APPENDIX F

Detailed Socioeconomic Assessment

UPPER COLUMBIA ALTERNATIVE FLOOD CONTROL AND FISH OPERATIONS EIS

SOCIOECONOMIC AFFECTED ENVIRONMENT

Appendix F: Part 1 of 2

prepared for:

U.S. Army Corps of Engineers
Seattle District

and

Bureau of Reclamation

prepared by:

Tetra Tech, Inc.
1925 Post Alley
Seattle, WA 98101

May 2005

UPPER COLUMBIA ALTERNATIVE FLOOD CONTROL AND FISH OPERATIONS EIS

SOCIOECONOMIC AFFECTED ENVIRONMENT

TABLE OF CONTENTS

Page F-

TABLES

Page F-

UPPER COLUMBIA ALTERNATIVE FLOOD CONTROL AND FISH OPERATIONS EIS

SOCIOECONOMIC AFFECTED ENVIRONMENT

1.0 Introduction

The Columbia River and its tributaries form the dominant water system in the Pacific Northwest Region. The mainstem of the Columbia rises in Columbia Lake on the west slope of the Rocky Mountain Range in Canada. After flowing a circuitous path for about 1200 miles, 415 miles of which are in Canada, it joins the Pacific Ocean near Astoria, Oregon. The river drains an area of approximately 219,000 square miles in the States of Washington, Oregon, Idaho, Montana, Wyoming, Nevada, and Utah. An additional 39,500 square mile portion of the basin, or about 15%, is within Canada. The major tributaries to the Columbia are the Kootenai and Flathead/Pend Oreille rivers, which drain southeastern British Columbia (BC), western Montana, and northern Idaho, the Snake River which drains western Wyoming, most of Idaho, eastern Oregon and southeastern Washington, and the Willamette River of western Oregon. (U.S.G.S, 9/02)

The Columbia River basin has been important to the peoples of the region for thousands of years, fostering the socioeconomic development of the region. First, the salmon runs, floodplains and wildlife sustained numerous Native American groups, and then as European settlers moved west the river became an important navigation corridor from the inland to the coast. The subsequent development of irrigation, hydropower and flood control facilities significantly facilitated the economic growth of the region.

The Columbia River system remains a very important component of the socioeconomic and natural environment through which it flows. The river system provides both direct and indirect economic benefits to the region. Socioeconomic categories evaluated in this EIS include:

- River-related recreation and associated employment and income
- Hydropower
- Flood control
- Navigation
- Agriculture and irrigation
- Municipal and industrial water supply
- Tribal socioeconomics

The affected environment and impact analysis for recreation are addressed in the **Recreation Sections** of the EIS. The affected environment and impact analysis for hydropower are addressed in the **Hydropower Sections** of the EIS. In this section, socioeconomic conditions in the Columbia basin for the remaining river uses listed above are discussed for three regional areas:

- Area 1 - Kootenai River Basin from Lake Koocanusa in Montana (MT) and British Columbia (BC) through Idaho (ID) to the Columbia River in BC
- Area 2 - Flathead/Clark Fork/Pend Oreille Basin from Hungry Horse Reservoir in MT to the Columbia River in Washington (WA)
- Area 3 - Columbia River mainstem from the mouth of the Kootenai River in BC downstream to the Pacific Ocean in Oregon (OR) and WA

All financial figures presented in this section are in Canadian dollars for Canadian locations and U.S dollars for U.S. locations.

2.0 Area 1 – Kootenai River Basin

Area 1 is dominated by federal and provincial forested and mountainous reserves including Kootenai National Forest (US), Panhandle National Forest (US), Flathead National Forest (US), Kootenay National Park (Canada), Purcell Wilderness (Canada), and many other smaller parks and private and public forest lands. Historically, miners settled this sub-basin followed by timber workers and the supporting communities that grew up around these natural resource industries. As the natural resource base has declined, other industries have become more important, particularly tourism.

Selected data on demographics, employment, and income for Area 1 are presented in the following paragraphs. **Table 1** summarizes the dams and reservoirs in Area 1.

Table 1: Dams and Reservoirs in Area 1

DAM	LAKE/ RESERVOIR	RIVER	LOCATION	YEAR COMPLETED	AUTHORIZED PURPOSE	CAPACITY	OPERATOR
Duncan	Duncan Reservoir	Duncan River	Howser, BC	1967	Flood Control	1,400,000 Acre-feet	BC Hydro
Libby	Lake Koocanusa	Kootenai	Libby, MT	1973	Flood Control	4,979,500 Acre-feet	U.S. Army Corps of Engineers
					Hydropower	525 MW	
Corra Linn	Kootenay Lake	Kootenay	Nelson, BC	1931	Hydropower	42 MW	BC Hydro
Upper Bonnington	n/a run of river	Kootenay	Nelson, BC	1907	Hydropower	63 MW	BC Hydro
Lower Bonnington	n/a run of river	Kootenay	Nelson, BC	1897	Hydropower	47 MW	BC Hydro
South Slocan	n/a run of river	Kootenay	Nelson, BC	1928	Hydropower	47 MW	BC Hydro
Kootenay Canal Generating Station	n/a run of river (side canal)	Kootenay	Nelson, BC	1976	Hydropower	529 MW	BC Hydro
Brilliant	n/a run of river	Kootenay	Castlegar, BC	1944	Hydropower	130 MW	Columbia Power

Sources: BC Hydro 2002; Hirst 1991

2.1 Area 1 Demographics

Area 1 includes portions of the East and Central Kootenay Regional Districts, BC; Lincoln County, MT; and Boundary County, ID. Cities and towns located adjacent to the Kootenai and Columbia Rivers are Cranbrook, Kimberley, Creston, Nelson, and Castlegar, BC; Eureka, Libby, and Troy, MT; and Bonners Ferry, ID. The following paragraphs provide an overview of selected Area 1 demographics in British Columbia, Montana and Idaho. **Table 2** presents a summary of this information for Area 1.

British Columbia. Approximately half of the population of the *East Kootenay Regional District* (RD) lives in the Cranbrook and Kimberley area, upstream of Lake Koocanusa. The East Kootenay RD is generally sparsely populated. The District's population in 2003 was 59,334. Annual population data shows that the population has been slowly increasing since 1999, with increases from 0.13 to 0.65 percent per year (an average annual growth rate from 1999-2003 of 0.44%). Growth is primarily attributable to births, and retirement and recreation population in-migration. (BC Ministry of Management Services 2004)

If the population of the East Kootenay RD increases at the same average annual rate as from 1999-2003, the population would be approximately 65,410 in 2025. The overall

projected population growth of British Columbia in whole to the year 2025 is estimated to be a 27% increase, an average annual increase of 1.09%. (BC Ministry of Management Services 2004). If the population of the District were to increase at the average annual rate projected for BC, the District's population would be approximately 75,280 in 2025.

The East Kootenay RD has an overall minority population of 7%, predominantly First Nation (Native American) peoples including those living in the Tobacco Plains and Kootenay Reserves. (BC Ministry of Management Services 2004)

Creston, Nelson and Castlegar are the major towns in the *Central Kootenay Regional District* and comprise approximately 40% of the overall district population. The Central Kootenay RD is also sparsely populated with a population in 2003 of 59,388. The population in this RD has been slowly declining since 1999 with decreases from 0.0 to 0.5 percent (annual average rate of -0.226%). If the population of the Central Kootenay RD continues to decline at the same average annual rate as from 1999-2003, the population would be approximately 56,500 in 2025. If the population of the District were to increase at the average annual rate projected for BC, the District's population would be approximately 75,350 in 2025.

The Central Kootenay RD has an overall minority population of 5%, again predominantly First Nation peoples. The Lower Kootenay (Yaqan Nukiy) Band main reserve is located near Creston. (BC Ministry of Management Services 2004)

Montana. *Lincoln County, Montana* is sparsely populated with a population of 18,835 in 2003. The largest towns in the county are Libby, Troy, and Eureka, all adjacent to the Kootenai River or its tributaries. The population of these towns, however, only accounts for about 25% of the county's population. The rest of the population is widely dispersed in rural areas and smaller towns. The population in Lincoln County increased by approximately 9% from 1990 to 2000 and has been estimated to be essentially steady since 2000 (0% annual average; US Census Bureau 2003 Population Estimates). This is below the average population increase for the nation since the 1990 census (13.2% increase). The State of Montana is projected to increase by approximately 11% from 2005 to 2025 (0.6% annual average; 1995 to 2025 Population Projections, U.S. Census Bureau). If the population of Lincoln County were to maintain as it has since the 2000 census, the population in 2025 would remain at approximately 18,835. If the population of Lincoln County were to increase at the Montana annual average projections, the population would be approximately 21,355 in 2025. Lincoln County has a small minority population (3.9%), predominantly Native American and Hispanic. (US Census Bureau 2004)

Idaho. *Boundary County, Idaho* is very sparsely populated with a population of 10,173 in 2003. The towns of Bonners Ferry and Moyie Springs, both on the Kootenai River, constitute approximately 33% of the county's population. The population of Boundary County increased approximately 15.6% from 1990 to 2000, and has increased slightly (~2.5 %) since 2000 (0.8% annual average; US Census Bureau 2003 Population Estimates). The population increased slightly faster than the national average from 1990

to 2000. The State of Idaho is projected to increase by approximately 17.5% from 2005 to 2025 (0.9% annual average; 1995 to 2025 Population Projections, U.S. Census Bureau). If the population of Boundary County were to increase as it has since the 2000 census, the population would be approximately 12,175 in 2025. If the population of Boundary County were to increase at the Idaho annual average projections, the population would be approximately 12,390 in 2025. Boundary County has a small minority population of ~4%, comprising predominantly individuals of Hispanic or Native American descent. (US Census Bureau 2004) The Kootenai Reservation is located along the Kootenai River in Boundary County.

Table 2: Selected Demographic and Socioeconomic Information for Area 1

	POPULATION ESTIMATE[1]	MEDIAN PER CAPITA INCOME[2]	% OF STATE/ PROVINCE INCOME[2]	% BELOW POVERTY LINE[2]	% MINORITY POPULATION[2]
STATES/PROVINCES IN AREA 1					
British Columbia	4,146,580	$22,095	not applicable	no data	26.0%
Montana	917,621	$17,151	not applicable	14.6%	9.4%
Idaho	1,366,332	$17,841	not applicable	11.8%	4.8%
CITIES/COUNTIES/REGIONAL DISTRICTS IN AREA 1					
East Kootenay Regional District	59,334	$21,732	98.4%	no data	7.0%
Cranbrook	24,275	$28,975	131.1%	no data	8.0%
Kimberley	6,484	$29,679	134.3%	no data	4.0%
Central Kootenay Regional District	59,388	$19,008	86.0%	no data	5.0%
Creston	4,795	$23,935	108.3%	no data	4.0%
Nelson	9,298	$25,041	113.3%	no data	5.0%
Castlegar	7,002	$31,601	143.0%	no data	5.0%
Lincoln County, Montana	18,835	$13,923	81.2%	19.2%	3.9%
Eureka	1,009	$12,619	73.6%	22.9%	3.2%
Libby	2,606	$13,090	76.3%	16.3%	4.5%
Troy	963	$10,620	61.9%	27.5%	4.2%
Boundary County, Idaho	10,173	$14,636	82.0%	15.7%	4.8%
Bonners Ferry	2,647	$13,343	74.8%	20.0%	4.3%

Notes:

[1]U.S. State and county population estimates are for 2003 from U.S. Census Annual Population Estimates, Release Date: April 9, 2004.
U.S. city/town population estimates are for 2003 from U.S. Census Annual Population Estimates FRO Incorporated Places, Release Date: June 24, 2004.
Canadian Province, Regional District, and city/town population data are for 2003 from BC Stats Community Facts, release date October 06, 2004.

[2]Canadian income and minority population data are for 2000 from the 2001 Census
U.S. data on income, poverty, and minority population are for 1999 from the 2000 Census.

2.2 Area 1 Employment and Income

Area 1 is a forested mountainous region with a historically strong natural resources industry including timber and mining. Tourism and recreation have become important components of the regional economy and government employment is also important. Agriculture is less important in this area relative to per capita employment. The population base is small and does not support a large number of manufacturing industries, but a few are important and are described below. Area 1 employment and income data are presented below for British Columbia, Montana and Idaho.

British Columbia. The major industries in the Central and East Kootenay Regional Districts, BC include forestry, mining, tourism, technology and electronics, construction, agriculture, and retail and commercial businesses. Federal, provincial, and local governments (including school districts) are the dominant employers. Forestry is an important employer in the Castlegar region, as well as Selkirk College and other educational facilities. Other major employers in Cranbrook and Kimberley include Tembec Industries, Ltd (forestry) and Cominco (mining, fertilizer). Nelson is the provincial administrative center for the Central Kootenay Regional District.

Lake Koocanusa and Kootenay Lake in British Columbia are tourist attractions for fishing, hunting, camping, and boating. Small towns and resorts are located along Lake Koocanusa catering to fishers and campers. The agriculture, hydropower, and tourism industries are most closely related to the river and reservoir system.

Sources of community income by percent of total income in the Kootenay Region, BC are shown in **Table 3**. As shown in Table 3, transfer payments such as retirement benefits and other social services rank as the second most important source of income, following public sector income. This reflects the overall attractiveness of the Kootenay Region, BC as a retirement area. Other major sources of income to the population in various communities in the region are forestry, mining and tourism, in that order. (BC Ministry of Management Services 2004)

Table 3: Percent of Income of Various British Columbia Industries in Area 1

	CRANBROOK-KIMBERLEY REGION	CASTLEGAR REGION	NELSON REGION	CRESTON REGION
FORESTRY	14	25	13	10
MINING	9	6	2	2
FISHING	0	0	0	0
AGRICULTURE	1	0	1	7
TOURISM	8	3	7	5
HIGH TECH	0	1	2	0
PUBLIC SECTOR	25	23	30	23
CONST	6	9	8	5
OTHER	5	3	2	2
TRANSFER PAYMENTS	18	18	19	29

Source: BC Ministry of Management Services 2004

Montana. The federal government owns approximately 72% of the area of Lincoln County, Montana. Lake Koocanusa, Kootenai National Forest and wilderness areas within Lincoln County are tourist destinations for fishing, boating, camping, hiking, and hunting. The major industries in the county include government (Federal, state, and local), retail trade, forestry, manufacturing, construction, and health care/social assistance. Major employers in Libby include Plum Creek Lumber Company, hospitals and health care facilities, First National Bank, and city, county and federal government.

The per capita money income in Lincoln County was reported as $13,923 in the 2000 Census; for comparison, this was approximately 81% of the Montana average. Approximately 19.2% of the population of the county lived below poverty level in 1999; for comparison, this was higher than the state average of 14.6% in that year. Historically, forestry and mining were major employers in the area, but have declined over many years and now provide a relatively smaller number of jobs (~8% of county employment--US Census Bureau 2004 and Bureau of Economic Analysis 2004). The percent of employment by industry in Lincoln County is summarized in **Table 4**.

Idaho. *Boundary County, Idaho* is dominated by 61% federally owned lands, including the Panhandle National Forest. The Kootenai River and Panhandle National Forest are tourist destinations for fishing, camping, hiking, and hunting. The major industries in the county include agriculture, forestry, health care, transportation, and government.

The per capita income in Boundary County was reported as $14,636 in the 2000 Census, approximately 82% of the state average. Approximately 15.7% of the population lived below poverty level in 1999, for comparison, this rate was higher than the state average of 11.8% in that year. Historically, transportation and supply to the mining and timber industries were large employers. Mining and timber were also major employers. Currently, timber and agriculture are still dominant industries, including Crown Pacific and Louisiana-Pacific, but CEDU Education Service (Rocky Mountain Academy) is the largest employer in the county. The Kootenai Tribe operates the Kootenai River Inn and Casino, which is also a relatively large employer. The Boundary Community Hospital, school district, and local and federal government are also major employers (US Census Bureau 2004 and Bureau of Economic Analysis 2004). Boundary County's employment by industry is summarized in **Table 4**.

Table 4: Percent Employment by Industry in the U.S. Portion of Area 1

	LINCOLN COUNTY, MT	BOUNDARY COUNTY, ID	AREA 1 AVERAGE (U.S.)
AGRICULTURE	6.8	14.2	10.5
FORESTRY AND FISHING	7.4	6.6	7.0
MINING	0.5	0.2	0.4
CONSTRUCTION	7.3	7.4	7.4
MANUFACTURING	9.5	9.7	9.6
RETAIL TRADE	11.7	10.1	10.9
TRANSPORTATION/WAREHOUSING	3.0	3.2	3.1
INFORMATION	1.4	0.8	1.1
FINANCE/INSURANCE	2.2	1.1	1.7
REAL ESTATE	4.5	2.7	3.6
PROFESSIONAL/TECHNICAL	3.4	3.8	3.6
EDUCATION	0.4	1.4	0.9
HEALTH CARE/SOCIAL ASSISTANCE	9.9	11.7	10.8
RECREATION/ENTERTAINMENT	2.0	0.9	1.5
ACCOMODATION/RESTAURANT	6.7	3.3	5.0
OTHER SERVICES	6.9	1.7	4.3
GOVERNMENT	16.5	21.3	18.9

SOURCE: Employment data is for 2002 as presented in Table CA25N – Total full-time and part-time employment by industry, Bureau of Economic Analysis, Regional Economic Information System, Table CA25 (NAICS), May 2004.

2.3 Area 1 Flood Control

In the U.S. portion of Area 1, economic losses from flooding have historically occurred along the Kootenai River, between Bonners Ferry, Idaho and Kootenay Lake, in Canada. This area is downstream of Libby Dam and is referred to informally as Kootenai Flats. Historically, high water from rain on snow events and snowmelt runoff would cover portions of the floodplain every year and less frequent events would flood the entire valley of more than 60,000 acres. Levees were constructed to protect about 35,000 acres of croplands in the United States and about 17,000 acres of agricultural land in Canada. Construction of Libby Dam provided further flood control in the area by providing flood control storage. (BPA *et al.* 1995, SOR EIS Main Report)

Bonners Ferry and Kootenai Flats floodplain land use and infrastructure with flood protection includes:

- 35,000 acres of agricultural croplands in U.S.
- 17,000 acres of agricultural croplands in Canada
- 190 acres of commercial and residential development in Bonners Ferry, ID
- Other transportation and public infrastructure

The zero-damage stage for the Bonners Ferry and Kootenai Flats floodplain has been identified at 1764 ft-msl.

In Canada, flooding from Kootenay Lake is a concern. The 1972 Columbia River Treaty Flood Control Operating Plan (FCOP) states that "damage commences at Nelson when Kootenay Lake reaches elevation 1755 feet and the major damage stage is elevation 1759 feet" (Corps 1972). Since 1972, encroachment around Kootenay Lake has occurred, and studies are being planned for identification of development and damages below elevation 1755 feet. A 2004 study involving interviews with Kootenay Lake stakeholders identified water levels as detrimental when above elevation 1750 feet. (BC Hydro *et al.* 2004)

2.4 Area 1 Navigation

The Canadian Ministry of Highways operates the Kootenay Lake Ferry. The 35 minute ferry crossing runs across Kootenay Lake, 20 miles east of Nelson on Highway 3A, between Balfour and Kootenay Bay. Year-round daily service is offered for car, truck and foot passengers.

Recreational Boating is discussed in the **Recreation Affected Environment Section** and the **Recreation Impact Sections** of this EIS.

2.5 Area 1 Agriculture and Irrigation

East and Central Kootenay Regional Districts, Canada: The East Kootenay RD is primarily a ranching area, although farming is also carried out. Total farm sales receipts from the East Kootenay RD in 2001 were approximately $15 million. Hay, much of which is irrigated, is the largest crop and is produced for cattle use. Alfalfa, oats, and barley are other crops produced in the area. Approximately 221,000 square ft of greenhousing is also present in the RD.

The Central Kootenay RD has a large area of prime farmland around Creston. Field vegetables and tree fruits grown here on irrigated fields include potatoes, peas, beans, apples, and berries. The dairy industry is important in this area. Total farm sales receipts in the Central Kootenay RD were approximately $26,000,000 Canadian in 2000 (U.S. equivalent equals $34,068,000, BC Ministry of Management Services 2004).

Lincoln County, Montana: Approximately 54,000 acres are farmed in Lincoln County, with about 4,700 acres irrigated (~9%). Major agricultural products include livestock and poultry such as beef cows, milk cows, hogs and pigs, sheep and lambs, and chickens. Hay and pastureland is the other dominant crop, with small amounts of oats and barley grown for grain. A total of 15 acres is in vegetable or fruit production in the county. The market value of the County's agricultural products sold in 2002 was $2,516,000. Net cash income is the cash earnings realized within a calendar year from the sales of farm production and the conversion of assets, both inventories (in years in which reduced) and capital consumption, into cash. Net cash farm income is a solvency measure representing the funds that are available to farm operators to meet family living expenses and make debt payments. The county's 2002 net cash farm income totaled -$478,000, an average of -$1,589 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002) A

summary of Lincoln County agricultural and irrigation information is presented in **Table 5**.

