands of certain river-user interests who oppose reservoir drawdowns as part of a recovery effort. I can understand agency tendencies to resist external efforts to change the status quo. It is unfortunate when credibility and objective analysis become the first casualties in resisting change.

I would think the Army Corps of Engineers would be attracted to the suggestion of modifying the dams and their operations as a solution to the juvenile salmon migration problem. If the Corps were to aggressively pursue such a course of action, your reputation as resource managers would be greatly improved.

With best regards,

Sincerely,

Cecil D. Andrus
Governor

Enclosure
AB

S29-1

S29-2

State of Idaho (Cecil D. Andrus, Governor)

STATE OF IDAHO'S COMMENTS ON THE DRAFT
1992 COLUMBIA RIVER SALMON FLOW
MEASURES OPTIONS ANALYSIS/EIS

November 14, 1991

Please consider the following comments of the State of Idaho on the Corps of Engineers' Draft Columbia River Salmon Flow Measures Options Analysis/Environmental Impact Statement.¹

The Corps deserves credit for producing the 1992 Flow Options Draft EIS in just a few months. We appreciate the Corps' intent to complete the NEPA process in time for implementation in spring, 1992.

The EIS includes a great deal of information that will be useful in developing and implementing a drawdown program for the four lower Snake River projects. For instance, the DEIS shows that reservoir drawdowns can achieve the flow recommendations of the Columbia Basin Fish and Wildlife Authority (CBFWA) in all of the fifty simulated years.² Even the most extreme flow augmentation alternative can achieve similar river velocities only 56 percent of the years, and then only in the month of May. The DEIS demonstrates that drawdown is the only alternative advanced to date that meets the flow levels recommended by the region's fish and wildlife agencies and tribes in furtherance of their legal mandate to protect a badly damaged fishery resource.

The EIS also explains the obvious: the current configuration of the dams presents obstacles to immediate operation of the reservoirs at near spillway crest levels. The removal of these obstacles should be the Corps' highest priority. Structures such as adult fish ladders and irrigation pump intakes may have to be modified. We are pleased that, in some areas, the Corps notes that the dams can be modified. The Corps seems to be opening the door to reservoir drawdowns a crack.

While the DEIS concedes that the lower Snake River projects can be modified to allow for drawdowns, its analysis overstates and exaggerates impacts from drawdowns. The Corps has either intentionally or unwittingly played into the hands of certain river user interests who oppose reservoir drawdowns. Many of the analyses in the DEIS suffer from a pervasive institutional bias against the drawdown to spillway crest. Agencies have a natural, sometimes unconscious, tendency to resist threats to the status

¹ These comments are the work of several contributors. Erri Bowler and Dexter Pinnas of the Idaho Department of Fish and Game and the staff of the Fish Passage Center provided biological analysis. Dr. Richard Gardner of the Idaho Division of Financial Management and Dr. Don Reading of Ben Johnson Associates addressed economic issues. Andy Brunsell of the Office of Governor Andrus, Wayne Haas of the Department of Water Resources, and Will Whelan of the Idaho Attorney General's Office also contributed.

² DEIS at ES-9

STATE OF IDAHO'S COMMENTS

ON THE DRAFT 1992 COLUMBIA RIVER SALMON

FLOW MEASURES OPTIONS ANALYSIS/EIS

November 14, 1991

S29-3

S29-4

quo. The drawdown option apparently poses such a threat because the Corps appears determined to deal option a "death of a thousand cuts" in the form of dozens of unfair assumptions.

The most basic flaw in the DEIS' treatment of drawdowns is the Corps' assumption that drawdowns will occur before modifications to the dams and reservoir structures. Most of the drawdown alternatives examined in the DEIS cannot be carried out in 1992 because the Corps has not yet modified fish ladders, bypass facilities, and other structures to operate at reduced pool elevations. Yet, the DEIS discusses the impacts of these alternatives as if they were to be implemented in 1992 with virtually no mitigation. The result is a grotesque and misleading overstatement of the impacts of long-term reservoir drawdowns.³

Potential impacts presented in the DEIS are inaccurate due to inconsistencies in projecting short-term and long-term impacts. The best analysis would focus on assessing impacts that occur after mitigation measures and other actions are implemented as part of a reservoir drawdown plan. The DEIS barely bothers to mention that many of the impacts could be easily mitigated as part of a long-term reservoir drawdown strategy.

The DEIS fails to convey the critical nature of the current situation. The 1992 actions are not being assessed merely to provide some additional benefits to the salmon. Four types of Snake River salmon are in danger of extinction. Coho are already extinct. Immediate and effective actions must be undertaken to prevent extinction of remaining stocks. Maintenance of the status quo or measures that do not significantly contribute to rapid improvements in survival are not real alternatives.

I. EXECUTIVE SUMMARY.

The Executive Summary information on the spillway crest option fails to distinguish adequately between the impacts of drawdowns for the April 15-June 15 and April 15-August 15 periods. A cursory reader of the DEIS (lobbyists, media, public relations firms) will generally only look at the executive summary. Using the longer period tends to exaggerate the impacts of the drawdowns for spring outmigrants.

The text of the DEIS frequently reports the uncertainty of impacts and notes that likely impacts would occur within a range. Yet, the tables in the DEIS usually report only the most severe of the impacts postulated, not the range. The Executive Summary seems to take information mostly from the tables. The tables --

³ An example of the misuse of the Corps' DEIS comes from the comments of the Pacific Northwest Utilities Coordinating Committee (PNUCC) on the proposed amendments to the Columbia River Fish and Wildlife Program. Regarding proposals to develop a reservoir drawdown strategy, PNUCC cites the DEIS for the proposition that spillway crest drawdowns would cause the loss of 51,000 acres of farmland. This assertion is absurd in light of the straightforward mitigation measure of extending irrigation pumps.

particularly in Chapter 4 -- should be corrected to report the range of impacts reflected in the text.

An example of this problem is found at page 4-117, which states that recreational impacts are "not a net loss of recreational activity." This acknowledges the fact that some recreation may be affected, some will not, and people will pursue other recreational options as a substitute. However, the executive summary's discussion of these impacts indicates that the drawdown alternative eliminated recreation.

Page ES-1, 2nd Column: The DEIS states that the projects have "state of the art" facilities of passing fish. However, these statement ring hollow in light of statements on page 3-13 and 3-14 that the facilities are not capable of simultaneous safe passage of both juveniles and adults and the long list of possible modifications to remedy the problem. With the current configuration, full reservoirs are needed to safely pass adults. Yet, these full reservoirs produce unacceptably high juvenile mortality. The EIS should acknowledge this problem.

Page ES-4: The DEIS mischaracterizes the "Idaho Plan." The draft maintains that a drawdown to spillway crest is "essentially the same as the 'Idaho Plan,' which was proposed by the State of Idaho at the Salmon Summit and advocated by numerous entities during scoping for this OAD/EIS." This statement misses the crucial point that the true "Idaho Plan" includes dam modifications and mitigation of adverse effects before full implementation of a drawdown scheme. The DEIS' lurid description of the impacts of the unmitigated four pool/spillway crest drawdown is part of a campaign to impugn what the DEIS calls the "Idaho Plan." We strongly object to this tactic.

II. DESCRIPTION OF THE EXISTING ENVIRONMENT.

Page 2-14, Section 2.2.4.: The EIS should explain that existing programs have failed to accomplish their stated purpose of mitigating for the effect of the Snake River projects and protecting, maintaining and enhancing the anadromous fish resources of the Columbia River Basin. Program such as fish transportation have not even sustained the runs much less rebuilt them.

Page 2-28, 2nd full paragraph: The EIS should not combine spring and summer chinook into a joint reference of "spring/summer chinook." The two stocks have been traditionally managed separately.⁴

⁴ The fact that the National Marine Fisheries Service has proposed to combine the two stocks into a single "evolutionary significant unit" should not change the descriptive terms used in management documents such as this EIS. The NMFS decision purports to implement specific policies under the Endangered Species Act. In any case, the State of Idaho believes that NMFS misapplied these policies and the two stocks must be listed separately under the ESA.

State of Idaho (Cecil D. Andrus, Governor)

- S29-14 Page 2-33: Trend information should refer to redd counts or other indicators of wild/natural escapement.
- S29-15 Page 2-37: This chapter should discuss the economic impact of declining salmon runs on salmon-dependent communities such as Salmon, Idaho.
- S29-16 Page 2-38: The discussion of the effects of the dams should include estimator of the change in water particle travel time in the lower Snake River. The Idaho Department of Water Resources, using a storage replacement analysis, estimates that the dams increased water particle travel time seven-fold. This information is included in graphic form at Appendix 1.
- S29-17 Page 2-39: Discussions regarding loss of habitat should explain that blockages are not responsible for the extremely low seeding levels in Idaho streams that remain accessible. The current discussion leaves the misimpression that all factors have contributed equally to the imperiled status of the chinook salmon. Critically low population densities in major untouched streams such as Sulphur Creek, a tributary of the Middle Fork of the Salmon River, reveal that the stocks would be in trouble even if no habitat had been blocked or degraded.
- S29-18 Idaho has over 4,000 miles of spawning and rearing habitat for spring, summer and fall chinook salmon. Nearly 80 percent of that habitat is in good or excellent condition for either steelhead or chinook. The enormous production potential of this habitat is not being met due to high migration mortality. For 1985-1988, wild juvenile chinook production was only 1 to 31 percent of potential; natural juvenile chinook production was only 2 to 40 percent of potential. Regardless of habitat quality, juvenile abundance is far below the potential production capacity.
- S29-19 Page 2-84: Data on number, cargo, and point of origin for shipments should be broken down by month in order to determine the effects of different reservoir drawdown options. Unlike the material presented in Section 4.7, the data should include monthly shipments as a percentage of total shipments in the Columbia/Snake River system.
- S29-20 Page 2-74: Recreational visitor day information should be broken down into months to facilitate analysis of the effect of various reservoir drawdown options on the lower Snake River projects. Such information is presented for the lower Columbia River projects at page 2-83.
- S29-21 Page 2-79: The discussion should explain that Brownlee Reservoir has highest level of recreational fishing use in Idaho and Eastern Oregon.
- S29-22 Page 2-83: The recreational use statistics cited for Brownlee Reservoir are from 1983. These figures are outdated and should be updated to reflect increased recreational use.
- S29-23 Page 2-83: The recreational use statistics cited for Brownlee Reservoir are from 1983. These figures are outdated and should be updated to reflect increased recreational use.
- S29-24 Page 2-83: The recreational use statistics cited for Brownlee Reservoir are from 1983. These figures are outdated and should be updated to reflect increased recreational use.
- S29-25 Page 2-83: The recreational use statistics cited for Brownlee Reservoir are from 1983. These figures are outdated and should be updated to reflect increased recreational use.
- S29-26 Page 2-83: The recreational use statistics cited for Brownlee Reservoir are from 1983. These figures are outdated and should be updated to reflect increased recreational use.
- S29-27 Page 2-83: The recreational use statistics cited for Brownlee Reservoir are from 1983. These figures are outdated and should be updated to reflect increased recreational use.
- S29-28 Page 2-83: The recreational use statistics cited for Brownlee Reservoir are from 1983. These figures are outdated and should be updated to reflect increased recreational use.

State of Idaho (Cecil D. Andrus, Governor)

S29-29	<p>Page 3-4: Lower Snake River Projects: The Lower Snake River pools should be lowered to minimum operating pool (MOP) during the 1992 season. Detailed monitoring of physical conditions at the projects as well as downstream monitoring of water velocities, fish populations and survival rates, and environmental impacts should be conducted. Operation at MOP, however, provides only relatively modest increases in river velocities and does not provide the travel times that the fish need.</p> <p>As explained above, it does not appear practicable to draft the four lower Snake River pools to spillway crest during the 1992 outmigration because of the need for structural modifications. However, the Corps should begin immediately to determine the changes necessary to permit operation at spillway crest.</p>	<p>Page 3-6: Flow Augmentation: Flow augmentation from upstream reservoirs cannot provide the river velocities considered necessary by the region's fisheries agencies and Indian tribes. Rather, long-term flow augmentation actions are best used to refill lower Snake and Columbia river pools after drawdowns.</p>
S29-30		<p>Storage rights in the upper Snake River reservoirs will have to be amended to permit fishflow storage and to allow these releases to be used outside of the state. At present, upstream storage is so low that it is doubtful that even 85,000 cfs could be reliably supplied by these sources in 1992.</p>
S29-31		<p>Page 3-8: Dworshak Reservoir releases should not exceed the 600,000 acre feet provided in 1991 if they impact refill by July 1.</p> <p>Page 3-10: The Target 200 alternative is proposed as a cap for flows in the lower Columbia River. An analysis by the Fish Passage Center of the Northwest Power Planning Councils version of Target 200 is enclosed as Appendix 3. This analysis raises serious concerns about the biological adequacy of Target 200.</p>
S29-32		<p>The DEIS' discussion of alternatives is legally flawed because Target 200 is the only lower Columbia River flow option considered. Why weren't other alternatives such as the 220 kcfs target proposed by the fisheries agencies at the Salmon Summit also evaluated? Target 200 was developed and championed by utility interests; it is by no means the only alternative for providing flows in the lower Columbia River.</p> <p>The consideration of alternatives is the heart of an EIS. An agency must "rigorously explore and objectively evaluate all reasonable alternatives...." 40 C.F.R. § 1502.14(a). In this instance, the DEIS has not even identified -- much less rigorously explored -- any alternatives to a flow measure championed by utility interests. The Corps has a legal obligation to consider a broader range of alternatives.</p>
S29-33		<p>Page 3-10: second paragraph: We support the statements in the last two sentences of the paragraph that operation at spillway crest would not involve conventional flow augmentation during the spring outmigration. As the DEIS notes, storage would be used to refill the lower Snake River pools.</p> <p>Page 3-11: Temperature Control: The biological basis for controlling temperature to benefit adult fall chinook is uncertain, and the goal of maintaining temperatures of 68 degrees has little scientific basis. The DEIS does not explain the reasoning for this target. Therefore, flow augmentation for adults should proceed only on an experimental basis that has minimum impact on the amount of water available for spring flow augmentation for juveniles.</p>

6 Any test conducted should fairly reflect conditions experienced during full implementation of reservoir drawdown. Differences between the test condition and the condition likely to be experienced under full implementation should be explicitly stated and considered in test interpretation. (See comments on page 4-10.) Tests should go forward after consideration of the risks to anadromous fish as well as dams and other structures. Obviously, critical structures such as the Lewiston locks should not be put at undue risk during the test.

State of Idaho (Cecil D. Andrus, Governor)

S29-41	<p>Page 3-11: <u>Monitoring</u>: The Corps should consider creating a process to modify the drawdown test during implementation if monitoring reveals unexpected problems. The process should include consultations with relevant fisheries agencies, including the Idaho Department of Fish and Game.</p>	S29-47	<p>occur after mitigation measures and other actions are implemented as part of a reservoir drawdown plan.</p>
S29-42	<p>Page 3-13: <u>Section 3.3.2.1</u>: We support the DEIS' listing of proposed structural modifications. The 1992 operations should include any tests needed to assist in implementation of necessary structural modifications. Modification of spillways, flipflips, and stilling basins should be added to the list of possible modifications.</p>	S29-48	<p>Page 4-2: <u>second paragraph</u>: The description of flow augmentation alternatives should state that -- in addition to having relatively minor environmental impacts -- these alternatives produce relatively modest reductions in water particle travel time.</p>
S29-43	<p>Page 3-14: <u>second full paragraph</u>: The reference to the engineering consultant retained by the State of Idaho should state that the consultant suggested a number of possible structural modifications to address fish passage issues associated with reservoir drawdowns.</p>	S29-49	<p>Page 4-8 to 4-10: <u>Gas Saturation</u>: The EIS should expressly note that spill conditions will be quite different with reservoirs drawdown to spillway equilibrium. Spilled water emerges beneath the tainter gates under a great deal of pressure under normal operation, while at spillway crest the discharge falls freely. The higher pressure experienced at normal operation increases the level of dissolved gas supersaturation relative to the spillway crest condition. The EIS correctly notes that reduced tailwaters in the stilling basin may tend to reduce gas supersaturation effects. At page 4-51, the EIS notes that increased river velocity will reduce fish exposure to dissolved gas and thereby reduce the impact of supersaturation.</p>
S29-44	<p>Page 3-21: <u>Grand Coulee</u>: It is apparent that refill needs for Grand Coulee are treated far more deferentially than refill needs for Dworshak Reservoir. Impacts should be shared equitably.</p>		<p>The Corps has not revealed how in light of these uncertainties it is possible to make responsible numeric predictions of gas supersaturation such as those made at page 4-10. The EIS should explain the methodology used to make the predictions. In light of uncertainties, the Corps should decline to cite a specific figure or should provide a range of potential outcomes.</p>
S29-45	<p>Page 3-26: <u>Figure 3.4-5</u>: Water particle travel time charts should show pre-dam conditions. It is important that the public understand the natural conditions to which the salmon adapted in order to interpret current conditions.</p>		<p>The Corps seems over-eager to jump to the conclusion that gas levels will be high. Evaluation of dissolved gas levels should be a key component of the 1992 test. Until more information is available, the Corps' numeric predictions are premature.</p>
S29-46	<p>Page 3-28: The Corps should present a clear cost-effectiveness analysis of achieving river velocities equivalent to 140 kcfs from flow augmentation and from reservoir drawdown.</p>		
S29-47	<p>IV. <u>ENVIRONMENTAL EFFECTS OF ALTERNATIVES</u>.</p> <p>Page 4-1: The Corps should insert a statement similar to the following at the beginning of the section on environmental impacts of alternatives:</p> <p>The EIS assumed a narrow view: drawdowns would occur before actions on the part of the region and federal agencies to modify the lower Snake River projects and associated structures such as irrigation intakes, and that mitigating measures and adjustments to navigation would not be implemented. This assumption is erroneous in the face of the Northwest Power Planning Council's proposed amendment proposing mitigation as part of a reservoir drawdown strategy.</p> <p>Many of the potential impacts presented in the DEIS were inaccurate due to inconsistencies in project short-term and long-term impacts. Therefore, more prudent analysis would focus on assessing impacts that</p>	S29-50	<p>Page 4-10: <u>first full paragraph</u>: The EIS assumes that drafting the lower Snake reservoirs to near spillway crest would require the entire river discharge to be passed over the spillway at each of the four projects. This assumption leads the Corps to conclude that spillway crest drawdowns may cause higher dissolved gas levels. However, this assumption may not hold true if the dams are modified prior to the drawdowns.</p> <p>Structural modifications may substantially mitigate for nitrogen gas supersaturation problems. For instance, a study by Morrison-Knudsen Engineers indicates that certain structural modifications may permit turbine operation at spillway equilibrium levels. The development of reservoir drawdown plans should examine opportunities for passing river discharge through powerhouse and/or navigation locks to ameliorate dissolved gas and tailrace turbulence.</p>

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S29-51 Page 4-10, third full paragraph: The EIS should explain that the spill test conducted in June 1991 was not a fair test of dissolved gas or tailrace conditions likely to be experienced during an actual drawdown to spillway crest for the reasons stated above. Corps statements to the media last summer that the test proves the infeasibility of reservoir drawdowns were highly inappropriate and undermined our trust in the agency's good faith. The fact that the Corps again cites to the test without fully explaining its limitations suggests a continuing bias against the drawdown strategy.

S29-52 Page 4-11 to 4-16: Temperature: It is clear from the discussion that there is not sufficient information to determine the precise effects of reservoir drawdown on lower Snake River temperature. The Corps' eagerness to reach the conclusion that drawdowns will increase temperatures should be tempered by elements of its own analysis.

The EIS states that increased water particle velocity and reduced surface area would tend to produce cooler river temperatures. How much cooler will temperatures be due to these effects? The EIS points out that daily temperature maxima might increase. But, the EIS fails to note that daily temperature minima are likely to be lower. Will the lower nighttime temperatures offset the effect of higher daytime temperatures on fish survival? What are the effects of diurnal temperature fluctuations relative to exposing the smolts to constant higher temperatures due to the reservoirs' heat storage characteristics?

S29-53 The DEIS states that seasonal temperature maxima with reservoir drawdown will occur earlier but fails to indicate how these maxima compare to the maxima under current operations.

S29-54 The DEIS fails to distinguish adequately between the an April 15-June 15 drawdown and a longer period running through August. Temperature concerns are less significant during the spring outmigration than they are during the heat of the summer.

S29-55 Dworshak Reservoir is the most likely source of water to refill the lower Snake reservoirs following the drawdown period. The EIS should consider temperature control benefits of using cold water from Dworshak to refill the pools.

In light of the uncertainties and omissions of the Corps' analysis, the conclusion that reservoir drawdowns will have adverse effects on temperature is premature.

S29-56 Page 4-16 to 4-18, Dworshak Releases for Temperature Control to Benefit Adult Fall Chinook: The State of Idaho opposes the provision for a 20 foot draft of Dworshak Reservoir in August. This measure is poorly considered and should be replaced with a provision suggesting continued testing of summer temperature control.

S29-57

There is no apparent need for Dworshak reservoir releases in August for adult fall chinook. The 10 percent passage date of adult fall chinook at Ice Harbor is September 6. Thus, an August release would provide little if any benefit for adult fall chinook.

S29-58

Moreover, the effectiveness of Dworshak releases in August is doubtful. As explained in the DEIS, the cold-water discharge from Dworshak Reservoir in September, 1990 did not appear to be effective in reducing Snake River temperatures. Temperature profiles showed surface reservoir temperatures in Lower Granite Pool similar to Snake River inflows. The denser and colder Clearwater River water did not mix with the lighter and warmer Snake River water and essentially filled the deadspace of Lower Granite Reservoir.

S29-59

Another feasibility study using of Dworshak Reservoir releases to moderate late summer temperatures at the mouth of the Snake River was conducted in 1991. The EIS acknowledges that preliminary modelling results "raise questions of whether the temperature objectives could be satisfied." The 1991 final report for the study has not been publicly available to date.

S29-60

Cold water releases from Dworshak Reservoir also conflict with the downstream requirements of the Dworshak National Fish Hatchery for warmer water to raise summer steelhead. As noted above, August releases may also conflict with the use of Dworshak for September flow augmentation, winter peaking, spring flow augmentation, and/or eventual use for lower Snake River reservoir refill.

S29-61

Page 4-20: The discussion of toxics in reservoir sediments is not understandable and needs to be edited.

S29-62

Page 4-21: Increased river velocity under spillway drawdown should at least partially offset the loss of dilution capacity. Has the Corps analyzed this issue?

S29-63

Page 4-21, last paragraph: The Corps should consider whether the spillway crest drawdown will offer opportunities to clean-up the landfill.

S29-64

Section 4.2: Anadromous Fish.

It appears that the Draft EIS' discussion of flow and survival relationships is based primarily on opinions contained in "Biological issues pertaining to smolt migration and reservoir draw-down in the Snake and Columbia Rivers, with special reference to salmon species petitioned for listing under

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the endangered species act" by Dr. Al Giorgi of Don Chapman Consultants, Inc. (hereinafter "Chapman Consultants' paper").

A review of the Chapman Consultants paper prepared by the Fish Passage Center is enclosed at Appendix 4. This review reveals that the Chapman Consultants' paper misrepresents the data presented by the Columbia Basin Fish and Wildlife Authority flow proposal justification, the Fish Passage Center Annual Reports, and the Berggren and Fillardo paper submitted for the Endangered Species Act record. The Chapman Consultants' paper presents substantial errors in analysis and conclusions. Reliance on the paper for an evaluation of reservoir drawdowns is unreasonable.

S29-65

Page 4-27: fourth paragraph: The discussion of mortality above Lower Granite Pool is meaningless because this mortality reflects natural factors. The chinook salmon adapted to natural mortality over a period of millennia and remained highly productive. It is man-caused mortality -- including low survival due to the transformation of the lower Snake River into a series of slackwater pools -- that reduced the natural productivity of the stock and is responsible for the current crisis. To attribute the depressed status of the stocks to natural migration mortality is misleading.

S29-66

The Corps should check Raymond's estimates of survival from White Bird to Ice Harbor Dam, which suggest a much lower rate of upstream mortality.

S29-67

Page 4-28: The draft EIS overstates uncertainty regarding the relation between flow and fish travel time. There is consensus among the federal and state agencies charged with fisheries management that the water velocity through the mainstem projects must be increased. For the spring outmigration in the Snake River, these agencies recommend flows of 140 kcfs. The purported uncertainty emanates chiefly from consulting biologists with a contractual relationship with utility interests.

S29-68

All of the models developed to date show a statistically significant relation between fish travel time and flow. It is true that additional factors can be used to account for some of the variability inherent in the travel time-flow relation. These variables, however, do not replace flow as an extremely important variable in determining a fish's travel time. Nor, are these other variables controllable by humans (e.g., photoperiod, temperature). Since there are no proposals to enhance a fish's smoltification level, size, or release date, etc. -- one can only

7 The fact that this paper is not included in the EIS and has not been available for review in its draft form represents a serious shortcoming in the process. In the future, we recommend that the Corps provide for advance review by the fisheries agencies and tribes of products like the Giorgi study before making major decisions such as the 1997 DHS on questionable analysis and conclusions. This type of concern is precisely why Idaho requested an ongoing consultation during the preparation of the draft EIS. A work group was not convened until after the draft EIS was finally finished.

S29-68
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assess the expected change in travel time relative to change in water velocity.

S29-69

We suggest that you incorporate the Berggren and Fillardo (1991) paper in this discussion. Their analysis incorporated other factors such as smoltification into a reciprocal model to account for variability in the relation. The EIS should also state that, regardless of the model used, flow is invariably one of the most influential factors (as measured statistically) determining a fish's travel time.

S29-70

P. 4-29, lines 2-3: The fact that Kindley found a slower migration associated with higher flow is an artifact of the data he used. In 1989, the Clearwater Trap was operated from March 29 to April 16, then pulled out of service due to high flows, and returned to service May 23 when flows had dropped again. Chinook marked at the trap were predominantly Dworahak Hatchery fish through April 16 and wild stocks after May 23. The groups had obvious smoltification differences due to their one month separation in time. His conclusion would have been different if he had analyzed the two groups separately. Aggregation of the two groups rendered his best fit model meaningless. Mr. Kindley's analysis should not be construed as showing that fish do not respond to flow.

S29-71

Page 4-29, last paragraph: The statement that the Fish Passage Center (FPC) data shows little change in travel time above 220 kcfs is not true. The rate of change in travel time at higher flow is less than the rate of change at lower flow, but this is a function of the curvilinear relation between the two variables. It is important to point out that run-off volume in 1988 was 73% of average. The FPC 1988 Annual Report documents that the FPC requested that flows be kept above the fishery minimum of 220 kcfs in the lower river.

S29-72

P. 4-30, first full paragraph: The conclusion that the quadratic model is the best fit to the smolt survival data should be changed in light of the analysis by Dr. Charles Petrosky of the Idaho Department of Fish and Game. Dr. Petrosky's analysis is enclosed at Appendix 5.

Dr. Petrosky's paper examines the relationship between flow and smolt survival for Snake River spring and summer chinook. In the paper and discusses the derivation and basic differences between three alternative flow-survival models. Dr. Petrosky provides a rationale for increased smolt survival above 85 kcfs.

8 The relation between smoltification, flow and fish travel time is addressed in a review by the Fish Passage Center appended to these comments at Appendix 11.

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In reviewing the Sims and Osslander data,⁹ Dr. Petrosky concludes that an exponential form best fits the data. That form shows survival benefits through and beyond 140 kcfs. Dr. Petrosky concludes that flow benefits would be even greater if the data were corrected for mortality due to dissolved gas conditions experienced in the 1970's during high flow periods. These dissolved gas problems have since been largely resolved through structural modification of spillways.¹⁰

S29-73

Dr. Petrosky also examined frequently overlooked data points for 1966-1968 derived from the NMFS studies conducted by Raymond.¹¹ This additional data shows significantly higher survival at reduced travel time and supports the ISP smolt survival model based on the exponential form. Appendix 5 at 4 and Figure 6.

S29-74

Four additional charts attached as Appendix 6 clarify the historic relationship between water particle travel time and returning adult runs. The first and second charts relate adult returns to the Lower Granite flows experienced by outmigrants and shows significantly increased returns at higher flow levels. Two of the charts compare Salmon River spring and summer chinook redd counts and lower Snake River velocity two and three years prior to the redd counts. There is a close fit between velocity and redd count data, particularly on the logarithmic scale. A fifth chart relates percent survival and water particle travel time for the Raymond data cited below.

S29-75

Page 4-10; Second full paragraph: The DEIS does not reference a study by Dr. Charles Petrosky entitled "Influence of Smolt Migration Flows on Recruitment and Return Rates of Idaho Spring Chinook." The study is enclosed at Appendix 7.

Dr. Petrosky reviews smolt-to-adult return rates for the 1960-87 smolt migrations for the wild spring chinook population in Marsh Creek, a tributary of the Middle Fork of the Salmon River in Idaho. This data shows a highly significant relationship between flow and smolt-to-adult returns. Appendix 7 at 5 and Figure 7. At flows of 140 kcfs, the data shows a smolt-to-adult return of approximately 0.8 percent.

S29-76

Page 4-31; Table 4.2-1: Charts prepared by the Idaho Department of Water Resources show river velocities under alternative operations for the four lower Snake River pools.

⁹ Sims, C.W. and F.J. Osslander 1981. Migrations of juvenile chinook salmon and steelhead trout in the Snake River from 1973 to 1979: a research summary. Final report to the Corps of Engineers. Contract DACW38-78-6038 NOAA NMATC, Seattle, WA 42p

¹⁰ Appendix 5 at 3

¹¹ Raymond H.L. 1979. Effects of dams and impoundments on migrations of juvenile chinook salmon and steelhead trout in the Snake River, 1966-1975. Transactions of the American Fisheries Society 108(4): 505-529

S29-76
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These charts are enclosed at Appendix 8. The EIS should provide this information.

S29-77

Page 4-35, first paragraph: The statement suggesting an absence of data regarding fish travel time through Lower Granite Pool ignores travel time data for PIT tagged fish released from the Lewiston trap from 1988 to 1991, and some data for 1987 and 1988. These data are analyzed in the FPC Annual Reports and in IDFG reports to BPA. We suggest that you review these data and the relation described between travel time and flow.

S29-78

A report by Edwin Buettnier entitled "Factors Associated with Chinook Salmon Movement in Lower Granite Reservoir" is enclosed as Appendix 9. The report reviews the relation between discharge, time of year, and smoltification by examining PIT tag data from yearling chinook smolts marked at the Snake River trap and interrogated at Lower Granite Dam. The report concludes:

The relation between chinook smolt travel time in Lower Granite Reservoir and discharge is very strong for the 1987-1990 outmigration years. Discharge is the primary factor that has the greatest effect on chinook smolt travel time.

Appendix 9 at 11. The report also concludes that chinook smolts will migrate faster through Lower Granite Reservoir with increased discharge regardless of the time of year or the level of APase.

S29-79

Page 4-35; fourth paragraph: The statement that no studies on yearling chinook have been specifically conducted on just the Snake River ignores Raymond, H.L. 1979. Effects of Dams and Impoundments on Migrations of Juvenile Chinook Salmon and Steelhead from the Snake River, 1966 to 1975. Transactions of the American Fisheries Society 108(6). The Raymond study was sponsored by the National Marine Fisheries Service and evaluated yearling smolt migration in the Snake River from various upstream tributaries and at Ice Harbor Dam. Data were also collected at the lower Snake River dams as they were brought on line in the 1960's and 1970's.

An analysis of the Raymond study prepared by the Idaho Department of Fish and Game in attached as Appendix 10. The Raymond data shows a strong relationship between increased flow and increased survival for river velocities equivalent to and above a flow of 140 kcfs through full reservoir pools. The IDFG analysis states "The relationship between water velocity and juvenile survival is very strong (r^2 -squared = 0.70; $P = 0.005$), when the data is adjusted for most dam-caused mortalities."

¹² Appendix 10 at 3. The analysis notes that the relationship would be even stronger if the data were adjusted for alternate gill netting and the increase in numbers of alternate hatchery fish causing the system since Raymond's study.

S29-79 The Raymond study should be fully incorporated into the discussion of the yearling chinook flow/survival relation.

S29-80 Page 4-35, fifth paragraph: We disagree regarding the ability of models to define a relation between travel time and flow. In all cases, the models (regardless of which is used) demonstrate a statistically significant relation between travel time and flow in the bivariate case.

A review of "The Migrational Characteristics of Chinook Salmon Emanating from the Snake River Basin" by Albert Giorgi of Chapman Consultants, Inc., is enclosed at Appendix 11. The review dispels the assertions by Dr. Giorgi that flows may not be as important for yearling and subyearling chinook, and that other factors such as smoltification are more important than flow. The review shows that flow influences smolt travel times at all levels of smoltification.

S29-81 P. 4-35, last paragraph: It is unclear what is meant when it is stated that the polynomial model most closely correlated with the data. We assume that had the highest R squared, but that does not make it any more biologically justified. But, the data set to which the polynomial model as applied was a different set of data than was used with the other models. (See also, comments on page 4-30, first paragraph)

S29-82 Page 4-36, graph: The description in the caption that data are mean annual indices is unclear. The linear model does not include the entire data set -- only a portion of the available data -- and should therefore be discarded from this analysis. If the linear model is referenced at all (which it should not be) the draft EIS should note that it utilizes only a partial data set.

S29-83 Page 4-37, Table 4.2-4: The legend for "d" should include an explanation that travel time was estimated from Lower Granite to McNary dams (Berggren and Filardo, 1991). The results were compartmentalized among the four Snake River projects by the COE and should not be attributed to the authors. The reference to the authors' name should be replaced by a reference to the name of the model.

S29-84 Page 4-42, seventh paragraph: The reference to Sims and Osslander relative to spill is not appropriate. Flow and spill are highly interrelated and, therefore, it is virtually impossible to determine which factor dominates.

S29-85 Page 4-43, Lower Granite Dam to Ice Harbor Dam: The Berggren and Filardo estimates are for Lower Granite Dam to McNary Dam, which the Corps divided by four dams to represent the Snake River reach. The estimates do not actually represent travel time to Ice Harbor.

S29-86

Page 4-43, first full paragraph: The EIS should note that the statement that reservoir drawdown benefits would be likely outweighed by negative factors is true only if one assumes that the dams are not modified.

S29-87

Page 4-44, first full paragraph: The refusal to calculate survival benefits of drawdown to spillway crest is another example of Corps bias. The Corps has been eager to make quantitative statements in the face of uncertainty for several other factors. But, the Corps suddenly becomes overly cautious when it comes to evaluating the survival benefits of spillway crest drawdowns.

A better approach is to estimate the survival benefits of the river velocities provided by drawdowns and to note that factors such as nitrogen gas supersaturation may reduce these benefits somewhat. Or, to hold dam-related mortalities constant in an assumption that dam modifications allow the projects to function the same down to spillway crest. Such an approach at least lets the public know the potential benefits of drawdowns and helps explain why further development of a drawdown strategy is worthwhile.

S29-88

Page 4-47, fourth paragraph: The claim that spillway crest drawdowns will have the adverse impact of preventing smolt transportation is absurd and misleading. The very purpose of drafting the reservoirs to spillway crest is to create in-river migration conditions that will increase survival over current levels. Elimination of transportation is not a negative effect of drawdowns, it is a benefit.

Transportation has only been utilized to the extent that in-river migration conditions have been unacceptable. Transportation has never been regarded as a desirable substitute for safe in-river migration. The EIS should explain that the current guidelines of the Fish Transportation Oversight Team call for halting transportation when flows are sustained above 100 kcfs. The Corps own analysis indicates that drawdowns will lead to flows equivalent to at least 140 kcfs. Thus, fish transportation is neither needed nor desirable with reservoir drawdowns.

S29-89

The DEIS' discussion of transportation is misleading in a number of respects. First, as explained above, the document inappropriately portrays smolt transportation as a benefit and characterizes alternatives that circumvent smolt transportation as an adverse impact to the salmon. (ES-1, ES-2, 2-15, 2-40, 3-2 4-45, 4-55). A smolt survival of 98 percent is claimed for smolts transported to below Bonneville Dam. The claimed transport benefit ratio (TBR) of transported to non-transported yearling chinook from Lower Granite to below Bonneville is 1.9:1. However, rather than the claimed TBR of 1.9:1, fantastical TBRs ranging from 80:1 to 34:1 would be needed for 98 percent smolt survival under flow conditions from 1977 to 1987. Rather than 98

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\$29-89 com'd	percent survival, estimated survival of transported fish each year during that period ranged from 2 to 55 percent.
\$29-90	While travel time objectives can be met with transportation, smolt survival goals cannot. The fish management agencies and tribes regard transportation only as an "emergency measure" (page 2-15); to be used only when flows are inadequate for comparable or better in-river, non-transported smolt survival.
\$29-91	The EIS should discuss the cost savings of eliminating the spring migrant transportation program and eliminating transport and post-transport mortality.
\$29-92	Page 4-52: The draft EIS should consider the potential benefits of reservoir drawdown in reducing predation and increasing the effectiveness of predator control.
	The DEIS indicates that reservoir drawdowns may adversely affect resident fish populations. What is the expected impact on northern squawfish?
	Sections 4.7, 4.8, 4.9, 4.10, and 4.13: General Statement Regarding Analysis of Economic Impacts:
	A number of flaws pervade the Corps' analysis of economic impacts. These flaws are described below.
\$29-93	<u>Inconsistent Time Period of Analysis.</u> There is no clear statement of whether the option to be tested in 1992 will be selected on the basis of its short-term benefits and costs in 1992, or on the eventual long-term benefits and costs of adopting an option after environmental and economic dynamics have played themselves out toward equilibrium. The purpose of the test plan is to help the Pacific Northwest, and the Corps in particular, arrive at an improved management regime for the Columbia/Snake River system. Therefore, this analysis should be conducted with a long-term perspective, as if the test option were permanently implemented. The costs of each option should then be the least cost alternative, including mitigation and allowing for corresponding changes in the ways of doing business. When faced with a change, affected parties will devise creative ways to minimize the impact to themselves.
	Static, partial analysis will often yield overestimates. Yet, this is exactly the type of analysis used for agriculture, transportation, and recreation. Short-run deviations in benefit or cost should be noted but should not be the overriding decision criterion.
	The DEIS is very inconsistent in time perspective. Agricultural impact estimates are for the short-run, despite much lower long-run costs noted. The indirect impact on the agricultural land values holds only in the long-run. Dam modifications could address many of the adverse short-run impacts
\$29-93 com'd	to smolt survival, such as gas supersaturation, and hydropower production. Similarly, adaptation is likely in recreation patterns with minor modifications to facilities. The analysis jumps back and forth between time horizons with little explanation.
\$29-94	<u>Inconsistency in Economic Concepts.</u> This EIS should compare the environmental, economic, and social benefits and costs of each management option. Since the purpose is to ensure the survival of salmon species, only options that achieve desired smolt survival conditions (or water particle travel time as a proxy) should be considered. The authorities contained in the Endangered Species Act and the Northwest Power Act suggest that this is not a time for marginal system changes. Of the options considered, only drawdown to near spillway crest is nonmarginal and biologically effective. All options should be analyzed in a consistent framework of benefits and costs such as outlined in nearly any textbook on project analysis.
\$29-95	When viewing the costs and impacts of the various options, the DEIS should not focus only on the total costs. Rather, we need to see what approaches will be best for the fish on a cost-effective basis. If we are going to spend such vast sums, we should make sure, to the extent possible, that the outcome is to restore the lost salmon runs and to meet the Corps' mitigation obligations under the Lower Snake River Compensation Plan, the Northwest Power Act, and other laws.
\$29-96	Unfortunately, the DEIS is very careless in the economic concepts behind the dollar estimates it puts forward. There is a major difference between economic "costs" and "impacts" — analogous to the difference between business sales and profits. For example, the agricultural costs are estimated on pages 4-117 to 4-121 as the gross value of foregone crop production. This is not even a short-run cost estimate, unless the Corps has decided that the crops take nothing to produce. Factors of production like labor and capital have alternative uses, and these opportunity costs must be netted out. The appropriate cost is the loss of net farm income.
\$29-97	Secondary economic impacts, such as mentioned on page 4-121, are normally estimated with an input-output model of the region's economy. The inappropriateness of using such estimates in benefit-cost analysis have often been noted in economic literature. Economic impacts, as measured by national income accounting through some tool like input-output analysis, are a much different concept from costs or benefits. Moreover, it is very difficult to convert impact estimates to benefit estimates. Because secondary impacts accompany any public investment and they tend to wash out in a national perspective, they are generally ignored in benefit-cost analysis.
	It is recommended that secondary impacts be ignored here for these reasons and three others. First, differentiation between

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impacts and costs and the proper interpretation of input-output estimates is very difficult, even for professional economists. Second, in an atmosphere of controversy it becomes easy to use the far larger economic impact estimates in ways that cause non-economists to confuse them with costs to society. Such misuse and misinterpretation serves to sensationalize the impacts and heighten conflict rather than the search for the win/win compromise answers. Finally, there are numerous technical problems in input-output analysis. These include data quality, the applicability of national technical coefficients to local areas, the fixed nature of technical coefficients that does not allow for changing technologies or production methods, and the cross-hauling of production in one area for processing elsewhere. These shortcomings make the results of input-output analysis of questionable value for policymaking. It is also not appropriate to include changes in asset values, like farmland, in project analysis.

A recent article in the American Journal of Agricultural Economics by four Pacific Northwest agricultural economists addressing these considerations is enclosed as Appendix 12.

S29-98

Failure to Account for Economic Benefit of Restoring Salmon Runs. Nearly all of the attention in the DEIS is on the "losses" and costs to the region for restoration. However, sectors of the Idaho economy have already been severely damaged due to the virtual elimination of the salmon runs. The EIS should consider the significant economic value in restoring the runs in any economic analysis of the cost of restoration.

S29-99

A fair evaluation of reservoir drawdowns must consider economic benefits of reservoir drawdowns. Care must be taken to include all benefits and costs, including those not immediately obvious such as foregone costs of smolt barging, reduced dredging costs for navigation due to transport of sediment to deeper reservoir areas, reduced O & M costs due to a longer maintenance window, and reduced recreational impacts at reservoirs otherwise incurred through flow augmentation. A complete accounting is ensured if incommensurable benefits and costs are included, that is those that cannot be accounted in dollar terms, as well as descriptions of intangible benefits and costs that cannot be measured at all.

S29-100

Omitted Studies and University Expertise: The DEIS should consider several studies and sources of information relevant to the assessment of economic impact. The following documents are included in the appendices to this document for the Corps' consideration.

Appendix 13: Power Loss Impacts From Salmon Mitigation Plans: A Report To The Office Of The Governor Of Idaho -- Ben Johnson Associates. Concludes that the FELCC impacts of "Target 200" flow augmentation and reservoir drawdown are approximately equal. Drawdowns are estimated to reduce

S29-100
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FELCC by approximately 240 AMW. This study is being updated.

Appendix 14: Lower Snake River Projects Flow Evaluation Study -- Morrison-Knudsen Corporation. Discusses structural modifications at the lower Snake River projects to permit operation at near spillway crest. Modifications that would allow power generation at lower pool are suggested. Up to 100 AMW lost to drawdown could be recaptured by dam modifications.

Appendix 15: Snake River Drawdown Operation -- Northwest Power Planning Council. Concludes that reservoir drawdowns will reduce FELCC by approximately 215 AMW. Discusses travel time information and reservoir operations to secure refill.

Appendix 16: Comments On The Transportation/Salmon Study Conducted By R.L. Henry -- Steven Peterson & Joel R. Hamilton, Univ. of Idaho Department of Agricultural Economics. Reviews impacts and mitigation measures for navigation sector.

Appendix 17: The Effect of Lower Snake Reservoir Drawdown On Barge Transportation: Some Observations -- Joel R. Hamilton, Michael Martin and Ken Casavant for the University Task Force on Salmon and the Columbia River System.

S29-101

Section 4.7: Transportation: The values assigned to lost transportation are vastly overstated. In the calculations for lowering the four lower Snake dams to spillway crest, data for the McNary Pool were included. However, lower Snake River pool drawdowns would not affect barge transportation in the McNary pool. Thus, the inclusion of the McNary pool inflates the estimates of tonnage-shipped dollar losses by about 25%.

S29-102

The impacts of a shorter drawdown period -- such as the four-to-six week period proposed by Idaho -- are not clearly displayed. If the normal two-week lock maintenance period is included in this timeframe, barge shipping would be shut down for only two to four weeks.

S29-103

Changes in a complex, multi-modal transportation and marketing system are very difficult to predict. The EIS here does not assume that farmers and other shippers will make less costly transportation decisions, such as selling before the drawdown period or holding shipments until the drawdown is completed. The EIS makes an estimate of \$3.6 million greater transportation costs for the April-June drawdown scenario (Table 4-7.10). This estimate does not allow for the normal two-week lock maintenance period; instead, storage and inventory costs for the entire period are attributed to the drawdown option.

S29-104

To the extent that barge shipments are simply advanced or deferred in this manner, economic impacts to barge operators are minimized. Rate increases of 25 to 40 percent cannot be justified on this basis (page 4-104). Dr. Gardner of the Idaho Division of Financial Management believes that upriver storage and deferred shipment is the most likely response of grain owners, with Portland grain exporters supplied with grain from elsewhere in the Pacific Northwest during the drawdown period. Dr. Gardner concludes that adverse price effects from an oversupply of grain after the drawdown, as implied on page 4-112 are not likely in the long-run.

S29-105

Page 4-97, Figure 4.7-1: This figure claims for the period of April to June 1990 that the wheat and barley moved through the four lower Snake dams would require 218 barge loadings. This estimate is based on the calculated tonnage of grain shipped and a capacity of 3,000 tons per barge. However, the investigators failed to check their own numbers for this estimated value. According to the Corps' own data, the grand total of all commercial vessels passing through the locks of the four lower Snake River dams during this time period in 1990 was 203. The Corps is thus claiming that it will take 15 more barge loadings to move JUST grain than it took to move everything on the river through the locks during a comparable period in 1990 -- including government vessels, passenger craft, and light boats. Overestimation of cargo moved will lead to an overestimation of loss from the interruption of barge traffic.

S29-106

Section 4.8: Agricultural Impacts: The discussion of agricultural impacts is a good example of how static economic analyses can overestimate true costs. The only numbers offered are inappropriate estimates of the gross value of foregone crop production. Using interview data of operators who claim to be forced out of business (page 4-117) introduces a strong response bias.

S29-107

Using single-year, 1989 prices is another source of overestimation. 1989 was a year of abnormally high prices due to national drought. For example, the 1989 Idaho average wheat price was \$3.67 per bushel versus \$2.60 in 1990; potatoes averaged \$7.10 per hundredweight in the selected year of 1989 versus \$5.20 the following year. To adjust very high 1989 prices by an arbitrary five percent annual factor for inflation exacerbates the error. Dr. Gardner suggests using a nominal five year average of 1986 through 1990, which reflects both low and high points on the crop price cycle.

S29-108

In trying to calculate changes in net farm income, an analysis both with and without the project is appropriate. The value of the land in dry crop or grazing production should be noted. Dr. Gardner believes that, without pump modifications, the highest use of the land might be to grow irrigated grains with heavy summer and fall irrigations to wet the soil profile following the drawdown period.

S29-109

Beyond these modifications to net farm income loss estimates, it is likely that the least cost alternative is simply the annualized capital costs of pump modifications plus any additional pumping costs of increased pumping lifts during the drawdown period.

S29-110

The draft EIS assigns values for agricultural losses associated with the drawdown scheme but fails to make equivalent assignments to the flow augmentation approach. In Section 4.8, the DEIS estimates a loss of \$77 million in crop value and \$7 million in potential pump modification and increased operating costs from drawdown of the four Snake River projects to spillway crest; but it claims there is no impact on irrigation from flow augmentation. For 1992, the impact of drawdowns should also be zero for the drawdown approach, if Ice Harbor Pool is not affected.

The flow augmentation option that achieves the same goal as the drawdown (140 kcfs equivalent at Lower Granite) would require several million acre feet from Dworshak, Brownlee, and other upper Snake River reservoirs. Attempting to supply this water would require eliminating or shortening the irrigation season in Idaho in many water years. This loss of crop value for agriculture in the upper Snake River Basin has been ignored in the EIS.

S29-111

The agricultural impacts are presented as if the 1992 test will involve a drawdown of all four reservoirs to spillway crest from April through August. This is not a realistic assumption given limitations on adult passage and other issues. The EIS should more clearly explain that the drawdown of Lower Granite and Little Goose pool will not affect irrigation facilities in Ice Harbor pool.

S29-112

Section 4.9: Electric Power: The estimates of power loss for drawdown are overstated. The DEIS' estimate of FELCC loss from drawdown is 250 aMW, a figure in line with earlier appraisals by BPA, Ben Johnson Associates. However, a later, more comprehensive analysis by the staff of the Northwest Power Planning Council estimates the loss at 215 aMW.

S29-113

Contrary to unsupported statements in the DEIS that long-term impacts to the power system would "likely" be much higher (page 4-123), experience has shown that the power system adjusts and that actual power losses are less than the original estimates. Furthermore, none of the above estimates includes dam modifications that would allow power production during drawdown - roughly estimated at 40% of production.¹³ This would decrease the long-term FELCC impact further.

¹³ The Morrison Knudsen study indicates that relatively straightforward dam modifications may permit turbine operation below minimum operating level. The M.K. study is enclosed as Appendix 14 of these comments.

State of Idaho (Cecil D. Andrus, Governor)

S29-114

Both the Corps' DEIS and BPA estimate the drawdown will cause a three-month loss of capacity of 3400 MW, valued at between \$40 million and \$120 million. (The MW number represents that combined maximum capacity of the four Snake River dams.) While it might be physically possible for the four dams, in a given instance, to produce that much power, it is highly unlikely that the system would be willing to release enough water to reach that generation level during the critical period. This is especially true in the springtime, when that level of power is not needed (power demands are lower and availability is very high because of melting snow and the need to restrain reservoir levels for flood control). The Northwest has least need for capacity during these months -- the need is to build for peak period. Capacity loss is thus not a serious problem in the drawdown approach, as most of the region's power analysts agree. The value of capacity losses should be zero.¹⁴

The inclusion of capacity loss for an EIS aimed at 1992 measures is especially misleading. As the DEIS itself states:

"It is important to note that currently the Northwest power system is not capacity-constrained, especially in the spring. Thus, these capacity losses may not affect the system's ability to serve Northwest peak loads."

Page 4-123. Despite this assessment, the Corps includes \$54 million for lost capacity in estimating the cost of drawing down the four lower Snake River pools to spillway crest. (Table 4.2-4).

S29-115

In Table 4.9 of the DEIS, the cost of nonfirm energy loss to the system from the drawdown option is put at \$38 million, or 5,000 to 8,000 MW-months. However, at the 15 mills value assumed by the Corps for nonfirm power, the amount of lost nonfirm should be calculated at 3,500 MW-months. It is apparent that the higher range was taken from BPA's estimates, which includes both firm and nonfirm power. BPA estimated nonfirm loss from the drawdown at \$35 million.

S29-116

The values of both the Corps and BPA are unwarranted. While it is true that the system would lose nonfirm generation during drawdown, the market value of this loss is difficult to judge. Furthermore, the loss in comparison with flow augmentation is likely to be considerably less, since the amount received for the residual generation will be higher. Under the flow augmentation scheme, such as Target 200, potential purchasers of nonfirm energy -- primarily California -- understand that the spring fish flush will produce large amounts of additional excess energy.

¹⁴ This position appears to be supported by BPA's comments to the Northwest Power Planning Council regarding Phase II amendments of the Columbia River Basin Fish and Wildlife Program. Those comments state that "May and June capacity may have no value."

S29-116
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This puts them in a strong bargaining position and forces the Northwest to sell its power cheap. While less spring energy is produced under the drawdown proposal, the bargaining position for this power is stronger.

S29-117

According to the Corps' DEIS, the approximate economic cost in power terms for a drawdown of the four lower Snake dams to spillway crest would be \$169 million, as opposed to the equivalent flow augmentation option. However, the costs assigned to the drawdown scheme improperly include the cost of capacity loss. Properly disregarding capacity would reduce the Corps' estimates of power loss to \$115 million. Dam modification may further reduce this number of \$70 million or approximately \$30 million less than the flow augmentation approach.

S29-118

In general, these power losses are worst case, assuming no adaptive changes to the system. The DEIS projects higher losses than should actually occur once a scheme is in place, because the system will adjust to a given set of requirements and tend to maximize power production under those constraints. For example, some flood control space could be shifted to the four lower Snake River pools during the drawdown, allowing more storage upstream in either the Snake or the Columbia. Some analyses also indicate that the region could make better use of capacity and energy exchanges. Moreover, the historical record shows that actual energy losses tend to be less than original estimates for any given change in the way the power system is operated, which indicates that such adaptation quickly takes place.

S29-119

Page 4-123: The DEIS fails to discuss the potential impacts of flow augmentation on capacity to meet load during high demand periods in summer and winter. The discussion of capacity at pages 4-123 and 4-124 only deal with the reservoir drawdown scenarios.

Flow augmentation shifts storage releases into the spring from winter or summer. Augmentation schemes that result in significant impacts to reservoir elevations and effect energy capacity. The DEIS states that flow augmentation impacts on capacity are minor (page 122, Table 4.9-4). However, these capacity impacts are not minor, especially for flow augmentation to achieve a flow of 140 kcfs at Lower Granite Dam. This option would require drafting Brownlee and Dworshak to empty many years. The resulting head loss may affect capacity during the summer and possibly the winter. Brownlee Reservoir is on the Idaho Power company system. The relative capacity impact to the Idaho Power system would be much greater than if it were part of the Federal Columbia River Power System. Furthermore, electricity demands in Idaho Power Company's service area are high in the summer due to irrigation demands.

The final EIS should refine the discussion of capacity and include capacity impacts to the system due to flow augmentation,

State of Idaho (Cecil D. Andrus, Governor)

S29-119
com'd

particularly the option that requires emptying Dworshak and Brownlee Reservoirs to achieve a target flow of 140 kcfs.

S29-120

Page 4-130: Section 4.2.7... Mitigation: The EIS overlooks several key actions in mitigation of impacts to the power system. The first step to mitigate impacts is to gather better quality information on the impacts. Since the EIS overstates the impacts on the power system, a more precise analysis will reduce the impact. The second step would be to examine the basis for remaining on critical year planning for FELCC. The operational flexibility approach to Target 200 appears to move away from critical water planning. Accepting a slightly higher risk above critical water planning will further lessen the impacts to the power system. The third step would be to modify the lower Snake River dams and recapture some of the lost electricity through ancillary generation that is compatible with fish migration. The fourth step would be to pursue energy marketing strategies that "firm" some of the surplus nonfirm energy. Energy exchanges could be a mitigating measure, for example. Another step would be to realign system operations around a reservoir drawdown strategy. Flood control storage in the drawdown lower Snake reservoirs should open up some flexibility to hold water in other reservoirs, leading to increased power benefits.

S29-121

Section 4.10. Recreation: Recreational impacts are not well-documented and tend to be overstated. Data sources are not adequately cited. The DEIS fails to distinguish between recreational activities that would and would not be affected by reservoir drawdowns. Instead the DEIS simply unfairly assumes that all of the recreational use may be lost. For instance, parks near the reservoirs will remain open and it is reasonable to assume that people will continue to use them. The DEIS does not present adequate data distinguishing among types of recreational activity and levels of use by time period.

S29-122

Section 4.10.3. Economic Aspects: This section provides a well-reasoned discussion of potential changes in recreational behavior but notes that changes should not be interpreted as a net loss to local and regional economies. The \$20 million figure of total recreation-related expenditures used in the discussion is for the April 15 to August 15 drawdown scenario. Idaho is concerned that this will be come another statistic that has no basis in reality and is misused by certain interests in the salmon debate.

S29-123

The DEIS should explain that much of the water-based recreation does not take place until the peak run-off has occurred. Boaters, water-skiers, and fishermen actively avoid the high run-off period, the period of reservoir drawdowns.

CONCLUSION

Once again, we appreciate the Corp's hard work in preparing a timely DEIS. While we have substantial concerns with the

content of the document, the fact that the Corps appears to be moving forward with a 1992 test is extremely positive. We hope to continue to work with Corps staff to resolve points of disagreement regarding reservoir drawdown and flow augmentation actions. Thank you for your consideration.

**Washington State
Department of Transportation**

Transportation Building 4th Fl.
Olympia, Washington 98504-5201
(206) 753 6005

Department of Army
Walla Walla District
Corps of Engineers
Attn: CNEPW-PL-ER
Walla Walla, WA 99362-9265

November 22, 1991

Duane Berentsen
Secretary of Fisheries

Subject: Draft Columbia River Salmon Flow
Measures 1992 Options Analysis/EIS
I-82, SR 12, 14, 124, 127, 129, 193, 261,
730

To whom it may concern:

Following are the Washington State Department of Transportation's comments concerning the
Options Analysis/EIS.

We have reviewed this document for water management to improve salmon migration in the
Columbia and Snake Rivers. This project could affect state transportation facilities that provide
access to and from these rivers and their associated facilities.

S30-1 Several state highways parallel and/or cross the Columbia and Snake Rivers within the study
area. We are concerned with the increased truck traffic that would be directed to state highways
when barge traffic on the rivers is stopped during river draw down. State highways will
experience additional wear and deterioration due to the increased truck traffic. Wear on the
highway's surfacing an paving system is disproportionately high, as compared to volume
increase, for heavy trucks. One truck is the equivalent of thousands of cars. Funding for the
repair of highways has been difficult to obtain.

S30-2 Draw down of the rivers would go below the existing highway fill riprap protection and bridge
footings. Low waters could cause erosion that would threaten the highway fill riprap and
bridges. Thus exposing the travelling public to unsafe conditions. To lessen the unsafe
conditions, additional fill riprap and structure protection would be necessary. Methods of
protection and associated costs should be the responsibility of the proponents.

S30-3 Any additional access to our utility service use of state highways and rights of way must be
coordinated through the District Utilities Section.

S30-4 Page 2-67, Table 2.9-3; Table does not include all the existing or proposed state highways that
could be affected by the diversion of commodities from barge transportation. The following
highways should be included:

Existing State Highways:

WA 193, US 12 to Port of Wilma (Clarkston)
WA 129, Oregon Border to US 12 (Clarkston)
WA 128, US 12 (Pomeroy) to US 12 (Clarkston) (To become county road April 1, 1992)

Proposed State Highways as of April 1, 1991:

WA 263, Kahlottus to Windust on the Snake River
WA 397, US 195 (Pasco) to Finley Industrial Park

Corps of Engineers
November 22, 1991
Page two

S30-5 Page 4-111, 4.7.3.1 Physical Effects; Two bridges that cross the Snake River in Washington
have not been included. US 12 crosses the Snake River via twin highway bridges between Pasco
and Burbank approximately two miles upstream from the confluence of the Columbia and Snake
Rivers.