Boundary County, Idaho: Approximately 76,000 acres are farmed in Boundary County with about 2,750 acres irrigated (<4%). Major agricultural products primarily include wheat and both beef and milk cows. Hay and alfalfa are also dominant crops with oats and barley for both grain and forage. Specialty crops include hops and tree fruits (apples). The market value of the County's agricultural products sold in 2002 was $2,822,000. The county's 2002 net cash farm income totaled $6,545,000, an average of $15,115 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002) A summary of Boundary County agricultural and irrigation information is presented in **Table 5**. Approximately 2,200 acres are farmed by the Kootenai Tribe and include grain and hay crops.

Table 5: Agricultural and Irrigation Summary Statistics for the U.S. Portion of Area 1

COUNTY, STATE	LAND IN FARMS	TOTAL CROPLAND	HARVESTED CROPLAND	IRRIGATED ACRES	IRRIGATED ACRES AS % OF HARVESTED CROPLAND	COUNTY'S NET CASH FARM INCOME
Boundary, ID	76,506	47,706	40,440	2,750	7%	$6,545,000
Lincoln, MT	54,236	18,696	9,188	4,762	52%	-$478,000

Source: USDA - NASS 2002

2.6 Area 1 Municipal and Industrial Water Supply

The Kootenai River and the reservoirs are used to provide municipal and industrial (M&I) water supply for several communities and private landowners in Area 1. **Table 6** is a summary of municipal, domestic and industrial water withdrawals in the U.S. Portion of Area 1 in 2000 (USGS 2000).

Table 6: Selected Statistics for M&I Water Supply for the U.S. Portion of Area 1

	LINCOLN COUNTY, MONTANA	BOUNDARY COUNTY, IDAHO
TOTAL POPULATION (x1,000)	18.84	9.87
TOTAL POPULATION SERVED BY PUBLIC SUPPLY (x1,000)	7.19	6.81
TOTAL PUBLIC SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	0.46	1.00
TOTAL DOMESTIC SELF-SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	0.04	0.00
TOTAL INDUSTRIAL SELF-SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	13.77	0.20

Source: http://water.usgs.gov/watuse/

2.7 Area 1 Tribal Socioeconomics

The recognized Native American Tribes and Bands located in the Kootenai sub-basin include the Kootenay and Tobacco Plains bands in British Columbia, and the Kootenai Tribe of Idaho in northern Idaho. The reserves and reservations are all located along the Kootenai River. The Tobacco Plains Reserve is located near Grasmere and encompasses approximately 10,800 acres. The reserve is located in the rolling hills and flat areas in the Kootenay River valley and the primary industries are forestry and agriculture. Commercial development includes a restaurant, gas station and duty-free shop (Tobacco Plains Website 2004).

The Lower Kootenay Indian Band reserve is located near Creston and is approximately 6000 acres. Agriculture is the primary economic activity including fruit, corn, wheat and barley. Other development includes recreational guiding and outfitting and tribal operations such as the elementary school and other administration. The Lower Kootenay Indian Band also holds an annual Pow Wow which is a tourist attraction (Lower Kootenay Indian Band Website 2004).

The Kootenai Tribe reservation is located north of Bonner's Ferry along the Kootenai River. The Kootenai River Inn and Casino is the major employer. The tribal business/administration operations and the fish hatchery also employ many tribal members. Approximately 2200 acres are farmed for hay, grains, and livestock; none of the agricultural lands are irrigated. Currently, their agricultural lands are subject to spring flooding and poor drainage. (P. Perry, Kootenai Tribe, pers. comm. 10/2004).

3.0 Area 2 – Flathead, Clark Fork, Pend Oreille River Basins

Area 2 is dominated by federal reserves, tribal lands and parks including the Flathead National Forest, Kootenai National Forest, Idaho Panhandle National Forest, Kaniksu National Forest, Colville National Forest, Lolo National Forest and Flathead Indian Reservation.

The Flathead Valley was developed and settled during and following the construction of the Great Northern Railroad. Major industries in this sub-basin were historically natural resource based including timber, mining, and agriculture. In more recent times, other industries such as tourism are becoming more important.

Table 7 provides a summary of dams and reservoirs in Area 2.

Table 7: Dams and Reservoirs in Area 2

DAM	LAKE/ RESERVOIR	RIVER	LOCATION	YEAR COMPLETED	AUTHORIZED PURPOSE	CAPACITY	OPERATOR
Hungry Horse	Hungry Horse Reservoir	S. Fork Flathead	Hungry Horse, MT	1953	Flood Control	2,982,000 ac-ft	U.S. Bureau of Reclamation
					Hydropower	428 MW	
					Irrigation		
Kerr Dam	Flathead Lake	Flathead	Polson, MT	1938	Hydropower	168 MW	PPL Montana
					Irrigation		
Thompson Falls	Thompson Falls Reservoir	Clark Fork	Thompson Falls, MT	1915	Hydropower	197 MW	PPL Montana
Noxon Rapids Dam	Noxon Reservoir	Clark Fork	Noxon, MT	1959	Hydropower	466 MW	Avista Corp.
Cabinet Gorge Dam	Cabinet Gorge Reservoir	Clark Fork	Cabinet, ID	1952	Hydropower	231 MW	Avista Corp.
						42 MW	
						1,155,200 ac-ft	
Albeni Falls Dam	Lake Pend Oreille	Pend Oreille	2.5 miles east of Newport, WA	1955	Hydropower	42.6 MW	U.S. Army Corps of Engineers
					Flood Control	1,155,200 ac-ft	
					Navigation		
Box Canyon Dam	Box Canyon Reservoir	Pend Oreille	Ione, WA	1956	Hydropower	60 MW	Pend Oreille Public Utility District PUD
Boundary Dam	Boundary Dam Reservoir	Pend Oreille	Metaline, WA	1967	Hydropower	1050 MW	Seattle City Light
Seven Mile	Pend Oreille Reservoir	Pend d'Oreille	Near Trail, BC	1979	Hydropower	608 MW	BC Hydro
Waneta	Waneta Reservoir	Pend d'Oreille	Near Trail, BC	1954	Hydropower	375 MW	Cominco, Columbia Power

3.1 Area 2 Demographics

Area 2 includes portions of the Central Kootenay Regional Districts, BC; Flathead, Lake, and Sanders Counties in MT; and Bonner County, ID; and Pend Oreille County, Washington. Cities and towns located along the rivers include Hungry Horse, Columbia Falls, Polson, Thompson Falls, Kalispell and Noxon, MT; Clark Fork, Sandpoint, and Priest River, ID; and Newport, Ione and Metaline Falls, WA. The following paragraphs provide an overview of selected Area 2 demographic data organized by British Columbia, Montana, Idaho, and Washington. **Table 8** presents a summary of selected demographic and socioeconomic information for Area 2.

British Columbia. A short reach of the Pend d'Oreille River flows through the *Central Kootenay RD*, but no large towns or cities are located along this stretch of river in Canada.

Montana. The several forks of the Flathead River flow primarily out of national park or wilderness areas and join near Hungry Horse and Columbia Falls, MT in Flathead County.

Flathead County had a population of 79,485 in 2003. The major population center and county seat is Kalispell. Other larger towns include Whitefish and Columbia Falls. The greater Kalispell area comprises approximately 43% of the county's population. The population of Flathead County increased 23% from 1990 to 2000, nearly double the average rate for the nation. Average annual population increases since 2000 have been approximately 2% (2003 Population Estimates, U.S. Census Bureau). If Flathead County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 121,715. If the population in Flathead County were to increase at the Montana annual average (.6%), the population in 2025 would be approximately 88,335. Flathead County is likely to continue to increase in population faster than the State of Montana as a whole. Flathead County has a small minority population of 3.7%, predominantly individuals of Native American and Hispanic descent.

The Flathead River flows through Flathead Lake and Lake County, MT.

Lake County had a population of 27,195 in 2003. The largest city in Lake County is Polson, the county seat, which comprises approximately 15% of the county's population. Polson is located within the Flathead Indian Reservation. The population of Lake County increased substantially (38%) from 1990 to 2000. Since 2000, annual average growth has been approximately 0.7%. If Lake County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 31,510. If the population in Lake County were to increase at the Montana annual average, the population in 2025 would be approximately 30,780. Lake County has a substantial minority population of 28.6%, predominantly Native American. Downstream of Flathead Lake, The Flathead River forms the boundary between Lake and Sanders Counties, MT before it joins the Clark Fork River and flows northwest through sparsely populated Sanders County, MT.

Sanders County had a population of 10,455 in 2003. The largest town is Thompson Falls, but generally the population is highly dispersed in several small towns located along the Clark Fork River and other rural areas, including the Flathead Indian Reservation. The population of Sanders County increased 20% from 1990 to 2000, and has averaged approximately 0.6% annual growth since 2000 (2003 Population Estimates, U.S. Census Bureau). If Sanders County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 12,035. If the population in Sanders County were to increase at the Montana annual average, the population in 2025 would be approximately 11,900. Sanders County has a minority population of 8.1%, predominantly Native American and Hispanic. (All information from US Census Bureau 2000 Census and 2003 Population Estimates)

Idaho. The Clark Fork River ends when it enters Pend Oreille Lake and continues as the Pend Oreille River as it flows through Bonner County, ID.

Bonner County had a population of 39,160 in 2003. The largest town is the county seat, Sandpoint, which comprises approximately 18.6% of the county's population. Other towns along the river include Clark Fork and Priest River. The population of Bonner County increased by approximately 29% from 1990 to 2000, and has continued increasing by an average annual rate of approximately 1.9% since 2000 (2003 Population Estimates, U.S. Census Bureau). If Bonner County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 59,120. If the population in Bonner County were to increase at the Idaho annual average, the population in 2025 would be approximately 47,695. Bonner County has a small minority population of 3.4%, predominantly Hispanic and Native American. (All information from US Census Bureau 2000 Census and 2003 Population Estimates)

Washington. The Pend Oreille River flows north through Pend Oreille County, WA to the Canadian border.

Pend Oreille County is sparsely populated and had a population of 12,254 in 2003. The largest town along the river is Newport, with approximately 16% of the county's population. The remainder of the population is dispersed among several other small towns and rural areas along the river and south. The population of Pend Oreille County increased by 24% from 1990 to 2000 and has continued increasing by an annual average of 1.4% since 2000. The State of Washington population is projected to increase by nearly 25% from 2005 to 2025 (annual average of 1.2%; Population Projections 1995 to 2025, U.S. Census Bureau). If Pend Oreille County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 16,725. If the population in Pend Oreille County were to increase at the Washington annual average, the population in 2025 would be approximately 15,930. Pend Oreille County has a small minority population of 6.5%, predominantly Hispanic, Native American and Asian. The Kalispel Indian Reservation is located north of Newport. (All information from US Census Bureau 2000 Census and 2003 Population Estimates)

Table 8: Selected Demographic and Socioeconomic Information for Area 2

	POPULATION ESTIMATE[1]	MEDIAN PER CAPITA INCOME[2]	% OF STATE/ PROVINCE INCOME[2]	% BELOW POVERTY LINE[2]	% MINORITY POPULATION[2]
STATES/PROVINCES IN AREA 2					
British Columbia	4,146,580	$22,095	not applicable		26.0%
Montana	917,621	$17,151	not applicable	14.6%	9.4%
Idaho	1,366,332	$17,841	not applicable	11.8%	4.8%
Washington	6,131,445	$22,973	not applicable	10.6%	18.2%
CITIES/COUNTIES/REGIONAL DISTRICTS IN AREA 2					
Central Kootenay Regional District	59,388	$19,008	86.0%	no data	5.0%
Flathead County, Montana	79,485	$18,112	105.6%	13.0%	3.7%
Kalispell	16,391	$16,224	94.6%	15.9%	4.2%
Hungry Horse	934	$10,530	61.4%	29.7%	5.1%
Columbia Falls	3,963	$14,355	83.7%	17.1%	3.7%
Evergreen	6,215	$14,277	83.2%	14.2%	5.2%
Lake County, Montana	27,197	$15,173	88.5%	18.7%	28.6%
Polson	4,497	$13,777	80.3%	19.8%	21.8%
Sanders County, Montana	10,455	$14,593	85.1%	17.2%	8.1%
Plains	1,169	$13,010	75.9%	20.3%	4.1%
Thompson Falls	1,323	$13,245	77.2%	16.1%	3.3%
Noxon	230	$14,350	83.7%	14.7%	2.6%
Bonner County, Idaho	39,162	$17,263	100.7%	12.4%	3.4%
Clark Fork	566	$13,979	81.5%	20.8%	6.0%
Sandpoint	7,378	$20,643	120.4%	18.0%	3.8%
Priest River	1,863	$14,125	82.4%	18.9%	5.3%
Pend Oreille County, Washington	12,254	$15,731	68.5%	18.1%	6.5%
Newport	2,105	$13,900	60.5%	23.6%	5.4%
Ione	487	$12,093	52.6%	16.4%	7.3%
Metaline Falls	226	$16,390	71.3%	33.2%	5.1%

Notes:

[1]U.S. State and county population estimates are for 2003 from U.S. Census Annual Population Estimates, Release Date: April 9, 2004. U.S. city/town population estimates are for 2003 from U.S. Census Annual Population Estimates FRO Incorporated Places, Release Date: June 24, 2004.

Canadian Province, Regional District, and city/town population data are for 2003 from BC Stats Community Facts, release date October 06, 2004.

[2]Canadian income and minority population data are for 2000 from the 2001 Census

U.S. data on income, poverty, and minority population are for 1999 from the 2000 Census.

3.2 Area 2 Employment and Income

Area 2 is primarily a forested mountainous region, but there are large open valleys in some areas (Montana) suitable for extensive agriculture. Forestry has historically been and continues to be a major part of the economy; but tourism, government and health care are now very important industries with higher employment than natural resource extraction industries. Area 2 employment and income data are discussed below for British Columbia, Montana, Idaho, and Washington. A summary of employment data by industry is provided in **Table 9**.

British Columbia. This sparsely populated reach of the Pend Oreille River is dominated by hilly and mountainous forestlands. The major industries are timber and ranching (BC Ministry of Management Services 2004).

Montana. *Flathead County, Montana* primarily consists of federally owned lands, particularly the Flathead National Forest, which includes the Great Bear and Bob Marshall Wilderness areas, and it is the western gateway into Glacier National Park. These are tourist destinations for camping, hiking, fishing, boating and hunting. Hungry Horse Reservoir and Flathead Lake are also tourist destinations for fish and boating in Area 2. Whitefish is well known as a ski destination. Education, health care and social services, retail, construction, manufacturing, and tourism are the major industries in the region (Kalispell Chamber of Commerce web site 2004). High-tech industry is becoming important in the area.

Some of the major employers in Kalispell include American Timber and Plum Creek Timber Companies, Big Mountain Ski Resort, Semitool, Burlington Northern, Wal-Mart, Columbia Falls Aluminum, hospitals and retirement/nursing homes, Flathead Valley Community College and school districts, and federal, state, and local government. Agriculture is also an important industry with products such as cattle, wheat, barley, hay, and fruit crops.

The 2000 census reported that the average per capita money income in Flathead County was $18,112, which was 105% of the state average. Approximately 13.0% of the population lived below poverty level in 1999, for comparison, this rate was less than the state average of 14.6% in that year. (US Census Bureau 2004)

Lake County, Montana comprises the Flathead Indian Reservation and Flathead Lake. There are also numerous wildlife refuges and state parks. These are all tourist destinations for activities such as fishing, camping, boating, and wildlife watching. However, government and agriculture are the larger industries in Lake County. Major employers in the area include Salish Kootenai College, and various health care and nursing facilities. The tourism industry is dispersed around Flathead Lake and near other destinations and supports numerous accommodation, restaurant, golf courses, marinas, and outfitters.

The 2000 census reported the County's average per capita money income at $15,173, approximately 88% of the state average. Approximately 18.7% of the population lived below poverty level in 1999, for comparison, this rate was above the state average of 14.6% in that year. (US Census Bureau 2004)

Sanders County, Montana is primarily comprises the Flathead Indian Reservation, Lolo National Forest, and Thompson River State Forest. There is a moderate amount of tourism for camping, hiking, fishing, and boating. The major industries are agriculture, retail, and government. Thompson Falls is the county seat and headquarters for all county government.

The 2000 census reported that the County's average per capita money income at $14,593, approximately 85% of the state average. Approximately 17.2% of the population lived below poverty level in 1999, for comparison, this rate was above the state average of 14.6%. (US Census Bureau 2004)

Idaho. *Bonner County, Idaho* has less federally owned land than other portions of the sub-region, although Panhandle National Forest comprises a large portion of the county. Tourism is a major component of the economy between Schweitzer Mountain Resort ski area and Pend Oreille Lake. Major employers include Coldwater Creek (catalog), Stimson Lumber, J.D. Lumber, and Riley Creek Lumber, Litehouse (food product manufacturing), Schweitzer Mountain Resort, government, and various health care and nursing facilities. Agriculture is also an important part of the economy.

The 2000 census reported that County's average per capita money income to be $17,263, 97% of the state average. Approximately 15.5% of the population lived below poverty level in 1999, for comparison, this rate was slightly higher than the state average of 11.8 that year. (US Census Bureau 2004)

Washington. *Pend Oreille County, Washington* is predominantly comprised of the Colville and Kaniksu National Forests. Due to its remote location it is not a major tourist destination, although some hunting and fishing take place. Agriculture, manufacturing, and government are the dominant industries, including agricultural products such as hay, beef and poultry.

The 2000 census reported that the County's average per capita income at $15,731, approximately 68% of the state average. Approximately 18.1% of the population lived below poverty level in 1999, for comparison, this rate was higher than the state average of 10.6%. (US Census Bureau 2004)

Table 9: Percent Employment by Industry for the U.S. Portion of Area 2

	FLATHEAD COUNTY, MT	LAKE COUNTY, MT	SANDERS COUNTY, MT	BONNER COUNTY, IDAHO	PEND OREILLE COUNTY, WA	AVERAGE AREA 2 (U.S.)
AGRICULTURE	4.2	17.9	18.1	5.6	15.2	12.2
FORESTRY AND FISHING	1.8	1.7	5.2	3.8	D	3.1
MINING	0.6	0.4	1.1	0.6	D	0.7
CONSTRUCTION	9.4	7.5	7.1	10.0	5.2	7.8
MANUFACTURING	6.5	6.8	7.1	8.8	12.1	8.3
RETAIL TRADE	14.0	11.4	9.2	15.6	8.2	11.7
TRANSPORTATION/WAREHOUSING	2.4	D	3.2	2.0	3.6	2.8
INFORMATION	1.4	1.2	0.9	1.2	1.3	1.2
FINANCE/INSURANCE	3.9	2.8	2.1	3.0	2.4	2.8
REAL ESTATE	5.5	3.5	4.8	6.0	2.0	4.4
PROFESSIONAL/TECHNICAL	6.4	3.6	3.0	5.1	2.3	4.1
EDUCATION	0.9	0.5	D	1.2	D	0.9
HEALTH CARE/SOCIAL ASSISTANCE	9.4	10.3	D	6.0	D	8.6
RECREATION/ENTERTAINMENT	3.4	1.9	1.4	4.0	D	2.7
ACCOMODATION/RESTAURANT	9.2	6.5	6.3	6.7	D	7.2
OTHER SERVICES	11.6	4.4	16.4	8.8	17.2	11.7
GOVERNMENT	9.3	19.6	14.0	11.8	30.0	16.9

NOTES:
(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included as "Other Services".
SOURCE: Employment data is for 2002 as presented in Table CA25N – Total full-time and part-time employment by industry, Bureau of Economic Analysis, Regional Economic Information System, Table CA25 (NAICS), May 2004.

3.3 Area 2 Flood Control

In Area 2, economic losses from flooding have historically occurred along the Flathead River, Flathead Lake, Clark Fork River, Pend Oreille River, and Pend Oreille Lake. Flood regulation in Area 2 is provided by Hungry Horse Dam on the South Fork, Flathead River; Kerr Dam on the Flathead River; and Albeni Falls Dam on the Pend Oreille River. Economic effects associated with flooding in Area 2 are described below for the following sub areas:

- Columbia Falls to Flathead Lake (Flathead River)
- Flathead Lake (Flathead River)
- Pend Oreille Lake (Pend Oreille River)
- Albeni Falls, ID to Cusick, WA (Pend Oreille River)

Columbia Falls to Flathead Lake (Flathead River): The Flathead River upstream drainage from Flathead Lake comprises of agricultural property upstream near Columbia Falls and becomes more commercial and residential downstream through Kalispell to Flathead Lake. The floodway is broad, extending one to three miles in width. Flood regulation occurs at Hungry Horse Dam and typically the controlled flood event duration is short, on the order of days. Additional flood control works have been constructed along the river including levees, channel realignments, and bank protection and erosion control measures. Flood stage discharge at Columbia Falls is identified as 51, 500 cfs. Minor localized flooding can occur at discharges above 44,500 (BPA 1995f).