S30-6 Page 4-111, 4.7.3.2 Redistribution of Traffic; The report indicates that increased truck traffic
would generate enough increased tax revenue to adequately maintain and repair the highway
system. This is probably not a entirely true statement. Increased revenue may be generated but
would probably no off set the additional costs required to maintain and repair the highways.

S30-7 Page 4-112; Truck percentages on US 3956, 20%, appears to be low. We believe that truck
percent is more like 30-35% near Pasco.

Sincerely,

B. L. CHAPLIN
Environmental Program Manager

BLC:mep/M132
GRB (EN)

Washington State Department of Transportation (B.L. Chaplin)

State of Idaho, House of Representatives (Charles D. Cuddy)

CHARLES D. CUDDY
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COMMITTEES
RESOURCES &
ENVIRONMENT
LOCAL GOVERNMENT

House of Representatives State of Idaho

December 13, 1991

Page 2

Mr. Tom Morse

DR. TOM MORSE
EIS Manager
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, WA 99362-2965

Dear Mr. Morse,

Per the article in the Lewiston Tribune dated December 12, 1991, it is apparent certain decisions have been made regarding draw down of Dworshak Reservoir.

This gives rise to numerous questions I believe remain inadequately addressed.

1. Does this decision comply with the directives commissioning Dworshak Project regarding use draw down, etc.?
2. The requirement for hearings specific to changes in Dworshak draw down have not been complied with as no limits actual time frames, etc. were established during any of the meetings I attended. The draft EIS contains alternatives A through J. All of which include Dworshak at different degrees of contribution.

I must conclude that the requirement for a hearing regarding draw down change has not been met as the specifics remain undefined.

3. The draft EIS does not adequately address the effects on resident fish in the Clearwater River including the Northfork watershed upstream of Dworshak Dam.

4. I further believe that the socioeconomic effects of the total proposal do not adequately address the present period of economic instability, high unemployment and governmental deficit we are now enduring and the added impact this total proposal adds to these serious concerns.

5. Until both offshore and inland harvest of fish is restricted, I contend there are no realistic solutions.

S31-6

I am of the impression that the plan contains adequate latitude to allow adjustment for these issues that remain inadequately addressed and unresolved.

I therefore am requesting a public hearing in Orofino, Idaho per Section 415-B of the 1990 Water Resource Development Act.

I would hope you could schedule this hearing at your earliest convenience.

Very Truly Yours,

Charles D. Cuddy
State Representative
District 7

Columbia River Inter-Tribal Fish Commission (Ted Strong)

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

975 SE Sandy Boulevard, Suite 202, Portland, Oregon 97214
Telephone (503) 238-0667
Fax (503) 235-4278

November 8, 1991

Robert Flanagan
North Pacific Division
U.S. Army Corps of Engineers
P.O. Box 2870
Portland, OR 97208-2870

Dear Mr. Flanagan:

R1-1

In reviewing the Options Analysis/EIS, we have identified a general type of alternative that should be considered in the final EIS so as not to foreclose possible implementation in 1992. Various measures to increase protection of juvenile fall chinook migration in the Snake River have been discussed in the region. One such measure would involve operating Dworshak Reservoir to increase flows in the Snake River during the juvenile fall chinook migration. While the draft EIS addresses July drafts from Brownlee Reservoir, it does not address July drafts from Dworshak. We would like the Corps to analyze such an operation and include it in the final EIS.

Recognizing that different consequences result from alternative levels of Dworshak drafts, we recommend that, if the Corps has limited resources to consider options, it should select an operation that would result in clear implications to reservoir levels (e.g. 400 kaf withdrawal during July). My staff is willing to assist the Corps in addressing this study need.

Sincerely,

Ted Strong
Executive Director

cc: Ed Sienkiewicz BPA
Greg Graham Corps

Columbia River Inter-Tribal Fish Commission (Ted Strong)

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

975 S.E. Sandy Boulevard, Suite 202, Portland, Oregon 97214
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November 14, 1991

Lieutenant Colonel Robert A. Volz
District Engineer, Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-2965

Dear Lieutenant Colonel Volz:

The Columbia River Inter-Tribal Fish Commission (CRITFC), a fisheries service organization for the Yakima Indian Nation, the Confederated Tribes of the Wampanoag Indian Reservation, the Confederated Tribes of the Umatilla Reservation, and the Nez Perce Tribe has reviewed the Draft 1992 Columbia River Salmon Flow Measures Options Analysis Document (OAD/Environmental Impact Statement (EIS) or OAD/DEIS. The CRITFC has provided the following general and specific comments to the OAD/DEIS. The measures examined in the OAD/DEIS could have potential benefits, or could cause further degradation of critical treaty anadromous fishery resources in the Columbia River Basin, and are of extreme importance to our member Tribes.

GENERAL COMMENTS

CRITFC conditionally supports the general concept of testing all Snake and lower Columbia River reservoir drawdowns and flow augmentation as expeditiously as possible. Nevertheless, we are concerned that such measures be implemented based on the ability to provide for optimal adult and juvenile migration and survival through the existing run of the river hydrosystem projects. Without structural modifications to provide for safe, unimpeded passage at each of these projects during elevations at spillway crest or lower, and without carefully considering the use of water in basin storage reservoirs, synergistic benefits of augmented flows and pool drawdowns could be negated.

The existence of important tribal cultural resources that may be exposed by pool drawdowns must be addressed by the Corps of Engineers in cooperation with each of the Commission's member tribes. The likelihood that skeletal parts and other items critically important to the tribes may be exposed appears to be quite significant. The Corps must provide adequate measures to assure that these matters will be protected, before proceeding with the drawdown

R2-2

As such, we conditionally support the eighth alternative as an immediate first step toward significantly aiding basin anadromous salmonids. This alternative, which was considered subsequent to the issuance of the OAD/DEIS, was presented by the Idaho Department of Fish and Game at a September 13, 1991 OAD/DEIS meeting. It consists of studying the physical, and if possible, biological effects of lowering Lower Granite Reservoir to spillway crest and lowering Little Goose Pool twenty feet, from March 1, 1992 to April 10, 1992. Further, the implementation of this alternative would take place largely outside of the critical migration period, and detailed contingencies are being developed to protect any migrating fish which may occupy affected reaches. We expect the information derived from this alternative will provide some critical knowledge necessary to determine what structural and operation measures can be effected at all basin run of the river hydroprojects to improve anadromous salmonid survival and production. We expect the final OAD/DEIS will contain a complete review of this alternative, and if chosen as the preferred alternative, the Corps will work closely with CRITFC and its member Tribes to monitor and mitigate possible impacts to anadromous fish, (especially fall chinook), cultural, and other treaty resources.

R2-3

Several measures, which directly impact the OAD/DEIS have not been thoroughly examined in the OAD/DEIS, and should be included in the final OAD/DEIS. The Columbia River Basin Expansion EIS, which is ongoing, could have major impacts on alternatives presented in the OAD/DEIS. The Non-Treaty Storage Agreement and operation of Mid-Columbia Public Utility hydroprojects could affect any OAD/DEIS alternative. A thorough review of the impacts and relationship of the Columbia River Emergency Dredging-Non-Federal Facilities Environmental Assessment (NPPPE-RP-91-05) to the OAD/DEIS is essential. We note that the implementation of NPPPE-RP-91-05 is premature, since several alternatives in the OAD/DEIS and the eighth alternative will not require measures identified in the NPPPE-RP-91-05. Although mentioned in the OAD/DEIS, a much more detailed analysis of the relationship of the System Operation Review EIS (SOR) and the Corps Columbia River Salmon Mitigation Analysis (CRSMA) should be presented in the final OAD/DEIS. Information derived from the implementation of OAD/DEIS alternatives are vital in the CRSMA process. CRITFC supports immediate utilization of such detailed information in CRSMA, so that Corps mitigation efforts can be expeditiously implemented and not delayed.

SPECIFIC COMMENTS

ES-1

The stated goal of the OAD/DEIS should be to create major adjustments in the extant regulated basin hydrograph and hydraulic geometry to aid critical salmonid life history stages which evolved under conditions prior to regulation. "[C]hanging instream flow levels" will not be sufficient unless they are directed toward the basin pre-hydrosystem hydrograph and hydraulic geometry conditions. It is important for the final OAD/DEIS to recognize the importance of flows and channel geometry not only to juvenile and adult migration needs (in terms of water particle travel time), but also to habitat needs of juvenile rearing fish and

R2-4

Columbia River Inter-Tribal Fish Commission (Ted Strong)

R2-4 |
cont'd | migrating adults.

R2-5 | It is extremely important that the final OAD/EIS contain a complete analysis of basin pre-hydrosystem hydrology. Utilizing the 50 year record is biased because it has been greatly perturbed by hydrosystem operations, which have been more and more pronounced (COE, BPA, BR 1991).

ES-4-7

R2-6 | 2.1 We do not support the no action alternative, as treaty anadromous fishery resources would continue to be diminished without possible mitigation.

R2-7 | 2.2 We conditionally support the eventual lowering of all Snake River pools to spillway crest or lower during migration seasons, combined with stable, flow augmentation. However, for immediate implementation, we support drawdown of Snake projects to minimum operating pools, combined with stable, flow augmentation.

2.2.2 We conditionally support the eventual lowering of all lower Columbia River pools to spillway crest or lower during migration seasons, combined with stable, flow augmentation. However, for immediate implementation, we support drawdown of lower Columbia River projects to minimum operating pools, combined with stable, flow augmentation.

R2-8 | 2.3.1-2.4.3 The flow augmentation options and the three combination scenarios (drawdown and flow augmentation) are limited to spring flows of 85-100 kcfs at Lower Granite and 200 kcfs at the Dalles (Target 200). These fixed "caps", which will not change regardless of the runoff year, can be met in most years under the base case scenario, and as such do not represent ranges which will do much to increase water particle travel time or approximate pre-hydrosystem spring flows. Thus, there would be little benefit to juvenile or adult fish survival under these flow scenarios, and we cannot support these. The importance of flows resembling the pre-hydrosystem hydrograph below Bonneville Dam cannot be overstated. These flows not only provide advantageous benefits to migrating and rearing salmonids in terms of water particle travel time, but also provide and maintain the critical lower river and estuary habitat essential for physiological preparation for ocean entry and overall survival as noted in Sherwood et al. (1990), Simenstad et al. (1982) and McDonald et al. (1987).

As suggested in the USFWS OAD/EIS comments, the final OAD/EIS should provide an analysis of a sliding scale which would establish flow minimums which would improve with increases in the April run-off forecast. This approach would be consistent with fish benefits derived from natural variations in the pre-regulated hydrograph.

R2-9 | The final OAD/EIS should examine specific flow needs for Snake River subyearling chinook. The OAD/EIS analysis of subyearling travel time is flawed as is noted in Attachment 1 and 2 (Memorandum from M. DeHart to FPAC, October 28, 1991; Memorandum from M. DeHart to FPAC, November 6, 1991). We support shifting flood control capacity from Brownlee and Dworshak Reservoirs to Grand Coulee Reservoir to enable maximum storage of water during the spring runoff period. This water can then be used to provide summer flows to provide both the necessary water particle travel time and provide the critical

R2-10 | rearing habitat necessary for rearing, migrating, subyearlings. Thus, as requested in our letter dated November 8, 1991 to the Corps (Attachment 3) the final OAD/EIS should include an analysis of various modeled options and scenarios for utilizing Snake River Basin storage water releases during the subyearling migration season in the Snake (June-September). Further, the final OAD/EIS should include an evaluation of fall chinook redds which have been identified in Lower Granite and Little Goose Pools, and examine possible flow impacts upon these.

R2-12 | 2.5 We support continuing efforts to control water temperatures in the Snake River to benefit fall chinook life history stages. Results of the 1991 Temperature Control Project were favorable as to physical habitat improvements in the river (Synopsis of Temperature Control Project, October 23, 1991). The final OAD/EIS should contain the draft 1991 Snake River Temperature Control Project, which is scheduled for release at the end of November, 1991.

1.0 Introduction

R2-13 | 1.1 This section should state that the hydrosystem has benefited resident fish, not anadromous fish. It should also state that the hydrosystem has greatly impacted the entire river and estuary system ecosystem which anadromous salmonids depend upon (Li et al. 1987; Sherwood et al. 1990).

1.4 Life History of Pacific Salmon

R2-14 | An important part of the salmon life history is omitted. After, "[s]pawn in freshwater...; add "extensively rear in freshwater rivers, migrate downstream and undergo physiological changes to gradually adapt to saltwater, and rear extensively in the Columbia River estuary".

R2-15 | 1.5 The document needs to state that salmon and steelhead must navigate fish ladders and unnatural pool habitats with degraded water quality parameters.

1.6 Issues of Concern

R2-16 | 1.6.1 The relationship between improved flow conditions and increased survival of salmon in the Columbia River Basin is not merely based upon water particle travel time relationships. Rather, survival is dependent upon the physical/chemical/biological relationship between salmonids and the basin's historical, pre-regulated hydrograph and the associated hydraulic geometry, which travel time relationships approximate and substantiate. We disagree with the document's assertion that travel time relationships are assumptions. Much careful and protracted study and analysis has been conducted by the resources co-managers, the agencies and Tribes. This analysis has been subjected to extensive peer review, and remains credible. The OAD/EIS is based upon two expedient, biased, analyses by hydro industry consultants, which were not available for peer review by the fishery co-managers, the agencies and Tribes. Little weight, if any, should be given to them because they are based upon unrepresentative,

Columbia River Inter-Tribal Fish Commission (Ted Strong)

R2-16
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selective data as noted in Attachments 1 and 2.

Besides increasing water particle travel time, the final OAD/EIS should contain a section documenting other advantages of increased flow such as more rearing habitat, maintenance of hydraulic geometry, maintenance of pre-hydrosystem turbidity, temperature and other water quality parameters, improved cycling of organic and inorganic nutrients necessary for primary and secondary food production, avoidance of predation, less risk of mortality related to parasitism and disease outbreak, and others.

2.0 Description of the Existing Environment

R2-17

This section is of extreme importance because it should carefully outline the future conditions of the river under the no action alternative. While we realize the document was prepared in a short time frame, the final OAD/EIS should be much more complete and technically defensible. In general, we recommend existing conditions be described in much more detail, with appropriate supportive literature, in the final document.

This section of the final OAD/EIS should contain the statistical hydrological analysis of historical pre-hydrosystem Columbia River Basin flows consistent with the methods described in Arnerman and Oribom (1987). It should also contain a complete description of historical and extant basin water quality parameters such as temperature, dissolved gases, turbidity sedimentation rates and pollutants. This section should also contain a detailed description of the historical and current Columbia River Estuary system in relation to critical salmonid life history stages and overall survival. Further, this section should contain a description of adult fallback as noted by Wagner (1991) and the delay of adult passage a documented by Junge (1971) and Wagner (1971). Finally, this section should contain a detailed analysis of historical, existing, and future basin cumulative impacts under the no action alternative.

2-8

2.2.1 Power Generation

R2-18

The final OAD/EIS should contain an statistical analysis, utilizing all Columbia Basin hydrological data, of the probability that the four lowest consecutive water years in the 50 year power planning record (1928-32) will reoccur. The firm energy load carrying capacity (FELCC) may be based upon unnecessary constraints, and these should be analyzed and reviewed.

2-15

2.2.4. Juvenile Bypass Program

R2-19

The final OAD/EIS should contain a chart showing estimates of fish guidance efficiencies (FGE's) for each of the Snake River and Lower Columbia Projects, with an explanation of FGE and fish passage efficiency (FPE) and how the two relate to each other.

2.2.4.2 Juvenile Salmonid Transport

R2-20

The final OAD/EIS should contain a summary of the available transportation information, as is presented in Section 4.2.1.5 here. Further, the final OAD/EIS should document problems with the transportation system, such as fish losses due to human or facility error, fish stress attributed to transportation facilities as reported by Schreck (1990), Maule et al. (1988) and Congleton et al. (1985); the close association between bacterial kidney disease outbreaks and transportation as documented by Elliot and Pascho (1991), and the loss of critical rearing periods, especially subyearling fall chinook as reported by Nicholas and Hankin (1989).

4.0 Environmental Effects of Alternatives

R2-21

As in section 3.0, this section of the final OAD/EIS should contain a much more detailed analysis, supported by the existing literature.

4.1.1 Gas Saturation

R2-22

The final OAD/EIS should note that high natural gas supersaturation levels such as in the Salmon River are restricted to small areas, compared to large expanses below mainstem dams.

4.1.1.2 Drawdown Options

R2-23

The Columbia and Snake Rivers are both categorized as "Class A" excellent under WAC 173-201-045 by the Washington Department of Ecology. Section (2)(iii) states, "[T]otal dissolved gas shall not exceed 110 percent of saturation at any point of sample collection" (WAC 173-201-045). It is apparent from Table 4.1-1 that the current standard for dissolved nitrogen gas is routinely exceeded in the river basin under existing conditions. We note little relevance to the fact drawdown conditions will cause any more infractions to the standard than under current conditions.

4.1.2 Temperature

R2-24

As in Section 3.0, we find this section seriously deficient in both detailed discussion and supporting literature of the effect of drawdown and augmentation flow options upon basin temperatures. The major effect of the hydrosystem on the Snake and Columbia River Basins has been the shift of the system temperature curve to the right, and the loss of temperature variance throughout the basin. Jastke and Synoground (1970) and Jastke and Goebel (1967) found that the basin impoundments and changes to the historical hydrograph had decreased the magnitude of river daily, weekly and seasonal fluctuations. Thus, life histories have been changed; adults now spawn later. It is likely that reservoir drawdown will mitigate this effect somewhat, and flow augmentation would have still more of a mitigation effect. It should be noted that, according to Table 4.1-2, temperatures in the Snake and Columbia River Basins have routinely exceeded the Washington water quality standard of 20 degrees centigrade (WAC-173-201-405).

Columbia River Inter-Tribal Fish Commission (Ted Strong)

4-15

R2-25

The final OAD/EIS should contain a detailed analysis supporting the contentions the Dalles and Bonneville pools, "would reach daily water temperature maximum levels that are slightly higher than existing conditions."

4.1.3 Turbidity and Other Water Quality Parameters

R2-26

This section should note that the river basin was historically more turbid than under current conditions. Junge and Oakley (1966) and Botton and Jones (1990) reported a dramatic decrease of mainstem and estuarine turbidity by the construction of mainstem dams. They concurred that this condition has increasingly contributed to increased piscivory of migrating and rearing juvenile salmonids by opportunistic predators. It is likely the combination of drawdown and flow augmentation will create such conditions.

4.2.1.1 Flow Effects on Survival

R2-27

We support the Fish Passage Center's statistical analysis of travel time relationships contained in CBFWA (1991). We also support the Fish Passage Center's critique (CRITFC Comments Attachments 1 and 2) of Kindley (1991) and Giorgi (1991).

4.2.1.5 Effects of Flow Options on Juvenile Bypass, Collection, and Transport

R2-28

The majority of this section describes existing conditions and belongs in Section 2.0. It should be noted that major flaws in study design and statistical analysis were found in Matthews et al. (1987) as noted by Heinith (1991). Thus, interpretation of results are suspect. In addition, it should be noted that transported fish have never been shown to successfully return to natal spawning areas, and that straying of adults transported as juveniles is problematic as documented by Slatick et al. (1988) and Johnson et al. (1990). Transportation was implemented as an experimental measure and has not prevented the downward decline in basin salmonid stocks. As such, in order to achieve the habitat and conditions for successful migration necessary for survival, other methods, such as reservoir drawdown and flow augmentations with dam structural modifications to mitigate for nitrogen supersaturation must be designed and implemented.

4.2.1.9 Effect on Habitat

R2-29

The document should note that water quality parameters, which in turn affect primary and secondary biological production, have been changed by hydrosystem reservoirs. Erickson et al. (1970) noted that basin zooplankton densities were the lowest in the lower Columbia, and that the mainstem river had lost benthic diversity. Sherwood et al. (1990) reported that the increased production of phytoplankton, due to the large mainstem reservoirs, and progressive phytoplankton influx into the mainstem and estuary areas has caused a deleterious shift in the food web essential to rearing juvenile salmonids.

R2-30

It is likely that reservoir drawdowns and flow augmentations will result in increased

R2-30

macroinvertebrate diversity, if perturbations in hydrographic regimes are minimal, and hydrosystem operations remain stable. Initial effects to primary and secondary production as a result of reservoir drawdown will be temporal. Wallace (1990) noted that sources of macroinvertebrate recolonization will be migration from the hyporheic zone, downstream drift, and aerial movement. The increased capacity of the river to transport organic and inorganic debris will provide the habitat necessary to macroinvertebrate production (Vannote et al. 1980) essential to rearing chinook (Waters 1969).

CONCLUSION

For 1992, CRITFC recommends inclusion of the eighth alternative, the lowering of Lower Granite pool to spillway crest and Little Goose Pool twenty feet as a first step in determining dam structural and other adaptations which will provide pre-hydrosystem hydrographic and hydraulic geometry conditions essential to anadromous salmonid survival. In addition, we support drawdown of all basin reservoirs to minimum operating pools during the extent of the spring and summer migration seasons, and further examination of augmentation flow regimes. We expect these conditions will provide both lower water particle travel time to aid migrating salmonids, and assist to provide the habitat conditions critical to all salmonid life history stages while they occupy the Columbia River Basin.

R2-31

We recommend that the Corps, BPA and the Bureau of Reclamation closely coordinate contingency plans with the basin fishery agencies and Tribes to assure minimal impacts to salmonids occupying the study area during possible design, implementation, and evaluation of any alternative identified in the OAD/EIS. Finally, our support for any alternative is conditional upon the Corp's assurances the any alternative's impact upon tribal archeological/cultural resources will be adequately addressed.

CRITFC appreciates this opportunity to comment on the OAD/EIS. Should you have questions please contact Bob Heinith of our staff at (503) 238-0667.

Sincerely,

T. Strong
Ted Strong
Executive Director

Attachments (1-3)

cc: Tribal Biologists
Nez Perce Tribe Water Resources Dept.
FPAC

The Shoshone-Bannock Tribes (James Osborne)

The SHOSHONE-BANNOCK TRIBES

FORT HALL INDIAN RESERVATION
PHONE (208) 238-3700
(208) 785-2080
FAX # (208) 237-0797

FORT HALL BUSINESS COUNCIL
P. O. BOX 306
FORT HALL, IDAHO 83203

November 14, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265
RE: Draft 1991 Columbia River Salmon Flow Measures Options
Analysis Document/Environmental Impact Statement

To Whom It May Concern:

The Shoshone-Bannock Tribes (Tribes) are a federally recognized Tribe of Indians located on the Fort Hall Indian Reservation in southeastern Idaho. The Tribes exercise on-reservation fishing rights as well as off-reservation treaty fishing rights pursuant to the Fort Bridger Treaty of July 3, 1869. Part of their off-reservation fishing grounds are located in the Salmon River area that is the subject of this Environmental Impact Statement (EIS). The Tribes are concerned with the declining stocks of salmon in this area and are interested in seeing flows appropriately adjusted to improve the stocks of salmon in this area.

The Tribes have adopted the comments submitted by the Fish Passage Center and have incorporated them into the Tribal Comments. See Attachment. In addition to the technical comments, the Tribes have comments regarding the EIS. The salmon play an important role to the Tribes, not only as a food source but also as part of their cultural and religious beliefs. Because of this, the Tribes believe that any EIS should include a cultural component with appropriate consultation with the different Tribal interests. It is possible that one of the options may be preferred because of the Tribes beliefs. This area should be fully explored in the final EIS. In addition, the Tribes would have preferred to see the alternatives that were not evaluated in detail be explored. Often times alternatives that do not appear to be feasible or that represent long term actions are preferred by the Tribes. The EIS did not appear to present all alternatives in an objective fashion. The Tribes have not had a great deal of time to evaluate the EIS but would appreciate greater involvement in the finalization of the

R3-2 cont'd EIS due to their interests in the matter.

Thank you for your attention to our comments. If you have any further questions, please do not hesitate to call.

Very truly yours,

James Osborne
James Osborne
Tribal Vice Chairman

CC: FHBC
Fisheries

R3-1

R3-2

Upper Columbia United Tribes Fisheries Research Center (Janelle Griffith and Dr. Allen T. Scholz)

UPPER COLUMBIA UNITED TRIBES FISHERIES RESEARCH CENTER

ADMINISTRATION AND
ACCOUNTING OFFICE
P.O. Box 385
Wellpinit, Wa. 99040
509-838-3463

RESEARCH OFFICE
Department of Biology
Eastern Washington University
Cheney, Wa. 99004
509-359-6397

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

11/12/91

RE: 1992 Draft EIS comments

R4-1

We would like to officially protest the lack of consultation with the Spokane Tribe of Indians on a government to government basis regarding the potential impacts to resident fish in Lake Roosevelt in your 1992 EIS.

R4-2

Several times throughout your report data from the Lake Roosevelt Monitoring Project dealing with water retention time and entrainment was misquoted and/or misconstrued.

The Peone report of 1990 dealing with FDR states that if water retention time is less than 30 days in the spring there are severe impacts to zooplankton densities and biomass throughout the reservoir. Additionally, low spring water retention times were found to be responsible for high entrainment of rainbow trout.

R4-3

Your report falsely gives the impression that Lake Roosevelt has high entrainment losses of rainbow due to net-pen operators releasing their fish in the spring in response to decreasing reservoir levels. Lake Roosevelt would not have high entrainment losses if low reservoir elevations were combined with low outflow. This would create a situation of increased water retention time and rainbow trout would residualize within the reservoir and not be lost from the Lake Roosevelt system. Your report does not emphasize that decreasing reservoir levels combined with increased outflow

R4-3
continued

result in lower water retention times. In 1991, net-pen operators released their fish in late spring. Despite this fact numerous rainbow trout were recovered below Grand Coulee due to the below normal water retention times within the reservoir in May and June, owing in part to transfer of Dworshak flood control responsibility to Grand Coulee.

R4-4

Water retention time is a critical factor in the biology of Lake Roosevelt that needs to be recognized and addressed within the Columbia River System. Many of the alternatives state that there will be only slight impacts and that these impacts will occur in May or June. It is our contention that any further drawdowns during these months will critically impact the biology of Roosevelt for the remainder of the year. April, May and June are months when zooplankton production is usually on the rise. Managing the reservoir in such a way that contributes to water retention times below 30 days decreases the potential for high zooplankton density and biomass values later in the summer. Low zooplankton levels result in decreased fish growth, and increased competition. If the reservoir is continually managed in such a way that leads to low zooplankton production, the long term result will be decreased fish growth. Eventually the economic value of the Lake Roosevelt fishery will decline because fishermen will not be harvesting the larger size fish that they are used to and will discontinue fishing the reservoir.

R4-5

In 1991, Dworshak flood control was transferred to Grand Coulee with serious and harmful impacts to the biology of Lake Roosevelt. Water retention times for April and May show water flowing through the reservoir at a rate of 18 days and 19 days respectively. It is because of this decreased water retention time that we are seeing a 50% decrease in zooplankton density in 1991 when compared to 1990 for the same time period. Additionally the flood control shift also affected wild runs of kokanee within the reservoir with the possibility that some of these runs were eliminated. This operational strategy was a prime example of the

Upper Columbia United Tribes Fisheries Research Center (Janelle Griffith and Dr. Allen T. Scholz)

R4.5 | harmful effects that reduced spring water retention time has on
cont'd | Lake Roosevelt and shows that Grand Coulee cannot absorb
Dworschaks flood control responsibilities without substantial
impacts.

In summary, your Draft 1992 EIS statement does not fully consider the impacts to resident fish within Lake Roosevelt from the different operational alternatives proposed and does not fully consider the damaging impacts that low water retention time has on the reservoir. It is for these reasons that we believe the 1992 EIS is seriously flawed.

Janelle Griffith
Lake Roosevelt SOR Biologist
Cheney, WA 99004

Dr. Allen T. Scholz
Director, UCUT Fisheries Research Center
Cheney, WA 99004

Colville Confederated Tribes

P.O. Box 150 · Nespelem, WA 99155

(509) 634-4711

November 21, 1991

Department of the Army
Walla Walla District, Corps of Engineers
Attn: CENPW-PL-ER
Walla Walla, WA 99362-9265

Dear Sirs,

The following are brief comments pertaining to the Columbia River Salmon flow Measures Option Analysis / EIS. I realize that comments were to be received by November 15, 1991 to be included in the final EIS, but I hope that you will give these comments some consideration. I believe that they are probably detailed in other agency comments.

Thank you for the opportunity to comment.

Sincerely,

Kirk D. Truscott

Kirk Truscott, Biologist
Fish and Wildlife Department
Colville Confederated Tribes

Colville Confederated Tribes (Kirk Truscott)

The option alternatives for the large part require operational changes to Grand Coulee reservoir either through Snake River augmentation (options D.F.G.H and I), Columbia River augmentation (options S.T and U) and combination alternatives X,Y and Z. It is apparent that it is a good possibility that there will be an impact on the Lake Roosevelt aquatic ecosystem, therefore I suggest the following questions and or comments have additional investigation.

- R5-1 1. Spawning habitat is unlikely to increase with elevation decrease due to the topographic nature of Lake Roosevelt (43.1 paragraph 1).
- R5-2 2. What assumptions lead to the conclusions that reductions in surface elevations would have an insignificant impact on aquatic resources in Lake Roosevelt? (4.3.4.3 paragraph 1) Additional decreases in reservoir elevations during indicated time period will likely desiccate additional yellow perch spawning sites and prey items for sub-adult and adult walleye as well as other sport fish.
- R5-3 3. Decreased water retention time that results in reduced zooplankton populations will effect not only juvenile walleye, but rainbow trout, kokanee, yellow perch and adult walleye. All the above species except adult walleye rely heavily on zooplankton. Adult walleye utilize small fish of various species that in turn utilize zooplankton. Effects can probably be measured with long-term monitoring of species diversity, density, age structure and incremental growth rates (4.3.4.3 paragraph 3).

- R5-4 As a final comment, nowhere in this draft EIS are there predictions of water retention times based on any of the proposed action alternatives. This type of data is absolutely essential for determining effects to zooplankton populations, entrainment of fish and ultimately fish populations and growth rates.

City of Boardman

TOWN SQUARE
P.O. BOX 275
BOARDMAN, OREGON 97618
TELEPHONE (503) 481-3252

City of Boardman (William C. Brown, Mayor)

L1-1
cont'd

Extrapolating from these figures a river elevation of 250 ft. would give us a yield of approximately 2,500 gallons/minute which is below our current peak usage.

In our research on the potential of replacing our water supply we could be facing costs as high as \$1,000,000 to construct a new Ranney Collector with a design to accommodate the lower pool levels. The Columbia River through a Ranney Collector remains as our most viable water supply to meet our needs for now and into the future as ground water sources in our area would be hard pressed to meet our demand.

You will find attached a copy of a letter from Ranney Method Western Corp., Inc. with the well yield curves that our information is based on.

I hope that this information is helpful for your purposes. If you or your staff should have any questions please contact us and we will do our best to address those questions and concerns.

Sincerely,

William C. Brown
William C. Brown
Mayor
City of Boardman

August 14, 1991

Senator Bob Packwood
259 Russell, Senate Office Building
Washington, D.C. 20510

Dear Senator Packwood,

I offer the following overview of a problem with disastrous potential to the City of Boardman municipal water system. We are mandated to develop long range water plans while at the same time we are constantly given bits and pieces of frightening data on future pool levels on the John Day pool (Lake Umatilla).

We have seen many articles recently about the issue of salmon runs in the Columbia and Snake Rivers dealing with numerous points of view. The articles on economic impacts have dealt with the effects on hydro power, river navigation, and irrigation costs and availability of the proposed lower pool levels. One item that is seldom if ever recognized is the effects that these lower pool levels would have on municipal water supply systems like the one in the City of Boardman.

The City of Boardman utilizes a Ranney Method Collector on the banks of the Columbia River. The current design capacity of this well is 6,000 gallons/minute with a potential yield at a river elevation of 265 ft. of 9,000 gallons/minute. Should the pool levels be lowered, there would be a corresponding drop in the potential yield of the well. In discussions with Ranney Method Western Corp., Inc. of Kennewick, WA. who designed the collector, the lower pool levels as proposed would create some very serious loss in the yields that would be available to the City in terms of water supply. Should the pool level in the John Day pool be dropped to the minimum level of 257 ft. the yield of the well would be 5,630 gallons/minute, if the level were to be 252 ft. the yield would fall to 3,650 gallons/minute, a 35% loss, and at 247 ft. the yield would be 1,940 gallons/minute a 66% loss.

L1-1

Port of Lewiston (Ron McMurray, Manager)

The Port of Lewiston appreciates this opportunity to comment on your Draft 1992 EIS.

There is very little scientific data on the effect of flows and drawdowns on salmon. As we analyze specific flow and drawdown measures we find the scientific community biologically controversial. What little data there is indicates that a certain amount of flow increase will benefit the young smolts while major flow increases have very little or no positive effect on the fish. What we do know, is that drastic drawdowns producing major flow increases will have a significant effect on the regions river-based economy.

This is why we have repeatedly stated that a comprehensive plan be based on sound science which addresses the "Four H's" of Hydro, Harvest, Hatcheries and Habitat.

In order to bring more biological data to the table it appears that a test drawdown will be necessary.

Drastic drawdowns to spillway level should be tested only if they are the best and least costly alternative to achieving stated biological survival goals. It is imperative that we first implement harvest restrictions, create hatchery and habitat improvements, finish installing irrigation screens and turbine screens, complete various fish bypass systems and test the feasibility of net pen barging.

Drawdowns to spillway crest is a dramatic step, and has the greatest potential of harming the salmon, as well as other fish and wildlife.

Port of Lewiston (Ron McMurray, Manager)

L2-3

Since downtown Lewiston is diked and is ten to twelve feet below the operating level of Lower Granite Pool, there is a fear of bank distabilization and the damage that could occur with the failure of that dike system. Damage to any part of the railroad right-a-way would stop all rail service to Lewiston.

L2-4

The Port of Lewiston is here today to go on record in support of a limited test drawdown that would be conducted during the two-week maintenance closure. In order to obtain the required biological data it may necessitate more time then two weeks. We may be able to offer more, but let it be known that six weeks is far too long a time to avoid economic hardship.

The limited test drawdown must be economically and structurally feasible and of course biologically prudent. It should be conducted over several years and not be harmful to the navigation industry.

L2-5

The Port of Lewiston opposes dramatic drawdowns and believes that they should be implemented only if the limited test drawdown deems it to be economically and biologically necessary.

Franklin Public Utility District (Beverly Cochrane, Commissioner)

Testimony of Beverly Cochrane on the Corps of Engineers Drawdown Draft Environmental Impact Statement

My name is Beverly Cochrane and I am a Commissioner for Franklin PUD. This issue is important to our utility since our largest industry is agriculture. The agricultural industry would be doubly impacted by drawdowns of the Snake River reservoirs. Drawdowns would impact our wholesale rates from the Bonneville Power Administration, and thus our irrigation retail rates. The ability of some of our large irrigators would also be affected by reservoir drawdowns. We have been active in the Northwest Power Planning Council's effort to come up with a regional solution to restore salmon runs on the Snake River. We have urged them to come up with a well balanced plan which is biologically sound and will protect the weak stocks of salmon. We still believe that fish recovery can occur while maintaining a healthy economy.

We applaud your effort to present both the benefits and costs of several major proposals to change river operations. By doing so, the Corps has made a significant step toward the development of well-reasoned public policy. The selection of a river operation plan for 1992 should be based on both cost effectiveness and measures of physical performance that are directly tied to a sound biological foundation. Any measure being considered should be able to pass cost effectiveness and biological justification tests. The data currently provided in the Corps' Option Analysis EIS indicate the drawdown proposals for the Snake and Columbia Rivers are not cost effective relative to the flow augmentation options or lack a sound biological justification. In fact, reservoir drawdown may harm salmon. Given the data in your EIS, flow augmentation options appear more viable. We agree with statements in the EIS calling for further analysis of potential hydropower costs.

We believe your discussion on flow regimes and smolt travel time should include a marginal benefit assessment. It is important to recognize that resource managers can commit to higher flow levels but only receive minor fishery

L3-4
com'd

benefits. We urge you to adopt the alternative which gets the greatest benefit to the weak salmon stocks with the least overall economic cost. Drawdown proposals impact irrigation. Drawdown proposals impact navigation. Drawdown proposals impact recreation. Drawdown proposals impact power generation, as well as resident fish. Based on your analysis, drawdowns are not a cost effective method for salmon enhancement. We urge you to continue to measure each alternative against cost effectiveness criteria.

L3-5

I also have a personal interest in the Snake River drawdown proposals. My family has farmed wheat in the Kahlotus area for many years. The grain elevator manager where we haul our grain to states that under proposals to lower the Ice Harbor pool the Port of Kahlotus will not be able to load barges as it usually does at the Dreyfus elevator at Windust. This will impact local wheat farmers, as well as grain haulers who bring wheat for barge shipment from as far away as Montana, that ship wheat downriver from the elevator at Windust.

We feel the weak stocks of salmon can still be saved without wreaking havoc on the region's economy. In order to do this, all proposals should pass a cost effectiveness test and be justified on biological criteria. We urge you to include both cost effectiveness and biological justifications in your analysis of alternatives.

L3-1

L3-2

L3-3

L3-4

Benton County PUD (James W. Sanders)Corps of Engineers
10/25/91
Page 2

L4-2 | various options and included in the final EIS. The analysis must look at both direct and secondary economic impacts associated with each option being considered.

L4-2 |
cont'd

October 25, 1991

Department of the Army
Wallia Wallia District, Corps of Engineers
Attn: CENPW-PL-ER
Wallia Wallia, WA 99362-9265

Gentlemen:

L4-1 | The District would like to thank you for the opportunity to comment on the Corps of Engineers Columbia River Salmon Flow Measures Options Analysis/EIS.

L4-1 | The focus of the region's effort regarding salmon must be on weak stock survival, not merely on increasing numbers as was the goal in the past. Hopefully the test expected to occur in 1992 will contribute meaningful information to this end.

The District operates an electric distribution utility and provides electric service to over 33,000 customers within Benton County. Many of our largest customers are farms irrigated with water pumped out of the McNary and John Day pools of the Columbia River.

GENERAL

The Corps' study is one of the first efforts to quantify the costs and benefits associated with changing the operations of the Snake and Columbia Rivers. Many of the options listed are extreme and significant departures from the "business as usual" way of operating the federal Columbia River power system. We believe the time you are taking to perform the analysis is prudent and we very much appreciate the effort.

Sound biological reasoning and rigorous cost effectiveness analysis are the standards against which each option must be measured.

Provisions for suitable monitoring of any test is absolutely necessary before any test is allowed to proceed.

RIVER DRAINOWN

L4-2 | Analysis performed by Northwest Irrigation Utilities indicates that the river draindown proposals fail to meet both the cost effectiveness and biological soundness tests. We believe further analysis by the Corps will verify NIU's conclusion. A formal cost effectiveness analysis should be performed on the

EFFECT ON IRRIGATORS

Any action that effect the levels of the John Day and McNary pools can have very significant impacts on the District. The District has invested over \$9,000,000 in electrical facilities needed to provide service to the large irrigation projects along the Columbia River. Recovery of this investment is made through the revenues we receive for electricity delivered to the farms. Presently irrigated agriculture accounts for some 13 percent of the District's total annual revenue.

L4-3 |

The District's Commission hired two consulting firms to study the effect a drawdown of the John Day and McNary pools would have on the farms served by the District. The study, titled Effects of the Columbia River Pool Draw-Down on Selected Pumping Stations in Washington, was prepared by IRZ Consulting and PACAM Engineering. A copy of the study was sent to the Corps of Engineers. Four pump decks were studied and the results of that study are presented in the report. We have been told the results of that study will be included in the final EIS.

L4-4 |

Drawing down the John Day reservoir to minimum operating pool levels will prevent all farms that pump out of this reservoir from operating. The District will lose significant revenue from these farms. Increased rates to other customer classes will be required to recover our investment.

However, to fully appreciate the impact the loss of irrigated agriculture would have on the District one must look past the direct lost revenue. Lost revenue from secondary industries must also be considered.

The produce from the farms is direct feed stock into a large number of value added industries served by Benton PUD; wineries, fresh pack plants, food processors, and cold storage warehouses are examples of these facilities.

Irrigated ag and related activities such as fertilizer production and food processors account for over 26 percent of the District's total annual revenue. Preventing farms from producing the raw product needed by these industries will devastate the economy of our area, and will ultimately be felt across the State. The State economy, already in decline, will deteriorate further.

L4-5 |

Costs to modify the pump decks must also be carefully determined in your study. The aforementioned study provides information on the cost to modify the four pump decks to operate at lower pool levels. Care must be taken when extrapolating the cost estimates for the specific pump decks modifications to all pump decks.

L4-6 |

The fact still remains that, even if steps could be taken to somehow assure

Benton County PUD (James W. Sanders)

Corps of Engineers
10/25/91
Page 3

L4-6
cont'd

that the farms could continue to operate at the lower levels, the biological benefits associated with operating the reservoirs at the minimum pool levels are not biologically sound. Proposals must be based on sound science, the John Day drawdown proposal is not.

CONCLUSION

The District supports sound and reasonable efforts to save the weak salmon stocks. We believe it is socially responsible to do so. We applaud the Corps' effort to be responsible and deliberate in their analysis of the options. We encourage you to stay the course and consider only cost effective and biologically sound options.

Very truly yours,

James W. Sanders
Director - Technical Services

JWS/caq

Port of Portland

Box 3529 Portland, Oregon 97208
503/231-5000

Port of Portland (Mike Thomas, Executive Director)

Walla Walla District, Corps of Engineers
Page 2
November 13, 1991

November 13, 1991

Commander
Walla Walla District, Corps of Engineers
Department of the Army
ATTN: CENFW-PL-ER
Walla Walla, WA 99362-9265

Dear Sir:

We welcome the opportunity to comment on the impressive work the Corps has already done in putting the "Draft Columbia River Salmon Flow Measures - 1992 Options Analysis/Environmental Impact Statement" together in such a short period of time. Because of the wide ranging economic impacts that could result from altering operations on the Columbia/Snake River navigation system, it is imperative that a full understanding of the cost-effectiveness of proposed measures be obtained. The Draft EIS represents an excellent first step in giving policy makers and the public a means to weigh the biological effectiveness and economic costs of various measures proposed for restoring salmon runs.

The Port of Portland joins every other river interest in supporting efforts to increase the numbers of adult salmon returning to their spawning grounds in the Columbia and Snake Rivers and their tributaries. At the same time, we believe that any changes in river operations must be able to meet the test of biological justification and cost-effectiveness. To this end, we offer the following comments to aid the Corps and other agencies in completing the Final EIS:

Navigation Interests Supported

As a member of the Pacific Northwest Waterways Association (PNWA), and a port district which works closely with barge and tug operator members of the American Waterways Operators (AWO) and the Columbia River Towboat Association (CRIA), we endorse the comments submitted to you earlier by these organizations. In addition to our other, more specific comments, which follow, we wish to emphasize the following general points addressed by PNWA:

The final EIS should be written from the perspective of analyzing whether a drawdown is biologically effective for fish or not, and not whether a drawdown should occur. Maximum benefit to salmon, rather than meeting CBRWA flow objectives, should be the aim of the test drawdown.

L5-2

- Any experimental drawdown must occur during the salmon migration season, in order to provide meaningful information on fish survival.
- The test drawdown should not last more than four weeks, in order to reduce the harmful effects of the drawdown on some salmon stocks, and to limit the adverse economic impacts of a drawdown.

Impacts of Drawdown on Navigation and International Trade

We share the concern of PNWA and others that the Draft EIS greatly underestimates the effect a drawdown will have on the ability of growers, manufacturers, and shippers to trade competitively on world markets. We hope the following comments on specific sections and elements of the Draft EIS are helpful in completing your economic analysis:

Transportation Costs

Table 4.7-15 underestimates the total impact of increased transportation costs. The EIS suggests that barge rates will likely increase 25 to 42 percent (presumably for the remaining navigable months) to compensate for revenue loss during the diversion. It is not clear that these costs are included in the table.

Impact on Competitiveness of Northwest Grain

This issue is not sufficiently discussed on Page 4-107. The study identifies \$3.0 to \$6.7 million in additional storage and transportation costs. On +- 9 million tons of wheat exported in 1990 from the Columbia River, this means a minimum of a \$0.30 to \$0.75 increase to the cost of a ton of wheat (averaged over the entire annual volume). Due to international competition, wheat is traditionally traded on very slim margins. Even a 1 percent increase in the costs may be a substantial impact on the region's ability to keep market share.

Deep-Draft Shipping Losses

Section 4.7.1.3 on Pages 4-107-108 does not do justice to the potential adverse impacts of reduced water depths in the lower Columbia River. There are also no tables presented to show the data on which the conclusions are derived.

L5-3

Transportation Costs

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L5-4

Impact on Competitiveness of Northwest Grain

This issue is not sufficiently discussed on Page 4-107. The study identifies \$3.0 to \$6.7 million in additional storage and transportation costs. On +- 9 million tons of wheat exported in 1990 from the Columbia River, this means a minimum of a \$0.30 to \$0.75 increase to the cost of a ton of wheat (averaged over the entire annual volume). Due to international competition, wheat is traditionally traded on very slim margins. Even a 1 percent increase in the costs may be a substantial impact on the region's ability to keep market share.

L5-5

Deep-Draft Shipping Losses

Section 4.7.1.3 on Pages 4-107-108 does not do justice to the potential adverse impacts of reduced water depths in the lower Columbia River. There are also no tables presented to show the data on which the conclusions are derived.

L5-1

The Port of Portland joins every other river interest in supporting efforts to increase the numbers of adult salmon returning to their spawning grounds in the Columbia and Snake Rivers and their tributaries. At the same time, we believe that any changes in river operations must be able to meet the test of biological justification and cost-effectiveness. To this end, we offer the following comments to aid the Corps and other agencies in completing the Final EIS:

Navigation Interests Supported

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The final EIS should be written from the perspective of analyzing whether a drawdown is biologically effective for fish or not, and not whether a drawdown should occur. Maximum benefit to salmon, rather than meeting CBRWA flow objectives, should be the aim of the test drawdown.

L5-2

L5-2

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- The test drawdown should not last more than four weeks, in order to reduce the harmful effects of the drawdown on some salmon stocks, and to limit the adverse economic impacts of a drawdown.

Impacts of Drawdown on Navigation and International Trade

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L5-4

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L5-5

Deep-Draft Shipping Losses

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Port of Portland (Mike Thomas, Executive Director)

Walla Walla District, Corps of Engineers
Page 3
November 13, 1991

L5-5
cont'd

It is suggested that a 1-foot draft reduction for two months would impact 19 vessels on the lower Columbia. This number seems to be derived from the erroneous assumption that only vessels with drafts of 40 feet or more will be impacted, although that assumption is not clearly stated. In actuality, an estimated 50 vessels would be impacted over a two-month period.

Terminal 6 container vessels sail with drafts between 35 and 38 feet when fully loaded. It might appear that vessels with these drafts would not be affected by a river level reduction of 1 foot. In practice, however, container carriers require 4 to 5 feet of clearance between the keel of the vessel and the river floor. This under-keel clearance requirement is meant to eliminate any risk of grounding. Under the guidelines promulgated by the container carriers, a vessel with 36 feet of draft would need a river stage of 40 or 41 feet to sail. Container vessels departing Terminal 6 are, in fact, challenging the depth of the channel, even though their drafts are less than 40 feet.

A reduction of water levels on the lower Columbia would have the effect of increasing the delay of container vessels at berth while they wait for ideal water conditions. Extended delays at berth would ultimately prove intolerable for transpacific carriers on tight fixed-day schedules. The viability of Portland as a direct-call port would be questioned; it is possible that Portland could lose direct transpacific container service as a result.

It has been suggested that container vessels would light load as a result of a draft reduction. This alternative would be prohibitively costly for carriers. To save 1 foot of draft, a vessel would have to leave 90 boxes of export cargo on the dock. A single export container represents \$2,000 in lost revenue; 90 containers would represent \$180,000 in lost revenue each time a carrier light-loaded a vessel. A carrier would discontinue service to Portland before incurring such costs.

Panamax-size grain vessels would also be impacted by a reduction in the depth of the channel. These vessels now transit the channel with drafts of 40 to 42 feet. Unlike container vessels, these grain vessels require only about 1 foot of under-keel clearance.

Walla Walla District, Corps of Engineers
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cont'd

Reducing water levels on the lower Columbia would result in these vessels light loading to reduce draft. To save 1 foot of draft, a Panamax grain vessel would have to load 2,000 fewer tons. This represents \$30,000 in lost revenue per voyage to the ocean carrier, assuming \$15 of ocean freight per ton of grain. The ocean carrier would recoup this loss by passing it along to the exporter in the form of a higher freight rate. A freight rate increase of this type would discourage the use of the Columbia River by Panamax-size grain vessels.

The timing of the potential draft reduction due to refill is particularly unfortunate. September is the highest volume grain month (see attached trends), and currently one of the months with a low-water stage.

Mitigation for Deep-Draft Losses

One mitigation option not discussed in Section 4.7.4., but worthy of serious consideration, is to maintain a minimum 40-foot channel in the lower Columbia River during refill by over-dredging. This would mean deepening the Columbia by 2 feet or more for its entire reach to maintain the authorized depths. The cost of this is significant (\$16 million for construction, and \$3.2 million annually for maintenance, according to Corps estimates associated with deepening the channel) and could not be accommodated by spring of 1992, but it should be mentioned as a potential option.

Secondary Impacts on Navigation

Secondary economic impacts of the loss of agricultural production are discussed on Page 4-121, but a similar section outlining the secondary economic effects of the navigation impact are ignored. The most serious among these is the viability of the river-based container barge system, which relies on timely, regular, and cost-effective transportation of the containers to Terminal 6. Without the normal schedule of grain barge movements, to which container loads can be economically added, containers now moved by barge will be forced to more expensive transportation modes.

Other shipments dependent on a steady flow of barge traffic include mineral bulk shipments, which are often taken on by deep-draft vessels also loading grain at

L5-6

L5-7

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L5-7
cont'd

lower Columbia River ports. The increased transportation costs of delayed or curtailed mineral shipments need to be quantified in the Final EIS.

In like manner, the EIS needs to include calculations of the increased transportation costs resulting from equipment down time and lower total cargo volumes tug and barge operators will experience if navigation is interrupted, as well as the probable increase in freight rates for all types of cargo, resulting from lack of barge competition.

Other secondary impacts for which there should be some attempt at quantification include replacing or improving access to alternative modes of transportation during river drawdowns; loss of employment and income resulting from reduced investments in port infrastructure, agricultural production, and so forth, due to market uncertainty; and the loss of revenue and jobs caused by reduced competitiveness in grain and other markets.

o Integrated System

The Corps knows--as well as, if not better than, anyone on the Columbia/Snake River waterway--an action in any one area will have an impact on the entire system. The salmon runs must be restored, but wisdom dictates that our actions to accomplish this goal must be fully informed ones. There is simply too much at stake, from both a regional and national economic perspective, to launch into actions without some reasonable idea of their potential consequences and value.

We realize your job is a tough one, but we are counting on the Corps to weigh the evidence and recommend a set of 1992 actions that are both cost-effective and biologically sound. The Port of Portland stands ready to assist you further in meeting this objective.

Yours very truly,

Mike Thorne
Executive Director

Attachments

SOURCE: COLUMBIA RIVER PILOTS
LEWIS & CLARK PILOTS

COLUMBIA RIVER VESSEL TRANSITS
VESSEL DRAFT 36 FEET OR MORE

NUMBER OF VESSEL TRANSITS WITH VESSEL DRAFT OF 36 FEET OF MORE

VESSEL DRAFT	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
36 FT	119	123	98	120	115	110	123	166	151	151
37 FT	61	62	56	65	55	51	68	89	71	62
38 FT	37	22	53	70	29	27	31	38	34	40
39 FT	2	6	6	42	61	37	42	63	50	41
>=40 FT	0	1	0	0	11	13	26	36	62	76

Port of Portland (Mike Thomas, Executive Director)

SEASONAL TRENDS

A few of the categories of cargo shipped via Portland exhibit seasonal movements. Three notable examples are containers, autos, and grain. The chart below shows the seasonal trend for these three categories of cargo, based on the experience of the past five years.

Historical data shows that the last quarter of the calendar year is normally the strongest for containers. The low point usually falls somewhere in the late spring or early summer. The seasonal variation in container volumes follows closely the demand cycle for lumber in Japan. Also, container exports grow after the summer season as agricultural harvests make a wide variety of goods available for shipment.

The seasonal trend for autos is more pronounced than that for containers. Auto shipments are usually weak in the first quarter, very strong in the second quarter as dealers stock for the summer selling season, weak in the third quarter, and strong again in the fourth quarter as the new model season comes on-line.

The seasonal trend for grain is most pronounced of all. The shipment of grain hits a strong peak in about September following the annual harvest. After September there is a fairly steady decline until grain exports hit rock bottom in June and July.

City of Bingen (Charles R. Long, Mayor)

November 11, 1991

Mr. Greg Graham
Department of the Army
Walla Walla District
Corps of Engineers
Walla Walla, WA 99362-9265

REFERENCE: COLUMBIA RIVER SALMON FLOW MEASURES
1992 Options Analysis/Environmental
Impact Statement

Dear Mr. Graham:

The City of Bingen owns and operates a wastewater treatment facility which has an outfall discharge to the Columbia River at approximately river mile 171. It is our understanding that one of the measures considered in the 1992 Options Analysis/EIS would be to lower the reservoir behind Bonneville Dam to the minimum operating pool elevation (71.5 feet) from April 1992 through August 1992.

The invert elevation of our existing outfall pipe is 71.8 feet which means that at minimum operating pool level it would be exposed. Under these conditions the outfall would not meet the current Department of Ecology criteria and the proposed reservoir drawdown would have to be taken into consideration in relocating the outfall discharge point.

We would appreciate if you could consider the impact on our outfall pipe in the development of any mitigating measures to be included in your implementation plan.

Sincerely,

Charles B. Long

Charles B. Long
Mayor

CBL:tmr

Port of Whitman County (Jim Weddell, Manager)

PORT OF WHITMAN COUNTY

WHITMAN COUNTY, WASHINGTON

W 105 ISLAND ST., COLFAX, WA 99111
TEL 1-800-535-PORT OR 509-397-3791

November 15, 1991

U.S. Army Corps of Engineers
Walla Walla District
Building 603
Walla Walla, WA 99361-9265

Dear Corps:

RE: Comment and Information on Draft 1991 Columbia River Salmon Flow Measures
Options Analysis and EIS

Thank you for the effort you have put into creating the OAD/EIS. We find it to be a thoughtful and balanced analysis of the problems facing the river system. We realize that yours is a thankless task and that the OAD/EIS will be attacked from all sides. We appreciate your willingness to take on this arduous task under such conditions.

You will receive comments from Dr. Ken Casavant who has conducted an economic impact study on Port of Whitman County tenants. In that study you will find information that contradicts your assertion in Section 5 (page 5-8, right-hand column, midway down) that "agricultural losses would not be associated with these [deep drawdown at Lower Granite with MOP or normal operation at the other three projects] options."

Economic losses to agricultural interests served by Lower Granite pool begin with a four week lock outage and mount thereafter. At two months without navigation one of the Port's grain shipping tenants goes out of business. At six months without navigation 15 of the port's water related tenants will abandon their facilities.

Also, treating any of the 4 Snake Water pools differently than the others has tremendous impact on individual shipping firms. Any of those who continue to have navigation will have a huge competitive edge over those who do not. Additionally, even if all pools are drawn down equally, those firms with upcountry storage facilities or excess capacity at the river will also have a more competitive position. The grain trade is fiercely competitive, with very low margins of profit.

We believe that the OAD/EIS should have more information on the fish transport system in place. We have been at a forum where Ed Chaney said "The more fish you barge, the more fish you kill." Is this accurate? What is the basis for such an opinion, and what evidence can the Corps present to counter this assertion? Since the loss of the transport system is one of the key negative impacts of drastic drawdowns, knowledge about the success or lack of success fish barging is critical to making the proper choices.

Sincerely,
Jim Weddell
Jim Weddell, Manager

L7-1

L7-2

L7-3

Port of Whitman County (Ken Casavant)

MEMORANDUM

TO: U.S. Army Corps of Engineers
Walla Walla District
Building 603
Walla Walla, WA 99361-9265

FROM: Ken Casavant
S.W. 1150 Marcel
Pullman, WA 99163
(509) 335-1608

SUBJECT: Comment and Information on Draft 1991 Columbia River Salmon Flow Measures Options analysis - EIS

I am submitting this statement on behalf of the Port of Whitman County, for whom I am presently conducting a study of economic losses due to Snake River drawdown. The purpose of that study is to determine, as precisely as possible, the impacts (damage), and alternatives to handle these impacts, of any Snake River level drawdown. Thus far, twenty one of the twenty four firms located on or near Port property have been interviewed; these interviews form the basis for this submissal. A final version of the completed study will be provided to the Corps of Engineers for its consideration later.

The general approach of the interviews was to generate as much as possible solid, defendable estimates of future impact and alternatives to mitigate that impact. The study's goal was to avoid inflated horror stories and to determine the specific process by which firms would react, as a business, to a river drawdown. Confidentiality was promised and this statement reflects that commitment. Specific questions sought out firm size, growth, wage bill, work force size, function performed or product produced, and probable impact of river drawdown.

Firm Characteristics

Two of the interviewed firms were located at Almota, one at Boyer Park, seven at Central Ferry and eleven at Wilma, all locations on the river operated by the Port of Whitman County. Reflecting the bulk movement characteristic of much of water transportation traffic, seven of these firms were grain elevators, most of which also owned other storage and handling facilities off the river. One firm was the concessionaire who operates the marina at Boyer Park. Three firms were fertilizer/chemical distributors, three were barge or barge construction firms, four were lumber or wood products firms, three firms specialized in manufactured concrete products, sand products and propane products, respectively.

These firms are generally well established, mature firms, but in some instances were fairly new to their location on the river. Parent firms ranged from three years to seventy two years of age with an average of 34 years. Some of the firms had built facilities on the river the same year slack water had come to the Lower Granite dam pool (16 years ago), while two firms had started operating from their river locations as recently as the last two months. The average time the firms were operating on the river was seven years.

These firms are significant sources of employment for a labor force located in a rural area. For the twenty one firms the total present labor force was about 705 people, up about 20 percent from the 590 people employed three years earlier. Firm plans were to increase an additional 175 jobs in the next three years. Additionally, about 45 more seasonal jobs were created by these firms. It should be noted that only 80 percent of

L8-1

Port of Whitman County (Jim Weddell, Manager)

L.B-1
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these jobs were located directly at facilities on the river; the other 20 percent were support personnel in the overall parent firm. The labor force ranged in size from 3 to 280 jobs at the different facilities.

The wage bill is also significant for these firms. Firms three years ago ranged from \$55,000 to \$550,000 with an average of \$210,000 and a total wage value generated by these river facilities of \$3.95 million. This has increased at the present time to an average of \$225,000 per firm and a total wage bill of \$4.3 million. Future plans reflected some expected growth, but only for seven firms, an average of almost \$90,000 more for each of these firms.

Impact of River Drawdown

The managers of the firms were asked to estimate the impact of the drawdown in three different scenarios; 1) minimum operating level for two months (April-May), 2) drawdown below minimum levels for two months (April-May) and 3) drawdown below minimum level for six months. The firms were almost unanimous that the present drawdown to minimum operating level had no effect on their operation. Two of the grain elevators were having some minor operational problems loading the grain barges because the barges, if loaded unevenly, were in the mud at the bottom of the river. Some minor dredging would eliminate even this problem. The concessionaire at Boyer Park did identify the loss of a swimming area but didn't feel it had a financial impact.

Eleven of the firms felt they would not be significantly impacted by a drawdown below the minimum level for two months; in fact, three of the firms did not use water transportation at all for the business. Of the 10 firms that identified impacts, the

L.B-3
cont'd

average impact varied from a one time loss of \$200,000 for one elevator firm who would abandon their facility to others who felt impacts would average about \$100,000 per year. The source of these impacts would usually arise from storage cost increases (1 1/2 to 2 1/2 cents per bushel per month), increased barge rates (1 cent per bushel recently announced), or increased handling or transshipment (7-10 cents per bushel). The total impact on these firms would be an annual \$1 million impact associated with a two month drawdown below minimum operating level. Because of the marketing structure most of this impact would be borne by the agricultural producer, either in the form of lower country prices, increased storage costs or loss of equity in their local cooperative. One of the fertilizer distributors uses specialized barges that draw only eight feet so little impact would be felt by this firm, as long as flow over the dam sills was maintained.

L.B-4

If the river were drawn down below minimum operating level for six months a startling different picture emerges. Only the three firms who didn't utilize water transportation felt no impact. Fifteen of the fifteen other firms felt their facilities would have to be abandoned and operations cease at that location. The dollar estimate of such a loss to each firm ranged from \$30,000 to \$3 million. The larger losses were associated with elevator firms who did not have rail available and, since these facilities serve primarily as put-through houses rather than a storage function, little economic value in the now isolated facilities would remain. The aggregate impact, on a one time basis, was \$18 million for these firms. For those firms that were not operating in the grain trade they would be individually incurring the impacts and would have to internally

Port of Whitman County (Jim Weddell, Manager)

L8-4
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restructure their firms. Again, much of the grain impact would be passed back to the producer.

It was hypothesized that the cost of mitigating these damages would be significantly less than the estimated impacts themselves. However, the mitigation in most cases was related to rebuilding capacity in another location and that cost was similar to the capital lost in the existing facility. The average one time mitigation cost was about \$600,000 per firm, or \$7.2 million in total, based on constructing 300,000 bushels of capacity at approximately \$2.00 per bushel construction cost. There was some thought that less replacement capacity would have to be provided than would be lost due to the river drawdown because some overbuilding of capacity had occurred.

This survey has allowed some conclusions to be drawn and offered for the Corps consideration. First, a consistent need expressed by these managers was, "Tell us what the rules are and we'll then make the best decisions we can for our firms." The degree of uncertainty surrounding the proposed river drawdown is unacceptable to these managers and they eagerly look forward to an environment where the rules and decisions are known. Some even expressed the thought that the uncertainty is more of a problem than the drawdown itself. An investment in detailed communication and information exchange between the Corps and these firms well in advance of any river drawdown may be a very effective mitigation measure.

L8-6

This statement has not included the impact of the river drawdown on the financial position of the Port of Whitman County itself. This will be addressed in the final version of the report of this study. It is obvious though that, as 11-15 of the firms

L8-6
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find they must leave their location under a long term drawdown, the financial impact on the Port's revenue and associated bond repayment capacity will be substantial. In the broader picture the port districts, and the taxpayers supporting the Port's economic development activities, might end up bearing some of the costs of any long term drawdown. Since these are units of local government, their welfare will be a special concern of the local areas. Failure to achieve expected future shipping volume, and the associated failure to meet the projected levels of revenue will affect financial servicing capability and long term viability not only for the Port of Whitman County but for all affected ports on the river.

L8-7

The final report will also include a discussion of grain marketing away from the river. What is obvious now is that grain that does not even move on the river benefits from the low rail rates that are induced by the availability of competitive water transportation. Thus, the impact of losing barge transportation may be larger than just the volume on the river. . . and this totally depends on the reaction of barge and rail firms as this environment changes. What is painfully evident is that, for agricultural producers, the extent of impact on them depends heavily on the competitive situation between the truck-barge and rail modes of transportation. The availability of truck-barge as a competitor to the Burlington Northern and Union Pacific Railroads has resulted in this situation. As late as 1989 grain was being moved from Whitman county on 1938 rail rates! This is not because of the benevolence of the railroad but because of the competitive water-based rates existing in the region. These rates encouraged the railroads to innovate (multiple car trains and rates) and quote competitive rates.

Idaho Water Users Association, Inc.

CORP EIS
PAGE 2

Idaho Water Users Association, Inc.

Representing Over 2,000,000 Acres of Irrigated Land

AFFILIATED WITH NATIONAL WATER RESOURCES ASSOCIATION
SUITE 144 BOISE, IDAHO 83705
419 E. ORCHARD TELEPHONE 344-8800

SHERIL L. CHAPMAN
Executive Director

TESTIMONY BEFORE
THE U.S. ARMY CORP OF ENGINEERS
ON THE DRAFT 1992 COLUMBIA RIVER
SALMON FLOW MEASURES OPTIONS ANALYSIS/EIS

My name is Lynn Tominega, I am the Water and Public Policy Analyst for the Idaho Water Users Association.

The Idaho Water Users Association is a non-profit educational association. The IWUA represents over 180 canal companies and many individuals in the state of Idaho. The testimony today will be directed toward the draft 1992 Columbia River Salmon flow measures option analysis/EIS. I would first like to thank the Corp for the opportunity to testify on this draft document.

I would next like to compliment the Corp on the comprehensive manner of accumulating this amount of information in one document which is easy to read and find items of information.

The Idaho Water Users Association does have some concerns about the different scenarios being proposed and would like to recommend options to be considered in the draft proposal. The comments made today will only apply to the Lower Snake River basin where Lower Granite, Little Goose, Lower Monumental, and Ice Harbor Dams would be effected.

Augmentation Flows. 3.2.3.1 Snake River. The Water Users Association would only be support options A, G, and I. These options would enable Dworshak and Brownlee reservoirs to refill in 80% to 90% of the time in normal water runoff years. The other options would basically drain the reservoirs providing less than a 15% chance of refill every year for Dworshak reservoir and Brownlee would only refill to 66% full during the summer months. This impact to the Idaho Power system and its peaking capabilities must be mitigated. One point must be made however, augmented flows only will not solve the problem of smolt survival. The Northwest power planning Council draft proposal clearly shows that flow augmentation will only increase smolt survival by 3% and water particle travel time by 1.7 days over a 50 year

A1-2
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average. Water particle travel time needs to be improved by 10 to 12 days not 1.7 days. The smolt survival needs to be increased 50% not 3%. This will only be possible by implementing a controlled drawdown of these reservoirs well below minimum operating pool.

A1-3

Augmentation Flows and Drawdowns. 3.2.4. The Water Users would like to see an expanded four-week test: Drop Lower Granite to spillway crest. If the four-week test information shows that no structural damage to the dam and no gas saturation problems occur, then to extend the test for a two month period to see if the smolt passage is improved. The 1992 augmentation and drawdowns on the Snake River would not have any more of an effect than the present operations in 1991.

A1-4

The Idaho Water Users Association would like to say that we support saving the Snake River salmon runs but none of the scenarios presented in this 1992 draft will have a dramatic impact upon improving the recovery of the salmon. The Idaho Water Users Association will support this water augmentation plan for only one year to get the results for the test drawdown. However our support for water augmentation will only be this year until a long term comprehensive plan can be put into place which will implement a finite time table for turbine screens on dam turbines, fish diversion screens, by-pass systems, harvest and escapement goals for the returning adult fish, and modification of dams for smolt survival.

A1-5

The Water Users Association would like to see the Corp start on dam structural modification plans for smolt survival and modification of adult fish ladders to operate below minimum operating pool immediately. The plans or alternative could be worked upon while the test is being done and after the results are evaluated then the best structural modification plan can be put into place.

A1-6

The Water Users Association is in favor of predator control and would like to see any method adopted which reduces smolt predation by other fish. The best method of predation reduction is getting rid of the slack water pools behind dams so the drawdowns on the lower Snake river would decrease predation.

A1-7

One item not mentioned in the draft proposal is that during the four week drawdown test, information on hydropower production and turbine operations during the drawdown should be reviewed. Such data would be useful in later determinations of economic impact or turbine modification.

A1-8

The Idaho Water Users Association would like to see spillway modification so that water flowing over the spill way during drawdowns would not have as far to fall thus minimizing the effect of gas saturation below the dams.

Idaho Water Users Association, Inc.

CORP EIS
PAGE 3

AI-9

Our Association is concerned that any drawdown program include mitigation for those pumping irrigation water from the four reservoirs, they should not have to bear the cost of design and relocation of their pumping facilities because of the Corps failure to operate these dams appropriately in the first place.

In conclusion, the Idaho Water Users think that this is a good first effort by the Corp within its operational authority to try and look at drawdowns and other factors which are associated with salmon recovery. The fact that specific time tables and further experimental drawdowns are not in the plan concerns us since without such timetables a that a commitment to saving the salmon does not exist by the Corp or other entity down stream. We understand why the plan does not go further in this 1992 draft but further commitments must be made. We hope that the Corp and BPA are not considering augmentation flows as the only solution to the salmon recovery because they cannot be.

The Water Users Association has been involved with helping develop a plan to save the Chinook Salmon. We believe that the only strategy which makes sense is a long term comprehensive plan in which the whole region contributes to help save the salmon. The Corp drafts emphasis is only on augmented flows and a test drawdown of Lower Granite. We hope this is not viewed as the only solution because IMUA would then have to withdraw its support for augmented flows. The document as it stands right now puts the burden of saving the salmon upon Idaho and not the region.

AI-10

The American Waterways Operators

Pacific Regional Office

5515 West Marginal Way, SW
Seattle, WA 98106

TEL (206) 764-1321
FAX (206) 764-1323

October 21, 1991

Gerald P. McMahon
Vice President Pacific Region

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PLER
Walla Walla, WA 99362-9265

Dear Sir/Madam:

On behalf of the American Waterways Operators (AWO) and the Columbia River Towboat Association (CRTA), the national and regional trade associations for the tug and barge industry, I am pleased to provide comment on the *Draft 1992 Columbia River Salmon Flow Measures Options Analysis/EIS*.

The barge industry is committed to participate in and contribute to programs to protect and restore wild stocks of northwest salmon. We endorse and support the actions of the U.S. Army Corps of Engineers, Bonneville Power Administration, the Bureau of Reclamation and the Northwest Power Planning Council to aggressively develop viable regional salmon recovery plan that is based on *biological soundness, cost effectiveness, and public acceptance*. The public review process is a necessary and commendable part of the regional effort to develop a salmon recovery plan and fulfill the region's obligation to protect its wildlife heritage.

It is imperative that any solution to save the salmon take into account the impacts to the regional economy. There must be a balance between measures that will truly benefit the fish and the impacts on the Columbia and Snake River waterway which is so vital to the economic health and vitality of the entire Pacific Northwest region. It is clear that numerous proposals have been presented to responsible agencies which contain the requisite balance. It is incumbent that public agencies adhere to the criteria that has been specified beforehand and not get caught up in the emotion of applying simple solutions to a very complex long-term regional problem.

The comments of the barge industry on the draft OAD/EIS document are as follows:

- A2-2 | 1. The barge industry will only support 1992 water management actions which are *biologically sound, cost effective, contain acceptable environmental impacts, do not foreclose balance of uses of project operations, and do not negatively affect fish*.

The American Waterways Operators

A2-3 |

2.

The barge industry supports the Corps of Engineers mandate to *undertake the processes necessary to design a study for Snake River reservoir drawdown during the operations year 1992 that would improve passage of migrants (juveniles) without impeding the upstream migrations (adults)*.

A2-4 |

3.

The barge industry emphasizes the overriding importance of navigation, as one of the original purposes of the federal projects, to the regional economy. Upstream industry, agriculture, communities and the public depend upon barge transportation for their very livelihood. The Federal barge navigation channel is authorized from The Dalles to Lewiston at 14 feet of depth by 250 feet of width. It is our understanding a new Congressional authority would be required to modify the authorized navigation channel.

A2-5 |

4.

The barge industry insists on the adherence to the typical Federal objective to *select the plan that maximizes contributions to national economic development (NEED) consistent with protecting the nation's environment*.

A2-6 |

5.

The barge industry urges the selection of Combinations of Drawdown and Augmentation, Combination Option X (3.2.4.1) or Combination Option Y (3.2.4.2), page 3-10. It is our understanding that all other drawdown alternatives below MOP on Snake River reservoirs would (1) impede adult migration; (2) subject juvenile migrants to lethal levels of dissolved gases as per June, 1991 Lower Granite spill test; and (3) paralyze the Juvenile Fish Transportation Program, thus increasing net smolt travel time.

A2-7 |

6.

The barge industry strongly supports *The PNJUC Flow Proposal* as the only scientifically sound flow proposal that would achieve the goal of being biologically sound, publicly acceptable, while being capable of maintaining a sound regional economy.

A2-8 |

7.

The barge industry opposes any drawdown measure that would only evaluate physical impacts, provide no biological benefit or data on fish survival and cause severe economic impacts. It is our understanding that such an alternative has been proposed by State of Idaho authorities and is being considered by the Corps of Engineers outside of the NEPA OAD/EIS public review process. Such an alternative would not fulfill the criteria to *improve passage of migrants (juveniles) without impeding the upstream migrations (adults)*. We strongly oppose this alternative, if it should exist.

A2-9 |

8.

The barge industry strongly supports the *Juvenile Fish Transportation Program*. The only proven juvenile fish migration program that we are aware of which protects smolts from lethal levels of dissolved gases, predation, turbine mortality and migration delays caused by slackwater is the Juvenile Fish Transportation Program. This program, which was scientifically developed

The American Waterways Operators

A2-9
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through research on NMFS's oversight and has successfully transported over 140 million smolt since the program began, should be the centerpiece of any program to assist juvenile salmon migration.

The barge industry would like to commend the Corps of Engineers, the Bonneville Power Administration, and the Bureau of Reclamation for taking the leadership in contributing to the development of a sound regional salmon recovery plan. We agree with much that is in the Corps document and urge the authorities to select a preferred water management alternative that will achieve the objective of *improve passage of migrants (juvenile) without impeding the upstream migrations (adults)*.

Sincerely yours,

Gerald P. McMahon

Lake Roosevelt Forum

Lake Roosevelt Forum

708 Creel Drive
P.O. Box 45
Coulee Dam, WA 99116
(509) 633-3763

Sponsoring Committee
Member Organizations:

National Park Service
Bureau of Reclamation
Washington State Department of Community Development

Spokane Tribe
Upper Columbia River Counties
Washington State Department of Wildlife

TO: LAKE ROOSEVELT FORUM

FROM: MARTY BLUM, CHAIRMAN, FISH & WILDLIFE SUBCOMMITTEE

DATE: October 22, 1991

The opportunity now exists to present concerns for consideration by those agencies which will make decisions affecting the future of Lake Roosevelt. The purpose of the Forum is to communicate the issues as seen by the public. The following is a brief history and discussion of opinions.

1940's

Grand Coulee Dam filled Lake Roosevelt in the early 1940's. For the first few years resident fish were seen flushed over the Dam when flood gates were opened in the spring.

1950's

Through the 1950's the lake was debris laden. The fishery was known to be comprised of great numbers of scrap fish, but few are edible as game fish

1960's

The 1960's brought awareness of improving recreational value to local residents. Launch ramps were made available, but there was slight use by the general public. Scientific studies of the fishery were uncoordinated and generally controversial. Walleye first appeared in the reservoir during this period. Innovation was developing to cope with the problem of reservoir fluctuations.

1970's

During the 1970's attention was focused on the construction of the Third Power House. Prior to this time reservoir drawdowns averaged 30 to 40 feet. Construction required drafts which reached 120 feet for final excavation of the forebay. The Columbia Basin Hydro Project was being completed throughout the region. The Keenleyside Dam at Castlegar, B.C. isolated Lake Roosevelt from both ends in terms of fish migration. Spawning habitat was reduced to only the small tributaries which are mostly inaccessible or have been depreciated by other activities. The severe impacts of the Hydro Project on resident and anadromous fish and wildlife were being realized throughout the region.

1980's

In the early 1980's the Northwest Power Planning Council was established with authority to assess and mitigate losses. The walleye has thrived but were being found throughout the lower Columbia and irrigation reservoirs and irrigation lakes. Attempts to introduce other game fish species fry to the reservoir had failed to take. New biological studies of the reservoir (Nigro, 1983 and Jagielo, 1984) revealed answers to the supply of food sources (zooplankton) for fish in the reservoir. Allen Scholz (1986) proceeded to project a supplemental Kokanee hatchery and management program for the reservoir. One of the key elements of this projection is seen to be the detrimental effects of severe drawdowns and late refill of the reservoir in spring. Win Self (1985) began the successful Net Plan rearing program with Rainbow Trout. The key to this program was recognized to be rearing the fish large enough to escape predation before release.

In 1987 the Northwest Planning Council directed Bonneville Power Administration to fund two fish hatcheries to supply Kokanee and Rainbow trout for the Grand Coulee project and to fund the Lake Roosevelt Fish Monitoring Program being conducted by Dr. Scholz of Eastern Washington University and the Upper Columbia United Tribes. By 1988 the Net Pen program was providing an excellent source of data by tagging a percent of the fish released. Volume then was reaching 200,000 annually, and Sport fishing was being acclaimed. Increased recreational activity was also being realized as the Colville Tribe introduced a house boat rental business and expanded two marinas on the lake with modernized facilities. Park Service statistics showed visitation to increase from less than 500,000 in 1985 to 1.3 million in 1989. However, in the spring of 1989 there was an extreme drawdown of the reservoir (70 feet) and refill was delayed. Tagged Net Pen fish were found in anadromous fish counting facilities several dams below Grand Coulee. The effect was soon seen by sportfishers as a near collapse of the fishery as compared to previous years since the net pen program had begun. There was an absence of larger carryover Rainbow and Kokanee as well as the spring release of small Rainbow. The experience seemed to prove the logic that small Rainbow and Kokanee have an anadromous urge to migrate downstream with high flow rates. Additionally, the mature fish follow the reducing food source as it is flushed through the dam. Much criticism was leveled at reservoir management. However, losses could only be estimated at tagged fish actually found because no facilities for tracking fish exist at Grand Coulee. Mature Rainbow and Kokanee were not recognized in counting facilities where they would be considered steelhead or sockeye. Reservoir management presented an excuse for the reservoir fluctuation and took criticism under advisement, but no future constraints were committed.

1990's

In 1990 the reservoir drawdown was held to a reasonable 38 feet due to low snow pack and refill calculations. No tagged fish were reported in migration facilities downstream. Creel Studies and samplings by the Lake Roosevelt Monitoring program confirmed

Lake Roosevelt Forum

heavier losses than originally estimated in 1989.

1991

The spring of 1991 yielded an above normal snow pack and abundant water supply for the upper Columbia. However, because there was ample water to refill, the reservoir was drawn down approximately 30 feet below flood control requirements for power revenue priorities. Delayed refill for revenue and Salmon priorities created high flow rates. This resulted in resident fish being identified in counting stations downstream. Again, losses can only be estimated. However, fishers are experiencing the effects to both Rainbow and Kokanee catch rates. The two new fish hatcheries are now completed to begin production this fall. Mitigation efforts have now focused on the depleted Salmon runs in the Lower Columbia and Snake river system. A plan to enhance Salmon migration by lowering some of those reservoirs and using augmented water from Lake Roosevelt to create higher flow rates is proposed. The Army Corps of Engineers has provided an environmental impact statement and is requesting public opinion. Bonneville Power Administration is also requesting public input for a system operation review.

Statement of Issues and Concerns

Past studies and experience predict that the conditions proposed to flush salmon through the Snake and lower Columbia Rivers with water from the upper Columbia has potential for disastrous waste of mitigation efforts which have begun for Lake Roosevelt. The theory of salmon flush serves to prove past operational arguments to constrain drawdowns of Lake Roosevelt and refill as early as possible to prevent high flow and resident fish loss. The primary issues are seen as follows:

A3-1 Although we do not wish to impede preservation and enhancement of salmon, we totally object to the sacrifice of resident fishery on that behalf. Nothing has been done to protect resident fish from the hastily drawn salmon proposals. There is some evidence that native trout and Kokanee could be claimed endangered in Lake Roosevelt because of problems similar to those which are affecting salmon. The results of mitigation efforts have established need to enhance resident fish and wildlife habitat. The actions now proposed on behalf of anadromous species impose a negligent and wasteful future for efforts and expenditures in progress.

A3-2 The third powerhouse forebay at Grand Coulee Dam is observed to be a primary site of fish entrainment. Install fish monitoring equipment to determine migration and rate of entrainment. Determine methods for deterrent barricades.

A3-3 Proposed waterflow augmentation plans represent reversal of all efforts to moderate drawdowns and high flow rates for many years because of detrimental effects to Fish and Wildlife habitats and recreation. Drawdowns below 40 feet and/or delay of refill within 30 feet of full pool during the last week of May has always been considered extreme. There is similarity between biological requirements and recreational interests. Lake Roosevelt is located in a geographic sunbelt. Public access becomes critical with the Memorial holiday. We, therefore, must object in the strongest terms to the findings of "minimal impact" to Lake Roosevelt as stated by the E.I.S. conducted by the Corps of Engineers.

A3-5 Lowering and delaying refill of the reservoir creates lower temperatures, impedes generation of food sources and encourages fish migration. Current water quality studies have determined existence of pollutants in bottom sediments of the river. Higher flows will disperse these further through the system and food chain.

Lewis-Clark Terminal Association, Inc.

LEWIS-CLARK TERMINAL ASSOCIATION, INC.

P. O. BOX 914 / LEWISTON, IDAHO 83501 / (208) 746-5065

LEWIS-CLARK TERMINAL ASSOCIATION, INC.

P. O. BOX 914 / LEWISTON, IDAHO 83501 / (208) 746-5065

October 22, 1991

October 22, 1991 page 2

Greg Graham
Study Manager
Department of the Army
Walla Walla District, Corp of Engineers
Walla Walla, WA 99362-2965

Dear Sirs:

As manager of Lewis-Clark Terminal Association, Inc., located in the Port of Lewiston, and as Director on the Idaho Feed & Grain Association, representing Idaho's Northern District, I would like to express my concern for our facility during an extended draw down below minimum operating pool.

LCTA, along with Clarkston Grain Terminal at Clarkston, Continental Grain at Lewiston, & Stegner Grain at Port of Walla, were all designed and built specifically to transfer grain from truck to barge. This efficient design has allowed the Lewiston-Clarkston valley to market over 50 million bushels of grain per year, or approximately 25% of all grain exported from the Pacific Northwest. The ability to truck-barge grain has meant that Pacific Northwest can service and compete in international markets. In a draw down below minimum operating pool, that efficiency is lost. Truck to rail is: 1) economically inefficient, and, 2) physically limited because currently none of the four area grain elevators have the mechanical equipment or track in place to load rail cars, and, 3) shipping approximately 2,400 cars into the already congested parts of Portland/Vancouver would likely result in the railroad placing an embargo on future deliveries, and, 4) faced with a four to six week or longer delay in current placement of rail cars, two weeks turn around for cars, and another thirty to sixty days to receive your money, grain companies would be better off to close up shop and wait until the river re-opens!

Taking the above mentioned into consideration, the wheat market will react accordingly:

- 1) Pacific Northwest export merchants will discontinue quoting prices out of the Lewiston-Clarkston valley.
- 2) Pacific Northwest export merchandisers will reduce the price offered to reflect the risk of taking ownership.

A4-2
com'd

3) Pacific Northwest export merchandisers will reduce the price offered per bushel prior to river closure, knowing that affected areas will have to move grain to avoid the cost associated with storage, and, 4) poorly timed or extended river closure will have the same affect on foreign and local markets as a previously ill-advised grain embargo.

Pacific Northwest growers cannot afford to lose their best cash customers to competitors such as Canada or Australia.

A4-3

Re-establishing Snake River Sockeye Salmon is an honorable cause, but should not supercede the opportunity to earn an honest living. For the 5,000 area growers and landlords, and over 500 area grain elevators in Montana, North and South Dakota, Wyoming and Utah, serviced by LCTA, and the fact that the United States is mired in the worst economic recession since the 30's, makes it unbelievable that the gamble to draw down the Snake River below minimum operating pool without sound, verifiable, scientific, biological or economic data would even be entertained.

Yours truly,

R. d. Lyman

Arvid Lyons, Manager
Lewis-Clark Terminal Assoc., Inc.

A4-2

Oregon Farm Bureau

1701 Liberty St. S.E. • Salem, OR 97302-5159 • (503) 398-1701 • FAX (503) 399-9082

TESTIMONY TO THE
DEPARTMENT OF THE ARMY
WALLA WALLA DISTRICT, CORPS OF ENGINEERS
ATTN: CENFW-PL-ER
WALLA, WASHINGTON 99362-9265

REGARDING THE
DRAFT COLUMBIA RIVER SALMON FLOW MEASURES-
1992 OPTIONS ANALYSIS/ENVIRONMENTAL IMPACT STATEMENT
OCTOBER 22, 1991

Good evening, I am Ken Bailey, first vice president of the Oregon Farm Bureau Federation, representing our membership of more than 11,000 farming and ranching families. I am also a partner in Orchard View Farms, a family fruit growing operation in The Dalles which relies upon the Columbia River for irrigation. I appreciate this opportunity to comment.

Agriculture has a great deal at stake in the salmon issue. The Columbia river and its tributaries are very important to Oregon agriculture. We rely on them for water for our crops and livestock, the generation of affordable hydroelectric power for irrigation, and for reliable barge transportation to transport our harvest to Portland and beyond. Each of the scenarios to restore the salmon population would affect one of the major agricultural uses of the system. Because of this, we're very concerned about whatever recovery plan is implemented.

We believe your efforts in the EIS should be commended. We believe the EIS represents one of the first real efforts to present

both the benefits and costs of several major proposals to change the river system operations. By doing so the Corps has made a significant step forward in the development of good public policy based upon valid biology and economic realism.

The Oregon Farm Bureau believes the selection of a river operation plan for 1992 should be based on cost effective alternatives born out by a sound biological foundation. All measures being considered must be able to pass cost effectiveness and biological justification tests.

In previous testimony before the National Marine Fisheries Service, I expressed our support for enhancing the salmon population throughout the Columbia River system if the recovery plans were based upon sound biology and responsible economics. We believe the data currently provided within the Corps' Option Analysis EIS indicates that the drawdown proposals for the Snake and Columbia rivers are neither cost effective relative to the flow augmentation options or have a sound biological basis. We do support the EIS statements calling for additional analysis of potential hydropower costs and other flow options.

As a farmer who is directly linked to whatever recovery plan is eventually agreed upon, I cannot stress to you the importance of this system to families' farms and thousands of others. Because of this the Oregon Farm Bureau has and will continue to be involved in the Salmon issue. We believe the restoration of the endangered salmon runs needn't be done at the expense of the regions economy. If the data and biology are sound and the implementation of the recovery plan is properly instituted, we believe the solution could

Oregon Farm Bureau

be a positive situation for the salmon and the entire region. We appreciate your efforts in a difficult situation and will continue to work with you to find a workable solution.

Thank you for this opportunity to comment.

Pacific Northwest Waterways Association

P.O. Box 61473, Vancouver, Washington 98666

FAX: (206) 699-5121

Telephone: (206) 699-4666

Pacific Northwest Waterways Association

PNWA Comments, Page 2

November 8, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9765

Comments on the "Draft Columbia River Salmon Flow Measures - 1992 Options Analysis/Environmental Impact Statement"

Thank you for the opportunity to comment on the Corps' 1992 Draft EIS. We would like to begin by congratulating the Corps on an impressive volume of work completed in such a short time. We appreciate that the Corps appears to be taking a balanced look at proposed measures, in terms of their biological effectiveness and their economic costs, and seeking cost effective measures that achieve biological goals. As impressed as we are with the work that has been accomplished, we do have several comments that we would like to see addressed in the final EIS.

The Premise of the Drawdown

The background section, page 1-2, states, "The Salmon Summit also requested that the Corps undertake the processes necessary to design a study for Snake River drawdown during operation year 1992...." This request was made in a document transmitted by Governors Andrus, Roberts and Gardner to Senator Hatfield at his hearing on May 1, 1991. That document was developed after completion of the Salmon Summit. Our point is that there never was a unified consensus for the drawdown at the Salmon Summit. Although we did not agree to a test drawdown at the Salmon Summit, we did agree that it should be explored further. We have been and we continue to work to find solutions to recover the weak stocks.

Since an EIS is produced after a desired action is proposed, it was our position that an EIS was premature. We did support a feasibility study by the Corps that would provide the information necessary to make a decision about a potential drawdown. The difference is that proponents of the EIS were looking for a study of how to make a drawdown happen, whereas we wanted a feasibility analysis that would answer the biological questions that would tell whether a drawdown was biologically effective for the fish or not, and whether a drawdown should happen. Also, the EIS makes frequent reference to meeting the CBFWA flow objectives. The test should not be designed to meet the CBFWA flows, but should determine what will provide the greatest benefit for fish. We would like to see the final EIS written from this perspective.

Test Biological Effectiveness

At that same May 1 hearing, PNWA and other river interests told Senator Hatfield that we could agree to an experimental drawdown provided that it was biologically sound, that it would provide biological information about fish survival, and provided that it would not cause significant hardship on the economic users of the river.

A6-3
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At that time we proposed a two-week test where the Corps would shift the navigation lock maintenance closure into the April - June migration season and conduct the test to coincide with the lock closure. We also proposed that this test should be conducted over a period of seven to ten years so that biological benefits could be determined over several life cycles. Ultimately the experiment has to prove the biological benefit to salmon. We do not understand how the proposed physical tests, conducted outside the migration season, will answer the necessary biological questions. Our position is that a test must provide biological information on salmon survival.

Test Duration

The minimum duration of any of the proposed tests in the EIS appears to be four weeks. In addition, on page 4-8, the draft EIS states that drafting reservoirs to spillway crest would require an additional one to three months for drawdown and refill. We recognize that our original proposal of two weeks may not be enough to conduct a biological test at spillway levels, but six weeks and more is beyond reason.

A test with a duration of anything more than four weeks from beginning of drawdown to completion of refill is not acceptable for two reasons. The first reason is that a longer duration will place entire populations of some stocks in jeopardy from the harmful biological effects of the drawdown. Any test that risks the stocks should be designed such that only a portion of the population of any weak stock is subjected to test conditions while a significant proportion of the population of the weak stock migrates outside of the test conditions and with the aid of transportation and with other bypass systems operating. This spread-the-risk policy should be a part of any test. The second reason is that any economic impacts of a drawdown increase exponentially as the duration increases.

Definition of Socio-Economic Study Area

The socio-economic study area for this EIS was defined as the counties adjacent to the 11 projects involved (Page 2-94). Because the Columbia/Snake River system serves as the main transportation corridor from the upper U.S. interior to the Pacific Coast, the socio-economic impacts need to include shippers and shipper dependent communities in the hinterland of the system ports. This extends throughout eastern Oregon and Washington, Idaho, and east into Montana, the Dakotas, and the Great Plains.

Economic Effects of a Drawdown

The economic effects of a drawdown are of great concern to the river users. They also are an important part of a cost effectiveness analysis. We are concerned that the EIS significantly understates the impacts of a drawdown on the navigation industry and river shippers. There are several economic elements that need to be included in the quantitative economic analysis.

Lost Grain Sales. On pages 4-106 and 4-107, the EIS states that there is an even split between grain importers who buy on regular intervals throughout the year and "surge" buyers. These regular buyers will not wait for a drawdown and will buy from other countries. These are lost sales and should be quantified. Half of the April-May-June volume is approximately 800,000 tons of grain sales which could be lost. At \$3.45 per bushel, lost sales to regular buyers could total more than \$92,000,000. Losses of sales to surge buyers are also likely and could be equally high. These potential losses may be difficult to determine, but they need to be quantified in the final EIS.

A6-4

A6-5

A6-6

A6-1

A6-2

A6-3

Pacific Northwest Waterways Association

PNWA Comments, Page 3

A6-7

Grain Storage Costs. The draft EIS understates the duration of storage and the resultant storage and inventory costs. The assumption used is that grain will be stored for an average of two months for a three month loss of navigation. The situation is this: three months' worth of grain will be entering the system for storage during the three month closure. At the end of the drawdown, there is more grain in storage than can physically be moved, or more importantly, can be sold in the marketplace. Therefore, this "April-May-June" grain will remain in storage after the closure, awaiting sale. At the same time, new grain is entering the system in July, August, September and thereafter. The "April-May-June" grain is then competing with the "July-August-September" grain for sales during July, August and September, and beyond. It may take several months or even a year to reach equilibrium between stored grain and grain sales.

Therefore, average storage costs and inventory costs will be higher than the \$2,979,415 estimated in the draft. It is reasonable to assume that it will take at least three months to reach equilibrium, and estimated costs should be at least double those in the draft. Page 4-112 states, "Some losses may be mitigated by temporary storage, but these gains may be offset by an oversupply of grain at a later date." This needs to be quantified in the final EIS.

A6-8

Grain Price Depression. Because the "April-May-June" grain will be in storage when the "July-August-September" grain arrives, there will be an excess of supply over demand. This will depress the prices the farmers receive for their grain. Depending on the volume of grain affected, each cent per bushel reduction in price could be a \$1 million loss of income to the region's farmers. Although this may be difficult to quantify, the final EIS should include drawdown induced grain price reductions as one of the economic effects.

A6-9

Barge Rate Increases. Pages 4-104 to 4-106 discuss the expectation that barge operators will need to recover lost revenues resulting from a drawdown by increasing their rates for the remainder of the year. Page 4-106 states that barge rate increases would need to be in the range of 25-40%, and this range would keep barges competitive with rail. With a rough order of magnitude of \$5 million, these rate increases are significant impacts and need to be quantified in the final EIS.

6-10

Wood Chip Impacts. Approximately 165,000 tons of wood chip shipments would be halted by a drawdown, but the draft EIS does not quantify the impacts. Page 4-101 states that rail is available from the sites on the Lower Granite pool, but none of the shippers use rail, and storage may be the optimum alternative. The rail rate differential to-day would amount to over \$800,000 in rate increases compared to barge, presuming that the downriver facilities have the capability to receive the chips by rail.

If storage were the option, then, as it did for grain, the EIS should calculate the storage and inventory costs for storing chips during the drawdown and, like we suggest for grain, for a period of time after the reservoirs are refilled.

The EIS does not address the capability of downriver mills to receive chips by rail or to store chips on site. Our research, presented at the Salmon Summit, shows that the mills on the lower Columbia do not have sufficient capacity to receive the necessary volume of chips by rail. Furthermore, we found that the downriver mills' storage capacity on the ground, or in barges, is sufficient for only two weeks to twenty days production, depending on the mill. After two weeks to twenty days, those mills would shut down. This lost production

PNWA Comments, Page 4

at the downriver mills must be quantified and included in the final EIS. It is comparable to the value of lost production for irrigated agriculture which is quantified on pages 4-117 and following.

A6-11

Deep-Draft Shipping Losses. Pages 4-107 to 4-109 discuss possible rate increases resulting from a loss of channel depth on the lower Columbia. By selecting 19 vessels as the likely number affected by reduced channel draft, the draft EIS does not reflect an understanding of container ship navigation. For safety reasons, container vessels sail with approximately five feet of clearance under keel. This would add 34 container ships that call the Port of Portland's Terminal 6 to the 19 included in the EIS that would be affected by reduced depth.

We agree that these rate impacts are a part of the impact, but a much greater impact will occur on the lower Columbia because the loss of draft will result in the loss of deep-draft steamship service. A loss of one foot of draft would require the average container ship to light load with a loss of 22% of its container volume and \$160,000 in revenue. This loss of revenue adds up to over \$5.5 million on 34 ship calls. In the competitive environment that has existed over the last ten years, the steamship lines will eliminate service to Portland. Grain and other bulk facilities would be similarly affected. Fewer grain vessels will call the Columbia if the cargo is being stored upriver. The impact on the port communities of this loss of steamship service is significant. The Corps is currently studying potential deepening of the lower Columbia channel by two feet. Completion of this project would mitigate for the loss of channel depth. Current estimates for the cost of deepening are \$16.3 million in construction and \$3.3 million in annual costs. This deep draft shipping impact should be quantified and included in the EIS.

Liability for Economic Losses

The Corps, through the draft EIS, is proposing to go beyond the design range of the system and the draft EIS describes considerable physical and economic risks of doing so. We are concerned about the potential long-term impacts of possible failures of the system or its parts during a test drawdown. Therefore, we will not be able to accept a drawdown test unless the Corps and the states proposing drawdowns agree in writing to hold ports, river facility operators, tug and barge operators, shippers of commodities, irrigators, marina operators and other affected parties harmless from any negative consequences of the test, and unless the Corps and the states agree in writing to take financial responsibility for any economic or other losses suffered by river users in the event the full refill cannot be completed by the end of any scheduled test drawdown or in the event that the test drawdown causes shoaling or other constraints on cargo handling, navigation, rail or truck service, irrigation or marina operation in any part of the river system.

Fish Transportation Works

The proposed measures in the EIS need to be compared with other known measures that contribute to increased fish survival. The NMFS Federal Register notice (V. 56, No. 124, p. 29550) of the proposed listing of spring/summer and fall chinook states, "Mortality of juvenile fall chinook salmon at dams and in reservoirs can be significantly reduced by collecting juveniles and transporting them downriver around the dams by barge and trucks." NMFS elaborates on the transportation benefits in "Factors of Decline," the June 1991 supplement to the notices for fall and spring/summer chinook. We urge you to consider fish transportation and the proposals for improvement of the transportation program, such as the mobile net pen, as alternatives to the drawdown and flow proposals.

A6-13

Pacific Northwest Waterways Association

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Conclusion

A6-14

When the economic impacts on navigation, along with those on agriculture and power, are combined with the relatively low expected biological benefits, the drawdown proposals are far less attractive than alternatives such as flow augmentation, fish transportation improvements, and a wide variety of measures that can be implemented with the reservoirs operating within their normal range. The Corps has the responsibility to weigh the biological evidence and develop a set of 1992 actions that will contribute to the biological goals for the fish.

If you have any questions about these comments, we would be happy to assist you.

Sincerely,

PACIFIC NORTHWEST WATERWAYS ASSOCIATION

Glenn Vanselow, Ph.D.
Executive Director

Kelly Creek Flycasters

KELLY CREEK FLYCASTERS
P.O. Box 2131, Lewiston, Id 83501
MEMBER OF 575

11-8-91

Greg Graham, CENPW-PL-PF
Walla Wall District
Corps of Engineers
Walla Walla, WA 99362-9265

Dear Mr. Graham:

A7-1

The Kelly Creek Flycasters support the Andrus Drawdown Plan, which is the only viable plan that has been brought to the table to save Idaho's wild salmon and steelhead.

We feel that all economic and cultural interests must share reasonable restrictions in a co-operative effort for the benefit of the resources. This includes any commercial fisheries, electrical, agricultural and shipping interests, as well as hydro-dependent businesses.

This plan may be the only chance to restore the Snake River's wild salmon and steelhead heritage.

Very truly yours,

Keith Stonebraker

Keith Stonebraker
Resources Committee Chairman
Kelly Creek Flycasters

Clarkston Chamber of Commerce

Lt. Col. Robert Volz
U. S. Army Corps of Engineers
Walla Walla District, Building 603
Walla Walla, WA 99362-9265

November 13, 1991

RE: Snake River Drawdown

A8-1

One of Clarkston, Washington's major industries is tourism. For this reason, the Tourism Committee of the Chamber of Commerce is opposed to drawing the water level of the Snake River below Minimum Operating Pool elevation.

Marinas and boat launches would be left without the necessary water to keep them operational. Boat outfitters who take visitors into Hells Canyon would be unable to launch their boats.

The Lewis-Clark Valley has become well known for the wonderful waters (both white water and slack water) in combination with the mild climate, thus making this a year around recreation destination. With a drawdown comes lost confidence, contributing to long-range negative affects.

Since no evidence has been forthcoming showing that any drawdown will be effective toward helping the salmon migration, we strongly request that you carefully consider all the implications before putting a drastic "test" into effect.

Thank you in advance for your careful consideration.

Very truly yours,

Dana Neil

Dana Neil, Tourism Director

cc: Roy Fox, Bonneville Power Administration
Robert Barbo, Bureau of Reclamation
James Goller, Northwest Power Planning Council

Wasco Co. Farm Bureau

Greg Graham
Study Manager
Dept. of the Army
Walla Walla Dist. Corps of Engineers
Walla Walla, Washington 99362-9265

Dear Mr. Graham:

A10-1
I am writing in behalf of Wasco County Farm Bureau to encourage the bureau to base their decisions on good science and sound economics. We are concerned about the Bonneville pool as it supplies water for approximately 6000 acres of irrigated orchard surrounding The Dalles. The intake for our irrigation project will allow for only a very slight draw down. Modification to accommodate more than a few feet would be very expensive and could possibly interrupt service at a critical time.

We are skeptical of the benefits of a Bonneville Pool draw down. We encourage the bureau to take incremental measures in order to help identify what measures are most effective.

Sincerely,

Timothy A. Dahle

Timothy A. Dahle
President, Wasco Co. Farm Bureau

Sawtooth Wildlife Council

Sawtooth Wildlife Council

P.O. Box 92, Stanley Idaho 83278

November 11, 1991

Lt. Col. Robert D. Volz
Dept. of the Army
Walla Walla District
Corps of Engineers
Attn: CENPW-PL-ER
Walla Walla, WA 99362-9255

Dear Lt. Col. Volz,

Thank you for the opportunity to comment on the Columbia River Salmon Flow Measures Options Analysis DEIS. The following are our comments.

A11-1 We find the failure of the Corps to acknowledge Idaho Governor Cecil Andrus' "Idaho Plan" within the formulation of alternatives to be a serious omission. The Corps must accept its responsibility to move swiftly in engineering the downstream passage solution needed to save these fish. Idaho has already presented the Corps with the components of reservoir draw-down and flow augmentation as being achievable.

A11-2 The Corps must take immediate action to implement measures which assure in-river passage of juvenile smolts, starting in 1992. Water flows must be increased during the six month migration period between April and September to permit downward as well as upward migration of wild stocks of spring, summer, and fall chinook as well as sockeye.

In the short term, this means a combination of significant reservoir draw down and flow augmentation which replicates natural pre-dam spring flows. The long term solution must be modification of the dam facilities made possible by a revamping of energy production. Idaho has already completed study of dam facility retrofiting to accomplish this goal; the Corps should be incorporating the results of this study into its own. Retooling energy production would include an increase in energy efficiency, fuel switching, seasonal exchanges on the regional power grid, and improved water conservation on the part of irrigators. The Northwest has enjoyed inexpensive electrical rates at the price of a resource subsidy - the depletion of the wild salmon resource. The region can be assured continued economical electricity through the implementation of such reasonable shifts in power marketing and water use.

A11-3 Reservoir draw-down can be planned to minimize impacts to barge operators. Coordination of lock maintenance with draw-down can reduce the critical period to six weeks. Commerce during this period can be shipped by alternative methods such as rail or truck.

A11-4 The chapter of fish collection and transport (barging) must come to a close as a proven failure. The only course of action which is going to save these fish is the establishment of in-stream downriver smolt passage.

A11-5 Four species of wild salmon will be listed under the Endangered Species Act within months. The work of the Corps should be anticipating this inevitability and setting in place measures which will be the basis for the recovery plan soon to be required. If the Corps cannot make swift response to the changes needed which in fact has been demonstrated, then a transfer of management authority to the Bureau of Reclamation merits consideration.

We appreciate your consideration and request that we receive a copy of the final EIS.

Sincerely,

Washington Wilderness Coalition

P.O. Box 45187, Seattle, WA 98145-0187 (206) 633-1992

November 11, 1991

Department of the Army
Corps of Engineers
Walla Walla District
Attn: CEMPW-PL-ER
Walla, WA 99362-9265

Re: SALMON DEIS

Gentlemen:

The Washington Wilderness Coalition (WWC) has long been interested in protection of endangered species and preservation of fisheries habitat and free flowing rivers. We believe that vigorous action must be taken now to preserve the remaining salmon and steelhead runs on the Columbia and Snake Rivers.

The Draft Environmental Impact Statement prepared by the Corps of Engineers on the dams on the lower Snake and Columbia rivers is seriously deficient in a number of respects. The major defect is that the DEIS assumes that no mitigation measures can be done in time for the 1992 migration, and therefore assumes and projects devastating environmental consequences for the 1992 migration. In fact, practical mitigation measures can and must be adopted to improve flows through the dams.

Fishery agency flow objectives to protect both smelt and adult salmon can be achieved one hundred percent of the time after mitigation measures are implemented by drawing down lower Columbia River reservoirs to minimum operating pools and by drawing down the lower Snake reservoirs to spillways to increase flows through those dams. The DEIS should evaluate an alternative for 1992 to draw down the lower Granite and Little Goose reservoirs to spillways from the middle of February through March 1992 before the chinook and sockeye migrate. This would substantially increase the flow through the dams and greatly reduce salmon mortality. The DEIS should also evaluate augmentation of lower Snake River flows during the period from April 15 to June 15 from storage to spill fish past the dams. These measures, to a considerable extent, recreate in the river system the impact of peak flow periods of a free flowing river. The DEIS should also evaluate drawing down the lower Columbia River reservoirs to a minimum operating pool for the

Washington Wilderness Coalition

Department of the Army
Corps of Engineers
November 11, 1991
Page 2

A12-5
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period from April through August to provide minimum flows as recommended by the fishery agencies.

A12-6

The DEIS should also consider mitigation measures which can be implemented after 1992. This would involve modifying juvenile and adult passage facilities on the lower Snake River dams and modifying irrigation pump intakes and water related facilities and activities in the Snake and Columbia River reservoirs. The Corps should then reanalyze the DEIS alternative to achieve fishery agency flow recommendations with the post 1992 mitigation measures. Failure to include mitigating measures is unrealistic and contrary to law.

A12-7

The DEIS must also clearly describe and analyze the environmental affects of the No Action Alternative. The DEIS concentrates on the economic consequences of the various proposed alternatives, but does not deal with the near destruction of the Snake River salmon and the social and economic consequences of continuing the present policy.

We believe that preservation of salmon runs on the Columbia and lower Snake Rivers is essential for protecting our important commercial and sports fisheries. It is essential that the DEIS adequately address alternatives to protect the salmon runs which have played such an important role in the history and economy of the Northwest.

Sincerely,

WASHINGTON WILDERNESS COALITION

Norman L. Winn
President

NLW:cajb

Washington Association of Wheat Growers

Comments On:
Options Analysis Document/Environmental Impact Statement
1992 Changes in Water Management Practices

U.S. Army Corps of Engineers
Bonneville Power Administration
Bureau of Reclamation

Submitted by:

Washington Association of Wheat Growers
109 E. 1st
Ritzville, WA 99169

Prepared by:
Dan Blankenship, 1st Vice President
H.C.R. #1, Box 303
Washtucna, WA 99371

I would like to comment on behalf of the 3,500 members of the Washington Association of Wheat Growers on proposals for in-stream flow augmentations to improve in-river fish migration conditions in the Lower Snake and Columbia River systems. There are severe implications for agriculture involved in these proposals, as for all segments of the Pacific Northwest economic and social systems. First, we would like to offer a few facts to give you some background for the concern of the small grain producing community of the Northwest in this arena.

The Columbia River is the second largest river transportation system in the U.S. More cargo moves on this system than in any other port on the West Coast of the United States. The exports from this port system include \$3 billion worth of agricultural products, including 30% of all wheat exported from the United States. Approximately 90% of all wheat grown in Washington is exported, most through Portland. The traffic pattern flow of exported wheat varies, but is fairly evenly distributed throughout the year. Grain exporting terminals operating along the lower Columbia estimate that they completely renew their inventories an average of 30 times a year, or every 10-14 days.

Grain and grain products from some 13 states funnel through lower Columbia River ports. Navigation problems brought on by experimental lowering of reservoir levels beyond minimum operational pool levels would most certainly force shipping rates higher, some estimates say as much as 20%. Grain producers would also bear additional costs of inputs shipped upriver, fuels fertilizers, etc.

Experimental lowering of pools which would disrupt barge traffic for any longer than two weeks per year, would, we believe, have disastrous affects on our reputation as a reliable supplier of wheat and barley for export. Lost market share in the world marketplace is something that is nearly impossible to retrieve once it is lost.

With that background, our association would like to say that it is our belief that drawdown experiments for 1992 should be limited to drafting the Lower Snake projects to M9P. During these drawdown periods, comprehensive scientific testing should be implemented to test the effects on fish populations, both anadromous and native trout and bass stock, as well as monitoring of the effects on structures and facilities. The analyses in your impact statement seem to state that all measures taken which can benefit juvenile travel time carry negative impacts which could offset or even be a net loss to survival of the species in question. Gas supersaturation and other problems to spawning habitat and negative consequences to habitat for other species will make the job of developing a recovery plan all the more difficult.

A13-1

A13-2

A13-3

Washington Association of Wheat Growers

A13-4

While the Washington Association of Wheat Growers is very supportive of the idea of developing a plan of action for recovery of anadromous fish populations in the Columbia/Snake River system, we are very concerned about the ability of the Northwest economy to absorb the impact and to share the costs associated with the plan equitably. We applaud your agencies for the thorough treatment you have given this terribly complicated issue. We, however wish to reiterate that we believe that the preferred plan for 1992 management of the River system should carry the least disruptive elements for navigation and electrical generation while still carrying some positive elements for salmon stocks.

Thank you for the opportunity to comment.

Trout Unlimited

Trout Unlimited

800 Follis Lane SE, Suite 250
Vienna, Virginia 22180-4906
America's Leading Coldwater Fisheries Conservation Organization
Tel: 202 1420, Fax: 202 361 1221

October 20th, 1991
Mrs. Sarah Wik
Corps of Engineers, Walla Walla District
Walla Walla, Wa. 99362-9265

Dear Mrs. Wik,

Below are my comments on the Draft EIS Columbia River Salmon Flow Measures/EIS. In general the draft EIS is a comprehensive document which goes well beyond these standards employed by the COE and other agencies in other EIS statements (where they exist). The other limits of impact appear to dominate most of the analysis found in the Executive Summary. One has to read the text carefully to find full discussion of the range of impacts, and in doing so one finds a great deal of useful and realistic discussion. That is the primary defect of the Summary, in that it does not accurately reflect the contents and conclusions of the body of the document. Environmental impact statements should make some effort to delineate realistic effects from realistic measures. In focusing on measures that were not to my knowledge seriously proposed by resource advocates the preparers have left the reader and public with no clear understanding of the impacts arising from a probable scenario.

A14-1

Of considerable significance is the conclusion of paragraph 4.1.4 that operation at spillway crest in the Snake River and MOP operation in the Columbia River meets the flow recommendation of CBFWA. On the other hand, the conclusion of 4.2.2 that "The net effects on salmon from drawdown to near spillway crest would be negative" is purely speculative. In view of the fact that the system has not yet been under spillway crest operation (SCO), and furthermore that the net effect of nitrogen supersaturation (NSS) under SCO are unknown it is clear, based on existing research, that NSS need not be a problem for salmonids in the Snake Columbia system until critical levels (> 125%) and differential pressures in excess of inflow levels are reached. Salmon have co-evolved with nitrogen supersaturation (> 115%) throughout the Columbia Basin. Celilo Falls and numerous rapids on the Snake River and Salmon River of Idaho developed or develop conditions favorable to nitrogen supersaturation. At levels at 125% small mortalities begin to be observed (for example studies by Parametrix, summaries by Milo Bell), but by comparison remain less than dam/turbine related mortality. In fact only experience will demonstrate if NSS is a problem. The conclusion of 4.2.2 is inappropriate and likely in error.

A14-2

In almost every case the EIS generalizes erroneously. Bass which are a resident species in the Snake River system are exceedingly prolific in both fluctuating riverine and lake environs. Loss of spawning habitat may be of no significance to that species due to high fecundity in excess of the carrying capacity of the lakes. It is unlikely that Bass fisheries in the Snake River reservoirs will suffer noticeably since bass and other species will use whatever habitat is available.

A14-3

Recreational impacts are clearly overstated. The river provides numerous recreational opportunities, but is utilized little during the most likely scenario period from April 15th to June 15th. Furthermore, fishing is likely to continue but altered in location shifting to river

A14-4

rather than lake emphasis. Large lakes will remain and attract the recreationalist, limited only by access, which in turn is limited only by our "will" and funding to provide boat ramp extension, construction and temporary relocation. I have pointed out previously that 733,000 visitor days is a gross exaggeration. As per our discussions and your clarification that the members are for a four month drawdown and subsequent refill period, that number might have merit. I will point out however that even 132,000 recreation days as noted on page 5-18 would require 550 persons per day involved in water based activity per pool for the April 15-June 15 period. During the period of April 15 to May 31 it is unlikely that 55 people per day use the pool at Lewiston on the busiest weekend in good weather. If you count camp ground occupancy or "project visitation" in your estimate, then the author is probably erroneously equating that use with water based recreation.

A14-4

The discussion of recreation in the text is relatively complete but none-the-less the Summary is misleading. It is also interesting that I was unable to find a graph of use in Lower Granite pool that shows monthly use based on real data reflecting absolute numbers. Figure 2.12.4 clearly shows that recreational use of non-Snake River pools composes a total of less than 15% of the annual total for the April to May window in each case. On the reasonable assumption that only a part of the recreational use will be impacted, annual use might be reduced or displaced in the range of 5 to 10 percent. Recreation is almost never lost, but is taken in an alternate form and may not result in a net regional economic loss. The economic significance of that reduction is therefore open to question.

A14-5

I am unable to continue this discussion, but the main point is made, and that is that this executive summary must be truthful, logical, concise and accurate in its representation of the EIS document. I trust that the draft will be revised appropriately.

Sincerely,

Michael Satterwhite, PhD
Representative on Pacific Salmon

Skamania County Chamber of Commerce

Skamania County Chamber of Commerce

U.S. Army Corps of Engineers
Walla Walla District
Building 602 / City County Airport
Walla Walla, WA 99362-9265

November 8, 1991

RESPONSE TO ENVIRONMENTAL IMPACT STATEMENT: IMPACT OF COLUMBIA
RIVER WATER LEVEL

A15-1

The Skamania County Chamber of Commerce Board of Directors is concerned about the impact of lowering Columbia River water levels. If the river is lowered during the summer season the impact could be severe on our recreation facilities. The impact could be:

The Sternwheeler would be unable to dock in Stevenson. Ongoing dredging at the Port of Skamania could be a mitigating factor. The Sternwheeler is one of our prime attractions and is extremely important to the local economy.

The windsurfing launch sites in Stevenson Port area, Rock Creek Cove and Home Valley would be rendered inaccessible.

Rock Creek Cove would virtually become a mud hole. This would hurt the geese and birds of prey habitat not to mention the aesthetics of our town entry being converted into a mud hole. Ongoing dredging would also mitigate the impact.

Fishing launch sites at Home Valley and at Drano Lake could also be impassable. Ongoing dredging could again alleviate the impact.

These facilities and attractions are extremely important to our ability to survive the transition from a timber-based economy to one of more diversity which includes tourism and recreation.

We have been designated a tier one timber dependent county by the State of Washington. This means that a further decline in timber production will produce an unemployment rate of about 40%. The Columbia Gorge Scenic Area legislation further restricts our growth. Being able to diversify through tourism development is vital.

We do understand the need to protect the salmon and believe there are solutions such as ongoing dredging.

Arlene Johnson

Arlene Johnson
Executive Director

PL 1017
2nd and Seymour

Northwest Resource Information Center, Inc.

NORTHWEST RESOURCE INFORMATION CENTER, INC.

P.O. Box 427 Eagle, Idaho 83616
Telephone 208-939-0714 -4731
Fax 208-939-7263

Department of the Army
Walla Walla District, Corps of Engineers
Building 602, City-County Airport
Walla Walla, Washington 99362-2965

November 14, 1991

RE: Draft 1992 Columbia River Salmon Flow Measures EIS

COR:

The following comments on the Draft 1992 Columbia River Salmon Flow Measures Options Analysis Document/Environmental Impact Statement.

The stated purpose of the draft EIS is to evaluate alternative ways of improving juvenile fish survival during the 1992 migration. The Corps, however, discontinuously evaluates alternatives that require mitigating measures which can't be implemented in time for the 1992 migration. Mitigating measures, therefore, are omitted. Consequently, the Corps projects horrendous, unrealistic environmental and economic consequences. This, unfortunately, was predicted (see attachments submitted as part of these comments) and is consistent with the Corps' long-standing, determined opposition to any substantial change in the status quo responsible for near destruction of the Columbia and Snake Rivers' watershed wild salmon and the regional economies they once supported.

The draft EIS reveals:

• In the four lower Snake River dams the Corps has created the perfect fish-killing machine. Until adult and juvenile fish passage facilities are modified, the dams can't be operated to safely pass juvenile fish without killing adult fish and vice versa. The dams are a doomsday machine that can't be turned off in 1992 to help wild salmon teetering on the threshold of extinction.

• Fishery agency flow objectives in the lower Snake and Columbia Rivers can be achieved 100% of time by drawing down lower Snake River reservoirs to spillways and by drawing down lower Columbia River reservoirs to minimum operating pools. [The unmitigated impact on Firm Energy Load Carrying Capacity would be less than 250 mw in the lower Snake (the Corps erroneously assumes no generation at spillway level) and zero in the lower Columbia, for a total FELCC reduction of about 0.012%. MOP in the lower Columbia would not affect waterway transportation.]

This cannot be done in 1992, because it requires modifying juvenile and adult fish passage facilities at the Lower Snake River dams, and modifying irrigation pump breaks, marina and port facilities, etc., in Snake and Columbia River reservoirs.