Flathead Lake: Historic data indicate that there are no significant flood losses for Flathead Lake and that flooding has not been a problem since the construction of Kerr Dam in 1938. Kerr Dam is primarily operated to prevent flooding in upstream areas caused by the lake backwater effect. The zero-damage stage for Flathead Lake has been identified as 2893 ft-msl (coincident with river flow above 51,500 c.f.s. (BPA 1995).

Pend Oreille Lake (Pend Oreille River): The normal operating range of Albeni Falls Dam, which controls the level of Lake Pend Oreille, is 2,051.0 to 2,062.5 ft-msl. Albeni Falls Dam operates to control flooding along the river and lakeshore upstream of the dam. The 2,062.5 ft-msl elevation represents the zero-damage stage (BPA 1995f).

Albeni Falls Dam to Cusick, WA (Pend Oreille River): In the Albeni Falls Dam to Cusick reach, flood losses occur on agricultural and the Kalispel Reservation lands. Historical flood control levees are no longer maintained since the construction of Albeni Falls Dam (BPA, 1995f, B-14).

This reach can be impacted by two types of flooding: 1) agricultural flooding in March and April as a result of early spring runoff from Calispell and Trimble Creeks and 2) flooding in June due to high flows in the Pend Oreille River from high elevation snowmelt.

Farmers near Cusick may have problems draining their fields in late March and April when Calispell and Trimble Creeks are running high and flows in excess of 43,000 cfs are passed through Lake Pend Oreille. Pend Oreille PUD operates Box Canyon Dam and pumping facilities at the mouth of the creeks to minimize backwater effects on agricultural lands.

Flooding below Albeni Falls Dam in June is due to spring snowmelt, and is a relatively common occurrence happening historically about one year in four. The National Weather Service issues flood warnings when the releases from Albeni Falls Dam are expected to exceed 100,000 cfs.

3.4 Area 2 Navigation

There is currently no commercial navigation at Albeni Falls Dam. For a short time, the dam's unique log chute feature was used to transport logs from the dam to the Diamond Match Company downstream during the 1950s. The chute was used about four years until hauling logs by trucks became more cost effective. The log chute hasn't been used since, and the old pilings are gone. Upstream of the dam, there is recreational boating, which is addressed in the **Recreation Affected Environment Section** of the EIS.

3.5 Area 2 Agriculture and Irrigation

In *British Columbia*, there is limited agriculture in Area 2 because fertile flat land is scarce along the Pend Oreille River. There is some cattle ranching on the uplands and hay/pasture production (BC Ministry of Management Services 2004).

Flathead County, Montana is an agricultural area, primarily in the Flathead Valley. Approximately 235,000 acres were farmed in the county in 2002, including approximately 32,000 irrigated acres (~14%). The market value of the County's agricultural products sold in 2002 was $30,513,000. The county's 2002 net cash farm income totaled $4,106,000, an average of $3,827 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002) The major agricultural products included livestock (primarily cattle, calves, and beef cows), wheat, barley, hay/grass, and approximately 150 acres of vegetables and fruits. (USDA – NASS 2002)

Lake County, Montana is also an agricultural area, primarily south of Flathead Lake. Approximately 601,500 acres were farmed in the county in 2002, including some 89,000 irrigated acres (~15%). The market value of the County's agricultural products sold in 2002 was $39,360,000. The county's 2002 net cash farm income totaled $6,056,000, an average of $5,089 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002) Major crops included livestock, primarily cattle and beef cows; wheat, oats, barley, potatoes, hay/pasture, and cherries. (USDA – NASS 2002)

Sanders County, Montana has ranch land along the Flathead and Clark Fork Rivers and uplands. Approximately 346,000 acres were farmed in 2002, including approximately 17,000 irrigated acres (<5%). The market value of the County's agricultural products sold in 2002 was $14,079,000. The county's 2002 net cash farm income totaled $1,420,000, an average of $3,047 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002) Major crops included livestock, primarily cattle and beef cows; oats and hay/pasture. Approximately 35 acres were in vegetable and fruit production. (USDA – NASS 2002)

Bonner County, Idaho has a moderate agricultural industry. Approximately 91,000 acres were farmed in 2002, including approximately 1,800 irrigated acres (<2%). The market value of the County's agricultural products sold in 2002 was $7,150,000. The county's 2002 net cash farm income totaled -$1,458,000, an average of -$1,962 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002) The major agricultural products included livestock, primarily cattle and beef cows; oats and hay/pasture. Approximately 110 acres were in vegetable and fruit production. (USDA – NASS 2002)

Pend Oreille County, Washington has a moderate agricultural industry. Approximately 61,000 acres were farmed in 2002; including approximately 1,400 acres irrigated (2%). The market value of the County's agricultural products sold in 2002 was $3,366,000. The county's 2002 net cash farm income totaled $1,038,000, an average of $3,949 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002) The major agricultural products included livestock, primarily cattle and beef cows; oats and hay/pasture. (USDA – NASS 2002)

Table 10: Agricultural and Irrigation Summary Statistics for the U.S. Portion of Area 2

COUNTY, STATE	LAND IN FARMS	TOTAL CROPLAND	HARVESTED CROPLAND	IRRIGATED ACRES	IRRIGATED ACRES AS % OF HARVESTED CROPLAND	COUNTY'S NET CASH FARM INCOME
Bonner, ID	90,585	33,430	18,052	1,844	10%	-$1,458,000
Flathead, MT	234,861	107,636	81,462	32,346	40%	$4,106,000
Lake, MT	601,544	135,199	78,680	88,871	113%	$6,056,000
Pend Oreille, WA	61,239	24,473	15,363	1,427	9%	$1,038,000
Sanders, MT	345,775	52,539	31,942	17,173	54%	$1,420,000

Source: USDA – NASS 2002

3.6 Area 2 Municipal and Industrial Water Supply

The rivers and reservoirs in Area 2 are used to provide municipal and industrial (M&I) water supply for several communities and private landowners. **Table 11** is a summary of municipal, domestic and industrial water withdrawals in Area 2 (USGS 2000).

Table 11: Selected Statistics for M&I Water Supply for Area 2

	FLATHEAD COUNTY, MONTANA	LAKE COUNTY, MONTANA	SANDERS COUNTY, MONTANA	BONNER COUNTY, IDAHO	PEND OREILLE COUNTY, WASHINGTON
TOTAL POPULATION (x1,000)	74.47	26.51	10.23	36.84	11.73
TOTAL POPULATION SERVED BY PUBLIC SUPPLY (x1,000)	52.74	15.05	5.42	16.94	5.39
TOTAL PUBLIC SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	2.11	0.89	0.14	3.38	0.13
TOTAL DOMESTIC SELF-SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	0.79	0.09	0.03	0.00	0.00
TOTAL INDUSTRIAL SELF-SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	0.07	0.00	0.00	0.81	0.92

Source: http://water.usgs.gov/watuse/

3.7 Area 2 Tribal Socioeconomics

The recognized Native American Tribes located in the Flathead-Clark Fork-Pend Oreille sub-basin include the Confederated Salish and Kootenai Tribes of the Flathead Reservation, Coeur d'Alene Tribe, and Kalispel Tribe. The Flathead and Kalispel Reservations are located along the river whereas the Coeur D'Alene Reservation is located on Coeur D'Alene Lake.

The Flathead Indian Reservation (CSKT) is located on the southern half of Flathead Lake and along the Flathead River from Polson to Paradise. Primary tribal associated business enterprises include many small businesses in the agriculture, construction, home improvement, retail, timber, professional/consulting, and recreation industries. The tribes also operate Salish Kootenai College. Water related businesses and facilities include the Kwataqnuk Best Western Hotel, S&K marina, a campground with temporary boat moorage, 3 lake boat ramps, and water intakes, as well the hydroelectric power generation at Hungry Horse Dam. The tribe also has facilities on the Lower Flathead River (below Flathead Lake) including 4 boat ramps and numerous undeveloped access locations for fishing, camping, and subsistence use. (Les Bigcrane, pers. comm. 2004; Confederated Salish and Kootenai Tribes Website 2004) Businesses and facilities that could be affected by changed flows and elevations include Flathead Lake marinas, boat ramps, and water intakes, as well the hydroelectric power generation at Hungry Horse Dam.

The Coeur d'Alene Indian Reservation is located south of Lake Coeur d'Alene, however, the tribe has usual and accustomed hunting, fishing, and gathering rights up to the north bank of the Pend Oreille River. There are also numerous archaeological and cultural resource sites associated with the tribe along the Pend Oreille River and Lake Pend Oreille. The tribe has no economic development adjacent to the Pend Oreille River or Lake, but continues to use many sites for fishing, hunting, or gathering of fruits and other plant materials. The Coeur d'Alene is primarily concerned about any impacts on cultural resource sites as a result of variable river and lake elevations. (Q. Matheson, Coeur d'Alene Tribe, pers. comm. 11/04)

The Kalispel Indian Reservation is located along both banks of the Pend Oreille River near Cusick, Washington. Tribal business enterprises include the Northern Quest Casino, Kalispel Case Line (manufacturing), Kalispel Agricultural Enterprise, Kalispel Day Care, and the Camas Institute. The tribe operates one boat ramp on the river. Future business development includes a marina, improved or additional boat ramp, and a commerce park. (Kalispel Tribe Website 2004)

4.0 Area 3 – Mainstem Columbia River

Historically, the mainstem Columbia River was a major navigation and immigration corridor on the Oregon Trail. Farmers and other immigrants taking advantage of first the Donation Land Act and then the Homestead Act to acquire free or very inexpensive land settled the Oregon Territory region. The subsequent dams provided a significant boost to development in the region by providing irrigation water and low-cost electricity for industry and residents. Today, the area remains a major farming region, although the larger metropolitan areas have far more diversified and economically important economies.

The following socioeconomic discussion of the mainstem Columbia River focuses primarily on the reach from the mouth of the Kootenay River to Chief Joseph Dam. The reason for this focus is that any planned variation in discharge volume and timing from Libby and Hungry Horse Dams will be largely reregulated at Grand Coulee Dam, thus minimizing any effects downstream from that point. Socioeconomic characteristics downstream of Chief Joseph Dam are addressed at a more general level where appropriate. **Table 12** presents a summary of dams and reservoirs in Area 3.

4.1 Area 3 Demographics

Area 3 includes portions of the Kootenay-Boundary Regional District, BC; Stevens, Ferry, Lincoln, Douglas, Grant, Okanogan, Chelan, Kittitas, Yakima, Benton, Walla Walla, Franklin, Klickitat, Skamania, Clark, Cowlitz, Wahkiakum, and Pacific Counties in WA; and Umatilla, Morrow, Gilliam, Sherman, Wasco, Hood River, Multnomah, Columbia, and Clatsop Counties in OR.

Cities and towns along the mainstem Columbia River within BC in Area 3 include Castlegar, Trail, and Montrose. Cities and towns along the mainstem Columbia River within WA include Northport, Kettle Falls, Grand Coulee, Bridgeport, Brewster, Pateros, Chelan, Wenatchee, Richland, Kennewick, Pasco, Vancouver, Kalama, and Kelso/Longview. Cities and towns along the mainstem Columbia River within OR include Umatilla, Boardman, Arlington, The Dalles, Hood River, Cascade Locks, Stevenson, the greater Portland metropolitan area, Cathlamet, Astoria, and Warrenton.

The following paragraphs provide an overview of selected Area 3 demographic data for British Columbia and the six Washington counties along the river downstream through the vicinity of Chief Joseph Dam (the primary affected reach of Area 3). These counties include Stevens, Ferry, Lincoln, Douglas, Grant, and Okanogan. **Table 13** presents a summary of selected demographic and socioeconomic statistics for these Area 3 jurisdictions.

Table 12: Dams and Reservoirs in Area 3

DAM	LAKE/ RESERVOIR	RIVER	LOCATION	YEAR COMPLETED	AUTHORIZED PURPOSE	CAPACITY	OPERATOR
Mica	Kinbasket Reservoir	Columbia	Sprague Bay, BC	1973	Flood Control	12,000,000 ac-ft	BC Hydro
					Hydropower	1,805 MW	
Revelstoke	Revelstoke Reservoir	Columbia	Revelstoke, BC	1984	Flood Control		BC Hydro
					Hydropower*	1,980 MW	
Hugh Keenlyside Dam	Arrow Lake	Columbia	Castlegar, BC	1968	Flood Control		BC Hydro
					Hydropower*	185 MW	
Grand Coulee	Lake Roosevelt	Columbia	Coulee City, WA	1942	Flood Control	125,000,000 ac-ft	U.S. Bureau of Reclamation
					Irrigation	Irrigates approx. 550,000 acres	
					Hydropower	6,809 MW	
					Navigation		
Chief Joseph	Rufus Woods Lake	Columbia	Bridgeport, WA	1961	Hydropower	2,069 MW	U.S. Army Corps of Engineers
Wells	Lake Pateros	Columbia	Pateros, WA	1967	Hydropower	840 MW	Douglas Cty PUD
Rocky Reach	Lake Entiat	Columbia	Wenatchee, WA	1961	Hydropower	1,280 MW	Chelan Cty PUD
Rock Island	Rock Island Reservoir	Columbia	Wenatchee, WA	1932	Hydropower	660 MW	Chelan Cty PUD
Wanapum	Wanapum Lake	Columbia	Vantage, WA	1963	Hydropower	1,038 MW	Grant Cty PUD
Priest Rapids	Priest Rapids Lake	Columbia	Priest Rapids, WA	1961	Hydropower	955 MW	Grant Cty PUD
McNary	Lake Wallula	Columbia	Umatilla, OR	1957	Hydropower	980 MW	U.S. Army Corps of Engineers
					Navigation		
John Day	Lake Umatilla	Columbia	Rufus, OR	1971	Flood Control	534,000 ac-ft	U.S. Army Corps of Engineers
					Hydropower	2,160 MW	
					Navigation		
The Dalles	Lake Celilo	Columbia	The Dalles, OR	1960	Hydropower	1,780 MW	U.S. Army Corps of Engineers
					Navigation		
Bonneville	Lake Bonneville	Columbia	Stevenson, WA	1938	Hydropower	1,050 MW	U.S. Army Corps of Engineers
					Navigation		

British Columbia. The mainstem Columbia River from Castlegar to the border primarily flows through the Kootenay Boundary RD.

The Kootenay Boundary RD is sparsely populated with a population of 33,227 in 2003. The population has been slowly declining since 1999, with an average annual decline of -0.376% over the period of 1999-2003. The larger towns along the river in Areas 3 include Trail and Montrose, with populations of 7,905 and 1,114, respectively. Nearby Castlegar, on the Kootenay River, is described in the Section on Area 1. If the population of the Kootenay Boundary RD declines similar to the past four year annual average the population would be approximately 30,582 in 2025. If the population increases at the British Columbia annual average projections, the population would be approximately 42,159 in 2025. The Kootenay Boundary RD has a very small minority population of 3%. (BC Ministry of Management Services 2004)

Washington. The mainstem Columbia River flows through or adjacent to 18 counties in Washington. The Primary Affected Reach includes those 6 counties upstream of Grand Coulee Dam and between Grand Coulee Dam and Chief Joseph Dam as presented in **Table 13**.

Stevens County, WA is sparsely populated with a population of 40,776 in 2003. Northport and Kettle Falls are the two larger towns located along the river, but only comprise 4.6% of the county's population. The rest of the population is dispersed in many small towns and rural areas. The Spokane Indian Reservation occupies a large portion of the county. The population of Stevens County increased by 23% from 1990 to 2000, and has been increasing by an average annual growth of 0.44% since 2000. If Stevens County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 44,905. If the population in Stevens County were to increase at the Washington annual average, the population in 2025 would be approximately 53,010. Stevens County has a minority population of 10%, predominantly Native American and Hispanic. (US Census Bureau 2004)

Ferry County, WA has no major towns along the river and is primarily comprised of Federal and Tribal lands of the Colville Indian Reservation. The county is sparsely populated with a population of 7,260 in 2000. The population, which is primarily dispersed in the Kettle River Valley, increased by 13% from 1990 to 2000. Since the 2000 census, population has shown an average annual increase of approximately 0.57%. If Ferry County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 8,400. If the population in Ferry County were to increase at the Washington annual average, the population in 2025 would be approximately 9,645. The minority population of Ferry County is 25%, predominantly Native American and Hispanic.

Lincoln County, WA is primarily in private ownership, mostly dryland wheat farms and ranches. Lincoln County is sparsely populated with no major cities; the population was

10,201 in 2003. The population increased by 15% from 1990 to 2000 and has been increasing by an average annual increase of 0.06% since 2000. If Lincoln County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 10,335. If the population in Lincoln County were to increase at the Washington annual average, the population in 2025 would be approximately 13,260. The minority population is approximately 4%, predominantly individuals of Native American and Hispanic descent. (US Census Bureau 2004)

Grant County, WA includes the Grand Coulee Dam and associated towns. The population of Grant County was 78,691 in 2003. The population increased by 27% from 1990 to 2000 and has been increasing by an average annual increase of 1.6% since 2000. If Grant County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 111,750. If the population in Grant County were to increase at the Washington annual average, the population in 2025 would be approximately 102,305. The minority population of Grant County is 23.5%, predominantly Hispanic. (US Census Bureau 2004)

Douglas County, WA includes the town of Bridgeport along the river. The population of Douglas County was 33,753 in 2003. The population increased by 20% from 1990 to 2000 and has been increasing by an average annual rate of 1.1% since 2000. If Douglas County were to increase in population at a similar rate as it has since 2000, the population in 2025 would be approximately 42,865. If the population in Douglas County were to increase at the Washington annual average, the population in 2025 would be approximately 43,880. The minority population of Douglas County is approximately 15%, predominantly Hispanic. (US Census Bureau 2004)

Okanogan County, WA includes the town of Brewster along the Columbia River, and the majority of the county's population is located in the Okanogan valley. The population of Okanogan County was 39,134 in 2003. The population increased by 16% from 1990 to 2000, and has experienced a slight average annual decline of 0.4% since 2000. If Okanogan County were to decline in population at a similar rate as it has since 2000, the population in 2025 would be approximately 36,105. If the population in Okanogan County were to increase at the Washington annual average, the population in 2025 would be approximately 50,875. The minority population of Okanogan County is approximately 25%, predominantly Native American and Hispanic. (US Census Bureau 2004)

Table 13: Selected Demographic and Socioeconomic Information for Area 3

	POPULATION ESTIMATE[1]	MEDIAN PER CAPITA INCOME[2]	% OF STATE/ PROVINCE INCOME[2]	% BELOW POVERTY LINE[2]	% MINORITY POPULATION[2]
STATES/PROVINCES IN AREA 2					
British Columbia	4,146,580	$22,095	not applicable		26.0%
Washington	6,131,445	$22,973	not applicable	10.6%	18.2%
Oregon	3,559,596	$20,940	not applicable	11.6%	13.4%
AFFECTED CITIES/COUNTIES/REGIONAL DISTRICTS IN AREA 3					
Kootenay-Boundary Regional District	33,227	$19,668	89.0%	no data	3.0%
Trail	8,167	$20,003	90.5%	no data	9.0%
Montrose	1,098	$23,714	107.3%	no data	3.0%
Stevens County, Washington	40,776	$15,895	69.2%	15.9%	10.0%
Northport	332	$11,679	50.8%	27.7%	5.1%
Kettle Falls	1,545	$13,614	59.3%	21.1%	8.7%
Ferry County, Washington	7,417	$15,019	65.4%	19.0%	24.6%
Lincoln County, Washington	10,201	$17,888	77.9%	12.6%	4.4%
Douglas County, Washington	33,753	$17,148	74.6%	14.4%	15.3%
Bridgeport	2,051	$10,302	44.8%	33.2%	39.2%
Grant County, Washington	78,691	$15,037	65.5%	17.4%	23.5%
Grand Coulee/Electric City	1,877	$16,513	71.9%	15.8%	14.5%
Okanogan County, Washington	39,134	$14,900	64.9%	21.3%	24.7%
Brewster	2,154	$9,555	41.6%	31.7%	45.1%

Notes:
[1]U.S. State and county population estimates are for 2003 from U.S. Census Annual Population Estimates, Release Date: April 9, 2004.
U.S. city/town population estimates are for 2003 from U.S. Census Annual Population Estimates FRO Incorporated Places, Release Date: June 24, 2004.
Canadian Province, Regional District, and city/town population data are for 2003 from BC Stats Community Facts, release date October 06, 2004.
[2]Canadian income and minority population data are for 2000 from the 2001 Census
U.S. data on income, poverty, and minority population are for 1999 from the 2000 Census.

4.2 Area 3 Employment and Income

Area 3 is highly diverse, encompassing the interior Columbia Basin in southern British Columbia, central Washington and Oregon down to the Pacific Ocean. The economy of this area cannot be easily summarized because it is so varied. Upstream of Chief Joseph Dam, agriculture is the major industry. Additional major industries include

manufacturing, forestry, government, tourism, and retail trade. Downstream of Chief Joseph Dam agriculture is still an important industry, as are manufacturing, government, tourism, retail trade, transportation/ navigation, and commercial and sport fishing. **Table 14** provides a summary of employment by industry within Area 3.

British Columbia. The *Kootenay-Boundary RD* was historically the most important copper mining region in the entire British Commonwealth, with three major smelters. Today, Teck Cominco Limited is still a major zinc producer along with other metals and products. A major smelter and metallurgical complex is located in Trail, BC. However, mining is now much less important to the region, and forestry is the dominant industry in the district. Tourism and agriculture, and other manufacturing are also major industries.

Pope and Talbot Limited (timber) is the region's largest employer. Other major employers include Canpar Industries (particleboard door cores), Roxul West Inc. (wool insulation), Telus Technologies, Firebird Technologies, Inc. (semiconductors), and BOC Gases Ltd. Healthcare is also a major employer at various facilities.

Agricultural crops include tree nurseries, flower and fruit nurseries, and vegetable and fruit crops. Tourism has less importance in this region than in either the East or Central Kootenays, but skiing and mountain biking are carried out. Fishing and boating along the Columbia River also occurs. The average per capita income is $19,688, approximately 89% of the provincial average. (BC Ministry of Management Services 2004, Boundary Country 2004)

Washington. *Stevens County* is mainly composed of the Spokane Indian Reservation, Lake Roosevelt National Recreation Area, and the Colville National Forest. Agriculture and government employment are the primary industries, and mining, forestry, and tourism are also important. Major private employers in the county include Boise Cascade, Stimson Lumber, Vaagen Brothers Lumber, Aladdin Hearth Products (wood and pellet stoves) and Wal-Mart. The Colville National Forest, Stevens County, and school districts are also major employers. Agricultural products include grains and hay, and livestock. Only a small number of acres are in orchard fruit crops. Agriculture is primarily located in the Colville Valley.

The 2000 census reported the County's per capita money income at $15,895, approximately 69% of the state average. Approximately 15.9% of the population lived below poverty level in 1999, higher than the state average of 10.6%. (US Census Bureau 2004)

Ferry County is predominantly occupied by the Colville National Forest and the Colville Indian Reservation. Major industries include agriculture, government, and timber. Tourism on Lake Roosevelt and camping, hiking, and fishing in the national forest are also important to the economy of the county. Agricultural products include hay and livestock.

The 2000 census reported the County's per capita money income at $15,019, approximately 65% of the state average. Approximately 19.0% of the individuals in the county lived below poverty level in 1999, almost double the state average of 10.6%. (US Census Bureau 2004)

Lincoln County is dominated by dryland wheat farming and ranching, and is the second largest wheat-producing county in the nation. Other major employers include government, and retail trade. There is limited tourism in the county, primarily camping and boating along Lake Roosevelt.

The 2000 census reported the County's per capita money income at $17,888, approximately 78% of the state average. Approximately 12.6% of the individuals lived below poverty level in 1999, slightly higher than the state average of 10.6 in that year. (US Census Bureau 2004)

Grant County consists primarily of private agricultural lands, predominantly irrigated by the Columbia Basin irrigation project from Grand Coulee Dam and Banks Lake. Leading agricultural products include wheat, corn, hay, dry beans, peas, onions and sweet corn. Fruit orchards are also numerous. Tourism is also an important industry in the county with many wildlife refuges and a multitude of camping, fishing and hunting areas both along the Columbia River and in the numerous pothole lakes and canals. Major employers include J.R. Simplot (food processing), Grant County, school districts, Inflation Systems (airbag manufacturing), and Wal-Mart.

The per capita income in 2000 was $15,037, approximately 65% of the state average. Approximately 17.4% of the individuals in the county lived below poverty level in 1999, which is higher than the state average of 10.6% that year. (Bureau of Economic Analysis 2004 and US Census Bureau 2004)

Douglas County is also dominated by privately owned agricultural lands. Farming is primarily dryland farming such as wheat and hay, although there is irrigated agriculture along the Columbia River, including orchard fruit crops, particularly peaches and apricots. Major employers in the county include Douglas County, school districts, Fred Meyer, Costco, Cashmere Valley Bank and Douglas County PUD #1.

The 2000 census reported the County's average per capita money income at $17,148, approximately 75% of the state average. Approximately 14.4% of the individuals in the county lived below poverty level in 1999, higher than the state average of 10.6% that year. (US Census Bureau 2004)

Okanogan County is the largest county in Washington by area and is very diverse, with major federal land holdings in the Okanogan National Forest and the Pasayten and Lake Chelan-Sawtooth Wilderness Areas. The Colville Indian Reservation also occupies a large part of the county, and there are large areas owned by the Washington Department of Natural Resources. Okanogan County is known as a major orchard fruit growing region, particularly apples and pears, mainly grown along the Okanogan and Columbia

Rivers. The county also has ranching and hay production in dryland and upland areas. Tourism is a major feature in the county including camping, hiking, fishing and hunting.

The 2000 census reported the County's average per capita money income at $14,900, approximately 65% of the state average. Approximately 21% of the individuals in the county lived below poverty level in 1999, more than double the state average of 10.6% that year. (US Census Bureau 2004)

Table 14: Percent of Employment by Industry for the U.S. Portion of Area 3

	STEVENS COUNTY, WA	FERRY COUNTY, WA	LINCOLN COUNTY, WA	GRANT COUNTY, WA	DOUGLAS COUNTY, WA	OKANOGAN COUNTY, WA	AVERAGE AREA 3 (U.S.)
AGRICULTURE	17.4	16.3	34.0	22.4	31.7	26.6	24.7
FORESTRY AND FISHING	5.2	D	2.5	D	6.3	7.9	5.5
MINING	0.5	D	0.2	D	0.1	0.3	0.3
CONSTRUCTION	5.4	D	3.8	3.6	5.4	4.5	4.5
MANUFACTURING	11.5	D	2.3	11.5	2.1	1.3	5.7
RETAIL TRADE	10.5	10.0	9.5	9.8	10.8	9.8	10.1
TRANSPORTATION/WAREHOUSING	2.6	D	D	2.6	3.4	1.3	2.5
INFORMATION	1.1	0.6	0.5	0.7	0.5	0.7	0.7
FINANCE/INSURANCE	2.0	1.2	4.3	1.7	1.7	1.8	2.1
REAL ESTATE	3.6	4.0	3.2	2.5	1.7	3.4	3.1
PROFESSIONAL/TECHNICAL	2.7	D	3.6	D	2.3	2.6	2.8
EDUCATION	0.7	D	L	0.6	0.9	0.5	0.7
HEALTH CARE/SOCIAL ASSISTANCE	10.4	3.6	D	7.2	4.9	6.5	6.5
RECREATION/ENTERTAINMENT	1.4	D	1.5	1.3	2.8	1.4	1.7
ACCOMODATION/RESTAURANT	4.4	D	3.3	4.6	6.4	5.8	4.9
OTHER SERVICES	1.2	31.4	3.7	13.8	1.3	1.0	8.7
GOVERNMENT	19.5	33.0	27.5	17.9	17.8	24.4	23.4

NOTES:
(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.
(L) Less than 10 jobs, but the estimates for this item are included in the totals.
SOURCE: Employment data is for 2002 as presented in Table CA25N – Total full-time and part-time employment by industry, Bureau of Economic Analysis, Regional Economic Information System, Table CA25 (NAICS,), May 2004.

4.3 Area 3 Flood Control

The major cities along the Columbia River in study Area 3 are Wenatchee, the Tri-cities (Richland, Pasco and Kennewick) and the Portland/Vancouver area. These areas are protected by flood control operations of the dams and reservoirs in the Upper Columbia

River system, the Snake River system and John Day Dam on the Lower Columbia as well as local flood control works and infrastructure. For example, the Tri-cities are protected by 17 miles of levees that prevent flooding from the backwater, storage pool behind McNary Dam. In addition, the Portland/Vancouver area is protected from flooding by dams and reservoirs in the Willamette River system and local levees.

The primary flood loss subarea identified for Area 3 is the Lower Columbia River area, which has a variety of floodplain types and land uses. The entire Lower Columbia is tidally influenced to Bonneville Dam at river mile 146. In the reach between Bonneville Dam and Washougal, the river is confined between steep, forested hills. It provides little floodplain, which is occupied by a few small communities, homes and farms. The landscape, floodplain and land use change through the Washougal and the Portland/Vancouver areas. As the floodplain widens, approaching the Willamette valley and confluence with the Willamette River, larger agricultural areas are found in the floodplain in the upstream portion of this segment and then a distinct transition into commercial/industrial and residential property in Portland and Vancouver. Downstream from the cities, the Columbia turns north towards Longview and travels through broad lowlands occupied by mostly rural and agricultural areas and industrial areas near Longview, WA. Downstream from Longview the Columbia progresses through the final 40 river miles through a broad, flat-bottomed valley, bordered by a steep and rocky headland on the north and a low peninsula on the south.

Flooding along the reach typically occurs from spring snowmelt runoff originating from the Snake and Upper Columbia Rivers, and rainfall or rainfall on snowmelt runoff originating from the Willamette River. Downstream from Westport, flooding concerns are related to the tidal influence on the reach. The system of reservoirs on the Upper Columbia and Snake Rivers provides spring flood control, and reservoirs in the Willamette River System provide wintertime rainfall and rain-on-snow runoff flood control protection. Major levee systems protect the urban and agricultural areas in the Lower Columbia reach (BPA 1995f).

4.4 Area 3 Navigation

For the purpose of this report, navigation is described for two subareas: Lake Roosevelt and lower Columbia River. For this analysis, the lower Columbia River subarea comprises the reach of the Columbia River downstream of the Snake River confluence and includes McNary, John Day, The Dalles, and Bonneville Locks and Dams.

Lake Roosevelt: The majority of navigation in the Lake Roosevelt subarea is recreational in nature. The affected environment and impact analysis associated with recreational boating is addressed in **Recreation Affected Environment Section** and the **Recreation Impact Sections** of this EIS. Commercial navigation is limited to the Keller Ferry on Lake Roosevelt, upstream from Grand Coulee Dam. Keller Ferry operations are under the jurisdiction of the Washington State Department of Transportation. The Keller Ferry crosses the Columbia River at its confluence with the Sanpoil River from Ferry County

and the Colville Indian Reservation on the north bank to Lincoln County on the south. The Columbia River is 1 1/4 miles wide at this point. Approximately 60,000 vehicles travel on the Keller Ferry each year. Walk-on passengers are few as the ferry route is a link in a rural highway, State Route 21. The nearest communities are Wilbur, 14 miles to the south, and Republic, 53 miles north. The free ferry operates seven days a week, 18 hours a day, from 6:00 a.m. until midnight. An additional small car ferry, the Gifford/Inchelium Ferry run by the Confederated Tribes of Colville Indian Reservation, runs every fifteen minutes in the daytime across the river.

Lower Columbia River: Commercial navigation occurs within the lower Columbia Reach of Area 3. Navigation projects in this subarea are classified into two types of projects; deep and shallow draft projects.
Deep draft navigation occurs in the lower portions of the river from the mouth upstream to Vancouver where a shipping channel 55 feet deep and 600 feet wide is maintained. Deep draft harbors along the Lower Columbia are at Astoria, Longview, Kalama, Woodland, Henrici Bar, Willow Bar, Kelley Point and Hayden Island. Deep draft harbors are also located on the Willamette River in Portland. The deep draft channel is used extensively by ocean going vessels transporting products to and from national and international markets. Waterborne commerce for deep draft projects is primarily composed of wheat, grain, corn, automobiles, containerized products, logs, petroleum, chemicals and other miscellaneous goods.

Major countries involved in import and exports area are Japan, Korea, Taiwan, Mexico, Canada and Pacific Rim nations. In 2002, more than 30 million tons of cargo valued at $14 billion was imported and exported from Columbia River Ports (CRCC 2003).

Shallow draft navigation using tugs, barges and log rafts occurs upstream from Vancouver through Bonneville, and continues upstream of McNary Dam to connect with the mainstem Snake River. Access to the inland areas is made possible through a series of locks on the dams. Products shipped on the shallow draft channel comprise mainly wheat, grain, wood products, petroleum, chemicals and other agricultural products. In 2001, 12 million tons of products were shipped along the Columbia shallow draft navigation channel. Shallow draft navigation projects upstream from Vancouver account for $2.2 billion in commerce annually in 1997 dollars (CSSR 2003).

4.5 Area 3 Agriculture and Irrigation

In Area 3, agriculture and irrigation was evaluated along the Columbia River through southern British Columbia and the six Washington counties along the mainstem Columbia River to Chief Joseph Dam. In this discussion, Franklin County is also included because it is a major user of irrigation water from the Columbia Basin irrigation project at Grand Coulee Dam and Lake Roosevelt/Banks Lake. **Table 15** provides a summary of agriculture and irrigation data for this portion of Area 3 in WA.

British Columbia: Along the mainstem Columbia River in British Columbia, there is limited farmland. The primary agricultural industry is cattle ranching. Some minor dairy and tree fruits are also present. The acreage of farmland has increased in the Kootenay Boundary RD from 1995 to 2000 to a total of about 141,000 acres, but the majority of the farmland is located west of the Columbia River valley in the Kettle River valley (BC Ministry of Management Services 2004 and Boundary Country 2004).

Stevens County, Washington has approximately 528,000 acres in farmland, with approximately 12,000 acres irrigated (2%). The major agricultural products include cattle and beef cows, with moderate numbers of other livestock such as hogs/pigs, sheep and chickens. Other major crops include wheat, oats, barley, hay/pasture, and about 250 acres in vegetable and fruit production. The market value of the County's agricultural products sold in 2002 was $28,245,000. The county's 2002 net cash farm income totaled $7,441,000, an average of $5,882 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002)

Ferry County, Washington has approximately 800,000 acres in farmland. Irrigated farmland however is limited, with approximately 4,000 acres irrigated (<1%). The major agricultural products are livestock, primarily beef cattle and hogs/pigs. There are limited other crops, primarily hay/pasture. The market value of the County's agricultural products sold in 2002 was $4,346,000. The county's 2002 net cash farm income totaled -$756,000, an average of -$3,734 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002)

Lincoln County, Washington is a major agricultural area with approximately 1,200,000 acres of farmland; approximately 53,000 acres irrigated (4%). The major agricultural crop is dryland wheat (2nd highest producing county in the nation); cattle and beef cows, barley, potatoes, and hay/pasture are also important crops. Approximately 100 acres are in orchard production. The market value of the County's agricultural products sold in 2002 was $93,555,000. The county's 2002 net cash farm income totaled $31,037,000, an average of $41,660 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002)

Douglas County, Washington has approximately 879,000 acres of farmland, with approximately 24,000 acres irrigated (3%). The major agricultural products are livestock (primarily cattle), wheat, oats, barley, and hay/pasture. Approximately 17,000 acres are in orchard production. The major fruit crops are apricots, peaches, and apples. The market value of the County's agricultural products sold in 2002 was $124,348,000. The county's 2002 net cash farm income totaled $29,345,000, an average of $30,922 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002)

Grant County, Washington is another major agricultural area with approximately 1,070,000 acres of farmland, including approximately 485,000 acres irrigated (45%). This county is a major beneficiary of the Columbia Basin irrigation project (along with Franklin County). The major agricultural products are livestock (over 150,000 cattle inventory); as well as hogs/pigs, wheat, oats, barley, beans, potatoes, hay/pasture, corn,

peppermint, spearmint, onions, sweet corn, apples, cherries, grapes, and pears. The market value of the County's agricultural products sold in 2002 was $881,756,000. The county's 2002 net cash farm income totaled $178,799,000, an average of $99,101 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002)

Okanogan County, Washington has the second largest amount of farmland in the state (second to Whitman County) with approximately 1,240,000 acres and approximately 48,000 acres irrigated (4%). The major agricultural products are livestock (primarily cattle and beef cows and sheep), wheat, oats, barley, hay/pasture, and fruit crops (primarily apples and pears). The market value of the County's agricultural products sold in 2002 was $137,418,000. The county's 2002 net cash farm income totaled $33,467,000, an average of $22,507 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002)

Franklin County. Franklin County has approximately 665,000 acres of farmland with approximately 241,000 acres irrigated (36%). The major agricultural products are livestock, primarily cattle; corn, wheat, beans, potatoes, hay/pasture, asparagus, carrots, onions, sweet corn, and tree fruits such as apples, grapes, and cherries. The market value of the County's agricultural products sold in 2002 was $350,483,000. The county's 2002 net cash farm income totaled $88,144,000, an average of $92,979 per farm. (USDA - NASS, Table 1, County Summary Highlights, 2002)

Table 15: Agricultural and Irrigation Summary Statistics for Area 3

COUNTY, STATE	LAND IN FARMS	TOTAL CROPLAND	HARVESTED CROPLAND	IRRIGATED ACRES	IRRIGATED ACRES AS % OF HARVESTED CROPLAND	COUNTY'S NET CASH FARM INCOME
Stevens, WA	528,402	116,370	72,272	11,553	16%	$7,441,000
Douglas, WA	878,867	550,085	213,942	24,049	11%	$29,345,000
Ferry, WA	799,435	23,644	11,705	4,184	36%	-$765,000
Franklin, WA	664,875	475,804	288,963	241,063	83%	$88,144,000
Grant, WA	1,074,074	804,793	599,943	485,459	81%	$178,799,000
Lincoln, WA	1,233,377	854,791	510,356	52,991	10%	$31,037,000
Okanogan, WA	1,241,316	139,753	71,149	48,416	68%	$33,467,000

Source: USDA, NASS 2002

4.6 Area 3 Municipal and Industrial Water Supply

The Columbia River and its reservoirs in Area 3 are used to provide municipal and industrial (M&I) water supply for several communities and private landowners. M&I water use is a relatively small portion (~8%) of water withdrawn from the river. Approximately 90 percent of water withdrawn from the entire Columbia River system in the U.S. is for irrigation purposes. Water supply for domestic use accounts for 4 percent; commercial use accounts for about 2 percent; and industrial use accounts for about 2

percent. The remaining 2 percent are shared between livestock, mining and thermoelectric. Water is pumped from Lake Roosevelt to Banks Lake to provide storage for irrigation. **Table 16** is a summary of municipal, domestic and industrial water withdrawals in Area 3 (USGS 2000).

Table 16: Selected Statistics for M&I Water Supply for the U.S. Portion of Area 3

	STEVENS COUNTY, WASHINGTON	FERRY COUNTY, WASHINGTON	LINCOLN COUNTY, WASHINGTON	DOUGLAS COUNTY, WASHINGTON	GRANT COUNTY, WASHINGTON	OKANOGAN COUNTY, WASHINGTON
TOTAL POPULATION (x1,000)	40.07	7.26	10.18	32.60	74.70	39.56
TOTAL POPULATION SERVED BY PUBLIC SUPPLY (x1,000)	23.40	2.88	0.00	28.84	49.56	21.06
TOTAL PUBLIC SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	0.00	0.03	0.00	0.00	0.57	0.63
TOTAL DOMESTIC SELF-SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	0.00	0.02	0.00	0.00	0.00	0.00
TOTAL INDUSTRIAL SELF-SUPPLY FRESH SURFACE WATER WITHDRAWALS (million gal/d)	0.12	0.00	0.00	0.00	0.00	0.00

4.7 Area 3 Tribal Socioeconomics

The recognized Native American Tribes located along the mainstem Columbia River, or with mainstem Columbia River interests, include the Confederated Tribes of the Colville Reservation, Spokane, Yakama, Umatilla, and Confederated Tribes of the Warm Springs Reservation. Only the Colville and Spokane Tribes will be discussed in detail in this EIS.