Respectful Reply

Two

The Final EIS should:

A16-5	1) Make explicit that juvenile fish cannot be safely passed at the four lower Snake River dams without killing adult fish and vice versa.
A16-6	2) Make explicit the need for emergency measures to prevent the Corps' dams from driving Snake River salmon and dependent economies to extinction.
A16-7	3) Adopt as the proposed action for 1992 an alternative with the following elements: • Draw down Lower Granite and Little Goose reservoirs to spillway for four-six weeks in late February-March, before chinook and sockeye migrate; define dam modifications required to pass juvenile and adult fish simultaneously and control nitrogen eutrophication. • April 15-June 15 augment lower Snake River flows from storage to maximum extent practicable and spill fish past the dams. • In the lower Columbia River provide fishery agency recommended flows April-August by releasing from storage and by drawing down reservoirs to extent practicable.
A16-8	4) Re-analyze, with post-1992 mitigating measures, the EIS alternative that would achieve fishery agency flow recommendations, i.e. draw down lower Snake River reservoirs to spillway April 15-June 15 and draw down lower Columbia River reservoirs to minimum operating pool April-August.
A16-9	5) Analyze and display the environmental effects of the no action alternative, including the regional social and economic effects of near-destruction of Snake River salmon.

Sincerely,
Ed Chaney
Ed Chaney

Pacific Northwest Utilities Conference Committee

PNUCC

PACIFIC NORTHWEST UTILITIES CONFERENCE COMMITTEE

PACIFIC POWER & LIGHT COMPANY
120 SW 56TH AVENUE - PORTLAND, OREGON 97204 - 503 464-5000

Robert W. Moench
President

November 14, 1991

Lieutenant Colonel Robert D. Volz
United States Army Corps of Engineers
District Engineer
Walla Walla District
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

Re: PacifiCorp's Comments on the Draft Columbia River
Salmon Flow Measures Options Analysis/Environmental
Impact Statement

Dear Colonel Volz:

Enclosed are comments prepared by Pacific Northwest Utilities Conference Committee ("PNUCC") on the Corps' draft Columbia River Salmon Flow Measures Environmental Impact Statement. PacifiCorp has reviewed these comments and supports the conclusions they reach. Although PacifiCorp does not make any additional comments, it respectfully asks that this letter and the attached comments be made part of the administrative record for this matter.

Sincerely,

RWM:ll

Enclosures

November 15, 1991

Mr. Robert D. Volz
Lieutenant Colonel, Corps of Engineers
District Engineer
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Re: PNUCC's comments on the Draft Columbia River Salmon Flow Measures Options
Analysis/Environmental Impact Statement

Dear Mr. Volz:

The Pacific Northwest Utilities Conference Committee (PNUCC) commends the Corps of Engineers for producing this draft Environmental Impact Statement (EIS) within a very short time period. The proposed drawdown test program is complex and will greatly impact many river users. PNUCC realizes that due to the limited time for development of this draft EIS, the Corps may have lacked the time to complete a highly detailed impact analysis. For instance, in our conversations with the Bonneville Power Administration (BPA), we have learned the power impact analysis is being updated. Therefore, our comments focus on our general concerns, although we have some listed detailed concerns.

A17-1

PNUCC has participated in the technical working group meetings on possible drawdown test scenarios. Based on this participation, PNUCC concludes that although the Corps has not stated a preferred alternative, it appears that the Corps is leaning toward the so-called "Idaho Plan" as the preferred alternative. If this is the case, PNUCC has serious concerns over the direction of the Corps' actions for 1992, if the tests are to be performed when critical stocks are in the river.

PNUCC's comments address the following points:

- The scope of the EIS is limited to the proposed 1992 operational plan. Thus, while information gleaned from the 1992 plan may provide important information for long-term measures, this EIS will not suffice for measures beyond the 1992 plan; a separate NEPA analysis will have to be prepared for the long term measures;
- As to the 1992 plan, no drawdown program is acceptable to PNUCC absent a biological foundation; the draft EIS is completely devoid of any biological foundation;

Pacific Northwest Utilities Conference Committee

Mr. Robert D. Volz
November 15, 1991
Page 2

- PNUCC objects to the use of water particle travel time as the appropriate standard; the correct standard for the 1992 plan is fish survival based upon biological information.
- The Corps should establish a Oversight Committee to assist in the evaluation of data collected during the 1992 operating year.

The EIS Is Only Sufficient to Cover 1992 actions

A17-2

PNUCC is concerned with the scope of this EIS and the possibility that long-term operations might be adopted without adequate biological evaluation. First, our concern with the scope of the EIS, is that the EIS will be used for long-term fish mitigation measures. This EIS is adequate to address the impacts from the 1992 test, but it is insufficient for Endangered Species Act (ESA) recovery program measures that NMFS might develop for future operations. Second, the favored 1992 test protocol does not directly measure smolt travel time in response to flow. We are concerned that drawdown operations might be adopted without directly addressing the biological relationships between flow, fish travel time, and survival. The following discussions address the basis for our concerns.

The Corps states that the purpose and scope of this EIS is limited to planning and conducting the 1992 tests. The Purpose and Need Section of the Draft 1992 EIS declares that the "purpose of this draft OAD/EIS is to evaluate the impacts and benefits for several alternatives to the way certain dams and reservoirs in the Snake-Columbia River System are currently operated. . . The evaluation will lead to the selection of a test plan to improve fish passage down the lower Snake-Columbia rivers for the 1992 season."¹ The Executive Summary, Section 1.5 Scope, states "[t]he scope is limited to flow improvements measures that potentially could be implemented in 1992."² These passages clearly indicate that the scope of the EIS is strictly limited to the evaluation of operational tests during 1992.

In addition, the section on Alternatives Eliminated from Detailed Consideration³ describes actions not within the scope of this EIS. These actions include: (1) additional reservoir options, (2) partial drawdown of Lower Granite and Lower Monumental below minimum operating pool, (3) cycle Lower Granite pool between minimum operating pool and elevation 710, (4) major structural measures, and (5) non-project measures.⁴ This list provides actions that the Corps cannot implement in the future without additional EIS analysis.

PNUCC recommends that the Corps should not use this EIS to satisfy NEPA requirements for actions taken later than 1992 or actions not directly related to the test. The Corps must develop

A17-3

¹ Draft 1992 Columbia River Salmon Flow Measures Options Analysis EIS at 1-1.

² *Id.* at ES-3.

³ *Id.* at 3-13.

⁴ *Id.* at 3-13 and 3-14.

Mr. Robert D. Volz
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Page 3

another EIS for implementing ESA recovery program measures if mandated by the National Marine Fisheries Service.

A17-3
cont'd

Biological Tests Required for Long Term Actions

The Corps must conduct tests that will provide a biological evaluation—survival or, at least, fish travel time benefits—prior to the adoption of any long-term drawdown operational program. These tests must be conducted with test fish and not based on measurements of water particle travel time.

A17-4

The objective of the Idaho proposal is to evaluate physical impacts to the dam, reservoir banks, and water quality. During the drawdown test, the Corps will also look at the problem of de-watered ladders and changes in tail-race flows, which may greatly impact the adults' ability to find fish ladder entrances. Most of the fishery biologists participating in the working group meeting would like the Corps to address physical factors, such as gas supersaturation and adult passage problems, before future tests are conducted with juveniles in the river. A dominate concern is the operations to lower the reservoirs will cause high levels of spill and lethal levels of gas supersaturation. Also, the biologists are strongly concerned about blocking adult passage during the spring. PNUCC has these same concerns.

The tests in 1992 will only evaluate physical impacts resulting from the drawdown operations, which provide limited biological information. No evaluations will be conducted to determine if the drawdown operations will reduce smolt travel time in the Snake or Columbia rivers.

Particle Travel Time Is an Inappropriate Standard

The Corps can attempt to estimate changes in fish travel time from reductions in water particle travel time but researchers lack a clear understanding of the relationship between smolt travel time and water particle travel time. The Corps cannot substitute reductions in water particle travel time as evidence of reductions in fish travel time. If the Corps wants to implement future reservoir drawdown operations to reduce smolt travel time, the Corps must conduct additional tests to evaluate observed smolt responses to the operations. The 1992 test, due to its limited evaluation of only physical impacts, is not an adequate surrogate for a sound biological study using test fish.

Technical Oversight Committee for Test Evaluation

PNUCC recommends that the Corps establish a technical oversight committee to oversee the analysis of any test results or data. Currently, the Corps has developed a technical working group to aid the Corps in the design and selection of drawdown test strategies. The Corps, however, has not addressed how and who will analyze all the results and information gathered during the tests. The current technical working group might lack the solid technical experience to provide adequate detailed guidance in the specifics of data analysis. Also, some of the current technical working group members may not want to participate in the details of data analysis. Other interested parties, however, will probably want some level of involvement in the direction of the analysis and interpretation of results, and might be willing to send an expert or scientist to participate in a

A17-6

Pacific Northwest Utilities Conference Committee

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A17-6 cont'd
biological oversight committee. PNUCC would like to participate on this type of committee and urges the Corps to establish this committee for the analysis phase of the tests.

Other Comments

- A17-7
• The power impact estimates presented in the EIS for all of the alternatives appear reasonable, except one. The alternative to draw the four lower Snake River projects to near spillway crest fails to include a firm power impact. PNUCC has been working with BPA in developing the power impacts for the various alternatives. Our estimate of this firm power impact is approximately 250 MWs. In addition, the non-firm power and capacity impacts listed in the draft EIS have all been updated. PNUCC recommends that the revised values from BPA be adopted.
- A17-8
• Any drawdown strategy to spillway crest will block adult passage. The fish ladders cannot operate with the reservoirs at this level. The incremental decreases in smolt travel time attributable to the drawdowns probably will fail to offset the detrimental impacts to the returning adults. PNUCC strongly recommends that any test that the Corps adopts should minimize, if not avoid, impacts to the returning adults.
- A17-9
• Drawdown of the reservoirs to approximately spillway crest may cause high spill levels and increase gas supersaturation up to 130 to 150 percent. The EPA and state standard is 110 percent. Although this might impact resident species, such as sturgeon, PNUCC supports the Corps' decision to study this factor under conditions that minimize impacts on salmon stocks. Therefore, we urge the Corps to conduct the initial drawdown studies during March or any other period that will minimize the detrimental impacts to migrating and resident fish.
- A17-10
• Drawdown to spillway crest will also prevent operation of the bypass/collection system at Lower Granite and Little Goose dams. This will stop fish transportation operations at these projects. According to the Northwest Power Planning Council's computer modelling efforts, allowing the total juvenile migration to remain in the river under low flow conditions will result in high smolt mortality. PNUCC recommends the Corps should consider the detrimental effects of conducting drawdown tests under low flow conditions. If the low water conditions are severe, PNUCC urges the Corps to postpone the tests during the migration season to minimize the detrimental impacts to smolts.
- A17-11
• The Corps speculates that some fall chinook spawn in the mainstem Snake River between Ice Harbor and Lower Granite dams. If the Corps drastically lowers reservoirs and significantly increases spill, some detrimental impacts could occur to these spawning areas. Additional investigation is needed and perhaps some operational constraints are needed on any tests that may injure these fall chinook redds.
- A17-12
• The flow augmentation alternatives may impact resident fish populations in the mainstem Snake River and various storage reservoirs. Dworshak Reservoir will incur the greatest

Mr. Robert D. Volz
November 15, 1991
Page 5

A17-12
cont'd

water withdrawals - with resulting impacts to the resident kokanee population. The magnitude of the Brownlee water withdrawal is dependent upon the participation of Idaho Power Company. If the withdrawal is significant, the impact to resident spiny-ray species and salmonids could be significant. PNUCC urges the Corps to strongly consider the detrimental impacts to resident species that may result from the drawdown tests.

• PNUCC does not support the alternatives to lower McNary and John Day reservoirs to 337 feet and 262.5 feet, respectively. These drawdown operations will greatly impact river users and provide little biological benefits. These actions might reduce smolt travel time by a few days at most, but they will significantly reduce power production and impact irrigation water withdrawals. The Corps needs to balance the economic impacts to biological benefits prior to adopting this proposal. PNUCC recommends the Corps not adopt this proposal if the biological benefits cannot justify the impacts.

We appreciate this opportunity to comment.

Very Truly Yours,

Al Wright
PNUCC Executive Director

313 S.W. 2nd Street, Suite D
P.O. Box 1033
Newport, Oregon 97365

OREGON SALMON COMMISSION

503/265-2437

Oregon Salmon Commission

Date: November 14, 1991

To: Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

From: Tom Robinson, Manager
Oregon Salmon Commission

RE: Draft Columbia River Salmon Flow Measures 1992
EIS/Options Analysis

----- Comments -----

I. Inadequacies in the Draft

- A18-1** A. The draft EIS lacks the substance required to truly delineate potential cost/benefits from various options available for improving juvenile fish survival during the 1992 migration. In fact, the draft seems not to address the 1992 migration, rather it evaluates measures which can't be implemented for that migration.
- A18-2** B. The draft totally ignores the socio-economic costs to the public which continue to accrue from lost salmon abundance and resulting lost fishing opportunities for recreational and commercial purposes. The effect of that omission is to document the Corps neglect of public responsibility to operate the Columbia/Snake hydrosystem in a manner which reverses the current level of lethal impact on salmon stocks.
- In fact, billions of dollars in regional economic impact are at risk in many communities over a wide geographic area stretching from Alaska to Central California. This money is a major portion of local community personal incomes. Also at risk is the long time birthright of Northwesterners to utilize our salmon. To neglect to mention these people and that economy should raise eyebrows at the highest level.
- A18-3** C. The draft does not show a clear requirement for emergency measures to prevent the status-quo operation of the hydrosystem from further destroying fish and fisheries.
- A18-4** D. The draft fails to include mitigating measures for reservoir draw down alternatives.

II. Key revelations documented in the draft

A18-5 A. The system of dams on the River as currently outfitted and operated is shown to be a highly efficient salmon killing machine. A horrifying condition exists in 1992 which makes it impossible to improve passage for adults without increasing kill of juveniles and vice-versa.

A18-6 B. The draft documents the miniscule cost of improving downstream flows and passage for salmon stocks in terms of lost power generation. The impact of 250 megawatts of the FELCC is a tiny factor when compared with the potential benefit to the fish and the public fisheries.

III. Recommendations

A18-7 A. Adopt a plan for 1992 which will:

1. Provide for draw down of Lower Granite and Little Goose reservoirs to spillway, prior to peak migration in order to define dam modifications required to pass both juvenile and adult salmon.

2. Begin in April to provide increased Snake River flows to pass juveniles downstream.

3. Provide mainstream Columbia River flows according to fish agency specifications from April through August.

A18-8 B. Include post-1992 mitigating actions in the analysis of fishery agency recommended flow regimes.

A18-9 C. Seriously analyze and publish the real life consequences of the no-action alternative in terms of regional socio-economic impacts resulting from continued losses of the salmon stocks.

Oregon Natural Heritage Council

Peter Bahls, Aquatic Ecologist
Oregon Natural Heritage Council
PO Box 161
Oceanside, Oregon 97134

November 14, 1991

Robert D. Volz, Lieutenant Colonel
Department of the Army
Walla Walla District Corps of Engineers
ATTN CENPW-PL-ER
Walla Walla, Washington 99362-9265

Dear Mr. Volz.

Please consider my comments on the Draft EIS, Columbia River Salmon Flow Measures. Restoring salmon and steelhead in the Columbia River is perhaps the biggest and most worthwhile challenge the Army Corps has ever faced. If you succeed, history will never forget you. If you fail, history will never forgive you.

1) The DEIS presents an unnecessarily narrow choice of alternatives. Because dams were constructed with little knowledge or consideration given to fish needs, the Corps is between a rock and a hard place when it comes to altering dam operations to benefit fish. And of anybody, the Corps should know how to get rid of a hard place. The best way to make significant progress in restoring fish runs is to remove one or several dams. Although this sounds radical, I think that if the costs and benefits were compared to the existing alternatives, removal of certain dams would prove the fastest, safest, most efficient and cost-effective choice. The Corps needs to evaluate dam removal as a viable alternative. The analysis should include an evaluation of which dams would be best to remove. For example, removal of Dworshak dam would reopen thousands of miles of free flowing river for recreational use and fish spawning habitat and provide excellent flow augmentation. Removal of a mainstream dam would eliminate several problems with full spill options, including the potential for nitrogen supersaturation and blockage of upstream fish passage.

2) The DEIS analysis of the environmental effects of alternatives is flawed. Restriction of fish transport that would be necessary with implementation of some alternatives is assumed to decrease fish survival. This is an invalid assumption. A number of studies have shown that fish transport by barge or truck may be hurting, rather than helping salmon by spreading disease and increasing stress levels. The DEIS needs to present a full discussion and literature review of the effects of fish transport on smolt and adult survival if it is going to use transport as a criteria used in evaluating and selecting an alternative.

Peter Bahls, Oregon Natural Heritage Council DEIS comments
Page 2 of 2

A19-3

3) Of the existing alternatives and potential combinations, we will only support an alternative that reduces water particle travel time to a maximum of 148 hours through the lower Snake River reach and a minimum flow of 140,000 cfs from April 15 to June 15, as specified in the Columbia Basin Fish and Wildlife Authority (CBFWA) "Integrated System Plan". A combination of MOP at all dams and enough flow augmentation to achieve this flow level with 100% probability is recommended as the best of existing alternatives.

Sincerely,

Peter Bahls
Aquatic Ecologist
Oregon Natural Heritage Council

A19-1

A19-2

Sierra Club, Cascade Chapter

SIERRA CLUB
Cascade Chapter

1516 Melrose Ave., Seattle, Washington 98122

November 14, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla Washington 99362-9265

Dear Sirs:

The Cascade chapter of the Sierra Club offers the following comments for the EIS on proposed 1992 measures to improve instream migration of juvenile and adult fish past Corps of Engineers projects on the main-stem Snake and Columbia Rivers.

A20-1

The draft EIS demonstrates clearly that the Corps' four lower Snake River dams are the perfect fish killing machine. Juvenile fish cannot be safely passed without killing adult fish and vice versa.

A20-2

The draft EIS does not reflect the clear need for emergency measures to prevent the Corps' dams from driving Snake River salmon and dependent economies to extinction.

A20-3

The Corps' failure to include mitigating measures for reservoir draw down alternatives is unrealistic and deceptive.

The final EIS should:

A20-4

- 1) Adopt the proposed action for 1992 as an alternative with the following elements:
 - a) Draw down Lower Granite and Little Goose reservoirs to spillway for 4-6 weeks in late February-March, before chinook and sockeye migrate; define dam modifications required to pass juvenile and adult fish simultaneously and control nitrogen supersaturations.
 - b) April 15 - June 15 augment lower Snake River flows from storage to maximum extent practicable and spill fish past the dams.

SIERRA CLUB
Cascade Chapter

1516 Melrose Ave., Seattle, Washington 98122

A20-4
cont'd

c) In the lower Columbia River provide fishery agency recommended flows April - August by releases from storage and by drawing down reservoirs to extent practicable.

A20-5

2) Re-analyze, with post-1992 mitigating measures, the EIS alternative that would achieve fishery flow recommendation, i. e. draw down lower Snake River reservoirs to spillway April 15 - June 15 and draw down lower Columbia River reservoirs to minimum operating pool April - August.

A20-6

3) Analyze and display the environmental effects of the no-action alternative, including the regional social and economic impacts of near-destruction of Snake River salmon.

Sincerely,

Andrew J. Lewis
Chair, Cascade Chapter
Sierra Club

SIERRA CLUB

Northwest Office

1516 Melrose Avenue, Seattle, Washington 98122 (206) 621-1696

November 15, 1991

Department of the Army
Corps of Engineers, Walla Walla District
Attn: CENPM-PL-ER
Walla Walla, WA 99362

Gentlemen:

We offer the following comments in response to your Draft 1992 Columbia River Salmon Flow Measures Options Analysis/EIS. The impressive compilation of data clearly represents substantial work. However, most of your analysis focused on evaluating the unmitigated impacts associated with draw down of the Snake River reservoirs related to navigation, irrigation, and migration of returning adult salmon. While it is certainly appropriate to describe and evaluate these effects, there needs to be equal work and effort employed in identifying and evaluating methods to avoid and mitigate these impacts.

We are most concerned that an evaluation of a two reservoir draw down to spillway sill level in the February/March period was not evaluated. This is critical to obtain the necessary information to start fixing the problems we have already acknowledged are part of any serious draw down of the Snake River Reservoirs.

We are also concerned that you did not evaluate the CBFWA flow (or velocity equivalent) proposal for the lower Columbia River. You do evaluate the CBFWA flow/velocity proposals for the lower Snake River and conclude that they can in fact be achieved 100% of the time by drawing down the reservoirs to spillway sill level. Yet you only evaluate Target 200 (200kcfs) for the Lower Columbia. The CBFWA proposal of 250-300 kcfs in the Lower Columbia River should similarly be evaluated.

With the listing of the Snake River Sockeye on November 14th, it is imperative that the Army Corp take emergency measures for the salmon. We were told at the Portland hearing that you did not expect to have a ROD until the end of February. This is not acceptable. We believe it is possible to move the process such that a ROD is completed by the end of January or before.

Specifically we recommend the following:

A21-5

1) The Army Corp must implement a test of drawing down both the Lower Granite and Little Goose reservoirs to spillway sill level for four to six weeks in late February and March of 1992. This will allow the test to be conducted before the irrigation season starts and before the adult salmon migration upstream.

Any test that does not embrace two reservoirs pulled down to spillway level will not accurately reflect the conditions of actual draw down necessary to meet CBFWA flow proposals. Draw downs will not help the smolts in 1992 because the necessary screening of turbines and other changes to the dams and will not have been accomplished. We need the Corps best effort to conduct the test in 1992 so that we are positioned to implement the measures necessary for serious draw downs as soon as possible.

A21-6

2) The Corp must assure the greatest possible survival of migrating smolts in 1992. This must include releasing all stored water that is possible in the Snake River from mid-April to mid-June and augmenting flows in the Columbia River from April to August.

A21-7

3) The Corps must evaluate the EIS alternative that will move smolts from Idaho to the ocean in the 15 day travel time recommended by the CBFWA. This evaluation must include evaluation of mitigation measures for adult fish ladders and irrigation pumps and intakes to work at variable pool levels, including spillway sill level. Alternatives for navigation including truck and rail, changing shipping schedules, and additional storage for pre-positioning commodities must also be considered.

A21-8

4) The Corps must evaluate the economic and environmental effects of the no-action, "business as usual" alternative.

We appreciate the work that you have done thus far. However, the beleaguered wild salmon runs of the Columbia Basin and Snake River need the best efforts of all concerned parties and agencies in the region.

Sincerely,

William L. Arthur

William L. Arthur
Northwest Regional Director

The Mountaineers

300 Third Avenue West • Seattle, Washington 98119 • (206) 284 6310

BRANCHES IN TACOMA, EVERETT, OLYMPIA AND BELLINGHAM

The Mountaineers

Department of the Army
Corps of Engineers
November 15, 1991
Page 2

November 15, 1991

Department of the Army
Corps of Engineers
Walla Walla District
Attn: CENFW-PL-ER
Walla, WA 99362-9265

Re: Lower Snake River DEIS

Gentlemen:

The Mountaineers is the largest recreation and conservation organization in the State of Washington, with more than 12,000 members. We have a long history of concern for fisheries resources and protection of endangered species. Along with environmental organizations, government agencies, and the general public, we are vitally interested in preservation of salmon and steelhead runs on the Columbia and lower Snake rivers.

The Draft Environmental Impact Statement (DEIS) prepared by the Corps of Engineers on the dams on the lower Snake and Columbia rivers is seriously deficient in a number of respects. The major defect is that the DEIS assumes that no mitigation measures can be done in time for the 1992 migration, and therefore assumes and projects devastating environmental consequences for the 1992 migration. In fact, practical mitigation measures can and must be adopted to improve flows through the dams.

Fishery agency flow objectives to protect both smelt and adult salmon can be achieved one hundred percent of the time after mitigation measures are implemented by drawing down lower Columbia River reservoirs to minimum operating pools and by drawing down the lower Snake reservoirs to spillways to increase flows through those dams. The DEIS should evaluate an alternative for 1992 to draw down the lower Granite and Little Goose reservoirs to spillways from the middle of February through March 1992 before the chinook and sockeye migrate. This would substantially increase the flow through the dams and greatly reduce salmon mortality. The Corps should also evaluate augmentation of lower Snake River flows during the period from April 15 to June 15 from storage to spill fish past the dams. These measures, to a considerable extent, recreate in the river system the impact of peak flow periods of a free flowing

A22-4

river. The Corps should also evaluate drawing down the lower Columbia River reservoirs to a minimum operating pool for the period from April through August to provide fishery agency recommended flows.

A22-5

The DEIS should also consider mitigation measures which can be implemented after 1992. This would involve modifying juvenile and adult passage facilities on the lower Snake River dams and modifying irrigation pump intakes and water related facilities and activities in the Snake and Columbia River reservoirs. The Corps should then re-analyze the DEIS alternative to achieve fishery agency flow recommendations with the post 1992 mitigation measures. Failure to include mitigating measures is unrealistic and contrary to law.

A22-6

The DEIS must also clearly describe and analyze the environmental affects of the No Action Alternative. The DEIS concentrates on the economic consequences of the various proposed alternatives, but does not deal with the near destruction of the Snake River salmon and the social and economic consequences of continuing the present policy.

Preservation of salmon runs on the Columbia and lower Snake Rivers is essential for protecting our important commercial and sports fisheries. Salmon have long played a critical part in the economic, social, and cultural history of the Northwest. It is essential that the DEIS adequately address alternatives to protect this priceless resource.

Sincerely,

THE MOUNTAINEERS

Dianne Hoff
President

DH:caj

A22-1

A22-2

A22-3

FAXED
1-15-91

November 15, 1991

Lt. Colonel Robert D. Volz
District Engineer
Walla Walla District, Army Corps of Engineers
Building 602, City County Airport
Walla Walla, Washington 99632-2965

RE: PPC Comments on Draft 1992 Columbia River Salmon Flow Measures Options
Analysis/EIS

Dear Colonel Volz:

The Public Power Council (PPC) appreciates this opportunity to comment on the Draft 1992 Flow Measures OAD/EIS. PPC recognizes the short time frame and the complexity of the issues involved in this effort, and appreciates the work that has gone into this document.

PPC Supports the Development of Special Flow Measures for 1992

There are several important reasons why a well designed plan for 1992 operations of the Columbia/Snake River Systems is critically important. PPC believes it is in the best interests of the power system and the fish that this OAD/EIS be successfully completed. PPC supports the development of a 1992 plan because:

- The region's electrical energy system is in load/resource balance and can be directly affected by decisions to change the operation of the river system;
- The salmon runs which are listed and proposed for listing under the Endangered Species Act can benefit from carefully planned changes in river operations for 1992;
- Additional research is needed to address longer term measures due to the lack of data associated with the associated with the biology of the anadromous runs.

In addition to these comments, PPC supports the comments presented by Pacific Northwest Utilities' Conference Committee (PNUCC) and the Northwest Irrigation Utilities (NIU).

The Corps Should Separate and Clarify the Proposed Actions in the Final OAD/EIS

PPC's understanding of the draft document is that there are two separate proposed actions involved in the Corps' study:

- Improving salmonid migration through the river system in 1992; and
- Conducting needed research into options that are not implementable in 1992.

The current draft does not clearly explain these separate elements -- a number of different purposes and objectives are stated at various points in the document. PPC recommends that the Corps state these proposed actions separately and clearly in order to avoid confusion and to facilitate achievement of the different goals.

The Corps Should More Thoroughly Analyze the Transportation Alternative for the 1992 Plan and the Long Term Measures

PPC agrees with the selection of alternatives the Corps is analyzing in this OAD/EIS with one exception: the final EIS should more thoroughly discuss the improved transportation of juvenile salmon as an alternative to drastic augmentation or drawdown measures. There is a great potential to improve the survival of these fish with the use of floating net pens, more successful collection techniques, lowered density during transportation, and other measures. These ought to be carefully considered by the Corps prior to making a major decision on flow operations.

PPC Disagrees With Standards Used in the OAD/EIS

PPC is concerned that the draft uses inappropriate standards, both general and specific, for both the 1992 plan and longer term considerations. On page 5-1, the document explains why the Corp has selected a physical rather than a biological standard. While we recognize the difficulties involved with selecting a biological goal, we argue that water particle travel time is not a reliable standard; fish survival is clearly the preferred standard and the proper one upon which to base important decisions which effect not only the fish but many sectors of society such as electricity production, irrigation, navigation, etc. To this end, PPC strongly objects to any suggestion that the Columbia Basin Fish and Wildlife Authority (CBFWA) flow proposal should be used as the basis for measuring success (page 3-23) because it is not the least cost way to achieve biological objectives, and has significant detrimental impacts for the power system and other river users. See PNUCC, PNUCC Analysis of Columbia Basin Fish and Wildlife Authority's Flow Proposal (March 1991). Several studies have shown that alternatives far less radical than the CBFWA flow proposal can result in fish travel times within a reasonable biological window such as 30 days. If a physical standard must be used, PPC believes the CBFWA flow proposal is not a reasonable standard upon which to base travel time objectives.

Public Power Council (William K. Drummond)

Improving Salmonid Migration in 1992

A23-4 Regarding the flow augmentation options being considered, the final EIS must accurately reflect the adverse impacts of the more drastic alternative measures, including power system impacts to both energy and capacity, and negative impacts on resident fish. In general, PPC believes the draft document is out-of-date and should be revised to reflect more recent analysis by BPA, the Corps, and PNUCC.

A23-5 The OAD/EIS also does a good job of addressing the severely adverse impact on fish that could occur in 1992 or later years from drawdown measures. Although drastic drawdown options may offer the greatest potential for reducing travel time, they also present the greatest risk to the salmon runs. Drastic drawdown measures could, without the proper planning (including changes to the structures) result in the elimination of upstream passage of adults and/or significantly increased mortality of juveniles from several sources, including gas supersaturation and the end of transportation.

A23-6 PPC believes the "preferred alternative" for 1992 in the final OAD/EIS should include the selection of a comprehensive series of practical measures, including drawdown, flow augmentation, and transportation, similar to the selection of measures for 1991. This approach could increase survival by providing a cost-effective way to achieve increased survival in the short term.

Studying Longer Term Options

A23-7 PPC is very concerned that the draft OAD/EIS does not contain a complete discussion of the proposed alternatives. Any serious consideration of long term radical measures, given their great potential for increased mortality and huge costs, must include scientifically valid biological tests, not just research on physical elements such as water particle travel time, turbidity, etc. In addition, PPC strongly endorses the intent of Section 3.2.6 which calls for an extensive and comprehensive monitoring program. It is only through effective verification that the region can properly evaluate the measures which are implemented.

Thank you for this opportunity to comment.

Sincerely,

William K. Drummond
Manager

Pacific Northwest Utilities Conference Committee

PNUCC

PACIFIC NORTHWEST UTILITIES CONFERENCE COMMITTEE

December 3, 1991

Mr. Robert Volz
Lieutenant Colonel, Corps of Engineers
District Engineer
Walla Walla District, Corps of Engineers
ATTEN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Re: Correction to PNUCC's comments submitted on November 15 concerning the Draft
Columbia River Salmon Flow Measures Options Analysis/Environmental Impact
Statement

Dear Mr. Volz:

A24-1

PNUCC would like to make the following correction to our comments submitted on November 15. I have attached a corrected copy of our comments. Please replace the second paragraph on the first page with the following paragraph:

PNUCC has participated in the technical working group meetings that address possible drawdown test scenarios. Based on this participation, PNUCC concludes that although the Corps has not stated a preferred alternative, it appears that the Corps is leaning toward implementing a drawdown test recommended by the Idaho Department of Fish and Game. Idaho Fish and Game suggests lowering Lower Granite and Little Goose reservoirs to approximately spillway crest during March 1992. Although PNUCC is concerned that these tests may have adverse impacts on returning adult salmonids, we support the drawdown test proposed by Idaho Fish and Game if impacts to adult fish can be minimized.

PNUCC appreciates this opportunity to make this revision. Thank you for your attention to this matter.

Sincerely,

Al Wright
Executive Director

RK117

The Dalles Irrigation District (Don W. Bailey)

The Dalles Irrigation District

DON DEAN, Operations Manager
Phone (503) 296-3366
3505 Olney Road

Post Office Box 767
THE DALLES, OREGON 97038

May 28, 1991

Dr. Ronald R. McKown
U.S. Bureau of Reclamation
Pacific Northwest Region
Federal Building and U.S. Courthouse
Box 043-550 West Fort Street
Boise, Idaho 83724-0043

Sir:

The Dalles Irrigation District operates a Bureau of Reclamation Project which pumps water from the Bonneville Pool about three miles below The Dalles Dam. We provide irrigation water to about 6000 acres of fruit orchards near The Dalles, which acreage is totally dependent on Columbia River water for survival.

Anything less than a pool level of 75' MSL causes cavitation problems in our pumps, and any material reduction of several feet would make it impossible to operate, resulting in disaster to our fruit orchards during our dry hot summers.

Since the Bonneville Pool is within the Columbia Gorge, with mostly verticle banks, no material increase in flow rate would result from lowering the pool to facilitate passage of fish.

We strongly urge that the Bonneville Pool not be lowered, especially not during the May-September vital irrigation season.

Sincerely,

Don W. Bailey

Don W. Bailey, Chairman
The Dalles Irrigation District
Board of Directors

Potlatch Corporation (Todd L. Maddock)

POTLATCH CORPORATION COMMENTS
U. S. ARMY CORPS OF ENGINEERS

DRAFT ENVIRONMENTAL IMPACT STATEMENT ON COLUMBIA RIVER SALMON FLOW MEASURE OPTIONS

September 17, 1991

I bring your attention to our earlier comments offered for the record by Potlatch Corporation, dated July 14, which outlines some of our general concerns regarding the potential drawdown of lower Snake River reservoirs.

Potlatch Corporation supports a limited drawdown which is part of a longer term study to determine the biological benefits of improving the survival of the Snake River salmon. We recommend that the 1992 test be designed to minimize disruption of navigation on the Snake River. Hopefully, the test drawdown would be conducted in conjunction with the lock maintenance closure which, under normal circumstances, extends for two weeks. Any longer drawdown test should be undertaken in a manner which will minimize harm to navigation or other commercial uses of the reservoirs.

Dramatic solutions such as the options which would draw down Lower Granite Dam to spillway crest should be undertaken only after less costly options have been fully evaluated. It is also important to use the initial test to determine if drawdowns have any destructive effect on upstream migration of adult salmon, resident fish and wildlife, or to the physical structure of the reservoir/railroad system. While not part of your present EIS, it is also important to evaluate other less costly measures such as improved screening net pins, harvest restrictions and hatchery improvements which may minimize or alleviate the need to adjust lower Snake River flows.

Any drawdown test which drops the Lower Granite reservoir below 727 will affect our pulp mill water intake. We will need to work closely with

Page 2
Potlatch Corporation Statement
September 17, 1991

12-4
cont'd

the Corps to determine what modifications must be made in order to continue operations. It may be possible to dredge a ditch to allow water to reach our intake. If for some reason this is impossible, it will be necessary to make structural changes in order to continue operations. Obviously, the timing of such an effort will be critical to assuring that no break in our operations occur.

Another important aspect of your decision will relate to the manner in which storage from Dworshak Reservoir is released to augment Snake River flows. Corps options B through F involve the discharge of 1200 KAF from Dworshak. Each of those options, if conducted after June 1, will eliminate our use of Dworshak for log transportation. Options G through I will allow a reasonable expectation that Dworshak log transportation and storage activities could be conducted when run-off and/or snow-melt conditions are near normal.

Obviously, the most attractive option for Potlatch Corporation would be no-action, since virtually any test will have an adverse effect on our transportation of logs, mill operation and subsequently, the transport of products to market. Since a no-action option is unlikely, it is our hope that the Corps will guide their actions in a manner which will be justified by biological results.

Todd L. Maddock

12-1

12-2

12-3

12-4

Elam, Burke and Boyd, Attorneys and Counselors at Law (Scott L. Campbell)

ELAM, BURKE AND BOYD
ATTORNEYS AND COUNSELORS AT LAW

KEY FINANCIAL CENTER
702 WEST IDAHO
POST OFFICE BOX 1839
BOISE, IDAHO 83701

TELEPHONE
208-343-5454
TELECOM
208-344-5544

SCOTT L. CAMPBELL

Lieutenant Colonel Robert D. Volz
October 8, 1991
Page 3

convert existing irrigation water storage contracts to stream flow maintenance or flow augmentation purposes will be vigorously opposed by the Pioneer Irrigation District.

Please continue to provide me with copies of all mailings and notices concerning this process. Thank you for your assistance.

October 7, 1991

Very truly yours,

ELAM, BURKE AND BOYD

Scott L. Campbell

Lieutenant Colonel Robert D. Volz
CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY
Walla Walla District
Corps of Engineers
Walla Walla, Washington 99362-2965

RE: Public Hearings to Consider Draft 1992
Columbia River Salmon Flow Measures
Options Analysis/EIS

Dear Lieutenant Colonel Volz:

Please consider this correspondence to constitute written public comment on behalf of Pioneer Irrigation District, a client of this firm.

As attorney for the Pioneer Irrigation District, I have reviewed the relevant portions of the above referenced document. I would like to compliment the individuals who worked in the preparation of the document from the standpoint of information collection, drafting, and organization. Given the relatively short time frame within which the document was prepared, the end product is of a very high quality.

The Pioneer Irrigation District has no substantive comments regarding the document with the exception of the references to flow augmentation and the utilization of water from storage reservoirs upstream of Brownlee Reservoir on the Snake River. The bulk of the discussion regarding this issue is contained in Section 3.2.3.1, found on pages 3-6, 3-7 and 3-8 of the document.

Pioneer Irrigation District has no objection to the utilization of excess water from the storage reservoirs upstream from Brownlee as long as that water is not taken from existing authorized purposes or from existing irrigation storage contracts between the U. S. Bureau of Reclamation and the various irrigation districts located in the affected region. Any attempt to

SLC:jm

cc: Pioneer Irrigation District
Board of Directors

B-1

B-2

Elam, Burke and Boyd, Attorneys and Counselors at Law (Scott L. Campbell)

ELAM, BURKE AND BOYD
ATTORNEYS AND COUNSELORS AT LAW

KEY FINANCIAL CENTER
702 WEST IDAHO
POST OFFICE BOX 1839
BOISE, IDAHO 83701

SCOTT L. CAMPBELL

TELEPHONE
208-343-8484
TELECOPIER
208-343-1844

14-2
cont'd

Lieutenant Colonel Robert D. Volz
October 9, 1991
Page 2

flow maintenance or flow augmentation purposes will be vigorously
opposed by the Settlers Irrigation District.

Please continue to provide me with copies of all mailings and
notices concerning this process. Thank you for your assistance.

Very truly yours,

ELAM, BURKE AND BOYD

Scott L. Campbell
Scott L. Campbell

October 9, 1991

Lieutenant Colonel Robert D. Volz
CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY
Walla Walla District
Corps of Engineers
Walla Walla, Washington 99362-2965

RE: Public Hearings to Consider Draft 1992
Columbia River Salmon Flow Measures
Options Analysis/EIS

Dear Lieutenant Colonel Volz:

Please consider this correspondence to constitute written
public comment on behalf of Settlers Irrigation District, a
client of this firm.

As attorney for the Settlers Irrigation District, I have
reviewed the relevant portions of the above referenced document.
I would like to compliment the individuals who worked in the
preparation of the document from the standpoint of information
collection, drafting, and organization. Given the relatively
short time frame within which the document was prepared, the end
product is of a very high quality.

The settlers Irrigation District has no substantive comments
regarding the document with the exception of the references to
flow augmentation and the utilization of water from storage
reservoirs upstream of Brownlee Reservoir on the Snake River.
The bulk of the discussion regarding this issue is contained in
Section 3.2.3.1, found on pages 3-6, 3-7 and 3-8 of the document.

Settlers Irrigation District has no objection to the utili-
zation of excess water from the storage reservoirs upstream from
Brownlee as long as that water is not taken from existing author-
ized purposes or from existing irrigation storage contracts
between the U. S. Bureau of Reclamation and the various irriga-
tion districts located in the affected region. Any attempt to
convert existing irrigation water storage contracts to stream

SLC:jm

cc: Settlers Irrigation District
Board of Directors

14-1

14-2

Paul Shaffer

PAUL SHAFFER • 1320 N. 12TH ST. • BOISE, ID 83702 • 208 385-9336

15-1

Oct-Dec 15, 1991

Testimony to the Army Corps of Engineers on the operation of mainstem Columbia and Snake river hydroelectric dams

The Pacific Northwest is in transition. Salmon, which embody the identity and character of our region, are imperiled—some 200 stocks are thought to be extinct and 200 more, threatened. Decisions made today, and this year, will determine if, a generation from now, our region's remaining wild salmon stocks might still swim the Columbia and Snake rivers on their way to Idaho's historic spawning grounds.

In every process of transition there is a focal point, a funnel where forces of change are brought to bear and where, depending on their aggregate and fluency, the forces take up a new heading and their new form emerges.

The Corps is that focal point—all steps that *must* be taken on behalf of the salmon rest finally on the doctsteps of the mainstem dams and in particular those in the Lower Snake River. The forces are arrayed. Those who depend on inexpensive hydropower, those whose livelihoods and traditions were lost as dams blocked the rivers, those who believe simply in the sanctity of wild things and wonder at the, hopelessly unknowing, arrogance of those who would trade wild-ness for short-term profit.

We all say we want to save the salmon, do we want to pay the cost? To answer that we first must know the cost. Can we succeed at saving wild salmon with a minimum of economic impact? Many believe we can.

Information is needed for devising alternative structures and operational schedules, information currently available only from those who operate these facilities. In order to take the necessary and appropriate steps—bold enough to save our wild runs and creative enough not to disrupt our regional and local economies—the Corps must actively cooperate in the process of change, not reactively cooperate. There is too little time.

Hydro-power is an apt term, those who control the Northwest's water are the seat of our region's political and economic power. Their resources could easily overwhelm any forces for the salmon, but I find concern among our

region's populace to save the fish. Our extraordinary—and extraordinarily unbalanced—political system demands accountability to our voters, and national law requires equitable and equal treatment for salmon in hydro-power planning. I encourage the Corps to honor the spirit of the process, along with the letter of the law.

Exactly how we reconsider current operation of the dams—reconsider in order to accommodate juvenile migration—will determine the new direction and form growing from our region's transitional process, and will answer the still unasked question of our grandchildren: What did you do to save and protect our region's salmon? *Remember* answer their entreaty, those of us here now, today. What did we do to protect and save our salmon? *Our* names will be attached forever to either our failure or our success.

Paul Shaffer

Clint Watkins

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENFW-FL-ER
Walla Walla, Washington 99362-9265

Comments-DEIS Columbia River Salmon Flow Measures

Lt. Colonel Robert D. Volz
District Engineer
Corps of Engineers

The DEIS is a fine effort by all of the staff involved in a very short time frame. A very good looking document. All are to be commended.

If the Water Year 1992 is to be a "Base Case" operation then the selection of Option "G" in combination with operation of all 8 Run-of-the-River projects at MDP seems to be the proper scenario. Practicability and limited time would seem to dictate the above solution. The analysis of data obtained from this scenario will dictate where operations go in the future.

It would appear that the final answer will contain many of the following items:

- Improved fish ladders.
- A ban on gill netting in the Lower Columbia.
- A test of the mobile net-pen concept with a slow down-river transportation of from 12 to 16 days.
- A ban of driftnets in the ocean fishery.
- A shorter sports and Native American fishing season.
- A put-back of all wild fish stock when caught.
- Improved fish by-pass facilities.
- Deeper screening at dams.
- More public awareness of the problems in river management.
- Adequate and timely funding to complete projects.
- Increased emphasis on wild-stocks with selected out-planting in areas now depleted.
- Increased efforts to maintain spawning areas free from siltation and contamination.
- A study of hatchery problems with an emphasis on fish diseases, their causes and prevention.
- A study of the effects of water temperature and how it dictates fish movements.

These are some of the things that come immediately to mind, there are many more.

Thank you for the opportunity to respond. I am looking forward to seeing the FEIS.

Clint Watkins
W. 2702 Walton
Spokane, Wa. 99205

16-1

16-2

Ron Appleby

BROETJE ORCHARDS

October 16, 1991

To whom it may concern:

My name is Ron Appleby, I am a Refrigeration & Controlled Atmosphere Engineer for Broetje Orchards. We are located on the Ice Harbor Pool.

I am here to talk about draw downs and the effect it could have on our apple orchard and processing plant.

We have 500 seasonal workers and 200 full time workers for our orchard. We also have 150 full time employees at our processing plant.

We irrigate 3000 acres of land, so to draw down the Snake River would be real detrimental to our economy. To draw down to minimum pool, would even have it's effects to our business.

I don't see any Scientific Facts that draw downs would improve fish reproduction. I think we need to look at harvesting of these fish. Is it more important to be a fish or fish a fish? We can't kill fish down stream and expect them to get up river?

If there was to be a draw down, what about the Sturgeon & local fish, what kind of effects would there be? Also there would be funding needs, Irrigation pumps, for ours would be about 3 mil. Navigation Passage. We need to find an acceptable plan for all.

Concerned Citizen,

Ron Appleby

Ron Appleby
Refrigeration Engineer

17-1

17-2

17-3

Stephen L. Barr

Oct. 16, 1991
10857 Silka Drive
Kuna, Idaho 83634

United States Army Corps of Engineers
Walla Walla District
Walla Walla, Washington 99362-7265
Attn: Doug Drexham

Gentlemen:

I have on Oct. 15, 1991 at Boise, Idaho, with much interest heard discussion on the "Drift Columbia River Salmon flow measures..." meeting. I have at this time four questions for your record directed at the wise use of enhancing our anadromous salmon and steelhead trout fishing.

1. Possibility of using a net or nets somewhat diagonally with the current and strung from the fish ladder at downstream base of dam to some point down river so as to effect a funneling action to get up stream moving salmon and steelhead quick access to and through fish ladders?

2. Could we make and use an accurate mechanism to detect salmonids and steelhead trout; mechanisms such as ultra sensitive

18-1
cont'd

infra red sensitive detection, underwater cameras, visual observation and methods of net fishing with capture, count and release thereby, allowing accurate records for future comparison?

3. Possibility of placing low concrete dams with some large oval culverts that have a movable grate on upstream side to catch drift wood, and a fixed grate protruding from atop or down stream side of dam to catch overflows drift and a somewhat lifted road on top to remove drift trail. Below the dams have, if necessary, a sub surface dike to effect some slack water to base of drift wood back rack dams, thereby allowing net or nets to funnel salmonid and steelhead trout into a funneling capture and on to a controllable transport down the river; these dams could be put near Lewiston, Idaho, on both Clearwater River and Snake River, both at a logical place slightly above that town?

Stephen L. Barr

4. Possibility of building dams some -
what similar to Sage Hen Reservoir
located Nem County, Idaho, for necessary
water release for enhancing latter part
of your migration of upper stream salmon
reproduction?

18-1
cont'd

Cordially Yours,
Stephen L. Barr

William L. Mathews

7630 Cherrywood Drive
Boise, Idaho 83704
October 16, 1991

Governor Cecil D. Andrus
State of Idaho
Boise, Idaho 83704

Dear Governor Andrus:

I appreciate your leadership in trying to find a way to save our salmon fishery.

Please consider the following concept as a means of moving juvenile salmon down through the series of dams on the Snake and Columbia Rivers.

The concept involves the use of a series of pumps operating water jets which would:

1. Create artificial stream flows that would guide the smolts down through the impoundments.
2. Utilize screens (nets) along with water jets to divert the smolts away from penstocks into a central collecting point.
3. Using water jets, elevate the fish from the collecting point over the dam.

The spacing of pumps, depth of the water jets, volume, etc., would need to be determined by experimentation. Obviously the effectiveness of the concept is dependent upon how well the smolts will respond to artificial stream flow.

Installation cost and maintenance would be relatively small. Adverse impacts on the multitude of values and uses of the water resource would be minimal.

See the enclosed rough drawing depicting how the concept could function.

Sincerely Yours,

W. L. Mathews

William L. Mathews
208-376-0301

cc: Tom Morse - Bonneville Power Administration
John Keys - Bureau of Reclamation
Jerry Connelly - Idaho Dept. of Fish and Game
President - Idaho Power Company
Lt. Col. Robert Volz - U.S. Army Corps of Engineers

Bill Wood

MY NAME IS BILL WOOD. I AM THE MANAGER OF GENESEE UNION WAREHOUSE COMPANY, A FARMERS GRAIN MARKETING COOPERATIVE REPRESENTING SOME 350 MEMBERS.

WE ARE LOCATED 15 MILES NORTH OF THE RIVER, WITHOUT DIRECT ACCESS TO RAILROAD TRANSPORTATION. ALL OF OUR WHEAT AND BARLEY AND APPROXIMATELY 95% OF OUR DRY GREEN PEAS GO TO MARKET TO THE WEST COAST VIA TRUCK TO LEWISTON AND BARGE TO THE PORTLAND AREA.

WE WOULD LIKE TO GO ON RECORD TO ENCOURAGE CONSERVATION OF MOST ANY NATURAL RESOURCE. DRAWDOWN OF THE RIVER OF A FOUR WEEK NATURE THAT COINCIDES WITH THE CORPS OF ENGINEERS MAINTENANCE PROGRAM WOULD BE ACCEPTABLE EVEN THOUGH IT WOULD LIMIT US TO ONLY AN 11 MONTH MARKETING YEAR. WE COULD PLAN AROUND THAT.

WE WOULD OPPOSE ANY DRAWDOWN LONGER THAN FOUR WEEKS BECAUSE OF PROHIBITIVE COSTS.

AS PRESIDENT OF THE LEWIS-CLARK TERMINAL ASSOCIATION, I CAN SAY THAT IT WOULD AFFECT THAT BUSINESS EVEN MORE. WE DO NOT KNOW WHAT FREE FLOW WATER MAY DO TO OUR BARGE LOADING DOLPHINS. ALSO, THERE WOULD BE NO WORK FOR THE EMPLOYEES TO DO AT THIS SYSTEM IF WE ARE NOT MOVING GRAIN, UNLIKE UP-COUNTRY WHERE THERE ARE OTHER THINGS FOR OUR MANPOWER TO BE DOING.

IT WOULD BE VERY DIFFICULT TO EVEN ESTIMATE ACTUAL DOLLAR AND CERT COSTS UNLESS WE GET SPECIFIC DETAILS OF THE DRAWDOWN LEVEL AND DURATION.

AGRICULTURE MARGINS ARE VERY NARROW AT THIS TIME. THAT INCLUDES PRODUCTION, MARKETING AND TRANSPORTATION. ANY SERIOUS DETERIORATION IN PROFIT MARGINS COULD PUT US INTO A "SAVE THE FARMER" PLAN.

ONE FINAL THOUGHT - IF THE PROBLEM IS AS SERIOUS AS WE BELIEVE IT IS, WHY DO WE STILL ALLOW COMMERCIAL HARVEST OF THE FISH?

110-1

110-2

110-3

Gehrke's Gink (George Gehrke)

GEHRKE'S GINK

"Just keeps it up - world's best dry fly dressing"
Snake River - Elkhorn Canyon
Asotin, WA 99402

FAX 509-243-4644 FRI 243-4100 ORDERS 1-800-356-4465

Draft Columbia River Salmon Flow Measures
1992 Options Analysis/Environmental Impact Statement

RE: Public Hearings Lewiston, ID 17 Oct 91

This process asks us to choose the most viable or non-viable solutions to the Columbia Drainage Salmon System crisis as proposed by the US Army Corps of Engineers. Frankly, I find none of the options offered to be to the public's liking. Under the circumstances, we must live within the operating perimeters of the options offered the public and given the choke of the lesser of a dozen evils . . . I choose the Governor's Plan as endorsed by the Governor of Washington, Booth Gardner and Cecil Andrus, Governor of Idaho.

If we can't come to some sort of consensus on the Governor's Plan, the US Wildlife Service will choose a much harsher plan that no-one may appreciate, even though the Wildlife Service's Plan may be in the better interest of Wild Steelhead and Wild Salmon migrations to their traditional spawning redds that are now blocked by twentieth century man and his dams. The perfect solution, in terms of our fisheries best interests is to eliminate all the dams. This, in terms of Man's best interests is unreasonable.

We are undisciplined when it comes to choices of life and death and what is required to sustain other life forms on this planet other than human. I support the most viable plan that guarantees the survival of our wild Steelhead and Salmon populations as they originally existed before the era of 'dams'. The barriers to our wild Steelhead and wild Salmon fisheries is not only dams. It is primarily the unwillingness of being stern in our

111-1

111-2

resolve in doing whatever is required to save a national heritage wrestled away from us by the Corps of Engineers, who in their blindness of dam constructions, have destroyed a national treasure and resource that belongs to all peoples of this nation and this planet.

The Governor's Plan assures the return of a historic salmon and steelhead run all the way up the Snake River to the distant cities that once enjoyed their presences. Pocatello Idaho readily comes to mind where I once was able to travel and catch Steelhead and Salmon so large that to drag one ashore was nearly impossible. There are other cities that once enjoyed the wild fish we speak of here, such as the many mountain hamlets in Montana that have been choked to death by Hungry Horse Dam and by the recent terroristic wall of Dworshak Dam. We are now in a generation of Americans who's memories are erased of the historic return of this once mighty fishery . . . for it does not exist in their memories anymore.

What the Governor's Plan entails is a pleading. We are not speaking of a multi-million dollar a year recreational resource here. We are speaking of saving a multi-billion dollar yearly resource here. We are not speaking of saving 3.5 Billion Dollars a year in total here. We are speaking of returning 3.5 Billion Dollars a year to each State! States that once enjoyed the exciting and literally stampeding herd-like returns of a once exciting and massive fishery that has been stolen from them by our unstudied dam and mismanagement policies. We are talking about returning 3.5 Billion Dollars a year in recreational income to Montana each year if Montana would have them. I can assure this study and review process, Idaho, State of Washington, and Oregon certainly wishes those dollars returned to it's economy. Finally, the choice should be permanent so that the yearly migration habits can be assured forever more. We also support and urge a river system around the dams.

Sincerely,

George Gehrke - President

Van Walkley

October 17, 1991

My name is Van Walkley and I have a combination dryland-irrigated farm in western Walla Walla county in southwest Washington. Thank you for having these public meetings and for the opportunity to testify.

In 1967, I installed a pump station approximately four miles upstream from Ice Harbor Dam. Since then I have added to the system. This year I mortgaged the farm because I had to do major replacement of mainline and replacement of sprinklers. This was done to be more efficient in my water use, and it has looked like a terrible decision for most of this year!

The Corps of Engineers' Option Analysis EIS represents a significant step toward the development of a well-reasoned public policy. I am now encouraged about my decision to replace mainline and sprinklers. The Corps' EIS is one of the first real efforts to present the costs and benefits of several major proposals to change Snake and Columbia river operations. We praise the effort that was put into this draft!

112-1

I support the Corps' cost-effectiveness and biological justification criteria for option evaluation. All proposals MUST pass a cost-effectiveness and biological justification test!

I realize that this draft EIS was charged to look at only the impacts of draw downs on the Columbia-Snake River systems. I certainly wish that you could do a complete EIS for other causes of salmon declines such as

112-2

harvest, habitat, transportation, and hatchery practices and any possible recovery solution.

I only have had time to quickly read the draft, so there are areas I may be somewhat unclear about. What is clear to me is that to do any drastic draw downs below normal operating pools is going to be very costly in terms of economic losses, power losses, losses to resident fish, losses in wildlife habitat, losses in recreation, and losses in transportation. It is also clear to me that the increase in smolt survival is minimal with any of the proposals presented. In other words more flow does not necessarily mean higher fish survival.

112-3

I had hoped more study could be done as to ways to improve the transportation of the smolts downstream. Ideas such as net pens, segregation of smolts, less density, and/or better discharges are possible ways to improve the physical movement of the fish downstream. I realize that transportation of the fish is not "natural" but we must use present day technology to solve present day problems.

112-4

My farm is a family farm and I presently have a loan for the improvements I made on the irrigation system. No where do I have someone with deep pockets to help me with increased expenses that a severe draw down would cause. These expenses are pump modification, increased power cost due to higher lift and ~~increased~~ increased power costs because of less power sales to B.P.A. In other words a triple cost increase. I have no one to whom I can pass on these costs.

Cheran Orchards, Inc. (Cathy Heller)

CHERAN ORCHARDS, INC.
P.O. BOX 5
PLYMOUTH, WA 99346
(509) 735-4459

Walla Walla District Corp of Engineers
October 21, 1991
Page 2

113-3

III. COMPROMISE - A compromise that everyone concerned could live with would be a reduced but an above minimum level in the John Day, Ice Harbor and McNary pools to insure continued irrigation for farming and other industry which rely on the rivers for production. While also banning or drastically reducing the harvesting of salmon in the Columbia and Snake Rivers. This compromise of reducing the harvesting of endangered fish and still keep the American farmers growing seems to be the most economically sound solution.

Sincerely concerned:

CHERAN ORCHARDS, INC.

Cathy Heller
Cathy Heller,
Administrative Assistant

October 21, 1991

Department of the Army
Walla Walla District Corp of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

RE: My Comments on the Proposed Amendments (91-25), Columbia River Basin Fish and Wildlife Program on Mainstem Survival, Harvest Production and Other Measures to Protect Salmon and Steelhead are as follows:

113-1

I. HARVESTING - I feel the first action to be taken when a species is close to endangered should be a ban on harvesting that species, both commercially and by sportsmen. It is my feeling by putting a temporary stop to any harvesting of these species in the Columbia and Snake Rivers for a given time, say 2 years and evaluate the population gain in that time is a more cost-effective and economically sound solution to our problem. I can not understand the reasoning behind letting harvesting continue when so much is at stake.

Certain environmental groups are so concerned the fish populations are so low as to put them on an endangered list, yet every day I drive to work I see the gill-nets stretching clear across the Columbia River, with hardly any way for a fish of any species to get by and I have also seen harvested fish that have sores on them, but have managed to escape the nets, only to fall prey to parasites and disease from the wounds inflicted by the nets.

113-2

II. IMPACT vs. BENEFITS - I have not seen any data that supports draw down as beneficial to salmon and steelhead enhancement. In fact, the number of farms and other industries that could not survive if the pools are lowered is phenomenal. And the effect of these lost crops, jobs and revenues would greatly cost not only our communities and our country, but would also affect world wide markets.

Broetje Orchards (Ralph Broetje)

OCTOBER 22, 1991 BROETJE ORCHARDS

TO WHOM IT MAY CONCERN:

MY NAME IS RALPH BROETJE, I FARM ALONG THE SNAKE RIVER BY FISHHOOK PARK. WE RAISE APPLES PEARS AND CHERRIES ON ABOUT 2000 ACRES AND PUMP WATER FROM THE ICE HARBOR POOL. I ALSO OWN AND OPERATE A COLD STORAGE, PACKING PLANT AND SALES OFFICE FOR THE 2 1/2 MILLION BOXES OF APPLES THAT WE GROW THERE EACH YEAR, WE PACK AND SHIP APPLES 12 MONTHS OUT OF THE YEAR.