The Colville Indian Reservation is located along the west bank of the Columbia River and Lake Roosevelt from a few miles south of Kettle Falls, Washington to the Okanogan River confluence. Major tribal business enterprises and employers include the timber and construction industries and social and tribal services (K. Desautel, Colville Tribes, pers. comm. 11/04). The tribe operates a small fish hatchery near Bridgeport. The tribe also operates a number of boat ramps, a campground, and two marinas under contract with the National Park Service. They operate the Inchelium ferry year-round. A total of 16 boat docks/ramps on Lake Roosevelt are on tribal lands. Five water intakes are located on Lake Roosevelt and 17 intakes are located on Lake Rufus Woods downstream of Grand

Coulee Dam. Most of the boat docks are not usable during low lake elevations currently. (Fulcrum Environmental Consulting, Inc. 2004) The tribe would be concerned about potential effects on the ferry operation, boat ramps and marinas, water intakes, and fish populations.

The Spokane Indian Reservation is located on the east bank of Lake Roosevelt and the north bank of the Spokane River. A boat ramp, marina, and 11 campgrounds on Lake Roosevelt are located on tribal lands adjacent to Lake Roosevelt; the remainder of the shoreline is fairly undeveloped, although there are a number of undeveloped fishing access locations.

REFERENCES

BC Hydro. 2002. Kootenay Canal Generating Station Website. http://www.bchydro.com/recreation/southern/southern1203.html

BC Hydro, Columbia Basin Trust, Environment Canada, Lower Kootenay Band, and Ministry of Water Land and Air Protection; A Stakeholders Summary of Preferred and Potential Negative Reservoir Levels and River stages on the Kootenay River System in Canada; Final Draft, September 2004.

BC Ministry of Agriculture, Food & Fisheries. 2004. Queries at website at www.agf.gov.bc.ca

BC Ministry of Management Services. 2004. BC Stats. Queries on regional district industries, agriculture, history, employment, and demographics www.regionalindex.gov.bc.ca/

Bond, Gary (USACE – Albeni Falls Dam), 2003. Personal communication regarding Albeni Falls authorization for navigation and current status of log-chute.

Bonners Ferry Chamber of Commerce. 2004. http://www.bonnersferrychamber.com/pages/history.html

Bonneville Power Authority, U.S. Army Corps of Engineers, North Pacific Division, and Bureau of Reclamation. 1995, Columbia River System Operation Review, Final Environmental Impact Statement; Appendix O; Economic and Social Impact.

Boundary Country. 2004. Queries on economic development at website www.boundary.bc.ca/economy/index.htm

Bureau of Economic Analysis. 2004. http://www.bea.doc.gob/bea/regional/ (all employment by industry data was from this website)

City of Libby, Montana. 2004. http://www.libbymt.com/community/#employment

Coalition for Smart Salmon Recovery, 2003, Internet web-page on value of Columbia River Basin Value. http://www.smartsalmonrecovery.org/Value/Transport.htm

Columbia River Channel Coalition, 2003, Internet web-page article on channel deepening.

Colville Tribes Official Website. 2004. http://www.colvilletribes.com/ctec.htm

Confederated Salish and Kootenai Tribes. 2004. http://www.cskt.org/business/businesses.html

Crook, A.G., 1993. Irrigation Depletion Estimate for Draft USBR/BRA, Columbia River System Operations Review.

Corps (see U.S. Army Corps of Engineers)

Desautel, Kyle. 2004. Personal communication, Colville Tribes. November, 2004.

Foundation for Water & Energy Education. 2004. http://www.fwee.org/c-basin.html

Fulcrum Environmental Consulting, Inc. 2004. Colville Indian Reservation Boundary Waters Shoreline Development Assessment. Prepared for the Confederated Tribes of the Colville Reservation.

Grant County Economic Development Council. 2004. http://www.grantedc.com/resources/economicdata/employers.html http://www.channeldeepening.com/channel_economic.asp

HDR Engineering, Inc. July 2003. DRAFT Seepage Analysis, Bonners Ferry, Idaho for U.S. Army Corps of Engineers, Seattle District.

Hirst, S.M., Impacts of the Operation of Existing Hydroelectric Developments on Fishery Resources in British Columbia, Volume II - Inland Fisheries; Canadian Manuscript Report of Fisheries and Aquatic Sciences 2093. 1991. By S.M. Hirst for Recreational Fisheries Branch, Ministry of Environment and B.C. Hydro.

Kalispel Tribe Website. 2004. http://www.kalispeltribe.com/index2.html

Lower Kootenay Indian Band Information Website. 2004. www.kktc.bc.ca/lower%20kootenay.htm

Matheson, Quannah. 2004. Personal communication, Coeur d'Alene Tribe, November, 2004.

Perry, Patty. 2004. Personal communication, Kootenai Tribe, October, 2004.

Regional District of Kootenay Boundary. 2003. http://www.rdkb.com/siteengine/ActivePage.asp?PageID=14

Tobacco Plains Website. 2004. www.kktc.bc.ca/tobacco%20plains.htm

Trail Economic Development Council. 2004. website at www.trailedc.ca/outlook.html

U.S. Census Bureau. Census 2000; 2003 Population Estimates; and 1995 to 2025 Population Projections. Queries at website at www.factfinder.census.gov

U.S.D.A., National Agricultural Statistical Service. 2002. 2002 Census of Agriculture – County Data. http://www.nass.usda.gov/wa/counties/

U.S.D.A., National Agriculture Statistics Service. 2004. 2002 Census of Agriculture - County Data. Queries at www.usda.nass.gov/nass

U.S. Army Corps of Engineers, Seattle District. 1984, Libby Dam and Lake Koocanusa; Kootenai River, Montana; Water Control Manual.

U.S. Army Corps of Engineers, North Pacific Division. 1995a, Columbia River System Operation Review, Final Environmental Impact Statement; Main Report. , North Pacific Division

U.S. Army Corps of Engineers, North Pacific Division. 1995b, Columbia River System Operation Review, Final Environmental Impact Statement; Appendix E, Flood Control.

U.S. Army Corps of Engineers, North Pacific Division. 1995c, Columbia River System Operation Review, Final Environmental Impact Statement; Appendix F, Irrigation, Municipal and Industrial/Water Supply.

U.S. Army Corps of Engineers, North Pacific Division. 1995d, Columbia River System Operation Review, Final Environmental Impact Statement; Appendix H; Navigation.

U.S. Army Corps of Engineers, North Pacific Division. 1995e, Columbia River System Operation Review, Final Environmental Impact Statement; Appendix I; Power.

U.S. Army Corps of Engineers, 2002a, Upper Columbia Alternative Flood Control and Fish Operations Interim Implementation Libby and Hungry Horse Dams Montana, Idaho, and Washington, Final Environmental Assessment.

U.S. Army Corps of Engineers, 2002b, Non-Federal Flood Control Works Inspection Reports, Emergency Management Branch, Seattle District.

U.S. Army Corps of Engineers, 2004, Kootenai River Habitat and Ecosystem Restoration Strategies, Draft Report.

U.S. Geological Survey, 2000. Water Use Data for the United States. http://water.usgs.gov/watuse/

U.S. Geological Survey, 2002. Columbia River Basin, Washington Description Website. URL:.http://vulcan.wr.usgs.gov/Volcanoes/Washington/ColumbiaRiver/description_columbia_river.html)

UPPER COLUMBIA ALTERNATIVE FLOOD CONTROL AND FISH OPERATIONS EIS

SOCIOECONOMIC IMPACT ANALYSIS

Appendix F: Part 2 of 2

prepared for:

U.S. Army Corps of Engineers
Seattle District

and

Bureau of Reclamation

prepared by:

Tetra Tech, Inc.
1925 Post Alley
Seattle, WA 98101

May 2005

UPPER COLUMBIA ALTERNATIVE FLOOD CONTROL AND FISH OPERATIONS EIS

SOCIOECONOMIC IMPACT ANALYSIS

TABLE OF CONTENTS

Page F-

LIST OF TABLES

Page F-

UPPER COLUMBIA ALTERNATIVE FLOOD CONTROL AND FISH OPERATIONS EIS

SOCIOECONOMIC IMPACT ANALYSIS

1.0 Introduction

The Socioeconomic Affected Environment report describes the potentially affected environment associated with Upper Columbia River Alternative Flood Control and Fish Operations. The affected environment report identified the following categories of potential socioeconomic impacts associated with changes in operations at Libby and Hungry Horse Dams:

- Flood Control
- Navigation
- Agriculture and Irrigation
- Municipal and Industrial Water Supply
- Hydropower
- Employment and Income, and
- Tribal Socioeconomics

Potential socioeconomic impacts in these categories were examined for each of the following three study areas.

- Area 1 - Kootenai River Basin from Lake Koocanusa in Montana (MT) and British Columbia (BC) through Idaho (ID) to the Columbia River in BC
- Area 2 - Flathead/Clark Fork/Pend Oreille Basin from Hungry Horse Reservoir in MT to the Columbia River in Washington (WA)
- Area 3 - Columbia River mainstem from the mouth of the Kootenai River in BC downstream to the Pacific Ocean in Oregon (OR) and WA

Two operations without fish flows, referred to as "benchmarks"[1], were evaluated:

- Standard Flood Control Operations *without* Fish Flows (LS)
- VARQ Flood Control Operations *without* Fish Flows (LV)

The two benchmark operations were evaluated to facilitate assessment of the potential recreational impacts of fish flows that have been implemented in response to the 2000 U.S Fish and Wildlife Service and National Marine Fisheries Service Biological Opinion.

[1] A "benchmark" does not meet the purpose and need of the action and provides a basis for comparison of the impacts of the effects of the fish flows at Libby.

In addition to the two benchmarks, four other operational alternatives were evaluated in Area 1 that include fish flows.

- Standard Flood Control Operations *with* Fish Flows up to Powerhouse Capacity at Libby Dam (LS1)
- VARQ Flood Control Operations *with* Fish Flows up to Powerhouse Capacity at Libby Dam (LV1)
- Standard Flood Control Operations *with* Fish Flows up to 10,000 cfs above Powerhouse Capacity at Libby Dam (LS2)
- VARQ Flood Control Operations *with* Fish Flows up to 10,000 cfs above Powerhouse Capacity at Libby Dam (LV2)

In Area 2, two operational alternatives were evaluated.

- Standard Flood Control Operations (HS)
- VARQ Flood Control Operations (HV)

To evaluate the effects that the Area 1 and Area 2 operational alternatives have in Area 3, the following combinations were addressed:

- HS + LS1 (no-action)
- HV + LV1
- HS + LS2
- HV + LV2
- HS + LS (benchmark combination)
- HV + LV (benchmark combination)

2.0 Socioeconomic Impact Analysis Methodology

Methodologies for evaluating direct socioeconomic impacts and their indirect impacts on regional employment and income are described below. Cost and benefit data are based upon October 2004 prices and conditions.

2.1 Flood Control Methodology

When flood waters exceed river banks and flow onto developed properties, losses may occur. The extent of flood impact is a function of the depth and duration of the floodwaters. Assessing expected flood losses involves three relationships; the stage-damage relationship, discharge-stage relationship, and discharge-frequency relationship.

- The stage-damage function defines the amount of losses that is expected to occur at different depths of flooding for defined flood impact areas.
- The discharge-stage function (sometimes called the rating curve) specifies the river stage associated with measured flow volumes at specified control points. For flood loss assessment associated with flow volume, the rating curve is integrated with the stage-damage curve to yield a discharge-damage curve.
- The discharge-frequency function defines the probability of exceeding a given discharge in any year. The discharge-frequency curve is integrated with the discharge-damage curve to yield the frequency-damage curve.

Expected annual flood damages are equal to the area under a frequency damage curve. Expected annual damages were estimated for flood-prone river reaches in Areas 1 and 2 with each alternative or benchmark using the Corps' Hydrologic Engineering Center program, Expected Annual Damages (EAD). Categories of impacts evaluated include residential, commercial, industrial, agricultural, public, and transportation-related losses; and emergency aid costs. Flood loss study reaches evaluated for flooding impacts are presented in **Table 1**.

Table 1. Flood Impacts Evaluation Areas

Study Area	Flood Loss Study Reach	Control Point
Area 1	Kootenai River (Bonners Ferry to Canadian Border)	Kootenai River Stage at Bonners Ferry, ID
Area 1	Kootenay Lake Shoreline	Stage at Kootenay Lake
Area 2	Flathead River from Columbia Falls, MT to Flathead Lake	Flathead River Flow at Columbia Falls, MT
Area 2	Flathead Lake Shoreline	Stage at Flathead Lake
Area 2	Lake Pend Oreille Shoreline	Stage at Lake Pend Oreille
Area 2	Pend Oreille River from Albeni Falls Dam to the Columbia River	Pend Oreille River Flow at Newport, WA
Area 3	Lower Columbia River	Columbia River Flow at The Dalles, OR

2.2 Navigation Methodology

Commercial navigation in the affected area is limited to ferry transportation in Areas 1 and 3. The operating range of each ferry loading ramp was identified and compared to water surface elevations with each alternative/alternative combination or benchmark/benchmark combination to identify impacts to ferry operations.

2.3 Agriculture and Irrigation Methodology

Changing reservoir and river stages may impact agricultural production in the study area. The primary categories of potential impact to agricultural production are changes in the energy required to pump water and resultant changes in irrigation pumping costs and changes in expected crop losses resulting from high groundwater levels. Any losses resulting from overbank flooding of crops are accounted for in the flood control analysis. Different methodologies were applied for evaluating each type of agricultural impact.

2.3.1 Irrigation Pumping Costs

Water rights data were collected, from MT, ID and WA state water rights databases[2], and evaluated for each county along the river to estimate the quantity of water pumped for irrigation. These irrigation volumes were distributed over the growing season of May to September. For the analysis, pumping volumes were divided with 20% assumed to occur prior to July 1 and 80% after July 1. The 20% was divided evenly across May and June and the 80% was divided evenly across July- September[3]. The distribution is shown in **Table 2**. Average monthly stages with each alternative/benchmark were used to estimate the relative number of kilowatt-hours required for pumping with each alternative/benchmark.

Table 2. Irrigation Water Use by Month

Month	% Use
May	10 %
June	10 %
July	20 %
August	20 %
September	20 %
TOTAL:	100%

Note: Because stage data was not modeled for Kootenai River at Bonners Ferry, ID gage in September, for that reach, irrigation use was assumed to be 30% in July and 30% in August.
Source: Orvis Irrigation, 2005 – Personal communication with Karl Orvis of Kalispell MT, regarding typical irrigation seasonal distribution in Upper Columbia Basin.

A typical pumping configuration for the Upper Columbia River was developed and applied for the analysis. For reaches with modeled stage data, the modeled stages were used. For river reaches without modeled stage data, stage discharge curves were used to

[2] The following is a summary of the surface water rights data sources:
-State of Montana Rivers: Two internet reference sources were utilized to determine the amount of agricultural and M&I water diversions within the state.
1)Digital Atlas of Montana - Surface water, points of diversion database query
This system provided all surface water diversions with each respective basin (http://maps2.nris.state.mt.us/mapper/index.html).
2) Montana Department of Natural Resources and Conservation Water Right Query
This system provided a summary of water rights and diversion method. The study focused on water rights with diversion methods stated as surface water and pumping (http://nris.state.mt.us/apps/dnrc2002/waterrightmain.asp).
-State of Idaho Rivers: The resource for State of Idaho water rights information is the State of Idaho, GIS Web Server named IDWR Water Right and Adjudication Search (http://www.idwr.idaho.gov/apps/ExtSearch/SearchWRAJ.asp).
-State of Washington: The resource for the State of Washington water rights information is a recent watershed level 1 planning report for WRIA 62 (Entrix, 2001 – Level 1 Assessment, WRIA 62, Pend Oreille Watershed Planning Unit.).

[3] Bonners Ferry stage data during the irrigation season were only available for May through August. For this reach the 80% of irrigation occurring after July 1 was spread evenly over the months of July and August for analysis.

relate flow rates to river stage. A standard power pumping formula was used to calculate power requirements for each alternative/benchmark.

2.3.2 Agricultural Impacts from High Groundwater Levels

Potential agricultural losses could result from higher stages in the Kootenai Flats reach of Area 1. Crop loss functions were developed that associate losses to river flows and/or stages in the area using a groundwater model developed for the region. Losses from high groundwater levels were evaluated for the four alternatives and two benchmarks in a separate report.

2.4 Municipal and Industrial Water Supply Methodology

Change in the energy required to pump water and the resultant change in pumping cost is the primary category of potential impact to Municipal and Industrial (M&I) Water Supply in the study area. The same methodology as described above for irrigation pumping power requirements was applied to collect data on M&I water rights and volumes; and to evaluate potential impacts to M&I pumping power requirements. For the analysis, monthly M&I water use was distributed as identified in **Table 3**.

Table 3. M&I Water Use by Month

Month	% Use
January	7.00%
February	7.00%
March	8.00%
April	8.25%
May	9.00%
June	9.25%
July	9.50%
August	9.50%
September	9.00%
October	8.50%
November	8.00%
December	7.00%
TOTAL	100.00%

Source: AQUARIOUS: A Modeling System For River Basin Allocation; U.S. Forest Service 2000; Chapter3; Municipal and Industrial Water Use.

2.5 Employment and Income Methodology

A qualitative evaluation of potential effects to local and regional economies was performed for each study area. The evaluation addresses potential localized impacts of changes in direct socioeconomic and recreation outputs.

2.6 Tribal Socioeconomics Methodology

Tribal socioeconomic characteristics are identified for each study area in the Recreation Affected Environment Report. Potential impacts to Tribal Socioeconomics in these study areas are addressed in this report. Categories of potential impact that were evaluated include flood control, navigation, irrigation, M&I water supply, and employment and income. Methodologies applied for evaluation of impacts in each of these categories are the same as described in the preceding paragraphs of this section.

3.0 Area 1 – Kootenai River Basin

3.1 Area 1 Flood Control

Impacts on existing flood control levels in Area 1 were identified as a concern on the Kootenai River from Bonners Ferry to (and including) Kootenay Lake. An assessment of overbank flooding impacts that would be associated with the different flood control and fish operation alternatives/benchmarks is documented below. Potential agricultural impacts associated with high groundwater levels are presented in **Section 3.3.2**.

3.1.1 Kootenai River Flood Control

The primary area of potential flood losses along the Kootenai River between Libby Dam and Kootenay Lake occurs in the reach known as Kootenai Flats, extending from Bonners Ferry, ID, to Kootenay Lake in Canada. In addition to Libby Dam, flood protection is provided in the United States portion of the floodplain by approximately 95 miles of levees that protect about 35,000 acres of agricultural lands used to grow wheat, barley, oats, canola, and hops. With a few exceptions (levees protecting hops) these levees have not been well maintained since Libby Dam began flood control operations. Levees also protect about 17,000 acres in Canada, between the international boundary and Kootenay Lake. Cropping patterns are similar to those in the United States. About 190 acres within the town of Bonners Ferry are also in the Kootenai River floodplain and are protected by well-maintained levees. In 1987 (the most recent floodplain survey data available) this area contained 106 homes, 66 commercial establishments and 12 public facilities.

Flood History: Before the Kootenai Flats area was partially protected by man made levees, yearly high water would flood portions of the floodplain and more infrequent events would flood the entire valley, in excess of 60,000 acres. Floods in the Kootenai Basin generally occurred during the snowmelt season often augmented by intense rainfall. Floods are of long duration and are notable for great volume rather than extreme stage crest. Because of the backwater effect of Kootenay Lake, maximum discharge of the river at Bonners Ferry usually occurs prior to the maximum river elevation. As Kootenay Lake rises, the gradient of the river becomes less, the velocity decreases and a higher stage for a given discharge occurs. The 1948 flood in the Kootenai Valley exceeded the 1894 flood, the largest known in the Columbia River Basin as a whole, in stage, although not in discharge. Estimates of flood losses caused by the 1948 flood totaled $5,792,000 ($107,036,000 in October 2004 prices and conditions). Prior to the completion of Libby Dam (operational for flood control in 1972), the town of Bonners Ferry experienced a 50-year event in 1894, a 40-year event in 1916, a 25-year event in 1948, and a 10-year event in 1956. During the course of interviews with merchants in Bonners Ferry, many revealed that they had been forced to move inventory and supplies four to six times between 1948 and 1972.

Stage – Damage Analysis: Data on damageable property, including residential, commercial/ industrial, public, agricultural, and emergency aid were obtained from a detailed economic study conducted for the *Columbia River System Operation Review – Environmental Impact Statement,* published in November 1995. For this analysis, loss figures were updated (from July 1992 Prices & 1995 Conditions) to October 2004 Prices and Conditions using the *Engineering News Record* building and construction cost indices, the CPI for West Urban areas, and an assumed rate of growth (0.5%/yr). Loss, by stage, for all categories of impact, is summarized on **Table 4**. The zero dollar damage point for this reach is 1764.0 feet.