WE ALSO OPERATE A CHILD CARE FACILITY AT THE SITE LICENSED FOR 70 CHILDREN. WE PRESENTLY HAVE 18 HOUSES ON THE FARM FOR FAMILIES THAT ARE EMPLOYED THERE AND WE ARE BUILDING MORE.

AT THE PRESENT TIME WE EMPLOY ABOUT 110 PEOPLE IN THE PACKING PLANT YEAR ROUND AND 250 IN THE ORCHARD. THAT INCREASES TO AROUND 650 DURING HARVEST. WE ARE THE FOURTH LARGEST TAX PAYER IN WALLA WALLA COUNTY.

I GIVE THIS INFORMATION TO SHOW HOW MANY PEOPLE'S LIVES ARE INFLUENCED BY THIS FARM AND HOW MUCH INVESTMENT IS INVOLVED. THIS IS MULTIPLIED SEVERAL TIMES BY ALL THE OTHER COLUMBIA SNAKE RIVER IRRIGATED FARMS. WITHOUT A TOTALLY RELIABLE WATER SUPPLY THAT IS UNINTERRUPTED, THIS FARM WOULD NOT CONTINUE TO EXIST. WE USE THE WATER NOT ONLY TO IRRIGATE, BUT ALSO FOR FROST CONTROL IN THE SPRING AND SUMMER COOLING. IF WE WERE WITHOUT WATER FOR EVEN ONE OR TWO HOURS ON A COLD NIGHT IN APRIL OR MAY, THE ENTIRE CROP WOULD BE LOST.

THE RIVER IRRIGATORS CANNOT PAY THE ADDED EXPENSES THAT WOULD COME FROM LOWER POOL LEVELS. THESE FARMS WERE DEVELOPED WITH PRIVATE MONEY, AND WITH PROFITS RANGING FROM SLIM TO NEGATIVES THE PAST SEVERAL YEARS MOST OF THE ORIGINAL DEVELOPERS WENT OUT OF BUSINESS AND NEW OWNERS ARE NOW TRYING TO CONTINUE FARMING. ANY INCREASE IN COSTS NOW WOULD PUT MANY OF THE EXISTING FARMS OUT OF BUSINESS. THESE COSTS WOULD COME FROM NOT ONLY THE COST OF LOWERING PUMP STATIONS TO REACH THE LOWER WATER LEVEL, BUT ALSO FROM THE INCREASED COST TO LIFT THE WATER THOSE EXTRA FEET AND INCREASED COST OF ELECTRICITY DUE TO THE LOST GENERATING CAPACITY. ENGINEERS ESTIMATES TO LOWER OUR PRESENT RIVER STATION ARE \$3.2 MILLION ALONE. THE BANKS ARE WATCHING THIS WATER ISSUE VERY CLOSE AND OPERATING LOANS MAY BE IN JEOPARDY.

114-3

WATER AND SALMON ARE BOTH VERY IMPORTANT NATURAL RESOURCES TO THE NORTHWEST. WE MUST BE VERY CAREFUL TO PROTECT THEM BOTH! DROWDOWN OF THE SNAKE AND COLUMBIA RIVERS WOULD USE A LARGE AMOUNT OF THIS PRECIOUS RESOURCE WATER, COSTING MILLIONS OF DOLLARS PER YEAR AS WELL AS IMPACTING FISH IN THE RIVER THAT DON'T MIGRATE TO SEA, SUCH AS, THE STURGEON AND BASS. LATER MIGRATING SALMON, SUCH AS, THE FALL CHINOOK WOULD ALSO BE AFFECTED. OPERATING THE RIVERS AT MINIMUM OPERATING LEVELS IS EXPENSIVE AND HAS ALMOST NO IMPACT ON SURVIVAL OF THE DOWN RIVER SMOLT, MAYBE 3 TO 4% INCREASE. IN FACT, THE CORP OF ENGINEERS OPTION ANALYSIS EIS INDICATED DROWDOWN PROPOSALS LACK SOUND BIOLOGICAL JUSTIFICATION AND ARE NOT COST-EFFECTIVE. BARGING OF THE SMOLT HAS PROVEN EFFECTIVE AND SHOULD BE IMPROVED AND INCREASED.

114-4

FLOW AUGMENTATION IS ALSO EXPENSIVE AND USES VAST AMOUNTS OF WATER. CARE MUST BE TAKEN HERE BECAUSE DURING DRAUGHT YEARS, WATER BECOMES VERY PRECIOUS AND WILL BECOME EVEN MORE SO IN THE FUTURE. IT'S THE NORTHWEST GREATEST RESOURCE! LETS BE SURE TO CONSERVE AND USE IT WISELY.

114-5

NOTHING MUST BE DONE THAT IS NOT HARD SCIENCE OR HAS SOUND BIOLOGICAL JUSTIFICATION. THE CORPS OPTIONS ANALYSIS/EIS IS A SIGNIFICANT STEP IN PRESENTING BOTH THE BENEFITS AND COSTS OF SEVERAL MAJOR PROPOSALS TO CHANGE RIVER OPERATION. I SUPPORT THE CORPS COST-EFFECTIVENESS AND BIOLOGICAL JUSTIFICATION CRITERIA FOR OPTION EVALUATION. ANY MEASURE BEING CONSIDERED MUST BE ABLE TO PASS THESE TESTS. A MARGINAL BENEFIT ASSESSMENT FOR FLOWS SHOULD ALSO BE INVOLVED.

114-6

THE MAIN AREA THAT NEEDS TO BE ADDRESSED MORE COMPLETELY IS THE HARVEST OF SALMON. WE THE PUBLIC AND ALL RIVER USERS HAVE AND WILL CONTINUE TO MAKE MAJOR INVESTMENTS TOWARD HEALTHY RUNS OF SALMON. BUT, HEALTHY RUNS CAN'T HAPPEN UNLESS THERE ARE REDUCTIONS IN HARVEST. UNDER THE NORTHWEST POWER PLANNING COUNCIL'S PLAN, FISH HARVESTS CAN KILL 60% OF SNAKE RIVER FALL CHINOOK ALMOST THE SAME AS THE PAST AND PRESENT. THIS IS NOT ACCEPTABLE! A WILD SPECIES OF SALMON WILL BE DRIVEN TO EXTINCTION AT CATCH RATES ABOVE 30% ACCORDING TO THE AMERICAN FISHERIES SOCIETY. NO MATTER WHAT STEPS ARE TAKEN TO SOLVE THE SALMON RECOVERY PROBLEM UPSTREAM, THE COUNCIL'S PLAN ALLOWS FOR CONTINUED OCEAN AND RIVER FISHING AT LEVELS THAT WILL DRIVE THE STOCK TO EXTINCTION. THE HARVEST RATE MUST BE REDUCED TO 30% OR LESS IMMEDIATELY!

114-7

114-1

114-2

Broetje Orchards (Ralph Broetje)

114-7
cont'd

HARVEST KILLS FISH WHETHER LEGAL OR ILLEGAL. THE OFF-SHORE HARVEST OF THE DRIFTNET FISHERY, TROLL FISHERY, PACIFIC RIM FISHERIES, ETC., MUST BE IMMEDIATELY AND COMPLETELY REGULATED. WITHOUT THIS IN SOLID PLACE AND QUICKLY, ALL OTHER PLANS AND EFFORTS WILL BE FAILURES. THE COMMERCIAL GILL NET FISHERY BELOW BONNEVILLE DAM NEEDS TO BE LOOKED AT AND PROBABLY BOUGHT OUT. AGAIN USE A COST-EFFECTIVENESS AND BIOLOGICAL EVALUATION. WE HAVE SPENT OVER 1 BILLION DOLLARS THE PAST TEN YEARS ON SALMON RECOVERY AND WILL SPEND ANOTHER \$400 MILLION NEXT YEAR ALONE. LET'S BE SURE IT'S NOT SO THE PACIFIC RIM FISHERIES CAN INCREASE THEIR HARVESTS!

114-8

THAT TYPE OF FISHING, THE SLAUGHTER BY THE HIGH SEAS DRIFT NET FISHERIES MUST BE STOPPED! WHEN YOU CONSIDER THAT OF ALL THE SALMON THAT LEAVE THE COLUMBIA RIVER ON THEIR WAY TO THE PACIFIC, ONLY TWO TO THREE PERCENT RETURN, WE MUST LOOK TO THE SEA FOR THE PROBLEM. HARVEST HAS INCREASED SEVERAL 100 PERCENT OVER THE PAST TEN YEARS, BUT SPANNING SALMON HAVE NOT.

MILD LOWER COLUMBIA RIVER CONO SALMON HAVE DECLINED TO THE POINT THAT THE NATIONAL MARINE FISHERIES SERVICE HAS DETERMINED THAT THEY NO LONGER CONSTITUTE AN "ENVIRONMENTALLY SIGNIFICANT UNIT". WE CAN'T BLAME THE DAMS FOR THEIR PREDICAMENT, SINCE THEY PASS NO DAMS. OVER-HARVEST AND HATCHERY PRACTICES ARE THE CAUSE OF THEIR DECLINE. THE "WANTON DESTRUCTION OF WILDLIFE" AS ROLLAND SCHMITTEN, PACIFIC NORTHWEST DIRECTOR OF THE NATIONAL MARINE FISHERIES SERVICE CALLED THE DRIFT NET FISHERY IN THE NORTH PACIFIC, MUST BE ENDED IMMEDIATELY. WE WOULD NEVER STAND FOR SUCH - INDISCRIMINATE SLAUGHTER ON LAND, WHY DO WE ALLOW IT AT SEA? PLEASE ADDRESS THIS PROBLEM NOW!

WE MUST ALSO LOOK AT THE MEASURES THAT HAVE BEEN PUT INTO PLACE THE LAST TEN YEARS AND ARE WORKING. SUBSTANTIAL PROGRESS HAS BEEN MADE THE PAST DECADE.

114-9

BYPASS FACILITIES AT DAMS, IMPROVED SCREENING, HABITAT IMPROVEMENT PROJECTS, STATE-OF-THE-ART PRODUCTION FACILITIES, BARGING AND TRUCKING OF SMOLT, REDUCING PREDATORS, SUCH AS, SQUAM FISH, AND MANY OTHER PROGRAMS ARE WORKING. EVEN WITH THE LAST FIVE YEARS OF DROUGHT. MOST SALMON AND STEELHEAD RUNS ARE CONSIDERABLY BETTER OFF THAN A DECADE AGO. LET'S CONTINUE TO EXPAND PROGRAMS THAT ARE PROVEN TO WORK.

IN CONCLUSION, WITH MILLIONS OF PEOPLE NOW LIVING HERE IN THE NORTHWEST, WE CAN'T GO BACK TO THE WAY IT WAS 200 YEARS AGO. WE HAVE TO MOVE FORWARD WITH THE BEST IN SOUND SCIENTIFIC AND BIOLOGICAL DATA. I BELIEVE THE CORPS OF ENGINEERS IS THE ONLY AGENCY WITH A CREDIBLE PLAN SHOWING THE BENEFITS AND COSTS OF DRAWDOWNS. I BELIEVE THE COST WILL BE GREATER THAN HAS BEEN PROJECTED. EVEN SO, THEIR EIS SHOWS THAT THERE MUST BE DOZENS OF BETTER WAYS TO GET THE SMOLT DOWN RIVER WITH LESS EXPENSE AND SIDE EFFECTS THAN RIVER DRAWDOWN OR FLOW AUGMENTATION.

THE PUBLIC HAS SPENT MILLIONS IN THE PAST ON PET PROJECTS THAT DIDN'T WORK. DON'T LET THIS DRAWDOWN PLAN BECOME ANOTHER MULTI MILLION DOLLAR "PET PROJECT" THAT DIDN'T WORK. LET ANY PLAN WITH SUCH FAR REACHING EFFECTS ON WILDLIFE, ECONOMICS, AND OUR ENVIRONMENT BE BASED ON SOUND BIOLOGICAL RESEARCH WITH PROVEN BENEFITS. LET'S REMEMBER THAT WATER IS A VERY IMPORTANT NATURAL RESOURCE IN THE NORTHWEST. DON'T WASTE THAT PRECIOUS RESOURCE WITH FLOW AUGMENTATION AND MINIMUM OPERATING LEVELS IF IMPROVED BARGING OF SMOLT WITH FISH PENS. REDUCED HARVESTING, IMPROVED FISH LADDERS, IMPROVED HATCHERIES ETC., ARE MORE SOUND AND IMMEDIATE WAYS OF INCREASING THE SALMON AND STEELHEAD RECOVERY. AS GRAHAM GALL, PROMINENT FISH GENETICIST FROM THE UNIVERSITY OF CAL. DAVIS STATED, "THE HARSH REALITY IS THAT STATISTICALLY THESE STOCKS CAN'T POSSIBLY SURVIVE THROUGH MANY MORE SPawning CYCLES UNLESS THE FEW REMAINING ADULT FISH ARE ALLOWED TO GET BACK UPSTREAM AND SPAWN." WE MUST MAKE MAJOR HARVEST REDUCTIONS IN OCEAN AND COLUMBIA SNAKE RIVER FISHERIES. WE ALL HAVE TO STOP KILLING THEM. THANK YOU FOR YOUR TIME.

SINCERELY YOURS,

Ralph Broetje

RALPH BROETJE, CONCERNED CITIZEN

P.O. BOX 2308 TRI-CITIES, WA 99072-2308
509-735-6461

October 23, 1991

Department of the Army
Walla Walla District, Corps of Engineers
Attention: CENPW-PL-ER
Walla Walla, WA 99362-9265

RE: September 1991 Draft - 1992 Columbia River Salmon Flow
Measures OPTIONS ANALYSIS/EIS

Attention: Planning Division:

On behalf of AgrNorthwest and myself, I would commend the Corps of Engineers for a very detailed and well thought out Environmental Impact Statement(EIS).

Concerning items detailed in the EIS, I would like to make the following statements:

1. On pages 5.16 and 5.17 under Plan Selection section, the gross crop value associated with the drawdown of the Snake River near spillway is placed at \$77 million and the lost crop value associated with lowering the Columbia River to minimum operating pool is placed at \$306 million. Some parties may question that these estimates are overstated and that only the farmers' profits are affected. Let me assure that, depending on the date of notification and the lead time given, the potential losses may be extreme and even surpass your estimate. If the crops are planted and growing, a lack of water will mean the total loss of crop production and revenue while most of the input costs are expended. This situation would be disastrous to the farmer involved. Farmers are now preparing their ground for 1992 crops. On page 4.114 of the EIS, the statement is made "it appears that the lead time required would preclude making such modifications for the 1992 irrigation season in virtually all cases." It not only appears but it does preclude all cases and may very soon preclude modifications for 1993.

2. The EIS does not appear to adequately include in the cost the loss of the productive assets as an effect of the drawdown. The loss of fruit trees and vineyards due to the lack of water is the easiest cost to estimate but the erosion and other damage to the productive capacity encountered by other irrigated farms must also be examined.

115-3

3. There is one additional problem with operating the Ice Harbor Pool at Minimum Operating Pool (MOP), which is 437 feet. AgrNorthwest has at Ice Harbor motors and pumps totalling 13,500 horsepower. These pumps are able to operate at 437 feet; however, at 436 1/2 feet, or at any level below 436 1/2 feet, these pumps and motors will be severely damaged if they are run at these lower levels. What happens at these lower levels is a vacuum develops in the intake to the pumps. This vacuum then causes the pumps to cavitate and there is not enough down-thrust to hold the propellers and motors in their proper alignment. Within just a few seconds, both pumps and motors are seriously damaged. Sometimes, when this happens, they can be repaired. But most often, this damage necessitates the replacement of both pump and motor at a cost of about \$120 thousand per unit. If we should have all of our pumps operating and the Corps should inadvertently draw the pool down below 437 feet, to say, 436 feet, and we were not able to get the pumps shut down in a timely fashion, then the total cost to AgrNorthwest of such an inadvertent drawdown by the Corps to below 437 feet could be well over \$1 million just to repair or replace the pumps and motors. Furthermore, if this happened during the growing season, we could have approximately \$15 million worth of potatoes, field corn, wheat and other crops at risk. There would be a total loss of these crops because it would not be possible to repair or replace the pumps in time to save the crops. The point I am making is that, although we could physically operate our pumps if the pool is at 437 feet, the Corps must not, inadvertently or accidentally, let the pool go below 437 feet, even for just a few minutes. Because if that happens, it could mean well over \$16 million in costs to AgrNorthwest in terms of pump repairs and lost crops.

115-4

4. The Corps should examine the percent increase in snail survival numbers on page 5.12 versus those on page 4.44. On page 5.12 the survival increase ranges toward 3.9%, while on page 4.44, 3.7% is the highest point for only 80 krfs. I may be misinterpreting the meaning of one of the pages.

Again, let me express my overall appreciation for the work performed thus far but, we also see the need to establish a meaningful goal. The emphasis must be placed on maximizing the number of adult fish returning to their spawning grounds or some other measurable output, as opposed to maximizing the costs and inputs in order to show we sacrificed for the salmon.

Thankyou,

R. Thomas Mackay

115-1

115-2

**CLARK JENNINGS
AND ASSOCIATES INC.**

504 N. Naches Ave., #1 P. O. Box 552 Yakima, WA 98907-0552 Phone (509) 248 5600
1919 N. 24th P. O. Box 2552 Pasco, WA 99302-2552 Phone (509) 547 9751

Clark Jennings and Associates, Inc. (James G. O'Connor)

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EIS Response
October 25, 1991

Pasco, Washington 99362
October 25, 1991

Department of The Army
Corps of Engineers - Walla Walla District
Building 602 - Walla Walla Airport
Walla Walla, Washington 99362

Attention: Dr. Tom Morse, EIS Manager

RE: Draft EIS - Columbia River Salmon Flow Measures

Dear Dr. Morse:

I am writing to you regarding the proposed draw down of the Columbia and Snake River system to accommodate enhancement of the Sockeye Salmon. As a tax payer, rate payer, business man for 25 years in the Tri-Cities and a concerned citizen I question the economics of implementation of draw downs of the Snake and Columbia Rivers.

I have been directly involved for the past 25 years in the agriculture and agri business sectors of the local economy as a real estate loan underwriter and appraiser. I am very familiar with most of the river projects along the two subject rivers. I am also very aware of the economic benefits of changing the dry pasture and dryland wheat lands to a higher and better use of center pivot irrigated farms, vineyards and orchards. The total economic benefit is ten fold of dryland vs. irrigated land and much more for orchards or vineyards.

Many of the higher lift center pivot irrigated farms were developed in the mid to late 1970's at a cost of \$1,000 to \$1,200

116-1

per irrigated acre plus land. At the time of development, energy costs for pumping water to the various farms was averaging \$28 to \$32 per acre. With the energy increases over the past 10 years, these costs have escalated to an average of \$65 to \$115 per acre pure power costs, depending upon the individual farm and its proximity to the rivers edge and the total lift. Many of the river project farms were sold in the late 1970's at \$2,000 to \$2,200 per irrigated acre. Those same farms, due to higher power costs, are currently selling at \$800 to \$1,200 per irrigated acre. Further energy increases as a result of the draw down could make many of the river projects uneconomical to operate. Therefore, they would revert back to dryland. This has been the case on one project already in Walla Walla County. This farm consisted of 1,700 irrigated acres.

I would like to take the liberty of drawing you a comparison of a large center pivot irrigated farm and an adjacent dryland wheat and dryland pasture farm located in the southwest portion of Benton County, on the north shore of the Columbia River.

Farm "A" was developed under center pivot sprinklers in the mid 1970's. Farm "B", which adjoins Farm "A" to the north, has water rights with proposed future development under center pivot irrigation. However, it remains in marginal dryland wheat production. This economic comparison is attached as Exhibit "A".

These two farms are almost equal in size with 11,400 irrigated acres in Farm "A" and 9,675 dry cultivated acres in Farm "B". The "land only" value as dry cultivation without irrigation influence is almost identical. The irrigation system contributes \$932 per acre or \$10,500,000. Also, the agri business enterprise contributes \$1,000,000 for the irrigated farm vs. \$100,000 for the dryland farm. The gross farm gate receipts are 10 fold or \$8,400,000 for Farm "A" and \$820,000 for Farm "B".

116-2

Clark Jennings and Associates, Inc. (James G. O'Connor)

504 N. Naches Ave. #1 P.O. Box 592 Yakima, WA 98907-0592 Phone (509) 248-5600
1919 N. 20th P.O. Box 2592 Pasco, WA 99302-2592 Phone (509) 540-9751

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EIS Response
October 25, 1991

The annual real estate taxes paid to Benton County are \$6.66 per acre for the irrigated land vs. \$3.51 per acre for the dryland. The one time sales tax paid for the irrigation system on Farm "A" was approximately \$800,000 vs. none for Farm "B". The excise tax in the event of a sale of the farms would be \$210,000 for Farm "A" and \$21,500 for Farm "B". The annual sales tax on the operating enterprise for Farm "A" would be approximately \$440,000 vs. \$40,000 for Farm "B". There are state lands incorporated within the two ownerships. The State of Washington's annual income from Farm "A" is \$33,618 vs. \$7,040 for Farm "B".

It is my recollection that there is approximately 300,000 acres of irrigated land on the Snake and Columbia Rivers in Oregon and Washington. I do not think the local economy can deal with a shut down of this magnitude. Agriculture is our #1 resource. It helps the United States balance the trade deficit.

AT WHAT COST SOCKEYE?

I pray that common sense will prevail regarding this issue.

Sincerely,

CLARK JENNINGS AND ASSOCIATES, INC.

James G. O'Connor, President

cc: Sid Morrison, U.S. Representative
Claude Oliver, Benton Co. Treasurer
N.W. Power Planning Council -
Benton County PUD
CJ & A - Yakima

IGO/kk

EXHIBIT "A"

The following is an economics comparison of a developed irrigated river project farm vs. a dryland cultivated/dry pasture farm in the same area.

TITLE	IRRIGATED FARM "A"	DRYLAND FARM "B"
Location	Benton County	Benton County
Gross Acres Deeded	12,404	14,864
State Leasehold	960	1,440
Acres Cultivated	11,420	9,675
Land Only Value	\$1,550,000	\$1,356,275
Irrigation System Value	\$10,650,000	\$ -0-
Agri Business	\$ 1,000,000	\$ 100,000
Gross Income '90	\$ 8,400,000	\$ 819,280
Assessed Value '90 (Market)	\$14,015,880	\$ 1,605,330
Assessed Value (Open)	\$ 7,133,290	\$ 565,380
Real Estate Tax	\$ 82,625	\$ 7,659
Excise Tax on Sale	\$ 209,880	\$ 21,656
Sales Tax on Irrigation System	\$ 798,750	\$ -0-
Sales Tax on Operation	\$ 441,000	\$ 43,000
State Leasehold	\$ 33,618	\$ 7,040

Pritchard Appraisal & Farm Financial Consulting (Jim Pritchard)

**PRITCHARD
APPRAISAL & FARM FINANCIAL CONSULTING**

Phone (509) 647-2611 - Message Phone (509) 647-2222 - Route 1, Box 20-A - Wilbur, WA 99185

October 28, 1977

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Re: Columbia River Salmon Flow Measures

I Favor the Existing Conditions (No Action) alternative. My Reasons are as follows:

1. There is little evidence that any of the proposed measures will save the salmon. Most of the evidence seems to be to the contrary.
2. The negative economic impacts are too great particularly considering the limited chances of saving the salmon.
3. Your EIS indicates the environmental impact may also be beyond acceptable levels.
4. The cost-benefit ratio is not acceptable.
5. We can raise salmon in coastal waters.

Sincerely,

Jim Pritchard
Jim Pritchard

117-1

The American Society of Farm Managers and Appraisers (ASFMA) conducts a voluntary program of continuing education, in accordance with the requirements of the program. Professional Member of ASFMA Since 1970

The Dalles Irrigation District (Don W. Bailey)

The Dalles Irrigation District

DON DEAN, Operations Manager
Phone (503) 296-3366
3505 Olney Road

Post Office Box 767
THE DALLES, OREGON 97058
October 31, 1991

Dennis B. Underwood
Commissioner of Reclamation
Bureau of Reclamation
1849 C. St. NW
Washington, D.C. 20240-900

Dear Commissioner:

I am writing in behalf of The Dalles Irrigation District, which operates a Bureau of Reclamation Project serving some 6000 acres of orchard crops. We are concerned about the various proposals being made to lower the pool levels in the Columbia River between Bonneville Dam and The Dalles Dam, which are operated by the Army Corps of Engineers.

Since our irrigation district pumps water from the Bonneville Pool, a short distance below The Dalles Dam, we are interested in the operating levels being proposed, supposedly to aid in fish migration. Our experience with our pumps in the Columbia River is that we begin to have severe cavitation problems when the water level is lowered to 73½ feet sea level elevation.

In the enclosed letter from the Corps of Engineers, it shows that at the water levels being proposed at the Bonneville Forebay, we would experience a considerable drop in the river level below necessary operating levels if they operate at the proposed 70-feet whenever the river flow rate is below 150,000 cfs. We would hope that any proposal for operating the Bonneville Pool at levels below the 74-foot forbay level, would not involve a flow rate below 150,000 cfs. Without significant modifications to the USBR design of the pump station, we need to operate at 73½-foot or more to avoid serious cavitation problems.

Any assistance you could provide so that future operation at Bonneville would not lower our pumping levels below the 73½-foot would be greatly appreciated.

Sincerely yours,

Don W. Bailey

Don W. Bailey, President
Board of Directors

Copy to: Dr. Tom Morse, EIS Coordinator, Corps of Engineer
Greg Graham, Study Manager, Corps of Engineers
Walla Walla, WA.

Lynn Hamilton, EIS Coordinator, Corps of Engineer
Nancy Yun, Study Manager, Corps of Engineers, Portland
Robert Hamilton, USBR, Boise, Idaho
Dick Haapala, CH2M Hill, Yakima, WA

Karen J. Lewis

Karen Lewis
148 Shiloh Dr.
Lewiston, ID 83501-9663
November 4, 1991

Greg Graham
Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CHRPV-PL-ER
Walla Walla, WA 99302-9265

Dear Mr. Graham:

I have been following the sockeye salmon issue since it began earlier this year. I am against drawing down the reservoirs below minimum operating pool. There are other aspects of this dilemma that need to be considered besides water flow.

This is supposed to be a good year for steelhead fishing. Why can steelhead migrate up and down the Snake and Columbia Rivers and salmon can't. Because salmon are a commercial fish and steelhead isn't. Using more net pen barges to take the smolts downstream and putting screens on all dam and irrigation intakes makes more sense. Modifying fish ladders to make it easier for the fish to go through the dams is an option too.

Environmentalists are busy getting into everyone's pocket. My husband works for Potlatch Corp., and Potlatch can't operate when Lower Granite is below minimum pool. Rainfall since Sept. 1 is already 1 1/2 inches below normal--where will the water come from to refill the reservoirs?

Sincerely,

Karen J. Lewis

Karen J. Lewis

Kip Dieringer

Nov. 7, 1991

U.S. Army Corps of Engineers

120-1

Everything possible must be done to ensure the survival of Snake and Columbia River fish. If the salmon cannot exist in this former river system turned irrigation ditch/barge canal, then it is a sad commentary on the human condition. Barge traffic is unimportant, the finest railway in the world was displaced by the dams. The barge companies did not pay for the dams and they will be destroyed by government

120-2

subsidy just as the railroads were. Irrigation can be accomplished by pumping spring runoff into reservoirs away from the river channels. The reason that we have low electric rates is that you are raping a natural resource, when the bill for the costs incurred comes due, rates will become excessive. I look forward to the day when the fish run free, the rivers are free of dams and the Corps of Engineers is no longer needed.

Kip Dieringer

11-7-91

Northwest River Planning Council
451 S.W. 6th Ave. Suite 1100
Portland, Oregon 97204-1348

I wish to notify you that NPPC
proposed amendments to the fish wildlife
Program is not a ready place by
any stretch of imagination. There is
no regional consensus with your
analysis or recommendations.

Please adopt my proposals as
described:

- Adopt juvenile fish travel time objectives
equivalent to the fishery agencies and tribes
Columbia River Fish Wildlife Authority
Flow Proposal. No other there objectives
hard constraints on the hydro system

(2)

Admit trucking & barging doesn't
work before the fish are
trying to recover being extinct.
Begin to practice what the Council
preaches about adaptive management
and learn from experience
Adopt a policy requiring soft
in-river navigation conditions;
it worked for decades prior
to canal arrival.

Try thinking for the benefit of restoration
of Riverine for a change
of pace. State may begin
to like the process

Establish a database of the four
lower Snake River fisheries
as an objective of the fish
& wildlife program. Set
emergency deadlines for
implementation; make
drawdowns a hard constraint
on the hydro system effective
Spring of 1994

Assist the states & tribes in
mitigating the impact on fisheries
caused by the unregulated
harvest of fish by the B.P.A. &
The Corps.

Tom Kovalicky

③

Encourage adequate controls
on Fisheries - over which the
Council has no jurisdiction. Pursue
your efforts on the job longer
described 10 years ago in
its mandate and minimize
harvesting fish through the
use of dams

Establish as a fish & wildlife
program goal: No irreversible
loss of genetic diversity due
to management action or
inaction

Establish specific spawning escapement
objectives for each salmon
and steelhead stock; monitor
actual spawning escapement
to ensure the objective is
adequate to fully & consistently
seed the habitat

Conclusion:

Bad hates a coward, but
prevails by giving us the political
fix. Nobody can do that!

Sincerely,
Tom Kovalicky
P.O. Box 48
Franklin, Idaho 83530

James M. Baker

Route #2, Box 303
Pullman, WA 99163
(509) 332-0945
November 8, 1991

Lt. Col. Robert D. Volz. District Engineer
Corps of Engineers
Walla Walla District
Department of the Army
ATTN: CENPW-PL-ER
Walla Walla, WA 99362

RE: Draft 1992 Columbia River Salmon Flow Measures Options
Analysis/EIS

Dear Col. Volz:

This letter is written in order to comment on the draft of the
"1992 Columbia River Salmon Flow Measures, Options Analysis/EIS"
(DEIS) released by the U.S. Army Corps of Engineers in September
of this year. As you know, I was a seated participant in the
Salmon Summit last winter, and continue to remain active on the
issue of salmon restoration in the Pacific Northwest.

Frankly, the DEIS completely misses the point of why the Corps
undertook this NEPA analysis at this time. During the concluding
meetings, my fellow participants at the Salmon Summit received a
firm commitment from the Corps that the agency would prepare an
EIS for, and conduct, a test of drawdowns of the four Lower Snake
River reservoirs in 1992. We at the Salmon Summit assumed that
the Corps would act in good faith on this commitment.
Unfortunately, this DEIS fails to poise the Corps to perform such
a test, or make any important progress toward drawdowns.

The DEIS notes correctly that only drawdowns of the four Lower
Snake River reservoirs can provide to migrating juvenile fish the
travel time out of the Snake River which has been recommended by
the Columbia Basin Fish and Wildlife Authority (CBFWA). For this
reason alone, much less the commitment made at the Salmon Summit,
the Corps should move aggressively to test the technical
feasibility of drawdowns.

In addition, the Corps must act in full consistency with the
salmon recovery plan currently under development by the Northwest
Power Planning Council. The Council in its draft recovery plan
has taken a "presumptive path" to implementation of drawdowns of
the four Lower Snake River reservoirs. Because the DEIS does not
analyze a test of drawdowns in 1992, the Corps under this document
as drafted currently would act in direct contradiction to the
Council's recovery plan.

122-1

122-2

122-3

Contrary to the conclusions in the DEIS (p. 5-4), it is possible
to drop the four Lower Snake reservoirs in 1992 without negative
impacts on fish, without unreasonable safety hazards, and without
irreversible future impacts. Fish advocates, like myself, have
never denied that reservoir drawdowns under the current
configuration of the dams would cause damage to adult and juvenile
fish as well as to other river uses, such as shutdowns of barge
navigation and pumped irrigation. However, we believe that the
Corps can find ways to mitigate these impacts acceptably, and
through drawdowns, provide reliable passage for juvenile salmon
out of the Snake River basin. At the Salmon Summit, the Corps
responded that, to develop a plan for these mitigations, the
agency would need to test drawdowns in order to collect data on
project performance and on impacts' magnitudes when the reservoirs
drop to spillway crest.

The Corps can accomplish this acceptable test of reservoir
drawdowns to spillway crests by conducting the operation in
January or February of next year. Annual maintenance and repair
of navigation locks can be re-scheduled for the test month.
During January and February, negative impacts on fish, irrigation
pumps, and other river uses would become minimal or none.
However, dropping the reservoirs in January or February, the Corps
can measure (1) project performance, (2) magnitude of such impacts
as bank erosion or nitrogen saturation, and (3) efficacy of
proposed mitigation measures.

As you know, fisheries agencies, environmental groups, and others
have proposed for such a 1992 test that the Corps drop at least
two reservoirs (Lower Granite and Little Goose) during the months
of January, February, and/or March. It is frankly disturbing that
the Corps has not incorporated this or a similar alternative into
the DEIS. Either the final document must include such a test as
the preferred alternative, or the Corps will act in bad faith to
its commitment at the Salmon Summit and in contradiction to the
Council's proposed recovery plan.

122-4

I am deeply disappointed that the Corps' draft EIS does not
analyze any potential mitigation measures for the various impacts
identified in the DEIS. If the Corps sincerely intends to do its
part in saving these dangerously depleted salmon runs, then the
agency's engineers must begin now to design the necessary
modifications of the Lower Snake dams and their operations.

In section 3.3.2 of the DEIS, the Corps rejects a long list of
proposed modifications to its projects in order to mitigate
negative impacts. While it may not be possible to implement these
or other project modifications in 1992, it is certainly feasible
to design, analyze, and review these and other mitigation
measures. The final EIS should contain a statement of what
mitigation measures the Corps intends to investigate, and a

James M. Baker

Page 3

122-4
cont'd

timeline for design, review, and eventual implementation. Again, the Council's "presumptive path" to reservoir drawdowns requires the Corps to proceed in this way, unless the agency prefers to act inconsistently with the Council's recovery plan.

122-5

The discussion on plan selection and implementation in section 5.0 of the DEIS is hopelessly wrong-headed, and should be discarded in the final document. As its sole decision criterion, the Corps should ask simply whether or not any proposed action is consistent with the Council's recovery plan.

In this regard, it is absolutely imperative that the Corps complete any needed tests of drawdowns in 1992. To avert extinction of these depleted salmon runs, the region must have answers to basic questions, such as these proposed drawdowns of the Lower Snake River reservoirs, in the immediate term. For this reason, the Council's recovery plan calls for the completion of basic design work for reservoir drawdowns by November, 1992.

122-6

Therefore, if a needed test is to take place on a timely basis, the Corps must issue a final EIS and record of decision no later than January 1, 1992. Failure to do so might push the test into an unacceptable time period such as April or May during salmon migration, or more likely, delay a test of reservoir drawdown until 1993. Such a delay would only serve to increase the likelihood of extinction for these species.

In summary, I urge the Corps in the final EIS to adopt a preferred alternative under which the Corps would move forward consistently with the Northwest Power Planning Council's salmon recovery plan, and would test drawdowns of the four Lower Snake River reservoirs in 1992 during the months of January or February.

Sincerely,

James M. Baker

Ron Mason

November 2, 1980

Dear sir:

123-1

I am writing in regards to the depleting runs of salmon and steelhead on the Columbia and Snake Rivers. In the mandate called the Power Planning Act of 1980, the Corps of Engineers and the Pacific Northwest Power Planning Council committed themselves provide equal status of power and migrating fish through the dams.

I myself being a avid fisherman of fifty-plus years old in both Idaho and Washington, I know what good fishing was. Now, it's almost a thing of the past, or soon will be if things continue on the route they are going.

Yes, I do realize progress has to be made in our waterways of dams, electric power, and water traffic. But, one should not forget and deplete a God given resource while doing it. There is room in this world for everything.

Please, do live up to your commitments and give us back our fish to our rivers and streams, like it was in the past. I am very concerned about this, and do hope this letter sheds a little light in the decisions that are being made.

A worried Fisherman.

Ron Mason
1116 VanArsdel St.
Clarkston, Wa. 99403

Colleen Wright

11337A 17th Avenue NE
Seattle, WA 98125
11/10/91

Department of the Army
Corps of Engineers, Walla Walla District
Walla Walla, WA 99362-9265

To whom it may concern:

I am writing you today about the need for a draw-down test on both the Lower Granite and Little Goose reservoirs and the augmentation of flow in both the Columbia and Snake Rivers while the draw-downs are being tested.

The draw-down testing on the Lower Granite and the Little Goose reservoirs to the spillway level should be for four to six weeks in late February and March before migrating smolts enter the river so that the test does not interfere with the years' spring migration.

The greatest possible survival of migrating smolts in 1992, when draw-downs will still be in the testing phase, must be insured by releasing as much stored water in the Snake River as possible from April 15 to June 15 and augmenting flows from the Columbia River from April to August to meet fishery agency recommendations. This is essential in order to spill water that will rush juvenile fish quickly downstream.

I also ask that the EIS, written by the Corps, be re-analyzed so that smolts will be moved from Idaho to sea in 15 days as is recommended by professional fishery managers. The current analysis is critically flawed because it does not consider mitigation measures, such as alteration of fish ladders and intake pipes to function at variable reservoir levels, that clearly will be necessary for draw-downs to work.

Finally, I ask that the Corps analyze the economic and environmental effects of the no-action alternative that would guarantee extinction for the Snake River's remaining wild salmon. Thank you.

Sincerely,

Colleen Wright
Colleen Wright

David J. Glickerman, M.D.

11337A 17th Avenue NE
Seattle, WA 98125
11/10/91

Department of the Army
Corps of Engineers, Walla Walla District
Walla Walla, WA 99362-9265

To whom it may concern:

- 125-1 I am writing you today about the need for a draw-down test on both the Lower Granite and Little Goose reservoirs and the augmentation of flow in both the Columbia and Snake Rivers while the draw-downs are being tested.
The draw-down testing on the Lower Granite and the Little Goose reservoirs to the spillway level should be for four to six weeks in late February and March before migrating smolts enter the river so that the test does not interfere with the years' spring migration.
- 125-2 The greatest possible survival of migrating smolts in 1992, when draw-downs will still be in the testing phase, must be insured by releasing as much stored water in the Snake River as possible from April 15 to June 15 and augmenting flows from the Columbia River from April to August to meet fishery agency recommendations. This is essential in order to spill water that will rush juvenile fish quickly downstream.
- 125-3 I also ask that the EIS, written by the Corps, be re-analyzed so that smolts will be moved from Idaho to sea in 15 days as is recommended by professional fishery managers. The current analysis is critically flawed because it does not consider mitigation measures, such as alteration of fish ladders and intake pipes to function at variable reservoir levels, that clearly will be necessary for draw-downs to work.
- 125-4 Finally, I ask that the Corps analyze the economic and environmental effects of the no-action alternative that would guarantee extinction for the Snake River's remaining wild salmon. Thank you.

Sincerely,

David J. Glickerman, MD

G.H. Bowers Engineering (Gregory H. Bowers)

G.H. BOWERS ENGINEERING

Consultations on Power System Planning

1930 North 122nd Street • Seattle, Washington 98133

Telephone: (206) 361-0461

November 11, 1991

Department of the Army
Walla Walla District, Corps of Engineers
Attn: CENPW-PL-ER
Walla Walla, WA 99362-9265

RE: Comments on OAD/EIS

Dear Sir:

126-1

Regarding "Storage Releases for Temperature Control", the EIS notes that "data and results of the... studies remains inconclusive" and that future modeling will be used to evaluated in detail. Storage release for temperature control would be very costly to the Northwest in many ways and should be held to the same public scrutiny as any major Federal action. The Corps should commit now to preparing a Supplemental EIS on this topic when and if such action is contemplated for implementation.

Sincerely,

Gregory H. Bowers
Gregory H. Bowers, P.E.

Pacific Grinding Wheel Company, Inc. (James H. Kean)

POST OFFICE BOX 458
MARYSVILLE, WA 98270 - USA

TELEPHONE (206) 659-6201
FAX (206) 653-1000

PACIFIC GRINDING WHEEL COMPANY, INC.

November 12, 1991

Department of the Army
Attn: CENDW-PL-ER
Corps of Engineers, Walla Walla District
Walla Walla WA 99362-9265

RE: Saving the wild salmon

Good morning:

Please include me with the other letter writers who are requesting a fair and honest test of draw-downs for enhancement of the survivability of smolts migrating to sea.

In addition it is requested that you augment flows in both the Snake and Columbia Rivers while draw-downs are being tested.

In 1992 our Pacific Grinding Wheel plant will move, and one of the locations under consideration is Walla Walla. It is attractive to us as owners, in part because we are sportsmen.

Please help save the runs of wild anadrymaous fish.

Sincerely,

James H. Kean
President

kvl

pc: The Honorable Booth Gardner, Governor of Washington
The Honorable Barbara Roberts, Governor of Oregon
The Honorable Cecil Andrus, Governor of Idaho
The Honorable Stanley Stephens, Governor of Montana
Northwest Power Planning Council

Joanne M. Roberts

Joanne M. Roberts
4025 Northeast 92nd Street
Seattle, Washington 98115

November 12, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Dear Sir or Madam,

Although the system of dams on the Columbia and Snake rivers has provided us in the Northwest with a number of benefits, the wild salmon runs have been dramatically and adversely affected. I am writing to urge that changes be adopted to save the wild salmon runs.

The practice of trapping and transporting smolt around the dams is not working. It is important to keep the fish in the water and to provide safe passage past the dams and power turbines. Improved screening devices, modifications to the operations of the dams and procedures to redirect water flows and fish away from the turbine blades must be pursued.

It is also essential that the smolt complete their migration quickly and therefore, during peak migration periods, the Snake River reservoirs must be drawn down (April 15 to June 15) and Columbia River water flow volumes increased (April to August) to achieve biologically necessary water velocity.

Hatchery salmon are not a substitute for wild salmon. Healthy runs of wild fish are critical for the long term success of salmon in the Northwest. It is essential that the habitat of the salmon be restored and maintained.

I appreciate your consideration of these comments and once again urge the importance of this issue.

Sincerely yours,

Jo Roberts
Joanne Roberts

D. Grave de Peralta

November 12, 1991

Department of the Army
Corps of Engineers, Walla Walla District
Attn: CENPW-PL-ER
Walla Walla, WA. 99362-9265

cc. Gov. Booth Gardner, State Capitol, Olympia, WA. 98504
cc. Honorable Al Swift, House of Representatives, Washington
D.C. 20515

Dear Corps of Engineers,

In order to save the wild salmon I support the following:

1. The Corps must adopt a 1992 test option that includes drawing down both Lower Granite and Little Goose reservoirs to the spillway level for four to six weeks in late February and March. The test must be conducted before migrating smolts enter the river so that the test do not interfered with this years' spring migration.
2. The Corps must insure the greatest possible survival of migrating smolts in 1992-when draw-downs will still be in the testing phase- by releasing as much stored water in the Snake River as possible from April 15 to June 15 and augmenting flows in the Columbia River from April to August to meet fishery agency recommendations. This is essential in order to spill water that will rush juvenile fish quickly downstream.
3. The Corps must re-analyze the EIS alternative that will move smolts from Idaho to sea in 15 days, as recommended by professional fishery managers. The current analysis is critically flawed because it does not even consider mitigation measures such as alteration of fish ladders and intake pipes to function at variable reservoir level-that clearly will be necessary for drawdowns to work.
4. The Corps must analyze the economic and environmental effects of the so-called no-action alternative, the business-as-usual plan, that would guarantee extinction for the Snake River's remaining wild salmon.

Truly yours,

D. Grave de Peralta

Robert Shank

November 13, 1991

Mr. Greg Graham, Study Manager
Department of the Army
Walla Walla District, Corps of Engineers Bldg 602
City/County Airport
Walla Walla, WA 99362-2965

Dear Mr. Graham:

The following letter is provided as an additional comment to the Columbia River Salmon Flow Measures Options Analysis /EIS. Because it is uncertain that any of the proposed flow alternatives will accomplish the stated purpose and need for action it is my primary concern that the scope of the proposal and the number of alternatives forwarded for detailed analysis has been to limited or restricted. This is primarily due to the following observations which are a critique of the EIS Chapter 3.0 Proposed Actions and Alternatives.

First, significant issues were not identified or addressed as part of the alternative formation process. Without this information it is unclear if a reasonable array of action alternatives have been proposed, or indeed if any of the alternatives address the issues which were identified during scoping.

Second, mitigation to reduce impacts to: other users navigation, power, irrigation, recreation, etc.; other species such as resident fish, wildlife, wetland and riparian communities; endangered, threatened and sensitive species; cultural resources; and water quality were inadequately addressed either implicitly or explicitly for any of the alternatives which were identified. This as required by CEQ regulation.

Finally, each alternative must be in compliance with federal state and local law to be considered viable or implementable. The overall assumption that compliance with federal environmental statutes and regulations exists is at the most preliminary in this draft and must be fully investigated. In addition, there is no evidence that an investigation of appropriate state and local laws within the study area was completed or analyzed. The assumption that the proposed actions are generally consistent is inadequate.

In conclusion, it is recommended that considerable review and analysis be completed in the alternative area. Without the above information it must be concluded that any proposed alternative will be found unreasonable and therefore unable to be implemented, or the overall study inadequate due to the lack of a reasonable array of alternatives presented for study.

Thank you for this opportunity to comment. I am looking forward to your response.

Sincerely,

Robert Shank

Robert Shank
Box 1154
Battle Ground, WA 98604

Lawrence Hickman

LAWRENCE HICKMAN

ATTORNEY AT LAW
N. 302 4th Street
CORVALLIS, WASHINGTON 99331
(509) 337-3491

November 13, 1991

Department of the Army
Walla Walla District
Corp of Engineers
Building 602, City-County Airport
Walla Walla, WA 99362-2965

Re: Draft Environmental Impact Statement On Water
Management To Help Fish Migration

Gentlemen:

The following comments are respectfully submitted for your consideration.

Introduction

I own farm land a few miles from the Snake River in Whitman County, Washington, which is benefitted by water transportation. I, my father, and my grandparents have lived in the vicinity of the river for a combined period commencing with the family's arrival in 1872. I have been interested in river development and have a substantial investment in a grain terminal. I was a member of the first Board of Port Commissioners of the Port of Whitman County and I thereafter served as Port attorney for over 20 years. As such, I have had considerable to do with river development. I am not a fish biologist or one claiming any special knowledge but the following comments should have sufficient basis to justify serious consideration.

Declining Salmon Runs

As to the cause of the declining salmon runs, I am definitely of the personal opinion that the dams with fish passages as now improved and operated are not the primary cause of the obvious decline. My father mentioned numerous times that it was common in the 1900 to 1910 period to see big salmon surface in the Snake River at Almota. In my lifetime, I have never seen that happen though I can remember seeing the river as far back as 1916.

Department of the Army
Page Two
November 13, 1991

In the early 1900's, commercial salmon fishing was common from the shores of Whitman County. I have helped eat a good many commercially caught Snake River salmon, both fresh and home canned. They were a very substantial addition to the diet of the pioneers. About the Fall of 1926 or 1927, I personally watched commercial fisherman at Penewawa. They were getting from 6 to 15 big salmon per haul. The following year, there was no fishing and I have known of no commercial fishing since. The story then told was that enough fish were not being caught to make it pay.

The point is that the fish runs declined dramatically long before the first dam on the Lower Columbia and Snake Rivers was ever built. That that decline has now since continued is no proof that they are a major cause of the continued decline. That is not to say they have absolutely no effect but there is good reason to believe that with the operation of the present "fish run" and some improvements already made at the dams themselves, any present decline due to them is very minor compared to other causes.

That conclusion appears to be supported by the fact that the steelhead seem to be thriving. Mr. Roskelley, in writing for the Spokesman-Review in December of 1990, reported that steelhead fishing at Lewiston and beyond was the best ever known by present day fisherman. They go over the same dams, through the same water, and face the same hazards as the salmon. There is one significant difference. Instead of being classified by the State of Washington as food fish and subject to commercial harvesting, they are denominated as "game fish" and not subject to commercial fishing except for Indians with treaty rights.

Mr. Truelove of the Northwest Power Planning Council stated in a recent meeting in Clarkston, Washington on October 8th, that the average harvest of fall Chinook was 77%. It seems obvious that the harvesting of steelhead as a game fish and not as a food fish subject to commercial fishing is resulting in a much higher percentage of steelhead going upstream to spawn than Chinook. It is submitted that that is one of the main reasons many times more steelhead are counted going over the ladder at Lower Granite Dam than Chinook.

Also the following statement points to the same over harvesting as to the lower Columbia River Coho. The "Green Sheet", a Newsletter

Lawrence Hickman

Department of the Army
Page Three
November 13, 1991

published by the Washington Association of Wheat Growers, in its
Issue of September 27, 1991, states at Page 2:

Wild Columbia Coho salmon have declined to the point that the National Marine Fisheries Service determined that they no longer constitute an "environmental significant unit." This has occurred even though there are no dams to blame for their predicament. Over harvest and hatchery practices are the cause of their decline.

Other areas where dams have had much less impact are also suffering declining numbers of fish. Puget Sound is one. A personal friend moved to Bremerton about 1918 and he reported numerous times of the fabulous salmon fishing in that immediate area with seldom a time when he caught no fish. I fished with him in 1929 at Seabeck on Hood's Canal with excellent results. Over the years, I have since occasionally fished for salmon at various places in the Sound with poor results. Due to the lack of fish, most sport fishermen appear to be going to such places as the mouth of the Columbia, Westport, Neah Bay, or to fly up Vancouver Island.

To me it seems obvious that in general food fish have long been and are continuing to be over harvested in most areas with the same deplorable results as the over grazing of pasture land. There are certainly other substantial causes such as loss of suitable habitat. Dams without ladders are definitely contributing to that except for those located on streams that never had any runs. Barring a big reduction of the fish harvest and other primary causes, the complete elimination of all dams and a return to the open river will not restore the runs.

Lowering Of The Pools

The Corp Draft Environmental Impact Statement is directed to the consideration of a number of proposals to increase the rate of flow of the waters impounded by the Lower Snake and Columbia River dams in an effort to shorten the time it takes a smolt to get from Lewiston to Bonneville. This is proposed to be accomplished by lowering pool levels and/or by increasing the flow through the

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cont'd

release of water from storage reservoirs. Those proposals are being made as an experiment at an unknown but obviously tremendous cost exceeding one hundred million and possibly over a billion or more. It is presently unknown whether an increased flow will be beneficial to the downstream movement of the smolts or not. It is a very expensive experiment the results of which won't really be known for years to come.

The proposal ignores facts already known about the operation of the dams and the passage of the smolts out to sea which most likely will prevent the experiment from succeeding and actually end up killing large numbers of smolts and resident fish as well. To increase the flow sufficient to be of any worthwhile benefit, large quantities of water must be spilled over the dams. That in turn will cause a super saturation of gas in the water downstream of a sufficient amount to kill fish, smolts as well as adults. To succeed, live fish must arrive at tidewater not dead ones. It is my understanding that it was the gas saturation problem which primarily motivated the implementation of "Operation Fish Run".

Any drawdown and/or increased flow proposal runs into a dilemma. If spillage is held to the amounts necessary to keep gas saturation sufficiently low, the increase in water velocity will probably not be enough to significantly benefit the downstream migration. If spillage is increased in a major amount, the increased gas saturation will kill not only smolts but adults and resident fish as well.

131-3

A second known fact is being ignored. "Operation Fish Run" has been successful. The Executive Summary of the Draft Environmental Impact Statement states at ES-2:

Currently, about 20 million juvenile salmon and steelhead are typically collected annually at these three projects and safely transported directly below Bonneville Dam. Additional collection and transportation facilities are being designed for Lower Monumental Dam.

Those three projects referred to are Lower Granite, Little Goose and McNary. Also Mr. Truelove of the Northwest Power Planning Council stated at the Wheat Growers Board meeting in Clarkston on

Lawrence Hickman

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cont'd

October 8, 1991, that the smolt transportation program was very successful.

Until some better solution can be developed, it would seem prudent to continue to operate the dams substantially as designed and to expand the transportation of smolts from the 35-81% (ES-11 Corps of Engineers Draft Statement) now hauled to nearly all of them.

That is one sure and known way to get the job done. Moreover, it will have no effect upon navigation, resident fish and wildlife, or recreation, and it will save huge amounts of power. The expansion of that program should be far cheaper than the expensive drawdown and augmentation proposals. It is already known that that can be done. If the Lower Granite Pool is adding to the migration problem, consideration should be given to collecting the smolts in the Lewiston area.

Hatcheries

Another proven means of increasing the fish numbers is to increase the number of hatcheries and hatchery fish released. Fishermen tell me that most of the fish being caught from the runs are hatchery fish. Sport fishermen are not being permitted to keep any of the wild stock.

Why not eventually increase the number of hatchery fish released to tidewater several times over? The results are already proven. Finance it with a tax on the commercially caught fish landed. If the supply of available fish is doubled and harvest is held to the present tonnage, the uncaught fish remaining to go upstream would be increased dramatically. Accepting Mr. Truelove's stated figures that 77% is the average harvest of fall Chinook, the average number now available to go upstream is 23 of each 100 fish available prior to harvest. By doubling the available fish, the same harvest of 77 fish would leave 123 available to go upstream (200-77). (Assuming all were hatched and released above the dams. Even if they weren't, the available number should at least double).

Once the hatchery production has been so expanded, the result is to a very large extent to overcome the over harvesting problem at

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cont'd

least at present tonnage levels. Also, if the objective is to so increase the numbers of migrating food fish, why have the major portions of the hatchery fish reared on the upper reaches of the various streams with all the problems of ladders, smolt transportation, and predators? For example, while the Sockeye run should be preserved and increased within reason with due consideration to the cost, why should enormous sums be spent for the major increase to safely enable Sockeye smolts to travel 900 miles to sea and subsequently return when hatcheries close to salt water would render those migrations unnecessary?

Hatcheries will work just as well close to tidewater such as below Bonneville. The results of the doubling of available food fish would be same. There would still be a large increase in the number of fish desiring to go upstream by doubling the number of fish and holding the harvest to the same tonnage. That should result in only half as many fish being harvested from the Snake River Runs. The other half of the harvest will be made up from the hatchery fish reared below the dams.

Research

While the Corp of Engineers is conducting research, I do not read that enough emphasis is being placed upon it. It is the lack of knowledge of the fish and all of their problems that is a major hindrance to a solution to the declining fish runs. More and better research should be implemented.

We have learned how to propagate hatchery fish on a stream and to create a run. I am told that the missing link is that the returning adults do not spawn in the streams but return to the hatcheries. A breakthrough is needed to devise some means to cause the returning adults to spawn naturally in the streams or perhaps in prepared spawning pools with stream access.

In another area, I have been told that marked transported smolts have been observed coming back upstream as adult fish. Nevertheless, I am still concerned that the percentage of those desiring to return may be very low as a result of becoming disoriented by the transportation downstream. There should be

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cont'd

more research to determine if the returning adults are percentage-wise as numerous among the transported smolts as those not hauled downstream and, if not, what can be done about it. While most fish returning are known to be hatchery fish, if only 50% are being transported, most of the returning hatchery fish could be the 50% not transported. I fail to note any discussion of that problem.

Also, what about some research to develop practical methods other than fish ladders to transport upstream spawning fish over the high dams having no passage facilities? Orofino hatchery fish were reared in North Fork water, would the returning adults spawn in Dworshak Pool if they were transported above the dam?

Flooding

One problem with the drawdown and augmentation proposals that I have not seen or heard discussed is the flood problem. The construction of dams has in no way reduced stream flows above the dams. Floods have no longer been a serious problem as the proper management of storage takes care of excess flood waters. Both the Snake and the Columbia Rivers have the highest uncontrolled flows between approximately the middle of May to the middle of June which appears to be the normal time when most of the smolts in the open river normally move downstream. The question, at least during much of the proposed drawdown period, is how much can the pool levels actually be lowered without causing flood problems below Bonneville? I fail to note any discussion in the Statement.

131-6

Legal Problems

Considerable legal problems are likely in the lowering of pool levels to the extent that substantial interference results to navigation, recreation, power generation, and other adverse effects. While I have practiced law for over 50 years, I am not now offering any legal opinion. As of this writing, I have not done the necessary research to do so. But I do see possible legal problems. Some waterfront sites along pool shorelines are owned by private parties who now are riparian owners and, as such, have certain property rights which have now in some instances been enjoyed for as much as twenty years and even more. The old sternwheelers plied the rivers as early as the 1860's. To the extent that vested rights may be interfered with, problems of compensation, damages, and even injunctive relief may arise.

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cont'd

It should not be overlooked that the U.S. government, particularly through the Corp of Engineers, has encouraged waterfront and industrial development along the rivers. Millions of dollars of private capital have been invested in those developments and in reliance upon assurances that certain stated pool minimum and maximum levels would be maintained assuring adequate water depths for those developments.

Economics

I have a copy of the August 28, 1991, statement on the Impact of Lower Columbia and Snake River Reservoir levels on commercial navigation prepared by Jonathan Schluter for the Pacific Northwest Grain and Feed Association. It is assumed that the statement has been forwarded to the Corp of Engineers. I, therefore, make no comment on the navigation problems and obvious economic impact upon the grain industry of any substantial interference with navigation. It's importance is clearly indicated by his statement that: "over 40% of the wheat and barley" marketed in the Northwest is transported by river barges.

In emphasis, I point out that from my personal contacts with farmers, there is probably the highest percentage of grain farm operators during the past year and one half being economically marginal than at any time since the Depression years of the 30's. That is especially true of tenant farmers. It also includes a substantial number of farmers with high farm land debts. A very substantial number cannot absorb any large increase in grain transportation costs and/or power rates. Many are now only able to continue farming because of Farm Program payments.

Hidden costs must not be overlooked. Actual dollars spent is not the total cost. The spillage of water producing no power will ultimately result in rate increases to cover the cost of more expensive replacement power. I personally heard Mr. Truelove of the Northwest Planning Council make the statement that the measures thus far utilized to protect the salmon have cost the rate payers of the Northwest a billion dollars. Neither the U.S. government nor the people of the Northwest can afford to protect the salmon without any limit as to cost.

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131-8
cont'd

It makes one wonder how much money should be spent to preserve a Sockeye run over Lower Granite Dam counted at 2 fish in 1988, 1 in 1989, none in 1990, and 8 in 1991, as of several weeks ago, and then to learn that the present spawning habitat consists only of Red Fish Lake in southern Idaho 900 miles from the sea. Even government money should not be spent foolishly. The benefits expected to be received should justify the cost to be paid. That is even more pertinent where the success of the experiment won't even be known for a number of years.

Recommendations

- (1) Operate the dams and water levels substantially as they recently have been.
- (2) Transport as nearly all of the migrating smolts as possible. (However, until it is definitely known that a reasonable percentage of those transported and available to go upstream actually do so in an adequate percentage it would be well not to transport all juvenile fish).
- (3) Hold the food fish harvest to sustainable levels with no increase pending the reestablishment of the runs. Temporary reductions may be necessary.
- (4) Greatly increase the number of fish hatcheries and the number of smolts raised and released with the vast majority of the hatcheries being located below dams and reasonably close to tidewater to avoid the migration hazards.
- (5) Expand and improve the quality of research.