Table 4: Stage vs. Flood Damage - Libby Dam to Kootenay Lake

Stage*	Residential	Commercial/ Industrial	Public	Agriculture	Emergency Aid	Other	Total Losses
1764	0	0	0	0	0	0	0
1768	28.2	382.3	191.2	438.8	232.4	95.6	1,368.5
1770	58.6	829.8	417.1	947.1	504.0	206.4	2,963.0
1772	99.9	1,405.4	699.5	1,605.3	853.7	351.9	5,015.7
1776	356.2	4,976.5	2,489.4	5,691.2	3,023.7	1,244.7	17,781.7
1777	510.5	7,148.8	3,575.5	8,169.7	4,340.1	1,787.7	25,532.3
1778	866.7	12,127.5	6,064.8	13,858.7	7,363.8	3,032.4	43,313.9
1780	2,033.2	28,471.2	14,234.5	32,535.4	17,284.3	7,116.2	101,674.8
1781	2,189.6	30,639.1	15,318.5	35,016.1	18,602.9	7,659.2	109,425.4
1782	2,278.7	31,916.4	15,957.1	36,475.8	19,378.3	7,978.5	113,984.8

*Note: *Elevation in feet, MSL Datum. Data presented in October 2004 Prices & Conditions - $1,000*

Expected Annual Damages: Stage – frequency relationships developed at the Bonners Ferry gage for the four alternatives and two benchmarks were used to derive expected annual damages for this flood impact reach. Details of these derivations can be found in the **Hydrology and Flood Control Section** of the EIS. Expected annual damages were derived using Corps of Engineers Hydrologic Engineering Center computer program *Expected Annual Flood Damage Computation.* This program integrates exceedance frequency with associated losses to determine expected annual damages for a given frequency interval. **Table 5** presents a summary of expected annual damages by impact category for the alternatives and benchmarks. As shown on **Table 5**, all operations except the LV benchmark would have identical expected annual damages of $21,780. Benchmark LV would increase total expected annual damages by $1,170, or 5 percent relative to benchmark LS.

Table 5: Expected Annual Damages - Libby Dam to Kootenay Lake

Alternative	Residential	Commercial/ Industrial	Public	Agriculture	Emergency Aid	Other	Total Damages
LS1	0.44	6.10	3.05	6.97	3.7	1.52	21.78
LV1	0.44	6.10	3.05	6.97	3.7	1.52	21.78
LS2	0.44	6.10	3.05	6.97	3.7	1.52	21.78
LV2	0.44	6.10	3.05	6.97	3.7	1.52	21.78
Benchmark							
LS	0.44	6.10	3.05	6.97	3.7	1.52	21.78
LV	0.46	6.43	3.22	7.34	3.9	1.60	22.95

Note: Data presented in October 2004 Prices & Conditions - $1,000

3.1.2 Kootenay Lake Flood Control

The 1972 Columbia River Treaty Flood Control Operating Plan (FCOP) states that "damage commences at Nelson when Kootenay Lake reaches elevation 1755 feet and major damage stage is elevation 1759 feet" (Corps 1972). Since 1972, development around Kootenay Lake has occurred, and it is probable that damage now commences below elevation 1755 feet. The Canadian entity is endeavoring to create an updated stage-damage relationship at Kootenay Lake.

From a flood control perspective, the impacts of VARQ flood control operations and fish flows on the level of Kootenay Lake are of greatest importance in May, June, and July. Elevation-frequency analysis during this period shows that for high percent-chance-exceedance (low runoff) events, the Kootenay Lake levels associated with VARQ flood control operations would be consistently higher than those under standard flood control operations. This effect diminishes toward the low percent-chance-exceedance (higher runoff) events, and the effects of the different flood control operations would be basically the same at or above elevation 1754 feet. In all simulations, the maximum stage at Kootenay Lake would remain below elevation 1755 feet, regardless of the flood control alternative/benchmark modeled.

Results were similar for alternatives (with fish flows) relative to the benchmark operations without fish flows. Overall, the alternatives all would lead to higher spring and summer time elevations at Kootenay Lake than the benchmarks (without fish flows) for the high percent-chance-exceedance events. The alternatives where fish flows are provided at powerhouse capacity +10,000 cfs would result in a higher Kootenay Lake stage than the alternatives where fish flows are limited to powerhouse capacity. In all of the fish flow simulations, the maximum stage at Kootenay Lake would remain below elevation 1755 feet.

In 2004, BC Hydro, the Columbia Basin Trust, Environment Canada, the Lower Kootenay Band, and the Ministry of Water Land and Air Protection collaborated to produce the report: A Stakeholders Summary of Preferred and Potential Negative

Reservoir Levels and River Stages on the Kootenay River System in Canada, Interest Group Response Summary to proposed VARQ Alternative Flood Control Operation. The report documents detrimental Kootenay Lake elevations relative to regional residential and commercial values, including the flooding of residential and commercial waterfront properties. The highest non-detrimental lake elevation identified in the report was elevation 1752 feet. Daily lake elevations were modeled with each alternative/benchmark over a 52-year period and reviewed to identify the average number of days per month that the lake level was at or below elevation 1752 feet. The results are shown in **Table 6**. Results show that the average number of days per year that the lake is below 1752 is the same for LS1 and LV1 (363 days) and one day less with LS2 or LV2 (362 days). The greatest numbers of days below 1752 were with the benchmark operations (365 days with LS and 364 days with LV). The greatest change in the number of days between any two alternatives/benchmarks is less than 1%.

Table 6. Average Days per Month with Kootenay Lake Elevation at or below 1752 Feet

Month	LS1 (No-Action)	LV1	LS2	LV2		LS benchmark	LV benchmark
January	31	31	31	31		31	31
February	28	28	28	28		28	28
March	31	31	31	31		31	31
April	30	30	30	30		30	30
May	31	31	31	31		31	31
June	28	28	27	27		30	29
July	31	31	31	31		31	31
August	31	31	31	31		31	31
September	30	30	30	30		30	30
October	31	31	31	31		31	31
November	30	30	30	30		30	30
December	31	31	31	31		31	31
Total:	363	363	362	362		365	364

3.2 Area 1 Navigation

Impacts on commercial navigation in Area 1 were identified as a concern on Kootenay Lake, where the Canadian Ministry of Highways operates the Kootenay Lake Ferry. The ferry is operational down to lake levels of 1739 feet. No alternatives/benchmarks would result in water surface elevations outside the ferry's operational range.

3.3 Area 1 Agriculture and Irrigation

The primary categories of potential impacts to Area 1 agriculture from changes in operations at Libby Dam are changes in agricultural pumping power requirements and changes in expected losses to agricultural production from seepage.

3.3.1 Irrigation Pumping Impacts

To evaluate the impacts to irrigation pumping from the Kootenai River, water rights data from MT and ID were reviewed to estimate pumped volumes for agricultural irrigation. Pumping power requirements were estimated based upon the average monthly stage for each alternative/benchmark as measured at the Libby, MT gage[4] for MT use and the Bonners Ferry, ID gage for ID use. In general, higher river stages tend to reduce power requirements for irrigation pumping.[5]

Montana Irrigation from Kootenai River: Based on review of state water rights data, annual Kootenai River withdrawals for agricultural irrigation in MT were estimated at 817 acre-feet. For the analysis, the total annual volume was distributed across the irrigation season (May-September) per the monthly distribution shown in **Table 2**. **Table 7** presents the estimates of pumping kilowatt-hours associated with each alternative/benchmark. Compared to no-action (LS1), the greatest change in the agricultural pumping power requirements with any other alternative/benchmark is less than one half of one percent.

Table 7. Summary of Agricultural Pumping Power Requirements, Area 1 - Kootenai River in MT

Location	Month	Pumping Power Requirements (kW-hr)						
		LS1 (No-Action)	LV1	LS2	LV2		LS benchmark	LV benchmark
Libby	May	16,100	16,000	16,100	16,000		16,300	16,100
	June	15,900	15,900	15,900	15,900		16,200	16,000
	July	42,700	42,500	42,700	42,500		42,600	42,600
	Aug	42,700	42,600	42,700	42,600		43,100	43,100
	Sep	43,200	43,200	43,200	43,200		42,000	42,100
Total		160,600	160,200	160,600	160,200		160,200	159,900

[4] The flow at this location was assumed to be equal to the simulated outflow from Libby Dam for each alternative.
[5] Methodology described in Section 2.3.1.

Idaho Irrigation from Kootenai River: Based on review of state water rights data, annual withdrawals for agricultural irrigation in ID were estimated at 2334 acre-feet. For the analysis, the total annual volume was distributed across the months of May to August (the months with modeled stage data for each alternative/benchmark) per the distribution identified in **Table 2**. **Table 8** presents the estimates of pumping kilowatt-hours associated with each alternative/benchmark. Compared to no-action (LS1), the greatest change in the agricultural pumping power requirements with any other alternative/benchmark is less than one percent.

Table 8. Summary of Agricultural Pumping Power Requirements Hours, Area 1 - Kootenai River in ID

Location	Month	Pumping Power Requirements (kW-hr)						
		LS1 (No-Action)	LV1	LS2	LV2		LS benchmark	LV benchmark
Bonners Ferry	May	44,700	44,200	44,600	44,100		44,900	44,100
	June	43,900	43,900	43,900	43,900		44,800	44,200
	July	182,200	180,900	182,500	181,200		181,100	180,700
	Aug	184,800	183,500	185,100	183,800		186,300	186,300
Total		455,600	452,500	456,100	453,000		457,100	455,300

3.3.2 Agricultural Impacts from High Groundwater Levels

Agricultural impacts were evaluated associated with crop losses from high groundwater levels in Kootenai Flats in a separate section of this EIS (see Appendix G). For this analysis, the Corps worked with local officials, USFWS, tribal staff, and property owners under facilitation of the Kootenai Valley Resources Initiative (KVRI) to reach a consensus on two years representing conditions of interest to the valley stakeholders and relevant to the seepage issue.

Water year 1964 was selected to represent a typical year, which was defined as a year with a May 1st Libby seasonal water supply forecast between 6.0 and 6.7 million acre-feet[6], with a relatively small May 1st forecast error, and hydrograph timing and volume similar to the 50% exceedance summary hydrograph. 1964 had a seasonal runoff of 6.9 million acre-feet (111% of average, with a May 1st forecast of 6.7 million acre-feet).

Water year 1961 was selected to represent "a more significant year," which was defined as a high-water year that is a cause of concern for the community. The high-water year was chosen solely by the stakeholder group from the period of record as the one year they wanted modeled to capture the upper bounds of seepage impacts. 1961 had a seasonal

[6] The average April-August water supply for Libby is 6.25 million acre-feet (MAF). Actual runoff in 1964 was 6.9 MAF, or 111% of average.

runoff of 7.9 million acre-feet (126% of average) and a May 1st forecast of 7.5 million acre-feet. Forecasts for 1961 in January, February, March, and April were all lower than the May 1st forecast. The greatest difference in river flows and resulting groundwater levels between VARQ and Standard FC would be expected in years such as 1961 with increasing water supply forecasts through the winter.

Analysis of groundwater pumping costs for each of these years was performed for each alternative/benchmark. The analysis was based upon crop budget research and a groundwater model developed for the study. Losses were evaluated for hops, winter wheat, spring wheat, barley, canola, and alfalfa. Aggregated results of the analysis for these crops are presented in **Table 9**.

Results show that for the typical year (1964), crop losses associated with high groundwater would be expected to increase by 0.8% with LV1, 2.8% with LS2, and 3.4% with LV2, when compared to no-action (LS1). The two benchmark operations show a decrease in losses when compared to no-action; a decrease of 31.5% with LS and a decrease of 14.9% with LV. For the more significant year (1961), results showed that losses would be expected to increase by 9.8% with LV1 and LV2, and decrease by 2.2% with LS2, when compared to no-action (LS1). The benchmark operations showed a decrease of 11.7% with LS and an increase of 9.0% with LV when compared to no-action.

Table 9. Impacts of High Groundwater Levels, Kootenai River Floodplain

Year	LS1	LV1	LS2	LV2		LS benchmark	LV benchmark
1964 (a typical year)	$3,811,000	$3,843,000	$3,916,000	$3,940,000		$2,609,000	$3,244,000
1961 (a more signifi-cant year)	$5,336,000	$5,860,000	$5,221,000	$5,860,000		$4,714,000	$5,817,000

3.4 Area 1 Municipal and Industrial Water Supply-

The primary category of potential impact to M&I water supplies resulting from changes in operations at Libby Dam is associated with changes in the energy required to pump water. MT and ID water rights data were reviewed to estimate pumped volumes for M&I water supply from the Kootenai River. Pumping power requirements were estimated based upon the average monthly stage for each alternative/benchmark as measured at Libby, MT for MT use and Bonners Ferry, ID for ID use.[7]

Montana M&I Water Supply from Kootenai River: Based on review of state water rights data, annual Kootenai River withdrawals for M&I water supply in MT were estimated at 5,263 acre-feet. For the analysis, the total annual volume was distributed

[7] Methodology described in Section 2.4.

across all months as presented in **Table 3**. **Table 10** presents the estimates of pumping kilowatt-hours associated with each alternative/benchmark. Compared to no-action (LS1), the greatest change in M&I pumping power requirements with any other alternative/benchmark is less than three tenths of one percent.

Table 10. Summary of M&I Pumping Power Requirements, Area 1 - Kootenai River in MT

Location	Month	Pumping Power Requirements (kW-hr)						
		LS1 (No-Action)	LV1	LS2	LV2		LS benchmark	LV benchmark
Libby	Jan	71,300	72,500	71,300	72,500		71,300	72,500
	Feb	72,200	73,000	72,200	73,000		72,200	73,000
	March	83,600	83,900	83,600	83,900		83,600	83,900
	Apr	86,600	86,600	86,600	86,600		86,600	86,600
	May	93,600	92,900	93,400	92,700		94,400	93,300
	June	94,600	94,700	94,600	94,700		96,300	95,600
	July	97,900	97,500	98,000	97,600		97,800	97,800
	Aug	98,000	97,700	98,100	97,800		98,900	99,000
	Sep	93,900	94,000	93,900	94,000		91,300	91,500
	Oct	89,000	89,100	89,000	89,100		88,900	89,100
	Nov	83,900	84,000	83,900	84,000		83,800	84,000
	Dec	71,800	71,900	71,800	71,900		71,600	71,800
	Total	1,036,400	1,037,800	1,036,400	1,037,800		1,036,700	1,038,100

Idaho M&I Water Supply from Kootenai River: Based on review of state water rights data, annual Kootenai River withdrawals for M&I water supply in ID were estimated at 1452 acre-feet. For the analysis, the total annual volume was distributed evenly across the months with modeled stages at Bonners Ferry (April-August). **Table 11** presents the estimates of pumping kilowatt-hours associated with each alternative/benchmark. Compared to no-action (LS1), the greatest change in M&I pumping power requirements with any other alternative/benchmark is less than 1 percent.

Table 11. Summary of M&I Pumping Power Requirements, Area 1 - Kootenai River in ID

Location	Month	Pumping Power Requirements (kW-hr)						
		LS1 (No-Action)	LV1	LS2	LV2		LS benchmark	LV benchmark
Bonners Ferry	Apr	69,500	68,700	69,300	68,500		69,800	68,600
	May	68,200	68,200	68,200	68,200		69,700	68,700
	June	70,800	70,300	70,900	70,400		70,400	70,300
	July	71,900	71,400	72,000	71,400		72,400	72,400
	Aug	69,500	68,700	69,300	68,500		69,800	68,600
Total		280,400	278,600	280,400	278,500		282,300	280,000

3.5 Area 1 Employment and Income

3.5.1 Employment and Income Effects of Flood Control Impacts

No employment and income effects are expected from flood control impacts of different alternatives/benchmarks in Area 1. All alternatives being considered for implementation were estimated to provide the same level of flood protection as measured by expected annual damages. Although no stage damage data was available to estimate expected annual flood damages at Kootenay Lake, analysis of days with the lake at documented flooding stages showed no substantial differences across the alternatives/benchmarks.

3.5.2 Employment and Income Effects of Navigation

No employment and income effects are expected from navigation impacts of different alternatives/benchmarks in Area 1. No navigation impacts were identified for any alternatives/benchmarks evaluated.

3.5.2 Employment and Income Effects of Agriculture and Irrigation Impacts

No employment and income effects are expected in Area 1 from changes in agricultural irrigation costs associated with different alternatives/benchmarks. All alternatives being considered for implementation were estimated to result in similar pumping costs (changes in cost from no-action to each alternative were 1% or less).

Employment and income effects for Area 1 farmers are expected as a result of changes in expected crop losses from high groundwater, as identified in **Section 3.3.2**. **Table 9**

shows the losses with each alternative/benchmark. These crop losses would be income losses for Area 1 farmers.

3.5.3 Employment and Income Effects of Municipal and Industrial Water Supply Impacts

No employment and income effects are expected in Area 1 from changes in M&I water pumping costs associated with different alternatives/benchmarks. All alternatives being considered for implementation were estimated to result in similar M&I pumping costs (changes in cost from no-action to each alternative were 1% or less).

3.5.4 Employment and Income Effects of Recreation Impacts

The Corps completed a Visitor Spending Profile Survey based on 12 Corps lakes in 1990.[8] This study showed that, on average, boating visitors spend $58 per person-day within 30 miles of the recreation site ($84 in October 2004 prices). Non-boating recreation visitors were found to spend an average of $55 per person-day within 30 miles of the recreation site ($79 in October 2004 prices). This spending supports local economies, including hotels and motels, paid camping areas, grocery stores, restaurants, auto and RV services, boating supplies and services, fishing and hunting guides and supplies, and entertainment services. Operational changes that affect recreation opportunities and visitation can have employment and income effects on regional communities.

Lake Koocanusa: The most recent (1999) Corps data on spending associated with visitation for Libby Dam/Lake Koocanusa shows that in 1999 the project was responsible for $4.23 million in annual sales ($4.8 million on October 2004 prices) within 30 miles of the project; translating to income of $2.23 million ($2.53 million in October 2004 prices) and 109 jobs (citation). There is potential for positive employment and income benefits at Lake Koocanusa with implementation of LV1 or LV2. These alternatives would result in an increase in usable boat ramp days, swimming days, and days with optimal lake elevations for lake area campsites.

In the U.S. portion of the lake, usable boat ramp days would increase by approximately 9% with LV1 or LV2 as compared to no-action (LS1). Usable days at the lake's swimming beaches would increase by 40% with LV1 and 32% with LV2 relative to no-action. Similarly, days with lake elevations that would be best for camping increase by 44% with LV1 and by 36% with LV2. In the Canadian portion of the lake, LV1 and LV2

[8] The Corps of Engineers 12 Lakes Visitor Spending Profile Survey was performed in 1990. Durable goods and visitor spending profiles information was gathered in personal interviews on site. Trip expenses for the entire trip were reported in mailback spending diaries, returned at the end of the trip. Source: Propst, D.B., D.J. Stynes, and R.S. Jackson. 1992. A Summary of spending profiles for recreation visitors to Corps of Engineers Projects. Technical Report R-92-1. Vicksburg, MS: Department of the Army, Waterways Experiment Station.

result in an 18% and 15% increase in usable boat ramp days, respectively when compared to no-action. Average swimming days would increase by 76% with LV1 and 55% with LV2. It is expected that increases of this magnitude in recreational opportunity would translate to increased visitation and local spending.

Kootenai River: Recreation analysis of the Kootenai River between Libby Dam and Kootenay Lake found that shore fishing days would be reduced with implementation of LV1 (-35%) and LV2 (-30%) relative to no-action (LS1) due to increased days exceeding the upper range of optimal shore fishing flows identified as 10,000 cfs. There is a slight improvement in shore fishing days relative to no-action with LS2 (+4%). Negative employment effects of the reduced shore fishing days would likely be offset by an increase in days with flows permitting boat fishing on the river. LV1 and LV2 would result in increases of 15% and 19% in boating days, respectively. The average spending associated with boat fishing ($82 per party day) is greater than that for shore fishing ($61 per party-day).[9]

Kootenay Lake: Recreation analysis for Kootenay Lake found a slight decrease (-2%) in the number of days in the identified optimal recreational range between elevations 1740 and 1754 feet with LV1 and LV2. The 2% decrease corresponds to an average reduction of 3 days in that range over the period of May to September.

Localized concern was voiced for impacts to off season moorage at Pilot Bay Resorts and fishing impacts at Kootenay Kampsites. No impacts were identified with any of the alternatives/benchmarks for Pilot Bay Resorts. It was indicated that fishing at Kootenay Kampsites requires a lake elevation of 1744 feet or higher. LV1 and LV2 would result in an increase of days with lake elevations above this level (+8% and +7% respectively over the period of May through September). Function of swim beaches at the lake requires lake elevations below 1749 feet. The recreation analysis showed a slight decrease in days under this elevation with LV1, LS2, and LV2 (-1%, -1%, and -3%, respectively).

It is not expected that these slight changes in usable recreation days at Kootenay Lake would result in significant effects to regional employment and income.