Respectfully Submitted,

Lawrence Hickman
Lawrence Hickman

Peggy Jo Randall and John C. Burke

November 13, 1991

Department of the Army
Corps of Engineers
Walla Walla District
Attn: CENPW-PL-ER
Walla Walla, WA 99362-9265

Dear Sir or Madam:

It is important for you to change your draft EIS concerning draw downs on the four reservoirs on the lower Snake River. This is the best way to ensure that wild salmon smolts reach the sea in one piece. You must conduct a fair draw down test.

The Corps should adopt a 1992 test option that includes drawing down the Lower Granite and Little Goose reservoirs to the spill way level in early spring before migrating smolts enter the river.

Augment flows in the Columbia River from April to August to meet fishery agency recommendations to rush young fish downstream.

Fish ladders and intake pipes must be altered to function at variable reservoir levels to make the necessary draw downs work.

The Corps should do everything in its power to ensure that it does not mandate the extinction of the Snake River salmon. God knows how to run a river, does the Corps only know how to ruin one?

Sincerely,

Peggy Jo Randall

John C. Burke

Peggy Jo Randall
John C. Burke
7804 Renton-Issaquah Road SE
Issaquah, WA 98027

cc. B. Adams
S. Gorton
B. Gudner

UMATILLA ELECTRIC COOPERATIVE ASSOCIATION

750 W ELM • P O BOX 1148 • HERNIMSTON, OREGON 97138

Telephone: (503) 547-4414

Fax: (503) 547-5142

Umatilla Electric Cooperative Association (M. Steven Eldrige)

COMMENTS OF UMATILLA ELECTRIC COOPERATIVE ASSOCIATION
TO THE U. S. ARMY CORPS OF ENGINEERS ON THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT

November 15, 1991

U. S. Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Gentlemen:

Please find enclosed our comments on the Corps of Engineers
Draft Environmental Impact Statement for Columbia River
Salmon Flow Measures Options Analysis/EIS.

Best regards,

M. Steven Eldrige
M. Steven Eldrige
General Manager

MSE:dbm

Enclosure

133-1

1. We find it very unusual that one of the flow regimens in the Draft EIS was not selected as the preferred choice.

133-2

2. A Columbia River Basin and Snake River ecosystem EIS should be done with the salmon as one element in the system.

133-3

3. Other methods should be advanced which would reduce the travel time for juvenile salmon by six (6) days but have the least effect on the other river users.

133-4

4. The fish and wildlife portions of the 1980 Northwest Power Act were included in large part to forestall a listing of Snake River salmon in 1980. What are the reasons for a listing in 1991? What helped salmon - what has not?

133-5

5. The Corps of Engineers, as the bona fide experts on the Columbia and Snake Rivers must develop a systematic approach to restoring the salmon runs. The Corps cannot continue to keep a low profile without jeopardizing their continued operation of the dams. Unless such a plan is developed, someone else will operate our dams - not the Corps of Engineers. It is a time for leadership, not bureaucratic nonsense.

P.O. Box 621
Medford, Idaho

Hello

It is absolutely obvious that efforts to preserve salmon and a tilled over in Idaho are not working

water down a river bed from Ch. history, Washington to
the south fork Ladder and Bonnell down.

Don't take me crazy or I promise that I could be done with a fraction of what has been spend on the schemes involving the dams.

The debate over what Brownell's estate would have or if he migration appeared on how to go of in a position in New York. Dead then. The conclusion then. (1994) was that 1/3 of the income would be lost. 8X15=120.

One convenience for food control, advertising, cheap electricity and transportation. Also in such that rice demand is not going to be removed.

to build a river! That or for love, quit coming up with schemes that include the dam.

Another alternative: Be prepared to accept the facts.
You can not have your cake and eat it too.

Reason

28. Lu Gray

Well at least the John Jay dam. Elimination of
 it dam would probably present a new

Dr. E. J. C. 21
Murdison, Glash.

261-

One to the present blinding affliction of attempting to
come as a sinner and stilled one. There are thousands
idle of prime fishing. A lot go to waste.

all trout, salmon and a talk in the kind of the river should be
' send after cleaning and dyeing for the trout.

your labor do that have lost the instinct to want to live
' and the ability to stand long harsh winters and

voice extremely evident spring over upper lip, as
me from the tip the side corner north of base, near

upies as well. But I had the wind rain low over
ice time and again. I've exceeded the temperature

4 bat were swung and lower. The boat were
we at a time. Not like they put and take high loads

ing seized and dumped in Lake today.
I have raided and seized Lake since 1964. That is

inger than I sailed in 1940 and New Mexico.
The exploding population could scatter along

in the hundreds of miles and enjoy good fishing. Not
in hundreds of miles. He improved tranquility.

Begin!

Lee Gray

Lee Gray

PO Box 621
Mordim, Rd. 60

Nello

Give it over it! He spotted and he adapted to and was
drastic change and floor changes in the past.

I was a scolding of to me to see something and he
picks. Greated pole. I was a scolding of to me to see something
and other birds. In all probability or he in a time
survive in one hour than other birds.

Personally, I don't want to see a person with a lot of
large number of incidents in a long way, then in a
chance of a person. Then we have a lot of birds in a
a large food supply to sustain them. A lot of
and they will be. It is the same conclusion
instinct to be a bird and it will be. It is a
reasonable facility of life that is an area of abundance
food. Personally, I don't want to see a person with a lot of
and people in a time of a person. I don't want to see a person
The practice of having a stand around a person in a way, saying
May? I don't know. I don't know. I don't know. I don't know.
being sent to a person. I don't know. I don't know. I don't know.
one. At the time, I don't know. I don't know. I don't know.
Apprentice to a person. I don't know. I don't know. I don't know.
got to experience should be saying. I don't know.

Reasonable

P.R. Scroggie

Salmon Flow Measure EIS
Corps of Engineers
U.S. Army Corps of Engineers
Walla Walla District
Building 603
Walla, Walla, WA
99362-9265

Gentle Warriors,
If the R DOD of Department
of Energy Bonneville Administration
report was put in place
as DOE/BP-236 that the more
even flow of Columbia Water
in the hydro electric system
it is this persons considered
opinion it would provide fuel
that is cheap if not about the
same as hydro ~~power~~ power
cost effective and provide a
more even flow for salmon
runs year around. I seek
in the EIS a footnote

135-1
cont'd

of DOE/BP-236 upon taking
R DOD not to be achieved to
be studied at a future day
for EIS

Signed

P.R. Scroggie
USMC R 7 Fleet Station
Reserve 536548382

Box 1775
Medical Lake, WA
99022-1775-USA

135-1

Gunkel Orchards (Dan Gunkel)

QUALITY - PEACHES, APRICOTS, CHERRIES.

89 MARTINEL HWY.
GOLDENDALE, WA 98620
PHONE (509) 773-4591

To Whom it may concern; the
Following are my comments on the 1992
draft Columbia River Flow Measures EIS.

136-1	1 Table H-1. No recreational inventory for
The Dallas Pool.
136-2	2. Table H-8. No summary of operational impact
to Peach Beach R.V. Park. Located at river mile
210 adjacent to Maryhill State Park
• Boat launch unusable at m.o.p.
• Windsurfing launch may be more difficult.
136-3	3. Table of contents and other chapters, and charts,
need to reflect above recreational facility.

Dan Gunkel

Dave Clark

Corp of Engineers
Walla Walla, Wn 99362-9265

Attention: Greg Graham

I fully support Idaho Governor Cecil Andrus' Draw Down plan
as the primary means of saving the wild Salmon and Steelhead
runs in the state of Idaho.

137-1

Dave Clark
8630 Brynwood Drive
Boise, Idaho 83704

Paul Worden

Comments for the Environmental Impact Statement to change pool levels on Columbia and Snake Rivers to save salmon.

From Paul Worden, 1065 Edith St., Pasco, WA resident of Burbank, Walla Walla County, Washington.

Below is a list of concerns for the Columbia and Snake Rivers and the environment which is affected by the river pool elevations. I would like each issue addressed in the EIS. This will help in the decision process in developing plans to restore the salmon while assessing the impact on resident and migratory wildlife and their essential habitat. The following assume pool levels are lowered then raised as river management for salmon.

- 1) Address the impact on the present shore vegetation should the pool levels be lowered for extended periods of time. The survivability of vegetation for short and long term of planned river management should be addressed.
- 2) If shore vegetation is impacted, please address impact on resident bird, mammal, reptile and amphibian species. Example: frogs, blackbirds, doves, sparrows, song birds, magpies, red-wing blackbirds, coots, fish eating ducks, beaver, muskrat, ducks, geese, blue herons, white pelicans, swans and water snakes.
- 3) Address the impact on survivability of newly hatched ducks and geese with the creation of a large beach (distance between vegetation and water's edge) if pool levels are lowered.
- 4) Address the impact on food supply of all species if pool levels are lowered for extended time. Each month for adult and juvenile species. Also, after pool levels are raised again.
- 5) Address the impact on the shoreline of the Walla Walla River. How severe will stream bed erosion be at the mouth, will muskrat and beaver survive? Will steelhead runs be impacted?
- 6) Address impact on Burbank sloughs and wetlands.
- 7) If lowering pool levels create fast water, address impact on white pelicans and pelican population of western United States.
- 8) Address impact on predators along shoreline (cats, dogs, owls, hawks, skunks, coyotes, children, mink/weasels, raccoon, sea gulls) their success when pool level is low and long term.
- 9) Address impact on changing river levels with respect to the relationship of fish and blue herons, and other fish eating birds.
- 10) Address impact to crayfish/crawdads and predator species which eat them as pool levels are lowered.

138-1
cont'd

- 11) Address impact to all fish species in rivers and ponds of Burbank if pool levels are lowered and stream flow speed increases.
- 12) Address impact on migratory water fowl if Burbank sloughs are drained and re-flooded, will food supply be adequate?
- 13) Address impact to aquifer under town sites of Burbank and Wallula.
- 14) Address the impact on existing vegetation, should pool levels be lowered, and the transition to other vegetation species. Example: willows replaced by Russian olives.
- 15) Address impact on long-billed Curlew.
- 16) Address impact on water insects and creatures which eat them, such as mosquitoes which is eaten by swallows and bats.
- 17) Address the impact on fresh water clams.
- 18) Address impact on migratory fish, salmon, steelhead and shad.

Paul Worden

Idaho Power Company (Bruce M. Smith)

ROSHOLT, ROBERTSON & TUCKER
Chartered

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November 8, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

Dear Sirs:

Enclosed are the Idaho Power Company's comments on the
Draft Columbia River Salmon Flow Measures -- 1992 Options
Analysis/Environmental Impact Statement.

Sincerely,

Bruce M. Smith

BMS:lb/68061
Enclosure

IDAHO POWER COMPANY COMMENTS
ON DRAFT COLUMBIA RIVER SALMON FLOW
MEASURES - 1992 OPTIONS/ANALYSIS
ENVIRONMENTAL IMPACT STATEMENT

Submitted to:

Department of the Army
Walla Walla District, Corps of Engineers
Attn: CENPW-PL-ER
Walla Walla, Washington 99362-9265

Idaho Power Company (Bruce M. Smith)

Idaho Power Company (IPC or Idaho Power) has reviewed the Draft Columbia River Salmon Flow Measures - 1992 Options Analysis/Environmental Impact Statement (DEIS) and has compiled the following general and specific comments.

General Comments

The Corps of Engineers (COE) has included analysis of various operations of the IPC Hells Canyon Complex as a pivotal part of this DEIS. The inclusion of a non-federal project, over which the COE has no jurisdiction or control for fish flush or similar purposes, in a manner that suggests such control or jurisdiction, is not reasonable. In fact, the manner in which the Hells Canyon Complex is analyzed and presumed to operate is misleading. As an example, this document arguably meets the federal requirements, NEPA obligations. However, the document ignores that certain operations at the IPCO Hells Canyon Complex may require additional NEPA compliance. Ignoring such constraints and obligations misleads the reader into thinking the alternatives suggested are fully implementable in 1992 when, in fact, they are not. IPC would point out that for most of the scenarios proposed for the Hells Canyon Complex, the authors of this DEIS have either not consulted IPC or have asked, but failed to include such information in the DEIS. Additionally, with regard to Brownlee Reservoir operations, it is obvious that the COE has relied extensively on the erroneous analysis used in the BPA Hells Canyon Environmental Investigation report of January, 1985. That reliance has resulted in the error in the BPA document being carried into this document and should be corrected.

Specific Comments

Page 1-5 section 1.5

Although significant portions of the habitat in the Columbia River and the Clearwater River were blocked off by Grand Coulee and Dworshak Dams, habitat in the Snake River basin was blocked in much smaller increments. For example, the Swan Falls dam was constructed by a mining company in the late 1800's and blocked upstream migration. The Boise River was blocked during the 1930's by the construction of Arrowrock Dam. The Payette River was blocked by the construction of Black Canyon Dam in 1924. The Owyhee River was blocked by the construction of Owyhee Dam in 1932. At the time the Hells Canyon complex was constructed, the only remaining free flowing river sections to which it blocked access were the Weiser River and the Snake River below Swan Falls.

The DEIS contains the following sentences:

Page 2-1 section 2.2

"The actions considered in this DEIS are operational changes that could be implemented at 10 Federal projects and 1 private project in 1992 . . ."

Page 2-2 section 2.2.1 Characteristics of Affected Projects storage and run-of-river projects . . ."

section 2.2.1.1 Storage Projects

"The main purpose of storage reservoirs is to adjust the natural flow pattern of a river . . ."

These quotations suggest this DEIS is a comprehensive review of reservoirs available to store water which could be used for fish. However, it is apparent that the Corps and the Bureau have omitted storage projects under their jurisdiction that are located throughout the Snake River Basin. If flow augmentation is the solution to problems at the Federal projects on the lower Snake River, it should be mandatory that other Federal projects be the first ones looked at to provide the solution. Idaho Power believes that the DEIS should focus on Federal solutions to Federal problems.

Page 2-2 Table 2.1-1 Columbia and Snake River Drainage Characteristics

The chart should indicate that "Volume (acre-feet)" is expressed in 1,000's of acre-feet.

Page 2-5 figure 2.1-3 Summary Hydrograph of Snake River Inflow to Lower Granite

The hydrology of the Snake River inflow into Lower Granite Reservoir and its affect on anadromous fish could be shown by adding a line indicating the average mean daily flow without flood control restrictions on the Snake River.

Page 2-6 Table 2.2-1 Characteristics of Projects

The list of projects should include Federal projects such as American Falls (USBR), Lucky Peak (COE), and Cascade (USBR). This would add over 2.6 million acre-feet of Federal storage.

Page 2-8 section 2.2.2 Project Purposes and Uses

It should be stated that Idaho Power is responsible for operating its project in a manner that best serves multiple uses.

Idaho Power Company (Bruce M. Smith)

139-9	<p>Page 2-8 section 2.2.2.1 Power Generation The description offered for firm power may be accurate for the Federal system, but it is a misrepresentation of the power system of Idaho Power. The explanation, set out in the DEIS, suggests that Idaho Power also operates under a four year critical period. This is not true, as Idaho Power was blocked from joining the Pacific Northwest Coordination Agreement. As a result, Idaho Power has a one year critical period. This means that any water and power which is removed from its reservoir and power system is a direct loss that particular year. The impacts cannot be viewed in the context of a four year critical period. Such one year impacts are much greater than those spread over the four critical years. In light of this oversight, power impacts to Idaho Power are understated and misrepresented.</p> <p>There are other reasons this section does not accurately represent the impacts to the company. The data submitted for use in the SAM model, and other models used throughout the region, was submitted approximately 10 years ago. This data is not consistent with the company's present operations. Rather, it reflects a planning perspective. Since the data was submitted, the Corps has revised the flood control rule curve for Brownlee reservoir. It is also IPC's understanding that the SAM does not model power operations above Brownlee. Idaho Power believes that the power impacts as stated are incorrect, and the Corps should not represent them as the expected impacts to IPC. In fact, the Corps should acknowledge its inability to model the IPC's generation system for energy, capacity or sustained load carrying capacity.</p>	<p>Page 2-13 section 2.2.3 Project Operation (Prior to 1991) Please refer to the comments regarding Power Generation on the previous page. (Page 2-8 section 2.2.2.1.)</p> <p>Page 2-14 (top of right column) Project Operation (Prior to 1991) Brownlee has filled every year since construction. The general comments made about Coordinated Operations in the Columbia River do not apply to Brownlee.</p>
139-12		<p>Page 2-17 section 2.2.4.5 Water Budget It is apparent that the water budget is ineffective. In 1991, 1.25 million acre-feet of water was provided for the out-migration. Even with this sizeable augmentation, only three days of flows were above the minimum flow requirements of 85,000 cfs at Lower Granite. Higher flows one month or a part of one month result in decreased flows the remainder of that month or the succeeding month. These reduced flows are detrimental to migrants that leave during the period of lower flows. The water budget should be regarded as an interim measure only and should be replaced as soon as it is possible to draw down the four lower Snake River projects.</p>
139-13		<p>Page 2-28 section 2.4.1.1 (Line 4) "Jacks" are adults capable of reproduction. Referring to "jacks" as sub-adults is inaccurate.</p>
139-14		<p>Page 2-28 section 2.4.1.2 (End of Paragraph) Spring and summer chinook are tributary spawners. It is inaccurate to state "the spawning regions for the summer chinook are found in the Snake River." It would be more clear and accurate to state summer chinook spawn in tributaries of the Snake River Drainage. For example, major spawning occurs in the tributaries of the Salmon Drainage tributary to the Snake River.</p>
139-15		<p>Page 2-31 section 2.4.2 Idaho Power hatcheries will not be affected by potential operational changes.</p>
139-16		<p>Page 2-47 section 2.5.4 This section is biased and incorrectly describes Brownlee Reservoir. Brownlee Reservoir serves as a nutrient processing facility for the Snake River. This processing has the potential to cause oxygen depletions of the Reservoir. Despite this potential, Brownlee Reservoir provides tremendous recreational fishing opportunities for crappie, smallmouth</p>
139-17		
139-10	<p>Page 2-12 section 2.2.2.2 Flood Control This section acknowledges that the primary flood control season in the Columbia System is May through July. This statement underscores one of the fundamental problems with past flood control operations. Snake River runoff has typically been earlier than the Columbia River's. As a result, the Corps has evacuated flood control space from Brownlee Reservoir in March and April under normal water years, and refilled the Reservoir during May and June. This scenario conflicts with the needs of fish and should be changed. Flood control on the Snake should be removed to permit greater flows in the Snake River at the time when fish need them. Snake River reservoirs should be full by April 15, unless space is needed to help reduce dissolved gasses. (As the table on page 2-6 indicates, space evacuated to achieve minimum operating pools in the reservoirs below the Hells Canyon complex and above the City of Portland accounts for 981,000 acre-feet of storage which could be utilized to reduce the risk of flooding in Portland.) This space is equal to the entire active contents of Brownlee Reservoir. In normal years, this 981,000 acre-feet is approximately the system flood control evacuation by both Brownlee and Dworshak Reservoirs.</p>	
139-11		

Idaho Power Company (Bruce M. Smith)

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bass, rainbow trout, and channel catfish. Brownlee Reservoir has a predator-dominated fish species composition that precludes establishment of the carp and sucker populations that are suggested. Brownlee Reservoir fishery production is as likely limited by the intense fishing pressure as by the lack of fish forage species.

It is inaccurate to state that bottom spawners are unaffected by variations in water surface elevations. Those fish that utilize the substrate as spawning media are the only ones that are affected by variations in water surface elevations. Preliminary results of research conducted by Idaho Power during the 1991 spring spawning period show impacts of Brownlee water surface elevation decreases and increases (Idaho Power Fall Chinook interim operation plan and study, Appendix 2). Smallmouth bass and crappie spawning habitat has been identified by Idaho Power's Brownlee Reservoir research to be dispersed throughout the reservoir and dispersed in time.

139-19

Page 2-67 section 2.10.2 Irrigation from Affected Pools

A portion of this section reads, "Secondly, some interviewed irrigators draw water from pools such as Brownlee Reservoir, and it was determined that none would be affected by any alternative under consideration in this DEIS."

This is not accurate. Idaho Power received calls from irrigators who were not able to irrigate during the period when the reservoir was down during the spring of 1989.

139-20

Page 2-68 Table 2.10-1 Selected Crops Grown on Irrigated Land, 1987

This table includes only Payette and Washington counties in Idaho and, as such, is misleading and incomplete. Based on the alternatives in this DEIS, all counties in Idaho adjacent to the Snake River should be included.

139-21

Page 2-70 section 2.11.1 Existing Hydroelectric Facilities

This document must recognize that Brownlee Reservoir is the only facility Idaho Power has which follows hourly and daily loads. Because Brownlee is the only facility that enables IPC to follow load, impacts to Brownlee are extremely detrimental to the Company. In contrast to this situation, the Federal Columbia River Power System (FCRPS) has a number of facilities that can adjust if a single facility is impacted.

Further, the FCRPS is a member of the Pacific Northwest Coordination Agreement (PNCA), which allows shaping of generation to meet FELCC. Idaho Power has been denied membership in the PNCA, and has to maintain greater flexibility

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in the operation of Brownlee reservoir in order to meet ever-changing loads.

139-22

Page 2-73, Table 2.12-1 Recreational Facility Inventory
This table should include facilities referred to in the application for amendment of the Hells Canyon license exhibit R (attached).

139-23

Page 2-79 section 2.12.1.4 Brownlee
This section dramatically underestimates the recreational importance of Brownlee Reservoir. Brownlee is the most fished body of water in the State of Idaho. During 1989, Idaho Department of Fish and Game estimated angler's effort at Brownlee Reservoir. They caught 2,079,756 crappie, 950,786 bass, 70,957 perch, 63,622 channel catfish, 23,821 trout, and 18,058 bluegill during 851,749 hours of fishing. This averages 3.77 fish per hour for the 851,749 hours fished. (See attached IDFG report.)

139-24

Page 3-2 section 3 Proposed Action and Alternatives
This section provides, in part, "Much migration research indicates that survival of juvenile salmonids, particularly those migrating downstream during the stream freshet . . . may be related to water flow or velocity . . ."

This language recognizes that historical Corps flood control operations have been detrimental to the survival of anadromous fish. To correct this, the Corps needs to shift flood control out of the Snake River Basin in the years when the fish need the water.

139-25

Page 3-7 section 3.2.3.1 Snake River

This section provides, in part, that "In some cases, these would be combined with reservoirs being held to flood control rule curves and/or a shift of flood control capacity from Dworshak and Brownlee to Grand Coulee." Idaho Power questions the need to transfer all of the flood control requirement to Grand Coulee Reservoir. Table 2.2-1, page 2-6 (Characteristics of Projects) indicates that if the eight federal projects downstream of Brownlee Reservoir were drafted to minimum operating pool, approximately 981,000 a/f of storage space would be available to capture spring floods. For this reason, the above-quoted sentence should be changed to indicate that the flood control would be shifted to the federal system, not necessarily to Grand Coulee.

139-26

An additional provision states, "The volumes cited for Brownlee refer to additional storage drafts above those

Idaho Power Company (Bruce M. Smith)

I39-26 cont'd	<p>included in the existing operation." As Idaho Power understands this quotation, the historic water budget of approximately 150,000 a/f is included in the base case. In addition to this amount, from 50,000 to 200,000 a/f of additional water would be evacuated from Brownlee. This statement is not only confusing, it indicates a misunderstanding of the potential impacts to summer migrants and fall chinook from the proposed evacuation. Under some circumstances, Idaho Power's ability to meet summer peak loads would be jeopardized.</p>	<p>I39-31 cont'd</p>	<p>statement is incorrect and misleading. It reflects a complete lack of understanding of the Idaho Power system as well as regional electrical operations.</p>
I39-27	<p>The DEIS also contains a provision that states, "Two additional modifications to this historical operation at Dworshak and Brownlee have also been proposed. The first is to require the projects to operate to the mandatory flood control rule curves." Idaho Power objects to the above language because it does not reflect a viable proposal. Such regulation would severely limit Idaho Power's ability to meet seasonal and daily loads. As noted earlier, Brownlee Reservoir and the Hells Canyon Complex represent 100% of Idaho Power's ability to meet changing system loads.</p>	<p>I39-32</p>	<p>There are also regional transmission conditions which prevent the delivery of power to the Idaho Power system. Under certain conditions, transmission overloads in northern Idaho prevent movement of energy from Washington and Oregon to the inland northwest. This transmission bottleneck makes the Company very reluctant to place the stability and reliability of service to its customers on the transmission system of others.</p>
I39-28	<p>Page 3-8 section 3.2.3.1 Snake River The draft DEIS contains the following sentence, "A flood control shift from Brownlee to Grand Coulee would be allowed only if the forecast April to July inflow to Brownlee is 4 MAF or lower . . ." The 4 MAF mentioned in the quoted sentence could be increased if the Corps recognized the evacuated space from the eight projects below Brownlee.</p>	<p>I39-33</p>	<p>The following quotation is also included in this section, "Power generation would be reduced in these months, but it was assumed that replacement power would come from the federal system, so there would be no impact on reservoir elevations." Although this is the assumption in the draft DEIS, Idaho Power has found Bonneville Power Administration very reluctant to return energy to Idaho Power in the months of December and January. Moreover, Idaho Power would be losing peak generation and sustained load carrying capability along with energy values.</p>
I39-29	<p>Page 3-9 section 3.2.3.2 Columbia River Option S contains the wording, "no special releases from Dworshak or upper Snake projects." Is the word "Dworshak" in that sentence correct?</p>	<p>I39-34</p>	<p>Page 4-55 section 4.2.1.10 Summary of Effects on Juveniles The DEIS contains the following statement, "Flow augmentation of 20 Kcfs has a greater effect on reducing water particle travel time in the Snake River than reducing reservoirs to MOP." This statement reflects the federal participants' view that flow augmentation is the solution to the out-migration problem of juvenile fish. However, based on the situation in 1991, in which over 1.2 million a/f of augmented flow was provided on the Snake River, it is obvious that flow augmentation is not the solution. In 1991, only 3 days of flows were above the minimum CBFMA travel time requirements. The federal participants apparently do not understand that if water is provided in one month or part of a month, the flows are reduced in the other part of that month or the subsequent month. Therefore, if flows are augmented the first of May, the flows are reduced the second half of May and June or if flows are augmented all of May, flows are reduced during the entire month of June.</p>
I39-30	<p>Page 3-16 section 3.4.2. Mainstem Refill Requirements and Effects The 50-foot draft at Dworshak that is needed to refill the mainstem projects is questionable. Does the reference to the 50-foot draft assume no inflow into Dworshak?</p>		
I39-31	<p>Page 3-19 section 3.4.3.2 Brownlee The DEIS refers to Appendix J for a detailed discussion of the operational impacts to Brownlee Reservoir. On page J-4, the following sentence is included in the summary statement: "The delivery of replacement power in June and July made it possible for the project to return to its normal rule curve elevations during the summer in all years." This</p>		

Idaho Power Company (Bruce M. Smith)

Page 4-71 section 4.3.4.2 Brownlee Reservoir

(Paragraph 1)

Brownlee Reservoir operations are proposed to be modified by the Idaho Power Fall Chinook Interim Recovery Plan and Study (Plan). The modifications call for Brownlee Reservoir to be full during the period of April 15 to July. The Plan addresses both resident and anadromous fish spawning and incubation. Resident bass and crappie spawn typically during the end of May through the beginning of July (Plan, Appendix 2). During this period, any changes in water surface elevations result in changes in spawning behavior and viability of previously spawned bass and crappie. The magnitude of the changes in fish behavior is dependent on the magnitude of the water surface elevation change. Discharge from Brownlee Reservoir affects the discharge that is passed through Oxbow and Hells Canyon Dams to the Snake River below.

Fall chinook spawn in the main Snake River below Hells Canyon Dam during November. The eggs and juveniles remain in the gravels to the end of May of the following spring. Because of possible impacts to fall Chinook spawning and migration, Idaho Power has proposed the new operation plan. The Plan calls for November spawning flows that are at a level that can be maintained throughout the spring emergence from the gravel. If Idaho Power is called to shape water during the spring period prior to the emergence and migration of fall chinook, significant risk to fall chinook could result.

(Paragraph 2)

Brownlee Reservoir does not have significant populations of suckers as indicated.

Rising water levels affect spawning and previously spawned crappie and bass (Plan, Appendix 2).

(Paragraph 3)

The letter from Idaho Department of Fish and Game (IDFG) indicates that only limited successful spawning is needed in Brownlee Reservoir to produce a successful fishery. This approach is unjustified for the most frequently fished body of water in Idaho (see attached IDFG report). It also indicates that IDFG believes the Brownlee Reservoir fishery is limited by factors other than spawning success. Idaho Power knows of no data that suggests that Brownlee bass and crappie populations are limited by factors such as food availability and rearing habitat.

Page 4-72 section 4.3.6 Mitigation

Idaho Power believes it is inappropriate to impact a self-sustaining population of bass and crappie to the extent

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cont'd

that it would require hatchery stocking of these species. Idaho Power has proposed a plan that balances resident fish needs with others. The proposals called for in this DEIS, instead of balancing needs, insists upon a scheme that necessitates unneeded impacts.

139-41

Page 4-72 section 4.3.4.3 Transfer of Flood Control Storage
The Corps of Engineers has overlooked the ability and opportunity to transfer flood control from Brownlee to the eight federal projects below Hells Canyon on the Snake and Columbia Rivers. Table 2.1-1 on page 2-2 indicates that over 980,000 a/f will be evacuated in those reservoirs if they are drawn to minimum operating pool.

139-42

Page 4-126 section 4.9.2 Replacement Power

Although it is true that the lion's share of the power impacts may be borne by the FCRPS, the effects to Idaho Power need to be documented in this report and should recognize that Idaho Power has a one year critical period, only one reservoir with which to follow load, and the inability to refill even modest drafts of the reservoir in some years.

139-43

Page 5-4 section 5.3.2 Flow Augmentation

This section indicates that flow augmentation alternatives that include more than 100 KAF of leased water from the upper Snake River are not implementable in 1992. This section should also note that shaping volumes greater than what Brownlee has done in the past are not possible because there have been no discussions with Idaho Power.

139-44

page 5-5 section 5.4.1 Performance Against Physical Objectives and p 5-23, Table 5.4-2 Anadromous Fish

The DEIS states "The objective of the 1993 options with respect to juvenile salmon is the reduction of water particle travel time." Idaho Power believes the options in this DEIS are primarily directed to spring and early summer migrants. The needs of later summer migrants and juvenile fall chinook may be negatively impacted by the shaping of large volumes of water from the Snake River basin during the spring. It is also readily acknowledged that significant information about fall chinook biology is lacking. Idaho Power has examined the data and concluded that the most viable method of increasing flows for spring migrants is to relax (remove) flood control constraints in the Snake River. This will result in more water higher in the basin that can be used for summer migrants. Table 5.4-2 on page 5-23 confirms this idea.

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139-38

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Idaho Power Company (Bruce M. Smith)

139-45

Page 5-10 section 5.4.2.3 Flow Augmentation
This section indicates that major changes to elevations at Brownlee Reservoir would only occur in the unrestricted draft option. This is a matter of perspective. Even in the restricted draft options, the reservoir is 20 feet lower than under previous operations. The COE's perspective is obviously much different than Idaho Power's, which depends upon this reservoir to meet its electrical demand. The perspective is also different from those people who use the Richland, Oregon arm of the reservoir for recreation. When the reservoir is drafted more than 9 feet, navigation in this area is highly curtailed. The COE's perspective is also different than that of the resident fish who abandon their nests with reservoir elevation changes of less than 2 feet. Idaho Power objects to the COE's describing departures of approximately 20 feet in May as minor:

139-46

Page 8-5 section 8.20 Wild and Scenic Rivers Act
The DEIS description of impacts from flow augmentation are incomplete and misleading. The DEIS discusses only impacts from elevated flows. It fails to discuss impacts from the decrease in flows which follow augmentation. It has been Idaho Power's experience that one week of increased flows often results in decreased flows for nearly a month. This time period varies, but the end result is the same - the river is much more difficult and in some cases impossible to navigate during the period when the system is refilling after a draft.

139-47

Page 13-8 Index
In spot checking the index, the Company reviewed the pages referencing Idaho Power and did not find any mention of the Company on these pages. It appears that some attention needs to be spent in this section.

139-48

Page h-9 Table h-4 Brownlee Recreational Facility Inventory
This table incorrectly identifies the site name as Dworshak Dam. Site number 3 should be identified as Spring Recreation Site and item number 4 should be identified as Steck Park.

139-49

Page h-16 Table h-7
The title Brownlee Reservoir should be emphasized to be consistent with other reservoirs in this section. Spring Creek Recreation Site and Farewell Bend should replace those listed.

3064m:dj

Kip Dietinger

Nov. 7, 1991

U.S. Army Corps of Engineers

Everything possible must be done to ensure the survival of Snake and Columbia River fish. If the salmon cannot exist in this former River system turned irrigation ditch/barge canal, then it is a sad commentary on the human condition, Barge traffic is unimportant, the finest railway in the world was displaced by the dams. The barge companies did not pay for the dams and they will be destroyed by government subsidy just as the railroads were. Irrigation can be accomplished by pumping spring runoff into reservoirs away from the river channels. The reason that we have low electric rates is that you are raping a natural resource, when the bill for the costs incurred comes due, rates will become excessive. I look forward to the day when the fish run free, the rivers are free of dams and the Corps of Engineers is no longer needed.

Kip Dietinger

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Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9266

ATTN: Greg Graham, CENPW-PL-PF

October 25, 1991

Mr. Graham,

I was pleased to attend the Public Meeting for the 1992 Draft Columbia River Salmon, Flow Measures and Options Analysis/EIS held in Portland on October 22. Please consider the following points when selecting the preferred alternative from the options under consideration as part of the 1992 EIS.

The owners, managers and employees of Columbia Grain are concerned about the population decline of Northwest Salmon. We hope the salmon will continue to be a part of the quality of life enjoyed by all of us who live in the Northwest. We are also concerned that if the population of various salmon species cannot be stabilized, future actions might severely restrict navigation on the Lower Snake/Columbia River System. Because Columbia Grain operates a grain storage and barge loading facility in Central Ferry, Washington, as well as a grain export facility at the Port of Portland, we have an interest in maintaining a navigable channel.

On the other hand, it is important not to overlook the impact of current actions on the human environment. Lowering the water levels of the eight pools on the Lower Snake and Columbia Rivers could substantially increase the cost of transporting grain from the interior of Oregon, Washington and Idaho. Currently it cost \$4 to \$5 per ton to transport grain from ports on the Columbia River and \$5 to \$6 per ton from ports on the Lower Snake River. It would cost \$8 to \$9 to transport grain by rail and \$10 to \$15 by truck. In addition, the infrastructure at the Port of Portland is incapable of handling a substantial increase of either rail or truck traffic. Therefore, the result of lowering the water level at any or all of the pools on the Lower Snake/Columbia River system would be to make wheat and barley grown in Oregon, Washington and Idaho less competitive in the world market.

Since there is no evidence to support the hypothesis that increasing the velocity of the river will improve the survival rate of the smolts, it would seem most prudent to choose the least disruptive alternative. Our recommendation is to operate all 8 pools of the Lower Snake/Columbia River System at or above minimum operating pool and utilize upstream storage capacity to

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flush larger volumes of water down the system in order to increase velocity during the peak of the downstream migration period. This would enable the Corps and others with an interest in the plight of the salmon to monitor the impact of reducing water particle travel time by several days and to determine whether more disruptive actions would be warranted.

Thank you for the opportunity to express our point of view. We look forward to learning the preferred alternative.

Sincerely,

Terry Cleaver
Terry Cleaver
Traffic Manager

140-1

140-2

140-3

Ron Vigil

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, WALLA WALLA DISTRICT
ATTN: CENFW-EL-ER
WALLA WALLA, WA 99362 9265

141-4

I support the alternative to draw down the Lower Snake Dam to spillway level, the Lower Columbia Dam to minimum operating pool level, and the augmentation of river flows that are necessary to return juvenile salmon to the ocean in 15 days.

However, I do realize that this would be impossible to do without killing juvenile or adult fish before modifying the present fish passage facilities. Because of this, I recommend that the dams are lowered to spillway level before the spring migration so dam modifications can be defined that will pass juvenile and adult salmon simultaneously while minimizing nitrogen super-saturation.

Next, during the spring migration, lower Snake and Lower Columbia Dams should be lowered and river flows augmented as much as possible to facilitate migration without killing fish.

Once necessary dam modifications have been identified and spring migrations are complete, then efforts should begin to retrofit dam structures to provide safe fish passage and survival of our valuable salmon. (OVER) 2

As you know, the condition of our salmon runs are in very bad shape. If we allow the continued decline of these insignificant fish, by conducting business as usual, we will soon have some additional species to add to the "extinct" list along with the "dolphin toad". Now is the time to take whatever measures are necessary to save and restore our remaining salmon runs.

Sincerely,

Ron Vigil

RON VIGIL
3620 SNAKE RIVER AVE
LEWISTON ID 83501

CC. GOVERNOR CECIL ANDRUS
SENATOR LARRY CRAIG
REPRESENTATIVE LARRY LA ROCCO

141-1

141-2

141-3

Rich Johnson and May Reed

Richard S. Johnson and May J. Reed
10042 36th Ave. SW
Seattle, WA 98146

11/2/91

Dept. of the Army
Corps of Engineers, Walla Walla District
Attn: CENPW-PL-ER
Walla Walla, WA 99362-9265

To Whom It May Concern:

142-1

We are writing to express our concern for *wild* salmon and the role that hydroelectric power generation has played in the reduction of salmon species. Whereas salmon ladders have allowed upstream access to adult salmon, its quite clear that a greatly reduced percentage of salmon smolts no longer are able to find their way out of the backwaters created by hydro dams. The best means of assisting the smolts would be to increase the river flows in the spring runoff. Energy planning involving conservation or regional power exchanges (e.g., with southern California) would reduce the impact of increased spring runoff on utility rates. In any case, we currently have the lowest electric rates in the country and we ought to be willing to pay these higher rates if it means preservation of this symbol of the northwest.

Sincerely,

Rich Johnson
Rich Johnson

May Reed
May Reed

Direct Service Industries, Inc.

Robert D. Volz
November 14, 1991
Page 2

those three topic areas, however, the DSIs submit the following general comments to the Draft EIS.

The Corps's EIS is appropriately of limited scope. The EIS is intended only to develop a test plan designed to assess the effect of different flow measures on smolt migration. See Comments on Legal Issues, attached at tab 3. Based on the available biological and operational information and based on legal limitations on what alternatives are permissible, the DSIs believe that only two general alternatives are appropriate: a four-week drawdown test in the lower Snake reservoirs; and limited duration drawdowns of the lower Snake reservoirs to minimum operating pool coupled with flow augmentation in order to achieve a target flow of 85 kcfs in the lower Snake. See Attached Comments at tabs 1-3.

The DSIs believe that a four-week drawdown test is an appropriate alternative. It meets the express goals of the EIS to generate biological and physical data on smolt migration with the least impact on the salmon. Two of the three variants of this alternative, however, would carry out the test at a time when few or no smolts are migrating and when few adults are attempting to migrate upstream. These options are less desirable because migrating smolts must be present in the river in order to generate biological data about the effect of flows on migrating smolts.

Because upstream and downstream migration tends to be simultaneous, however, the Corps must take care to design its test so that biological data on smolt migration can be gathered while not impeding upstream migration. The proposed drawdown of Lower Granite to spillway would render the fish ladder inoperable to the injury of migrating adults. The DSIs would suggest that the Corps should explore alternatives to the proposed Lower Granite drawdown in the Final EIS.

The other alternative which would be appropriate is a combination of drawdowns and flow augmentation in the Snake River which would have a reasonable probability of meeting a target flow of 85 kcfs. Because drawdowns of the lower Snake River reservoirs to spillway would render upstream migration impossible, these options must be discarded immediately. It would be the worst kind of folly to select an option which precludes spawning adults from migrating upstream. Of the other options, drawing down the reservoirs to minimum operating pool is the most logical and appropriate.

The DSIs support this option over the others for a variety of reasons. First, the target flow velocity of 85 kcfs in the lower Snake River is biologically justified from the standpoint of

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November 14, 1991

Robert D. Volz
Lieutenant Colonel, Corps of Engineers
District Engineer
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9265

Attention: CENPW-PL-ER.

Re: Formal Comments of the Direct Service Industries to the Corps of Engineers' Draft 1992 Columbia River Salmon Flow Measures Options Analysis/EIS.

Dear Lt. Col. Volz:

The Direct Service Industries (DSIs),¹ offer the following formal comments to the Corps of Engineers' Draft 1992 Columbia River-Salmon Flow Measures Options Analysis/EIS (Draft EIS). The DSIs appreciate the opportunity to comment on this Draft EIS and commend the Corps on its efforts to develop a test of flow measures in the Snake and Columbia River systems.

The comments submitted by the DSIs include comments on biological, power and legal issues. Those topical comments are found in the tabbed sections of these comments. Before turning to

The Direct Service Industries are Aluminum Company of America, Atochem North America, Columbia Aluminum Corporation, Columbia Falls Aluminum Company, Georgia-Pacific Corporation, Intelco Aluminum Company, Kaiser Aluminum & Chemical Corporation, Northwest Aluminum Company, Oregon Metallurgical Corporation, Reynolds Metals Company, and Vandalco, Inc.

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Direct Service Industries, Inc. (John Carr)

Robert D. Volz
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Page 3

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assisting juvenile migration. See Biological Comments, at tab 1, and Legal Comments, at tab 3. Second, after correction of the power costs and losses estimated by the Draft EIS, See Power and Operational Comments, at tab 2, the data clearly demonstrates that this is the most cost-effective alternative presented by the Draft EIS.

In that regard, the DSIs would like to refer the Corps to the comments offered to it by the Northwest Irrigation Utilities (the NIU). The DSIs particularly wish to highlight the cost-effectiveness analysis prepared by the NIU. That analysis demonstrates that a target flow of 85 kcfs in the lower Snake River is the most cost-effective of the alternatives, providing migrating smolts with sufficient increased flows to benefit them and imposing the least cost on the power system.

144-4

This analysis, however, does not substitute for an independent judgment on the biological benefits which may accrue to the salmon from the alternatives analyzed. The available biological data does not demonstrate that flows in excess of Water Budget would be effective to assist smolt migration in the lower Columbia River. Thus, the alternatives which propose to increase flows in the River beyond that level do not merit serious consideration.

144-5

We understand that the Corps has proposed to work with the NIU and other interested parties to develop a cost-effective analysis of the options for the Final EIS. The DSIs wholeheartedly support that effort and believe that it is an essential component of the Final EIS. Without such an analysis, it will be extremely difficult to select the best option for the region.

144-6

The DSIs urge the Corps to form a team of biologists and other appropriate experts from the Corps, the participating agencies and the parties interested in this process for the purpose of monitoring data collection associated with the test plan and of assisting in the analysis of the data generated. The DSIs feel strongly that the Corps is presented with an important opportunity to answer many of the questions about smolt migration and survival that are critical to assisting these species to survive. Even if these questions are not answered definitively, the data generated promises to assist the region in its recovery planning.

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Robert D. Volz
November 14, 1991
Page 4

Thank you for the opportunity to comment on the Draft EIS. We hope that these comments assist you in completing the EIS process and in selecting a preferred alternative from the alternatives presented.

Very truly yours,

John Carr
Executive Director
DIRECT SERVICE INDUSTRIES, INC.

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ASSESSMENT OF DRAFT 1992 COLUMBIA RIVER SALMON
FLOW MEASURES OPTIONS ANALYSIS DOCUMENT (OAD) AND
ENVIRONMENTAL IMPACT STATEMENT (EIS)

EXECUTIVE SUMMARY

These comments address biological issues raised by the Corps of Engineers' Draft 1992 Columbia River Salmon Flow Measure Options Analysis Document/Environmental Impact Statement. Based on its review of the scientific literature and on the observed migration behavior of juvenile anadromous salmonids, this paper reaches the following conclusions regarding the effect of flows on migration:

1. Migration behavior of juvenile salmonids is controlled by endogenous (hormonal) and exogenous (environmental) variables.
2. Environmental variables which exert a major influence on migration behavior include photoperiod and temperature.
3. Salmonid juveniles exhibit active migration in standing water (lakes), where their migration speed is similar to that observed in rivers.
4. Salmonid juveniles exhibit diel changes in migration behavior, with migration occurring mostly in darkness.
5. Predictive and functional relationships between migration behavior and environmental variables are frequently confounded by time.
6. Evidence from observational data that increased flow in the Columbia River will result in decreased travel time of salmonid juveniles is equivocal.
7. Implementation of flow augmentation and/or drawdown actions proposed for the Columbia and Snake Rivers should be postponed until relationships between flow and migration behavior of juvenile salmonids are clarified.

These conclusions are significant because they reveal considerable uncertainty about the importance of flow as a principle variable influencing migration of juvenile salmonids in the Snake and Columbia rivers. The scientific basis for increasing flow as a strategy to speed migration of juvenile salmonids requires clarification before proposed actions on flow augmentation or drawdown are implemented.

by William J. McNeil

for Direct Service Industries, Inc.

November 12, 1991

Direct Service Industries, Inc. (John Carr)

Direct Service Industries, Inc.

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November 14, 1991

Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9265

Attention: CENPW-PL-ER.

Re: Comments of the Direct Service Industries on Power And
Operational Matters Pertaining to the Corps of Engineers' Draft
1992 Columbia River Salmon Flow Measures Options Analysis/EIS.

Dear Lt. Col. Volz:

These comments are directed to the system operations and power aspects of the
Corps of Engineers' Draft 1992 Columbia River Salmon Flow Measures Options
Analysis/EIS (Draft EIS) and are made on behalf of the Direct Service Industries
(DSIs).¹

We have reviewed the Draft EIS's data and analysis of the power impacts that
may result from the various alternatives considered in the Draft EIS, sec 4.9, page 4 -
122. Our review of these power impacts causes us to conclude that further analysis is
required in order to reflect accurately the likely impacts. We understand from our
discussions with Bonneville Power Administration staff that the data is in fact being
revisited and will be revised for the Final EIS. Our comments on the power impacts
data, therefore, are offered for the additional purpose of identifying problems for that
review.

¹ The Direct Service Industries are Aluminum Company of America, Atochem North
America, Columbia Aluminum Corporation, Columbia Falls Aluminum Company, Georgia-
Pacific Corporation, Intalco Aluminum Company, Kaiser Aluminum & Chemical
Corporation, Northwest Aluminum Company, Oregon Metallurgical Corporation, Reynolds
Metals Company, and Vanalco, Inc.

Power Loss Analysis

Review of the data and analysis is needed for all three power categories:
capacity, firm energy and non-firm energy.

1. **Capacity.** The Corps analyzes the power impacts caused by the
alternatives in terms of the loss of instantaneous capacity. Draft EIS, sec 4.9.1.1, page 4-
123. Use of instantaneous capacity to measure capacity loss is inappropriate. Capacity
costs should be based on the sustained capacity losses suffered. Sustained capacity is the
basis upon which BPA makes their capacity sales. The capacity impacts should be
revised to reflect sustained capacity losses.

2. **Firm Energy.** The Draft EIS's analysis shows no firm energy losses for the
operation of the lower Snake projects or the lower Columbia projects at MOP. Draft
EIS, sec. 4.9, page 4-122. Losses for these flow alternatives should be reflected in the
analysis. Some firm energy loss will occur from operating the reservoirs at these levels
due to reduced head, i.e. reduced efficiency.

Some of this loss will occur during the months of May and June when there will
most likely be a surplus of energy. Some loss, however, will come in July and August if
the projects are operated at MOP until that time. Operation at MOP during that period
will produce firm energy losses.

In addition, it is not clear that the projects will be able to return to their normal
operating ranges by July or August. Refill will require reduced flows below the projects.
This may adversely impact upstream and downstream migration during the refill period.
This year, for example, as of early November there were projects on the lower Snake
that still had not returned to the normal operating range, head loss continued into the
late fall.

3. **Non-Firm Energy.** The DSIs have prepared analyses of non-firm power
impacts for substantially similar proposals made by the Northwest Power Planning
Council in its Proposed Amendments to the Columbia Basin Fish and Wildlife Program.
Working with BPA technical experts, the DSIs estimated the cost of each part of the
Council's plan. The non-firm costs estimated for the comparable Council proposals do
not compare favorably with the estimations of non-firm costs presented by the Draft EIS.

Specifically, we have compared the Council's proposed drawdown of the Snake
reservoirs to MOP from mid-April to the end of August to the Corps' proposed
drawdown of those reservoirs to MOP from April 1 to July 31. The Draft EIS estimates

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Direct Service Industries, Inc. (John Carr)

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that operating the lower Snake to MOP would result in non-firm energy losses of 1500 - 2000 MW-Mo. Draft EIS, sec 4.9, page 4-122. Analysis prepared by the DSI's, however, indicates a loss of only 900 MW-Mo for the Council's comparable proposal.

Finally, flow augmentation would indeed increase the availability of non-firm energy. See Draft EIS, sec. 4.9, page 4-122, and sec. 4.9.1.3, pages 4-125 and 4-126. This will offset some of the losses on non-firm energy caused by drawdowns. However, there are three reasons that the value of that non-firm is in question. First, much of the additional non-firm would be available during the period of the spring when the market is already saturated so that the non-firm energy would not have any value. Second, some of the firm water saved for the fish operation will be spilled at Dworshak when the project will probably be operated with flows in excess of turbine capability. Third, not only will firm energy be converted to non-firm, but non-firm will be devalued when Dworshak is operated to flood control, as adjusted for shift of flood control to Grand Coulee. Non-firm sales will be lost January through April. The water will once again come out of the reservoir during the already saturated fish operation.

Power Cost Analysis

We believe there are two areas in which the power cost analysis needs additional thought. First, if in future years Dworshak is limited to operate at the flood control curve, then BPA will lose the use of that reservoir for provisional draft. See Draft EIS, sec. 3.2.3.1, page 3-8. The contract between the Corps, the USBR and BPA provides for the provisional drafting of up to 260 MW-Mo of energy from Dworshak. A provisional draft allows the reservoir to draft deeper early in the year so that some of the water that comes out in the spring which would otherwise be spilled will be converted to sales. The Federal System will therefore lose up to 260 MW-Mo of non-firm energy sales each year which converts to approximately \$3.5 million, at an average non-firm sales price of 17.8 mills per kilowatt-hour.

Second, the DSI's will incur costs not incurred by other parties if the selected alternative requires BPA to purchase energy or give up non-firm sales. The first quartile of the DSI load is served by BPA with non-firm energy from January through June. A reduction in BPA's non-firm energy will reduce BPA direct service to the DSI's. If that occurs, the DSI's must either shut down, curtail operations or buy replacement energy to continue operations. This energy is called Industrial Replacement Energy (IRE). Purchase of that energy represents an additional cost for the DSI's. Moreover, if BPA is purchasing energy for its fisheries obligations at the same time that the DSI's are buying IRE, the DSI's will be competing with BPA for energy. This competition will raise the price of energy.

Cost-Effectiveness Analysis

The Northwest Irrigation Utilities have produced a cost-effectiveness analysis of the drawdown and flow augmentation alternatives considered in the Draft EIS. This analysis was provided to the Corps during the public hearing process. The DSI's comment that analysis to the Corps and wish to lend their support to the analysis and to future efforts to flesh it out more fully.

The NIU analysis points out that, based on the data provided in the EIS, very few of the alternatives are cost-effective when their cost is compared to the amount of increased flows. Based on the NIU's cost-effectiveness analysis and on the biological analysis provided by Dr. McNeil (appended in these comments at tab A), it appears that an effective flow of 85 kcf/s on the Snake River, provided by a combination of flows and of drawdown to MOP, will be effective for the fish without significant jeopardy to the power system.

Conclusion

As a result of our review of the Draft EIS there are three major components which need further review. First, the power analysis needs additional evaluation of capacity, firm and non-firm energy to appropriately capture the costs of the various alternatives. Second, there are two components of the power analysis which have not been analyzed in the EIS; (a) the loss of the ability to provide provisional draft from Dworshak when an alternative requires operation of Dworshak to flood control and (b) the costs suffered by the DSI's due to the reduced availability of non-firm or the increased competition for purchased power. Third and finally, we urge you to follow through with NIU in the analysis of the cost-effectiveness of each alternative.

Very truly yours,

Doug Faulkner
Senior Operations Engineer
DIRECT SERVICE INDUSTRIES

Direct Service Industries, Inc. (John Carr)

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November 14, 1991

Robert D. Volz
Lieutenant Colonel, Corps of Engineers
District Engineer
Department of the Army
Walla Walla District, Corps of Engineers
Walla Walla, Washington 99362-9265

Attention: CENPFW-PL-ER.

Re: Comments of the Direct Service Industries on Legal
Matters Pertaining to the Corps of Engineers' Draft
1992 Columbia River Salmon Flow Measures Options
Analysis/EIS.

Dear Lt. Col. Volz:

These comments are directed to legal issues presented by the
Corps of Engineers' Draft 1992 Columbia River Salmon Flow Measures
Options Analysis/EIS ("Draft EIS") on behalf of the Direct Service
Industries ("DSIs").¹ The DSIs support the Corps's efforts to
develop a test of flow alternatives which may improve salmon smolt
survival. The Corps's Draft EIS is legally supportable, however,
only to the extent that it adopts a temporary test plan which does
not purport to define any long-term solution or to attempt to
require flows above a specified level. Because the Draft EIS is

¹ The Direct Service Industries are: Aluminum Company of
America, Atochem North America, Columbia Aluminum Corporation,
Columbia Falls Aluminum Company, Georgia-Pacific Corporation,
Intalco Aluminum Company, Kaiser Aluminum & Chemical Corporation,
Northwest Aluminum Company, Oregon Metallurgical Corporation,
Reynolds Metals Company, and Vanalco, Inc.

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ambiguous regarding the nature of the alternatives proposed, a
portion of these comments addresses the EIS's scope and purpose.

1. The Scope of The EIS Is Limited To The Selection Of A
Temporary Test Plan, And The Corps Should Discard Any
Alternative Which Does Not Come Within That Limitation.

A. The EIS Process Is Limited To The Evaluation Of
Alternative Test Programs.

In order to understand the purpose of this EIS process it is
important to place this EIS and the proposed actions in context.
The Corps's decision to study modification of flows in the Columbia
and Snake Rivers was triggered by recent events concerning the
decline of anadromous salmon populations in those river systems.
See Draft EIS, Abstract, p. iii. In April and June 1990, the
National Marine Fisheries Service ("NMFS") received requests to
list Snake River sockeye salmon, Snake River spring, summer and
fall chinook salmon and lower Columbia River coho salmon as
endangered species under the Endangered Species Act. After a
year's study, NMFS proposed to list Snake River sockeye salmon as
endangered and list Snake River spring, summer and fall chinook
salmon as threatened. 56 Fed. Reg. 14055, 56 Fed. Reg. 29542
(1991). (These four species are collectively referred to as "the
salmon.")

Prior to NMFS's decision to propose the listings, a group of
regional organizations and interests met to develop a management
plan for these salmon. While no plan was forthcoming, a request
made by that group contributed to the impetus to undertake this EIS
process.

[The group] . . . requested that the Corps "undertake the
processes necessary to design a study for Snake River
reservoir drawdown during operation year 1992 that would
improve the passage of migrants (juveniles) without
impeding the upstream migration (adults)." Subsequent
agency discussions expanded the original request to
include all practical water management measures to
improve salmon passage, for both juveniles and adults,
through the eight federal dams on the lower Columbia and
Snake rivers.

Draft EIS, § 1.2, p. 1-2. Consistent with those requests, the
Corps's stated goal for the instant EIS process is to develop "a
test plan to improve fish passage down the lower Snake-Columbia
rivers for the 1992 season." Draft EIS, § 1.1, p. 1-1.

Direct Service Industries, Inc. (John Carr)

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The Corps's study, then, is not a review of long-term solutions for the problems of the salmon. That task will fall to three other studies, which are more comprehensive and which will take a long-term look at the options available and their impacts. These are the System Operation Review, which is a joint project of the Corps, the Bonneville Power Administration and the Bureau of Reclamation, the Northwest Power Planning Council's comprehensive, long-term recovery plan for salmon and steelhead stocks, and the Corps's Columbia River Salmon Mitigation Analysis. Draft EIS, § 1.3, p. 1-4. The results generated by the Corps's test plan will be "factored into [these] other studies. . . ." Id.²

The Draft EIS acknowledges the limited nature of its mission. The Draft's formal statement of "Purpose and Need" confirms that its purpose is to:

evaluate the impacts and benefits of several alternatives to the way certain dams and reservoirs in the Snake-Columbia River System are currently operated. The proposed changes in the operation of the dams are designed to increase the flow of the Snake-Columbia rivers to decrease the travel time required for young salmon to migrate to the ocean because it is thought that this, in turn, would increase salmon survival rates. The study also examines the effect of river flows on adult salmon migration.

² The evaluations of the alternatives considered in this EIS process, however, may not be "tiered" into a different EIS process or used to support future, comprehensive measures. A broader EIS may be tiered into a narrower EIS, but not vice versa. NEPA Regulations, 40 CFR § 1502.20 (1990).

We assume that the statement in the Scope section of the Draft EIS, § 1.3, p. 1-4, that "[t]he results of this 1992 plan will be factored into other studies currently underway. . . ." including the System Operation Review, the Council's long-term recovery plan, and CRSMA, means only that the data generated by the test plan may be used in those processes. To the extent that this is the meaning of that statement, the DSIs have no objection; the data generated by the Corps may have great value in assessing the effectiveness of using increased flow velocities to increase smolt survival. If the Corps intends by this statement to imply that the evaluations of the options in this EIS will be included in those processes, however, the DSIs believe that this would be impermissible tiering in violation of CEQ guidelines and NEPA.

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The evaluation will lead to the selection of a test plan to improve fish passage down the lower Snake-Columbia rivers for the 1992 season.

Draft EIS, § 1.1, p. 1-1 (emphasis added). The temporary nature of the purpose is reconfirmed later in the Draft EIS in the analysis of the various alternatives. "[T]his document . . . analyz[es] temporary measures that are designed to test proposed methods which water management agencies may be able to contribute to the survival of the salmon that have been proposed for listing" Draft EIS, § 5.2, p. 5-1.

Additional support for the limited nature of this EIS can be found in the methods used to screen alternatives for consideration. Because this EIS is an exercise limited to evaluation of one-year options, the Corps expressly excluded all options which could not be executed during 1992. Draft EIS, § 5.2, p. 5-1 - 5-3 & fig. 5.2-1. The selection protocol selected only "those options which can be physically implemented by March 1992 and can be implemented within existing authorities." Draft EIS, § 5.2, p. 5-3; see also Draft EIS, § 3.3, p. 3-11 - 3-15.