3.5.5 Employment and Income Effects of Hydropower Impacts

The hydroelectric dams in the Columbia River Basin provide the foundation of the northwest United States' power supply. The **Hydropower Section** of this EIS documents the evaluation of impacts to the Columbia River Basin hydropower system associated with the proposed alternative/benchmark combinations. The documentation in this Section applies to all socioeconomic study areas in this report.

[9] Recreation visitors spending profiles were calculated from data on Corps Lakes from the Corps 1989/1990 National Visitor Survey. Table 4A: Trip Spending by Fishing Segments (boat-angler vs. other angler, $ per party-day).

Table 12 shows simulated average annual hydropower generation with each alternative/benchmark combination for three groupings of hydropower projects. The three groupings listed are the Columbia River basin hydropower system (System), the Federal hydropower projects downstream of Libby and Hungry Horse Dams (Federal), and non-Federal hydropower projects downstream of Libby and Hungry Horse Dams (Non-Federal). Some combinations result in a loss of generating capacity for the system. The loss in generated electricity will need to be replaced by other higher cost resources which may lead to rate increases for consumers. This in turn may increase the electric bills of residential and commercial consumers of electricity. Conversely, some combinations result in increased generating capacity and could result in lower electric rates.

Table 12. Simulated Hydropower Generation with Each Combination

Hydropower Generation (GWh)							
	LS1+HS	LV1+HV	LS2+HS	LV2+HV		LS+HS benchmark	LV+HV benchmark
System	131,442	131,370	131,724	131,611		131,463	131,384
Federal	67,043	67,072	67,233	67,235		67,060	67,085
Non-Federal	32,082	31,934	32,084	31,948		32,072	31,936

When compared to no-action (LS1+HS), Columbia River System hydropower generation would be expected to decrease by approximately 72 GWh with LV1+HV (-0.05%), and increase by 282 GWh (+0.21%) and 169 GWh (+0.13%) with LS2+HS and LV2+HV, respectively. The change in expected system generation from no-action to either benchmark combination was less than 0.1%. With the exception of LS2+HS, all alternative/benchmark combinations showed a decrease in generation at non-federal projects downstream of Libby and Hungry Horse Dams of 0.5% or less, when compared to no-action. Alternative combinations LS2+HS showed a very slight increase in generation of 0.01%.

3.6 Area 1 Tribal Socioeconomics

The socioeconomic affected environment report identified existing agricultural problems associated with agricultural lands on the Kootenai Tribe Reservation, north of Bonners Ferry, ID. These problems relate to spring flooding and poor drainage. As identified in **Section 3.1.1**, the Area 1 flood control analysis did not identify any increase in expected annual flood damages with any alternative/benchmark when compared to the no action (LS1) with the exception of benchmark operation LV. This benchmark operation is not being considered for implementation.

As identified in **Section 3.3.2**, a separate study identifies and quantifies the effects of high groundwater levels on agriculture in the Kootenai River Valley with the different alternatives/benchmarks at Libby Dam. Results of this study are reported in Appendix G.

The study evaluates agricultural impacts of high groundwater throughout the Kootenai Valley for each alternative and benchmark operation.

As identified in **Section 3.5.4**, no employment and income effects were identified along the Kootenai River. It is expected that employment and income effects associated with reductions in optimal days for shore fishing would be offset by increased days suitable for boat fishing. Additionally, no employment and income effects are expected in the Kootenay Lake study reach in the vicinity of the Lower Kootenay Indian Band reserve and the Tobacco Plains reserve.

4.0 Area 2 – Flathead, Clark Fork, Pend Oreille River Basin

4.1 Area 2 Flood Control

In addition to providing approximately 5% of the total flood storage in the Columbia River Basin for system flood control, Hungry Horse Dam provides local flood control benefits along the Flathead River from Columbia Falls to Flathead Lake and downstream to Lake Pend Oreille and Albeni Falls Dam. Changes in the timing and volume of discharge from Hungry Horse Dam have potential implications on expected annual flood damages in Area 2. Flood impact evaluation areas in Area 2 include the Flathead River from Columbia Falls to Flathead Lake, the Flathead Lake Shoreline, Lake Pend Oreille, and the Pend Oreille River from Albeni Falls Dam to the Columbia River. Flood impact assessments were performed for each evaluation area and for each of the two alternatives applicable to Area 2 (HS and HV).

4.1.1 Flathead River (Columbia Falls, MT to Flathead Lake)

The primary area of potential flood losses along the upper Flathead River downstream of Hungry Horse Dam occurs in the reach between Columbia Falls, MT and Flathead Lake. Residential and commercial losses are concentrated in an area adjacent to the city of Kalispell, MT, and agricultural losses are predominately upstream and downstream of this area. In recent years, residential development has been displacing agriculture in the floodplain upstream of Kalispell. The slope of the Flathead River from its source to Columbia Falls is very steep. In the flood impact reach between Columbia Falls and Flathead Lake, the slope varies from 5 to 7 feet per mile. The river flows through meandering channels in a floodplain varying from 1 to about 3 miles wide. Flood durations are relatively short because of regulation of the South Fork of the Flathead River by Hungry Horse Dam. During the extremely rare flood of June 1964, the river had a maximum rate of rise of about 1 foot per hour at the Columbia Falls gage, and remained out of banks between two and three days. Water velocities during major floods range up to six feet per second in the channel, and are generally less than three feet per second overbank.

Flood loss prevention measures within this flood impact reach include several miles of levees along both banks of the river, channel improvements and realignments, bank protection and erosion control devices. The South Fork of the Flathead River, a major tributary of the river upstream of Columbia Falls, is regulated by Hungry Horse Dam, a Federal (Bureau of Reclamation) multi-purpose project completed in 1951. The regulation of the South Fork during large floods reduces the extent and duration of flooding in this reach, as well as in Flathead Lake and the lower Flathead valley.

Flood History: The Flathead River floods the lower portions of this flood impact reach about once in every four years. Normally flooding is caused by runoff from snowmelt. Floods from snowmelt are the basis for the Standard Project Flood (SPF) determination. Normally, a SPF is an extremely rare occurrence, and on most rivers is usually larger than floods that have occurred. On the Flathead River however, the June 1964 flood was approximately 70 percent greater in magnitude than the calculated SPF. The June 1964 flood was also caused by rainfall rather than snowmelt, and was an extremely rare event. Nevertheless, a recurrence of this flood event in October 2004 prices and conditions would result in $40.4 million in losses. Major floods in 1932 (89,800 c.f.s.), 1933 (91,200 c.f.s.), and 1948 (102,000 c.f.s.) also caused extensive losses. Actual discharges of floods and losses caused by floods prior to October 1951 would now be reduced somewhat by available storage at Hungry Horse Reservoir.

Discharge – Damage Analysis: Data on damageable property, including residential, commercial, agricultural, and other (emergency aid and public) were obtained from a detailed economic study conducted for the *Columbia River System Operation Review – Environmental Impact Statement*, published in November 1995. For this analysis, loss figures were updated (from July 1992 Prices & 1995 Conditions) to October 2004 Prices and Conditions using the *Engineering News Record* building and construction cost indices, the CPI for West Urban areas, and an assumed rate of growth (0.5%/yr). Losses by discharge, for all categories of impact, are summarized in **Table 13**. The zero dollar damage point for this reach (assumed to be the design levee height in areas with levees) is 52,000 c.f.s.

Table 13: Discharge vs. Flood Damage - Columbia Falls to Flathead Lake

Discharge (cfs)	Residential	Commercial	Agricultural	Other	Total Damages
52,000	0	0	0	0	0
79,000	3,630	1,162	2,178	871	7,841
100,000	9,438	3,485	5,808	2,178	20,909
130,000	14,084	5,082	8,567	3,194	30,927
176,000	18,295	6,824	11,180	4,065	40,364

Note: Data presented in October 2004 Prices & Conditions - $1,000

Expected Annual Damages: The point of zero damage for this reach was determined from historical flood records and available information on stream bank capacity. Expected annual damages were derived from discharge-damage data calculated for three hypothetical floods and the 1964 flood event. Discharge-frequency relationships developed for the Columbia Falls gage for the no action - base case condition (HS), and one alternative (HV) were used in this analysis. Details of these derivations can be found in the **Hydrology and Flood Control Section** of the EIS. Expected annual damages were derived using Corps of Engineers Hydrologic Engineering Center computer program *Expected Annual Flood Damage Computation.* This program integrates exceedance frequency with associated losses to determine expected annual damages for a given frequency interval. **Table 14** presents a summary of expected annual damages by

impact category for both alternatives. As would be expected, since the discharge-frequency curves of both alternatives merge at a point just below the zero damage discharge of 52,000 c.f.s., there is no difference in total expected annual damages between the two alternatives.

Table 14: Expected Annual Damages - Columbia Falls to Flathead Lake

Alternative	Residential	Commercial	Agricultural	Other	Total Damages
HS	233.41	78.02	140.89	55.13	507.45
HV	233.41	78.02	140.89	55.13	507.45

Note: Data presented in October 2004 Prices & Conditions - $1,000

4.1.2 Flathead Lake Shoreline

Kerr Dam located near Polson, MT, controls Flathead Lake. Kerr Dam is operated by PPL-Montana for power, flood control, and recreation. While Kerr Dam regulates the level of Flathead Lake and thus prevents flooding to lake front property, the dam is primarily operated to prevent flooding upstream of the lake which is caused by backwater effects of high lake levels and high Flathead River flows. Specifically, flooding in the Kalispell area begins if the lake level reaches elevation 2893 feet coincident with the river flow being above 52,000 c.f.s. The zero damage lake stage for lake front flooding is also 2893 feet. The Corps and PPL-Montana jointly manage the springtime refill of Flathead Lake for flood control. If no flood potential exists in the river basin above the lake, the agreed upon target flood control rule curve for Flathead Lake is presented in **Table 15.**

Table 15: Flathead Lake Flood Control Operations

Date	Lake Stage (ft)
15 April	2883.0
30 May	2890.0
15 June	2893.0

Flood History: No information has been found regarding historic flooding of Flathead Lake, but it is believed that lake front flooding has not been a significant problem since construction of Kerr Dam in 1938.

Stage – Damage Analysis: Data on damageable property including residential, commercial, agricultural, and public were obtained from windshield surveys and analysis conducted in 1993 for the *Columbia River System Operation Review – Environmental Impact Statement*, published in November 1995. For this current analysis, loss figures were updated (from July 1992 Prices & 1995 Conditions) to October 2004 Prices and Conditions using the *Engineering News Record* building and construction cost indices, the CPI for West Urban areas, and an assumed rate of growth of 0.5 percent per year.

Erosion losses of waterfront land and dock impacts represent the majority of losses. Erosion losses are included in the Residential and Public categories, and dock impacts are included in the Residential category. The lake front floodplain has changed significantly over the years from a primarily rural agricultural area to a developing residential area of primary or recreational second homes. Residential development has accelerated over the last 5 years. Losses by lake stage, for all categories of impacts, are summarized in **Table 16**. The zero dollar damage point for this reach is 2893 feet.

Table 16: Stage vs. Flood Damage - Flathead Lake

Stage*	Residential	Commercial	Agricultural	Public	Total Damages
2893	0	0	0	0	0
2895	2,904	116	58	755	3,833
2897	5,764	290	145	1,510	7,709
2899	8,697	581	290	2,294	11,862
2900	10,599	726	363	3,049	14,737

*Note: *Elevation in feet, MSL Datum. Data presented in October 2004 Prices & Conditions - $1,000*

Expected Annual Damages: Expected annual damages were derived for stage-damage data calculated for four hypothetical floods. Stage-frequency relationships, developed for the Polson gage for two alternatives (HS, and HV) were used in this analysis. Details of these derivations can be found in the **Hydrology and Flood Control Section** of the EIS. Expected annual damages were derived using Corps of Engineers Hydrologic Engineering Center computer program *Expected Annual Flood Damage Computation.* This program integrates exceedance frequency with associated losses to determine expected annual damages for a given frequency interval. **Table 17** presents a summary of expected annual damages by impact category for both alternatives. As shown in the table, implementing HV would increase total expected annual damages about $15,000, or 4 percent over the no action alternative (HS).

Table 17: Expected Annual Damages - Flathead Lake

Alternative	Residential	Commercial	Agricultural	Public	Total Damages
HS	250.92	15.92	7.96	70.96	345.76
HV	262.44	16.38	8.19	73.95	360.96

Note: Data presented in October 2004 Prices & Conditions - $1,000

4.1.3 Lake Pend Oreille

Pend Oreille Lake is controlled by Albeni Falls Dam, which was constructed by the Corps starting in 1951. It was authorized for the regulation of Lake Pend Oreille and for the associated purposes of flood control, navigation, conservation, recreation, and power generation as part of the comprehensive plan of improvement for the Columbia River system. The flood control benefits of the project are realized from lowering of maximum

stages on Lake Pend Oreille and managing downstream discharges. The project was operational for flood control in 1952. The reservoir is formed by artificial control of Lake Pend Oreille between elevations 2062.5 and 2051.0 feet. The area of the lake at elevation 2062.5 feet is 94,600 acres with 226 miles of shoreline.

Flood History: The lowlands along Lake Pend Oreille and portions of the cities of Sandpoint and Priest River have been flooded in 1894, 1913, 1927, 1928, 1933, 1948, 1956, 1969, and 1974. The major cause of this flooding is snowmelt. The flood of record occurred in 1894, and resulted in a maximum lake stage of 2075.9 feet (which equates to 2069.3 feet with the present upstream storage regulation). Losses from that event were estimated at $50.5 million (October 2004 prices and level of development). Losses from previous flooding have included residential and commercial development in urban areas, and grain crops, pasture land and roads in rural areas around the lake.

Stage – Damage Analysis: Data on damageable property including residential, commercial, agricultural, and public properties were obtained from windshield field surveys and aerial photography analysis conducted in 1992 for the *Columbia River System Operation Review – Environmental Impact Statement*, published in November 1995. For this current analysis, loss figures were updated (from July 1992 Prices & 1995 Conditions) to October 2004 Prices and Conditions using the *Engineering News Record* building and construction cost indices, the CPI for West Urban areas, and an assumed rate of growth of 0.5 percent per year.

The lake front floodplain has changed significantly over the years from a primarily rural agricultural area to a developed area of commercial activity and primary or recreational second homes. Sandpoint and surrounding areas have experienced extraordinary residential development (single and multi-family) since the mid 1990's. Losses by lake stage, for all categories of damage, are summarized on **Table 18**. The zero dollar damage point for this reach is 2062.5 feet.

Table 18: Stage vs. Flood Damage - Pend Oreille Lake

Stage	Residential	Commercial	Agricultural	Public	Total Damages
2062.5	0	0	0	0	0
2065.0	15	10	3	9	37
2067.0	38	25	9	22	94
2069.0	84	51	20	49	204
2071.0	164	100	38	97	399

*Note: *Elevation in feet, MSL Datum. Data presented in October 2004 Prices & Conditions - $1,000*

Expected Annual Damages: Expected annual damages were derived for stage-damage data calculated for four hypothetical floods. Stage-frequency relationships, developed for the Hope gage for two alternatives (HS and HV) were used in this analysis. Details of these derivations can be found in the **Hydrology and Flood Control Section** of the EIS. Expected annual damages were derived using Corps of Engineers Hydrologic

Engineering Center computer program *Expected Annual Flood Damage Computation.* This program integrates exceedance frequency with associated losses to determine expected annual damages for a given frequency interval. **Table 19** presents a summary of expected annual damages by impact category for both alternatives. As shown in the table, total expected annual damages would be essentially the same for the two alternatives analyzed.

Table 19: Expected Annual Damages - Pend Oreille Lake

Alternative	Residential	Commercial	Agricultural	Public	Total Damages
HS	5.18	3.27	1.16	3.07	12.68
HV	5.17	3.26	1.16	3.06	12.65

Note: Data presented in October 2004 Prices & Conditions - $1,000

4.1.4 Pend Oreille (Albeni Falls Dam to Columbia River)

The area subject to flooding along the Pend Oreille River downstream of Albeni Falls Dam is located in the reach known as Calispell Flats, in the vicinity of Cusick, WA. In addition to the community of Cusick (2000 population 212, and 106 housing units), areas subject to flooding under natural conditions include about 15,000 acres of agricultural land on the west bank of the river and about 2,000 acres of the Kalispel Indian Reservation, located across the river from Cusick, on the east bank of the river. Prior to the completion of Albeni Falls Dam and other upstream storage, low levels of flood protection were provided to Cusick and the agricultural land on the west bank by locally constructed levees, which are no longer maintained.

Flood History: Historically, before the area was partially protected by local levees, portions of the Calispell Flats area were inundated by yearly high water. The flood of record occurred in 1894 and had an estimated peak discharge of 195,000 cubic feet per second at the Albeni Falls Dam site. Other major floods occurred in 1913, 1927, 1928, 1933, and 1948. Losses from previous flooding have been primarily agricultural and residential, but have also included some commercial and public property. **Table 20** presents peak discharges (at Albeni Falls Dam) for selected historical floods.

Table 20: Albeni Falls Dam Peak Discharges

Date	Lake Stage (ft)
1894	195,000
1913	139,000
1927	133,000
1928	137,000
1933	137,000
1948	171,000

Discharge – Damage Analysis: Data on damageable property including residential, commercial/ industrial, agricultural, and public were obtained from windshield field surveys and aerial photography analysis conducted in 1992 for the *Columbia River System Operation Review – Environmental Impact Statement,* published in November 1995. For this current analysis, loss figures were updated (from July 1992 Prices & 1995 Conditions) to October 2004 Prices and Conditions using the *Engineering News Record* building and construction cost indices, the CPI for West Urban areas, and an assumed rate of growth of 0.5 percent per year. Damageable property in the flood plain is believed to have changed little (except cropping patterns) since the 1992 survey was conducted. The little residential development that is believed to have occurred in the flood plain likely has been flood proofed to above the 100-year flood level due to strict local and WA State flood plain ordinances and enforcement.

Losses, by discharge, for all categories of impacts is summarized on **Table 21**. The zero dollar damage point for this reach is 85,000 c.f.s. which causes nuisance flooding in areas without levees. Substantial losses begin to occur at flows of about 120,000 c.f.s. which approximates the design levee height in the areas protected by levees.

Table 21: Discharge vs. Flood Damage - Albeni Falls to Box Canyon Dam

Discharge (cfs)	Residential	Commercial/Industrial	Agricultural	Public	Total Damages
85,000	0	0	0	0	0
120,000	436	145	1,307	290	2,178
140,000	1,307	290	3,920	581	6,098
160,000	4,211	1,016	13,358	2,178	20,763
180,000	6,098	1,597	19,021	3,049	29,765
200,000	8,131	2,033	25,700	4,065	39,929

Note: Data presented in October 2004 Prices & Conditions - $1,000

Expected Annual Damages: Expected annual damages were derived for discharge-damage data calculated for five hypothetical floods. Discharge-frequency relationships, developed for the Newport gage for two alternatives (HS and HV) were used in this analysis. Details of these derivations can be found in the **Hydrology and Flood Control Section** of the EIS. Expected annual damages were derived using Corps of Engineers Hydrologic Engineering Center computer program *Expected Annual Flood Damage Computation.* This program integrates exceedance frequency with associated losses to determine expected annual damages for a given frequency interval.

Table 22 presents a summary of expected annual damages by impact category for both alternatives. As shown in the table, implementing HV would increase total expected annual damages about $83,860, or 12 percent, over the no action alternative (HS).

Table 22: Expected Annual Damages - Albeni Falls to Box Canyon Dam

Alternative	Residential	Commercial/Industrial	Agricultural	Public	Total Damages
HS	140.05	39.50	423.81	76.18	679.54
HV	157.25	44.32	477.66	84.17	763.40

Note: Data presented in October 2004 Prices & Conditions - $1,000

4.2 Area 2 Agriculture and Irrigation

The primary categories of potential impacts to Area 2 agriculture from changes in operations at Hungry Horse Dam are changes in the energy required to pump water and resultant changes in agricultural pumping costs. The potential for impacts to Area 2 irrigators were evaluated along the Flathead River, Flathead Lake, lower Flathead River, and Pend Oreille River downstream of Albeni Falls Dam.[10]

4.2.1 Flathead River Agriculture and Irrigation

To evaluate the impacts to the power required for irrigation pumping from the Flathead River, water rights data from MT were reviewed to estimate pumped volumes for agricultural irrigation. Power requirements were estimated based upon the average monthly stage for each alternative as measured at the Columbia Falls, MT gage.

Based on review of state water rights data, annual Flathead River withdrawals for agricultural irrigation were estimated at 18,315 acre-feet. For the analysis, the total annual volume was distributed across the months of May-September as identified in **Table 2**. **Table 23** presents the estimates of pumping kilowatt-hours associated with each alternative. Compared to no-action (HS), the change in agricultural pumping power requirements with HV is less than two tenths of one percent.

Table 23. Summary of Agricultural Pumping Power Requirements, Area 2 – Flathead River at Columbia Falls

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Flathead River, Columbia Falls	May	351,100	350,100
	June	351,300	350,700
	July	952,400	952,100
	Aug	961,500	961,500
	Sep	973,400	973,400
Average Annual Power Requirement:		3,589,700	3,587,800

[10] Methodology described in Section 2.3.1.

4.2.2 Flathead Lake Agriculture and Irrigation

To evaluate the impacts to irrigation pumping from Flathead Lake, water rights data from MT were reviewed to estimate pumped volumes for agricultural irrigation. Pumping power requirements were estimated based upon the average monthly stage for each alternative.

Based on review of state water rights data, annual Flathead River withdrawals for agricultural irrigation were estimated at 1,598 acre-feet. For the analysis, the total annual volume was distributed across the months of May-September as identified in **Table 2**. **Table 24** presents the estimates of pumping kilowatt-hours associated with each alternative. Compared to no-action (HS), the change in agricultural pumping power requirements with HV is less than one tenth of one percent.

Table 24. Summary of Agricultural Pumping Power Requirements, Area 2 – Flathead Lake

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Flathead Lake	May	30,600	30,500
	June	30,100	30,100
	July	80,200	80,200
	Aug	80,100	80,100
	Sep	80,600	80,600
Average Annual Power Requirement:		301,600	301,500

4.2.3 Lower Flathead River and Lower Clark Fork Agriculture and Irrigation

To evaluate the impacts to irrigation pumping from the lower Flathead and lower Clark Forks, water rights data from MT were reviewed to estimate pumped volumes for agricultural irrigation. Pumping power requirements were estimated based upon the average monthly stage for each alternative as measured at the Flathead River; Polson, MT gage.

Based on review of state water rights data, annual lower Flathead and lower Clark Fork withdrawals for agricultural irrigation were estimated at 4,148 acre-feet. For the analysis, the total annual volume was distributed across the months of May-September as identified in **Table 2**. **Table 25** presents the estimates of pumping kilowatt-hours

associated with each alternative. Compared to no-action (HS), the change in agricultural pumping power requirements with HV is less than two tenths of one percent.

Table 25. Summary of Agricultural Pumping Power Requirements, Area 2 – Lower Flathead River, Polson MT

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Lower Flathead, Polson MT	May	80,900	80,800
	June	80,600	80,400
	July	218,100	218,000
	Aug	216,100	216,000
	Sep	220,700	220,700
Average Annual Power Requirement:		816,400	815,900

4.2.5 Pend Oreille River Agriculture and Irrigation

To evaluate the impacts to irrigation pumping from the Pend Oreille River, water rights data from ID and WA were reviewed to estimate pumped volumes for agricultural irrigation. Pumping power requirements were estimated based upon the average monthly stage for each alternative as measured at the Cusick, WA gage.

Based on the review of water rights data, annual Pend Oreille River withdrawals for agricultural irrigation were estimated at 2,139 acre-feet. For the analysis, the total annual volume was distributed across the months of May-September as identified in **Table 2**. **Table 26** presents the estimates of pumping kilowatt-hours associated with each alternative. Compared to no-action (HS), the change in agricultural pumping power requirements with HV is less than one tenth of one percent.

Table 26. Summary of Agricultural Pumping Power Requirements, Area 2 – Pend Oreille River, Albeni Falls ID to U.S-Canada Border

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Pend Oreille River, Newport WA	May	40,400	40,400
	June	40,300	40,200
	July	111,300	111,300
	Aug	113,600	113,600
	Sep	113,800	113,800
Average Annual Power Requirement:		419,400	419,300

4.3 Area 2 Municipal and Industrial Water Supply

The primary category of potential impact to M&I water supplies resulting from changes in operations at Hungry Horse Dam is associated with changes in the energy required to pump water and the resultant change in the cost of pumping. MT and WA water rights data were reviewed to estimate pumped volumes for M&I water supply from the Flathead, Clark Fork, and Pend Oreille Rivers. Pumping costs were estimated based upon the average monthly stage for each alternative as measured at Columbia Falls, Flathead Lake, and Polson gages in MT; and Cusick gage in WA.[11]

4.3.2 Flathead River Municipal and Industrial Water Supply

Based on review of state water rights data, annual Flathead River withdrawals for M&I water supply in MT were estimated at 5,136 acre-feet. For the analysis, the total annual volume was distributed across all months as identified in **Table 3**. **Table 27** presents the estimates of pumping kilowatt-hours associated with each alternative. Compared to no-action (HS), the change in M&I pumping power requirements with HV is less than one tenth of one percent.

Table 27. Summary of M&I Pumping Power Requirements, Area 2 – Flathead River at Columbia Falls

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Flathead River, Columbia Falls	Jan	71,100	71,300
	Feb	71,100	71,300
	March	81,700	81,700
	Apr	82,700	83,100
	May	88,600	88,300
	June	91,100	91,000
	July	95,100	95,100
	Aug	96,100	96,100
	Sep	92,100	92,100
	Oct	87,000	87,000
	Nov	81,800	81,800
	Dec	71,600	71,600
Average Annual Power Requirement:		1,010,000	1,010,400

[11] Methodology described in Section 2.4

4.3.3 Flathead Lake Municipal and Industrial Water Supply

Based on review of state water rights data, annual Flathead Lake withdrawals for M&I water supply in MT were estimated at 1,101 acre-feet. For the analysis, the total annual volume was distributed across all months as identified in **Table 3**. **Table 28** presents the estimates of pumping kilowatt-hours associated with each alternative. No change in M&I pumping requirements was identified between no-action (HS) and HV.

Table 28. Summary of M&I Pumping Power Requirements, Area 2 – Flathead Lake

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Flathead Lake	Jan	15,100	15,100
	Feb	15,300	15,300
	March	17,600	17,600
	Apr	17,800	17,900
	May	19,000	18,900
	June	19,200	19,200
	July	19,700	19,700
	Aug	19,700	19,700
	Sep	18,700	18,700
	Oct	17,800	17,800
	Nov	16,900	16,900
	Dec	15,000	15,000
Average Annual Power Requirement:		211,800	211,800

4.3.4 Lower Flathead River / Lower Clark Fork Municipal and Industrial Water Supply

Based on review of state water rights data, annual lower Flathead River and lower Clark Fork withdrawals for M&I water supply were estimated at 3,856 acre-feet. For the analysis, the total annual volume was distributed across all months as identified in **Table 3**. **Table 29** presents the estimates of pumping kilowatt-hours associated with each alternative. Compared to no-action (HS), the change in M&I pumping power requirements with HV is less than one half of one percent.

Table 29. Summary of M&I Pumping Power Requirements, Area 2 – Lower Flathead River, Polson MT

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Lower Flathead, Polson MT	Jan	53,800	52,400
	Feb	53,800	52,500
	March	60,500	60,500
	Apr	61,600	62,000
	May	67,700	67,600
	June	69,300	69,100
	July	72,200	72,200
	Aug	71,600	71,500
	Sep	69,200	69,200
	Oct	65,200	65,200
	Nov	61,100	61,100
	Dec	52,800	52,700
Average Annual Power Requirement:		758,800	756,000

4.3.5 Pend Oreille River Municipal and Industrial Water Supply

Based on review of water rights data, annual pumped withdrawals from the Pend Oreille River (between Albeni Falls Dam in ID to the U.S/Canadian Border in WA) for M&I water supply were estimated at 1,656 acre-feet. For the analysis, the total annual volume was distributed across all months as identified in **Table 3**. **Table 30** presents the estimates of pumping kilowatt-hours associated with each alternative. No change in M&I pumping requirements was identified between no-action (HS) and HV.

Table 30. Summary of M&I Pumping Power Requirements, Area 2 – Pend Oreille River, Albeni Falls ID to U.S-Canada Border

Location	Month	Pumping Power Requirement (kW-hr)	
		HS (No-Action)	HV
Pend Oreille, Newport WA	Jan	23,000	23,000
	Feb	22,900	23,000
	March	26,200	26,200
	Apr	26,700	26,700
	May	28,200	28,200
	June	28,900	28,800
	July	30,700	30,700
	Aug	31,300	31,300
	Sep	29,700	29,700
	Oct	27,900	27,900
	Nov	26,200	26,200
	Dec	23,000	23,000
Average Annual Power Requirement:		324,700	324,700

4.4 Area 2 Employment and Income

4.4.1 Employment and Income Effects of Flood Control Impacts

Columbia Falls to Flathead Lake: No employment and income effects would be expected from flood control impacts of different alternatives in the Columbia Falls to Flathead Lake reach of Area 2. HS (no-action) and HV were estimated to provide the same level of flood protection as measured by expected annual damages.

Flathead Lake: Slight negative employment and income effects could be expected from flood control impacts of different alternatives in the Flathead Lake portion of Area 2. HV would result in a 4.2% increase in expected annual damages over HS (no-action). Employment and income effects could be witnessed by the commercial and agricultural sectors in this reach that show increases in expected annual damages (**Table 17**).

Lake Pend Oreille: No employment and income effects would be expected from flood control impacts of different alternatives in the Lake Pend Oreille area of Area 2. HS (no-action) and HV were estimated to provide approximately the same level of flood protection as measured by expected annual damages.

Pend Oreille River: Slight negative employment and income effects could be expected from flood control impacts of different alternatives in the Pend Oreille River reach of Area 2. HV would result in an 12% increase in expected annual damages over HS (no-action) in this reach. Employment and income effects could be witnessed by the

commercial/industrial and agricultural sectors in this reach that show increases in expected annual damages (**Table 22**).

4.4.2 Employment and Income Effects of Agriculture and Irrigation Impacts

No employment and income effects would be expected in Area 2 from changes in agricultural irrigation pumping costs associated with different alternatives . All alternatives being considered for implementation were estimated to result in similar pumping costs. Changes in cost from HS (no-action) and HV would be less than 1% in all reaches evaluated except for the lower Flathead River as evaluated at the Polson, MT gage, where the change would be 1.6%.

4.4.3 Employment and Income Effects of Municipal and Industrial Water Supply Impacts

No employment and income effects would be expected in Area 2 from changes in M&I water supply pumping costs associated with alternative alternatives. All alternatives being considered for implementation were estimated to result in similar pumping costs. Changes in cost from HS (no-action) and HV would be less than 1% in all reaches evaluated.

4.4.4 Employment and Income Effects of Recreation Impacts

Operational changes that affect recreation opportunities and visitation can have employment and income effects on regional communities. **Section 3.5.4** described how spending associated with recreational visitation supports local economies, including hotels and motels, paid camping areas, grocery stores, restaurants, auto and RV services, boating supplies and services, fishing and hunting guides and supplies, and entertainment services. Effects of identified recreation impacts on regional employment and income are described below for applicable Area 2 study reaches.

Hungry Horse Reservoir: Recreational analysis of Hungry Horse Reservoir identified a slight increase in usable boat ramp days at the lake (+4%, or 43 additional usable ramp days) under HV. The increased recreational opportunity could result in increased boating visitation and associated regional spending.

Flathead River: The optimal range of Flathead River flows for fishing were identified as between 4,000 and 17,000 cfs. HV would result in an average of 4 less days in this range per summer (May to September), a 5% decrease. This slight decrease would not be expected to have a significant effect on regional income and employment in Area 2.

Flathead Lake: Recreational analysis of Flathead Lake identified a very slight (less than 1%) increase in usable boat ramp days at Flathead Lake. This slight increase in recreational opportunity at the lake would not be expected to have a significant impact on regional income and employment.

Lower Flathead River: Recreational analysis for the lower Flathead River and lower Clark Fork identified a decrease in average kayaking days per month at Buffalo Rapids with HV. The decrease would be four days over the summer months of May to September (-7%). The analysis also showed a very slight decrease (-2%) in days within the identified optimal flow range for fishing of 4,000-17,000 cfs. It is not expected that these minor changes in recreational opportunity would have a substantive impact on regional income and employment in Area 2.

Lake Pend Oreille: Recreational analysis of Lake Pend Oreille identified no recreational impacts that would be expected to result in changes to regional income and employment.

4.4.5 Employment and Income Effects of Hydropower Impacts

The potential for employment and income effects of hydropower impacts are discussed in **Section 3.5.5** of this report.

4.5 Area 2 Tribal Socioeconomics

Native American Tribes with socioeconomic interests/development adjacent to affected rivers and reservoirs within Area 2 are the Confederated Salish and Kootenai Tribes of the Flathead Reservations (CSKT) and the Kalispel Tribe of the Kalispel Indian Reservation.

The CSKT are located on the southern half of Flathead Lake and along the Flathead River from Poulson, MT to Paradise, MT. CSKT businesses and facilities that could be affected by changed flows and water surface elevations include marinas, boat ramps, water intakes, and hydroelectric power generation at Kerr Dam. The **Recreation Impact Section** of the EIS shows slight increases in function of boating facilities with HV as compared to HS (no-action). **Sections 4.2.2 and 4.3.3** of this report identified a slight decrease in expected power requirements for agricultural and M&I water pumping from the Lake with HV as compared to HS. No employment and income effects are expected associated with these slight changes. A portion of Kerr Dam hydroelectric power generation revenue goes to the CSKT. Impacts to hydroelectric power generation at Kerr Dam is documented in the **Hydropower Section** of the EIS and in Appendix J. **Section 4.1.2** documents findings of flood control studies that show an approximate 4% increase in expected annual damages along the Flathead Lake shoreline.

The Kalispel Indian Reservation is located along both banks of the Pend Oreille River near Cusick, WA. The tribe operates a boat ramp on the river and is interested in future

development including a marina and additional boat ramp. No impacts to use of boat ramps were identified in the reach. Additionally, no alternatives would be expected to preclude the identified future development of a marina or additional boat ramp. Flood control analysis in the vicinity of the Kalispel Indian Reservation is documented in **Section 4.1.4** of this report. **Table 20** presents a summary of expected annual damages by impact category for both alternatives. As shown in the table, implementing HV would increase total expected annual damages about $83,860, or 12 percent, over HS. As identified in **Section 4.4.1** of this report, slight negative employment and income effects could be expected from the flood control impacts with HV in this Pend Oreille River reach of Area 2. Employment and income effects could include lost income due to increased agricultural flooding.

5.0 Area 3 – Mainstem Columbia River

5.1 Area 3 Flood Control

The Columbia River Treaty Flood Control Plan (FCOP) provides the basis for the current Columbia River system flood control operation. The Columbia River at The Dalles, in OR, is used as the main system control point in the FCOP. The exceedance flow at The Dalles for initiation of minimal flood impacts is 450,000 cfs. The exceedance flow for major flood impact is 750,000 cfs. Changes in flow at The Dalles with the different alternative/benchmark combinations were evaluated. Expected annual damages were not calculated in Area 3 based upon findings of the hydrologic and hydraulic (H&H) studies that indicated no significant flood control impacts in Area 3 from the alternative combinations evaluated. The H&H analysis is documented in the **Hydrology and Flood Control Section** of the EIS. Conclusions of the H&H studies included the following: [12]

- The LV+HV benchmark operation at Libby and Hungry Horse Projects would cause a small change in flow at The Dalles during the winter drawdown and spring runoff season. During the spring runoff, LV+HV would add less than 10,000 cfs, on average, to the flow at The Dalles for duration of flow between one and 120 days with LS+HS. Libby would provide about 60 percent of the extra flow while Hungry Horse would provide 40 percent.
- The chance of a flood level flow of 450,000 cfs at The Dalles, OR (exceedance flow for minimal flood impacts) would increase from 40 percent for LS+HS to 43 percent for LV+HV. The frequency curves converge in the neighborhood of one-percent exceedance.
- Peak 1-day discharges at The Dalles would increase for nine of the ten study years evaluated, and decrease for the remaining year with LV1+HV compared to LS1+HS. The average absolute difference would be about 1.6 percent. Peak 1-day discharges at The Dalles would increase for all ten years with LV2+HV compared to LS2+HV. The average absolute difference would be about 1.4 percent.
- There would be minimal difference at The Dalles with LV1+HV when compared to LS1+HS, and also with LV2+HV when compared to LS2+HV. For the 0.5%-chance-exceedance event, however, LV1+HV and LV2+HV would increase the discharge at The Dalles by 21,000 cfs.

In addition to the analysis of flows at The Dalles, an analysis of changes in frequency of flood stages for the Vancouver, WA/Portland, OR area was performed. Results include:

[12] Since flood control operations superseded fish flow operations if they were in conflict, the frequencies of exceeding the flood flow threshold at The Dalles for Standard FC Alternative Combinations LS1+HS and LS2+HS, would be no greater than those described for Benchmark Combination LS+HS, and those for VARQ FC Alternative Combinations LV1+HV and LV2+HV would be no greater than those for Benchmark Combination LV+HV.

- The impact to flooding in the Portland/Vancouver harbor from LV+HV would average about 0.2 ft in peak stage for the 1929-1989 hydro-regulations modeled. The chance that a stage of 16 ft (flood stage) would be equaled or exceeded in a given year increases from 44 percent with LS+HS to 46 percent with LV+HV. The modeled frequency curves converge as exceedance levels approach five percent.
- Peak 1-day elevations at Vancouver would increase for nine of ten study years, and decrease for the remaining year, with LV1+HV compared to LS1+HS. The average absolute difference for all values would be about 0.3 ft.

5.2 Area 3 Navigation

There are two ferries on Lake Roosevelt, the Keller Ferry and the Inchelium Ferry which operate throughout the year. The Washington Department of Transportation (WDOT) operates the Keller Ferry, and the Confederated Tribes of the Colville Indian Reservation operates the Inchelium Ferry. The lowest operating levels for the ferries are 1208 feet and 1225 feet, respectively. No impact was observed when the modeled alternative/benchmark combinations were compared to the operating range of the ferries. Impacts to navigation on the lower Columbia River are not expected.

5.3 Area 3 Agriculture and Irrigation

The predominate source of water for irrigation uses in the potentially affected portion of Area 3 is provided by the Columbia Basin Project, operated by the Bureau of Reclamation. The Columbia Basin Project is a multipurpose development utilizing a portion of the resources of the Columbia River in the central part of the State of WA. The key structure, Grand Coulee Dam, is on the main stem of the Columbia River about 90 miles west of Spokane, WA. The extensive irrigation works extend southward on the Columbia Plateau 125 miles to the vicinity of Pasco, WA, where the Snake and Columbia Rivers join.

The widely distributed irrigation works that extend southward from the Grand Coulee Pump- Generating Plant begin with the 16-mile feeder canal which carries water to Banks Lake, the equalizing reservoir. This 27-mile-long reservoir occupies the floor of the upper Grand Coulee between North Dam near the town of Coulee Dam, WA, and Dry Falls Dam near Coulee City. The project irrigation facilities were planned to deliver a full water supply to about 1.1 million acres of land previously used only for dry farming or grazing. About 671,000 acres are currently irrigated and further development is not anticipated. Power production facilities at Grand Coulee Dam are among the largest in the world; the total name plate generating capacity is rated at 6,809 megawatts.

Because of the linkage of Columbia Basin Project irrigation to the power costs associated with pumping from Lake Roosevelt, the impact analysis for Area 3 irrigation is provided in the **Hydropower Section** of the EIS.

5.4 Area 3 Municipal and Industrial Water Supply

No impacts were identified for M&I pumping costs in Area 3.

5.5 Area 3 Employment and Income

The potential for employment and income effects of hydropower impacts are discussed in **Section 3.5.5** of this report. No additional impacts were identified from the implementation of the different alternative/benchmark combinations in Area 3 that would be expected to affect regional employment and/or income.

5.6 Area 3 Tribal Socioeconomics

The socioeconomic affected environmental report focused the identification of Area 3 Tribal socioeconomic resources to those of the Confederated Tribes of the Coleville Reservation and the Spokane Indian Reservation.

The Coleville Indian Reservation is located along the west bank of the Columbia River and Lake Roosevelt. The Tribe owns and operates or leases a number of boat ramps and docks, a campground, two marinas, the Inchelium Ferry, and a number of water intakes. No impacts to the operation of these facilities or to employment and income in this reach was identified with any combinations as compared to HS + LS1 (no-action).

The Spokane Indian Reservation is located on the east bank of Lake Roosevelt and the north bank of the Spokane River. A boat ramp, marina, and 11 campgrounds on Lake Roosevelt are located on tribal lands adjacent to Lake Roosevelt; the remainder of the shoreline is fairly undeveloped, although there are a number of undeveloped fishing access locations. No impacts to the operation of these facilities or to employment and income in this reach was identified with any combinations as compared to HS + LS1 (no-action).