Having selected a narrow range of alternatives, the Draft EIS does not analyze how these measures might or might not fit into any comprehensive recovery plan, or whether they are appropriate long-term, as opposed to test, measures. Moreover, the Draft EIS does not analyze the alternatives it considers in terms of their long-term impacts. This is particularly true of the alternatives' economic and socioeconomic costs. For example, no attempt is made to calculate the economic impacts of the options in other than 1991 dollars or to forecast future impact. The Draft also expressly declines to assess the alternatives' impact on power rates after 1992. Draft EIS, § 4.9.4, p. 4-128 - 4-129.

Thus, this document evaluates only temporary and limited measures. It is designed to test the feasibility of flow regimes which might be beneficial to the salmon, not to offer an option which could serve as a permanent measure in a comprehensive plan. This needs to be expressed more clearly and consistently in the Final EIS, however, because conflicting signals are given throughout the draft document.

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B. Alternatives Which Are Not Temporary Measures Designed To Test Flow Regimes Must Be Discarded As Contrary To The Purpose Of The EIS.

While the purpose of the EIS is to develop a test plan, that goal does not appear to be consistently followed through the evaluation of alternatives. This is impermissible. An alternative which is incompatible with, or which does not fulfill the EIS's goal, must be eliminated. The statement of purpose must control the intent and scope of the EIS process. See *Trout Unlimited v. Morton*, 509 F.2d 1276, 1286 (9th Cir. 1974); *Sierra Club v. Marsh*, 714 F.Supp. 539, 574-575 (D.Me. 1989). A "reasonable alternative" has been defined as "one which serves the underlying goals of a project" Residents in *Protest-I-35E v. Dole*, 583 F.Supp. 653, 660 (D.Minn. 1984) (emphasis added). The goal here, expressly and fundamentally, is to develop a test program which will generate needed data on the physical and biological effects of different flow proposals at the least cost to the salmon and the region. To the extent that any alternative is designed as more than a test, it fails to meet the stated goals of the EIS.

While the statement of purpose clearly indicates that this EIS is to generate a test plan for the 1992 season, the balance of the EIS blurs the clarity of that statement. As a general matter, the options considered by the Draft EIS are far broader than this purpose requires. Only one option is structured as a test. That option calls for a four-week drawdown test in the lower Snake in either January, February, or July and August. Draft EIS, § 3.2.2.1, p. 3-5.

Many of the options, however, are not limited to the purpose of testing. Rather, they appear to be measures designed to implement, not test, unproven and unwarranted recovery measures. These include drawing down all four Snake reservoirs to spillway for four consecutive months, drawing down all four lower Columbia reservoirs to minimum operating pool (MOP) for four consecutive months, and drawing down Bonneville and The Dalles dams to MOP and John Day and McNary to specified elevations for four consecutive months. Draft EIS, §§ 3.2.2.1, 3.2.2.2, p. 3-4 - 3-6. These measures go far beyond what is required to test the system and do not appear to have been designed to produce useful biological or physical data. Because they are not consistent with the goal, they should not be evaluated and may not be selected.

Exclusion of alternatives from consideration is also of concern in this regard. For example, the Draft EIS excludes from consideration measures to transport smolts around dams and reservoirs. Draft EIS, § 3.3.2, p. 3-13 - 3-14; see also Draft

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EIS, § 3.3.3, p. 3-14 - 3-15. So long as the EIS's purpose is to adopt alternatives that test the biological and physical effects of flow measures, exclusion of these alternatives may be appropriate. If, however, the Corps's purpose is to adopt measures which would assist smolt migrations and survival, these measures ought to have been considered and evaluated. See NEPA §§ 102(2)(C)(iii), 102(2)(E), 42 U.S.C. §§ 4332(2)(C)(iii), 4332(2)(E); cf. *Sierra Club v. Marsh*, 714 F.Supp. at 574. Under those circumstances, failure to consider this alternative would deprive the Corps of a complete look at the options and would be a violation of NEPA.

2. Reliance On The Assumption That Increased Water Particle Velocity Correlates With Decreased Smolt Migration Time And Increased Survival May Be Improper For Flow Velocities Above 185 kcfs In The Lower Columbia And For Flows Above 85 kcfs In The Lower Snake.

The fundamental premise underlying this Draft EIS is that smolt survival would be improved if water velocity could be increased in the lower Snake and Columbia Rivers. The rationale for that premise rests on two further assumptions. It assumes first that juvenile salmon migration time and water particle travel time are closely correlated and that flow velocity is a major determinant of migration time. It assumes, second, that decreasing smolt migration time will increase smolt survival rates.

The DSIs believe that these assumptions are at best of uncertain value. In making these assumptions, the Corps oversimplifies the complex process of migration and its timing. See Comments of Dr. Wm. McNeill, appended in this package as Exhibit 1. The Draft EIS acknowledges that the link between migration and water particle travel time is uncertain, especially at higher

³ This assumption is translated into specific objectives for the alternatives. For example: "The overall objective of reservoir drawdown and flow augmentation plans is to reduce water particle travel time. A more specific objective would be to achieve travel times equivalent to those that would be realized if the CBFWA flow recommendations would be met." Draft EIS, § 3.2, p. 3-2. "The objective of the 1992 options with respect to juvenile salmon is the reduction of water particle travel time." Draft EIS, § 5.4.1, p. 5-5. The DSIs question whether these objectives are entirely consistent with the EIS's stated goal as they may be read to ignore the need to generate biological data.

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Direct Service Industries, Inc. (John Carr)

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flows. Draft EIS, § 1.6.1, p. 1-5 - 1-6.⁴ Its review of current knowledge of that relationship suggests that the relationship is far more tenuous at high flows so much so that reliance on that assumption may be considered improper.

Agency decisions are held to a standard which assesses whether they were made "without observance of procedure required by law." *Trout Unlimited v. Morton*, 509 F.2d 1276, 1282 (9th Cir. 1974). An EIS meets the NEPA requirements under this standard if it "provide[s] decision-makers with an environmental disclosure sufficiently detailed to aid in the substantive decision whether to proceed with the project in the light of its environmental consequences." *Trout Unlimited*, 509 F.2d at 1283; see also *State of California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982).⁵ The assumptions made in the Draft EIS fail to distinguish between high and low flows or between the Snake and Columbia rivers. These assumptions may mislead the reader regarding the appropriate conclusions to draw from the data and prevent an informed decision regarding the environmental effects of these alternatives.

The Corps reviewed only three sources of information on the nexus between migration and flow velocity. Draft EIS, § 4.2.1.1, p. 4-28. The bulk of that information is inconclusive. Analysis of yearling chinook smolt migration and flow data from the John Day pool indicates some relationship but no clear relationship at flows above 190-200 kcfs. As pointed out by one source, "part of the flow problem may be that Columbia River flows did not correlate with Snake River flows." Draft EIS, § 4.2.1.1, p. 4-29. For subyearling chinook, reliance on the assumed relationship is less justified.

⁴ The DSIs agree with the Corps that the relationship is unproved and uncertain. While they agree that some correlation can be established between those two factors for flow of less than 85 kcfs on the Snake and of less than 185 kcfs on the Columbia, the biological data suggests that there is no correlation above that point that would justify the increased danger to the salmon posed by the alternatives.

⁵ Agencies have also been required to consider the relevant factors and have been judged on whether they have made a clear error in judgment. See e.g. *Western & Southern Life Ins. Co. v. Smith*, 859 F.2d 407 (6th Cir. 1988). The DSI believes that it would be a clear error in judgment, under the circumstances, to extend the flow velocity-smolt migration assumption to lower Columbia River flows which exceed 185 kcfs or to lower Snake River flows in excess of 85 kcfs.

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None of the data examined demonstrated a positive relationship between travel time and increased flow for subyearling chinook. In addition, one study (Sims and Miller, 1982; Miller and Sims, 1983, 1984) found no correlation between travel times and flows for subyearling chinook.

Draft EIS, § 4.2.1.1, p. 4-30.

The Corps was only able to conclude from this review that, at best, "water particle travel time may have effects on fish travel time and survival." Draft EIS, § 4.2.1.1, p. 4-30 (emphasis added). While this may be a reasonable conclusion for lower flow conditions (85 kcfs in the Snake and 185 kcfs in the Columbia), it is not a reasonable conclusion for higher flows, and the Corps must differentiate between those two situations.

Because the connection between flow velocity and smolt migration, or survival, is tenuous and because the Corps's analysis oversimplifies the relationship between smolt migration and flows, the assumptions made by the Corps must be approached with extreme caution. Whatever relationship might arguably exist, it admittedly breaks down at higher flows; the Corps can not conclude, and has not concluded, that any benefit is gained at higher flows. Given these facts, it would be improper to use these assumptions to support flow levels above 85 kcfs in the Snake River or above 185 kcfs in the Columbia River.

3. **The Corps's Conclusion That The Alternatives Considered Would Not Cause A Rate Increase May Not Be Lawful.**

Because BPA has already set its rates for fiscal years 1992 and 1993,⁶ the Corps concludes that:

the costs associated with implementation of any of these options during FY 1992 would not be recovered through increased rates. Rather, it likely that BPA's operating reserves would be reduced. Assuming BPA's financial goals remained the same, this might lead to a rate increase in the FY 1994-1995 rate period; however, this is difficult to predict.

⁶ FERC has not yet approved those rates as required by the Regional Act.

Direct Service Industries, Inc. (John Carr)

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Draft EIS, § 4.9.4, p. 4-128 - 4-129.⁷ While the DSIs agree that the rate impacts may not be significant for 1992, they believe that the Corps should assume that a rate increase will occur in 1994 and 1995.

Such a rate increase is reasonably foreseeable given BPA's financial policy. If an indirect impact is "reasonably foreseeable," the Corps is required to evaluate the impact. NEPA Regulations, 40 CFR § 1502.16 (1990); cf. *Sierra Club v. Marsh*, 714 F.Supp. at 559, 563-65. Analyzing the possible rate impact will provide the Corps with additional valuable information to assist it in distinguishing among the various alternatives.

Conclusion

Given the restrictive purpose of this EIS process, it would be error for the Corps to choose an alternative which requires lower Columbia River flows to exceed 185 kcfs or to choose an alternative which constitutes a recovery measure as opposed to a test. The DSIs would support an analysis of the rate impacts of the proposals and believe that such an analysis is required by law

Sincerely,

Nancy P. Baker

Nancy P. Baker

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⁷ The Corps also states that "[l]ost hydroelectric generation would represent an economic cost to the region, which could translate into increased power rates." Draft EIS, § 4.9, p. 4-123.

Colleen Wright

1137A 17th Avenue NE
Seattle, WA 98125
11/10/91

Department of the Army
Corps of Engineers, Walla Walla District
Walla Walla, WA 99362-9265

To whom it may concern:

I am writing you today about the need for a draw-down test on both the Lower Granite and Little Goose reservoirs and the augmentation of flow in both the Columbia and Snake Rivers while the draw-downs are being tested.

The draw-down testing on the Lower Granite and the Little Goose reservoirs to the spillway level should be for four to six weeks in late February and March before migrating smolts enter the river so that the test does not interfere with the years' spring migration.

The greatest possible survival of migrating smolts in 1992, when draw-downs will still be in the testing phase, must be insured by releasing as much stored water in the Snake River as possible from April 15 to June 15 and augmenting flows from the Columbia River from April to August to meet fishery agency recommendations. This is essential in order to spill water that will rush juvenile fish quickly downstream.

I also ask that the EIS, written by the Corps, be re-analyzed so that smolts will be moved from Idaho to sea in 15 days as is recommended by professional fishery managers. The current analysis is critically flawed because it does not consider mitigation measures, such as alteration of fish ladders and intake pipes to function at variable reservoir levels, that clearly will be necessary for draw-downs to work.

Finally, I ask that the Corps analyze the economic and environmental effects of the no-action alternative that would guarantee extinction for the Snake River's remaining wild salmon. Thank you.

Sincerely,

Colleen Wright

Colleen Wright

Eric Young

Eric Young, P.C.

ATTORNEY AT LAW

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November 20, 1991

Department of the Army
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Gentlemen:

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I have reviewed over a considerable period of time the Corps' efforts to conserve and preserve the migratory fish stocks in the Columbia River System. The condition of fish stocks are such that immediate action needs to be taken by the Corps to assist in the survival of the fish.

The Corps' history of effort in the upper reaches of the Snake River and Columbia System is deplorable. The priorities for the fish stocks survival is obviously on the bottom of your list.

146-2

I support the immediate 1991 test of draw down on the Lower Granite and Little Goose Reservoirs. The Corps should immediately test all alternatives to insure survival of the fish stocks for 1992.

The Corps will look derelict and incompetent if it does not take immediate action. The blame for loss of stocks may not be all on the Corps lack of sound engineering and biological study and planning, but your work is so suspect that it appears to be your responsibility.

Respectfully,

Eric Young

EY:lb

Patricia J. Fong

November 12, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PL-ER
Walla Walla, WA 99362-9265

RE: Draft Environmental Impact Statement

I am writing to urge you to draft a more realistic and viable Environmental Impact Statement that wholeheartedly addresses the survival of the wild salmon. I urge you to adopt as the proposed action for 1992, an alternative with these elements:

- 147-1 1) Adopt a 1992 test option that includes drawing down both Lower Granite and Little Goose reservoirs to the spillway level for four to six weeks in late February and March. This test must be conducted before migrating smolts enter the river so that the test does not interfere with this year's spring migration;
- 147-2 2) Insure the greatest possible survival of migrating smolts in 1992 - when draw-downs will still be in the testing phase - by releasing as much stored water in the Snake River as possible from April 15 to June 15 and augmenting flows in the Columbia River from April to August to meet fishery agency recommendations. This is essential in order to spill water that will rush juvenile fish quickly downstream;
- 147-3 3) Re-analyze the EIS alternative that will move smolts from Idaho to the sea in 15 days, as recommended by professional fishery managers. The current analysis is critically flawed because it does not even consider mitigation measures - such as alteration of fish ladders and intake pipes to function at variable reservoir levels - that clearly will be necessary for draw-downs to work;
- 147-4 4) Finally, analyze the economic and environmental effects of the so-called "no-action alternative", the business-as-usual plan, that would guarantee extinction for the Snake River's remaining wild salmon.

Please! It is obvious that the Columbia and Snake Rivers must be run more like natural rivers. We cannot allow the extinction of our wild salmon!

Thank you for your consideration.

Sincerely,

Patricia J. Fong
8556 - Evanston Avenue North
Seattle, WA 98103-3850

cc: Gov. Booth Gardner, Olympia, WA 98504
Gov. Barbara Roberts, Salem, OR 97310
Gov. Cecil Andrus, Boise, ID 83720
Gov. Stan Stephens, Helena, MT 59620
Senator Steve Gorton
Senator Brock Adams

Charles Mabholt

11/11/91
CHARLES MABHOLT
WEST FORK ROAD
DREBS, MT 59829

DEAR GREG GRAHAM + OR OTHER COMMENT REVIEWER;

PLEASE INCLUDE MY REMARKS IN THE OFFICIAL HEARING RECORD FOR THE
"DRAFT COLUMBIA RIVER SALMON FLOW MEASURES - 1992 OPTIONS ANALYSIS/EIS."

THE WAY THE DAMS ON THE LOWER SNAKE + COLUMBIA RIVERS, FROM LOWER
GRANITE DAM THROUGH TO BONHEVILLE, ARE BEING OPERATED IS THE PRINCIPLE CAUSE
OF THE DEMISE OF WILD NATIVE ANADROMOUS FISH IN THE SALMON RIVER SYSTEM.

WILD, OR NATIVE, AS OPPOSED TO ~~FRUIT~~ HATCHERY REARED ~~CHUM~~ CHUMCOOL
SALMON WILL NOT SURVIVE IF BEING BARGED, OR TRUCKED AROUND THE DAMS,
ONLY BY LETTING THE RIVER ~~BEHAVE~~ BEHAVE MORE LIKE A RIVER DURING THE
SPRING RUNOFF WHEN THE SMOLTS ARE MIGRATING TO THE OCEAN WITH THE NATIVE
SALMON SURVIVE.

148-1 ~~DOWN~~ ^{DOWN} ~~RESERVOIR~~ ^{RESERVOIR}, ON THE EIGHT DAMS FROM LOWER GRANITE
ON DOWN, COMBINED WITH FLOW AUGMENTATION FROM PUDSINKA + OR THE
DAMS IN HELLS CANYON MUST BE MANAGED TO ASSURE THE PASSAGE OF THE
ANADROMOUS SMOLT-FAST ENOUGH FOR THEM TO REACH THE SALT WATER
ACCORDING TO THEIR EVOLUTIONARY TIME TABLES.

148-2 INABILITY TO TEMPORARILY ~~AND~~ OPERATE BARGES OR IRRIGATION PUMPS
SHOULD BE MEASURED AGAINST THE SALMON FISHING AND CANNING ECONOMY
THAT THE DAMS OBSTACLED. RECREATION OF THE SALMON, + STEELHEAD,
RUNS WILL PROVIDE JOBS FOR RIVER GUIDES IN IDAHO, PEOPLE WHO COULD
USE THE FALL WORK, SIMPLY BY MANAGING THE RIVER MORE LIKE A RIVER.

148-3 SALMON MIGRATION MUST NOT BECOME A THING OF THE PAST. WILD
NATIVE SALMON ARE AN INDICATOR SPECIES FOR THE QUANTITY OF WILDLIFE, FOR
THE HEALTH OF THE ENTIRE PACIFIC NORTHWEST BIOREGION. THEY MUST BE
ALLOWED THEIR PASSAGE TO THE OCEAN.

SINCERELY

Charles Mabholt

CHARLES MABHOLT

Dennis Baird

P.O. Box 8787
Moscow, ID 83843
12 November 1991

Walla Walla Dist., Corps of Engineers
Attn. CENPW-PL-ER
Walla Walla, WA 99362

Dear Sirs:

Thank you for sending me the draft EIS concerning anadromous fish flows & management on the Columbia River.

149-1 I hope that you will modify, improve, and then quickly implement the one alternative that is sound from a fish standpoint--one that moves smolts from Lewiston to the ocean in 14-16 days. It is now well understood that fish passage in times less than this is a key source of juvenile mortality.

149-2 It is also crucial that a full test of a Lower Granite and Little Goose drawdown begin this coming spring--and early on at that.

149-3 Finally, the crucial period for fish in general is next year, from April to June in particular. Serious efforts at providing major spill levels are badly needed then, and cannot wait for another 1-2 years.

149-4 I also trust that if you chose to take no action at all--which seems unlikely--then the full cost to man and to nature of extirpating a species will be considered and accounted for. Nothing comes free, least of all eliminating a species from this planet.

Please send me the final EIS when it is polished.

Sincerely,

Dennis Baird

Dustin J.E. Miller

November 12, 1991

To Whom It May Concern,

I am writing to inform you about my feelings in regard to the salmon runs in the Snake and Columbia Rivers. A copy of this letter has been sent to the Army Corps of Engineers, Governor Barbara Roberts, U.S. Senator Mark Hatfield, U.S. Congressman Ron Wyden, State Senator Wayne Fawbush, and State Representative Greg Walden.

As a concerned citizen currently living on the Columbia River, I want you to know that I want the salmon of this river to be saved from extinction. No power, no food and no money is worth the price of a once flourishing ecosystem to rapidly deteriorate. As a single individual, I will give up whatever it takes to make this river run more like a river and less like a power generator, even if it means closing down a dam and writing this letter by candle light. My family owned Kier Construction-- the one involved with building the Bonneville Dam-- and, for whatever weight it may carry, we all want more effective measures taken right now to save the wild salmon runs in this region. The following is a list of actions and opinions, in response to the Army Corps of Engineers' Environmental Impact Statement, that I support in determining the future of the Snake and Columbia Rivers:

150-1

150-2

150-3

150-4

--The draft EIS does not reflect the clear need for emergency measures to prevent the Corps' dams from driving Snake River salmon and dependent economies to extinction.

--In the EIS, the failure to include mitigating measures for reservoir draw-down alternatives is unrealistic and deceptive.

--The Army Corps of Engineers must adopt a 1992 test option that includes drawing down both Lower Granite and Little Goose reservoirs to the spillway level for four to six weeks in late February and March. The test must be conducted before migrating smolts enter the river so that the test does not interfere with this years' Spring migration.

150-5

150-6

150-7

--The Corps must ensure the greatest possible survival of migrating smolts in 1992-- when draw-downs will still be in the testing phase-- by releasing as much stored water in the Snake River as possible from April 15 to June 15 and augmenting flows in the Columbia River from April to August to meet fishery agency recommendations. This is essential in order to spill water that will rush juvenile fish quickly downstream.

--The Corps must re-analyze the EIS alternative that will move smolts from Idaho to the sea in 15 days, as recommended by the professional fishery managers. The current analysis is critically flawed because it does not even consider mitigation measures-- such as alteration of fish ladders and intake pipes to function at variable reservoir levels-- that clearly will be necessary for draw-downs to work.

--The Corps must analyze the economic and environmental effects of the so-called no-action alternative, the business-as-usual plan, that would guarantee extinction for the Snake River's remaining wild salmon.

Please do what it takes to make this a great place to live for the salmon also.

Sincerely,

Dustin J.E. Miller
Dustin J.E. Miller
1025 State St.
Hood River, OR 97031

Ron and Mimsi Wise

3221 16th Street
Leviston, NY 13354
November 1, 1991

Department of the Army
Walla Walla District, Corps of Engineers
Attn: CENR-PL-ER
Walla Walla, WA 99362

Dear Corps:

We are writing in response to your EIS on restoring the
Salmon runs in the Columbia/Shake Rivers.

Your EIS demonstrates that the four lower Snake River dams
are perfect fish-killing machines. Juvenile fish cannot
safely pass without being killed. These dams must be
modified immediately so young fish can pass safely.

The EIS does not reflect the clear need for emergency
measures to prevent the dams from driving Snake River salmon
to extinction. If there ever was an extreme emergency, this
is it and it requires quick action on your part!

The EIS fails to include mitigating measures for reservoir
draw down alternatives. This is unrealistic and deceptive
and must be corrected in the final EIS.

The final EIS should include the following:

1. Draw down Lower Granite and Little Goose reservoirs to
spillway for four-six weeks in late February-March, before
chinook and sockeye migrate; define dam modifications
required to pass juvenile and adult fish simultaneously and
control nitrogen supersaturation.

2. April 15-June 15 augment lower Snake River flows from
storage to maximum extent practicable and spill fish past
the dams.

3. In the lower Columbia River provide fishery agency
recommended flow April-August by releases from storage and
by drawing down reservoirs to extent practicable.

4. Re-analyze, with post-1992 mitigating measures, the EIS
alternative that would achieve fishery agency flow
recommendation, i.e. draw down lower Snake River reservoirs
to spillway April 15-June 15 and draw down lower Columbia
River reservoirs to minimum operating pool April-August.

5. Analyze and display the environmental effects of the no-
action alternative, including the regional social and
economic effects of near-destruction of Snake River salmon.

For many years you, the Corps of Engineers, have promised to
modify your dams to assist the Salmon, and you have done
very little. NOW is the time to redeem yourselves and get
going with the above measures.

Saving the salmon has already been studied to death. NOW is
the time for immediate action. Please add our names to your
mailing list for all future information on this issue.

Sincerely yours,

Ron & Mimsi Wise

Janet Burcham

November 13, 1991

Public Relations Office
ATTN: Carol Wolf
Walla Walla District Office
U.S. Army Corps of Engineers
Walla Walla, WA 99362-9265

SUBJECT: Comments to the DEIS, Columbia River Salmon Flow Measures

To the Staff:

Due to time constraints, my comments to the DEIS apply to the basic specifications and determinations for the 8 options presented in the Executive Summary.

1. Draft Lower Snake Projects to MOP - This is not a significant increase in water particle travel time and basically deviates little from standard operations. Other uses than fish are maximized.

2. Draft Lower Snake Projects to Near Spillway Crest - This plan offers the greatest possibility for increasing smolt movement downstream. This plan should be given priority consideration for immediate implementation in spring 1992. In addition, reservoir pools in the lower Columbia River should also be dropped below MOP in conjunction with releases from the Snake River dams. If more water is released from the lower Columbia R. dams, reservoirs in the lower Snake R. might be maintained at minimum power generating levels and the water particle travel time still be dramatically reduced.

3. Four-week test: Drop Lower Granite to near spillway crest, remaining projects to MOP - This "test" is not really a test since it is timed to occur before and after the peak smolt outmigration. The improved movement of these fish cannot then be measured by sampling nor will survival of the 1991 age class be improved.

4. Drop Lower Granite to 710 feet, remaining projects to MOP - This option does not go far enough. More of the Lower Snake R. dams should be lowered to the same relative elevation (see 2.).

Flow augmentation could be added in addition to drawdown at all dams as needed.

Target flows by any combination should approach the targets proposed by the Columbia Basin Fish & Wildlife Authority by 60% or greater from April 15 through June 15. More than three combination options should have been evaluated for implementation in spring

152-6
cont'd

1992. Maximizing spill on the Lower Snake dams while maintaining MOP levels in the lower Columbia R. is an unbalanced burden on upriver users in otherwise arid regions. It's possible that a combination that draws down Lower Snake dams to some level for minimum power generation and drawing down lower Columbia R. dams at some level below MOP would achieve the same target flows and reduction in temperature and travel time through the whole system.

152-7

Briefly, my opinion on the very subjective statements that the net effects of drawdown to near spillway crest levels on salmon will be negative is that it is a feeble and transparent attempt to maintain "business as usual". The statements that mortality will increase as a result of "significantly increased" gas supersaturation, increased predation, and loss of shallow water habitat and spawning areas are unfounded and unsupported by data. None of these factors have ever been tested because the dams have not been allowed to spill at near spillway levels. Any predictions are very broadly extrapolated from limited observations which the DEIS clearly states. It seems too convenient to find that what would "probably" impact the fish (actual impacts unknown) also affects power production.

152-8

I think that a third, impartial party is absolutely necessary to do an unbiased, scientifically sound, and credible EIS of flow augmentation options and dam operations. The U.S. Corps of Engineers is acting like the proverbial fox guarding the hen house on this critical evaluation of methods necessary to prevent certain salmon stocks from becoming extirpated.

Sincerely,

Janet Burcham
Janet Burcham
Fisheries Biologist

cc: U.S. Fish and Wildlife Service
Northwest Power Planning Council

152-1

152-2

152-3

152-4

152-5

152-6

Janet L. Stewart

Nov. 13, 1991
Janet L. Stewart
5195 SW Sherwood Pl.,
Beaverton, Oregon 97005

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPW-PI-ER
Walla Walla, Wa. 99362-9265

Gentlemen:
We know that present practices in management of our natural resources can no longer be tolerated. Immediate changes must be made.

Let us consider a river, a flowing avenue of life. Without the flow of the river it loses its viability and livability. Without life including salmon it becomes a dead water and we have lost a significant link in our food chain.

All dams must be built to accommodate this life stream, but time is short. This could be the last migration of the salmon and we must deal with what we have until greater improvements can be made. We cannot leave this process to chance. We must put into place immediate practices to preserve this life. This can be done NOW.

153-1

- Increase water flows for juvenile salmon in the lower Columbia River and temporarily draw down reservoirs in the Snake River to speed-up water velocity at peak migration times.

Fishery biologists say that 15 days for smolts migration is maximum.

153-2

- Invest in ways to stop wasting water - energy conservation, water conservation for irrigation - so there will be more water to flush young fish down stream quickly.

Irrigation by spraying is a very wasteful technique. Too much loss from evaporation.

153-3

- Modify turbine intakes and dam operation to provide safe passage for small fish in the river - not passage on a barge downstream.

Fifteen years of barging smolts has resulted in continued, severe decline in wild salmon.

We have all shared in the benefits both economically and for recreation and the fulfilling of lifes necessities and now we must alter our procedures in order to preserve this life sustaining element. We must all participate especially those that have derived the most benefit.

Thank You, Janet L. Stewart
Janet L. Stewart

Kurt Fuerstenau, DMD

NOVEMBER 13, 1991

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, WALLA WALLA DISTRICT
ATTN: CEMENT-PAVER
WALLA WALLA, WA 99362-9263

SIR,

1 I URGE YOU TO DO AS MUCH AS POSSIBLE TO INSURE THE SURVIVAL OF SALMON IN
THE COLUMBIA SYSTEM. TO DO SO, I URGE YOU TO ALLOW AS MUCH WATER AS
POSSIBLE TO BE RELEASED IN THE SNAKE RIVER TO ALIMENT FLOWS IN THE
COLUMBIA. FLUSHING THE SMOLTS QUICKER TO SEA. THE SMOLTS MUST BE ALLOWED
TO JOURNEY FROM IDAHO TO THE PACIFIC IN NO MORE THAN 15 DAYS. AS
RECOMMENDED.

154-1

2 YOU MUST TEST THE DRAW DOWN IN THE UPPER RIVER DAMS, INCLUDING BOTH
LOWER GRANITE, AND LITTLE GOOSE, IN MID FEBRUARY AND MARCH.

154-2

3 FURTHER YOU MUST ANALYZE THE EFFECTS OF THE NO-ACTION PLAN. WHICH WOULD
GUARANTEE THE EXTINCTION OF THE REMAINING SNAKE RIVER FISH.

154-3

SINCERELY,

KURT FUERSTENAU, DMD
3650 NE 138
PORTLAND OREGON 97230

Jeanette Germain

JG
Jeanette Germain
1721 Canova Drive
Boise, Idaho 83706
208/336-5812

November 13, 1991

Department of the Army
Corps of Engineers, Walla Walla District
Attn: CENFW-PL-ER
Walla Walla, WA 99362-9265

Corps:

My husband, an engineer, always uses the Army Corps as an example of a government agency that does things "right."

But as we all know by now, the Corps hasn't done things right for migrating salmon in the Columbia, Snake, and Salmon river drainages. I don't blame the agency or its staff for past ignorance that we all shared. But now that we know better, I expect all of us to do what's right to fix past mistakes.

That means we need to stop barging fish. We need to redesign fish passage facilities, irrigation pump intakes, marinas, port facilities and other structures to protect the fish. We need to test a drawdown of at least two reservoirs this spring. And we need to hustle, before more than the sockeye are near extinction.

Your people have the skills, the organizational abilities, and the drive to save our salmon. Please make a commitment to do it.

Regards,

Jeanette Germain
Jeanette Germain

155-1

155-2

Stephen A. Willie

Flow Measures
Page 2

14 November 1991

Department of the Army
Walla Walla District
Corps of Engineers
Attn: CENPW-PL-ER
Walla Walla, Washington 99362-2965

Dear Mr. Greg Graham,

For many years now I have watched helplessly as once numerous salmon returning to northwest rivers dwindled to mere remnants of their former runs. The enactment of the Northwest Power Act seemed to signal an impending change, when fish and wildlife resources were given equal footing with other important economic interests throughout the basin. What happened? It is truly a sad situation we now find ourselves in. Unfortunately, a seemingly avoidable situation if responsible action had been taken a decade earlier. In reviewing the draft EIS document "Columbia River Salmon Flow Measures", I see little real change being proposed to avert future emergency measures to prevent the Corps' dams from driving Snake River salmon and dependent economies to extinction.

I suggest the following elements be included in the 1992 action plan of the final EIS document:

1. A legitimate test drawdown of reservoirs in the lower Snake River must be accomplished to determine what structural adjustments must be completed to simultaneously pass adult and juvenile salmon. Lower Granite and Little Goose reservoirs should be drawn down to spillway for 4-6 weeks starting in late February before Idaho bound chinook and sockeye begin to migrate. Additional work can then focus on addressing dam modifications required to pass downstream migrating juveniles at the same time adult fish are moving upstream.
2. Beginning in mid-April, lower Snake River flows should be augmented from storage to the maximum extent possible to spill juvenile fish past the dams. The flow levels recommended by qualified fishery agencies should be provided by releases from any and all available storage and by drawing down the reservoirs to the extent practicable.
3. More analysis needs to be conducted to control nitrogen supersaturation throughout the basin. There seems to be little information on the stress effects this has on both adult and juvenile fish

156-4

4. A serious shortcoming in the draft EIS is the lack of details for the no action alternative. Additional information should explain the effects on the environment, dependent economies, and social impacts of the loss of Snake River salmon resources.

156-5

5. After everything I have read about barging, I still fail to see how it is working. Why are so few adult fish returning, even though millions of smolt are being barged and trucked from upriver sites? Any additional reliance on barging seems to be inviting further disaster, and I for one cannot support it.

Thank you for the opportunity to provide input.

Sincerely,

Stephen A. Willie
2301 NE 121st Street
Vancouver, Washington 98686-3247

156-1

156-2

156-3

Potlatch Corporation (Todd L. Maddock)

Potlatch

Potlatch Corporation

P.O. Box 1016
Lewiston, Idaho 83501-1016
Telephone (208) 799-0123

November 14, 1991

Lt. Col. James A. Walter
Department of the Army
Walla Walla District
Corps of Engineers
Building 602
City-County Airport
Walla Walla, WA 99362-9265

RE: Comments of Potlatch Corporation on Draft 1992 Columbia River Salmon
Flow Measures - Options Analysis Document/Environmental Impact
Statement ("OAD/EIS")

Dear Lt. Col. Walter:

Potlatch Corporation is a forest products company with significant land holdings in northern Idaho, including manufacturing facilities in Post Falls, St. Maries, Santa, Pierce, and Lewiston. Our largest manufacturing facility is at Lewiston, located on the Clearwater River one mile east of town. We manufacture lumber, pulp, paperboard, and tissue products, which are shipped via barge, rail, and truck to both foreign and domestic destinations.

In northern Idaho Potlatch employs about 3,300 people with a 1990 payroll of \$117 million, of which 2,400 employees and an \$80 million payroll are associated with the Lewiston facility. Annual Idaho purchases of raw material and supplies (exclusive of payroll) amount to about \$110 million.

We wish to commend the Corps of Engineers, the Bureau of Reclamation, and Bonneville Power Administration for its commitment to the task of salmon protection consistent with maintenance of healthy environmental, cultural, and economic conditions for the people of the Northwest, a commitment which is reflected in the Draft OAD/EIS. We appreciate this opportunity to offer the following comments on that document.

Lt. Col. James A. Walter
November 14, 1991
Page 2

The potential effects of salmon flow measures on Potlatch are large. Potlatch operations in Idaho may be affected in several ways by the Columbia River Salmon Flow Measures now under consideration:

Transportation. Potlatch's first concern is the potential disruption of barge, rail, and highway transportation. Reservoir drawdown below Minimum Operating Pool ("MOP") will halt barge traffic service to Lewiston for the duration of the drawdown. It also poses a risk of catastrophic disruption of rail traffic through erosion of support for railroad bridges and rights of way. These transportation links are essential to Potlatch's continued operation. A significant share of our pulp and paper products are shipped from Lewiston by barge via the lower Columbia ports to international markets (\$85 million in 1990). Pulp chips, sawdust, and supplies also are delivered by barge. The remainder of the Lewiston wood fiber, chemicals, supplies, and products are shipped by rail or truck.

If Potlatch were forced to shift its pulp, paperboard, and wood products exports from barge to rail transport to the lower Columbia ports, the delivered cost of the products would increase \$140,000 per month. More importantly, assuming that such increased costs could be absorbed, there is considerable doubt as to whether sufficient container on flat car ("COFC") service even would be available on a short term basis. Cars are typically committed by the rail carriers to dedicated long term movements.

Unlike grain, a fungible good which can be stored temporarily if transportation is interrupted, our products move in a global market which demands timely, consistent delivery. Particularly in Japan, just in time delivery is critical.

If certain salmon flow measures reduce water depth at the deep draft Columbia ports (as described in 4.7.1.3 "Effects on Deep Draft Shipping"), the ocean carriers handling Potlatch exports may not choose to call at those ports or, alternatively, may call on a reduced schedule. Under such circumstances, Potlatch may then be required to use Puget Sound ports at a substantial increase in cost in order to assure timely delivery of our products. This possible impact on lower Columbia ports would affect major break bulk shippers (e.g., grain) and other container shippers (e.g., food products), as well as Potlatch.

Our supplies of chlorine can be delivered only by rail. Without chlorine we cannot produce bleaching chemicals required to bleach pulp in the manufacture of our paperboard and tissue products. Under federal regulations, chlorine must be shipped by rail tankers given the unavailability of qualified trucks. Our pulp, paperboard, and tissue operations would be shut down within three to five days of closure of rail service. The shutdown would result in excess of \$500,000 per day

157-1

157-2

Potlatch Corporation (Todd L. Maddlock)

Lt. Col. James A. Walter
November 14, 1991
Page 3

loss to Potlatch depending upon the number of hourly workers furloughed. Such an event would strike a devastating blow to the local economy.

Water Supply. Water for the operation of the Lewiston facility is withdrawn from the Clearwater River in the Lower Granite pool. If the reservoir is drafted below MOP, dredging in the Clearwater River will be required to assure that water can reach the Lewiston facility intake.

Water Discharge. Potlatch's Lewiston facility discharges effluent in the confluence of the Snake and Clearwater Rivers in the Lower Granite pool. It is possible that flow alterations could affect effluent discharge under our NPDES permit. This effect should be explored with respect to dischargers throughout the affected region.

Power Supply. The Lewiston facility expects to purchase in 1992 approximately 80 megawatts of power at flexible energy rates, which will be directly and immediately affected by any reduction in hydroelectric generating capacity at the Columbia River dams.

Log transportation. Logs used at the Lewiston lumber operation are harvested in the Clearwater River drainage and a significant portion usually are transported on Dworshak Reservoir.

Potlatch supports a sound program to restore the salmon runs in the Columbia River Basin. Potlatch and its thousands of employees share in and enjoy the natural heritage of the Northwest. Its rivers, forests, and particularly its salmon are priceless resources we must manage and protect for ourselves and our children. We consistently have applauded efforts by governmental agencies, tribes, and private organizations to help restore the salmon runs. Consequently, we have followed with considerable interest the recent developments in the Columbia Basin including the petitions for listing of fishes by tribes and conservation groups, the proposal by the National Marine Fisheries Service ("NMFS") to list as endangered the Snake River sockeye salmon (*Oncorhynchus nerka*)¹ and to list as threatened the Snake River spring, summer, and fall chinook (*Oncorhynchus tshawytscha*)², the convening of the Salmon Summit, the preparation of this Draft OAD/EIS, and newspaper reports that NMFS will place the sockeye on the endangered list today.

¹56 Fed. Reg. 14,055 (Apr. 5, 1991).

²56 Fed. Reg. 29,542 (June 27, 1991); 56 Fed. Reg. 29,547 (June 27, 1991). We note that the Draft EIS fails to note the second Federal Register notice. It should be included in the introduction at page 1-1.

Lt. Col. James A. Walter
November 14, 1991
Page 4

The object of the 1992 River Study is to gain information. The challenge we face is enormous. Stocks of salmon are declining. At the same time the economic health of the entire region depends absolutely on the multiple benefits derived from its rivers. If we are to protect the salmon runs, as we must, it is critical that we do so in a way which does not simultaneously and unnecessarily cut off the economic lifeblood of our citizens. The key to this effort is sound scientific understanding. It is a keen recognition of this truth which led to the Salmon Summit and to the 1992 Columbia River Salmon Flow Measures study ("1992 River Study") which is the subject of this Draft OAD/EIS.

Manmade alterations of the rivers of the Columbia Basin are an important factor in the decline of wild salmon runs. Delays in down migration caused by slack water in reservoirs appear to be one of several factors contributing to the species' low rates of survival. It is reasonable to assume that decreases in travel time brought about by reservoir drawdown, flow augmentation, or a combination thereof, may improve survival rates. A fair test of this hypothesis is what the 1992 River Study is all about.

For this reason, it is essential that the Draft OAD/EIS spell out in detail the test protocols, their implementation, and how the results will be employed in development of recovery strategies. This issue is treated too lightly in the Draft OAD/EIS. Decision makers—and the public—must understand how the test results will be derived, the likelihood that they are verifiable, and the potential for their use in recovery plan development. As the Corps has observed, movement of water particles may not have a linear relationship with the movement of fish.

Radical proposals for drawdown and flow augmentation not only will be enormously disruptive both to the existing environment and to the economy, but they could produce negative biological impacts as well. This is not just a pocketbook issue; the very livelihood of thousands of individuals are at stake—lifetime investments in home, family, and community.

To say that the human stakes are high is not a call to do nothing. It is a call to act prudently. The core of prudence is knowledge. The acquisition of scientific and economic knowledge is what this exercise is all about.

With this perspective in mind, we support the development of sound, comprehensive plans which address the full range of factors affecting the salmon: hatchery management, disease control, harvest limits, predator control, habitat enhancement, aids to migration (including flows, pool levels, up- and downstream fish passage, net pens, and barging), gas supersaturation prevention, other water quality measures, temperature management, and ocean protection. Single minded

Potlatch Corporation (Todd L. Maddock)

Lt. Col. James A. Walter
November 14, 1991
Page 5

157-10
cont'd

solutions will not work, particularly ones with draconian effects on Northwest communities.

The "Purpose and Need" statement in the 1992 River Study should be clarified. Until such a plan can be developed, we need to concentrate on improving our understanding of the effectiveness and costs of various measures. Because this information gathering function is central to the 1992 River Study, we propose that the "Purpose and Need" section of the Draft OAD/EIS be re-written along the following lines:

The purpose of implementing any of the alternatives considered in this document is to gather the best information, at the least environmental, economic, and social cost, on strategies to improve in-river migration conditions (velocity and temperature) for juvenile and adult salmon in the lower Columbia and Snake rivers in 1992. These actions are required to improve the survival rate of declining stocks of Pacific salmon originating in the Snake River System.

157-13

The goal is not just to gather information, but to gather information to identify alternatives that would achieve the desired result with the least harm to the environment, to the economy, and to the people of the Northwest. In order to gather information in a practical manner, there needs to be both a clear definition of the information sought and careful attention to the minimization and fair distribution of the cost of its acquisition. Selection of the flow alternative is a two step process:

- (1) identification of alternatives which can provide the needed information and
- (2) selection of the alternative which can provide the information at the least social, environmental, and economic cost.

Because the people of the Northwest rely so heavily on the Columbia River system for both their livelihood and their enjoyment, because huge financial commitments have been made to the region's economy in reliance on river operation modes adopted by the government, and because some forms of regulation of the river now under consideration will be enormously damaging to the lives and well-being of so many, it is essential that the Corps and other decision makers pay the most careful attention to issues of costs and equity of their distribution.

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As the Draft OAD/EIS clearly demonstrates, the acquisition of knowledge through changes in river operation will not come cheaply. Some alternatives proposed for 1992 will greatly harm both the economy of the region and its environment. The Corps is to be commended for its careful identification of both types of cost.

The 1992 River Study should address the issue of equity. There is another dimension to cost, we believe, which deserves greater attention. That is the issue of equity. Even a moderate cost, unfairly placed, may pose a greater burden than a larger cost evenly distributed. Indeed, this principle is at the heart of the Constitution's prohibition against uncompensated takings.³ As recent decisions of the U.S. Supreme Court have made clear, even the navigation servitude is not a complete defense against a violation of this provision of the Constitution.⁴ While it would be premature to argue here the reach of the takings provision and its interaction with the navigation servitude, it is certainly appropriate for the government to be guided in the preparation of the OAD/EIS by the spirit of equity and fair play which underlies that constitutional guarantee.

Should an unduly large proportion of environmental or economic cost fall on a few entities, the government should consider other alternatives which more equitably share the environmental and economic burden, or should provide sufficient mitigation or compensation to the burdened parties. The Draft OAD/EIS pays insufficient attention to this issue. For instance, the emphasis on economic effects on the region, while critically important, tends to mask the harshness of specific impacts on communities, firms, and individuals. At a minimum, the document should display alternative mechanisms for mitigating or compensating for unfairly localized burdens, including the cost of direct payments to disproportionately burdened parties. In this respect, the various discussions of mitigation in the Draft OAD/EIS are inadequate. (We also note that the discussion of socioeconomics (4.13) fails to include a mitigation section at all.)

³1N]or shall private property be taken for public use, without just compensation". U.S. Const. amend. V (takings clause).

⁴Kaiser Aetna v. United States, 444 U.S. 164 (1979) (proposed regulation to require public access to pond newly connected to a bay amounted to a taking); Vaughn v. Vermillion Corp., 444 U.S. 206 (1979) (proposed regulation to require public access to waterbody amounted to a taking). We note as well that the Court has long held that the navigation servitude is triggered only when federal action is taken pursuant to the navigation power, as opposed to other federal powers (such as the commerce power). Arizona v. California, 283 U.S. 423 (1931). Given that this study is undertaken pursuant to the Endangered Species Act (a commerce power function) and is not in aid of navigation, but patently offensive to navigation, there is a real question as to whether the navigation servitude even comes into play.

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157-13
cont'd

Without this analysis, all the information needed to make an informed choice will not be displayed—which, of course, is the single goal of NEPA.⁵

The social effects analysis overlooks localized impacts. The study area as defined by the Corps (4.13.2) runs from northern Idaho to west of Portland, Oregon. More than 1.2 million people live there, but a majority live in the Portland-Vancouver metropolitan area. If the Corps is going to make such comparisons, the analysis should be more focused. At a minimum the study area should be divided into two areas, lower Columbia and Snake River. More appropriately, the analysis of social effects of lowering a specific pool should look at the proportion of affected people in the counties adjacent to the pool.

157-14

157-15

The Corps should pay particular attention to catastrophic risk. Most of the costs attendant to the various river re-regulation proposals are direct, immediate, and easily identified (if not completely understood). For instance, if reservoirs are drawn down below particular levels, fish ladders fail and barge traffic ceases. On the other hand, we believe, the Draft OAD/EIS pays inadequate attention to the potential for catastrophic disruption of transportation resulting from erosion of support for bridges, levees, and rights of way if pool levels are drawn down severely. While this sort of damage⁶ is, perhaps, less certain than other consequences of actions analyzed, NEPA nevertheless demands that it be explored fully.⁷

⁵National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4370a. *Robertson v. Methow Valley Citizens Council*, 109 S. Ct. 1835 (1989) (Tik is now well settled that NEPA itself does not mandate particular results, but simply prescribes the necessary process. . . . If the adverse environmental effects of the proposed action are adequately identified and evaluated, the agency is not constrained by NEPA from deciding that other values outweigh the environmental costs.)

⁶Other examples of lower risk/great damage impacts are found throughout the Draft OAD/EIS. See discussion of wetlands (4.4.3), embayment ponds and associated tributaries (4.4.4), water fowl (4.4.5), erosion (4.5.2 and 4.5.3), and railroads and highways (4.7.2 through 4.7.3.1).

⁷Scientists' Institute for Public Information v. Atomic Energy Comm'n., 481 F.2d 1079 (D.C. Cir. 1973), generally is viewed as the judicial source of the requirement. It stated that NEPA's "requirement that the agency describe the anticipated environmental effects of a proposed action is subject to a rule of reason. The agency need not foresee the unforeseeable, but by the same token, neither can it avoid drafting an impact statement simply because describing the environmental effects of alternatives to particular agency action involves some degree of forecasting. . . . Id. at 1092. This reasoning was later incorporated into the CEQ's "worst case analysis" regulations. Those regulations were repealed and replaced, however, with "incomplete or unavailable information" rules in 1986. 51 Fed. Reg. 15,618-26 (1986), codified at 40 C.F.R. § 1502.22; correction, 51 Fed. Reg. 16,846 (1986). These rules accomplish largely the same result, but while emphasizing that the analysis is to be based on scientific information rather than pure conjecture. In *Robertson v. Methow Valley Citizens Council*, 109 S. Ct. 1835 (1989), the Supreme Court found the new CEQ regulations consistent with the Act and prior case law.

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cont'd

Once this information is displayed, it is the duty of the government to base its decision to proceed on a reasoned assessment of the likelihood and scope of the potential risk. If streambanks erode to the point of threatening the safety of transportation links—and even of dams themselves—the government would be obligated to halt the experiment and undertake costly repairs. Even then, it might be too late to prevent catastrophic results. Given the urgency of the need to acquire information about migration flows and the enormity of the risk to commerce and safety, we urge the Corps to display fully in the OAD/EIS both the risks and the consequential remedial measures—and ultimately to avoid any option which poses a real, even if low probability, danger of this magnitude.

157-16

The Corps should give greater emphasis to options involving short term tests of drawdown to MOP. Based on the information contained in the Draft OAD/EIS, it is apparent that the alternatives involving short term reservoir drawdown to MOP levels (as opposed to near spillway levels) coupled with reasonable flow augmentation offer the best opportunities to gain needed information about river operation impacts on salmon runs with the least damage to other environmental and human resources. We urge the Corps, however, to expand the range of alternatives involving short term (four week) testing of reservoir drawdown. For instance, none of the combinations (X, Y, and Z discussed at 3.2.4) entail a four week test drawdown. It appears that such a combination would produce the needed information while avoiding high environmental and economic costs focused in the area of the Lower Granite pool.

157-17

If any alternative disrupting barge transportation is chosen, the timing of the annual repairs to the navigation locks should be coordinated with the salmon flow measures. Every year, barge transportation on the river is interrupted for repair of the navigation locks at the Columbia and Snake River dams. This interruption generally lasts about two weeks and, we understand, is next scheduled for March 1992. (We also understand that, with sufficient advance notice, those entities responsible for navigation lock repair have considerable flexibility in scheduling repair activities.) The Draft OAD/EIS does not mention any coordination of annual lock repair with salmon flow measures. If a salmon flow measure alternative that disrupts barge transportation is analyzed, the Corps also should explore the possibility of conducting the annual lock repair at the time of the flow test. We are aware that the Corps has addressed this possibility in discussions outside the Draft OAD/EIS. The issue should be explored fully within the OAD/EIS. Disrupting barge transportation at one time for annual lock repair and another for the salmon flow measure is illogical unless shown to be necessary.

157-18

The OAD/EIS should explore adverse environmental impacts associated with increased reliance on fossil fuels. Reduction in

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hydroelectric power generation is inherent in nearly all the proposals under consideration. While the Draft OAD/EIS has focused on some of the economic and social costs attendant thereto, it fails to fully explore the environmental consequences of the shift to other fuels which would inevitably accompany any reduction in hydropower generation. While it may be impossible to predict with precision exactly which sources would pick up the slack if hydropower production in the region is reduced, the overall magnitude and direction of the shift is entirely predictable. There is no doubt that many river management proposals will result in at least temporary increases in the use of fossil and, to some extent, nuclear fuels.

Decision makers need to be made aware in general, quantitative terms of the environmental consequences of anticipated shifts in power production—including air emissions (particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, and carbon dioxide), ash disposal, and others. Bonneville and generating utilities should be able to provide some estimate of the sources from which replacement power may be obtained. With a sense of the sources of replacement power, the Corps should be able to describe meaningfully the pollution impacts and nonrenewable energy use impacts of the generation of replacement power.

The OAD/EIS analysis of power production consequences is inadequate and understates the costs for all alternatives. The OAD/EIS correctly recognizes that implementation of any of the alternatives (other than the "no action" alternative) necessarily will result in significant losses of both energy production and capacity availability on the lower Snake and Columbia hydroelectric system. The Draft OAD/EIS does not, however, attempt to analyze the impact of these losses in any detail. Instead, the document acknowledges that only the most important power impacts are described, and it concedes that the economic effects are only estimates.⁸ While the difficulty of preparing a complete analysis of power production loss impacts must be acknowledged, the Draft OAD/EIS is flawed by its superficial analysis of constraints on the acquisition of replacement power and by its consistent underestimation of the cost of lost power production.

Replacement of FELCC. One of the more obvious omissions concerns the effect of power production losses on the region's firm energy load carrying capability ("FELCC"). The Draft OAD/EIS acknowledges that the region's firm energy production is roughly in balance with load requirements. Thus, a reduction in FELCC as a result of implementing any of the reservoir drawdown or

⁸OAD/EIS at 4-123.

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flow augmentation regimes would require the acquisition of replacement energy to meet regional needs. The OAD/EIS simply assumes that these losses could be replaced "through the BPA's various acquisition processes."⁹ This assumption is undocumented and improbable as stated.

The Bonneville Power Administration ("BPA") acquisition process to which the document refers is a competitive bidding process that has, thus far, failed to produce any definitive commitments of resources. Whether it could do so in time to replace lost FELCC by the Spring of 1992 when the program begins is, at best, unlikely. Even if it is assumed that a BPA selection of bidders could be finalized and contracts signed within the requisite time frame, the implementation lead time of either conservation programs or new resource construction is normally measured in years rather than weeks.

Nor can it be automatically assumed that replacement energy could be secured from sources outside the region. While energy transactions with other regions are not unusual, the timing of the sudden demand for replacement energy could be awkward. During the spring and early summer, the southwestern United States normally plans on purchasing energy from the Northwest, rather than selling into the region. Transmission constraints, including load balancing requirements, must also be considered before it is assumed that energy supplies could be transported from other regions. The failure of the Draft OAD/EIS to consider the full ramifications of FELCC losses is a significant defect in the document that should be rectified by further analysis in the final OAD/EIS.

Short Term Power Cost Impacts. The failure to comprehend the difficulties of securing replacement FELCC is compounded by the consistent underestimation of the cost of replacement energy and capacity. The Draft OAD/EIS estimates the cost of replacement firm energy at 35 mills/kwh in leveled 1991 dollars. Capacity costs are estimated at \$4/kw/month, using BPA's existing rate as a proxy for market rates. Both figures are at the lower end of a reasonable range of estimates of costs if continuation of the status quo in the region's hydroelectric production is assumed.¹⁰

⁹OAD/EIS at 4-126.

¹⁰Both the estimated energy and capacity prices are below those generally available from most of the region's investor owned utilities. They also appear to be at the lower end of the range of prices regional utilities are paying for new resources, either pursuant to PURPA (Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117 (1978)) (codified in part at 16 U.S.C. §§ 2601-2708) or in market transactions.

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The question, however, is not what short term replacement costs would be if the status quo is continued, but rather what will be the cost of replacement energy and capacity if any of the proposed options are implemented. Implementation will tend to drive up power prices in two ways. In the first place, the loss of available supplies of capacity and energy will, in a normal market, force up the per unit price of replacement supplies. Thus, it is unlikely that the 35 mills per kwh and \$4 per KW of capacity estimates will hold if some combination of reservoir drawdowns and flow augmentation diminishes available supplies.

In addition, the Draft OAD/EIS incorrectly assumes that the total cost of the power production loss can be calculated by simply multiplying the lost capacity and energy by its assumed replacement price. The fact is, however, that the loss of low cost hydroelectric supplies will tend to force up the market price of power for all power transactions, not just replacement power purchases. All other things being equal, the loss of a significant block of hydroelectric production will result in all sellers receiving greater payments, and all buyers paying more, regardless of whether they are purchasing wholesale power from Bonneville or some other source. State and federal price regulation of a number of the region's electric producers may tend to dampen this ripple effect somewhat, but it is unlikely that it will be eliminated completely.

157-22

Long Term Power Costs. The OAD/EIS further underestimates the impacts of lost hydroelectric generation by failing to consider the long run costs of implementation of the alternatives.¹¹ Long run costs are crucial to an informed analysis for two reasons. In the first place, firm energy supplies are not always available for periods as short as one year. If the Draft OAD/EIS is correct in assuming that replacement power will be provided via a combination of acquired resources, such acquisitions normally require contractual commitments for 20 to 30 years. These time frames are necessary in order to secure financing and allow investors to recoup costs that are generally heavily waited toward the front end of a long term investment.

Moreover, a long run analysis is necessary because it is impossible to evaluate the proposed alternatives in its absence. While it is true that the immediate decision involves a one year trial, the trial is only significant as an attempt to derive a long run solution to a long run problem. Salmon and steelhead runs cannot be restored to their former numbers in a single year. The

¹¹The estimated cost of replacement firm energy appears to be based, in part, on an attempt to derive longer term prices, but it clearly understates the prevailing price for energy supplies committed for a term equivalent to the economic life of the lost hydroelectric resources, i.e., thirty years or more. The estimates of the replacement costs of non-firm energy and firm capacity, on the other hand, contain no long run component at all.

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effort will require years, perhaps decades, of effort. Any meaningful cost analysis should, therefore, include some measure of the long run economics of any proposed solution. As the Draft OAD/EIS concedes, long run costs of the proposed program will likely be "much higher" than the short term costs isolated by the document. Some attempt should be made to quantify those "much higher" costs before a commitment is made to the trial of what could prove to be an insupportably expensive solution.

157-23

The OAD/EIS Improperly Fails to Estimate the Impact of the Program on Electric Ratepayers and Consumers. Potlatch's final criticism of the document's analysis of energy impacts is very simple and straightforward. The OAD/EIS makes no attempt to compute the effect of the proposals on the region's electric rates and the ratepaying public. The ostensible reason for this failure is that BPA has already set its rates for fiscal years 1992 and 1993. This explanation is nonsensical for two reasons.

The first is that the costs of the program and the associated impact on ratepayers do not disappear simply because BPA will not recover its costs via an immediate rate increase. Cost recovery can only be deferred, it cannot be eliminated. The loss of a substantial portion of the region's hydroelectric capacity will impose real costs that will have to be recovered sooner or later. Presumably the general public would like to have some idea of the general magnitude of those costs and the meaning for individual ratepayers.

The second defect in the stated rationale for the failure to consider rate impacts is that not all of the region's ratepayers will be protected from an immediate pass-through of increased costs simply because BPA's rates are fixed. Investor-owned utilities will be free to seek immediate rate increases if necessary to recover the increase in market driven electric prices. In addition, many of the region's larger industrial consumers have market based contracts that will be immediately impacted by price increases. Potlatch is one of those customers. Beginning in 1992, the Lewiston facility will purchase 80 MW or more of power from Washington Water Power. The price of the energy will be closely related to the price of electric energy available in the wholesale markets in the Northwest. With the loss of hydroelectric power generation to the flow measures, the market price of power is likely to rise. For every 0.1 cents per kwh the price rises, the cost of purchasing 80 MW of power at Potlatch will increase \$57,600 per month. If the market price rose 0.5 cents per kwh, the monthly increase would be \$288,000 per month. While the 80 MW estimate is a reasonable one at the Lewiston facility for 1992, electricity use at the facility is rising as the plant expands and these costs would be greater in years after 1992.

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157-24

The Draft OAD/EIS gives inadequate attention to water supply constraints on various alternatives. The discussion of alternatives in the Draft OAD/EIS largely fails to identify and explore legal and contractual constraints which would preclude their implementation in 1992 (or later). For instance (except for passing references to the independence of Idaho Power Company's dams and the need to negotiate for water supplies upstream of Brownlee Reservoir) nowhere does the report address the legal and contractual availability of water to implement its various flow tests. To do so the Corps needs to take into account state water rights, federal water rights, federal regulatory authority, federal contracts for water supply and power, interstate power agreements, Indian treaties, and international treaties. While it is certainly true that the Corps is not excused from discussing alternatives simply because they may be unavailable under current authority, NEPA nevertheless requires that it display those constraints.

Moreover, assuming that the federal government has the authority to implement these alternatives given the constraints of international, federal, and state water laws, the Corps needs to assess the extent to which individual users will no longer be in priority to receive water. In the Draft OAD/EIS, the Corps treats water supply purely as a question of the physical ability to pump from reservoirs. It is not at all clear, however, whether particular users would be in priority to pump under significantly different flow and storage regimes.

The Draft OAD/EIS contains some misconceptions and misleading information regarding Potlatch. The following specific points are offered to improve the quality of the characterization of impacts of the various alternatives:

Dworshak Logging Operations (4.7.1.4). Review at Potlatch concludes that there is a reasonable expectation that Dworshak log transportation and storage operations could be conducted with flow augmentation options A (base case), G, H, and I in years with near normal runoff. Such operations could not be conducted with flow augmentation options B through F. Analysis of increased log transportation and storage costs over the next five years should Dworshak Reservoir not be available indicates additional costs of \$1,438,000 or an average cost of about \$290,000 per year. (Of course, the cost in any specific year is a function of harvest volumes that could be transported and stored in the reservoir.) Moreover, increased road maintenance is not included in these costs.

Use of trucks to haul logs will cause increased vehicle emissions to the air in the local area near the reservoir. We find no estimate or mention of this environmental impact on loss of logging operations on the reservoir and recommend that an estimate be prepared and included in the final document.

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157-27

Lewiston Facility Water Intake. The water intake to the Lewiston facility is at elevation 727 and is in the Lower Granite pool. The OAD/EIS incorrectly states that the water intake to the Lewiston facility is above the lower Granite pool. (Pg. 2-96 and 4-153) Usage is over 35 million gallons per day. Based on photographic evidence from 1973, we believe that it is possible to obtain water from the Clearwater River if the pool elevation falls and the facility must obtain water from the free flowing river. To assure that the water is available, we would be required to use a channel which previously excavated in the river bottom. Our divers recently have determined that the channel has become filled with silt and must be dredged prior to initiating the flow measures test. Spoils from the dredging must be disposed of. Potlatch recently filed a permit application with the Corps, but to date we have received no response. Dredging and spoils disposal are an environmental and cost impact of the salmon flow measures which should be noted in the analysis. A single dredging may cost over \$100,000, and a permanent solution may involve a capital investment as high as \$1 million).

Should Potlatch be unable to get process water from the river, the facility would not operate and there would be major economic impacts to Potlatch, including loss of lumber, pulp, paperboard, and tissue production and sales, electric power production and sales, and resulting loss of significant established markets. Because the Potlatch facility at Lewiston is the predominate employer in the area, closure for any sustained period would be catastrophic locally.¹²

Lewiston Facility Effluent. Aqueous discharge from the facility is governed by a National Pollution Discharge Elimination System permit. The permit relates flow at the combined Snake and Clearwater rivers to allowable discharge from the facility. The discharge point is near the river bottom at the confluence of the two rivers. While we anticipate no restrictions in manufacturing operations under the permit with flows described in the Draft OAD/EIS, there is some possibility of the discharge becoming noticeable if the levels in the Lower Granite are reduced significantly. We believe this effect, if it occurs, will be wholly cosmetic.

Summary

Potlatch supports effort by the federal agencies to devise a recovery strategy for salmon and steelhead which addresses not only downstream migration but the full range of factors which have contributed to their decline. We believe recovery can and must be achieved in a manner consistent with the protection of the

¹²We note here that "Water Supply" is relegated to a sub-subheading under Socioeconomics (4.12.1.6), rather than receiving equal treatment with such other impacts as Water Quality (4.1), Anadromous Fish (4.2) and so on.

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environmental, social, and economic well being of the region. As the Corps has ably documented in its Draft OAD/EIS, many of the alternatives under consideration entail enormous known costs and even larger risks of catastrophic failure. The OAD/EIS needs to do an even better job of displaying those costs and fully exploring how they may be minimized, mitigated, and fairly distributed.

With such matters fully disclosed, the government will be in the best position to select flow measures which will most effectively provide vitally needed information with the least impact on the environment and people of the region. Only then may we get on with the critical task of protecting salmon runs for ourselves and our children. It is to this end that we offer these comments on the 1992 River Study.

Sincerely,

Todd L. Maddock
Director, Public Affairs

Jami Delmore

Nov. 11, 1991

To the Corps of Engineers,

I'm a 20-year-old college student who has only recently learned of some of the projects to help save our wild salmon. I have lived in Idaho my whole life and I'm disturbed and angry at the destruction going on in Idaho. If there was anything more wrong than letting a species go extinct because of human ignorance and inflexibility please let me know. All life should be important. I don't want to tell future children about what salmon were, as if they were dinosaurs. I want them to see the salmon first hand and their unique abilities and customs. I'm in support of the Corps adopting a 1992 test option that includes drawing down both lower Shoshone and Upper Shoshone

158-1

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158-2

158-3

reservoir to the spillway bed for four to six weeks in late February and March. You must insure the greatest possible survival of migrating smelts in 1992, when the draw-downs will still be in the testing phase. Please release as much stored water in the Snake River as possible from April 15 to June 15 and augmenting flows in the Columbia River from April to August to meet fishery agency recommendations. Re-analyze the EIS alternative that will move smelts from Idaho to the sea in 15 days, as recommended by professional fishery managers. Your current analysis didn't take into account the migration measures necessary for this to work. Please don't let the salmon all die without doing all you can do to save them. It is wrong to disrupt their natural lifecycle and do nothing to save them. We caused their numbers to be so low, we should also be responsible for doing everything possible to keep them alive.

Jami Delmore

Jami Delmore

Central Ferry Terminal Association, Inc. (Karl R. Hagman)

CENTRAL FERRY TERMINAL ASSOCIATION, INC.

ROUTE 1, BOX 84
POMEROY, WASHINGTON 99147
PHONE (509) 349-3335
FAX (509) 349-3335

November 14, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENFW-PL-ER
Walla Walla, Washington 99362-9265

Gentlemen:

A correction, if I might, to Table G-1 and G-2 on pages G-3 and G-4. Central Ferry Terminal Association Inc. has been the Owner and Operator of the grain shipment terminal located at mile 83.7 of the Snake River since June of 1988.

Another Terminal has been constructed up river from our operation and it is operated by The McGregor Company Of Colfax Washington. The McGregor terminal, which you have not listed, is involved in unloading barge loads of ammonia.

Regards,

CENTRAL FERRY TERMINAL ASSOCIATION, INC.

Karl R Hagman, Gen Mgr.

159-1

William S. and Marjorie G. Hayes

November 14, 1991
7440 Manorwood Drive
Boise, Idaho 83704

ATTN : CENP4-PL-ER

The U. S. Army Corp of Engineers
Department of the Army
Walla Walla District, Corp of Engineers
Walla Walla, WA 99362-9265

Re: US Army Corp of Engineers
Draft Environmental Impact
Statement on Anadromous
Fisheries

Dear Sir,

It is our understanding that the Corps' 4 lower Snake River Dams are now identified as a primary cause of the mortality of both the smolts and the adult anadromous fish.

Your draft EIS does not reflect the need for quick action to ameliorate this pivotal cause of decline for our sock-eye, a lessening of the flourishing steelhead runs and an ever increasing loss of our Chinook. We feel that your Final EIS SHOULD:

1. Draw down Lower Granite and Little Goose reservoirs to spillway level for four to six weeks in late February through March, before chinook and sockeye migrate; and define dam modifications required to pass juvenile and adult fish simultaneously and control nitrogen supersaturations.
2. April 15 through June 15 augment lower Snake River flows from storage to maximum extent and spill fish past the dams.
3. In the lower Columbia River provide fishery agency recommended flows April through August by releases from storage and by drawing down reservoirs to extent needed for fish survival.
4. Analyze and display the environmental and economic effects of no action and the consequential destruction of Snake River Salmon.

I ATTENDED THE FIRST SALMON HEARING WHEN GOVERNOR EVANS OF WASHINGTON STATED THE NORTHWEST POWER PLAN TO SAVE THE ANADROMOUS FISH

AND HEARD THE CORP OF ARMY ENGINEERS PROMISE TO DO EVERYTHING IN THEIR POWER TO SAVE THE FISH. WE FEEL THAT YOUR HONOR IS AT STAKE AND IT IS PAST TIME FOR YOU TO LIVE UP TO YOUR COMMITMENT.

Thank you for your attention to our request.

Sincerely,

William S. & Marjorie G. Hayes
William S. & Marjorie G. Hayes

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160-2

160-3

160-4

JAMES RIVER CORPORATION
NORTHWEST FIBER SUPPLY
508 NW Drake Street Camas WA 99607

Northwest Fiber Supply (James R. Smither)

161-3

cont'd

November 15, 1991

Department of The Army
Walla Walla District
Corps of Engineers
Building 602
City-County Airport
Walla Walla WA 99362-2965

SUBJECT: Comments of James River Corporation on the Draft 1992
Columbia River Salmon Flow Measures--Option Analysis/EIS

161-1

1. James River will support 1992 water management actions which contain acceptable environmental impacts, do not impact returning adult fish, are biologically sound, with shared economic impact, and where data offers reasonable assurance that the intended goal will be reached.

161-2

2. James River urges the selection of Combinations of Drawdown and Augmentation, "Combination Option X" (3.2.4.1) or "Combination Option Y" (3.2.4.2). We believe that all other Drawdown Alternatives below MOP on Snake River reservoirs would: impede returning adult migration; subject juvenile migrants to lethal levels of dissolved gasses as per the June 1991 lower Granite spill test; and paralyze the Juvenile Fish Transportation Program, thus increasing net smolt travel time.

Further, the other alternative Drawdown options could impact the water intake capability at our Camas Washington pulp and paper mill should the instantaneous minimum flow drop below 70kcfs, or the minimum average daily flow drop below 80kcfs at Bonneville Dam.

161-3

3. Sections in the Draft EIS address wood chips and log impacts primarily in the upper Snake River system, but do not address impacts below Bonneville Dam.

The James River Camas Mill already experiences low water impacts during the months of July-October. Chip barges have to be light-loaded with 20-30% less volume to enable them to safely navigate and unload at the Camas Mill. Chip Barges passing through Lower Granite to Bonneville Dams comprise 34% of Camas chip supply annually. Proposals to drop river levels below navigational levels, or to stop barge movement in the upper Snake River system for 5 months while refilling Draw

Down dams, would restrict Camas's ability to receive chips by barge.

Shipping this volume by rail car would result in a freight penalty of between \$1.8mm-\$4mm annually if the rail cars could be found. Storing these chips for 3-5 months is not a good alternative either as our experience is that chips degrade during storage at the rate of 1% loss per month as storage time increases beyond two months.

Log raft storage could be impacted by Drawdown alternatives as raft storage areas are typically near river shore lines. Significant river level drops in the Snake River system will put rafts aground and limit their recovery and use.

James River's last concern focuses on water quality standards for the Columbia River. The Camas Mill has performed ambient water quality surveys in the Columbia River for many years.

Exceptionally dry summers usually result in marginal water quality with respect to temperature, PH, dissolved oxygen and bacteria. Typical summer low flow conditions exist from mid to late July, through mid September. Further reducing these flows during this time frame will create greater opportunity for adverse changes in water temperature and increased proliferation of algae. The algae in turn will dramatically affect PH and DO saturation levels.

At this time, we cannot say that these conditions would cause hardship for either our Camas or Wauna mill's operation, but may limit the mills ability to make future operational changes.

In summary, James River urges the selection of a preferred water management alternative that will achieve the objective of improved passage of juvenile salmon. This alternative must not be at the expense of upstream adult migrations, and should minimize environmental and economic impacts.

Sincerely,

James R. Smither
Operations Coordinator
James River Corp

cc: M. Frank
J. Brown
A. Elsbree
B. Morgan
J. Hanby

Edward McCrady Henderson, Jr.

EDWARD MCCRADY HENDERSON, JR.

407 SMITH STREET
SEATTLE, WASHINGTON 98109

November 15, 1991

Department of the Army
Walla Walla District, Corps of Engineers
ATTN: CENPM-PL-ER
Walla Walla, WA 99362-9265

RE: Comments on Draft EIS on Snake River Dams Draw Down to Save Salmon

Dear Sirs;

With the declaration of the Snake River Sockeye Salmon as endangered, it is necessary and vital that all government agencies including the Corps of Engineers move immediately to save this species.

The dams on the Snake River as constructed and currently operated are fish killing machines. Neither allowing the safe passage of juvenile fish to the sea nor the return of adult fish to their spawning grounds.

Modifications are clearly required to both the physical configuration and operations of these dams. However the draft EIS does not reflect the clear need for emergency measures to prevent these dams from causing the extinction of the Snake River Sockeye Salmon. The failure of the Draft EIS to include mitigating measures for reservoir draw down alternatives is unrealistic and deceptive.

I urge you to include the following actions in the Final EIS:

For 1992,

Draw down Lower Granite and Little Goose reservoirs to spillway level for four to six weeks in late February - March, before the sockeye migrate; define dam modifications required to pass juvenile down stream and adult fish up stream simultaneously;

During the period April 15-June 15 augment lower Snake River flows to spill fish past the dams.

In the Lower Columbia river provide fishery agency recommended flows from April to August by releases from storage and drawing down the reservoirs.

After 1992,

Reanalyze, with post 1992 mitigating measures, the EIS alternative that would achieve fishery agency flow recommendations, i.e. draw down lower Snake River reservoirs to spillway April - June and lower Columbia River reservoirs to minimum operating pool April - August.

Analyze and report the realistic environmental effects of the no-action alternative, including the regional social and economic effects of the destruction of the Snake River Sockeye and other species.

Sincerely,

Ed Henderson, Jr.

Nancy Roberts, M.D.

Dr. Nancy Roberts

14546 Greenwood Avenue North Seattle, WA 98133 362-3250

Dear Folks

For all of my college years I remember hearing tales of the idiotic environment ruining schemes and tactics of the Army Corps of Engineers. Why then does it shock me that you dept has once again mismanaged the Salmon to the brink of extinction. Lets have an upsurge - a well spring of conscience and basic common sense - Run the Rivers like a River! Draw down the reservoirs during Feb + March - give the fish some water at minimal expense to all
Please.

163-1

Thank you

Nancy about 10

Kathy L. Munger, DVM

Kathy Munger DVM
374 SW Hamilton CT
Portland, OR 97201

Dept. of the Army
Corps of Engineers, Walla Walla District
Attn: CENPW-PL-ER
Walla Walla, WA 99362-9265

Dear Corps of Engineers:

164-1

I am writing on behalf of remaining few wild salmon. I urge your department to make the necessary tests (such as releasing stored water from the Snake River from April 15 to June 15) in order to move juvenile fish more efficiently downstream. I realize that these tests and the actual drawing down of reservoirs is complicated by many factors and I do not pretend to know them all. The main purpose of this letter is only to let you know how important the wild salmon is to the Northwest as an industry and as a species. Thank you.

Sincerely,

Kathy L. Munger DVM

APPENDIX O

**BIOLOGICAL ISSUES PERTAINING TO
SMOLT MIGRATION AND
RESERVOIR DRAWDOWN
in the
SNAKE AND COLUMBIA RIVERS**

APPENDIX O

Biological Issues Pertaining to Smolt Migration and Reservoir Drawdown in the Snake and Columbia Rivers

With Special Reference to
Salmon Species Petitioned for
Listing Under the Endangered Species Act

Prepared by

**Albert Giorgi
Don Chapman Consultants, Inc.**

Prepared for

**The U.S. Army Corps of Engineers
and
Bonneville Power Administration**

Under the System Operation Review

July 1991

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Executive Summary

Predictive capabilities regarding the extent of improved smolt survival associated with the speed of migration are extremely limited and of a very general nature. Furthermore, the degree to which yearling chinook salmon increase their migration speed with increased flow or water speed is not as clear as some analyses would suggest. The literature indicates that at least two factors affect the migration speed of yearling chinook; water velocity and the smoltification status of the fish. The vast majority of evaluations conducted to date have not been designed to separate the effects due to each variable. This presents complications, since the observed response cannot be entirely attributable to either single variable. Thus, many relationships that express smolt travel time in terms of flow, or water particle speed, are not calibration curves, and have limited predictive capability.

This complication is readily apparent for smolt travel time evaluations conducted in the Lower Granite Pool. Depending on the year or mark/release site (Clearwater or Snake River trap) different yearling chinook travel time/flow relationships are described. Physiological data collected at the traps in recent years suggests that temporal changes in smolt development may have a pronounced effect on the observed migration speed of smolts. As a consequence, it is difficult to confidently predict smolt speed at a given water velocity. Thus, reservoir draw-down alternatives that target smolt passage through Lower Granite Pool cannot confidently predict migration speed in response to water velocity.

Within the mainstem Snake River downstream from Lower Granite Dam there are some data that may provide some general predictive capability. Annual indices of smolt travel time and smolt survival, derived from system estimates offer a general assessment of how yearling chinook respond to flow or water velocity. Those data indicate that when the average water particle travel times per project drop below approximately 1.9 to 2.4 days the improvement in smolt travel time and survival is slight to negligible. Accordingly, draw-down alternatives that produce WPTT in this range could be considered adequate to provide effective migratory conditions in terms of smolt travel time, given the data currently available.

The only data available to assess yearling chinook migration dynamics in the lower Columbia River are within the John Day Pool. Poor mark-recovery capabilities at John Day Dam in combination with inappropriate mark-release protocols at McNary Dam have resulted in disparate analyses and conclusions from the same data set. Therefore, predicting smolt travel time at various water velocities is uncertain. Thus, the effects of any draw-down alternative being considered in the lower river would require direct evaluation.

Fall and summer races of chinook salmon that emigrate as subyearlings do not exhibit a substantive response to flow/water velocity. NMFS investigators conducted research in John Day Pool and concluded there was no relationship between migration speed and prevailing flow volumes. They also observed behavior that is not indicative of active downstream migrants. In excess of 50% of the fish they marked within the reservoir were recaptured at, or upstream from, the point of release. Furthermore, they concluded it was not possible to attribute observed changes in survival to adulthood to flow, because of strong correlations among several key independent variables. CBFWA analyzed a subset of the NMFS travel time data, as well as transport controls from 1986-1988. They identified a weak correlation between flow and travel time.

A host of issues, other than smolt travel time/survival, are associated with reservoir draw-down and are of concern. Both predators and prey will be concentrated in the smaller pools, potentially increasing predation on all species of juvenile salmon. Rearing habitat, particularly of subyearlings in the Snake River, could be altered. Certain draw-down scenarios will disable collection systems, precluding smolt transportation as a passage option, and eliminating existing smolt monitoring facilities, severely limiting evaluation capabilities. Gas supersaturation and reduced turbine efficiencies are obvious outcomes that can produce conditions that are injurious to juvenile and adult fish as well. These issues be addressed in detail elsewhere in the EIS.

The selected alternative(s) will require thorough multifaceted evaluations. At this juncture there is no way to predict if the net effect of any draw-down scenario will be positive or negative.

Background

Hydroelectric development in the Snake and Columbia rivers has resulted in substantive delay in the migrations of certain species or races of juvenile salmonids. Ebel and Raymond (1976) estimated that in low flow years, e.g. 1973, yearling chinook salmon and steelhead would take about 65 days to reach The Dalles Dam from trap sites on the Salmon River in Idaho. They suggest this was approximately twice the time required before dam construction. Bentley and Raymond (1976) made similar estimates. Following the installation of Lower Monumental and Little Goose dams on the Snake River, yearling chinook smolts took about twice as long to traverse the distance from release sites on the Salmon River to Ice Harbor Dam. During three years prior to impoundment, they estimated that yearling chinook migrated through the free-flowing reach to Ice Harbor Dam in 9 to 15 days.

Sims et al. (1978), observed that during the dramatically low flows in 1977, yearling chinook traversed the reach from those same Salmon River traps to the Dalles in 57 days. Whereas, in 1975 and 1976 Sims et al. (1976 and 1977) indexed travel time at 21 and 27 days, respectively, about half that observed in 1977 with the same numbers of dams in place. The authors characterized the two earlier years as above average flow years. These data sets provided the first indication of the influence of flow on smolt migration speed through the hydroelectric system.

Sims and Ossiander (1981) presented a synthesis of flow/ travel time data for yearling chinook and steelhead for the years 1973-1979. They regressed annual indices of travel time against the flow at Ice Harbor dam during the migration peak. The regression indicated that in years when flows were high, fish moved faster from Lower Granite to The Dalles Dam. They noted that the greatest differences in travel time were observed at flows below 100 kcfs. In that same report the authors also regressed estimates of smolt survival against the same flow index. They found the relationship to be positive. This was the initial evidence that linked smolt survival to travel time and flow.

The National Marine Fisheries Service continued collecting similar data through 1983 (Sims et al. 1984), but their last synthesis included only data acquired through 1982 (Sims et al. 1983). Since 1984, the Fish Passage Center has continued to add to the smolt travel time data set. Their last published synthesis was presented in the 1987 Annual Report (FPC 1988), for the years 1973-1987. The authors fit a curvilinear function to the data that suggests that travel time continues to decrease over the entire range of observed flows.

These observations have prompted fisheries managers who are charged with smolt passage issues to characterize smolt migration as a generally passive process. A key premise that has evolved within the regional fisheries community is that downstream migrants are passively swept downstream and that speed of the migration is dictated by water velocity as indexed by either flow or average water particle velocity. If it is possible to appreciably increase the speed of migration this would better enable smolts to enter a theoretical "biological window" at the estuary, as well as reduce encounter time with predators. The anticipated overall result is improved smolt survival.

This theory is embraced by the Columbia Basin Fish and Wildlife Authority (CBFWA) and is the foundation for the water management activities they propose for the Snake and Columbia rivers (CBFWA 1991). In that document CBFWA contends that the water particle/smolt travel time principle holds for both yearling and subyearling chinook as well as steelhead. The proposal presents a series of graphs, which in their view support the proposed theory.

A number of investigators contend this characterization oversimplifies smolt migratory dynamics (Chapman et al. 1991, Giorgi 1991, Kindley 1991, and Stevenson and Oisen 1991). Those authors present additional pertinent data that have been acquired in the basin over the last five years, that are inconsistent with the water particle speed hypothesis, and question the predictive capabilities of smolt travel time/flow relationships presented by CBFWA. These investigators stress that two factors influence smolt travel time, flow or water velocity and smolt development. They

question the predictive capability of certain travel time/flow relationships that fail to analytically define or isolate effects due to each separate variable.

The following discussions focus on data pertaining to the migratory characteristics of chinook salmon races in the Snake River, those currently being considered for listing as threatened or endangered species by the National Marine Fisheries Service. Although sockeye have also been proposed for listing, only a very limited amount of migration timing data are available. That information will also be presented.

Spring and Summer Chinook Salmon

Lower Granite Reservoir

The Idaho department of Fish and Game has been estimating smolt travel time from two trap sites just upstream from the confluences of the Snake and Clearwater rivers during the most of the 1980's. In 1987 they increased their marking effort and began using PIT tags in their program. One objective was to define the relationship between prevailing flow volumes and smolt travel time to Lower Granite Dam. Their most recent treatment of the collective data appears in their 1990 report (Buettner and Nelson 1991). For yearling chinook salmon, a composite of spring and summer races, they observed a positive relationship between smolt migration speed and flow volume in each of the four years. However, among years the relationships were not equivalent. They presented the separate regressions for each year and found several of them to be significantly different from each other. Furthermore, they documented different relationships for fish originating in either the Snake or Clearwater rivers. As a consequence, there is no single equation that the authors present as a predictive relationship between travel time and flow. Even so, they generally concluded that salmon moved twice as fast through the reservoir at 100 kcfs as at 50 kcfs.

Several investigators believe that such analyses are confounded and do not clearly depict the degree to which smolts respond directly to flow (Chapman et al.

1991, Giorgi 1991). Those authors noted a recurring pattern where late migrating fish travelled significantly faster than earlier migrants regardless of the prevailing flow. They cited a number of examples where under equivalent flows migrants were travelling at significantly different rates. In other instances fish were actually migrating faster at lower flows. They attribute these observations to changes in migratory behavior associated with the process of smolt development. This could in part explain the inconsistent relationships observed from year to year, as well as differences Buettner and Nelson (1991) documented between fish marked at the Snake and Clearwater River traps. This general topic will be addressed further, elsewhere in this report. Detailed treatment of the data and topic are presented by Chapman et al.(1991) and Giorgi (1991).

Kindley (1991) further examined the Snake and Clearwater trap data for 1989 and found much stronger correlations between travel time and release date than to flow. The analyses suggest that some other time-related variable in addition to flow may be affecting travel time of yearling chinook. Furthermore, he demonstrates linkage between the level of smolt development exhibited by the population and the release date of PIT-tagged groups, as increasing over the course of the outmigration. These analyses also suggest some indeterminable amount of the travel time response was affected by changing physiological disposition of the population.

Predicting Travel Time in Granite Pool. Neither CBFWA (1991), nor Buettner and Nelson (1991) presented a single representative relationship that characterizes yearling chinook travel time response to water discharge. In fact, figure 15 in the 1989 Fish Passage Managers Annual Report (FPC 1990) clearly illustrates the limitations of such attempts at prediction. As depicted in that graph fish migrating from each of the traps moved to the dam at dramatically different speeds under the same flow/water velocity. In that report the relationships are not defined quantitatively, nor are statistical comparisons conducted.

Based on this cumulative body of information I conclude that analyses/data are not currently available that permits us to accurately predict the magnitude of yearling

chinook responses to flow in Lower Granite Pool. Consequently, predictions extrapolated to specific velocities are not possible.

Snake River, Reach Travel Time to McNary Dam

The travel time of individual marked hatchery groups has been estimated for yearling chinook migrating from Lower Granite to McNary Dam (Berggren and Filardo 1991). The authors analyzed the data using multiple regression techniques and determined that of the various independent variables explored, only flow entered the model. They defined the relationship between smolt travel time and flow as:

$$TTIME = 4.95 + 596.97/FLOW$$

with a coefficient of determination = 0.426, indicating a weak relationship. This same relationship is graphically depicted in the CBFWA flow proposal.

Kindley (1991), using a different data set, also examined the relationship between yearling chinook travel time from Lower Granite Dam to McNary Dam. He considered two factors, flow and release date of the tagged group. The travel time data were extracted from the Fish Passage Manager's Annual Report (FPC 1990) and were PIT-tagged groups released at the Snake River trap in 1989. The estimated median travel time through the reach was based on the estimated median passage date of each group at the upper and lower dam. Kindley (1991) could not identify relationship between travel time and flow ($r\text{-squared}=0.03$), but a strong relationship with the date of release ($r\text{-squared}=0.79$). Smolt development at the trap increased over the tagging period, and Kindley (1991) suggests that changes in smolt development may be responsible for the strong date-related relationship.

Another data set used to estimate travel time as yearling chinook migrate downstream through the Snake River to the Columbia River was examined by Giorgi (1991). In 1989, as part of the NMFS transportation study, groups of branded yearling chinook were released in the tailrace of Little Goose Dam (Matthews et al. 1990). The

Fish Passage Center presented the travel times of a subset of those groups as they migrated from Little Goose to McNary Dam (FPC 1990). A graph constructed from those data clearly indicate that the slowest fish were observed when flows were at their highest levels (Giorgi 1991). Over the course of the outmigration period flow volumes decreased, yet the observed speed of yearling chinook increased. These data are clearly inconsistent with the water particle speed theory.

Factors Affecting Smolt Migration Speed

The aforementioned data indicate that there are other processes that change over the course of the spring outmigration, which in turn may influence the migration speed of these fish. In 1989, Beeman et al. (1990) periodically assayed the developmental status of smolts at the Snake River trap. They found that gill ATPase, an index of smolt development, increased over the spring sampling period, concomitant with flow.

There is direct experimental evidence that indicates developmentally advanced (more-smolted) yearling chinook migrate significantly faster than less developed counterparts. In the spring of 1989 and 1990, physiologically advanced yearlings (those displaying elevated gill ATPase) were released from Dworshak NFH and passed LGR 7-8 days sooner than a corresponding control group (Giorgi 1990, Giorgi et al. 1990, Muir et al. in press). In 1990, the more-smolted group moved readily downstream while flows ranged from only 31-78 kcfs. This information, in conjunction with the temporally increasing levels of ATPase at the Snake River trap (Beeman et al. 1990) offers a plausible explanation as to why, in 1989, the later migrants were the fastest, regardless of the prevailing water particle speed.

Repeatedly, over the last two decades fisheries managers as well as research biologists have expressed smolt migration speed as a function of a single variable, flow (or water particle velocity). However, concomitant changes in smolt development and flow volumes over the course of the spring outmigration limit our ability to isolate effects that may be attributable to either independent variable. Beeman et al. (1990) recognized this confounding condition; they stated, "The independent variables, gill

ATPase activity and river flow, were intercorrelated, and therefore can carry redundant or misleading information." Furthermore, the intercorrelation of these independent variables has been documented not only at headwater sampling sites such as the traps, but also at dams within the mainstem, such as Rock Island. And similar temporal increases in gill ATPase have been observed at McNary Dam, (FPC 1991 draft ms). When the correlations among the independent variables are strong, analyses that express the response, in this case travel time, in terms of any single independent variable, are inappropriate, and the results will be confounded to some indeterminable extent.

There appear to be no data that currently permit us to directly assess the effects of flow on yearling chinook that are at the same level of smolt development. Analyses and experimentation to date have not focussed on this issue. Research regarding this issue is warranted.

Annual Indices of Smolt Travel Time

Dam installation has resulted in appreciable increases in travel time throughout the hydroelectric system. The intention of providing increased flows is to diminish the delay by passively flushing smolts downstream more quickly. It is generally held that this in turn appreciably increases smolt survival. For reasons stated thus far, the predictive capability of many flow/travel time relationships are problematic. That is not to say that flow (water velocity) does not affect migration speed, it assuredly does. There are additional data sets that may provide insight into the dynamics of smolt migration.

NMFS (Sims et al. 1984), and more recently the FPC, have derived annual travel time indices for yearling chinook (and steelhead as well). Those data are annual indices of smolt travel time from the upper dam to a lower river recovery site, either The Dalles or John Day Dam. The index is the average median travel time estimated from a number of marked stocks, that traversed the system. These marked groups and are usually of hatchery origin. This travel time index is usually expressed as a per

project estimate. For each annual travel time index, a corresponding flow index, for the Snake River, is typically calculated for a one or two-week period bracketing the time of peak passage for the population. Travel time is then often depicted as a curvilinear function of the flow index (Figure 1). There is a notable difference in the manner in which NMFS and the FPC estimated the medians used to generate the annual travel time index. NMFS expanded brand recoveries by a project specific collection efficiency estimate. In contrast FPC calculated a passage index, which includes no estimate of collection efficiency. These procedures and the resultant estimated medians are not equivalent.

Obviously, these types of data are very general indices of travel time, with no measures of variance for either the dependent or independent variables. As such, they provide only a general assessment of travel time. Furthermore, these data do not assess potential effects of smolt development, nor other factors such as temperature or the amount of spill encountered during passage. Although, it could be argued that the effects of such factors are accommodated, or offset, by averaging across a broad representative sample of marked groups. However, the marked groups within any year consisted primarily of hatchery stocks in the Salmon and Clearwater rivers and apart from the other aforementioned limitations, may not be directly representative of wild stocks.

Considering the general nature of the data and considerable uncertainty regarding the variability associated with each annual index, Chapman et al. (1991) and Giorgi (1991) chose to view the data in general terms. With reference to the currently prescribed fishery flow of 85 kcfs in the Snake River they examined the trends in travel time at flows above and below that value. They concluded there was no appreciable decrease in travel time above 85 kcfs, but dramatic increases when flows were readily apparent when flows were indexed below that value. They suggested that a minimum flow of 85 kcfs in the Snake provided effective migratory conditions for yearling chinook.

LGR to JDA Travel Time vs IHR Flow

Figure 1. Figure from FPC (1988). Average yearling chinook travel time per project plotted against the flow index at Ice Harbor Dam. The exponential function that best fit these data appear in Figure 2. Data are detailed in Table 1.

Predicting Travel Time: Snake River Downstream from LGR Dam. Using these annual indices of travel time (Table 1), this analysis offers generalized predictions regarding the average smolt travel time through the Snake River projects below Lower Granite Dam. Several mathematical models were fit to the data set using the regression routine in the GB-STAT software. The exponential function for this data set as depicted in FPC (1988) was calculated to have a correlation coefficient of -.82; the algorithm and pertinent statistics are presented in Figure 2. However, the model that yielded the highest correlation coefficient (.95) was a third order polynomial (Figure 3). I used these two models to predict smolt travel times at 10 kcfs intervals from 40 to 140 kcfs (Figure 4, Table 2). These results are compared with those predicted by the threshold-linear model of Chapman et al. (1991) and Giorgi (1991), as described previously.

Flows were converted to average water particle travel time (WPTT) using data provided by USACE staff. Predicted water travel times were based on minimum operating elevations for the years the smolt travel time data were collected.

Regardless of the model the predicted smolt travel times are quite similar at per project WPTT above approximately 2.2 d, or 90 kcfs. The greatest difference among the three models in this range of flow is .5 days at 140 kcfs/1.4 d WPTT (Figure 4, Table 2).

As a further basis of comparison, the relationship derived by Berggren and Filardo (1991) as depicted in CBFWA flow proposal was used to calculate travel times. Refer to previous passages in this report for details regarding their analysis. Even though their relationship was developed from different types of data, their predicted smolt travel times at flows above about 90 kcfs/2.2 d WPTT are consistent with predictions of the models based on annual indices of travel time (Figure 5, Table 2). All of the models predict similar changes in smolt travel time in response to flows above 90 kcfs.

$$Y = 107.6943 * X^{-.7843}$$

UNADJUSTED R² = .6754
 CORRELATION COEFFICIENT = -.8218

ANOVA FOR PREDICTION F = 34.8894
 CHANCE PROBABILITY P = <.0001

STD ERROR OF ESTIMATE = .1912
 VARIANCE OF ESTIMATE = .0366

DEGREES OF FREEDOM = 1 AND 13

WITH X = flow AND Y = travti

Figure 2. Exponential Function describing the relationship between yearling chinook travel time and flow. Data from Table 1.

N'TH ORDER $Y = A + BX + CX^2 + DX^3 + \dots$

CONSTANT	=	15.96581
1 DEGREE COEFFICIENT	=	-.294674
2 DEGREE COEFFICIENT	=	.002127
3 DEGREE COEFFICIENT	=	-.000005
UNADJUSTED R ²	=	.899
MULTIPLE CORRELATION	=	.9482
ANOVA FOR PREDICTION	F =	32.6752
CHANCE PROBABILITY	P =	<.0001
STD ERROR OF ESTIMATE	=	.4638
VARIANCE OF ESTIMATE	=	.2151
DEGREES OF FREEDOM	=	3 AND 11
WITH X = flow	AND Y =	travti

Figure 3. Polynomial Function describing the relationship between yearling chinook travel time and flow. Data from Table 1. This model provides the best fit to the data set.

Predicted Travel Time, Yearling Chinook Average Per Project

Flows were indexed at Ice Harbor.
Data are mean annual indices; NMFS, FPO.

Figure 4. Three models describing the relationship between yearling chinook travel time and flow in the Snake River. The exponential is taken from Figure 2, the polynomial from Figure 3, and the linear is from Chapman et al. (1991). All models were fit to the same data set (Table 1). Water particle travel time (WPTT) estimates are derived from data provided by U.S. Army Corps of Engineers.

Predicted Travel Time, Yearling Chinook Average Per Project

Flows were indexed at Ice Harbor.
Data are mean annual indices; NMFS, FPC.
Bergg. & Filardo are for Ind. hatcheries

Figure 5. Comparison of predictions from models presented in Figure 4 with those from model presented by CBFWA (Berggren and Filardo 1991). Those investigators used a different data set in their analysis.

Table 1. A compilation of flow, travel time and survival estimates for yearling chinook salmon. Data for the years 1973-1983 were taken from tables presented in Sims, et al. (1983, 1984). Travel time for the years 1984-1987 were derived from data presented by FPC (1988).

Year	Mean flow (kcfs)	Travel Time (days)		Survival (%) per project
		reach	per project	
1973	71	22	4.4	55
1974	158	12	2.4	82
1975	140	12	2.4	79
1976	110	15	3.0	79
1977	40	36	7.2	52
1978	106	11	2.2	85
1979	85	13	2.6	79
1980	110	12	2.4	82
1981	94	12	2.4	na
1982	120	14	2.8	76
1983	109	10	2.0	
1984	150	13	2.6	
1985	86	17	3.4	
1986	97	18	3.6	
1987	80	16	3.2	

Table 2. Predicted average median yearling chinook travel time per project. Estimates are based on models that were fit to the data set presented in Table 1. Figures 2 and 3 describe the exponential and polynomial models. The linear model for flows greater than 85 kcfs was taken from Chapman et al. (1991). The Berggren and Filardo (1991) model was derived from a different data set and per project estimates are presented as an additional basis of comparison. The water particle travel times(WPTT) were calculated from data provided by the USACE for pool elevations at MOP for each of the Snake River projects downstream from Lower Granite Dam.

		Yearling Chinook Travel Time			
Flow/WPTT		Exponential	Polynomial	Linear	Bergg. & Filardo
40	4.8	6.0	7.3	--	5.0
50		5.0	5.9	--	4.2
60	3.2	4.3	4.9	--	3.7
70		3.8	4.0	--	3.4
80	2.4	3.5	3.4	2.9	3.1
90		3.2	3.0	2.8	2.9
100	1.9	2.9	2.8	2.7	2.7
110		2.7	2.6	2.7	2.6
120	1.6	2.5	2.6	2.6	2.5
130		2.4	2.6	2.5	2.4
140	1.4	2.2	2.7	2.5	2.3

Since some of these data sets are recognized to be general and/or with limited statistical foundation, no single model can be readily identified as the best, or most accurate. I recommend using the polynomial and Berggren & Filardo models to bracket the potential range of response at a given water velocity.

The polynomial model becomes nearly asymptotic as flows increase. This suggests that changes in smolt travel time are nearly indiscernible above about 90 kcfs/2.2 d WPTT. In contrast the Berggren & Filardo model predicts further decreases in travel time above this level, but the change between 90 and 140 kcfs only equates to .6 days per project. At flows less than about 90 kcfs the models diverge considerably in their predictions (Figure 5). The polynomial model predicts much longer travel times at low flows/water velocity.

The collective models appear to indicate that at WPTT less than about 1.9 to 2.4 days, the decrease in smolt travel time is slight, ranging in the extreme from .1 to .8 days per project over the range of WPTT examined (Table 2). These data suggest that alternatives that produce an average per project WPTT of about 1.9 to 2.4 days should provide effective migratory conditions.

Some portion of the delay associated with smolt passage is probably due to encountering the structure itself. Lowering pools to the spill sill means fish will not have to sound to pass the dam. This in itself may increase migration speed through the system, apart from what these models may generally indicate. There is no way to predict such responses. Any alternative must be accompanied by thorough evaluations that are readily interpretable.

Yearling Chinook: John Day Reservoir

There is little data available with which to evaluate migratory dynamics of smolts in the lower Columbia River. Data are only available within John Day Pool. Some data were collected as a spin-off from the U.S. Army Corps of Engineers and National Marine Fisheries Service transportation research staged at McNary Dam.

Several investigators have examined these data. Migratory characteristics of yearling chinook as they traverse John Day Reservoir have been described by the FPC (1989), see pages B-16 through B-19 of that report. Using transportation control groups released below McNary Dam in the years 1986-1988, they estimated the median travel time to John Day Dam and regressed those estimates against an index of flow in the pool. The function they used to describe the relationship was:

$$\ln(\text{travel time}) = 10.701 - 1.67261 * \ln(\text{flow})$$

The correlation was strong with a coefficient of determination of 0.85. They concluded that the flow in John Day Pool should be kept above 220 kcfs to benefit the yearling chinook migration. They noted that the curve begins to flatten above 220 kcfs, indicating that higher flows will have less effect. In their 1989 annual report (FPC 1990) they present the same graph with 1989 marked groups included. However, no equations or statistics describing the data are provided. It is not apparent from these analyses how CBFWA arrived at the 300 kcfs spring flow volumes recommended in their flow proposal.

Kindley (1991) examined those same data. He performed the same regression on the 1986-1988 data and got a slightly stronger correlation, $r\text{-squared} = 0.88$, by fitting a polynomial function to the data. He then applied a bias correction to the data as suggested by Skalski (1988) and recalculated the regression. The best fit function to the bias-corrected data was a polynomial yielding an $r\text{-squared}$ of 0.71. He further examined the data and suggested a flow threshold may exist, near 190 to 240 kcfs, above which measured changes in travel time are not appreciable.

Stevenson and Olsen (1991) also analyzed data from transportation controls, but for the years 1989 and 1990. These two years data were not treated by Kindley (1991) because the mark release protocol was different from 1986-1988, precluding pooling of the data into a single analysis. They did not detect a consistent relationship between travel time and either flow or release date of the marked groups, when they pooled the data in different fashions.

None of these data sets included measurements of smolt development. Consequently, the effects of this variable on the observed response could not be directly evaluated.

Predicting Travel Time in John Day Pool. Two models were examined to predict yearling chinook travel time through John Day Pool; the logarithmic (FPC 1989), and the polynomial using the bias-corrected data set. The polynomial based on the uncorrected data set was not examined because Skalski's (1988) assessment convincingly demonstrated the bias correction was necessary. The FPC has not as yet adopted the bias correction in their analyses. The two models predict different results. The relationship based on the log model shows smolt travel time decreasing with increasing flows, but the rate of change diminishes as flows increase (Figure 6, Table 3). The polynomial model predicts that travel times decrease up to near 200 to 240 kcfs/5.5 to 4.5 d WPTT, then remain nearly constant at higher flows.

Corresponding WPTT at given flow levels (Table 3) were estimated by from data provided by the USACE. These values were based on a pool elevation of 262', the approximate pool elevation during the years when smolt travel time data were collected.

John Day Pool is the only reach of the lower Columbia River where specific smolt travel time (STT) data have been acquired. Inferences derived from these observations will have to be cautiously applied elsewhere in the lower river.

The USACE is considering three draw-down alternatives; full pool (268'), 262', and 257' (MOP). The WPTT, in days, are estimated to be:

<u>Flow</u>	<u>268'</u>	<u>262'</u>	<u>257'</u>
100	12.7	11.0	10.1
200	6.4	5.5	5.0
300	4.3	3.7	3.4
450	2.8	2.5	2.3

Predicted Travel Time, Yearling Chinook John Day Pool

Figure 6. Relationship between yearling chinook travel time and flow between McNary Dam and John Day Dam. Freeze-branded fish were released in the tailrace and recovered at John Day Dam.

Table 3. Predicted yearling chinook travel time through John Day Pool. Estimates are based on models derived from relationships described by the FPC and PNUCC. The FPC model is an logarithmic function (FPC 1989), and the PNUCC model is the polynomial function presented by Kindley (1991), se Figure 6. The estimated average water particle travel time (WPTT) was taken from curves developed by the USACE. The average pool elevation during the collection of smolt migration data was estimated near 262'. Flow units are kcfs, travel time units are in days.

		Smolt Travel Time		% Decrease in:		
Flow	WPTT	FPC	PNUCC	WPTT	FPC	PNUCC
160	6.7	9.1	7.2	--	--	--
180	5.9	7.5	5.9	12	18	18
200	5.5	6.3	5.0	7	16	18
220	5.0	5.4	4.4	9	14	12
240	4.5	4.6	4.1	10	15	7
260	4.1	4.1	3.9	9	11	5
280	3.8	3.6	4.0	7	12	-2
300	3.7	3.2	4.2	3	11	-5

The % decrease in WPTT relative to full pool is:

<u>Flow</u>	<u>262'</u>	<u>257'</u>
100	13%	20%
200	17%	22%
300	14%	21%
450	11%	18%

Since the STT data were acquired when the pool elevation was approximately 262', this is the basis for comparison as pertaining to smolt travel time. A decrease in pool elevation from 262' to 257' decreases WPTT by an estimated:

<u>Flow</u>	<u>Days</u>	<u>%</u>
100	.9	8
200	.5	9
300	.3	8
450	.2	8

At 200 kcfs the draw-down from 262' to 257' decreases WPTT from 5.5 to 5.0 days. This is approximately equivalent to increasing flows from 200 to 220 kcfs @ a pool elevation of 262' (Table 3). The predicted change in smolt travel time, depending on the model, is .5 and .9 days for the PNUCC and FPC model, respectively (Table 3). As WPTT decreases from 4.5 days the two models differ considerably. The FPC predicts further decreases in STT, but at a decreasing rate (Table 3). In contrast, the PNUCC model predicts no readily discernable decrease in smolt travel time.

Since the models are so disparate, any alternative actually implemented will be cloaked in uncertainty and require thorough and extensive evaluation studies.

Relating smolt travel time to survival in John Day Pool is not possible, because no pool specific survival estimates exist, nor do any exist for other reaches in the lower Columbia. The only general rationale for improved smolt survival comes from the annual system survival estimates treated elsewhere in this document.

Annual Indices of Smolt Survival

Smolt travel time has been identified as a key index of smolt performance as they migrate through the mainstem. The implicit relationship is that shorter travel times translate to improved inriver survival.

The relationship between smolt survival and flow was examined by Sims and Osslander (1981), COFO (1982), and Sims et al. (1983). In those analyses, annual system survival estimates were plotted against an annual index of flow during peak migration (Figure 7). These data, in conjunction with the aforementioned, associated travel time/flow relationships, have been used to identify the minimum flows for fish protection, 85 kcfs at Lower Granite Dam and 220 kcfs at McNary Dam.

An important concern has been the general quality of the existing system survival estimates. Measures of precision or assessments of accuracy were not reported. In most instances this wasn't possible, because the manner in which system survival estimates were calculated changed through the years. Much of this was simply due to uncontrollable environmental or operational conditions. A detailed account of this issue can be found in the appendix of Kindley (1991).

Over the last decade there has been repeated concern voiced throughout the fisheries community, regarding the applicability these early survival estimates in representing conditions currently prevailing in the system. Factors in addition to flow, affect smolt survival as they migrate through the system (the expanse of river from the uppermost dam to a lower river dam used as the terminal sampling point). Project impacts due to turbine or bypass passage, as well as environmental conditions apart from flow, are also reflected in the annual system survival estimates. Thus, expressing survival in terms of flow alone ignores other potential sources of mortality which may in themselves vary from year to year. To rectify this shortcoming, and more accurately assess the effects of flow on survival, the Northwest Power Planning Council's Analytical Methods Work Group (AMWG) is attempting to estimate the project-related mortality in each year's system estimate. The residual survival then should primarily represent

Figure 7. Relationship between the estimated yearling chinook survival per project and the Ice Harbor flow index. Figure from Sims et al. (1983).

reservoir survival, variations in which could reasonably be attributable to flow-related effects.

Chapman et al. (1991) recognized the limitations of relationships derived from a data set with such inherent uncertainty and unassessable statistical properties. Accordingly, they chose to examine the data in a general fashion, as they did with the associated travel time estimates. They considered the trend in survival estimates when flows in the Snake River were indexed at 85 kcfs, the currently prescribed minimum fishery flow. They could detect no positive relationship between yearling chinook survival and flow above that value, (see Figure F14 in Chapman et al. 1991). However, it was readily apparent that in years when flows were indexed below approximately 85 kcfs pronounced decreases in survival were observed. They suggested that there appears to be a critical flow threshold, below which deleterious impacts can be expected. They concluded that the critical level occurred when flows were indexed below approximately 85 kcfs, corresponding to a WPTT approximately 6 to 7 days from LGR to the mouth of the Snake River. Sims et al. (1983) expressed the entire set of the same data (Table 1) as a quadratic function (Figure 7). This relationship has been broadly applied as evidence supporting the need for requested levels of flow for smolts.

Predicting Smolt Survival. I reexamined the relationship presented by Sims et al. (1983) using data presented in that report. Those data include data from Sims & Ossiander (1981), plus two additional years of data acquired by NMFS (see Table 1). In an attempt to synthesize this information I fit several types of curvilinear functions to the data set, including exponential, hyperbolic and nth-order polynomial functions. The best fit was a quadratic function, yielding a correlation coefficient of .88 (Figure 8). This was not the same function presented by Sims et al. (1983); I could not reproduce that function with the data set that appeared in that report. As contrasted with the threshold-linear model presented by Chapman et al. (1991) and Giorgi (1991), the polynomial predicts increasing survival as flows increase. However, the rate of increase diminishes appreciably above approximately 90 to 100 kcfs. At flows above 100 kcfs the predicted survival from both models is nearly identical (Figure 9, Table 4).

N'TH ORDER $Y = A + BX + CX^2 + DX^3 + \dots$

CONSTANT	=	17.01105
1 DEGREE COEFFICIENT	=	.942199
2 DEGREE COEFFICIENT	=	-.003415
UNADJUSTED R ²	=	.7682
MULTIPLE CORRELATION	=	.8765
ANOVA FOR PREDICTION	F =	9.941
CHANCE PROBABILITY	P =	.0125
STD ERROR OF ESTIMATE	=	6.7292
VARIANCE OF ESTIMATE	=	45.2824
DEGREES OF FREEDOM	=	2 AND 6
WITH X = flow	AND Y = surviv	

Figure 8. Quadratic equation that provided the best fit to data plotted in Figure 7; the relationship is notably different from that originally presented by Sims et al. (1983).

Predicted Survival, Yearling Chinook Average Per Project

Data from Sims et al. (1983)
Polynomial • best fit all data
Linear from Chapman et al (1991) >85 kcfs

Figure 9. Comparison of survival predicted from two different models. Data from Table 1. Quadratic Function from Figure 8. Linear model from Chapman et al. (1991) for flows greater than 85 kcfs.

Table 4. Average per project yearling chinook survival at prevailing indices of flow/WPTT in the Snake River. Predictions are made from two different models that were used to describe the data set. The linear model for flows above approximately 85 kcfs was taken from Chapman et al. (1991). The quadratic model was a recalculation of the broadly applied quadratic relationship presented by Sims et al. (1983), see figures 7 through 9 and related text for details. The predicted benefits are presented as % change associated with incremental decreases in WPTT. As a further basis of comparison the % change in smolt travel time as predicted from two models is presented; the polynomial as described in Figure 3 and Table 2, and the CBFWA model adopted from Berggren & Filardo (Table 2, Figure 5).

		Predicted Survival		% Change in: Survival			% Change in Travel Time	
Flow/WPTT		Quadratic	Linear	WPTT	Quadratic	Linear	Poly.	CBFWA
40	4.8	.49	--	--	--	--	--	--
60	3.2	.61	--	33	25	--	33	26
80	2.4	.71	.80	25	16	--	31	16
100	1.9	.77	.80	21	8	<1	18	13
120	1.6	.81	.80	16	5	<1	7	7
140	1.4	.82	.80	13	1	<1	0	8

Given the general nature of the data, the uncertainty regarding its quantitative merit, and the fact that the system survival estimates are not adjusted for other system effects apart from flow, I recommend these results be viewed as general rather than specific, reliable predictions. Both of these models suggest that below some critical flow level dramatic impacts are apparent, above that level benefits are slight to negligible. The critical level appears to lie between 80 and 100 kcfs, or based on data supplied by the USACE, an estimated per project average water particle travel time of approximately 1.9 to 2.4 days. These data suggest that alternatives that produce WPTT in this range should provide effective migratory conditions, in terms of smolt travel time and related survival. However, these potential benefits must be balanced against any negative effects associated with pool draw-down that will be addressed elsewhere in the EIS.

Fall Chinook; Subyearlings

There have been no investigations conducted in the Snake River which describe the relationship between migration speed or survival and flow, for fall chinook salmon. However, studies have been conducted in the Columbia River for the general subyearling chinook population, which is comprised of fall chinook stocks from both rivers, as well as summer chinook from the Columbia.

NMFS conducted a multi-year study of the migratory behavior of subyearling chinook in John Day Pool, during the years 1981-1983 (Sims and Miller 1982, Miller and Sims 1983, 1984). Freeze-branded and coded-wire tagged juvenile chinook were released into the McNary Dam tailrace. Based on three years of brand recoveries at John Day Dam, the authors concluded there was no relationship between fish travel time and flows ranging from 112 to 393 kcfs.

Giorgi et al. (1990) presented the adult contribution analysis for the NMFS study, and reanalyzed the travel time data. Their reanalysis included two variables in addition to flow, water temperature and date of release. Using stepwise regression procedures, they did not identify a relationship between travel time and flow, however, in two of the three years, release date and/or water temperature were entered into the

model. They noted that poor recovery capability at John Day Dam resulted in few recoveries for some marked groups, and recommended that any future investigations use improved recovery capabilities. Also, they cautioned that strong correlations observed among the independent variables would confound any regression analysis, which attempts to isolate the potential effects of any single variable.

In that same multi-year study Sims and Miller (1982) and Miller and Sims (1983, 1984) also described the movement patterns within the reservoir. Purse seine sampling at transects throughout the reservoir indicated that 54% of mark recaptures occurred either at, or upstream from, the original capture/release location in the reservoir, i.e., subyearlings were not exhibiting consistent downstream movement indicative of active migrants. One striking example was a fish released at river-kilometer 348, which was recaptured 104 days later 82 km upstream. These observations were made during years when flows, and associated water velocities, were at their highest levels (see the following text table as a basis of comparison across different years). The extended residence times and upstream movement indicate that subyearling chinook range and rear within the pool, and accounts for the protracted migration exhibited by subyearling chinook.

Based on analyses conducted by Berggren and Filardo (1991), CBFWA's assessment of subyearling chinook migratory behavior, as presented in their flow proposal, differs with the preceding characterization. Those authors regressed subyearling chinook travel time in John Day Pool against an index of flow for selected mark groups from the years 1981-1983 and from transport controls released in McNary tailrace, 1986-1988. The associated correlation was very weak, with an R-squared value of 0.33. CBFWA presented this analysis as the basis for the requested summer-flow volumes.

Predicting Fall Chinook Travel Time. Of the analyses conducted to date, none have identified a convincing substantive relationship between subyearling chinook migration speed and river flow/water velocity. However, the evaluations have all occurred in the mainstem Columbia River; the migratory dynamics in the Snake River may be different.

Until we have information regarding Snake River fall chinook, we are left to speculate.

Reservoir Rearing

Is extended reservoir residence deleterious to subyearlings? On the one hand, longer residence time increases exposure time to predators within the reservoir. However, subyearling's egress to environs below Bonneville Dam does not eliminate exposure to predators. Squawfish populations in the vicinity of Jones Beach increased substantively from 1966-1983 (Kirm et al. 1986). Thus, even if it was possible to speed the fish through one reach only to have them continue their extended freshwater residence in another area of predation, may afford little advantage to the subyearling population.

Furthermore, there is evidence that indicates that extended freshwater residence is beneficial to fall chinook. Reimers (1973) studying fall chinook in the Sixes River identified the optimum size at ocean entry to be about 130 mm. He noted that suitable length was attained by the juveniles that remained in fresh or estuarine waters for extended periods of time. We have seen that extended residence has been an obvious trait in the Columbia River, even before dam construction. Furthermore, summer residents in the Columbia River are the same size range of those in the Sixes River. At McNary Dam, the mean size of subyearling chinook increases steadily over the summer from about 90 mm in early June to near 140 mm in late August (Koski et al. 1985).

If, as the evidence suggests, fall chinook do not respond readily to increased water velocity, they will continue to rear in the Snake River pools. The various pool lowering scenarios being considered could dewater critical rearing habitat. If this habitat is limiting, serious negative effects could result. The early life history of Snake River fall chinook is poorly understood. A study is currently being initiated by the U. S. Fish and Wildlife Service to acquire such vital information. Until adequate data is available, effects of pool lowering on rearing habitat cannot be predicted.

A related effect is the potential downstream displacement of silt associated with reservoir draw-down and increased water velocity. It is difficult to assess the magnitude of such an event. However, there are a variety of computer-based hydraulic models that permit simulated assessments of water velocity/sediment load scenarios. It would be prudent to consider these tools in any sort of comprehensive treatment of this issue. The ecological impacts of silt displacement to environs downstream is uncertain.

Other Considerations

Reservoir draw-down will constrict the size of existing reservoirs. This in turn will probably concentrate predators and prey alike, potentially increasing predation on downstream migrants. This issue warrants attention when proposing draw-down scenarios. Consultation with USFWS and ODFW researchers who have studied predator dynamics is recommended. I suspect any implemented draw-down will need to include a concurrent assessment of predator/prey interaction.

Currently, there are no data that describe the travel time dynamics of sockeye salmon. This is of particular concern for the Snake River stock. We must rely on data from other species to provide insight. And as noted in this report data for other species are limited and have poor predictive capability.

Additional effects associated with reservoir draw-down include gas supersaturation accompanying spill. Also, turbine efficiency will decrease at lower head. Both of these conditions will have a negative effect on juvenile survival and will be addressed elsewhere by the USACE in the EIS.

Draw-down alternatives that disable smolt collection systems also eliminate existing smolt monitoring facilities including PIT tag detectors and brand-reading capabilities. To evaluate smolt responses under such alternatives would require the installation of new facilities/traps at existing or new sampling sites.

Furthermore, alternatives that disable collection systems preclude smolt transportation as an alternative passage strategy. A strategy that is recognized as the most effective for steelhead as well as fall chinook, and has been adopted by the fisheries agencies as a viable strategy for "spreading the risk" for other species. Furthermore, the vast numbers of steelhead that would remain inriver, rather than being removed and transported, may in themselves become effective predators on smolts, particularly subyearling fall chinook.

Although it is not one of the water management alternatives being considered in the context of this environmental impact assessment, pulsing flows through one or several pools may be an effective means to move smolts through reservoirs. Chapman et al. (1991) noted that observed short response time between changes in flow and corresponding fluctuations in smolt passage indices at Lower Granite Dam suggests smolts may be staging near the face of the dam. They hypothesize that rapid changes in forebay velocity may expedite passage by drawing smolts into the collection facility. If this mechanism functions as they hypothesize, pulsing water through one or more projects, particularly those equipped with collection systems, may be a viable passage strategy. It is advisable to note those same authors recommend transporting all smolts collected under this scheme.

Any of the water management alternatives presently being considered, that may be implemented in the future, should be considered experimental, and warrant thorough evaluation. It is apparent that we can predict few, if any, biological effects of the proposed activities. In fact, we cannot even predict whether the net effect of such alternatives will be positive or negative. Consequently, considerable effort will have to be devoted to designing biological evaluations that can be readily interpreted. Such evaluations will necessarily be multi-faceted and extremely difficult to design and implement. We cannot run the risk of assuming the draw-down alternative is beneficial, or of conducting a protracted test that may rely on adult returns for evaluation, only to learn the management alternative had devastating impacts.

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